Information Services Activities, April 2018 to March 2019

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The Information Services group is responsible for developing and maintaining the Geoscience and Mines Branch (GMB) Geographic Information System and associated databases, the NovaScan publications and maps database, for supplying digital data and services to clients and staff, and for developing and maintaining the GMB Internet website. Permanent Information Services staff consists of Jeff Poole (supervisor), Jeff McKinnon (geologist/GIS specialist), Angie Barras (GIS specialist/ cartographer), Courtney MacMullen (geologist/GIS specialist), Sonya Cowper (GIS and map server specialist), and Susan Saunders (web/ desktop publishing technician). Diane Webber is the manager for the group. Susan Saunders retired in August 2018 and Sonya Cowper returned from maternity leave in January 2019.

Digital Geoscience Data Products

A collection of digital geology maps, databases, and images of Nova Scotia (in Esri shapefiles, ArcGIS file geodatabase, KML/KMZ, DXF, ARC export, TIFF, JPEG, and MrSID formats in a UTM projection using the NAD83 datum, and in PDF format) has been developed, and is available for viewing or free download from the GMB website (https://novascotia.ca/natr/meb/download/gis-data.asp). ArcGIS file geodatabase and Esri shapefiles are now our main data distribution formats. We are no longer producing the ARC E00 export and DXF formats. A licence agreement is issued with all digital data sets. This agreement allows unrestricted use of the data with the understanding that the Nova Scotia Department of Energy and Mines remains the owner of the data and is not transferring copyright to the user. Several of our datasets are also available through the Nova Scotia Government's Open Data Portal (https://data.novascotia.ca/).

GIS Development

Information Services GIS staff worked together with other GMB staff on numerous projects in 2018-2019. This included providing advice and assistance as requested, along with developing databases and maps for the projects outlined below.

Valley Aggregate Project: The Valley Aggregate dataset contains more than 9,000 aggregate site observations that are linked to 9,340 photos, 972 sample analyses, and site descriptions. Work was done in finalizing the digital dataset. Release of these data, along with the publication of a preliminary online interactive map application for stone resource potential in western Nova Scotia is anticipated for early in the next fiscal year. This application will provide valuable information to the stone resource industry, public works agencies, and others looking for sources of materials to make stone-based products.

Antigonish Highlands Mapping: Section staff worked with Chris White to produce a 1:75 000 scale bedrock geology map of the Antigonish Highlands and an accompanying digital product. The geology includes new work from a block in the Antigonish Highlands as well as some legacy compilation data. Open File Map ME 2018-001 was released in January 2018 (Fig. 1) and Digital Product ME 479 was released in April 2018.

Parrsboro Map Project: Information Services staff provided GIS support to John Calder while he compiled data for outcrop and fossil locations from Black Rock to Moose River in the Parrsboro region of Cumberland County. Data were collected by Dr. Calder over several years and compiled by GIS staff. Open File Map ME 2019-001 (Fig. 2) was released in March 2019 and Digital Product ME 492 will be released in the spring of 2019.

Poole, J. C., McKinnon, J. S., Barras, A. L., MacMullen, C. C., Cowper, S. L. and Saunders, J. S. 2019: *in* Geoscience and Mines Branch, Report of Activities 2018-2019; Nova Scotia Department of Energy and Mines, Report ME 2019-002, p. 53-62.

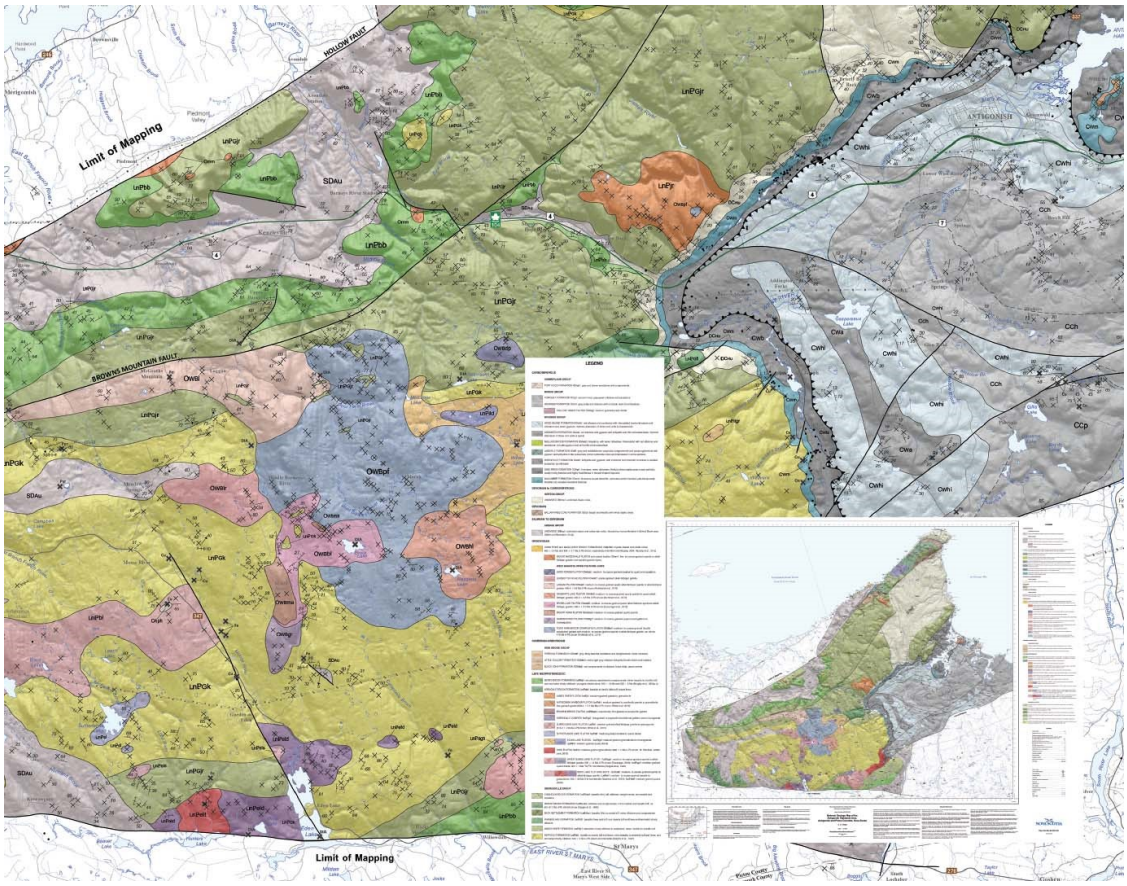

Figure 1. Open File Map ME 2018-001 of the Antigonish Highlands was selected and featured in the 2019 Esri Canada calendar.

Cobequid Highlands Project: Last year, work in the Cobequid Highlands focused on the Warwick Mountain area. This year Information Services staff worked with geologists Trevor MacHattie, Denise Brushett, Geoff Baldwin, Kevin Neyedley, and Chris White on the ongoing compilation of data in the broader Cobequid Highlands project area from Mount Thom to Cape Chignecto. This includes geochemical data from stream sediment, till, and rock samples; the results of bedrock mapping, including structural data; geochronological data; and photographs. These data will be released as reports, maps, and digital products.

GIS Support to Field Staff: The GIS staff provided support to the field geologists in the Branch throughout the year. The group ensures that data are shared readily among branch staff and provides general GIS support and advice as required. This support ranges from simply creating and printing field maps to acquiring and/or processing digital data for staff. These data generally include satellite imagery, digital orthophotos, and lidar. The GIS group encourages and helps staff to capture their field data digitally using mobile data collection applications such as Collector and Survey123 for ArcGIS.

Some of the projects GIS staff have worked on this year are

- Denise Brushett: till sampling
- Geoff Baldwin: biogeochemical sampling
- Amy Tizzard: processing survey and lidar data on the Oxford sinkhole.

Eastern Shore Project: The GIS staff supported Chris White's work along the eastern shore of Halifax and Guysborough counties by assisting with the compilation of geological data and by creating 1:10 000 scale field maps that include base layers and SPOT satellite imagery. The group also downloaded and processed lidar imagery in the area provided by GeoNova.

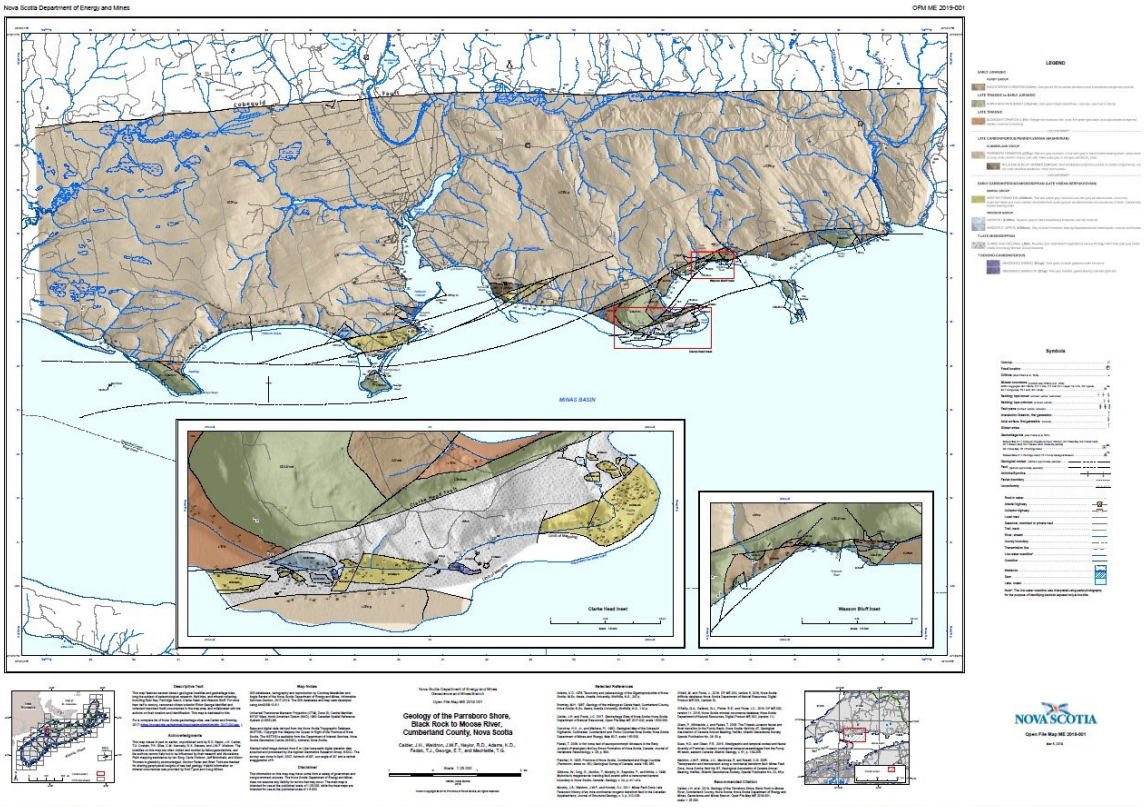

Figure 2. Open File Map ME 2019-001 Geology of the Parrsboro Shore, Black Rock to Moose River, Cumberland County, Nova Scotia.

Geophysical, Geochemical and Lidar Data Releases: The GIS group processed and released a number of geophysical, geochemical, and lidar datasets last year, including

- Lidar DEM and Shaded Relief Images for the Warwick Mountain Area, Eastern Cobequid Highlands (Digital Product ME 507)
- Magnetic and Radiometric Surveys for the Warwick Mountain Area, Eastern Cobequid Highlands (Digital Product ME 508)
- Ground Gravity Survey, Cobequid-Chedabucto Fault Zone, Northern mainland, Nova Scotia (Digital Product ME 509)
- Airborne Radiometric Images for the Province of Nova Scotia (DP ME 163)
- Sampling of Soils for Background Substances in Urban Areas of the Halifax Regional Municipality (Digital Product ME 514)

Provincial Bedrock Geology Map: GIS staff are working to create a new provincial bedrock geology map. The goal is to compile and integrate the best and most up-to-date bedrock geological mapping for Nova Scotia and thus create a single, seamless digital dataset. This involves compiling recent mapping projects as well as legacy data from a variety of sources. This project is intended to update our current provincial bedrock map and corresponding databases, which were published in 2000. We are also working with our colleagues in the New Brunswick Geological Survey and the Atlantic Geoscience Society to produce a new geological highway map for the region in 2022.

Process Improvement: Staff have been working on a Workflow Process Improvement Project. This initiative, led by Policy and Planning staff of the former Department of Natural Resources, looked to review and improve our current process of collecting, creating, and compiling data, which are ultimately published. The goal was to make our current processes faster and more efficient, while ensuring that the quality and format of published products are current and useful to our clients. The "GIS Process Improvement" summary report was completed in late 2018 and presented to management in early 2019. The report has two key components: 1) flow diagrams that illustrate the current GIS workflow and the future, more

efficient work-flow, and 2) detailed recommendations to achieve the improved work-flow. Staff are currently implementing the recommendations in the report and will continue to do so over the next several years.

Geoparks: GIS staff continued to work with John Calder for the Cliffs of Fundy aspiring Geopark nomination. Two thematic maps of the nomination area, produced at a scale of 1:100 000, were created in the fall of 2018. These maps were used in the nomination package submitted first to the Canadian National Committee for Geoparks and Canadian Commission for UNESCO, and ultimately to UNESCO.

Karst Risk Project: Work continued with geological staff on the development of a karst risk dataset and an online interactive map. Areas of karst risk, based on 1:50 000 scale bedrock geology maps in the province, have been compiled into a database and ranked according to levels of potential karst risk. A database of mapped karst occurrences in the province has also been compiled. An online interactive map (https://fletcher.novascotia.ca/DNRViewer/?viewer=karst) and Digital Product ME 494 were released February 2019.

Registry of Mineral and Petroleum Titles Database/NovaROC: Staff made updates to several geospatial layers that will be incorporated into the next update of the NovaROC application. Staff also worked with registry staff to maintain the GIS digital product (Digtal Product ME 493) Nova Scotia Mineral Rights Database (NovaROC). The product is normally updated daily and released at 2:00 AM. (https://novascotia.ca/natr/meb/download/dp493.asp).

Nova Scotia Gypsum Rights: In June 2018 GIS staff assisted staff of the Mineral Management Division to compile an online map (Fig. 3) and digital product indicating land and gypsum rights held by companies that have an interest in gypsum mining. These products will help support and facilitate responsible gypsum resource development in Nova Scotia. Links to the information about gypsum rights, the online map, and the digital product can be found at https://novascotia.ca/natr/meb/download/dp515.asp.

GeoNova and Government IT Initiatives: In 2018 GIS staff of the GMB, other branches of the former Department of Natural Resources (DNR, Now Lands and Forestry), and GeoNova were

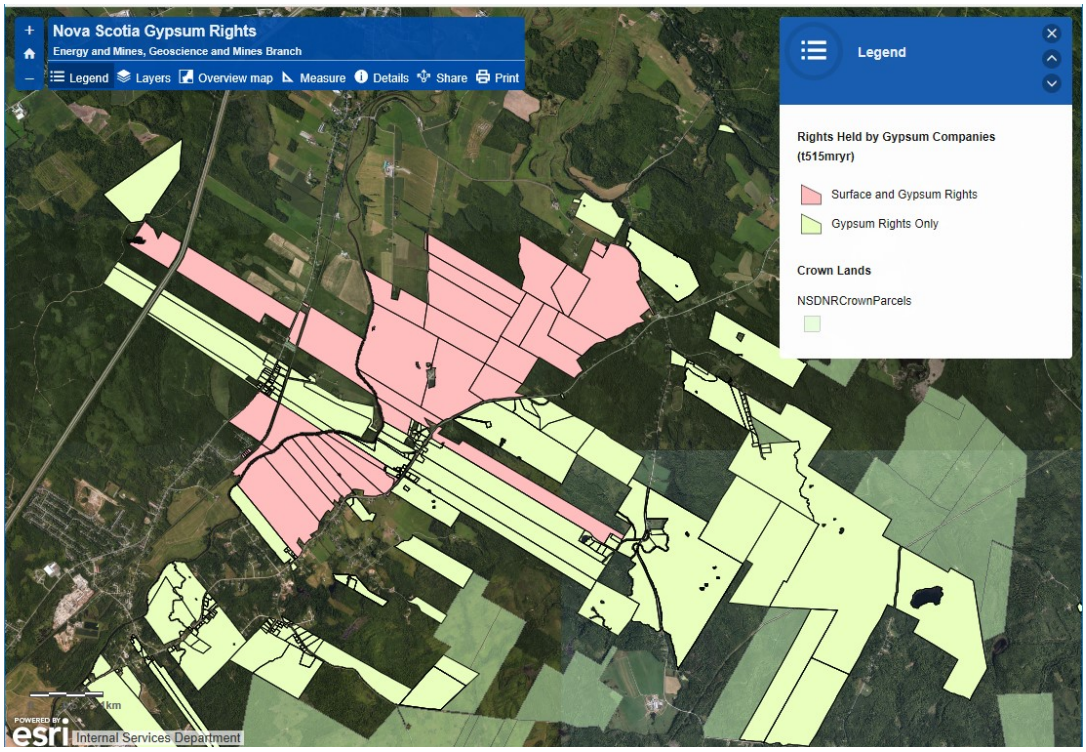

Figure 3. An example of the Nova Scotia Gypsum Rights web map application.

involved with the testing of the latest versions of ArcGIS Desktop 10.51 and ArcGIS Pro 2.x. At the same time, there was a government-wide plan to move all computer systems to the Windows 10 operating system, and GMB GIS staff were involved with a testing group for DNR. GMB GIS staff were also involved in government-wide discussions with GeoNova on ArcGIS Portal, the latest map server technology for delivering maps, data, and applications to clients and the public on the Internet.

Internet Map Server Applications

The section continues to maintain three primary public Internet Map Server (IMS) interactive map applications: the Geoscience Atlas, the Groundwater Atlas, and the Mineral Resource Land-Use Atlas. All the applications are built using ArcGIS Server and Geocortex and have a common 'look and feel.' These applications all use HTML5, which makes them compatible with most browsers on many devices, such as PC's, laptops, tablets, and handhelds.

The Geoscience Atlas application (Fig. 4) provides the public with a single geographic compilation of geoscience maps, databases, and images. The application displays a number of different layers from previously released digital products. Mineral occurrences, drillholes, and abandoned mines openings are present along with the provincial bedrock geology map and shaded relief imagery. Mineral rights information is available in the application through a connection to NovaROC and is up-to-the-minute in its currency. We also added private property and Crown land layers to the application in 2016. Layers were updated as required and included the Abandoned Mine Openings layer in July 2017. The URL link to the Geoscience Atlas application is https://fletcher.novascotia.ca/DNRViewer/?viewer=Geoscience.

The purpose of the Groundwater Atlas application (Fig. 5) is to provide the public with an interactive map application containing layers of spatially referenced maps, databases, grids, and images of interest to hydrogeologists, particularly those interested in the hydrogeological properties associated with the identified groundwater regions. Private property and wetlands layers were added to the application in 2016. There were updates to a number of layers in this application this year. The month and year are indicated at the end of many layer names to indicate their currency. The URL link to the Groundwater Atlas application is https://fletcher.novascotia.ca/DNRViewer/?viewer=Groundwater.

The main purpose of the Mineral Resource Land-Use Atlas (MRLU) interactive map application is to provide the public with a single geographic compilation of mineral resource and related land-use information at a reasonably detailed scale of 1:50 000. A key objective is to create a useful reference for practitioners working in land-use and environmental planning, geotechnical firms, and groups involved in community economic development. The MRLU displays the location and distribution of mineral and energy resources, activities related to these resources, and aspects of environmental geology that relate to land-use and environmental planning. Special land-use designations on Crown and some privately owned land are shown to indicate how Nova Scotia's land-base varies regarding the ability of mineral resource interests to access land and hold secure tenure. A major update of several protected land layers was made in the fall of 2016. The URL link to the Mineral Resource Land-Use Atlas application is https://fletcher.novascotia.ca/DNRViewer/?viewer=MRLU.

The GIS group also maintains a number of simple but more focused applications for the Branch that use ArcGIS Server technology. These applications are HTML5 Geocortex applications. These are the Potential for Radon in Indoor Air application (https://fletcher.novascotia.ca/DNRViewer/?viewer=Radon), the Bedrock Acid Rock Drainage Potential for Southwestern Nova Scotia application (https://fletcher.novascotia.ca/DNRViewer/?viewer=ARD), and the Southwest Nova Bedrock Map application (https://fletcher.novascotia.ca/DNRViewer/?viewer=SouthWestNova). In 2017 the Arsenic Risk in Bedrock Water Wells application was added to the website (https://fletcher.novascotia.ca/DNRViewer/?viewer=As_Risk_Wells). The Potential Impact of Drought to Private Wells application was updated over the summer and fall of 2018 (https://fletcher.novascotia.ca/DNRViewer/?viewer=DroughtIndex). New this year is the Karst Risk Map application (https://fletcher.novascotia.ca/DNRViewer/?viewer=Karst).

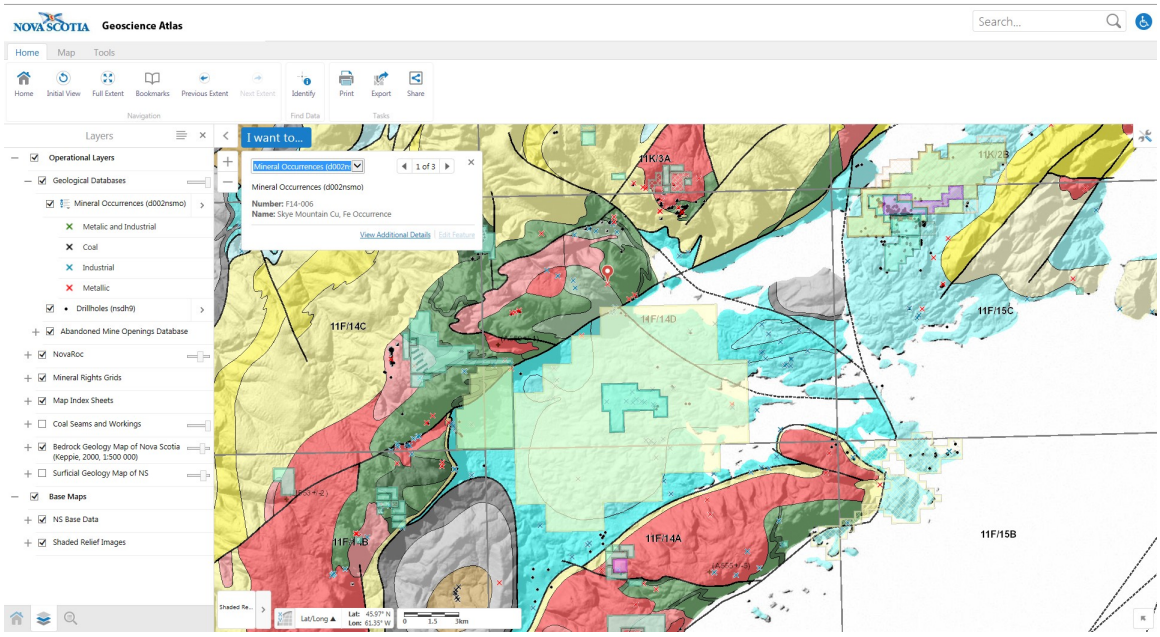

Figure 4. An example of the Geoscience Atlas application with shaded relief imagery turned on, transparency adjusted for the bedrock geology, NovaROC mineral rights layers turned on, and a mineral occurrence selected.

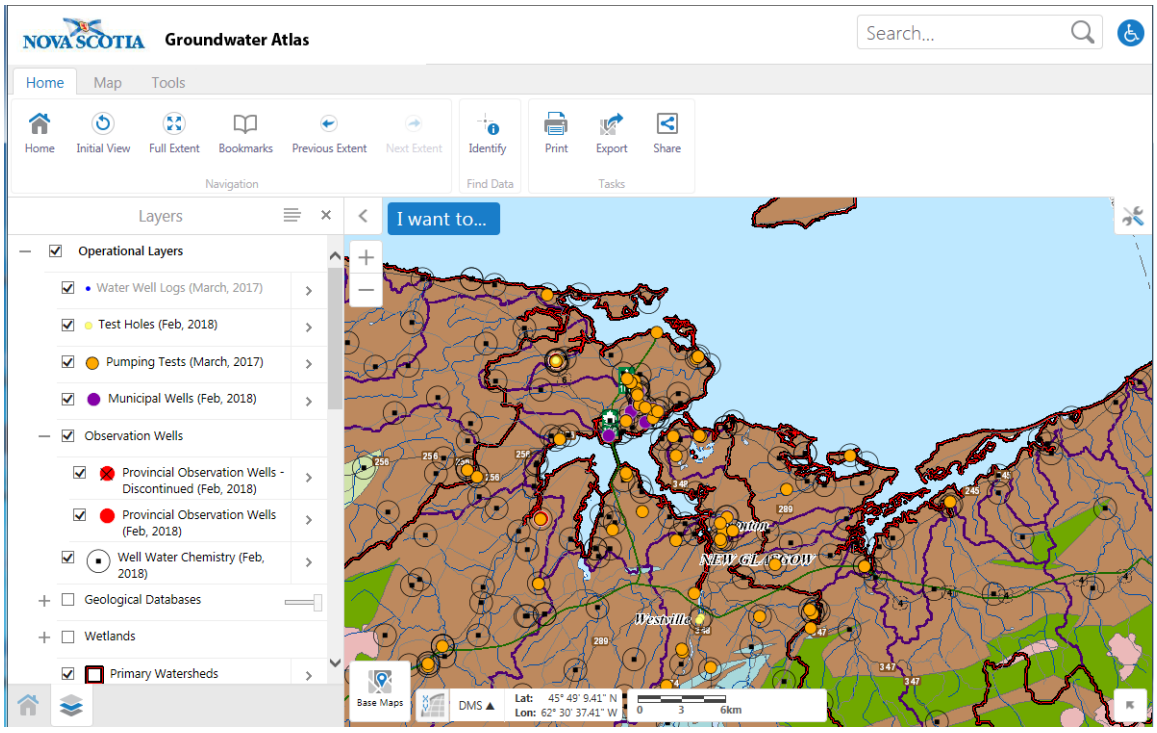

Figure 5. An example of the Groundwater Atlas application zoomed into the New Glasgow area.

The Potential for Radon in Indoor Air application (Fig. 6) was developed to show areas in the province where people are more likely to be exposed to hazardous radon in indoor air. This application has an address and postal code search capability to help users find their home on the map. It provides a simple high-, medium-, and low-risk ranking scheme but emphasizes that the only way to know for sure how much radon is in your home is to test for it no matter where you live.

The Bedrock Acid Rock Drainage Potential for Southwest Nova Scotia application shows the potential of bedrock to generate acid rock drainage (ARD) if it is physically disturbed or exposed. This map uses a simple high, moderate, and low ranking scheme to inform landowners and planners about the hazards of ARD if they plan to excavate to bedrock in a given area.

The Southwest Nova Bedrock Map application is an interactive map showing the compilation of geological data in southwestern Nova Scotia by Chris White (https://novascotia.ca/natr/meb/geoscience-online/sw_nova_about.asp). It shows many map layers, including bedrock geological units, geological contacts, age dates, anticlines/synclines, drillholes, dykes, faults, fossils, bedrock geological units, geological contacts, gold districts, mines, mineral occurrences, outcrops, quarries, shafts, stockworks, structural data, and shear zones.

The Arsenic Risk in Bedrock Water Wells application (Fig. 7) was developed to show areas of Nova Scotia where there is a relative high, medium, or low risk of arsenic in bedrock water wells. It is emphasized that testing your well is the only way to find out whether arsenic is a concern in your well no matter where you live.

The Potential Impact of Drought to Private Wells application (Fig. 8) was developed to show areas of Nova Scotia where private-well owners are more likely to experience water shortages (especially owners of shallow wells) if drought conditions develop in the summer and fall of a given year. The application presents a new map every month in the summer and early fall and currently maintains an archive of past maps for the summer and fall of 2016, 2017, and 2018.

The Karst Risk Map Application (Fig. 9) was developed to show areas of Nova Scotia where there is a relatively high, medium, or low risk of encountering karst and naturally occurring sinkholes caused by soluble bedrock. For more

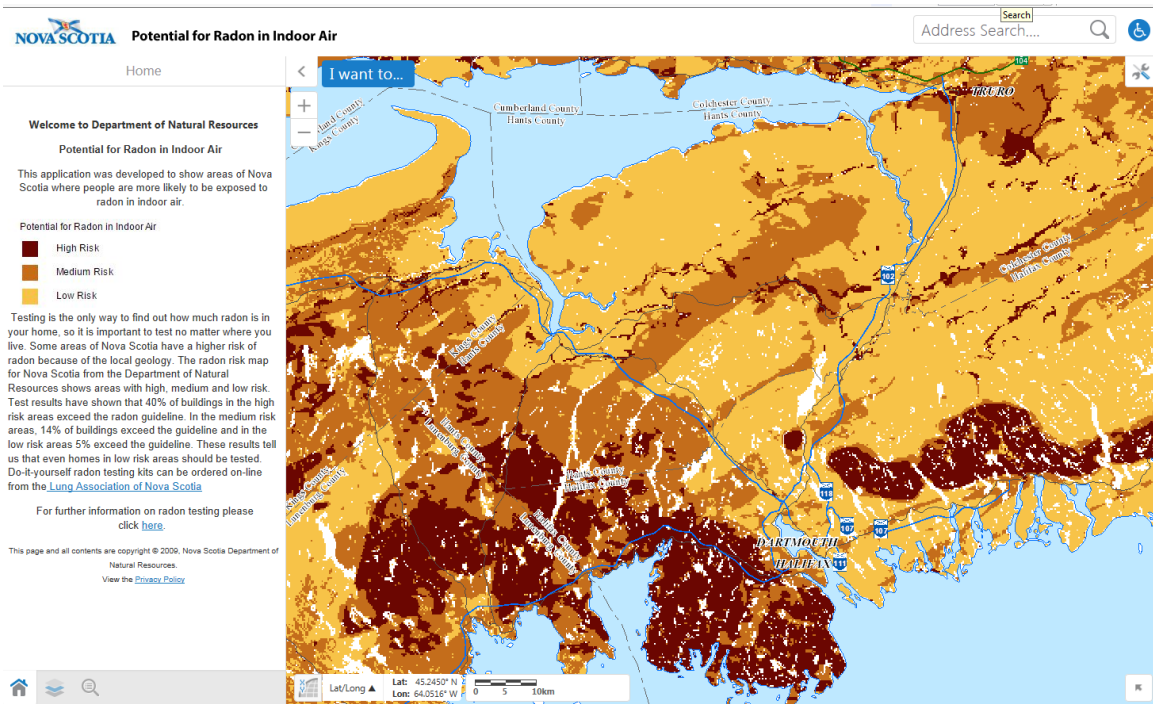

Figure 6. An example of Potential for Radon in Indoor Air application zoomed into central Nova Scotia. Address searches are possible with this application by typing in an address or postal code in the box in the upper right of the application.

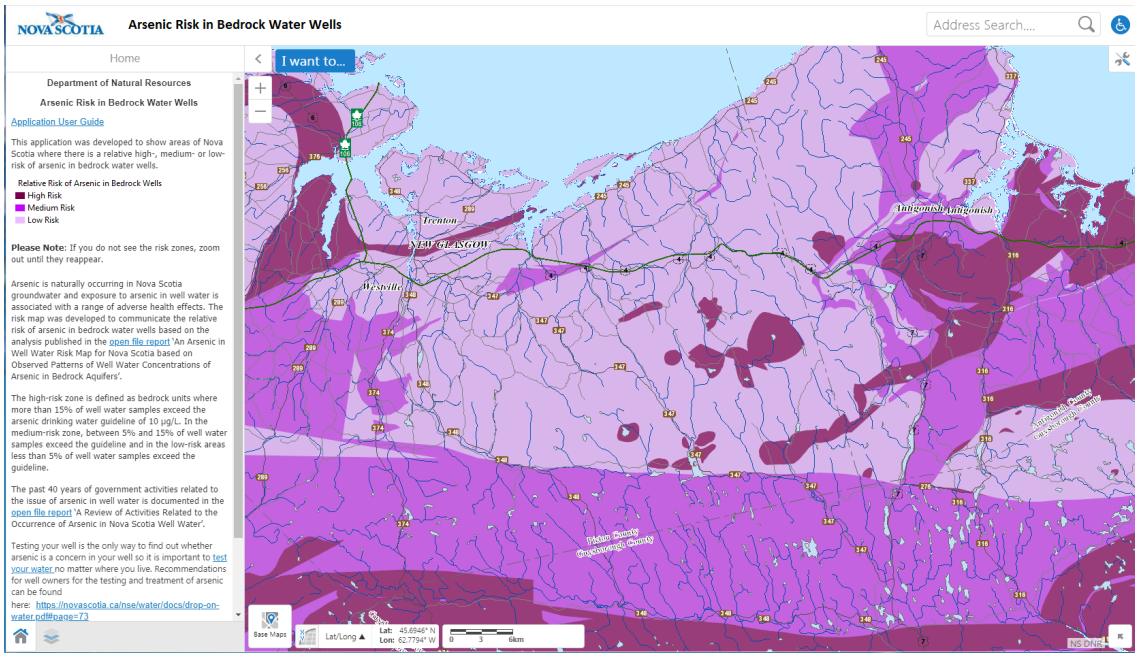

Figure 7. An example of Arsenic Risk in Bedrock Water Wells application zoomed into central Nova Scotia.

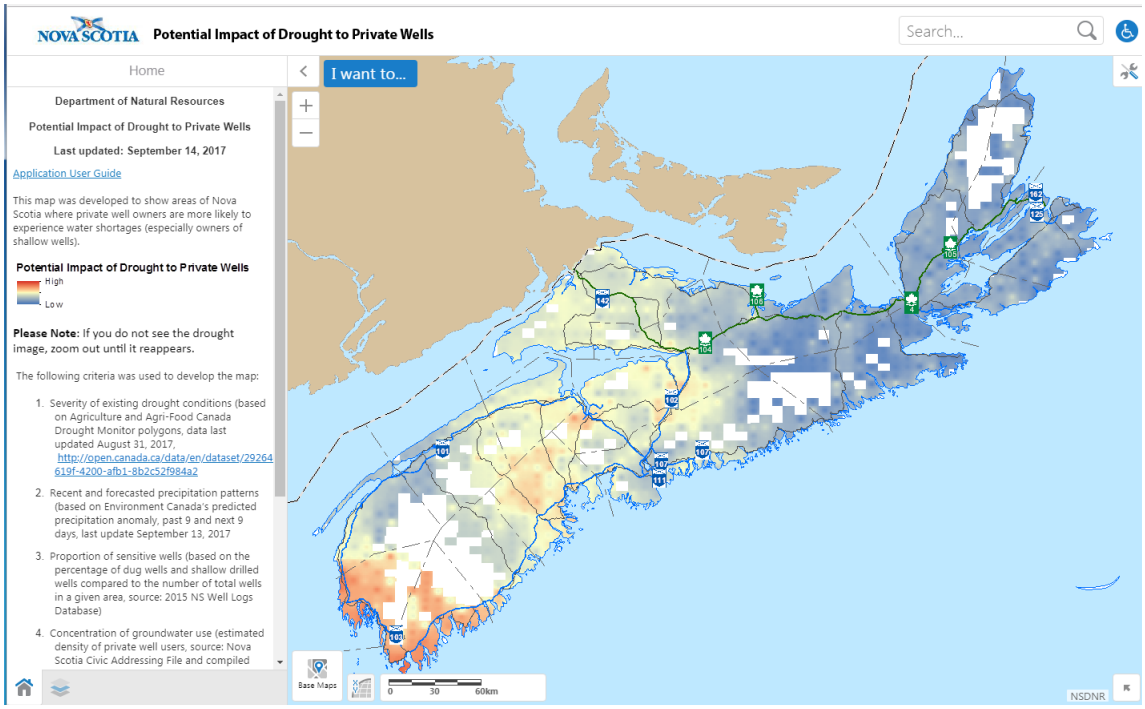

Figure 8. An example of the Potential Impact of Drought to Private Wells application. The map in this example shows an archived image from September 2016, a particularly dry month.

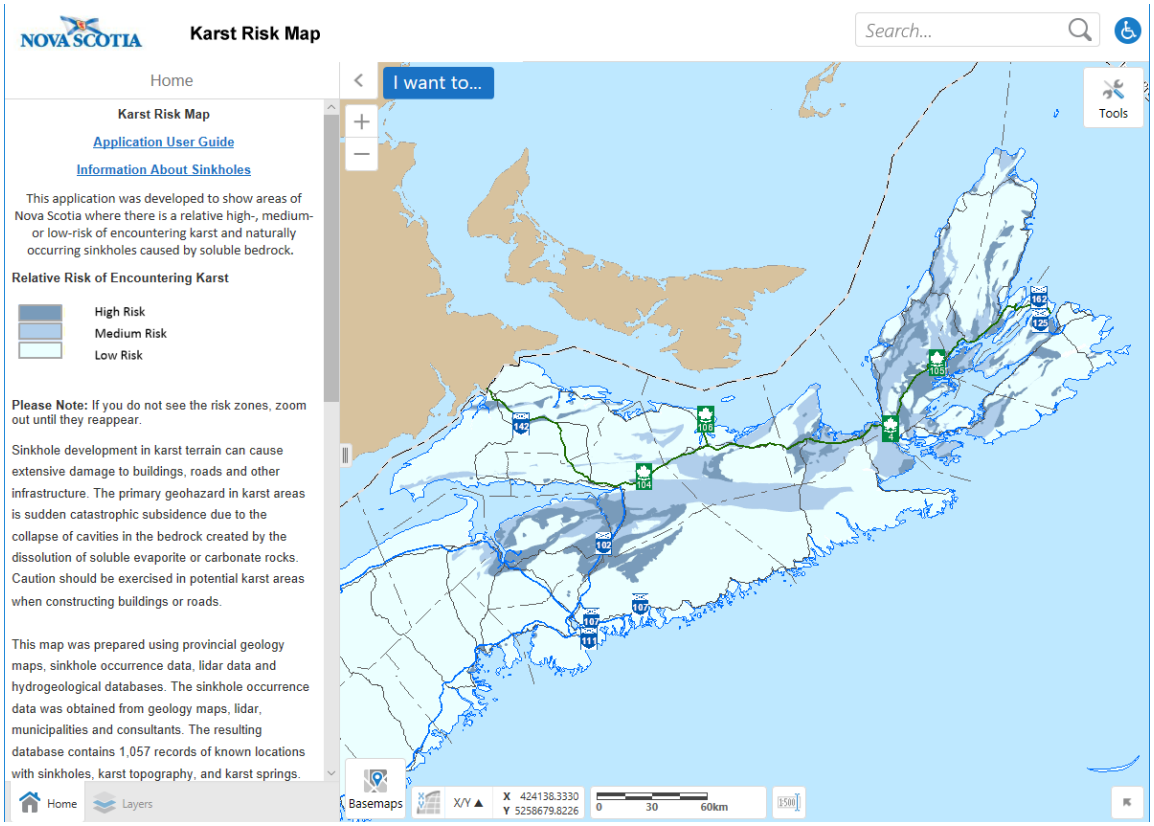

Figure 9. An example of the Karst Risk Map application.

information about karst and sinkholes in Nova Scotia and a report that describes the derivation of this karst risk map, please visit https://novascotia.ca/natr/meb/hazard-assessment/sinkholes.asp.

NovaScan

NovaScan is the geoscience publications and maps database on Nova Scotia and its offshore regions. As of March 23, 2018, the database contained 17,899 records, consisting of 8,895 mineral exploration assessment and property reports, 4,051 publications, 1,425 open file reports, 2,127 maps and illustrations, 867 theses, 280 contribution series, 214 digital products, and 32 outside publications.

In order to provide better service to our staff and clients, the Branch maintains a public search application that allows the public to query records in the NovaScan database using an Internet browser. NovaScan can be searched by title, author/organization, subject, area, map sheet (NTS), map type, licence type, licence number, document type, document number, year, and map scale. NovaScan is updated monthly as new geoscience maps, publications, open files and theses become available. The search interface can be accessed at https://gesner.novascotia.ca/novascan/DocumentQuery.faces.

Products Released in 2018-2019

The following new digital products and maps were released in 2018-2019. All digital products can be downloaded for free from the URL listed with the product.

Digital Products

DP ME 163, Version 1, 2018, Airborne Radiometric Images for the Province of Nova Scotia, (50 m x 50 m Resolution). Digital product compiled by M. S. King. Available in JPEG format. Available as a free download from the GMB website at https://novascotia.ca/natr/meb/download/dp163.asp

DP ME 470, Version 1, 2018. Digital Version of Nova Scotia Department of Natural Resources Open File Map ME 2018-001, Bedrock Geology Map of the Antigonish Highlands Area, Antigonish and Pictou Counties, Nova Scotia, scale 1:75 000, by C.E. White, 2018. Digital Product by C.E. White, A.L. Barras and J.S. McKinnon. Available in SHP and GDB format. Available as a free download from the GMB website at https://novascotia.ca/natr/meb/download/dp470.asp

DP ME 507, Version 1, 2018. Lidar DEM and Derived Shaded Relief Images for the Warwick Mountain Area, Eastern Cobequid Highlands, Nova Scotia. Digital product compiled by J. C. Poole. Available in TIFF and JPEG formats. Available as a free download from the GMB website at https://novascotia.ca/natr/meb/download/dp507.asp

DP ME 508, Version 1, 2018, Airborne Magnetic and Radiometric Surveys for the Warwick Mountain Area, Eastern Cobequid Highlands, Nova Scotia. Available in GDB, GRD, and TIFF formats. Available as a free download from the GMB website at https://novascotia.ca/natr/meb/download/dp508.asp

DP ME 509, Version 1, 2018, Ground Gravity Survey, Cobequid-Chedabucto Fault Zone, Northern mainland, Nova Scotia. Available in SHP and JPEG formats. Available as a free download from the GMB website at https://novascotia.ca/natr/meb/download/dp509.asp

DP ME 514, Version 1, 2018. Sampling of Soils for Background Substances in Urban Areas of the Halifax Regional Municipality, Nova Scotia. Digital product compiled by G.W. Kennedy, L. King, C. Lake, P. Currie and J. Drage. Available in SHP, GDB and XLS format. Available as a free download from the GMB website at https://novascotia.ca/natr/meb/download/dp514.asp

DP ME 515, Version 1, Nova Scotia Gypsum Rights. Available in SHP, GDB and KML format. Available as a free download from the GMB website at https://novascotia.ca/natr/meb/download/dp515.asp

Open File Maps

Open File Map ME 2018-004, Mineral Resources Development Fund Approved Grants: 2018-2019; scale 1:2 000 000, by J. C. Bonaparte, 2018. Available as a free PDF download from the Geoscience and Mines Branch website: https://novascotia.ca/natr/meb/data/mg/ofm/pdf/ofm_2018-004_mrdf_dp.pdf

Open File Map ME 2019-001, Geology of the Parrsboro Shore, Black Rock to Moose River, Cumberland County, Nova Scotia; scale 1:25 000, by J. H. Calder, J. W. F. Waldron, R. D. Naylor, K. D. Adams, T. J. Fedak, E. T. George, T. G. MacHattie, 2018. Available as a free PDF download from the Geoscience and Mines Branch website: https://novascotia.ca/natr/meb/download/mg/ofm/htm/ofm_2019-001.asp