

SECTION REVIEW 2011

Overview

The Geochemistry, Geophysics and Terrain Sciences Section provides a diverse range of geological services, including aggregate resource assessments, till and lake sediment geochemical surveys, Quaternary geology and ice-flow mapping, geophysical compilations and interpretation, and environmental initiatives including geological hazard mapping and coastal erosion monitoring. The section currently has a staff of 12, and has undergone some staffing changes during the past year. Melanie Irvine joined the Section in May as a Project Geologist, and Denise Brushett rejoined in June as a Quaternary mapping geologist.



Sampling for till geochemistry is an important component of the Survey's activities.



The newly acquired ICP-MS at the Geochemical Laboratory will significantly enhance our analytical capabilities.

There were two field mapping projects in 2011. **Denise Brushett** continued surficial geological mapping and till geochemistry sampling in northeastern Newfoundland, focusing on NTS 1:50 000 map areas 2E/08, 2F/04, and 2F/05. This was the final field season for a multiyear till geochemistry and surficial mapping program started in northeast Newfoundland in 2009. The main field objectives were to: collect samples for a regional till geochemical survey, complete surficial mapping and reconstruct the glacial history of the area, all to support mineral exploration activities. A total of 549 samples were collected from the C- or BC- horizons of hand dug pits through a combination of truck, ATV and helicopter-supported work.



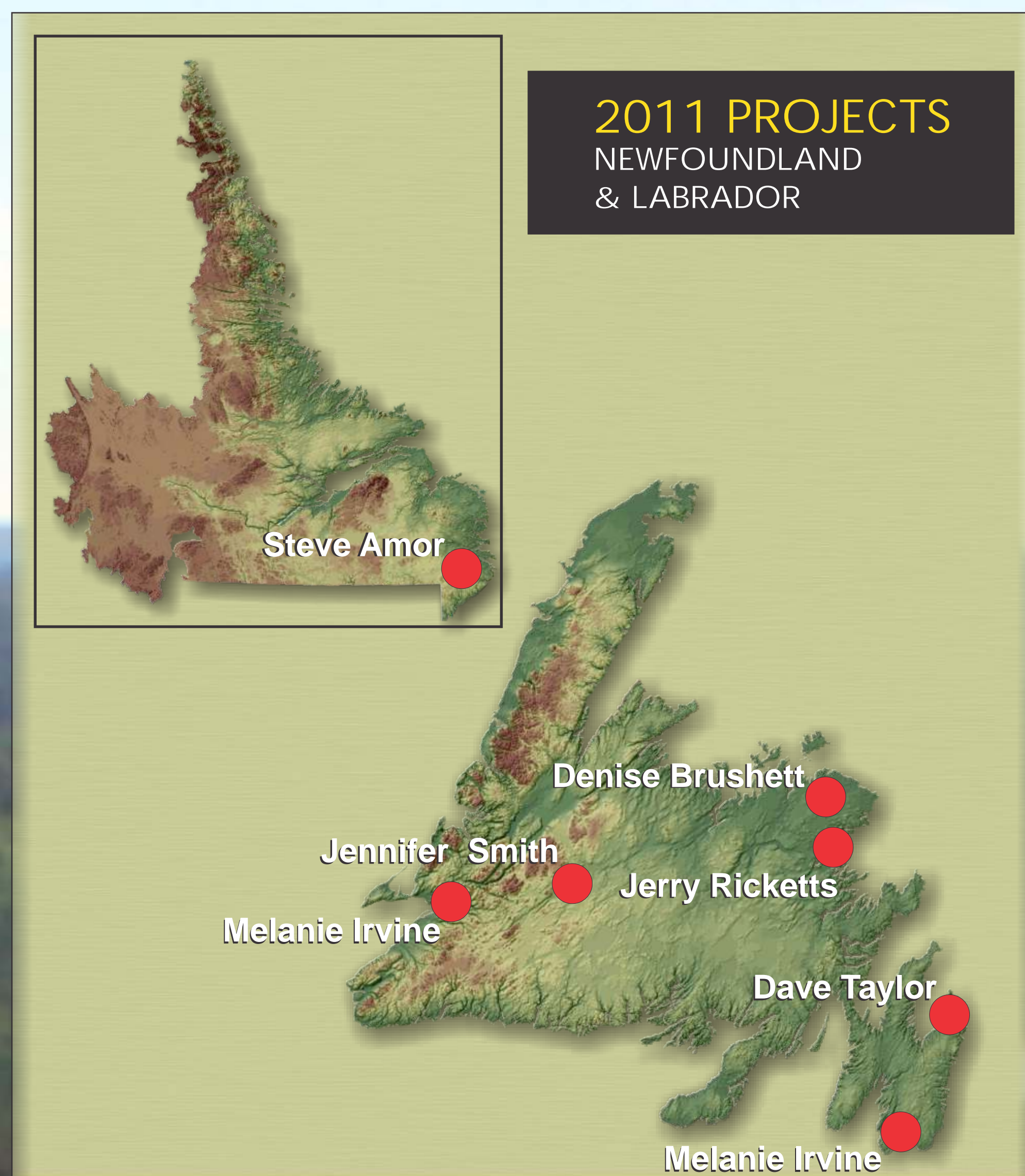
Sampling near Gander

Samples will be analyzed in preparation for inclusion in an Open File report to be released in 2012. In addition, 52 previously unrecorded striation sites were located and indicate that the area was affected by three ice-flow phases; an early eastward phase ($104 \pm 30^\circ$) extending over much of the area, and two later northward phases ($036 \pm 28^\circ$ and $343 \pm 15^\circ$) present in the western part of the study area. Clast fabric and clast provenance work were also conducted to provide further details on sediment genesis and palaeo-ice flow directions.

In central Newfoundland, **Jennifer Smith** focused on mapping of surficial geology, stratigraphy and proglacial lake development in the Red Indian Lake Basin. This is the continuation of a multi-year project that began in 2007 in response to increased mineral exploration activity in the Tullks Volcanic Belt. A week-long field program was conducted to review outstanding issues regarding stratigraphy and proglacial lake extent within the area. A backhoe program on the north side of Red Indian Lake between Star Lake and Halfway Mountain Brook assisted in the identification of glaciolacustrine sediments at critical elevations, as well as providing additional data on till thickness and composition. A short helicopter survey provided access to remote parts of the basin and gave a unique perspective of the landscape, from which preliminary models of retreat and proglacial lake formation could be assessed.



Ice retreated across the Lloyds River valley from left to right.



2011 PROJECTS
NEWFOUNDLAND
& LABRADOR

Quaternary Mapping

Regional Geochemistry

John McConnell is primarily writing reports on geochemical surveys. Over the past year he has released a report on a litho-geochemical survey of the REE-enriched Flowers River Igneous Suite in northeastern Labrador (OF13N/0139) and a Current Research article summarizing highlights of the lake sediment and water survey in southeastern Labrador, also a REE hotspot. More recently, John has released a report on a lake sediment and water survey conducted in two areas in central and western Labrador (OF LAB/1585). John is currently preparing a report that will integrate ICP analyses performed by the Survey's geochemical laboratory on more than 19,000 lake sediment samples from Labrador as part of the National Geochemical Reconnaissance project, and those collected in earlier surveys. These analyses include several elements not previously determined. Additionally, there will be a web release of all data from the detailed stream sediment and water surveys conducted by the Geological Survey in Labrador.

Steve Amor carried out a lake-sediment and water sampling survey in southeastern Labrador, over the Exterior Thrust Belt and Interior Magmatic Belt of the Grenville Province, in NTS map areas 13A/02, 13A/07, 13A/08, 13A/10, 13A/14 and 13A/15. Operations were based out of Mary's Harbour and a total of 854 lakes were sampled by a three-person crew.



Heavy-liquid separations at the Geochemical Laboratory

Over the rest of the summer Steve worked on data compilation and interpretation, presented a paper on Labrador lake-sediment geochemistry at the 25th International Geochemical Symposium in Rovaniemi, Finland, and released Open File report 14E/0229 describing a coincident geochemical and geophysical anomaly in northern Labrador that suggested the presence of significant rare-earth element mineralization. The report was released on August 2nd and resulted in the online staking of more than 500 claims in less than three hours. In the geochemical laboratory, heavy-liquid separations were completed for all till samples collected in central Newfoundland and the Bay de Verde Peninsula during the 2010 field season. These samples will be analyzed by ICP-MS.



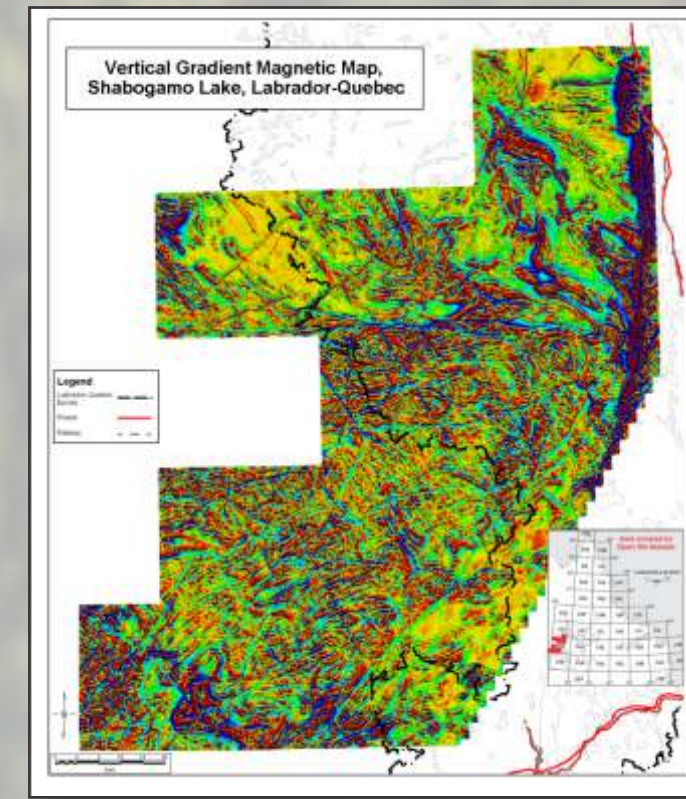
Lake sediment sampling in Labrador

Geophysics

Gerry Kilfoil continued to provide geophysical support to the mineral industry, as well as assuring that geophysical data submitted to the department meet the required standards and formats. The index of airborne surveys, available through the on-line Geoscience Atlas, has been updated at intervals to include releases of airborne data flown by mineral exploration companies.

During the past year, the results of several detailed airborne geophysical surveys, flown as part of mineral exploration programs have been released. **Robyn Constantine** has provided technical assistance by standardizing data formats and generating images from this new information as it gained non-confidential status. This has allowed these data to be made available digitally in a much more timely fashion.

In addition to new airborne surveys from the mineral exploration industry, the digital products from a large government-sponsored survey were made available via the online Geoscience Atlas: Phase III of aeromagnetic surveys (Shabogamo Lake Aeromagnetic Survey) was flown over the Ashuanipi Complex, immediately north of Labrador City/Wabush in western Labrador in early 2011 as part of a multidisciplinary program (GEM), a joint federal-provincial mapping initiative with the Geological Survey of Canada and the Province of Quebec.



Aggregates



Esker sampled during the regional aggregate assessment program.

Jerry Ricketts conducted an aggregate-resource project in the Centreville-Wareham-Trinity area in June 2011. The project was conducted at the request of the Mineral Lands Division to find an alternate source of gravel to replace quarries that are now used within the community. The study area included the southeast corner of NTS area 2D/16, the northeast corner of NTS area 2E/01, the southwest corner of NTS area 2F/04, and the northwest corner of NTS area 2C/13. Deposits sampled in the study area ranged in size from 100 000 m³ to 500 000 m³. These deposits are located between 1.3 and 4.5 km from Route 320, the major highway through the communities. Based on analyses of samples collected from each deposit, the grain-size and petrographic quality of the surficial aggregate resources identified are suitable for most construction purposes.

Other work included the digital release of six aggregate maps (NTS areas 13E/01, 13F/03, 13F/04, 13N/10, 13N/15, and 13O/03). This is an ongoing project to digitize all aggregate map data that were previously available in a paper format. To date 206 of 237 aggregate-resource maps are available in digital form.

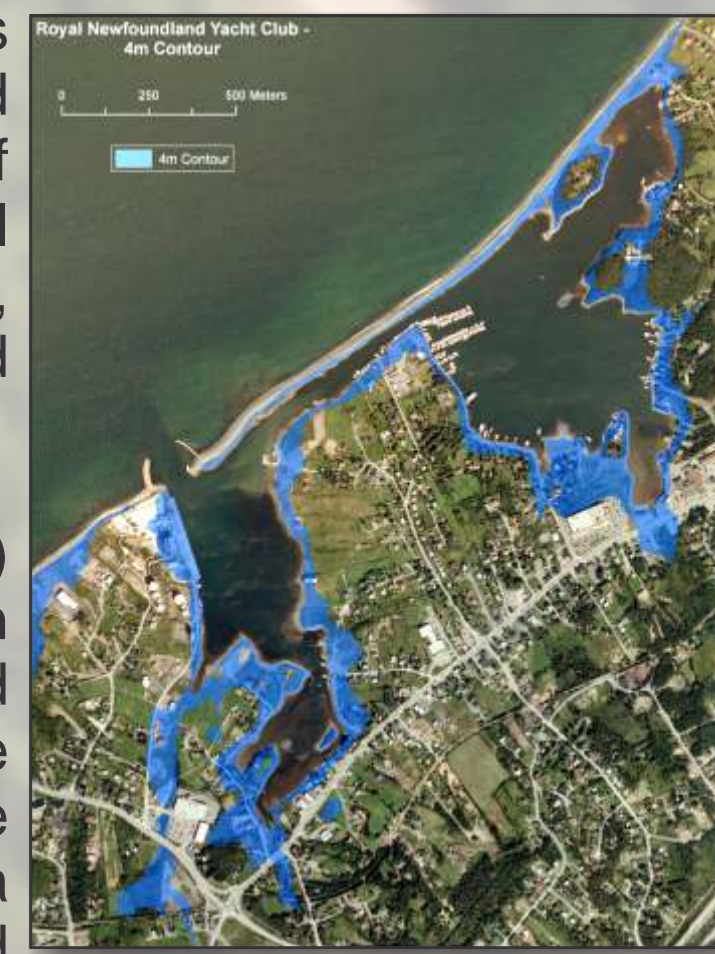
Environmental Geology



RTK survey at Mistaken Point

Melanie Irvine (new hire) established over 40 coastal erosion monitoring sites on the Island of Newfoundland, as part of a new initiative funded through the Office of Climate Change and Energy Emissions Trading at Executive Council. These areas will be revisited on an annual or semi annual basis in order to increase the understanding of current conditions, how coastal areas are changing over time and their sensitivity to environmental change, including climate change. Sites varied in terms of location, geomorphology, orientation, type, size and sediment characteristics and included bluff and beach locations. Coastal monitoring included the establishment of permanent survey markers and Real Time Kinematics (RTK) surveying of transects and site characteristics such as turf lines, sediment change, cusps and crests. This information can provide guidance to community decision making and planning and decrease the vulnerability towards coastal issues.

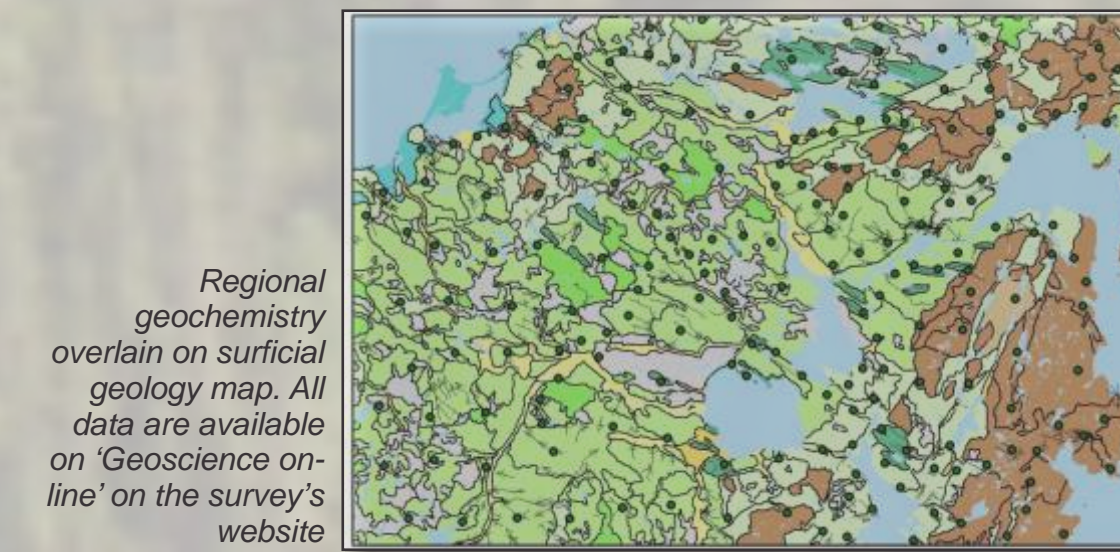
Martin Batterson, in conjunction with Neil Stapleton (Geoscience Publications and Information Section) and Gillian Roberts (Geoscience Data Management Section), continued work on hazard mapping projects in the northeast Avalon and Humber Valley Peninsula in support of regional municipal planning. Hazard vulnerability reports were completed for the towns of Conception Bay South and Portugal Cove-St. Philip's; individual reports were provided to the respective communities for their input. This project will help to ensure that development avoids hazardous areas, and that planning considers the potential effects of climate change. Much of the province is likely to experience sea-level rise of up to 100 cm over the next century, through a combination of global sea level rise and isostatic adjustment. A rise of this magnitude will affect coastal development in some places, and increase flood risk in those communities located at sea level and susceptible to flooding.



Potential inundation from sea level rise + storm surge in the town of CBS.

Digital Data

David Taylor is responsible for the integration of digital data generated within the Section with the Geoscience Resources Atlas. These data include surficial geology and aggregate resource maps, geochemistry data and ice flow data. David has compiled four existing 1:50 000-scale digital surficial geology maps: there are now 100 digital 1:50 000-scale surficial geology maps for the Island and 38 for Labrador. Till geochemistry, ice-flow and aggregate databases have been updated to reflect the most recent data available. A new surficial landform layer has been added to the Geoscience Resources Atlas, containing 36 200 linear landforms along with 19 375 point landforms for Newfoundland and Labrador. David also completed road-accessible till sampling for the northeast Avalon Peninsula as part of the Eastern Newfoundland Till Geochemistry Program. Geochemical results for the 2010 sampling program on the southern Avalon Peninsula have been released.



Regional geochemistry overlain on surficial geology map. All data are available on 'Geoscience on-line' on the survey's website

Laboratory Services

The Geochemical laboratory of the Department of Natural Resources is mandated with the task of performing all analytical requirements of the Geological Survey. The laboratory is located in the Howley Building, Higgins Line, St. John's NL. The laboratory has four staff, viz., the Laboratory Director (**Chris Finch**) and three mineral laboratory chemists (**Anne-Marie Bourgeois, Krista Hawco and Lisa Connors**).

The laboratory carries out analysis for approximately 40 elements with an annual production of over 200,000 determinations. The majority of analyses are carried out by Inductively Couple Plasma Emission Spectrometry (ICP-OES) for trace and major elements. Other selective methods for LOI, FeO, Fluoride, Conductivity and pH are also carried out. The laboratory is also responsible for the preparation of all samples submitted. These include rock, drill core, lake sediment, stream sediment, till and water. The laboratory also maintains an archive of all samples collected by Geological Survey geologists and submitted for analysis.

This past year saw the replacement of the laboratory ICP-OES instrument with a new state-of-the-art instrument. In addition, we have in place a new Inductively Couple Plasma Mass Spectrometer (ICP-MS), a first for the Geological Survey. This will greatly increase the scope of analyses that the laboratory can perform, and will reduce the need for external contract analyses.



Sample analysis at the geochemical laboratory.