

SECTION REVIEW 2013

Overview

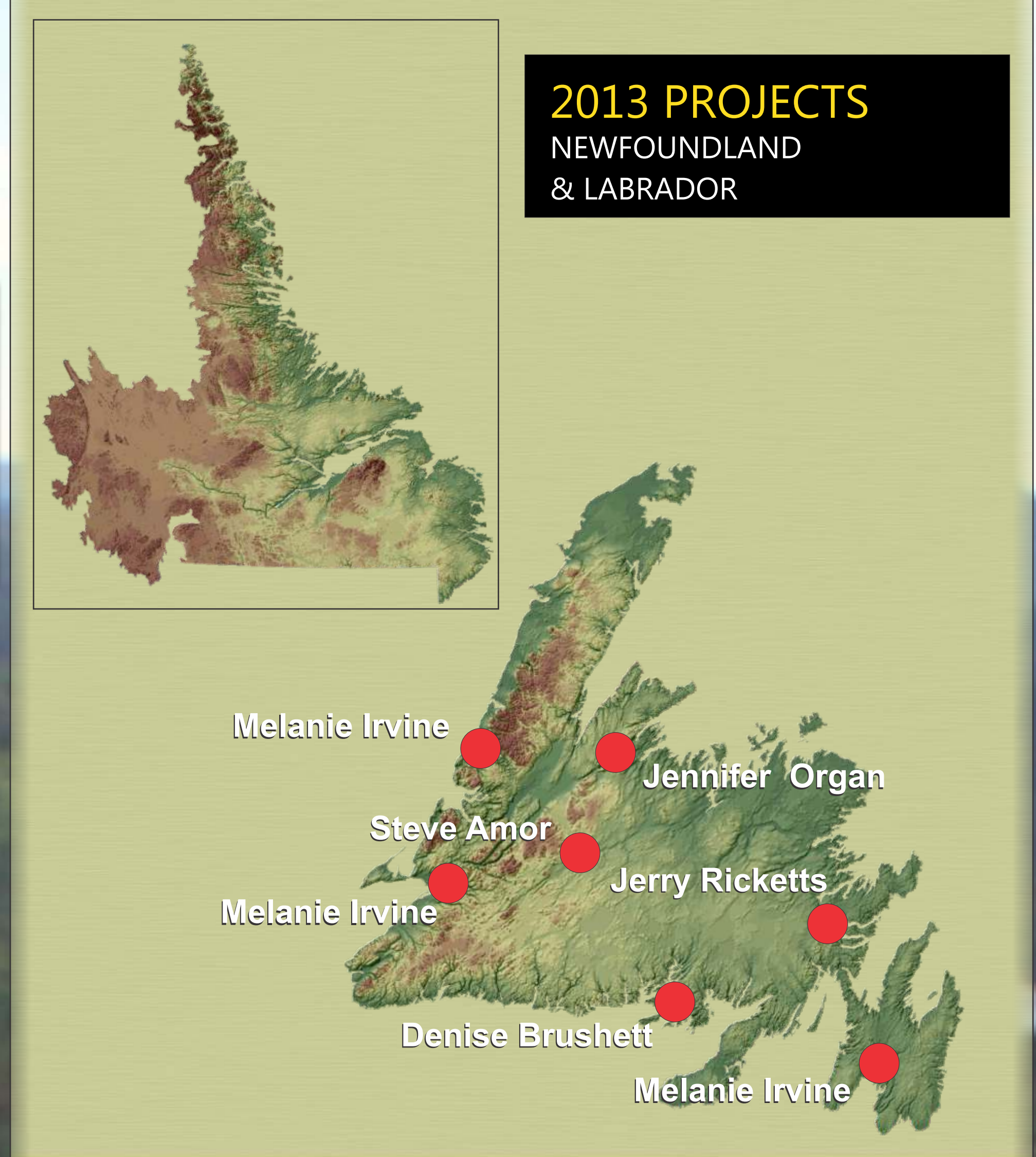
The Geochemistry, Geophysics and Terrain Sciences Section provides a diverse range of geological services, including aggregate resource assessments, till and lake sediment geochemical surveys, Quaternary geology and ice-flow mapping, geophysical compilations and interpretation, environmental initiatives including geological hazard mapping and coastal erosion monitoring, and laboratory services including geochemical and particle size analyses. The section currently has a staff of 14.



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

Rosauro Roldan (left) has replaced Anne Marie Bourgeois (right) at our Geochemical Laboratory. Anne Marie retired in the spring after over 30 years with the public service.

2013 PROJECTS NEWFOUNDLAND & LABRADOR



Quaternary Mapping



Delta sediments at St. Veronicas.

There were two field mapping projects in 2013. **Denise Brushett** conducted surficial geological mapping and till geochemistry sampling in the St. Alban's and Cold Spring Pond map areas (NTS 2M/13 and 12A/01). This was the first season for a multiyear till geochemistry and surficial mapping program in the Bay d'Espoir area. Two hundred and thirty three samples were collected. Striations indicate that the area was covered by southward ice-flow (~179°), ranging from 110° to 280°. Raised deltas were also examined; samples were taken for micro-fauna analysis and elevations were measured to help constrain the marine limit in the area, which averaged 21 m asl.

In north-central Newfoundland, **Jennifer Organ** began surficial mapping and till-geochemistry sampling on the Dawe's Pond, Sheffield Lake and Springdale map areas (NTS 12H/1, 7 and 8). This is the first year of a project that will include, surficial geological mapping, describing the stratigraphy of Quaternary sediments, and defining the palaeo ice-flow history; the project also includes sampling for till geochemistry.

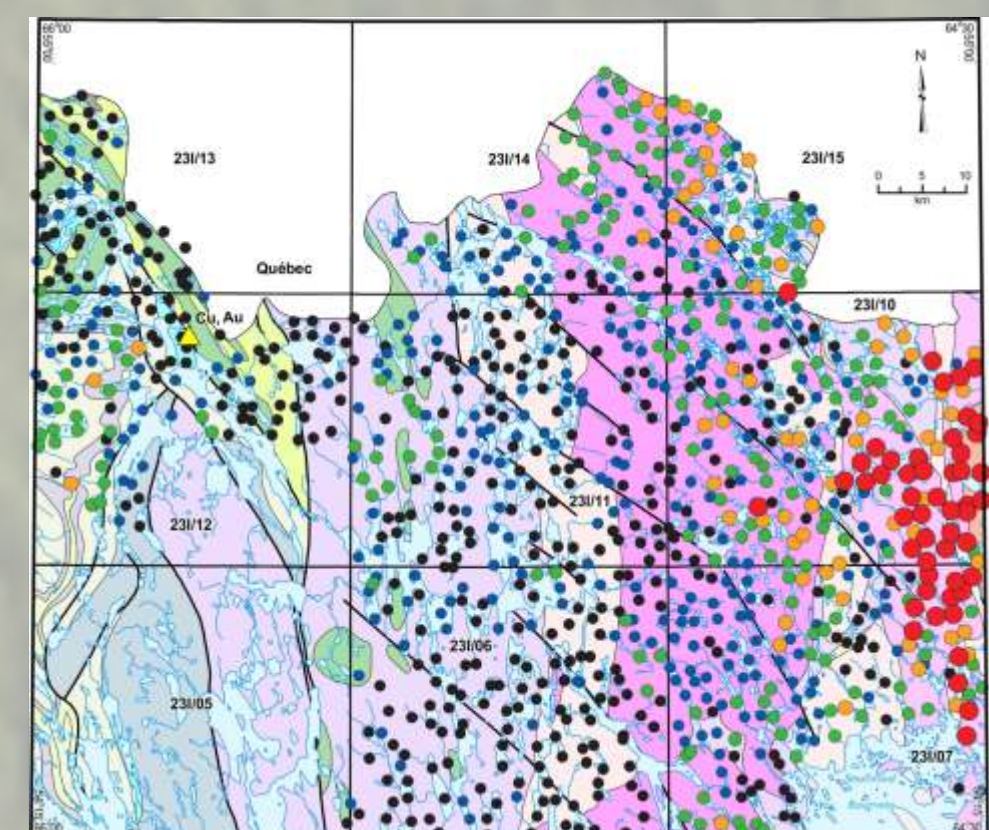
Nine hundred and twenty-one samples were collected. Forty-one new striation measurements were collected in 2013, which indicate a single dominant north to northeast ice flow over most of the area. Thick deposits of locally-derived glacial diamicton form blankets and hummocky terrain on the Topsails Plateau and adjacent areas, however towards the coast bedrock is more prevalent. Valleys leading from the Topsails Plateau northward toward the coast contain glaciofluvial outwash. The Birchy Lake – Indian Brook valley, not only contains abundant glaciofluvial material, and eroded diamicton produced during deglaciation, but also glaciolacustrine muds, possibly deposited in glacial Lake Howley. Marine limit in the area, at 75 m asl, is defined by the maximum elevation of ice-contact deltas.



Esker complex on The Topsails.

Regional Geochemistry

John McConnell has principally been involved in two areas of geochemical data preparation and report writing. Firstly, he has begun digitization of three years of stream-sediment, stream-water and rock analyses from several areas on the south coast of Newfoundland. Field work for the project was completed in 1982, 1983 and 1984. The areas are primarily underlain by granophile rocks and are characterized by tin, tungsten and molybdenum mineralization. Recently new analyses have been performed on approximately 1200 samples of stream sediment from this project. These new data will be interpreted and released together with the previous analyses in an open file report.



Fluorine geochemical analysis from lake water survey in western Labrador.

Secondly, John has prepared digital field and geochemical data for rock samples collected in 1991 and 1992 in northern Labrador. Most of these data were not available previously and were released as Open File LAB/1621 to accompany the stream sediment and water data already available for Open File LAB/1016.



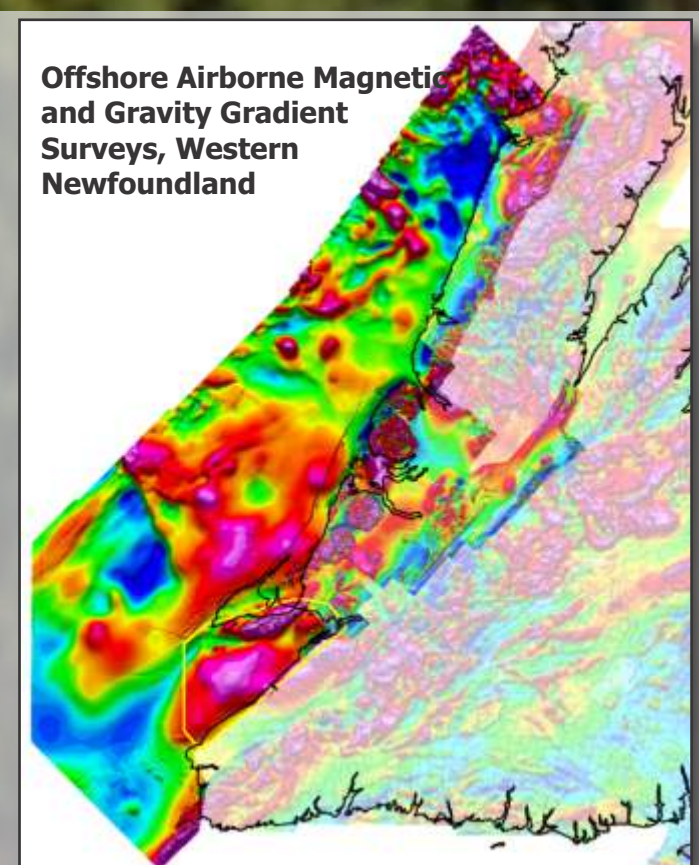
Lake sediment sampling in Labrador.

Steve Amor collected till samples in central Newfoundland from previously-sampled sites that had returned anomalous responses in elements suggestive of gold and rare-metal mineralization, that had not been followed up by the private sector. In the current program, the coarsest clasts were retained for analysis in an attempt to identify the rock-types that have produced the anomalies. A pilot biogeochemical survey, sampling spruce twigs and bark, was carried out along a transect over the buried Lemarchant VMS deposit in central Newfoundland. A real-time mercury-vapour analyzer was also tested along the same transect line.

Geophysics

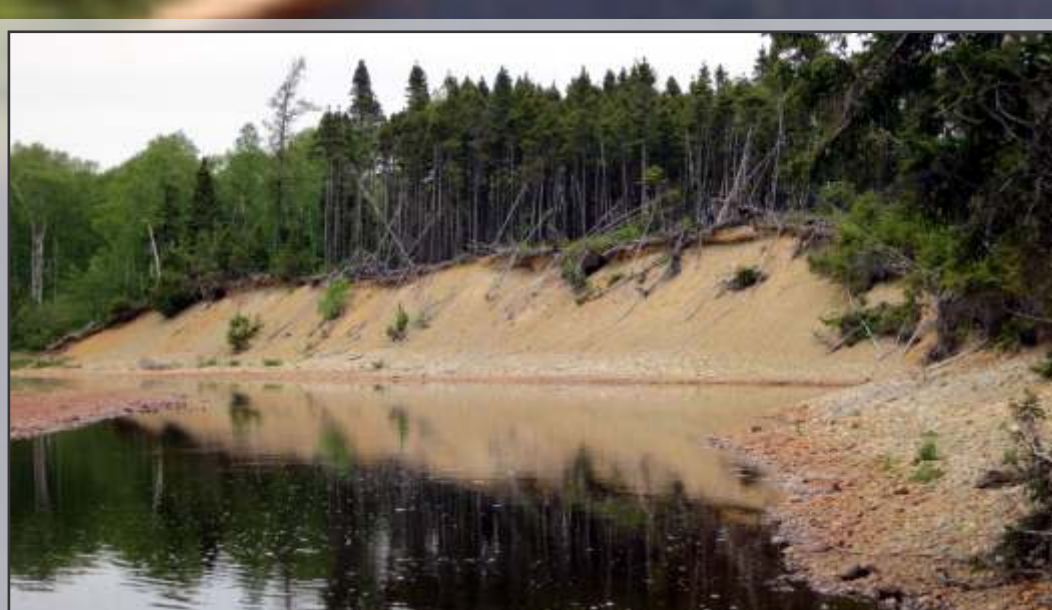
Gerry Kilfoil continued to provide geophysical guidance to the mineral industry, plus assuring that new geophysical data submitted to the department meet the required standards and formats, and preparation of geophysical data for the survey website. The index of airborne surveys, available through Geoscience on-line, was updated to include releases of airborne data flown by mineral exploration companies.

During the past year, the results of several detailed airborne geophysical survey programs, 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. During the past year, we have digitized the results of several older surveys from paper maps. In addition to new airborne surveys from the mineral exploration industry, digital products from government sponsored surveys were made available via the Geoscience on-line. During 2012, nearly 160,000 line-km of airborne horizontal magnetic gradient survey was flown over a large part of the eastern Gulf of St. Lawrence, offshore western Newfoundland. This survey was funded by the Offshore Geoscience Data Program (OGDP) and co-administered by the GSC, our Energy Branch, and Nalcor Energy. Under a second phase of that program, a pilot airborne gravity survey (6600 line-km) was flown in the offshore, St. George's Bay. The results of both surveys were released in 2013.



Offshore Airborne Magnetic and Gravity Gradient Surveys, Western Newfoundland

Aggregates



Shoreline exposure near Port Blandford

Jerry Ricketts conducted granular-aggregate-resource mapping on the Sweet Bay and Port Blandford map areas (NTS 2C/5 and 2D/8) during the 2013 field season. This was a continuation of 2012 fieldwork on adjacent NTS map areas 2C/4 and 2D/1.

In 2013, sampling was concentrated on the Port Blandford map area where large sand and gravel deposits were sampled along the Terra Nova North River, Sams Brook, Terra Nova River, near the south side of Terra Nova Lake, and southwest of Northwest Pond. Sand and gravel deposits were sampled on the Sweet Bay map area, but these are small, or have been depleted by past quarry activity. Till deposits were sampled throughout the Sweet Bay and Port Blandford map areas. When laboratory analyses are completed, sand, gravel and till deposits, with low silt/clay content suitable for aggregate use, will be outlined on granular aggregate-resource maps. These maps will be published in early 2014.

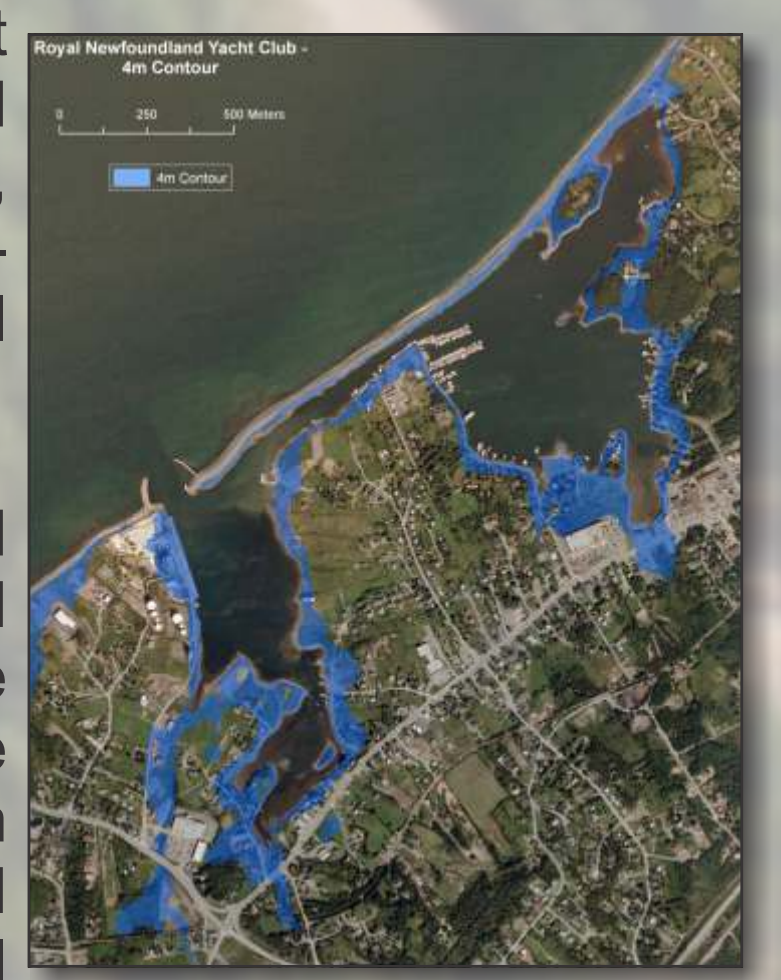
Environmental Geology



RTK survey at Mistaken Point ecological reserve

Melanie Irvine continued studying coastal areas in the Province as part of the Coastal Monitoring Program, an initiative funded through the Office of Climate Change and Energy Emissions Trading at Executive Council. Fifty-six sites were monitored in 2013, bringing the total number of sites to 104 for the Island of Newfoundland and southern Labrador. During the 2013 field season new sites were established in: Sandbanks Provincial Park, Cheeseman Provincial Park, Point au Mal, Motion Head, Middle Cove, Norris Point and Parsons Pond. Rates of shoreline change vary across the province; areas of high erosion include Holyrood Pond and Point Verde which are eroding at rates of over 1 m/a. Wave action, groundwater flow, surface run-off, and wind are the main causes of coastal erosion in the Province. Analysis of data collected from repetitive long-term surveys of monitoring sites will quantify rates of coastal change, identify processes resulting in coastal change, and identify areas at risk from coastal erosion, slope movement and flooding.

Martin Batterson, in conjunction with Neil Stapleton (Geoscience Publications and Information Section) continued work on hazard mapping projects in the northeast Avalon Peninsula in support of regional municipal planning. Hazard vulnerability reports were completed for the towns of Conception Bay South, Portugal Cove-St. Philip's, Torbay and Bauline; 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, from global sea level rise and isostatic adjustment. A rise of this magnitude will increase flood risk in those communities located at sea level and susceptible to flooding. In addition, Martin was requested by the Department of Municipal Affairs to conduct site assessments on several hazardous areas in the Province.



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

Digital Data

David Taylor continued to coordinate the integration of digital data with the on-line Geoscience Atlas. Four new 1:50 000 digital surficial geology maps have been added to the Geoscience Atlas on the Survey's website, bringing the total to 106 for the Island of Newfoundland and 38 for Labrador. The striation database has been extensively edited with duplicate sites removed and previously incorrectly located sites repositioned. New striation data from the 2013 field season has also been edited and added to the database. Similar updates, to include the most recent data, have been made to the till geochemistry, aggregate resources and surficial landform databases. Work continues on updating the Carbon-14 database with completion expected before 2014.



Regional geochemistry overlay 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 Geochemical Laboratory is located in the Howley Building, Higgins Line, St. John's. It consists of four staff: Laboratory Director (**Chris Finch**) and Mineral Laboratory Chemists, **Krista Hawco**, **Rosauro Roldan**, **Lisa Connors** (currently on maternity leave).

The laboratory carries out analysis for approximately 65 elements with an annual production of over 200 000 determinations. Most of the analyses for trace and major elements are carried out using Inductively Couple Plasma Emission Spectrometry (ICP-ES) and Inductively Couple Plasma Mass Spectrometry (ICP-MS). Other selective methods for LOI, FeO, Fluoride, Conductivity and pH are also used. The laboratory also maintains an archive of all samples collected by Survey geologists that were submitted for analysis.

This past year with the introduction of the laboratory's new ICP-MS, trace element analysis has expanded to provide a full suite of Rare Earth Elements. In the coming year procedures for the analysis of vegetation and water samples by ICP-MS will be developed and implemented.



Sample analysis at the geochemical laboratory uses our newly acquired ICP-MS.