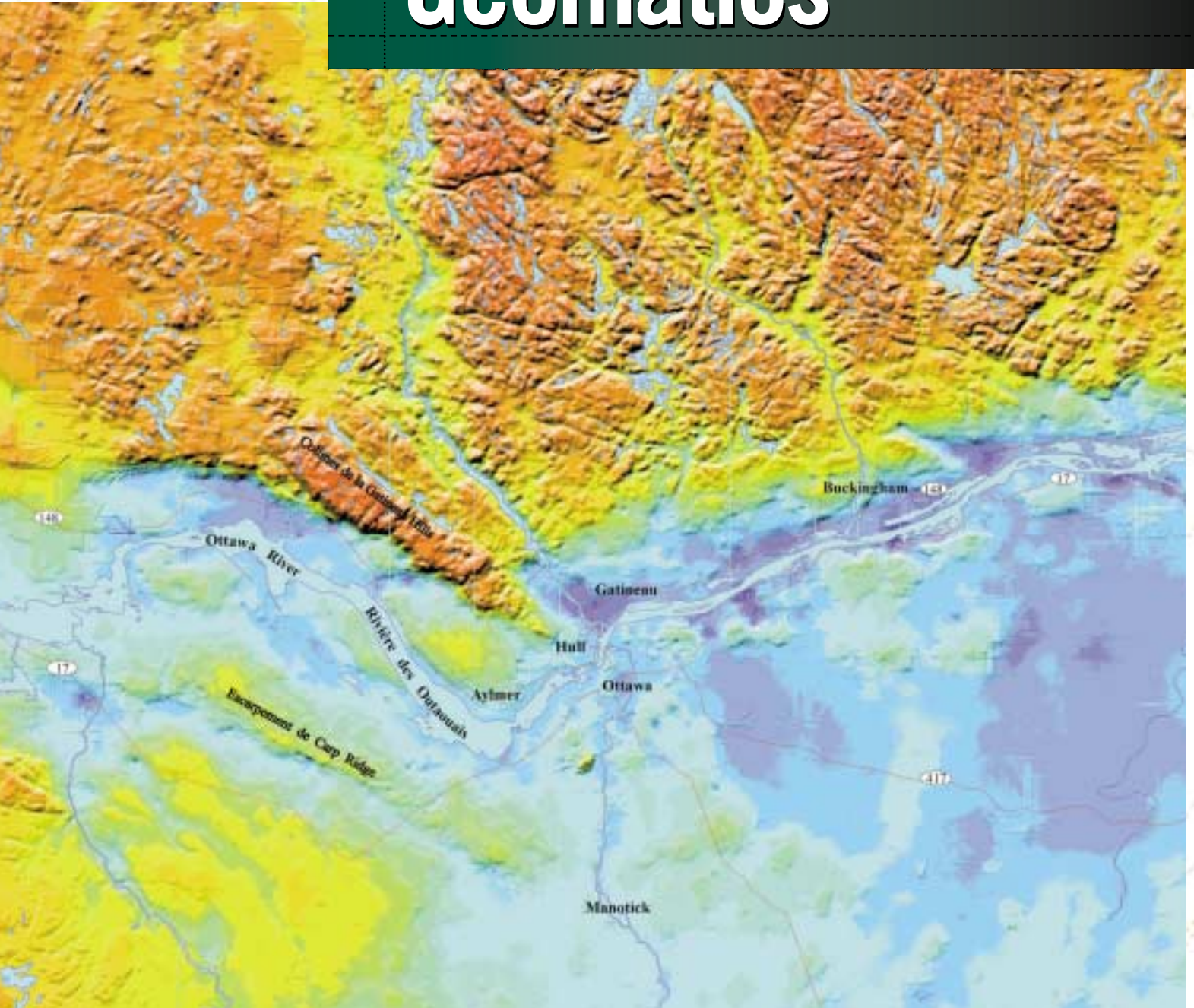


Geographic Information Systems (GIS) Technology

# Geomatics



Natural Resources Canada  
Ressources naturelles Canada

Canada

## What is Geomatics?

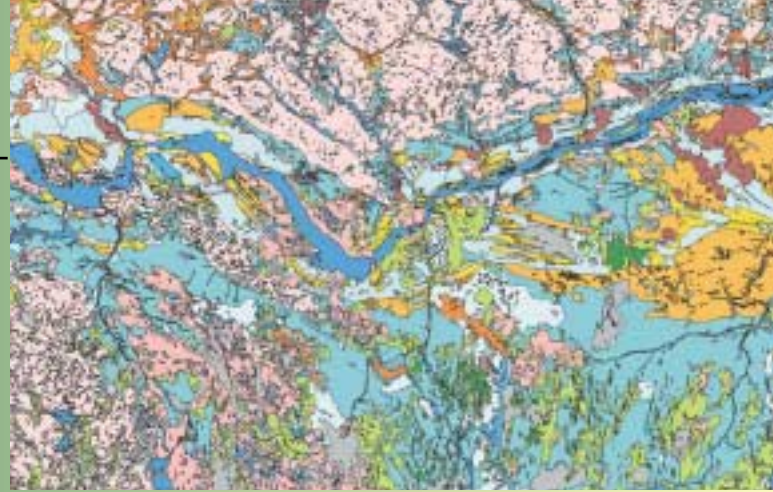
Geomatics is the science and technology of gathering, analyzing, interpreting, distributing and using geographical information. Geomatics encompasses a broad range of technologies that can be brought together on a common spatial reference system to create a detailed but understandable picture of the physical world and our place in it. These technologies include:

- GEOGRAPHIC INFORMATION SYSTEMS;
- GLOBAL POSITIONING;
- REMOTE SENSING;
- DIGITAL MAPPING; and
- CADASTRAL SURVEYING.

## A Vibrant Technology Sector

Canada has earned recognition as a world leader in the field of geomatics — one of the fastest growing technology sectors over the last decade. The Canadian geomatics community provides software, hardware and value-added services to help clients resolve problems and seize opportunities in areas such as:

- the earth sciences;
- infrastructure management;
- the environment;
- land management and reform;
- natural-resource monitoring and development;
- development planning; and
- coastal-zone management and mapping.



## The Canadian Advantage

Canada's knowledge and expertise in geomatics are the result of decades of research and development, and practical application. Through an understanding of our diverse geography, we are managing our resources and the environment for the benefit of present and future generations.

Canadian-developed geomatics products and services are now being used throughout the world. Our clients range from government agencies in industrialized and developing nations, to large and small businesses, and remote communities.

Partnering with the Canadian geomatics community, which welcomes international collaboration through joint ventures or strategic alliances, will give you full and favoured access not only to these products and services, but to some of the world's leading geomatics experts.

*Why not put the  
Canadian advantage to  
work for you?*



# Geographic Information Systems

**G**eographic Information Systems (GIS) — developed and pioneered in Canada close to 30 years ago — are among the most exciting and powerful geomatics decision-making tools in the world.

A GIS uses computer technology to integrate, manipulate and display a wide range of information to create a picture of an area's geography, environment and socio-economic characteristics. Today, Geographic Information Systems are commonly used for everything from basic mapping to supporting resource exploration and development; from environmental management to the planning and administration of transportation and telecommunications systems, utility infrastructures, urban development and land use.

## GIS in Data Collection

Canada's success in harnessing GIS technology has made it a world leader in modern field-data collection, and it has exported this expertise to many other countries in applications such as forestry, the environment and geoscience.

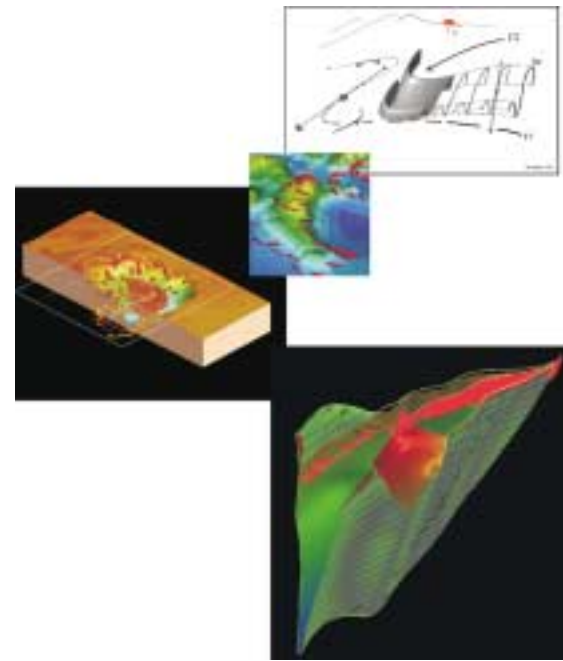
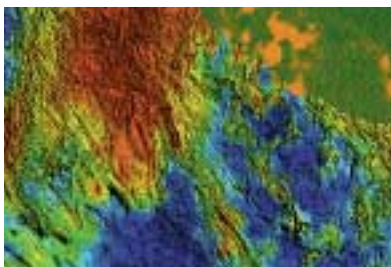
Recording observations in the field is an important element in spatial-data collection. Geologists, for instance, use GPS to locate themselves in the field; computers to record observations at the outcrop; and GIS software to integrate and evaluate a variety of data-sets (field notes, remotely sensed, topographic, geophysical, geological, etc.). The technology withstands rugged conditions and harsh use while providing a complete digital-mapping and information solution in the field.



## GIS in Mapping

A key component of a successful mapping or exploration program is being able to efficiently manage and interpret a wide range of data. Canada has developed an integrated geological mapping system where spatial data remain in the digital domain from collection in the field through interpretation to publication.

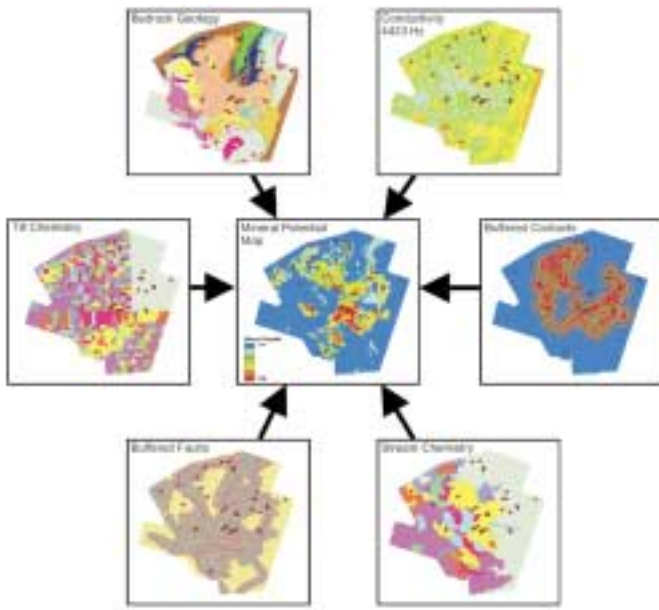
GIS technology provides users with a powerful tool with which to archive, manipulate, integrate, analyze and visualize both the spatial and statistical characteristics of the volumes of data that are routinely collected. For example, GIS is changing the concept of the traditional geological map. GIS tools are being used to produce innovative, non-traditional maps that can be printed on demand, going hand-in-hand with the increasing availability of digital data. The GIS, as the ultimate data integrator, is changing the way geologists analyze, present and distribute the data they collect, giving us greater understanding of our geological environment.



## 3-D GIS Applications

Three-dimensional (3-D) GIS is a technology that is increasingly being used for display and analysis of data containing horizontal and vertical spatial coordinates. 3-D GIS geoscientific applications include oil exploration, mining, meteorology, environmental monitoring, landscape architecture and geological modelling.

Geologists, for example, use 3-D GIS to improve their understanding of sub-surface and surface observations and measurements by creating sophisticated visualizations of the sub-surface geology. Ongoing research and development projects are expanding the 3-D tool kit, with mapping projects in Canada providing the complex geology data for application development. Advanced interpolation, projection and surface-editing techniques now allow visualization and modelling of 3-D geological scenarios that previously could only be imagined.



## Advanced Applications

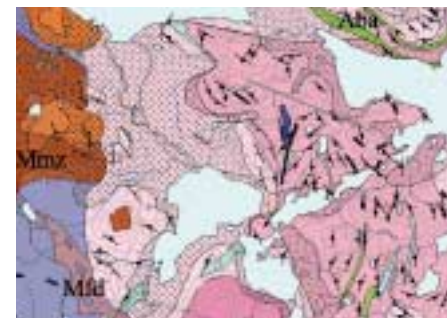
User-friendly statistical and expert-system tools that complement commercial data visualization software have been developed in collaboration with Canadian industry. With these tools, methods such as fuzzy logic and weights of evidence are applied to combine maps and images, and to produce new maps showing new application-specific areas.

For example, a recent geological application identified areas with high potential for discovering new base-metal deposits. Geochemical maps (based on stream and till sampling), airborne geophysical images and recently re-mapped geology were combined to estimate favourable conditions for new discoveries. This map successfully predicted known deposits and a recent new discovery.

## GIS Standards for Data and Maps

Suitable standards for spatial data are essential for the exchange and integration of these data between agencies. Canada is working with other countries to develop a comprehensive geological data model and GIS standards for spatial data. The realization and implementation of these standards should fundamentally alter the way in which digital map data are recorded and used by governments, researchers, industry, students and the public.

Being able to share and integrate digital geological-map information is not only important to geologists, for example, but is also critical in meeting many important societal concerns. Geology is an important component in resolving issues related to mineral resources, energy, the environment, land use, natural hazards and water resources, among others.





## Internet Access to Networked Geoscience Data

A Geographic Information System is the ideal tool with which to integrate and analyze spatial information. To realize the full potential of GIS for interpretation of geospatial information, users must be able to search for information and access it in a usable format. For example, Canadian experts are developing a national geoscience knowledge network which uses the Internet to access providers of Canadian Earth-science information.

This Canadian geoscience network will provide a single window to the wealth of Canadian Earth-science knowledge. The aim is to provide Internet-based discovery, viewing and delivery of knowledge in a client-focused and consistent manner. International standards and new advances in network/data base technology will allow for the seamless and consistent delivery of information that remains distributed and maintained at geological sites across Canada.

For non-specialist users, Internet GIS tools support on-line visualization and integration of raster, vector and point data using common browser software. These tools allow users throughout the world to find available Canadian geoscience data, and to quickly integrate and create customized views of these data suitable for their particular application.



## Why a Canadian Geomatics Solution?

The Canadian geomatics community is a respected and competitive player in international geomatics markets. The more than 1500 Canadian geomatics firms provide nearly \$2 billion worth of geomatics products and services annually, and many firms maintain offices and support capabilities abroad to meet the needs of clients.

At the federal government level, the Geological Survey of Canada which is part of Natural Resources Canada provides leadership in developing GIS applications and technologies. In addition, the Geomatics Industry Association of Canada (GIAC) assists its members in developing new business in Canada and around the world through promotional, educational and advocacy activities. The Canadian geomatics community can provide the expertise to respond to international geomatics project opportunities.



### *Canada offers you:*

- ***A PARTNERSHIP APPROACH TO GEOMATICS AND GEOSCIENCE APPLICATIONS***

The geomatics and geoscience industries, along with federal and provincial governments and the academic sector, often work in teams to develop technology and expertise and to deliver services.

- ***FLEXIBILITY, RESPONSIVENESS AND CREATIVITY***

The industry can provide value-added products and services that are tailored to the unique requirements of individual clients. Technology transfer and skill-sharing are important elements of many export arrangements.

- ***A COMMITMENT TO TECHNOLOGICAL INNOVATION***

Working together, government, industry and universities continue to explore and develop new geomatics and geoscience applications and technologies through cooperative research and development.

- ***A FOCUS ON SOLUTIONS***

Canada can provide multi-disciplinary, integrated solutions to problems related to the natural and the developed environment. Canadian geomatics and geoscience expertise has already helped many government and industry clients around the world.





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