

Overview of Trends in

Canadian
mineral

exploration



CANADIAN INTERGOVERNMENTAL WORKING GROUP ON THE MINERAL INDUSTRY

2009

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Cette publication est aussi disponible en français, sous le titre
Survol des tendances observées dans l'exploration minérale canadienne

COVER PHOTO REPRODUCED WITH PERMISSION FROM BHP BILLITON LTD.

The cover photo shows employees from drilling contractor Akita Drilling Ltd. and coring contractor Sebco Coring Ltd. pulling out the first potash core at BHP Billiton's wholly owned Jansen potash project in Saskatchewan. With a pre-approved capital expenditure budget of US\$240 million, the Jansen potash project is currently in the final stages of the Selection (pre-feasibility) study. It will move to the Definition (feasibility) phase in mid-2010, if approved, with a full investment decision expected in late 2011. With the completion of the January 2010 offer to acquire Athabasca Potash Inc., which has neighbouring properties, BHP Billiton will have access to over 14 000 km² of exploration ground in the Saskatchewan potash basin.

Preface

The *Overview of Trends in Canadian Mineral Exploration* report is prepared annually by Natural Resources Canada (NRCan). The 2009 edition contains a review of mineral exploration and resource development, an analysis of recent indicators of exploration and deposit appraisal activity, an analysis of ore reserves and recent production decisions, a listing of informative provincial/territorial web sites, a review of the worldwide activities of the larger Canadian exploration and mining companies, and a statistics-based summary of Canada's post-1980s mineral exploration history.

The information and analyses found in this report were prepared by officials from the Minerals, Metals and Materials Knowledge Branch of NRCan's Minerals and Metals Sector. The report covers exploration, deposit appraisal, and occasionally mine complex development activities for metallic minerals, nonmetallic minerals, coal, and uranium (it does not refer to petroleum-related work). The information in this report was current as of December 2009. Please note that the information and analyses found on provincial/territorial web sites are the responsibility of the respective jurisdictions.

This report is available on the Minerals and Metals Sector's web site at www.nrcan-rncan.gc.ca/mms-smm/busi-indu/cme-omc-eng.htm.

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Contacts/Information Requests

For further information on specific issues related to this report, the reader is invited to contact the Minerals and Metals Sector of NRCan or one of the federal officers listed below. Contact information for the provinces and territories is provided in Chapter 4 (Regional Outlook) of this report.

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Mineral Exploration	www.nrcan-rncan.gc.ca/mms-smm/busi-indu/mex-exm-eng.htm
Minerals and Metals Markets	www.nrcan-rncan.gc.ca/mms-smm/busi-indu/mmm-mmm-eng.htm
Minerals and Mining Statistics	http://mmsd.mms.nrcan.gc.ca/stat-stat/index-eng.aspx
Mining Taxation	www.nrcan-rncan.gc.ca/mms-smm/busi-indu/tax-fis-eng.htm

Executive Summary

This report covers the years 2008 and 2009, a period that will be remembered for the major financial and economic crisis that shook the world and forced the introduction of massive government fiscal and monetary stimulus packages, including the Government of Canada's Economic Action Plan. The worldwide crisis had a significant and immediate impact on the Canadian and global mineral exploration and mining industry. Collapsing minerals and metals prices, a tightening of both debt and equity, and uncertainty about the future economic outlook resulted in mine closures, production cutbacks, project deferrals, slashed exploration budgets, and other measures aimed at preserving cash and flagship properties.

In terms of mineral exploration and deposit appraisal activity, statistics from the federal-provincial/territorial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures show that, while 2008 still ended with a record \$3.3 billion in exploration and deposit appraisal spending, 2009 was a different story as expenditures declined by 44% to \$1.8 billion. This reduced spending interrupted a record-breaking trend of eight consecutive years of increasing expenditures that saw the emergence of a strong junior mining sector and a widely distributed exploration effort among commodities and regions.

In fact, this period of intense activity led to the announcement of numerous mineral occurrences and discoveries, the advancement of many projects, and upgrades in resources and reserves. While companies had to adjust their plans in 2009, work still continued on significant properties, but often at a reduced pace. Up-to-date information and analysis on these developments can be found on the provincial/territorial web sites that are listed in Chapter 4 of this report.

When adding mine complex development expenditures, capital, and repair and maintenance costs, total investment amounted to almost \$13 billion in 2008 and an estimated \$10 billion in 2009. The group of projects in the mine complex development and deposit appraisal stages is counted on to provide Canada's future mines. Some of these projects will be particularly important in helping address the long-term decline in base-metal reserves in some of Canada's better-known mining camps.

In the midst of all this economic turmoil, Canada continued to be the top destination in the world for exploration capital, accounting for a 16% share of global budgets in 2009. In addition, Canadian companies were once again planning to spend more than those from any other country, accounting for 34% of all planned exploration programs in the world in 2009.

Going forward, factors that will influence the performance of the Canadian mineral exploration sector include: the price of gold; the outlook for base metals; interest in potash, uranium, and rare earth elements (REE); the receptiveness of debt and equity markets; capital infusions from new project owners/partners; and positive exploration results. Barring any further economic turmoil, 2010 could mark a return to exploration and deposit appraisal expenditure growth with total spending climbing over the \$2 billion mark.

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1. Mineral Exploration and Resource Development in Canada - 2009 Review

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INTRODUCTION

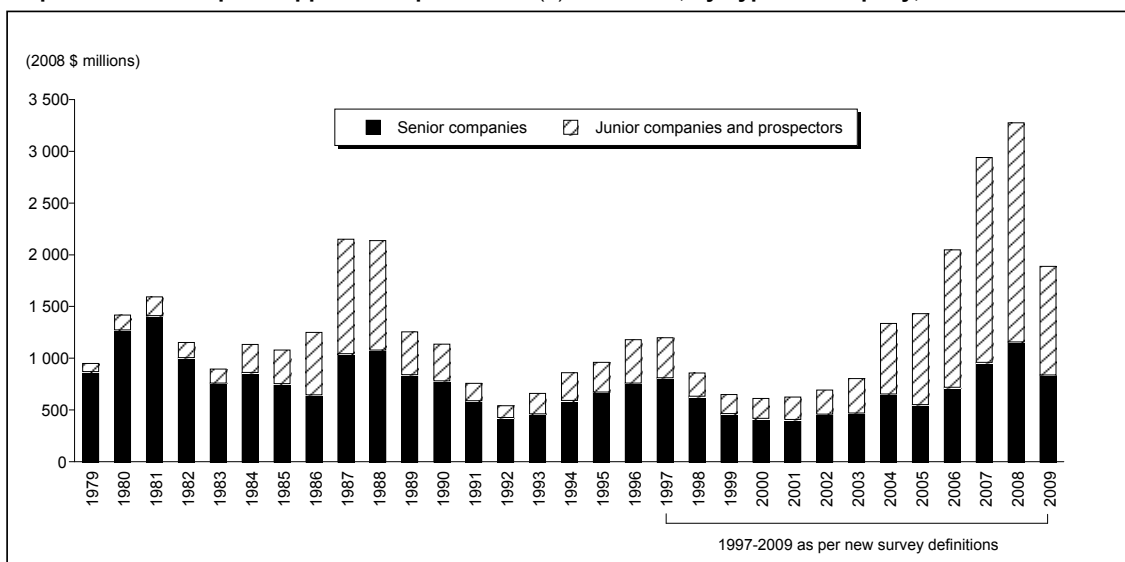
The eight-year upward trend in exploration and deposit appraisal expenditures that carried the Canadian mineral exploration sector to record levels of activity came to a sudden halt in 2009 (**Figure 1.1**). However, the slowdown really began in the second half of 2008 when the global financial and economic crisis began to take a toll on metal markets as illustrated by Natural Resources Canada's (NRCan) Monthly Metals Price Index (**Figure 1.2**). Despite a \$1.5 billion decline from the 2008 total of \$3.3 billion, the revised company spending intentions total of \$1.8 billion for 2009 remains strong by historical standards. For instance, in the late 1990s/early 2000s, prior to the just-mentioned upward trend, exploration and deposit appraisal spending in Canada hovered around the \$500 million mark (current dollars), reaching a constant 2008 dollar low of \$615 million in 2000.

The worldwide crisis had a major and immediate impact on the Canadian and global exploration and mining industry. Companies that were under sudden financial duress had to move beyond simply delaying plans and projects and adopt more drastic measures to survive and preserve their cash and property assets. At the time of writing this report (January 2010), there were signs that the global economy was beginning to turn around and it was becoming clearer that some shifts were occurring in the industry. In particular, changes in the ownership of promising exploration and development properties, and the arrival of new capital providers, were starting to breathe new life into some projects and accelerate their development.

This article presents a summary of some of the events and trends that both affected and shaped the Canadian mineral exploration sector in 2009. It also introduces, summarizes, and complements other articles found in the 2009 *Overview of Trends in Canadian Mineral Exploration* report.

ECONOMIC CONTEXT

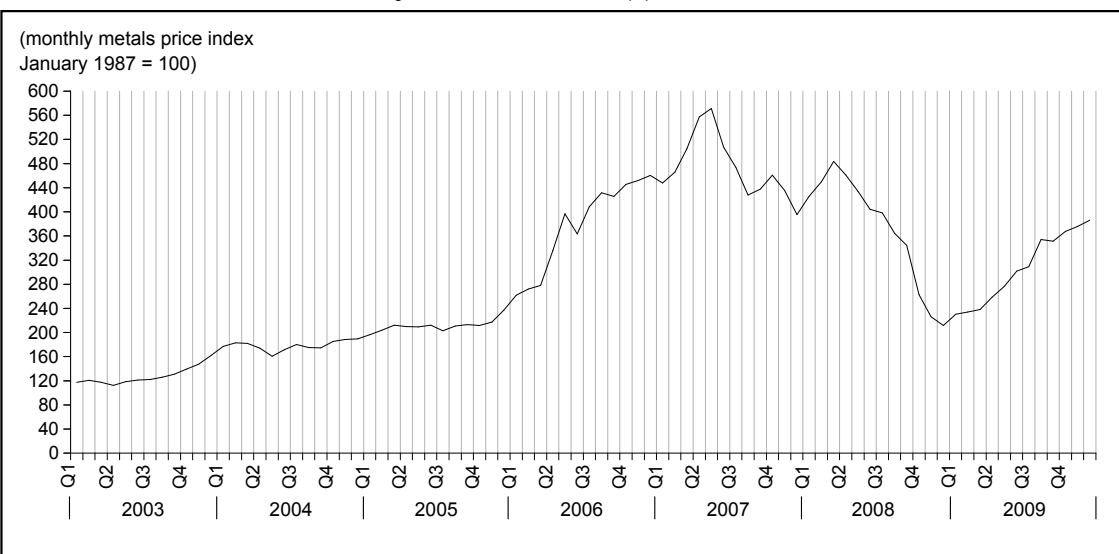
Apart from geological potential and other elements of a country's mineral investment climate, such as taxation and political stability, mineral exploration activity in a given year can be linked to the quality and prospectivity of existing projects and new discoveries, and to past and future price outlooks for minerals and metals. Prices are an important factor in a senior mining company's exploration budgeting exercise as they influence revenues and profits and thus determine the amount of internally generated funds that will be available for exploration and deposit appraisal work. In the case of junior companies, which have no internal sources of revenue, the same factors apply, but these firms have more flexibility in deciding which commodities to pursue. The key for this group of companies remains a combination of prices, positive outlook, and positive project-related news that will convince potential partners and equity investors to finance their activities.

Figure 1.1**Exploration and Deposit Appraisal Expenditures (1) in Canada, by Type of Company, 1979-2009**

Sources: Natural Resources Canada and Statistics Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on-mine-site and off-mine-site activities.

Notes: Data for 1979-1996 include only field and overhead costs. Overhead costs include mineral leases, claims and property taxes, and project-related head office expenditures. Total exploration expenditures for 1975-81 are overstated by an average of about 17% relative to earlier years because of changes to the methodology used by Statistics Canada over the years. For 1987 and 1988, overhead costs were estimated based on previous years' ratios of total costs/field costs. Data for 1997-2009 include both exploration and deposit appraisal expenditures as defined in the 1997 survey reform and include field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Figure 1.2**Natural Resources Canada's Monthly Metals Price Index, (1) 2003-09**

Source: Natural Resources Canada.

(1) The NRCan Monthly Metals Price Index is a Fisher Ideal Index that is based on the prices of six metals: gold, silver, copper, zinc, lead, and nickel.

Impact of the Economic Crisis

As discussed in more detail in Chapter 2, mineral exploration and deposit appraisal spending in Canada had been trending upward since the early 2000s. Buoyed by strong prices, it reached a record \$3.3 billion in 2008. However, in the latter half of 2008 and in 2009, companies were suddenly faced with a tightening of credit, both debt and equity, and collapsing prices. Companies swiftly revised their plans and adopted survival measures to service debt, preserve cash reserves, and protect main assets (properties) in hope of a quick recovery. As a result, exploration and capital expenditure budgets were slashed in the second half of 2008 and in 2009.

On the mine development and production side, cuts were multi-faceted. They included production cutbacks, mine closures, and a host of other corporate decisions resulting in delays, suspensions, and cancellations of planned investments and developments. These measures were, for the most part, announced in the last quarter of 2008 and first quarter of 2009. High-profile examples of such announcements include reduced output at De Beers Canada's Snap Lake and Victor diamond mines (November 2008),² the closure of Xstrata Nickel's Craig and Thayer-Lindsley nickel-copper-platinum group metals mines (January 2009), and Iron Ore Company of Canada's decision not to proceed with its Sept-Îles pelletization plant restart project (February 2009).

In terms of total exploration and deposit appraisal spending intentions, corporate adjustments to the new economic reality translated into a year-on-year expenditure decline of 44% as revised spending intentions for 2009 fell to \$1.8 billion. In retrospect, this level of investment remains well above the historical average (**Figure 1.1**). However, the magnitude and suddenness of this drop raised the prospect, especially in early 2009, of it being the initial phase of a multi-year declining trend. Also at issue was the fact that many of the projects that had progressed along the mineral development curve in the recent growth period were at risk due to corporate financial difficulties. Examples of such projects encountering difficulties included Baffinland Iron Mines Corporation's Mary's River iron ore project³ in Nunavut, Canadian Royalties Inc.'s Nunavik nickel project⁴ in Quebec, and Shore Gold Inc.'s Star diamond project⁵ in Saskatchewan.

Year-End Economic Conditions

Although 2009 was a tumultuous year, the prices of most minerals and metals ended up rallying and overcoming generally high inventory levels. In 2009, the prices of copper and zinc had increased by 139% and 111%, respectively (in U.S. dollar terms). The price of gold, which surpassed US\$1200/oz in December, rose by 26% during the year to provide a much-needed lifeline to the mineral exploration sector in Canada and to hard-hit junior mining companies in particular.

Besides continuing uncertainty, the rally in metal prices has been offset, albeit only partially, by a strengthening of the Canadian dollar vis-à-vis the U.S. dollar. In 2009, the Canadian dollar appreciated by 16% relative to the U.S. dollar. While this appreciation in the exchange rate may have affected mining companies with operations in Canada, it probably had less of an impact on investment directed to the earlier stages of mineral development (exploration and deposit appraisal). However, project operators will have to consider the potential impact of the anticipated longer-term weakness of the U.S. dollar in economic and feasibility studies conducted on their projects.

Based on information available at the end of 2009, the prices of most minerals and metals were expected to continue to rise in 2010, but at a slower pace and scale than in 2009. Major factors that will influence short-term price levels include demand by China and sovereign wealth funds, supply constraints (labour strikes, underinvestment, ore depletion), re-stocking of metals by developed economies, the performance of the U.S. dollar, investors' interest in hard assets as opposed to the U.S. dollar or government bonds, the continuation or scaling back of the massive fiscal and monetary stimulus that was implemented in many countries, and the potential for further global economic disruptions.

ACTIVITY LEVELS

Mineral Exploration and Deposit Appraisal

As mentioned earlier in this chapter, and as described in more detail in Chapter 2, the year 2009 marked the end of a strong period of growth in Canadian mineral exploration. Following the difficult years of the late 1990s and early 2000s, the period from 2004 to 2008 was one of substantial investment and project advancement. The latter years displayed particularly strong year-to-year growth in spending, although an allowance has to be made for inflationary pressures on the supply of goods and services to this industry (e.g., as shown in **Figure 2.5b** in Chapter 2, drilling costs increased significantly starting in 2003). Along with rising expenditures, the following sub-trends were noted in the latest growth period:

- The intensification of the exploration effort was multi-jurisdictional; most provinces and territories recorded strong growth in exploration and deposit appraisal spending.
- The focus of the exploration effort was multi-pronged; strong prices for a number of minerals and metals resulted in a broader range of targeted commodities.
- Exploration (grassroots exploration) was more predominant than deposit appraisal (advanced exploration) although, in the latter years, many projects progressed towards the later stages of the exploration phase and into the deposit appraisal phase.
- Junior mining companies gathered a lot of strength and momentum early on and overtook senior companies as the most important group of companies conducting exploration in Canada.

While it is too early to assert that the 2009 decline was temporary, there are significant economic risks remaining for a weakened industry and a nervous and risk-averse investor base. The strength of the gold price, continued interest in commodities such as uranium and potash, and the emergence of rare earth elements as a popular target should support the industry, but a positive outlook for base metals will be instrumental to a return to long-term expenditure growth.

Mineral Resource Development

The eight-year upward trend in exploration and deposit appraisal spending resulted in a number of projects moving ahead on the mineral resource development curve. Progress within the exploration phase and graduation from the exploration phase to the deposit appraisal phase were relatively common as spending, and associated work programs, intensified during this prosperous period. Overall, total mineral resource development (exploration, deposit appraisal, and mine complex development, including associated capital, and repair and maintenance expenditures) peaked at \$12.7 billion in 2008.

Out of this cohort of advancing projects, the ones most likely to contribute to Canada's future minerals and metals production are those undergoing deposit appraisal and capital-intensive mine complex development work. In 2008, 19 projects entered the mine complex development work phase and 50 new or re-emerging projects became part of a deposit appraisal program. Despite delays and uncertainties created by the economic crisis, recent adjustments in schedules, scope, and/or ownership should reaffirm or even accelerate development intentions.

Observations From the Preliminary 2009/Spending Intentions 2010 Survey

Responses to the Preliminary 2009/Spending Intentions 2010 survey were being compiled at the time of writing this report (January 2010) with a view to publishing a 2010 company spending intentions forecast in February 2010. Preliminary inferences from the compiled data include:

- a rebound in the number of survey respondents (including a number of newly formed companies);
- a lingering hesitancy to report definite exploration plans for the coming year because of ongoing economic uncertainty;
- a continuation of the strong contribution of junior companies to the country's exploration effort (access to funds permitting);
- a commodity focus that is centred on gold and precious metals, reflecting continued uncertainty surrounding the outlook for base metals; and
- a company spending intentions forecast that would mirror or slightly exceed the preliminary total recorded in 2009 (in the range of \$1.8 billion-\$2.2 billion).

Canada's Contribution to Global Exploration

As explained in Chapter 5 of this report, global mineral exploration statistics are collected by the Metals Economics Group (MEG) and published in an annual analytical report titled *Corporate Exploration Strategies: A Worldwide Analysis*. Using information from this report, the global exploration presence of Canadian-based companies can be analyzed and Canada, as a source of exploration or as an exploration target, can be compared to other countries of the world. The following points summarize Canada's contribution to global mineral exploration as per the data contained in the MEG report.

- The economic crisis took its toll on worldwide exploration budgets as the value of exploration programs expected to be undertaken in 2009 was down by US\$5.3 billion (42%) from the US\$12.6 billion recorded in 2008.
- On a country basis, the largest decrease was recorded in Canada (US\$1.2 billion) followed by Australia (US\$795 million), the United States (US\$434 million), and Mexico (US\$406 million).
- Despite a significant decrease in market share and exploration budgets, Canadian companies were once again planning to spend more than those from any other country surveyed, with Canada accounting for 34% of all exploration programs undertaken in the world in 2009.
- Canada continues to be the world's top destination for mineral exploration capital, accounting for a 16% share of global budgets in 2009.

FINANCING

Canada continues to be a major centre for generating the equity needed to discover, investigate, and develop mineral resources, both in Canada and abroad. Canada's TMX Group (which includes the Toronto Stock Exchange [TSX] and the TSX Venture Exchange [TSX-V]), along with a well-developed specialized services cluster (banks, brokerage firms, legal firms, mining analysts, etc.), provide exploration and mining companies with the resources they need to access a mining-friendly pool of risk capital.

In fact, according to statistics from the TMX Group,⁶ 57% of the world's public mining companies were listed on the TSX and TSX-V at the end of June 2009. The TSX-V provides junior mining companies with access to risk capital and, pending successful results, a streamlined path towards potential graduation to the TSX. As of June 30, 2009, a total of 334 mining companies were listed on the TSX and 1084 were listed on the TSX-V. In a year that saw the erosion of company valuations, these 1418 companies had a combined market capital value of over \$278 billion.

According to data compiled by Gamah International Limited,⁷ mining equity raised in Canada totaled \$19.5 billion in the first 11 months of 2009 (**Table 1.1**), a significant 79% increase from the same period in 2008 (\$10.9 billion). These funds were destined for projects in Canada and elsewhere around the world.

A further examination of 2009 data from Gamah International reveals that:

- Large companies (with an annual revenue greater than US\$5 billion) were mostly planning to use the equity raised to retire or refinance debt.
- Companies in the US\$50 million-US\$5 billion revenue range were mostly planning to use the funds for working capital and project development/construction.
- Exploration companies with no production (junior companies) were planning to use the equity for project development/construction, exploration, working capital, and acquisitions.
- The funds raised for Canadian-based projects targeted mainly gold, diamonds, uranium, and nickel.

Of the 1071 transactions (private placements, non-brokered private placements, prospectus offerings, etc.) recorded for the first 11 months of 2009, successful Canadian issuers (besides large companies like Barrick Gold Corporation, Teck Corporation, and Cameco Corporation) included future producing companies like Osisko Mining Corporation (Canadian Malartic), Lake Shore Gold Corp. (Timmins mine, Thunder Creek, Bell Creek), and Detour Gold Corporation (Detour Lake).

Of the overall total of \$19.5 billion, \$335 million was raised during the first 11 months of 2009 (**Table 1.1**) with the help of Canada's flow-through-share mechanism (which allows companies to flow through to their investors the 100% Canadian Exploration Expenses [CEE] corporate income tax deduction they receive for eligible work expenses). Therefore, at least \$335 million was raised on Canadian exchanges for pure exploration work (CEE qualified) in Canada. This amount represents a 41% decrease from the \$568 million raised during the same period in 2008 (after a full-year total of \$1 billion in 2007). In an effort to support the junior mining sector, the federal government, in its 2009 Budget, extended the 15% Mineral Exploration Tax Credit (METC) for another year (until March 31, 2010). Junior company shares are usually considered a speculative investment and the lower levels of flow-through-share financing for 2008 and 2009 are a clear reflection of the unease that took hold of the stock markets as the economy weakened.

Flow-through shares and the METC have been supporting the financing activities of junior mining companies and have been instrumental, along with rising metal prices, in helping these companies achieve record levels of spending. Since the October 2000 introduction of the METC, over \$4.2 billion in flow-through funds has been raised for exploration in Canada. While the use of these mechanisms has declined in the past two years, the junior mining sector remains concerned about the future of the METC beyond March 2010 and about access to risk capital.

TRENDS AND DEVELOPMENTS

Project Ownership

The economic turbulence of 2008 and 2009 created fertile ground for cash-rich companies, sovereign wealth funds, and state-owned enterprises to secure ownership stakes in a number of Canadian projects. In order to survive, companies in weakened financial positions were forced to sell properties and/or find new financial partners.

In Canada, the participants in this realignment exercise included junior companies with promising projects, but currently without the necessary resources to advance them further (i.e., Canadian

Royalties Inc.'s Nunavik project), well-financed senior companies looking for new sources of resources and reserves or product diversification/complementarity (i.e., Kinross Gold Corporation's strategic investments in Harry Winston Diamond Corporation, BCGold Corp., and Underworld Resources Inc.), and private and state-owned foreign companies seeking promising properties to meet their financial and/or strategic (security of supply) imperatives. In the latter category, some notable transactions recorded in 2009 with potential to spur activity in different regions of the country include:

- the creation of a joint-venture company between China-based Yunnan Chihong Zinc & Germanium Co. Ltd. (50%) and Selwyn Resources Ltd. (50%) to advance the Selwyn zinc-lead project on the Yukon-Northwest Territories border towards a bankable feasibility study and production;
- the formation of a joint venture, by early 2010, with respect to Taseko Mines Limited's Gibraltar copper-molybdenum mine in British Columbia, in which Taseko Mines will hold 75% and Japan-based Sojitz Corporation will hold 25%;
- the acquisition of Freewest Resources Canada Inc.'s interests in three "Ring of Fire" chromite properties in the James Bay Lowlands of northern Ontario by U.S.-based Cliffs Natural Resources Inc.;
- the acquisition of Canadian Royalties Inc. and its Nunavik nickel-copper-PGM project in northern Quebec by Jien Canada Mining Ltd. (China-based Jilin Jien Nickel Industry Co., Ltd. [75%] and Goldbrook Ventures [25%]);
- the acquisition of Yukon Zinc and its Wolverine zinc-silver project in the Yukon by China-based Jinduicheng Molybdenum Group Ltd. and Northwest Nonferrous International Investment Company Ltd.;
- a strategic investment of US\$240 million by China-based Wuhan Iron and Steel (Group) Corporation for a 25% share in a limited partnership to develop Consolidated Thompson Iron Mines Ltd.'s Bloom Lake iron ore project (Quebec);
- the confirmation of the eligibility, in principle, of Baffinland's Mary River iron ore project in Nunavut for untied loan guarantees in the amount of US\$1.2 billion from the Federal Republic of Germany;
- the acquisition by Brazil-based Vale (Companhia Vale do Rio Doce) of the Regina exploration-stage potash property in Saskatchewan from Rio Tinto plc.; and
- a private placement of \$1.74 billion in the Class B voting shares of Teck Resources Limited by China Investment Corp., translating into 17.2% of the equity and 6.7% of the voting interest of the large, diversified Canadian natural resources company.

Although some of these transactions resulted in a loss of control or ownership for companies that had concentrated their resources on bringing projects forward, the infusion of fresh capital, skills, technology, and management that the new investors will bring in this wave of transactions should provide the impetus needed to develop new mines in Canada.

Commodities of Interest

The overall strength in the prices of minerals and metals during the years that preceded the economic downturn (**Figure 1.2**) resulted in exploration and deposit appraisal expenditures being distributed across many different commodities and regions of Canada (**Figure 2.6** and **Table 2.8** in Chapter 2). In addition to precious metals, base metals, and diamonds, significant sums were invested in the search for other commodities such as uranium, coal, and molybdenum. While the overall commodity

basket remained more or less the same in 2009, some products stood out in terms of investment received or attention gathered. This is the case for gold, potash, uranium, and rare earth elements (REE).

With the price of gold averaging US\$972.35/oz in 2009⁸ and reaching a high of US\$1212.50/oz on December 2nd, it is not surprising that this metal became a lifeline for companies attempting to survive the economic downturn. With an abundance of gold properties to offer, including some in new prospective areas and in former producing districts, companies presented investors with opportunities to take advantage of gold's attractiveness as a safe haven and hedge against the weakness of the U.S. dollar. The latter responded favourably by providing the capital necessary for projects to proceed, and over \$1.7 billion was spent on searching for gold in 2008 and 2009 (**Figure 2.6** and **Tables 2.7** and **2.8** in Chapter 2).

Although the short-term outlook for the price of potash does not appear to be strong, its longer-term prospects are behind the strong activity levels recorded in 2008 and 2009 in Saskatchewan. Both BHP Billiton (Jansen project) and Vale (Regina project) have made the decision to enter the fertilizer sector, as have a number of junior companies (such as Potash One Inc. [Legacy project] and Western Potash Corp. [Milestone project]).

Uranium, which began to draw serious interest in 2006, continues to be a major exploration target despite public opposition to exploration for this metal in some parts of the country (see the Land Access and Security of Tenure section below). Driven by a relentless demand for energy and fueled by a massive expansion of emissions-free nuclear power generation capacity, especially in Asia, uranium exploration and deposit appraisal expenditures in Canada have amounted to over \$1.2 billion since 2006. Uranium expenditures now outrank those for copper, nickel, and diamonds (see **Figure 2.6** and **Table 2.7**). While Saskatchewan, which announced a strategic direction to enhance uranium development in December 2009,⁹ remains the country's unquestionable leader in terms of uranium production and exploration, Quebec, Nunavut, and Newfoundland and Labrador (where a temporary uranium moratorium is in effect on Inuit-owned lands) also attract their share of interest in this energy commodity (see **Tables 2.8** and **2.9**).

Exploration interest in REE has increased significantly in the last two years because of their importance in the green economy (electric and hybrid vehicles, wind turbines, low-energy light bulbs, etc.), in high-technology products, and in military applications. A proposal by China's Ministry of Industry and Information Technology to ban Chinese exports of some REE and to limit exports of others by 2015 has fueled a rush to secure sources of REE outside of that country. According to the U.S. Geological Survey Mineral Commodity Summary on REE, China accounts for 97% of world production of these elements.¹⁰ In the automotive sector, the need to secure lithium supplies has even led companies like Toyota Motor Corporation, Mitsubishi Corporation, and Magna International Inc.¹¹ to bypass established market sources and invest directly into lithium exploration and development projects. Although exploration and deposit appraisal spending for these products remains relatively modest (see Chapter 2), this commodity group should experience significant growth in activity in 2010 as projects continue to be developed in a number of Canadian jurisdictions.

OUTSTANDING AND EMERGING ISSUES

As part of the global industry that finds, extracts, and processes depletable mineral resources, the Canadian mineral exploration and mining sector faces a number of challenges at the international, national, and local levels. While corporate social responsibility¹² and Bill C-300¹³ have a more international focus, the issues discussed in this section are more about the industry's ability to sustain its contribution to the Canadian economy, remain a pole of regional development, and co-exist with other land users.

Declining Base-Metal Ore Reserves

As reported in Chapter 3 of this report, Canada's base-metal reserves (at mines in production or committed to production) have declined continuously for almost 30 years. As a result of this prolonged decline, reserves in 2008 were equal to 45% of the 1980 level for copper, 43% for nickel, 40% for molybdenum, 18% for zinc, 17% for silver, and 7% for lead (**Figure 3.2** and **Table 3.6** in Chapter 3). The opportunity presented by increased prices over the period 2001-07 was not enough to reverse this long-term trend and the situation has been further exacerbated by the economic downturn. Consequently, Canada's base-metal reserves continued their decline in 2008 and, given the outlook in the second half of that year and the first half of 2009, companies were not likely to increase their efforts to incrementally define new base-metal reserves at existing mines. Going forward, it will be interesting to follow the development of new base-metal projects and base-metal mining camps, and their impact on future reserve levels.

Land Access and Security of Tenure

Land access and security of tenure have long been identified as a major concern for Canada's mineral exploration industry. Reductions in the area of land open for exploration and uncertainty regarding future land-use plans continue to be of concern to the industry. Notable developments in terms of land access and security of tenure in 2009 include:

- Bill 173 (*An Act to Amend the Ontario Mining Act*) passed Third Reading in the Ontario Legislative Assembly on October 21, 2009, and the *Mining Amendment Act, 2009*¹⁴ received Royal Assent on October 28, 2009. As a result, a number of important regulations affecting mineral exploration are in effect or will be proclaimed once they are developed. Measures include: notification and consultation requirements for planned work on Aboriginal lands, removal of Crown mineral rights on privately held lands in southern Ontario, the development of criteria to withdraw Crown mineral rights under privately held surface rights in northern Ontario, a revised list of lands not open to staking and exploration, and the future introduction of on-line map staking. In addition, Ontario's Bill 191 (the *Far North Act*), introduced in June 2009 and at the Second Reading stage¹⁵ on October 22, 2009, proposes the protection of ecological systems in the Far North by including at least 225 000 km² of the Far North in an interconnected network of protected areas.
- Bill 79 (*An Act to Amend the Quebec Mining Act* [*Projet de loi no. 79 - Loi modifiant la Loi sur les mines*]) was tabled in the Quebec National Assembly on December 2, 2009. As in Ontario, this proposed act aims to address some of the issues raised by the general population with regard to the conduct of mineral exploration and mining activity. In addition to a number of other measures, such as those concerning site rehabilitation work, it proposes the introduction of a number of modifications to tighten up the claim-staking regime, to allow the withdrawal of lands from mining activity at the Minister's discretion, and to refuse the granting of certain mining rights that would be in conflict with the objectives of other land users.
- Other developments include the creation/expansion of parks (i.e., the Nahanni National Park Reserve of Canada in the southwest corner of the Northwest Territories was expanded over sixfold [from 4766 km² to over 30 000 km²] in June 2009), the threat to exclude mineral exploration from certain high-ecological-value areas (such as British Columbia's Flathead Valley where stakeholders commenting on this issue in 2009 have included organizations such as UNESCO, the Sierra Club, and the Association for Mineral Exploration British Columbia), and mounting opposition to exploration for radioactive commodities such as uranium and thorium (e.g., existing moratoria in Nova Scotia and British Columbia, a temporary moratorium on Inuit-owned lands in Labrador, a temporary moratorium in New Brunswick [lifted after the introduction of strict regulations in 2008], and public outcry and the threat of mass resignation by medical doctors in Sept-Îles, Quebec, opposed to a nearby uranium exploration project in December 2009).

Despite these developments, 19 million hectares of land were staked in 2008 (2009 statistics were not available) and claims in good standing covered 7.9% of Canada's total landmass.

Infrastructure

Having the necessary infrastructure in place to support Canada's future mines is an important issue. Ore reserves continue to be depleted or are costly to replace in mature mining camps, while many of Canada's most promising deposits are currently being developed in remote or northern regions of the country. Whether it be roads, railroads, air strips, deep-water ports, or electricity-generating facilities, and whether these are financed entirely by governments, private companies, or through public-private partnerships, infrastructure projects can help open up entire regions to economic development and increase the standard of living and economic opportunities available to the local population. Well-known examples of infrastructure projects (proposed or under development) that could benefit mining projects, including strategically important project clusters, and surrounding communities include:

- The extension of Highway 167 in northern Quebec: in its March 2009 budget, the Quebec government announced the \$130 million extension of Highway 167 from Chibougamau to the Otish Mountains. The extended highway will facilitate access to projects such as Renard (diamonds), Matoush (uranium), and Macleod Lake (copper-molybdenum).
- The Northwest Transmission Line (NTL) in northwestern British Columbia: on September 16, 2009, the federal government announced a \$130 million commitment to help build the 335-km NTL. Part of the remaining \$274 million, from a total cost of \$404 million, would come from private industry, but the Government of British Columbia, which has committed to build the NTL, would bear the largest costs with a contribution that could reach a reported \$250 million. Upon completion, the NTL would improve the economics of a number of significant mining projects in northwestern British Columbia, including Galore Creek, Kerr-Sulphurets-Mitchell, and Schaft Creek.
- The Bathurst Inlet Port and Road (BIPR) project in Nunavut: this proposed deep-water port and permanent all-weather road would foster mineral exploration and production in the Kitikmeot region of Nunavut by reducing transportation costs associated with projects in this area and by lengthening the trucking season. A 50-50 joint venture between Kitikmeot Corporation and Nuna Logistics, the BIPR would be financed through a public-private partnership. Its Environmental Impact Statement is currently on hold with the Nunavut Impact Review Board. Examples of projects that could benefit from the BIPR include Hope Bay (gold); Izok Lake, NICO, Hackett River, and High Lake (all base metals); Gahcho Kue (diamonds); and Thor Lake (REE).

Other infrastructure projects with potential to contribute to mineral resource development include the proposed Nunavut-Manitoba Route, the proposed all-weather road through the MacKenzie Valley (Northwest Territories), the proposed Alaska-Canada Rail Link, the MacKenzie Valley Pipeline (which was the subject of a favourable Joint Review Panel report in December 2009), the completed 110-km access road to the Meadowland gold deposit in Nunavut, a proposed heavy-haul railway through Baffin Island, a proposed railroad link to the James Bay Lowlands "Ring of Fire" projects, and the proposed expansion of the Talston hydro-electric facility in the Northwest Territories.

PROJECTS IN THE NEWS

In recent years, the federal-provincial/territorial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures has collected information from as many as 851 project operators in Canada (**Table 2.6** in Chapter 2). In 2009, the number of project operators surveyed decreased to 650 as a number of projects became dormant in the midst of the economic crisis. It should be noted that many of these 650 projects continued to progress along the mineral development curve, as reported to the investment community by public companies regularly disclosing related information.

There are so many interesting projects in Canada, and exploration is such a dynamic activity, that presenting a list of projects in the news in this report would be unrealistic and the information presented would quickly become dated. However, mining provinces and territories keep a close eye on permitted projects and provide valuable reviews and reports to the public on activities in their respective jurisdictions. The reader can access this information via the Internet links provided in Chapter 4 of this report. Between provincial/territorial information and company news releases, the reader can find ample information on projects such as James (direct shipping iron ore in Newfoundland and Labrador), Canadian Malartic (gold in Quebec), Renard (diamonds in Quebec), Hardrock (gold in Ontario), McFaulds Lake (nickel-copper-PGE-chromite in Ontario), Lalor Lake (zinc-copper-gold in Manitoba), Midwest Northeast (uranium in Saskatchewan), Jansen (potash in Saskatchewan), Mt. Milligan (copper-gold in British Columbia), Central South (metallurgical coal in British Columbia), White Gold (gold in the Yukon), Nechalacho (REE in the Northwest Territories), and Hackett River (silver-zinc in Nunavut), to name just a few examples.

OUTLOOK

The short-term outlook for the Canadian mineral exploration sector appears to be definitely more favourable in early 2010 than it was one year earlier. However, significant risks remain as governments must decide whether to tone down their fiscal and monetary response to the crisis or continue to stimulate the economy amid persistent worries about the strength of the economic recovery.

Factors that will determine which direction Canadian mineral exploration and deposit appraisal activity will take include continued strength in the price of gold; a more favourable demand outlook for base metals; continued interest in commodities such as potash, uranium, and REE; mining-friendly equity markets (helped by generally low interest rates); capital infusions by new project owners or partners; and positive news from the field.

Barring any further economic turmoil, 2010 could mark a return to exploration and deposit appraisal expenditure growth, but at a slower pace than that recorded before the economic crisis.

ENDNOTES

¹ With contributions from Ginette Bouchard, Arlene Drake, Peter Trelawny, and Jianping Zhang of the Industry Economics and Taxation Division; Minerals, Metals and Materials Knowledge Branch; Minerals and Metals Sector; Natural Resources Canada.

² In December 2009, De Beers Canada announced that it was proceeding with production ramp-up and construction of the previously suspended accommodation camp at the Snap Lake mine. Full production levels are expected to be reached by the end of 2012. De Beers was also planning to increase overall production at the Victor mine in the second half of 2009 to match improvements in economic conditions and demand.

³ On January 29, 2009, Baffinland Iron Mines Corporation announced that it was scaling back its activities due to global economic conditions. For updated information on Baffinland and its Mary River iron ore project in Nunavut, go to www.baffinland.com/Home/default.aspx.

⁴ After instigating an asset conservation plan in August 2008, Canadian Royalties Inc. completed critical construction activity, demobilized personnel, and protected on-site equipment at its Nunavik project in northern Quebec. The company was acquired by Jien Canada Mining Ltd. in November 2009 (www.jiencanadamining.com).

⁵ On January 7, 2009, Shore Gold Inc. announced that, in response to global financial and diamond markets, it would adopt a significantly reduced budget resulting in staff reductions at its Star and Orion diamond projects in Saskatchewan. Its focus was to remain on the completion of a pre-feasibility study and reserves calculation for the Star project and a resources calculation for the Orion project. For updated information on these projects, go to <http://shoregold.com/index.php>.

- ⁶ See TMX Group's *Mining Sector Profile* at www.tmx.com/en/pdf/Mining_Sector_Sheet.pdf.
- ⁷ Gamah International Limited, *Mining & Exploration Company Financings (MECO)*, November 2009.
- ⁸ Kitco.com, London PM Fix cumulative average.
- ⁹ See the Government of Saskatchewan's December 17, 2009, press release on the Internet at www.gov.sk.ca/news?newsId=4c9d1ce3-a344-4b4e-a0f5-a1e02670cbea.
- ¹⁰ See the U.S. Geological Survey's 2009 Mineral Commodity Summary on the Internet at http://minerals.usgs.gov/minerals/pubs/commodity/rare_earths/mcs-2009-raree.pdf.
- ¹¹ Through its subsidiary Toyota Tsucho Corporation, Toyota signed a July 2009 letter of intent regarding properties owned by Great Western Minerals Group in New Brunswick and Saskatchewan. Also in July 2009, Canadian company Neo Material Technologies entered into a partnership with Mitsubishi Corporation to identify, develop, and commercialize REE opportunities outside of China. According to a January 7, 2010, report in *The Globe and Mail*, Magna International Inc. participated in a December 2009 equity financing valued at \$10.5 million for a stake in Toronto-based Lithium Americas Corp., which owns the Salares lithium project in Argentina.
- ¹² For more information on corporate social responsibility activity in the Canadian mining industry, see the web sites of the Department of Foreign Affairs and International Trade at www.international.gc.ca/trade-agreements-accords-commerciaux/ds/csr.aspx and the Prospectors and Developers Association of Canada at www.pdac.ca/pdac/advocacy/csr/index.html.
- ¹³ Bill C-300, *An Act Respecting Corporate Accountability for the Activities of Mining, Oil and Gas Corporations in Developing Countries*, is a private member's bill tabled in the House of Commons by John McKay (Liberal Member of Parliament for Scarborough-Guildwood) on February 9, 2009. A copy of Bill C-300, which passed Second Reading on April 22, 2009, and was referred to the Standing Committee on Foreign Affairs and International Development, is available at www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=3658424&file=4. When Parliament resumes on March 3, 2010, following prorogation, Bill C-300 will be reinstated and will still be under consideration by the Standing Committee.
- ¹⁴ For more information on Bill 173 and the *Mining Amendment Act, 2009*, please consult the Ontario Ministry of Northern Development, Mines and Forestry at www.mndm.gov.on.ca/miningact/miningact_e.asp.
- ¹⁵ For updated information on the legislative status of *Bill 191, Far North Act, 2009*, see the Legislative Assembly of Ontario web site at www.ontla.on.ca/web/bills/bills_detail.do?locale=en&BillID=2205&detailPage=bills_detail_status.

Note: Information in this chapter was current as of December 2009.

NOTE TO READERS

The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

**TABLE 1.1 TOTAL MINING EQUITY
FINANCING RAISED IN CANADA AND FLOW-
THROUGH-SHARE FINANCING, 1995-2009**

Year	Total Mining Equity Financing	Flow-Through- Share Financing
(\$ millions)		
1995	3 744	123
1996	6 632	220
1997	5 516	127
1998	3 039	55
1999	2 292	50
2000	1 655	102
2001	1 655	133
2002	3 477	192
2003	5 816	235
2004	6 721	473
2005	5 027	398
2006	10 633	628
2007	21 422	1 071
2008	11 547	625
2009 (a)	19 543	335

Sources: From 1995 to 2007, Gamah International finalized annual reports; for 2008 and 2009, Natural Resources Canada (compiled from Gamah International monthly reports).

(a) Eleven-month data (January-November).

2. Mineral Exploration, Deposit Appraisal, and Mine Complex Development Activity in Canada

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INTRODUCTION

The analysis presented herein is the result of the amalgamation of two articles: one from the *Canadian Minerals Yearbook* entitled “Mineral Exploration, Deposit Appraisal, and Mine Complex Development Activity in Canada” and the other from the *Overview of Trends in Canadian Mineral Exploration* report entitled “Indicators of Mineral Exploration and Deposit Appraisal Activity in Canada.”

With respect to the above-mentioned documents, this chapter describes mineral resource development activities in Canada from an analytical standpoint that is based on data collected by the federal-provincial/territorial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures. Data are from the 2008 survey exercise (final 2008 survey) and also cover, to some extent, 2009 (revised spending intentions for 2009). Through this survey, companies reported on a full spectrum of cost data and, when applicable, these statistics are analyzed in the context of the three work phases covered by the survey, namely: exploration, deposit appraisal, and mine complex development expenditures. The statistics include data on field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access, along with associated capital,¹ and repair and maintenance costs for construction, machinery, and equipment.

In order to better understand the Canadian mineral exploration industry, including its challenges and strategies, the adopted analytical approach is to drill down through results and trends from a total mineral resource development perspective using national and regional comparisons. Thereafter, following a discussion of exploration and deposit appraisal activity drivers, the analysis focuses on indicators such as claim staking and drilling before a thorough review of the most important indicator of all: spending. The latter is covered separately and extensively up to the level of off-mine-site and on-mine-site location of activity. Unless otherwise specified, the results at this level are discussed without capital, and repair and maintenance costs. The reader should also note that historical comparisons are denominated in constant 2008 dollars to account for inflation.

SURVEY OF MINERAL EXPLORATION, DEPOSIT APPRAISAL AND MINE COMPLEX DEVELOPMENT EXPENDITURES

The statistics for the 2008 and 2009 analyses contained in this report were collected simultaneously through the annual federal-provincial/territorial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures (the Survey). This survey was conducted primarily between January and June of 2009. Since the outlook for metal markets improved in the second half

of 2009, after the Annual 2008/Revised Intentions 2009 survey was closed, the real impact of improving economic conditions on the 2009 level of expenditures is not yet known. Firmer results for 2009 (from the Preliminary 2009/Spending Intentions 2010 survey) will be released in March 2010.

A small-scale redesign of the Survey was implemented in the Preliminary 2008/Spending Intentions 2009 compilation. This minor redesign allows better reporting of mineral commodities sought and improved work phase validation. The impact of these changes will be briefly discussed in this chapter. More adjustments to the Survey are being considered to reflect the industry's constant evolution and to improve the pertinence of the analysis.

For copies of the Survey form and Reporting Guide, as well as information about the mandate, response rate, and history of the Survey, the reader is invited to consult the following two web sites:

- <http://mmsd.mms.nrcan.gc.ca/stat-stat/expl-expl/form-form-eng.aspx>
- <http://mmsd.mms.nrcan.gc.ca/stat-stat/expl-expl/menu-menu-eng.aspx>

Generalized Model of Mineral Resource Development

The definitions used in the Survey are based on the Generalized Model of Mineral Resource Development (the Model), which is available on the Internet at:

- http://mmsd.mms.nrcan.gc.ca/stat-stat/expl-expl/pdf/04_e.pdf

The Model is currently under review and an updated version should be available during 2010. The goal of this review is for the Model to present a better-integrated perspective of an exploration project evolving into a feasible mining project. Some of the new criteria developed through the review process have already been embedded in the survey definitions, and new questions on work objectives, technical studies, and National Instrument 43-101 (NI 43-101) compliant mineral resources are being tested to improve the accuracy of reporting and to further validate the Model.

Key Definitions

The *exploration* work phase is defined as the search for, discovery, and first delimitation of a previously unknown mineral deposit or the re-evaluation of a sub-marginal or neglected mineral deposit in order to enhance its potential economic interest based on delimited tonnage, grade, and other characteristics. This phase is completed when a deposit has sufficient indicated mineral resources accompanied by a positive scoping study (preliminary economic assessment) that justifies additional, more detailed, and costly *deposit appraisal* work.

The *deposit appraisal* work phase is defined as the steps undertaken to bring a delimited deposit, by definition drilling, comprehensive tests, and planning, to the stage of detailed knowledge required for a complete feasibility study that will fully justify and support a production decision and the large investment required.

A mining project is considered committed to production or migrating to the *mine complex development* work phase when: the final feasibility study has demonstrated production at a profit, the production decision has been taken by the organization, financing is on hand or has been arranged, all permits and authorizations have been obtained, and major pieces of production equipment have been purchased or ordered.

The *on-mine-site* category of expenditures is defined as the area that can be accessed and exploited from the current or committed installations. The size of this area is determined by the environmental permits obtained (except for Quebec, where it is based on the size of the mining lease) and varies depending on the commodity under consideration; the attitude (horizontal, inclined, vertical); the type, extent, and number of deposits; and the mining method(s) in use. The allocation of expenditures

on a single mine site to either mine complex development, deposit appraisal, or exploration activity is based on distance criteria and their application is not always straightforward.

In some analyses, results are presented by company type. “Seniors” (senior companies) are project operators that derive their income from mining or other business ventures and that can direct part of that income towards their exploration and deposit appraisal projects. On the other hand, “juniors” (junior companies) usually have no regular source of income and must finance their projects through the issuance of shares.

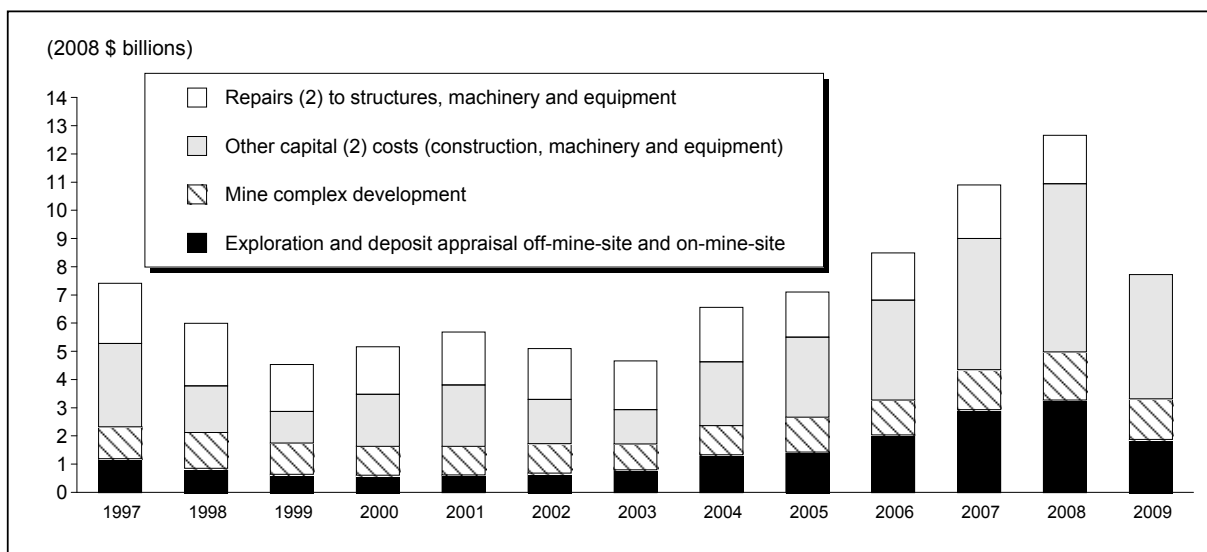
The reader should note that only project operators (that is, the single project owner or the reporting entity of a joint venture or partnership) are surveyed to avoid duplication in reporting by project/property. Joint-venture or partnership details are collected to ensure proper follow-up and validation of such business agreements.

MINERAL RESOURCE DEVELOPMENT

Total Investment

For the purpose of this analysis, total expenditures for all three work phases (mineral exploration, deposit appraisal, and mine complex development), inclusive of capital, and repair and maintenance costs, are called “total investment.” In 2008, statistics were compiled from 871 active companies/project operators, a slight decrease from the 884 recorded in 2007. These 871 project operators are responsible for an all-time record \$12.7 billion in total investment, or a 21% increase over the 2007 high of \$10.5 billion (**Figure 2.1**). As a result of the economic downturn, the number of active projects that were reported on in the 2009 Revised Intentions survey declined to 691. Although data for repair and maintenance costs will be collected in the next survey exercise, an estimate for this cost component, based on previous years’ reports, indicates that the 2009 total will not likely exceed the \$10 billion mark.

Figure 2.1
Total Mineral Resource Development Expenditures in Canada, 1997-2009 (1)



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Data for 2009 do not include repair and maintenance costs. (2) Includes expenditures related to exploration, deposit appraisal, and mine complex development.

Note: Data for 2009 are revised spending intentions.

In 2008, the shares of each main component of total investment (**Figure 2.1** and **Table 2.1**) consisted of 47% for all capital costs (including an 8% or \$471 million share for such costs in the exploration and deposit appraisal work phases), 26% for exploration and deposit appraisal projects, 14% for repair and maintenance, and 13% for mine complex development. A rough estimation for 2009 results in spending shares of 47% for capital, 20% for exploration and deposit appraisal, 17% for repair and maintenance, and 16% for mine complex development.

Property Distribution

The Survey collects information that is supplied on properties by project operators. Properties can be the object of activities at more than one work phase. As such, the record total investment of \$12.7 billion from 871 active project operators recorded in 2008 came from more than 3000 properties across Canada. At least 2700 of these properties were in the exploration stage, 93 were in deposit appraisal, 168 were in mine complex development, and 12 were mills and plants.

Highlighting the importance of senior companies in terms of mine complex development, capital, and repair costs in total investment, 637 projects (414 at the exploration stage, 55 at the deposit appraisal stage, and 168 at the mine complex development stage) were managed by 154 senior companies, which represented only 20% of all properties but accounted for 81% of total investment.

Expenditure Fluctuations

A comparison with 2007 numbers reveals that 68% of the \$2.2 billion investment increase in 2008 can be attributed to capital costs for structures, machinery and equipment (in all work phases), 21% for exploration and deposit appraisal activity, and 16% for mine complex development work. Repair and maintenance costs decreased by 5%.

By comparing the 2009 total of \$7.5 billion with the 2008 total of \$10.9 billion on the same basis (excluding repair and maintenance), it was found that total capital costs are responsible for 49% of the decrease in 2009, while exploration and deposit appraisal activity accounted for 42% and mine complex development work accounted for 9% (**Figure 2.1** and **Table 2.1**). New mining projects under construction and mine expansions, for which expenditures are included under the capital and mine complex development categories, are the most important determinants of year-to-year investment fluctuations. These components are discussed below while the exploration and deposit appraisal activity components are addressed later in this chapter.

Project-Specific Impacts

A total of 19 new mining projects entered the mine complex development work phase in 2008. They consisted of eight base-metal (seven nickel and one copper-gold), four gold, three coal, one antimony, one iron, one potash, and one dolomite project. In 2009, only six projects were expected to make that transition. They consisted of three gold, one silver, one copper, and one magnetite project. In 2008, six mines were removed from this work phase while, in 2009, fourteen were removed or were inactive, including five newly committed to production in 2008. The fourteen projects consisted of eight base-metal, three precious-metal, one molybdenum, one antimony, and one coal project.

Of the nineteen new projects committed to production in 2008, six represented investments of \$100 million or more each, for a total contribution of \$1.5 billion. They consisted of Nickel Rim South (nickel-PGM) in Ontario, New Afton (copper-gold) in British Columbia, Meadowbank (gold) in Nunavut, Picadilly (potash) in New Brunswick, Lac Bloom (iron ore) in Quebec, and Nunavik (nickel-copper-PGM) in Quebec.

Existing projects also continued to show important levels of investment. Among the most significant were the Rocanville, Cory, and Lanigan potash mines of PCS Inc. in Saskatchewan and the Esterhazy

and Colonsay potash mines of The Mosaic Company, also in Saskatchewan. Expansions at some of these operations and at Agrium Ltd.'s Vanscoy potash mine were expected to continue in 2009.

Contrary to the strong investment in potash facilities, construction was winding down at the Snap Lake (Northwest Territories), Ekati (Northwest Territories), and Victor (Ontario) diamond mines, while Diavik's underground mine continued to unfold in 2009, although at a slower pace. Overall, a total decrease of about \$1 billion was recorded for the diamond mines in 2008.

In 2008, construction expenditures at the Endako molybdenum mine in British Columbia somewhat compensated for the drop in investment resulting from the suspension of the Galore Creek (copper-gold) mining project in the same province. Other major investments were made at the Luce mine (iron ore) at Carol Lake in Labrador and at the Highvale mine (coal) in Alberta.

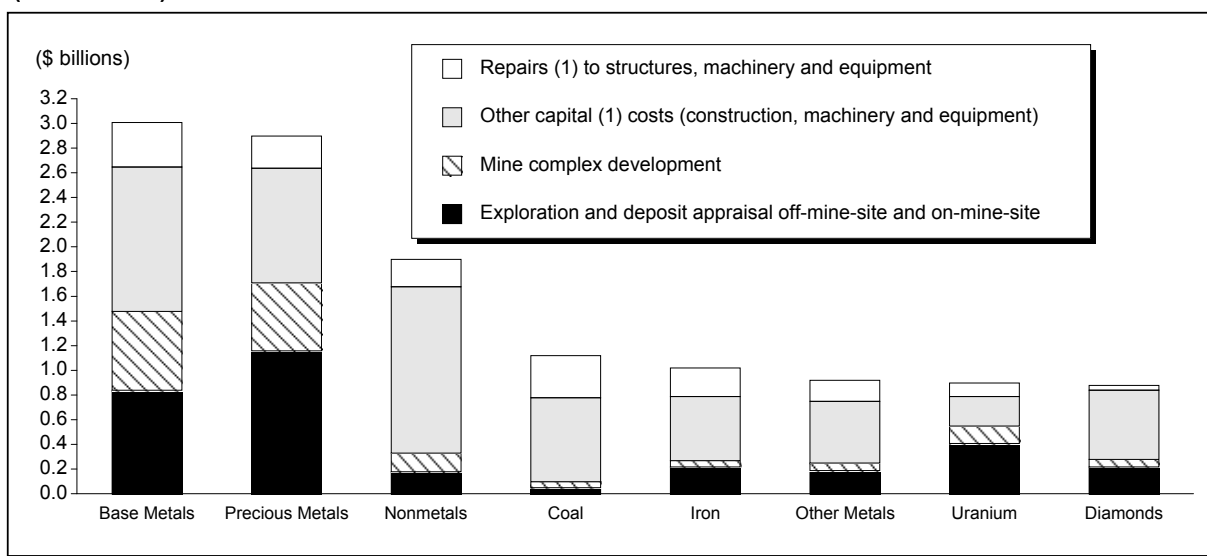
Overall, total investment in each mineral commodity group increased (except for diamonds, which recorded a drop of 50%) (**Figure 2.2**). Investment more than doubled in the nonmetals and iron categories and, not surprisingly, these two commodity groups recorded the largest total investment increases in 2008.

Regional Trends

Saskatchewan climbed from fourth place in 2007 to first place in 2008 with \$2.4 billion in total investment (**Figure 2.3**), surpassing Ontario for the first time ever. In 2009, Saskatchewan is expected to maintain its top total investment ranking with \$2.6 billion (including estimated repair and maintenance costs of \$234 million), its highest level since 1997. Ontario will remain in second place despite a significant drop in expenditures. British Columbia and Quebec were the third and fourth top jurisdictions in 2008. Quebec is expected to surpass British Columbia in 2009. The Northwest Territories, the Yukon, and Nova Scotia are the only jurisdictions with expenditure decreases in 2008. Along with Saskatchewan, the Yukon and Nova Scotia are the only other jurisdictions expected to have investment increases in 2009.

Figure 2.2

Total Mineral Resource Development Expenditures in Canada, by Mineral Commodity, 2008
(\$12.7 billion)

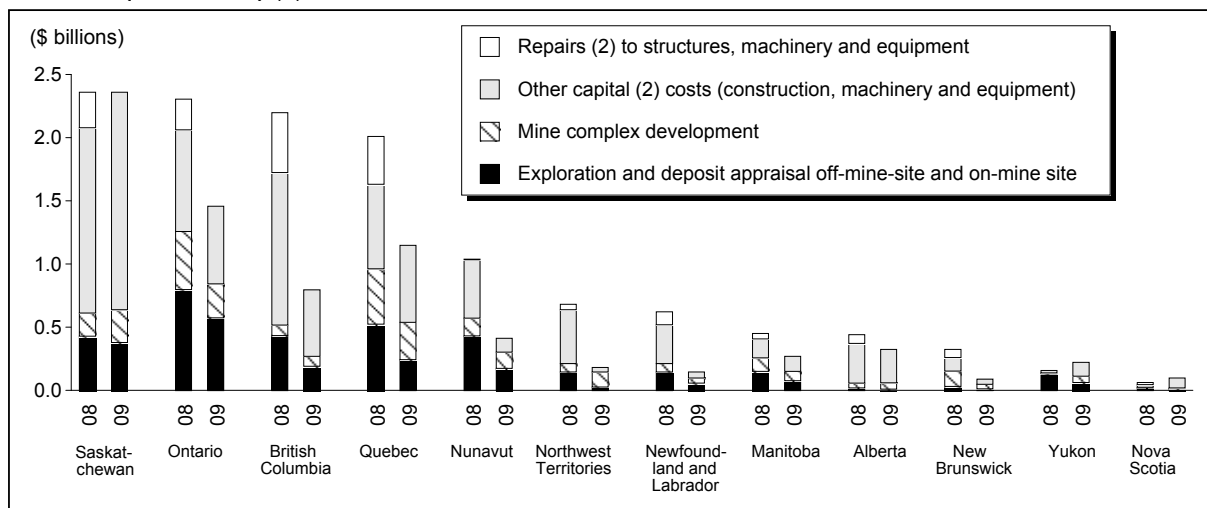


Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes expenditures related to exploration, deposit appraisal, and mine complex development.

Figure 2.3

Total Mineral Resource Development Expenditures, by Province and Territory, 2008 (\$12.7 billion) and 2009 (\$7.5 billion) (1)



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Data for 2009 do not include repair and maintenance costs. (2) Includes expenditures related to exploration, deposit appraisal, and mine complex development.

Note: Data for 2009 are revised spending intentions.

Saskatchewan's rise is related to increases in total investment for potash. The strong demand for potash caused the potash price to peak in 2008. In fact, an average price of \$576 per tonne was recorded for that mineral commodity, compared to \$190 per tonne in 2007 (**Table 2.2**). Furthermore, the impact of a 10-year tax holiday on potash mine expansions, introduced in 2005 to increase potash mine capacity, has certainly encouraged expansion at existing operations. At the other end of the spectrum, decreased diamond activity resulted in the Northwest Territories recording the largest total investment decrease of all Canadian jurisdictions in 2008.

Exploration and Deposit Appraisal

One of the objectives of this chapter is to analyze exploration and deposit appraisal indicators (mostly spending, but also claim staking and drilling). In order to introduce this analysis and to provide some context, this section begins with a review of the main drivers of investment.

Activity Drivers - Prices

Exploration and deposit appraisal intensity is influenced by several drivers. The main driver is certainly the price outlook. In recent years, emerging economies, especially China, put upward pressure on mineral commodity demand, driving prices up for a number of key commodities. For most commodities, prices peaked in 2007 (average yearly price), except for platinum, iron ore, coal, and potash, which continued to increase in 2008. Thriving in times of economic uncertainty as prices for other products weakened, the price of gold was still rising at the time of writing this chapter (**Table 2.2**).

A major impact of rising prices up to the end of 2006/early 2007 on exploration and deposit appraisal activity was a renewed interest in previously marginal or sub-economic former deposits or mining camps. At least 130 of the reported projects in 2008 were related to former mines. Companies were quickly re-evaluating the most promising deposits by updating or initiating scoping and pre-feasibility studies, and by reviewing and upgrading historical mineral resource inventories to NI 43-101 compliance standards. Revamped projects, enhanced by new exploration results and the application of modern technologies and models, attracted investors eager to participate in their development. Strong

commodity prices and record financing levels offset higher operating costs due to high demand for services and equipment. Many projects were fast-tracked (especially those managed by junior companies) and mine expansions, where possible, were initiated in an effort to take advantage of high commodity prices.

Activity Drivers - Financing

Despite the global credit crunch that began back in August 2007 with the U.S. mortgage crisis and the subsequent international financial crisis that developed during 2008, financing was still available for most of the year and company budgets were secured for the field season. Consequently, exploration and deposit appraisal spending reached a peak of \$3.3 billion in 2008 (**Table 2.3**).

However, access to financing quickly deteriorated near the end of 2008. Companies started to rationalize their business activities, postponed costly project development, and kept exploration work to a minimum in the hope of surviving the downturn and retaining financial and property assets for the next economic upturn. As a result, total exploration and deposit appraisal expenditures are expected to decline by a dramatic 44% in 2009 to \$1.8 billion. While this amount is significantly lower than the 2008 total, it is still comparable to the \$2 billion (constant 2008 dollars) achieved in 2006 and is far from the low of \$615 million recorded in 2000. Based on improved access to financing and continued interest in gold and some other commodities, exploration appeared to be picking up somewhat at the end of 2009. It is also expected that some companies will be reluctant to release their exploration budget forecast for 2010 given the economic uncertainty.

The availability of generous tax incentives has also been singled out as a successful contributor to the financing activities of the Canadian mineral exploration industry. Measures such as the federal flow-through-share (FTS) mechanism and the 15% Mineral Exploration Tax Credit (METC), as well as additional tax deductions and credits at the provincial/territorial level (some of which are harmonized with the federal tax credit), are designed to support the junior exploration sector.

The METC, which has been extended five times since its inception in October 2000, is slated to expire on March 31, 2010. It has been estimated by Gamah International Ltd.² that from its inception to December 31, 2008, a total of \$3.9 billion had been raised via the FTS mechanism to finance mineral exploration in Canada (**Table 1.1** in Chapter 1). While existing tax rules do not allow a full, direct correlation between FTS financing and spending, the former peaked at \$1.1 billion in 2007 at the same time that junior company spending peaked at \$2.0 billion (constant 2008 dollars) (**Figure 2.4** and **Table 2.3**). Total FTS financing was down to \$625 million in 2008 while junior company spending grew by a further \$138 million. FTS financing slowed down considerably in 2009 with only \$296 million in funds being raised during the first 10 months of the year.

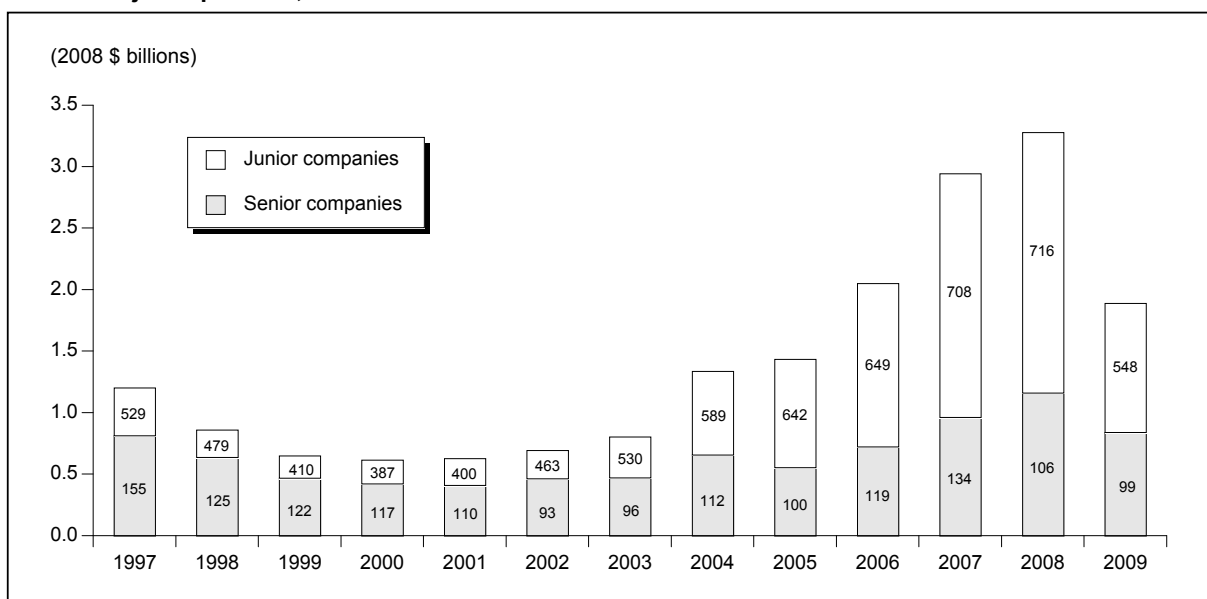
Activity Drivers - Discoveries

While not documented in this report, new discoveries and positive results at existing projects also influence exploration and deposit appraisal activity levels. Canada has a very large and geologically diverse land mass, and large areas of the country have yet to be fully explored using state-of-the-art knowledge and techniques. The importance of new discoveries and positive work results is quite evident when very rich drill intersection results are released. In underexplored terranes, such announcements often lead to a claim- or map-staking rush to secure property rights as a precursor to more intense and costly exploration activity. Some examples of recent exploration rushes include the areas surrounding the Lalor Lake zinc discovery in Manitoba, the McFaulds Lake's Eagle One (nickel) and Blackbird (chromite) discoveries in Ontario, and the Eleonore gold deposit in Quebec.

Activity Indicators - Claim Staking

Claim or map staking usually occurs at a relatively early stage of mineral exploration and usually provides a good indication of current grassroots-type activities and some insight into where future

Figure 2.4
Exploration and Deposit Appraisal Expenditures in Canada, (1) by Type of Company With Number of Active Project Operators, 1997-2009



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on-mine-site and off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Notes: Numbers indicated in the bars represent the number of active project operators by type of company. Prospectors are excluded from the count. Data for 2009 are revised spending intentions.

advanced (deposit appraisal) work may be focused. Nonetheless, the analytical value of this indicator alone is limited.

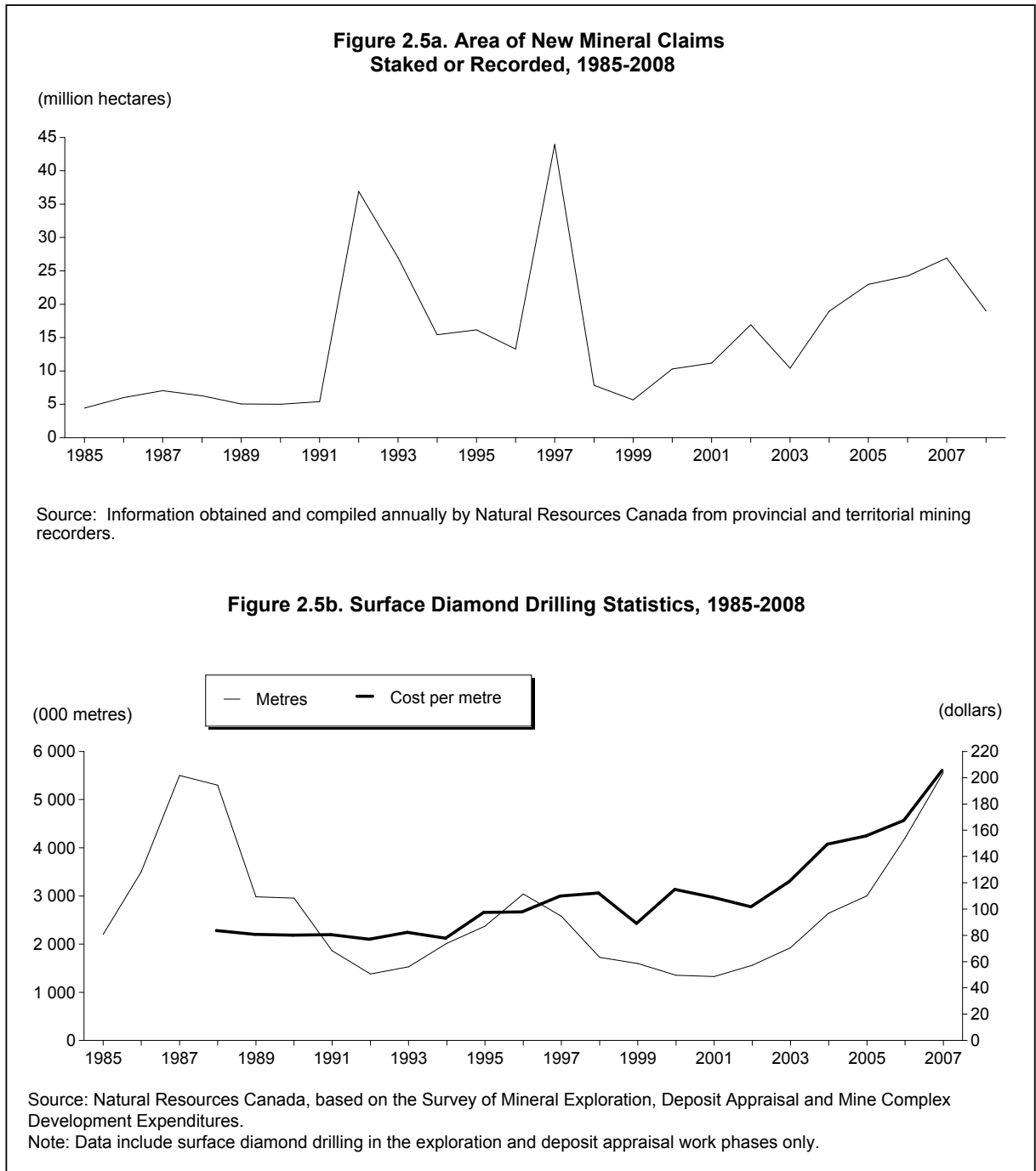
Claim registration rules and guidelines differ across Canada and the following analysis is based on an attempt to collate similar types of information provided by provincial/territorial mining recorder offices. Furthermore, in recent years, mineral tenure has evolved with the advent of Internet-based map staking. Many jurisdictions have migrated toward this easier on-line registration method, which may have spurred the number of claims recorded during the transition period. The reader can find more information on the different mining rights regimes across Canada at www.mndm.gov.on.ca/mines/lands/provter/default_e.asp.

The area of new claims staked or recorded peaked at 26.9 million hectares (Mha) in 2007 and decreased by almost 30% to 19.0 Mha in 2008 (**Figure 2.5a** and **Table 2.4**). Apart from Alberta (+44%) and New Brunswick (+858%), the area of new claims recorded decreased in all other jurisdictions in 2008. The very large increase in New Brunswick was induced by the November 2008 implementation of the new map-staking system following a five-month moratorium on staking. The strongest proportional decreases were in Saskatchewan (-67%), Quebec (-63%), and the Northwest Territories (-61%). But, in terms of actual hectares, Quebec (-3.1 Mha), Saskatchewan (-2.5 Mha), and British Columbia (-1.4 Mha) accounted for 70% of the total decreases. Altogether, British Columbia, Quebec, Alberta, and Saskatchewan accounted for over 70% of all new claims staked or recorded in Canada in 2008.

In any given year, “total claims in good standing” provides a measure of the total area that companies have decided to reserve for their current and future exploration needs. The portion of Canada’s land mass covered by mineral claims in good standing in 2008 remained unchanged at 7.9%

compared to 2007 (**Table 2.4**). Overall, the total amount of claims in good standing decreased slightly in 2008 (-1%), but not by enough to make a difference in the total land mass available for exploration and deposit appraisal activity. The leading jurisdictions in terms of the share of their land mass covered by claims in good standing were Alberta (18.0%), British Columbia (16.3%), and Saskatchewan (16.2%). In terms of total hectares covered, the leaders were British Columbia, Quebec, Alberta, and Saskatchewan.

Figures 2.5a and 2.5b
Selected Measures of Exploration Activity



Although the total area of claims in good standing remained relatively unchanged (78.4 Mha in 2008 versus 79.0 Mha in 2007), important variations occurred on a regional basis. For instance, decreases totaling 4.9 Mha were recorded in Saskatchewan, the Northwest Territories, Manitoba, and Newfoundland and Labrador. In contrast, increases totaling 4.2 Mha were recorded in British Columbia, Ontario, the Yukon, Quebec, Alberta, Nunavut, and New Brunswick.

These regional increases in the area of claims in good standing indicate that some of the increased spending recorded in 2008 was incurred on new ground and that exploration and mining companies had decided that their new properties warranted further investigation. This was the case for Ontario, Quebec, Alberta, and Nunavut, which all experienced increases in both expenditures and area of claims in good standing during that year. Although expenditures increased in Saskatchewan, no correlation with the area of claims in good standing is evident from **Table 2.4** because potash is excluded from the compilation of claims. In 2005, a 20-plus-year hiatus from potash exploration in Saskatchewan ended, and potash dispositions (not displayed in **Table 2.4**) have grown since then, reaching a peak of 4.5 Mha in 2008.

Activity Indicators - Drilling

An historic compilation of surface diamond drilling statistics provides a good indication of the intensity of exploration and deposit appraisal activity. Drilling is the means by which companies test mineral targets, discover and delimit a deposit (exploration), and finally obtain the internal characteristics of the deposit through definition drilling to establish the mining parameters (deposit appraisal). Drilling activity (including surface and underground work using diamond and other types of drilling) represented 47% of total exploration and deposit appraisal spending in 2008 (**Table 2.5**). On its own, surface diamond drilling represented 41% of the total spending and amounted to 6.2 million metres, or 87% of all metres drilled in 2008. This 6.2 million metres drilled represents an 11% increase over 2007 when 5.6 million metres were recorded, and also sets a record for the 1985-2008 statistical series (**Figure 2.5b**).

With respect to surface diamond drilling, the importance of junior companies is even more pronounced than it is on an expenditure basis. In 2008, junior companies accounted for 71% of all surface diamond drilling while the senior companies' share was only 29%.

The intense exploration and deposit appraisal activity that took place in recent years, particularly in 2007 and 2008, contributed to an increase in the demand for equipment and services. This was especially the case in the diamond drilling sector where the calculated cost per metre incurred by the company (inclusive of all other related costs such as drill mobilization, site preparation, and assaying) increased to over \$200 per metre in 2007 and reached \$215 per metre in 2008 (**Figure 2.5b**). Not surprisingly, costs can vary by region and type of mineral commodity drilled, but that level of detailed analysis is beyond the scope of this chapter.

Activity Indicators - Expenditures

Expenditures (spending) are the most important indicator of exploration and deposit appraisal activity. They are also the most amenable to detailed analysis because of the wealth of information found in the federal-provincial/territorial survey. Hence, this section covers different aspects of exploration and deposit appraisal spending in Canada and provides data breakdowns by work phase and by sub-work phase (on-mine-site vs. off-mine-site) for type of company, commodity, and region.

EXPENDITURES - OVERVIEW

Exploration and deposit appraisal spending reached a record \$3.3 billion in 2008, shattering the previous year's record of \$2.8 billion with a 16% increase in expenditures (**Table 2.1**). In Canada's mining history, the only other time that spending exceeded the \$2 billion mark (in constant 2008 dollars) was in 1987 and 1988 during the heyday of the Mining Exploration Depletion Allowance

(**Figure 6.1** in Chapter 6). When associated capital and repair and maintenance costs are included, total exploration and deposit appraisal expenditures reached \$3.8 billion in 2008, a 30% share of total investment and a 13% increase over the \$3.3 billion recorded in 2007 (**Table 6.1** in Chapter 6). This total represents another record high when compared to similar data in the 1997-2008 statistical series (**Table 2.3**).

Revised spending intentions for 2009 indicate a dramatic decline of some 44% as exploration and deposit appraisal expenditures are expected to drop to \$1.8 billion. Brought on by the economic crisis, this reduced spending has interrupted a record-breaking trend of eight consecutive years of increasing expenditures (since 2001). Reflecting the uncertain economic times, a number of companies (mainly junior companies) that reported expenditures for 2008 did not have their budgets available for the 2009 survey. These companies' expenditures, if any at all, will be captured in the *Preliminary 2009/Spending Intentions 2010* survey compilation.

EXPENDITURES - BY TYPE OF COMPANY

It is noteworthy that the total expenditure increase in 2008 is a result of higher spending by company as opposed to an increase in the number of companies. The total number of active companies, excluding prospectors, decreased in 2008 compared to 2007 (822 compared to 842), but the number of companies spending over \$10 million increased from 65 to a high of 78 in 2008, accounting for 59% of total expenditures, compared to 53% in 2007 (**Table 2.6**). This number has increased steadily since 2003. Similarly, the number of companies spending in the \$1 million-\$5 million range has also increased. This spending interval has become, since 2005, the dominant range in terms of the number of companies. However, their share of total expenditures has remained at about 25% through the years. Altogether, companies spending over \$1 million contributed 97% of the total exploration and deposit appraisal spending in 2008, compared to 95% in 2007 and the 94% expected for 2009.

In recent years, junior companies have funded a greater proportion of Canada's exploration effort. Total expenditures by junior project operators continued to climb from \$182 million in 1999 (438 junior project operators) to a record high of \$2.1 billion in 2008 (716 junior project operators). In 2007, a total of \$2 billion was reported by 708 junior project operators. Junior companies contributed less than half of the total \$449 million increase in 2008. In comparison, the juniors contributed 73% of the total \$919 million increase recorded in 2007. In 2009, 548 junior project operators are expected to account for 76% (or \$1.1 billion) of the total expected decrease of \$1.4 billion. The effects of the deteriorating economic situation were noticeable in the 2009 survey results as more junior companies were reporting in lower ranges of spending such as in the \$500 000-\$1 million and \$200 000-\$500 000 intervals (**Table 2.3**).

Junior companies have outspent senior companies since 2004. In fact, they have accounted for over 60% of total annual expenditures from 2005 to 2008. Their proportion of total spending is expected to decline to 56% in 2009.

It is important to remember that a change in company classification or the upgrading of an advanced exploration or deposit appraisal project to the mine complex development work phase can affect the breakdown of expenditures by company type.

In 2008, the growth experienced by juniors was the result of both spending increases by existing companies and the addition of new companies. These new companies accounted for about \$62 million in spending. In addition, the reclassification of a senior company resulted in some \$19 million being reallocated to junior spending. On the other hand, eight projects previously managed by junior companies (including four at about \$10 million each) entered the mine complex development phase in 2008. These projects accounted for \$93 million in spending during 2007. A senior company also took over a junior company with significant spending of around \$60 million in 2008. Overall, these adjustments contributed to slower growth in junior company spending in 2008.

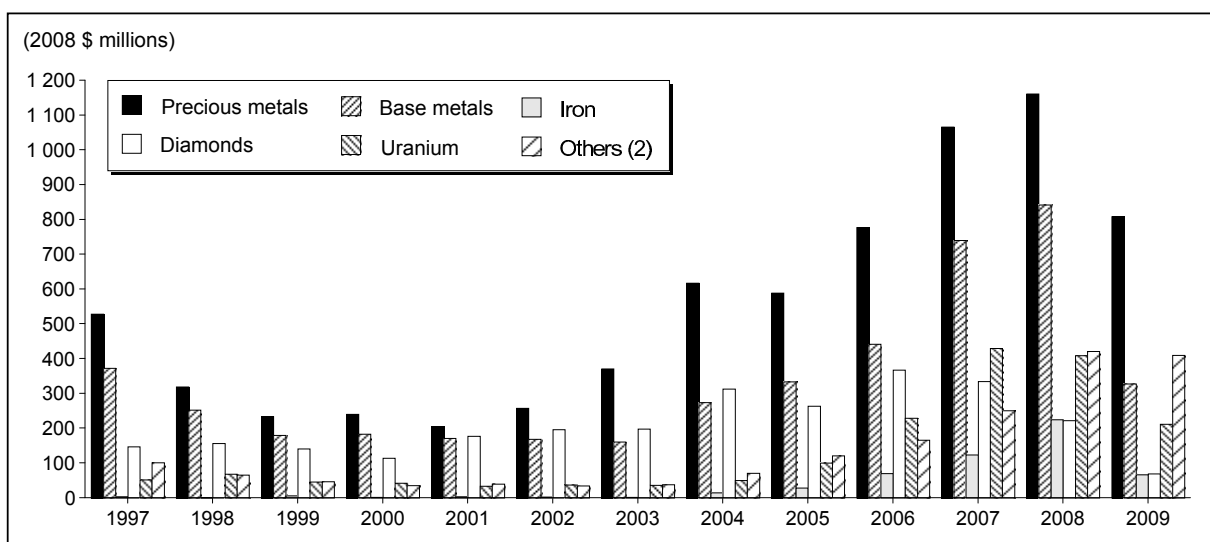
In 2009, exploration and deposit appraisal spending will be affected by three important changes in the work phase classification of projects managed by junior companies, namely Osisko Exploration Ltd., Similco Mines Ltd., and Alexco Resource Corp. These projects are expected to enter the mine complex development work phase and therefore will not be counted as junior company projects in the 2009 *Revised Intentions* survey.

EXPENDITURES - BY MINERAL COMMODITY GROUP

The leading commodity groups in 2008, in decreasing order of expenditure, were precious metals, base metals, and uranium (**Figure 2.6**). These three commodity groups accounted for 74% of total exploration and deposit appraisal expenditures. This distribution mirrored that of 2007, both in terms of commodity groups and proportion of total spending. Major proportional increases were recorded for the nonmetals (+468%), including an even more spectacular rise for potash (+797%), followed by iron ore (+89%), coal (+52%), base metals (+18%), including a 63% rise for nickel, and precious metals (+13%), including a 23% increase for silver. As discussed in Chapter 1, these increases were based on the favourable price outlook that had existed in 2007 when 2008 exploration budgets were being prepared. In dollar terms, nonmetals, base metals, and precious metals accounted for \$415 million of the \$552 million net increase in spending from 2007 to 2008. Uranium, while still showing strong results, experienced a slight 1% decrease while diamonds experienced a 31% decrease for a combined spending reduction of \$104 million (**Table 2.7**).

In 2009, expenditures are expected to decrease for all commodity groups except coal (+6%) and nonmetals (+43%) (**Tables 2.8 and 2.9**). In dollar terms, the bulk of the decrease should come from base metals (-\$524 million), precious metals (-\$375 million), uranium (-\$203 million), and iron ore (-\$160 million). These four commodity groups should account for 88% of the \$1.4 billion decrease in spending in 2009. Total expenditures for diamonds are expected to decline by a further 70% to reach a low of \$67 million, the lowest level since 1992 when the Ekati diamond mine was discovered, fueling diamond exploration in subsequent years (**Figure 6.2** in Chapter 6). In its peak years, diamonds contributed up to 28% (2001) of total expenditures in Canada. In 2008, the contribution by diamonds dropped to 7% and will probably drop below 4% in 2009.

Figure 2.6
Exploration and Deposit Appraisal Expenditures in Canada, (1) by Mineral Commodity, 1997-2009



Source: Natural Resources Canada, based on the Survey of Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on-mine-site and off-mine-site activities for field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs. (2) Others include coal, other metals, and nonmetals.

Note: Data for 2009 are revised spending intentions.

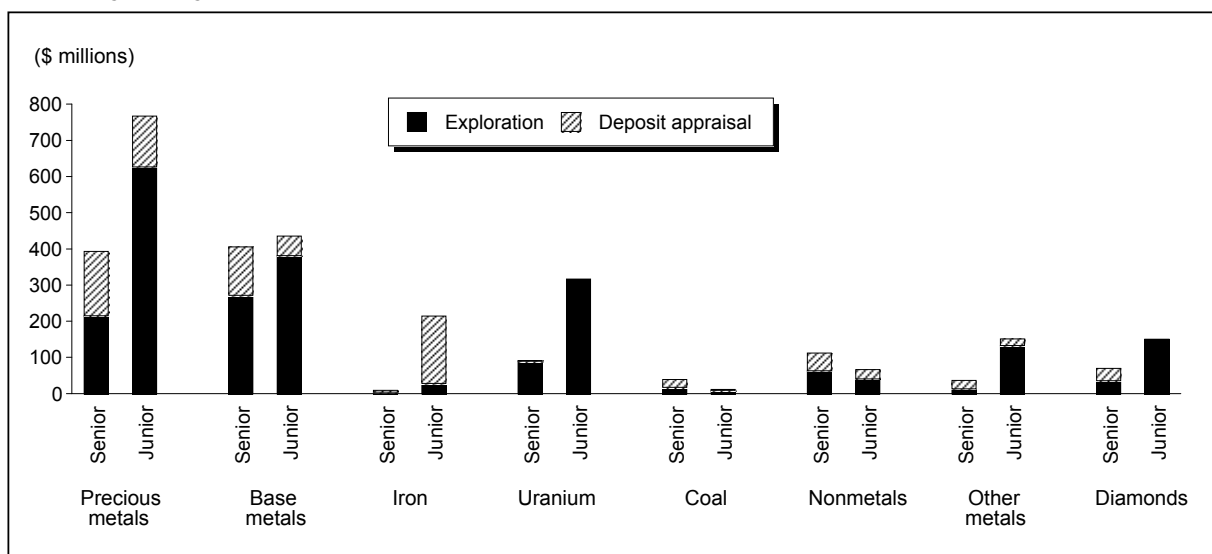
The mineral commodity analysis presented in this chapter is based on primary mineral commodity sought information supplied by survey respondents. However, the 2008 survey redesign has introduced the possibility of also collecting information on secondary (accessory) commodities. More details will be presented in the next issue of this publication, but a small example, using the up-and-coming rare earth elements (REE), shows the usefulness of such data. In 2008, about \$16 million was spent across Canada by 11 project operators (3 of which reported their rare earths spending in the secondary commodity category) at 18 different projects. Given the increasing strategic importance of such minerals, it can be expected that expenditures for that previously unrecorded secondary commodity group will grow substantially in 2010.

A look at total metres drilled (diamond drilling and other types of drilling) by commodity group reveals that the majority of surface drilling (76%, or 4.8 million of 6.3 million metres) was associated with base- and precious-metal projects. Surface drilling for precious metals increased by 15% in 2008 and accounted for 50% of all surface drilling. Surface drilling for base metals, however, decreased by almost 5% and represented 25% of the total. The opposite was observed for underground drilling as precious metals accounted for 26% less metres drilled than in the previous year and base metals saw their total increase by 51% (**Table 2.10**).

Spending by type of company and commodity group indicates that, in 2008, junior companies focused on the same commodity targets as in the previous year (precious metals, base metals, and uranium). As far as the senior companies are concerned, they still focused on precious and base metals, but replaced diamonds with the “others” group of commodities (mainly nonmetals) (**Figure 2.7** and **Table 2.11**).

Increases were recorded in each commodity group for the juniors, except for uranium and diamonds, while, for the seniors, only diamond-related expenditures decreased. The strongest increases in dollar terms for junior companies were for precious metals (+\$106 million) and iron ore (+\$98 million). Meanwhile, senior companies increased their spending on base metals by \$115 million and on the “others” group (mainly nonmetals) by \$105 million. Iron ore and potash were the emerging commodities of interest for both groups of companies in 2008.

Figure 2.7
Exploration and Deposit Appraisal Expenditures (1) in Canada, by Mineral Commodity, by Type of Company and by Work Phase, 2008



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on-mine-site and off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

EXPENDITURES - BY REGION

Total exploration and deposit appraisal expenditures increased in half of the Canadian mining jurisdictions in 2008. In percentage terms, these increases were recorded in Alberta (+75%), Manitoba (+48%), Ontario (+39%), Saskatchewan (+37%), Nunavut (+28%), and Quebec (+10%), together accounting for a \$547 million increase in spending. In dollar terms, Ontario (+\$228 million) and Saskatchewan (+\$117 million) accounted for 63% of these increases. The remaining provinces and territories accounted for a total decrease of \$98 million, mainly in the Northwest Territories and British Columbia (**Table 2.8**).

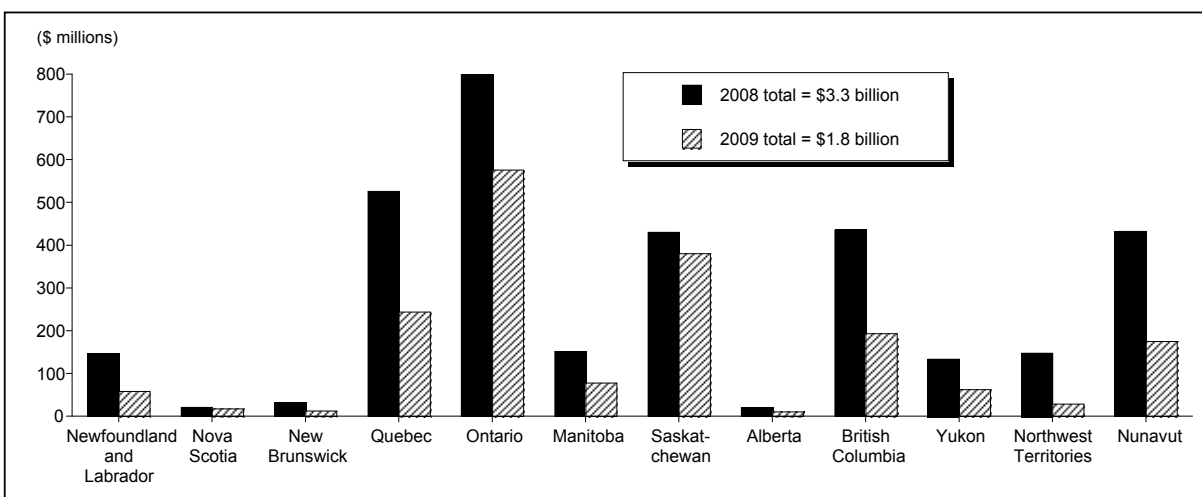
In terms of total spending, the leading jurisdictions in 2008 were Ontario, Quebec, British Columbia, Nunavut, and Saskatchewan. Together these jurisdictions accounted for 80% of all exploration and deposit appraisal expenditures. In 2005 and 2006, British Columbia ranked second to Ontario, while Quebec placed second in 2007 and 2008 (**Figure 2.8**).

In 2009, all mining provinces and territories are expected to experience a decrease in total exploration and deposit appraisal expenditures. Declines exceeding \$200 million are expected in each of Quebec, Nunavut, British Columbia, and Ontario. These four jurisdictions will in fact account for 70% of the total anticipated \$1.4 billion decrease. The leading jurisdictions in terms of spending are expected to be Ontario, Saskatchewan, Quebec, British Columbia, and Nunavut (**Table 2.9**). Saskatchewan will be well served by a sustained interest in potash.

As mentioned earlier, on a national basis, junior company spending overtook that of the senior companies in recent years. This was also the case on a provincial/territorial basis in 2008, except in Nova Scotia. In 2009, senior companies are expected to regain first place in Manitoba, Saskatchewan, and Nunavut. In Manitoba and Nunavut, this turnaround is predicated on a larger decrease in junior spending than senior spending. In Saskatchewan, sustained interest in potash projects (especially those of senior companies) should boost senior spending (**Figure 2.9** and **Tables 2.12** and **2.13**).

Figure 2.8

Exploration and Deposit Appraisal Expenditures, (1) by Province and Territory, 2008 and 2009



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on-mine-site and off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Note: Data for 2009 are revised spending intentions.

EXPENDITURES - BY WORK PHASE

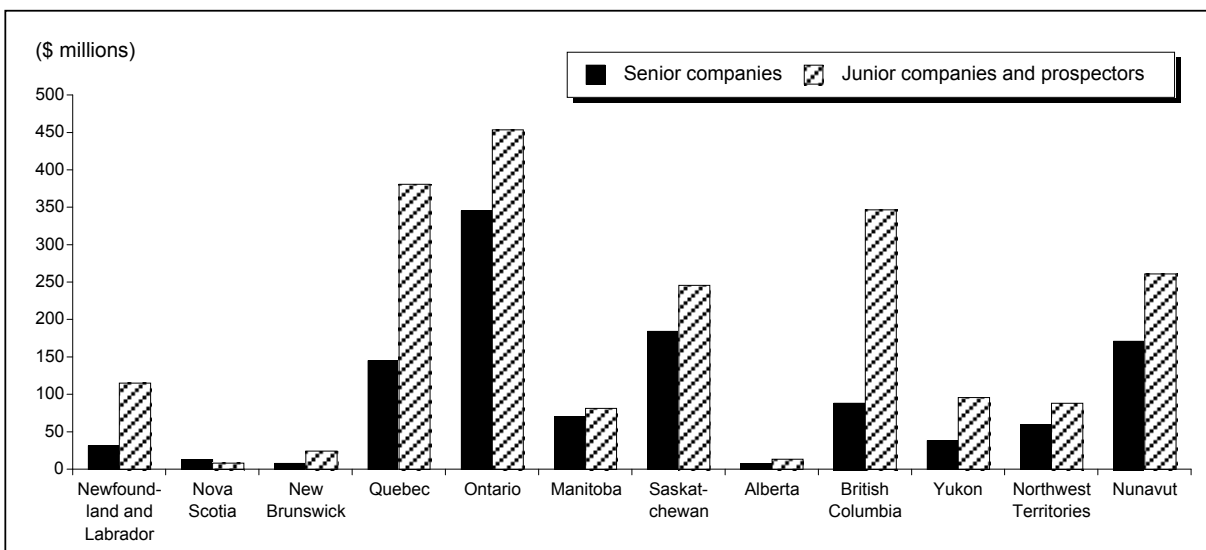
This section explains the main expenditure fluctuations and highlights some of the projects or events responsible for the trends already discussed. To do this, expenditures are broken down by work phase and sub-work phase (on- vs. off-mine-site). The work phases (exploration, deposit appraisal, and mine complex development) are based on the previously mentioned Generalized Model of Mineral Resource Development.

One way to visualize the differences between work phases is to look at the type of activity undertaken in each one. The exploration work phase goes from grassroots exploration to the completion of a preliminary scoping study or preliminary economic assessment, demonstrating the basic economics of the deposit. In order to investigate a deposit, companies rely on an array of tools and studies (**Figure 2.10**). For example, the main activities conducted in the exploration phase are surface drilling (52% of all expenses in that work phase) and geoscientific surveys (22%).

As projects enter and progress through the deposit appraisal phase, other evaluation tools, such as technical studies, gain in importance. Costs, such as those for engineering, economic, and pre- or production feasibility studies, become more predominant (22%, compared to 3% in the exploration phase). Rock work (underground work to access mineralized zones, define a deposit and its internal characteristics, and gain access to ore and prepare it for production) also gains in importance as the project progresses through the different work phases, accounting for 3% of the exploration phase, 18% of the deposit appraisal phase, and 58% of the mine complex development work phase.

In 2008, for the first time since the data series was initiated in 1997, deposit appraisal expenditures increased more, in monetary terms, than exploration expenditures. This stronger commitment to deposit appraisal may reflect the fact that a number of projects were progressing along the mineral development curve during the record spending period of 2007 and 2008.

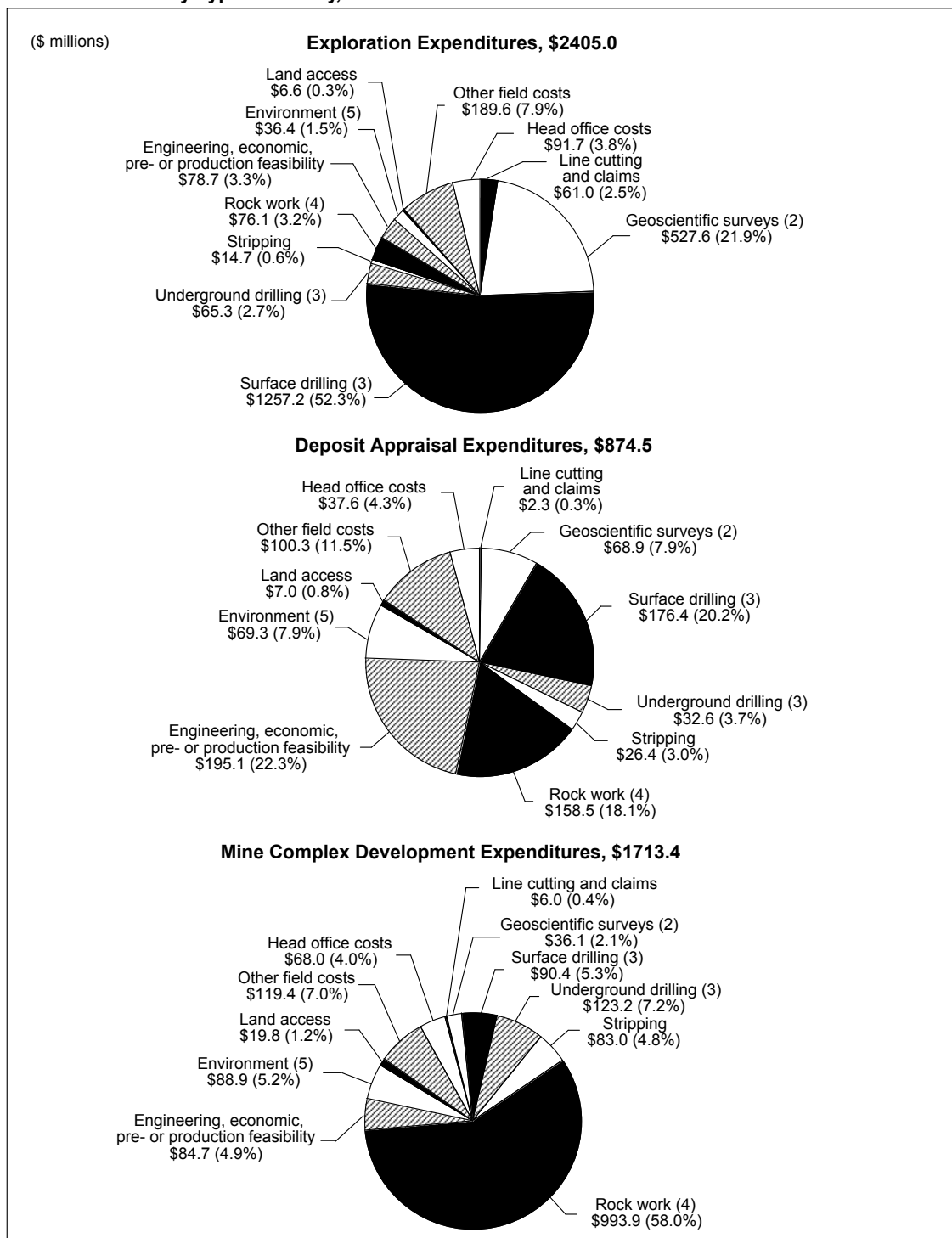
Figure 2.9
Exploration and Deposit Appraisal Expenditures, (1) by Province and Territory and by Type of Company, 2008



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on-mine-site and off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Figure 2.10
Exploration, Deposit Appraisal, and Mine Complex Development Expenditures (1) in Canada, by
Work Phase and by Type of Activity, 2008



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on-mine-site plus off-mine-site activities. (2) Geoscientific surveys include geology, geochemistry, ground geophysics, and airborne geophysics. (3) Drilling includes diamond and other types of drilling. (4) Rock work activity includes shaft work, drifts, cross-cuts, raises, declines, and dewatering costs. (5) Environment includes characterization, permitting, protection, monitoring, and restoration.

As projects migrate from exploration to the deposit appraisal phase, their number diminishes and their costs increase. In fact, of a total 74 off-mine-site deposit appraisal projects in 2008 (**Table 2.14**), 55 projects accounted for \$756 million, or 23% of all exploration and deposit appraisal expenditures in Canada in 2008. Considering that there are about 3000 active projects in Canada, these 55 projects are certainly some of the most promising in terms of future mineral production in Canada. Other critical projects, in terms of investment and potential for future development, are those waiting on the outcome of scoping studies before entering the deposit appraisal work phase.

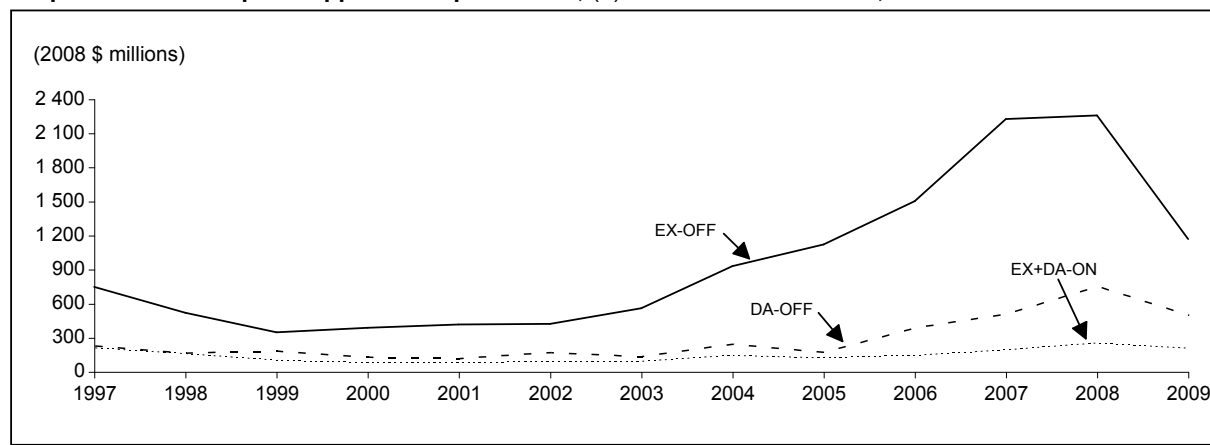
New projects entering the deposit appraisal phase or existing mining projects entering the mine complex development work phase can be important contributors to yearly expenditure fluctuations. Furthermore, not all off-mine-site deposit appraisal projects will become successful mining projects. Factors that may affect the evolution of a project, either positively or negatively, can include the permitting process, metallurgical and engineering problems, insufficient economic resources and ore reserves to sustain higher production costs, fluctuating metal markets, access to financing, mergers and acquisitions, etc. As a result, projects can be cancelled, delayed, sent back to earlier work phases, or accelerated towards the production stage.

For example, 22 projects that were classified under the off-mine-site deposit appraisal work phase in 2007 exited this category in 2008. Among them, 13 entered the mine complex development work phase, 5 went back to the exploration work phase, and 4 became inactive. In 2009, 26 off-mine-site deposit appraisal projects that were active in 2008 were reclassified. Only 4 of them entered the mine complex development work phase. Projects entering or re-entering the deposit appraisal phase numbered 30 in 2008 and 28 in 2009.

Another observation from this recent period of growth is the importance of off-mine-site spending as opposed to on-mine-site spending. In 2008, off-mine-site exploration (\$2.3 billion) represented 94% of all exploration expenditures while off-mine-site deposit appraisal (\$760 million) represented 87% of all deposit appraisal expenditures (**Figure 2.11** and **Table 2.15**).

In terms of off-mine-site exploration, the leading jurisdictions were Ontario, Quebec, Saskatchewan, and British Columbia, while for off-mine-site deposit appraisal the leaders were Nunavut, Ontario,

Figure 2.11
Exploration and Deposit Appraisal Expenditures, (1) On- and Off-Mine-Site, 1997-2009



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

EX-OFF: Exploration off-mine-site. DA-OFF: Deposit appraisal off-mine-site.

EX+DA-ON: Exploration plus deposit appraisal on-mine-site.

(1) Includes field work, overhead, engineering, economic, pre- or production feasibility studies, environment, and land access costs.

Note: Data for 2009 are revised spending intentions.

British Columbia, and Quebec. The bulk of the \$287 million increase in 2008 off-mine-site exploration belonged to Ontario (+\$160 million), Saskatchewan (+\$48 million), and Manitoba (+\$33 million). Decreases totaling \$171 million were recorded in Nunavut, the Northwest Territories, British Columbia, New Brunswick, and Newfoundland and Labrador. Nunavut (+\$182 million) and Saskatchewan (+\$69 million) were mainly responsible for the \$309 million increase in off-mine-site deposit appraisal expenditures. Off-mine-site deposit appraisal decreases in the Yukon, the Northwest Territories, Newfoundland and Labrador, Nova Scotia, and Alberta amounted to \$45 million (**Table 2.16**).

For 2009, decreases in off-mine-site exploration expenditures ranging between 30% and 80% should be recorded in all Canadian mining jurisdictions. In dollar terms, Quebec, British Columbia, and Ontario are expected to account for 53% of the \$1.1 billion decline. In the deposit appraisal work phase, decreases totaling \$343 million are expected in six jurisdictions with Nunavut recording the most severe decline (\$185 million). Among the provinces/territories where this type of spending is expected to increase (by a total of \$74 million), Saskatchewan stands out with a \$60 million gain (**Table 2.17**).

The most significant reason for major variations in expenditures in work phases in 2008 was the number of projects leaving the off-mine-site exploration work phase for the deposit appraisal work phase, plus some new projects re-entering this phase. Some major spending fluctuations at existing projects were also noted. Significant projects in the deposit appraisal phase in 2008 included the Meliadine West and Hackett River precious-metal projects in Nunavut, Canadian Malartic in Quebec, Young Davidson in Ontario, and Bingo in Saskatchewan. Two potash projects (Jansen and Legacy) had a significant impact on expenditures in Saskatchewan. Significant base-metal projects included: Izok Lake in Nunavut; Schaft Creek, Copper Mountain, and Galore Creek in British Columbia; and Minago in Manitoba. Furthermore, Nunavut was the site of costly pre-production work at the Mary River iron ore project, and project re-evaluation and infrastructure access work at the Hope Bay gold project.

SUMMARY AND CONCLUSION

Despite facing deteriorating economic conditions, the Canadian mineral exploration and resource development industry had a good year in 2008 as total mineral resource development investment reached a record high \$12.7 billion, up 21% over the \$10.5 billion reported in 2007. The portion of this total dedicated to exploration and deposit appraisal activity amounted to \$3.3 billion (26% of the total), or \$3.8 billion (30%) when capital, and repair and maintenance costs are included.

Financing raised in 2007 and the earlier part of 2008, on the strength of a then favourable minerals and metals price outlook, provided the necessary impetus to keep the upward exploration and deposit appraisal spending trend alive for one final year. However, commodity prices, with the notable exception of gold, were battered in 2009 and both debt and equity financing became extremely difficult to obtain. As a result, exploration and deposit appraisal expenditures were expected to decrease to \$1.8 billion, a 44% drop compared to 2008. While this \$1.8 billion total represented a major year-on-year decline in activity, it remained quite strong on an historical basis.

Towards the end of the eight-year upward trend in spending that began in 2001, companies were working feverishly to advance their projects along the mine development curve. In 2008, 19 projects entered the mine complex development work phase and 50 new or re-emerging projects became part of a deposit appraisal program. These movements among the different work phases, along with larger budgets at existing projects, contributed to a \$760 million peak in off-mine-site deposit appraisal expenditures.

Junior companies continue to account for a large share of the spending. In 2008, their expenditures exceeded the \$2 billion mark. While junior companies have clearly been assuming a greater share of

the risk and responsibility of discovering, investigating, and developing mineral resources in Canada, senior companies have started to become more active. In 2008, their investments in exploration and deposit appraisal expenditures surpassed the \$1 billion mark for the first time since the 1987-88 peak period.

In 2008, the exploration and deposit appraisal effort continued to be focused primarily on precious metals, base metals, and uranium. Iron and nonmetals (mainly potash) were emerging commodities of interest.

Forecasting 2010 expenditures is a challenge given the prevailing economic uncertainty. However, at the start of the year, continued strength in the price of gold, the world's growing demand for uranium and rare earth metals, and investments by state agencies and large corporations attempting to alleviate security of supply concerns appeared to be the key factors. Overall, 2010 spending could be similar to that recorded in 2009.

ENDNOTES

¹ Does not include capital costs incurred for quarries, sand and gravel, and petroleum.

² Gamah International Limited, Mining & Exploration Company Financings (MECO), November 2009.

Note: Information in this chapter was current as of December 2009.

NOTE TO READERS

The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

TABLE 2.1. TOTAL MINERAL RESOURCE DEVELOPMENT IN CANADA, BY WORK PHASE, ON- AND OFF-MINE-SITE, 2007-09

Expenditure Category by Work Phase	2007					2008					2009				
	Off-Mine-Site		On-Mine-Site		Total	Off-Mine-Site		On-Mine-Site		Total	Off-Mine-Site		On-Mine-Site		Total
	(\$ millions)	(%)	(\$ millions)	(%)	(\$ millions)	(\$ millions)	(%)	(\$ millions)	(%)	(\$ millions)	(\$ millions)	(%)	(\$ millions)	(%)	(\$ millions)
EXPLORATION															
Field work and overhead (1)	2 016.4	94.0	127.8	6.0	2 144.2	2 138.0	93.6	145.4	6.4	2 283.3	..	..	..	..	..
Engineering studies	61.1	96.6	2.1	3.4	63.3	22.0	99.7	0.1	0.3	22.0	..	..	..	..	..
Economic and pre-feasibility studies	22.1	91.7	2.0	8.3	24.1	53.7	94.9	2.9	5.1	56.6	..	..	..	..	..
Environment	35.2	96.7	1.2	3.3	36.4	36.0	98.8	0.4	1.2	36.4	..	..	..	..	..
Land access	6.3	100.0	—	—	6.3	6.6	99.2	0.1	0.8	6.6	..	..	..	..	..
Subtotal	2 141.2	94.1	133.1	5.9	2 274.3	2 256.2	93.8	148.8	6.2	2 405.0	1 136.6	90.4	121.3	9.6	1 258.0
Capital (2)	46.9	66.3	23.9	33.7	70.8	46.5	85.1	8.1	14.9	54.6	4.7	80.2	1.2	19.8	5.8
Repair and maintenance (2)	4.7	57.2	3.5	42.8	8.2	4.0	100.0	—	—	4.0	..	..	..	..	..
Total	2 192.8	93.2	160.5	6.8	2 353.2	2 306.6	93.6	157.0	6.4	2 463.6	1 141.3	90.3	122.5	9.7	1 263.8
DEPOSIT APPRAISAL															
Field work and overhead	329.6	87.5	47.2	15.3	376.8	501.3	83.1	101.8	16.9	603.1	..	..	..	..	..
Engineering studies	67.7	93.7	4.5	2.6	72.3	105.9	98.0	2.2	2.0	108.0	..	..	..	..	..
Economic, and pre- or production feasibility studies	42.0	85.1	7.3	0.7	49.3	80.3	92.2	6.7	7.8	87.1	..	..	..	..	..
Environment	52.7	98.0	1.1	2.6	53.8	65.9	95.1	3.4	4.9	69.3	..	..	..	..	..
Land access	4.4	100.0	..	..	4.4	7.0	100.0	—	—	7.0	..	..	..	..	..
Subtotal	496.4	89.2	60.2	10.8	556.6	760.4	87.0	114.1	13.0	874.5	491.8	84.5	90.0	15.5	581.7
Capital (2)	401.6	97.6	9.9	2.4	411.4	399.8	96.1	16.1	3.9	415.9	110.8	40.5	162.6	59.5	273.4
Repair and maintenance (2)	13.1	100.0	—	—	13.1	6.9	86.3	1.1	13.7	8.0	..	..	..	..	..
Total	911.0	92.9	70.1	7.1	981.1	1 167.1	89.9	131.3	10.1	1 298.4	602.6	70.5	252.5	29.5	855.1
EXPLORATION AND DEPOSIT															
Field work and overhead	2 346.0	93.1	175.0	6.9	2 521.0	2 639.2	91.4	247.2	8.6	2 886.4	..	..	..	..	..
Engineering studies	128.9	95.1	6.7	4.9	135.6	127.9	98.3	2.2	1.7	130.1	..	..	..	..	..
Economic, and pre- or production feasibility studies	64.1	87.3	9.3	12.7	73.4	134.1	93.3	9.7	6.7	143.7	..	..	..	..	..
Environment	87.9	97.5	2.3	2.5	90.1	101.9	96.4	3.8	3.6	105.7	..	..	..	..	..
Land access	10.7	100.0	..	..	10.7	13.5	99.6	0.1	0.4	13.6	..	..	..	..	..
Subtotal	2 637.5	93.2	193.3	6.8	2 830.8	3 016.5	92.0	262.9	8.0	3 279.5	1 628.4	88.5	211.3	11.5	1 839.7
Capital (2)	448.5	93.0	33.7	7.0	482.2	446.3	94.8	24.2	5.2	470.5	115.5	41.4	163.7	58.6	279.2
Repair and maintenance (2)	17.8	83.5	3.5	16.5	21.3	10.9	90.8	1.1	9.2	12.0	..	..	..	..	..
Total	3 103.8	93.1	230.5	6.9	3 334.3	3 473.7	92.3	288.3	7.7	3 762.0	1 743.9	82.3	375.0	17.7	2 118.9
MINE COMPLEX DEVELOPMENT															
Field work and overhead	n.a.	n.a.	1 192.4	100.0	1 192.4	n.a.	n.a.	1 520.0	100.0	1 520.0	n.a.	n.a.	..	..	..
Engineering studies	n.a.	n.a.	61.9	100.0	61.9	n.a.	n.a.	71.3	100.0	71.3	n.a.	n.a.	..	..	..
Economic, and pre- or production feasibility studies	n.a.	n.a.	14.6	100.0	14.6	n.a.	n.a.	13.4	100.0	13.4	n.a.	n.a.	..	..	..
Environment	n.a.	n.a.	93.2	100.0	93.2	n.a.	n.a.	88.9	100.0	88.9	n.a.	n.a.	..	..	..
Land access	n.a.	n.a.	4.5	100.0	4.5	n.a.	n.a.	19.8	100.0	19.8	n.a.	n.a.	..	..	..
Subtotal	n.a.	n.a.	1 366.6	100.0	1 366.6	n.a.	n.a.	1 713.4	100.0	1 713.4	n.a.	n.a.	1 400.4	100.0	1 400.4
Capital (2)	n.a.	n.a.	3 986.0	100.0	3 986.0	n.a.	n.a.	5 486.3	100.0	5 486.3	n.a.	n.a.	4 005.3	100.0	4 005.3
Repair and maintenance (2)	n.a.	n.a.	1 805.8	100.0	1 805.8	n.a.	n.a.	1 708.2	100.0	1 708.2	n.a.	n.a.	..	..	..
Total	n.a.	n.a.	7 158.3	100.0	7 158.3	n.a.	n.a.	8 907.9	100.0	8 907.9	n.a.	n.a.	5 405.7	100.0	5 405.7
Grand total	3 103.8	29.6	7 388.8	70.4	10 492.7	3 473.7	27.4	9 196.2	72.6	12 669.9	1 743.9	23.2	5 780.7	76.8	7 524.5

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

— Nil; .. Not available; ... Amount too small to be expressed; n.a. Not applicable.

(1) Includes mineral leases, claims staking, and project-related head office expenditures. (2) Includes construction, and machinery and equipment expenditures, as well as related environmental protection and restoration expenditures.

Notes: Data for 2009 are revised spending intentions. Totals for 2009 revised spending intentions are incomplete; they do not include any repair and maintenance expenditures. Numbers may not add to totals due to rounding.

TABLE 2.2. METAL PRICES OF SELECTED COMMODITIES, 2006-09

Commodity	U.S. Currency	2006	2007	% Change 2007/2006	2008	% Change 2008/2007	2009	% Change 2009/2008
		Annual Average						
Copper	¢/lb	304.91	322.89	5.90	315.52	-2.28	233.59	-25.97
Nickel	\$/lb	11.00	16.89	53.49	9.59	-43.23	6.65	-30.66
Zinc	¢/lb	148.54	147.08	-0.99	85.04	-42.18	75.08	-11.71
Lead	¢/lb	58.50	117.03	100.05	94.87	-18.94	77.99	-17.80
Molybdenum	\$/lb	24.75	30.23	22.17	28.73	-4.97	11.12	-61.28
Gold	\$/troy oz	604.43	696.66	15.26	871.71	25.13	972.98	11.62
Silver	\$/troy oz	11.57	13.39	15.75	15.02	12.13	14.65	-2.44
Platinum	\$/troy oz	1 141.67	1 304.79	14.29	1 576.40	20.82	1 204.05	-23.62
Palladium	\$/troy oz	320.43	354.66	10.68	352.19	-0.70	263.57	-25.16
Uranium (U ₃ O ₈)	\$/lb	49.61	90.83	83.09	61.71	-32.06	46.06	-25.35
Coal, metallurgical	\$/t f.o.b.	107.00	89.00	-16.82	136.00	144.38	129.00	-55.36
Coal, thermal	\$/t f.o.b.	42.50	55.65	30.94	89.00	59.93	76.00	-39.20
Iron ore	¢/dmt	77.35	84.70	9.50	140.60	66.00	101.00	-28.17
Potash	\$/t	172.00	190.00	10.47	576.00	203.16	(a) 694/500	..

Sources: Platts Metals Week for base metals, molybdenum, and precious metals (base metals are based on London Metal Exchange [LME] Settlement prices, molybdenum on the MW Mean, and precious metals are LME Final or PM Fix prices); Cameco Corporation for uranium (uranium price is the U.S. Spot price); B.C. Ministry of Energy, Mines and Petroleum Resources for coal prices for 2005-08; Indexmundi (www.indexmundi.com) for 2009 thermal coal estimate; *Canadian Minerals Yearbook*, 2008, Coal chapter, for 2009 metallurgical coal price estimate; Indexmundi.com for 2008 and 2009 iron ore price estimates, previous years from Econostats.com; *Canadian Minerals Yearbook*, 2008, Potash chapter, for 2005-08 benchmark potash contract prices, f.o.b. Vancouver.

.. Not available; dmt Dry metric tonnes.

(a) For 2009, the \$694 potash contract was in effect from February through mid-June, and the \$500 is a weighted average of two contracts from mid-June through December (\$505 from July through late October, and \$455 for the remainder of the year).

TABLE 2.3. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES IN CANADA, (1) BY TYPE OF COMPANY, 1997-2009

Year	Current Dollars				Constant 2008 Dollars		
	Share of Total		Total	% of Total Junior	Share of Total		Total
	Junior	Senior			Junior	Senior	
	(\$ millions)			(%)	(\$ millions)		
1997	298.0	623.0	921.0	32.4	388.8	813.0	1 201.8
1998	170.5	485.4	655.9	26.0	223.8	636.8	860.6
1999	141.4	362.9	504.3	28.0	182.4	468.1	650.4
2000	156.0	340.7	496.7	31.4	193.1	421.9	615.0
2001	177.7	335.1	512.9	34.7	217.6	410.4	628.0
2002	190.8	382.6	573.4	33.3	231.1	463.4	694.4
2003	283.7	403.0	686.7	41.3	332.6	472.5	805.1
2004	599.7	578.1	1 177.8	50.9	681.3	656.7	1 338.0
2005	801.3	503.5	1 304.8	61.4	880.5	553.3	1 433.8
2006	1 238.0	673.5	1 911.5	64.8	1 327.9	722.4	2 050.4
2007	1 904.4	926.5	2 830.8	67.3	1 979.6	963.0	2 942.6
2008	2 117.8	1 161.7	3 279.5	64.6	2 117.8	1 161.7	3 279.5
2009	1 020.6	819.1	1 839.7	55.5	1 020.6	819.1	1 839.7

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on mine-site and off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Note: Data for 2009 are revised spending intentions.

TABLE 2.4. SUMMARY OF CLAIM STATISTICS, 2007 AND 2008

Province/Territory	Area of New Claims Staked	Percentage of New Claims Staked	Area of Claims in Good Standing	Canada Total Area	Area of Claims in Good Standing as a Percentage of Canada Total Area
	(hectares)	(%)	(hectares)	(hectares)	(%)
2007					
Newfoundland and Labrador	1 980 150	7.4	4 732 075	40 572 000	11.7
Nova Scotia	671 987	2.5	749 931	5 549 000	13.5
New Brunswick	12 691	...	597 664	7 344 000	8.1
Quebec	4 853 966	18.0	11 348 539	154 068 000	7.4
Ontario	1 817 264	6.8	4 925 264	106 858 000	4.6
Manitoba	925 576	3.4	3 741 070	64 995 000	5.8
Saskatchewan	3 679 981	13.7	13 266 341	65 233 000	20.3
Alberta	3 888 239	14.5	11 437 358	66 119 000	17.3
British Columbia	6 518 126	24.2	14 135 800	94 931 000	14.9
Yukon	258 124	1.0	1 892 994	48 345 000	3.9
Northwest Territories (1)	1 160 821	4.3	5 472 144	143 232 000	3.8
Nunavut (1)	1 134 438	4.2	6 746 774	199 400 000	3.4
Total Canada	26 901 363	100.0	79 045 954	996 646 000	7.9
2008					
Newfoundland and Labrador	828 950	4.4	4 307 000	40 572 000	10.6
Nova Scotia	356 140	1.9	570 995	5 549 000	10.3
New Brunswick	121 570	0.6	608 000	7 344 000	8.3
Quebec	1 796 015	9.5	11 982 772	154 068 000	7.8
Ontario	1 611 584	8.5	5 808 352	106 858 000	5.4
Manitoba	694 423	3.7	3 127 582	64 995 000	4.8
Saskatchewan	1 226 883	6.5	10 576 816	65 233 000	16.2
Alberta	5 601 924	29.5	11 921 430	66 119 000	18.0
British Columbia	5 167 296	27.2	15 451 291	94 931 000	16.3
Yukon	252 507	1.3	2 605 146	48 345 000	5.4
Northwest Territories (1)	448 922	2.4	4 493 169	143 232 000	3.1
Nunavut (1)	872 986	4.6	6 900 011	199 400 000	3.5
Total Canada	18 979 200	100.0	78 352 564	996 646 000	7.9

Sources: Natural Resources Canada; provincial/territorial mining recorder offices.

... Amount too small to be expressed.

(1) Excludes prospecting permits.

Notes: Data for Prince Edward Island are excluded. Excludes coal.

TABLE 2.5. EXPLORATION AND DEPOSIT APPRAISAL ACTIVITY, (1) BY PROVINCE AND TERRITORY, 2008

TABLE 2.3: EXPLORATION AND DEPOSIT APPRAISAL ACTIVITY, (1) BY PROVINCE AND TERRITORY, 2006																			
Province/Territory	Surface Drilling				Underground Drilling				Line Cutting and Claims	Geochemistry and Geology	Geophysics	Rock Work (2)	Engineering Studies	Economic and Pre- or Production Feasibility Studies	Environment	Land Access	Other Field Costs	Head Office	Grand Total
	Diamond		Other		Diamond		Other												
	Metres	Cost	Metres	Cost	Metres	Cost	Metres	Cost											
	(000)	(\$000)	(000)	(\$000)	(000)	(\$000)	(000)	(\$000)							(\$000)				
Newfoundland and Labrador	213	61 842	5	1 585	20	1 255	—	—	2 471	26 921	14 296	5 514	3 765	740	4 574	378	17 960	5 360	146 660
Nova Scotia	40	6 241	3	364	—	—	5	1 200	1 341	2 471	2 539	612	2 340	1 384	1 586	261	129	928	21 397
New Brunswick	108	19 615	...	145	—	—	—	—	836	6 440	1 905	412	320	876	649	2	1 051	495	32 745
Quebec	1 511	252 814	10	3 749	118	8 435	5	297	8 423	76 328	39 265	40 065	12 094	19 105	5 610	234	36 069	23 655	526 141
Ontario	2 106	355 431	17	16 659	515	58 393	26	8 163	13 819	78 790	34 183	129 030	6 781	38 864	8 712	2 507	29 483	18 450	799 266
Manitoba	369	86 350	9	9 425	38	7 040	—	—	1 525	16 129	9 809	2 000	1 801	6 229	2 119	50	3 656	5 941	152 075
Saskatchewan	515	188 333	26	28 524	—	—	—	—	16 765	30 883	68 072	18 268	7 909	20 237	6 082	3 546	19 910	22 204	430 735
Alberta	10	6 715	16	2 230	—	—	—	—	1 180	1 587	2 274	—	171	331	2 339	1 144	975	1 814	20 758
British Columbia	820	171 628	51	12 570	73	12 323	—	—	6 402	56 410	14 064	25 130	26 523	20 201	26 470	2 266	43 939	17 515	435 441
Yukon	214	55 109	3	1 283	...	6	—	—	2 043	25 726	6 363	9 855	3 231	4 858	7 248	292	14 787	3 161	133 962
Northwest Territories	124	36 897	6	17 981	1	858	—	—	5 057	15 403	12 595	—	7 678	12 793	10 353	1 138	18 679	8 316	147 749
Nunavut	163	91 204	8	6 947	—	—	—	—	3 415	33 963	20 123	44 848	57 464	18 102	29 939	1 749	103 289	21 509	432 551
Total	6 194	1 332 178	154	101 463	765	88 310	36	9 661	63 278	371 052	225 487	275 734	130 077	143 720	105 680	13 568	289 927	129 347	3 279 479
Percentage of grand total	n.a.	40.6	n.a.	3.1	n.a.	2.7	n.a.	0.3	1.9	11.3	6.9	8.4	4.0	4.4	3.2	0.4	8.8	3.9	100.0

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

— Nil; ... Amount too small to be expressed; n.a. Not applicable.

(1) Includes on-mine-site plus off-mine-site activities. (2) Includes stripping, trenching, shaft work, drifts, cross-cuts, raises, declines, rock sampling, and de-watering costs.

2.24 OVERVIEW OF TRENDS IN CANADIAN MINERAL EXPLORATION

TABLE 2.6. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES IN CANADA, (1) BY RANGE OF EXPENDITURES AND BY TYPE OF COMPANY, 2006-09

Range of Expenditures	Junior			Senior			Total		
	Companies	Expenditures	Percentage of Total Expenditures	Companies	Expenditures	Percentage of Total Expenditures	Companies	Expenditures	Percentage of Total Expenditures
(\$)	(no.)	(\$000)	(%)	(no.)	(\$000)	(%)	(no.)	(\$000)	(%)
2006									
>10 million	20	428 611	34.6	20	477 257	70.9	40	905 868	47.4
5 million-10 million	36	247 745	20.0	15	114 204	17.0	51	361 949	18.9
1 million-5 million	202	438 012	35.4	25	71 308	10.6	227	509 320	26.6
500 000-1 million	96	69 404	5.6	5	4 066	0.6	101	73 470	3.8
200 000-500 000	99	34 444	2.8	11	3 813	0.6	110	38 257	2.0
100 000-200 000	63	9 532	0.8	14	1 884	0.3	77	11 417	0.6
50 000-100 000	44	3 331	0.3	7	541	0.1	51	3 871	0.2
1-50 000	89	1 517	0.1	22	424	0.1	111	1 941	0.1
Subtotal	649	1 232 596	99.6	119	673 497	100.0	768	1 906 093	99.7
Prospectors (2)	13	5 434	0.4	—	—	—	13	5 434	0.3
Total 2006	662	1 238 031	100.0	119	673 497	100.0	781	1 911 527	100.0
2007									
>10 million	36	773 400	40.6	29	738 140	79.7	65	1 511 540	53.4
5 million-10 million	62	428 131	22.5	14	98 343	10.6	76	526 474	18.6
1 million-5 million	244	583 013	30.6	32	77 453	8.4	276	660 466	23.3
500 000-1 million	101	73 716	3.9	8	5 641	0.6	109	79 357	2.8
200 000-500 000	90	29 111	1.5	13	4 284	0.5	103	33 396	1.2
100 000-200 000	46	6 177	0.3	14	1 996	0.2	60	8 172	0.3
50 000-100 000	38	2 550	0.1	5	382	0.0	43	2 931	0.1
1-50 000	91	1 906	0.1	19	218	0.0	110	2 124	0.1
Subtotal	708	1 898 003	99.7	134	926 456	100.0	842	2 824 460	99.8
Prospectors (2)	9	6 359	0.3	—	—	—	9	6 359	0.2
Total 2007	717	1 904 362	100.0	134	926 456	100.0	851	2 830 819	100.0
2008									
>10 million	49	978 002	46.2	29	950 759	81.8	78	1 928 761	58.8
5 million-10 million	52	361 216	17.1	14	112 577	9.7	66	473 794	14.4
1 million-5 million	291	684 221	32.3	33	91 907	7.9	324	776 127	23.7
500 000-1 million	71	51 733	2.4	4	3 326	0.3	75	55 059	1.7
200 000-500 000	84	28 604	1.4	6	2 004	0.2	90	30 608	0.9
100 000-200 000	60	8 433	0.4	3	444	0.0	63	8 877	0.3
50 000-100 000	30	2 098	0.1	7	474	0.0	37	2 572	0.1
1-50 000	79	1 460	0.1	10	176	0.0	89	1 636	0.0
Subtotal	716	2 115 768	99.9	106	1 161 666	100.0	822	3 277 433	99.9
Prospectors (2)	4	2 046	0.1	—	—	—	4	2 046	0.1
Total 2008	720	2 117 813	100.0	106	1 161 666	100.0	826	3 279 479	100.0
2009									
>10 million	22	396 511	38.9	19	623 508	76.1	41	1 020 019	55.4
5 million-10 million	33	209 545	20.5	16	116 907	14.3	49	326 452	17.7
1 million-5 million	152	307 318	30.1	31	71 465	8.7	183	378 783	20.6
500 000-1 million	97	61 143	6.0	7	3 800	0.5	104	64 943	3.5
200 000-500 000	123	36 785	3.6	7	2 160	0.3	130	38 945	2.1
100 000-200 000	48	6 064	0.6	5	680	0.1	53	6 744	0.4
50 000-100 000	25	1 521	0.1	6	428	0.1	31	1 949	0.1
1-50 000	48	888	0.1	8	170	0.0	56	1 058	0.1
Subtotal	548	1 019 776	99.9	99	819 117	100.0	647	1 838 893	100.0
Prospectors (2)	3	801	0.1	—	—	—	3	801	0.0
Total 2009	551	1 020 577	100.0	99	819 117	100.0	650	1 839 694	100.0

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

— Nil.

(1) Exploration and deposit appraisal expenditures include off-mine-site and on-mine-site costs incurred for field work and overhead, plus engineering, economic and pre- or production feasibility studies, environment, and land access costs. (2) The number of prospectors is underestimated because it contains groups of prospectors.

Notes: Data for 2009 are revised spending intentions. Numbers may not add to totals due to rounding.

TABLE 2.7. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, (1) BY SPECIFIC COMMODITY OF INTEREST, 2006-08

Mineral Commodity	2006 Expenditures	2006 Ranking	2006 Percentage of Total	2007 Expenditures	2007 Ranking	2007 Percentage of Total	2007 as % of 2006 Expenditures	2008 Expenditures	2008 Ranking	2008 Percentage of Total	2008 as % of 2007 Expenditures
	(\$ millions)		(%)	(\$ millions)		(%)	(%)	(\$ millions)		(%)	(%)
Base metals	411.9		21.6	711.5		25.1	172.7	842.1		25.7	118.4
Nickel	111.5	5	5.8	173.5	5	6.1	155.6	282.5	4	8.6	162.8
Copper	194.9	4	10.2	343.1	3	12.1	176.0	352.3	3	10.7	102.7
Lead	26.7	13	1.4	47.6	11	1.7	178.5	29.0	14	0.9	60.8
Zinc	74.5	6	4.0	133.1	6	4.7	178.6	172.3	7	5.3	129.4
Precious metals	724.6		37.9	1 025.2		36.2	141.5	1 161.4		35.4	113.3
Gold	614.4	1	32.1	862.2	1	30.5	140.3	1 005.3	1	30.7	116.6
Platinum group metals	44.7	10	2.3	84.0	9	3.0	187.7	61.7	11	1.9	73.5
Silver	63.3	8	3.3	76.3	10	2.7	120.5	94.2	9	2.9	123.4
Iron	65.1	7	3.4	118.6	7	4.2	182.3	224.3	5	6.8	189.1
Uranium	213.6	3	11.2	413.3	2	14.6	193.5	409.0	2	12.5	99.0
Other metals	85.5		4.5	174.7		6.2	204.4	189.0		5.8	108.2
Molybdenum	34.5	11	1.8	90.9	8	3.2	263.4	81.3	10	2.5	89.4
Cobalt	30.3	12	1.6	38.4	12	1.4	127.0	33.8	13	1.0	87.9
Nonmetals	17.5		0.9	31.7		1.1	181.5	180.0		5.5	567.5
Potash	2.9	17	0.2	17.8	15	0.6	619.4	159.7	8	4.9	896.9
Diamonds	342	2	17.9	321.6	4	11.4	94.0	221.6	6	6.8	68.9
Coal	51.3	9	2.7	34.2	13	1.2	66.5	51.9	12	1.6	152.0
Total	1 911.5		100.0	2 830.8		100.0	148.1	3 279.5		100.0	115.8

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on-mine-site and off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Notes: Numbers may not add to totals due to rounding. Totals of commodity groups may not add to totals of its listed components as some unspecified amount belonging to each commodity group are not re-allocated to a specific commodity for this exercise.

TABLE 2.8. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, (1) BY PROVINCE AND TERRITORY AND BY MINERAL COMMODITY, 2008

Province/Territory	Metals					Nonmetals	Diamonds	Coal	Total
	Base	Precious	Iron	Uranium	Other				
	(\$000)								
Newfoundland and Labrador	47 951	12 855	16 608	58 108	8 398	2 727	–	13	146 660
Nova Scotia	8 320	7 617	–	–	376	184	–	4 900	21 397
New Brunswick	13 226	9 352	–	2 919	5 793	337	–	1 118	32 745
Quebec	122 426	263 294	22 385	87 319	14 621	3 320	12 776	–	526 141
Ontario	256 998	444 577	2 730	16 944	47 063	11 993	18 962	–	799 266
Manitoba	110 618	29 762	–	6	19	11 013	657	–	152 075
Saskatchewan	10 732	20 674	–	189 530	4 631	148 802	53 692	2 674	430 735
Alberta	455	–	1 300	3 760	287	251	8 006	6 699	20 758
British Columbia	167 378	146 409	4 572	719	78 548	962	469	36 384	435 441
Yukon	45 547	70 753	–	2 730	14 778	–	–	154	133 962
Northwest Territories	16 970	19 334	14	3 637	14 490	180	93 123	–	147 749
Nunavut	41 483	136 822	176 778	43 346	4	181	33 936	–	432 551
Total	842 105	1 161 450	224 386	409 017	189 006	179 951	221 622	51 942	3 279 479

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

– Nil.

(1) Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Note: Numbers may not add to totals due to rounding.

TABLE 2.9. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, (1) BY PROVINCE AND TERRITORY AND BY MINERAL COMMODITY, 2009

Province/Territory	Metals					Nonmetals	Diamonds	Coal	Total
	Base	Precious	Iron	Uranium	Other				
	(\$000)								
Newfoundland and Labrador	20 135	3 179	16 753	10 786	2 365	4 908	—	125	58 250
Nova Scotia	3 452	6 660	—	—	250	115	—	7 000	17 477
New Brunswick	5 962	2 512	50	167	4 077	303	—	—	13 071
Quebec	57 114	113 737	12 182	43 524	10 098	1 538	6 011	—	244 205
Ontario	124 576	395 686	1 993	6 934	24 003	7 171	15 801	—	576 163
Manitoba	45 282	29 654	—	156	459	2 957	23	—	78 531
Saskatchewan	474	7 944	—	110 752	4 355	237 931	15 022	4 251	380 729
Alberta	455	—	250	641	110	57	4 433	5 041	10 986
British Columbia	40 135	93 849	2 762	—	16 648	1 173	—	38 831	193 398
Yukon	13 037	33 047	—	—	16 518	—	—	—	62 602
Northwest Territories	1 911	7 271	19	474	6 924	450	11 636	—	28 684
Nunavut	5 885	92 590	30 000	32 373	600	—	14 150	—	175 598
Total	318 416	786 129	64 009	205 807	86 407	256 602	67 076	55 248	1 839 694

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

— Nil.

(1) Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic, and pre- or production feasibility studies, environment, and land access costs.

Notes: Data for 2009 are revised spending intentions. Numbers may not add to totals due to rounding.

TABLE 2.10. EXPLORATION AND DEPOSIT APPRAISAL SURFACE AND UNDERGROUND DRILLING, (1) BY PROVINCE AND TERRITORY AND BY MINERAL COMMODITY, 2008

Province/Territory	Metals														Nonmetals	Diamonds		Coal		Total	
	Base		Precious		Iron	Uranium	Other		Surface	Surface	Underground	Surface	Underground	Surface		Underground					
	Surface	Underground	Surface	Underground	Surface	Surface	Surface	Underground													
(000 metres)																					
Newfoundland and Labrador	62	20	11	—	33	72	21	—	18	—	—	—	—	218	20						
Nova Scotia	23	—	20	—	—	—	—	—	—	—	—	—	5	43	5						
New Brunswick	53	—	28	—	—	4	21	—	1	—	—	1	—	108	—						
Quebec	362	5	955	117	30	133	26	—	6	9	1	—	—	1 521	123						
Ontario	460	210	1 442	300	5	42	115	31	32	27	—	—	—	2 123	541						
Manitoba	264	38	103	—	—	—	—	—	10	1	—	—	—	379	38						
Saskatchewan	48	—	24	—	—	358	9	—	68	31	—	3	—	541	—						
Alberta	—	—	—	—	...	2	—	—	—	9	—	15	—	26	—						
British Columbia	231	71	340	2	13	1	224	—	—	—	—	62	—	871	73						
Yukon	65	—	119	—	—	—	33	—	—	—	—	—	—	217	—						
Northwest Territories	16	—	61	—	—	2	14	—	—	37	1	—	—	130	1						
Nunavut	21	—	93	—	13	24	—	—	—	20	—	—	—	171	—						
Total	1 605	344	3 197	419	95	638	463	31	136	134	2	81	5	6 348	801						

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

— Nil; ... Amount too small to be expressed.

(1) Includes on-mine-site and off-mine-site drilling activity for diamond and other types of drilling.

Notes: Numbers may not add to totals due to rounding. No underground drilling was performed for iron, uranium, and nonmetals.

TABLE 2.11. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, (1) IN CANADA BY WORK PHASE (OFF- AND ON-MINE SITE), BY TYPE OF COMPANY AND BY MINERAL COMMODITY, 2008

Work Phase/ Type of Company	Base Metals	Precious Metals	Iron	Uranium	Diamonds	Others (2)	Total
(\$000)							
Exploration, off-mine-site							
Junior companies and prospectors	381 944	627 263	28 506	317 326	150 808	184 491	1 690 338
Senior companies	222 914	126 347	4 571	90 188	28 284	93 538	565 842
Total	604 858	753 611	33 077	407 513	179 092	278 029	2 256 180
Exploration, on-mine-site							
Junior companies and prospectors	—	—	—	—	—	—	—
Senior companies	49 438	89 309	—	—	7 755	2 331	148 834
Total	49 438	89 309	—	—	7 755	2 331	148 834
Exploration, off- plus on-mine-site							
Junior companies and prospectors	381 944	627 263	28 506	317 326	150 808	184 491	1 690 338
Senior companies	272 352	215 657	4 571	90 188	36 038	95 870	714 676
Total	654 296	842 920	33 077	407 513	186 847	280 361	2 405 014
Deposit appraisal, off-mine-site							
Junior companies and prospectors	53 829	140 444	186 489	—	—	46 713	427 475
Senior companies	76 261	139 850	—	1 504	30 676	84 594	332 884
Total	130 089	280 295	186 489	1 504	30 676	131 307	760 359
Deposit appraisal, on-mine-site							
Junior companies and prospectors	—	—	—	—	—	—	—
Senior companies	57 720	38 235	4 820	—	4 100	9 232	114 106
Total	57 720	38 235	4 820	—	4 100	9 232	114 106
Deposit appraisal, off- plus on-mine-site							
Junior companies and prospectors	53 829	140 444	186 489	—	—	46 713	427 475
Senior companies	133 980	178 085	4 820	1 504	34 776	93 826	446 990
Total	187 809	318 530	191 309	1 504	34 776	140 539	874 465
Exploration plus deposit appraisal, off- plus on-mine-site							
Junior companies and prospectors	435 773	767 708	214 995	317 326	150 808	231 204	2 117 813
Senior companies	406 332	393 742	9 391	91 691	70 814	189 695	1 161 666
Total	842 105	1 161 450	224 386	409 017	221 622	420 899	3 279 479

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
— Nil.

(1) Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

(2) Includes other metals, coal, and nonmetals.

Note: Numbers may not add to totals due to rounding.

TABLE 2.12. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, (1) BY PROVINCE AND TERRITORY, BY WORK PHASE AND BY TYPE OF COMPANY, 2008

Province/Territory	Exploration			Deposit Appraisal			Exploration and Deposit Appraisal		
	Junior Companies and Prospectors	Senior Companies	Total	Junior Companies and Prospectors	Senior Companies	Total	Junior Companies and Prospectors	Senior Companies	Total
	(\$000)								
Newfoundland and Labrador	109 791	17 891	127 683	5 659	13 318	18 977	115 450	31 209	146 660
Nova Scotia	7 245	6 675	13 920	1 100	6 377	7 477	8 345	13 052	21 397
New Brunswick	24 684	6 921	31 605	–	1 140	1 140	24 684	8 061	32 745
Quebec	325 284	109 798	435 081	55 903	35 156	91 059	381 187	144 954	526 141
Ontario	392 880	200 650	593 530	60 896	144 840	205 736	453 776	345 491	799 266
Manitoba	67 156	70 321	137 477	14 598	–	14 598	81 754	70 321	152 075
Saskatchewan	221 766	131 005	352 771	24 256	53 709	77 964	246 022	184 713	430 735
Alberta	13 504	5 177	18 681	177	1 900	2 077	13 681	7 077	20 758
British Columbia	285 564	44 374	329 938	61 500	44 002	105 502	347 065	88 376	435 441
Yukon	94 446	24 823	119 269	1 466	13 227	14 693	95 912	38 050	133 962
Northwest Territories	74 456	24 422	98 878	14 095	34 776	48 870	88 551	59 198	147 749
Nunavut	73 562	72 619	146 181	187 825	98 545	286 370	261 387	171 163	432 551
Total	1 690 338	714 676	2 405 014	427 475	446 990	874 465	2 117 813	1 161 666	3 279 479

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

– Nil.

(1) Includes on-mine-site and off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Note: Numbers may not add to totals due to rounding.

TABLE 2.13. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, (1) BY PROVINCE AND TERRITORY, BY WORK PHASE AND BY TYPE OF COMPANY, 2009

Province/Territory	Exploration			Deposit Appraisal			Exploration and Deposit Appraisal		
	Junior Companies and Prospectors	Senior Companies	Total	Junior Companies and Prospectors	Senior Companies	Total	Junior Companies and Prospectors	Senior Companies	Total
	(\$000)								
Newfoundland and Labrador	23 347	12 051	35 398	13 242	9 609	22 851	36 589	21 660	58 250
Nova Scotia	5 444	3 533	8 977	–	8 500	8 500	5 444	12 033	17 477
New Brunswick	11 031	1 605	12 636	424	12	436	11 454	1 617	13 071
Quebec	140 022	66 209	206 231	23 610	14 363	37 973	163 632	80 573	244 205
Ontario	277 449	131 712	409 160	105 142	61 861	167 003	382 591	193 573	576 163
Manitoba	14 421	47 810	62 231	3 000	13 300	16 300	17 421	61 110	78 531
Saskatchewan	102 512	140 092	242 604	24 000	114 125	138 125	126 512	254 217	380 729
Alberta	5 669	2 917	8 586	–	2 400	2 400	5 669	5 317	10 986
British Columbia	105 033	28 231	133 264	37 055	23 079	60 134	142 088	51 310	193 398
Yukon	35 236	8 445	43 681	–	18 921	18 921	35 236	27 366	62 602
Northwest Territories	16 703	2 631	19 334	9 350	–	9 350	26 053	2 631	28 684
Nunavut	33 337	42 532	75 869	34 550	65 179	99 729	67 887	107 711	175 598
Canada	770 204	487 768	1 257 972	250 372	331 349	581 722	1 020 577	819 117	1 839 694

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

– Nil.

(1) Includes on-mine-site and off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Notes: Data for 2009 are revised spending intentions. Numbers may not add to totals due to rounding.

TABLE 2.14. NUMBER OF PROJECTS BY MINERAL COMMODITY IN THE OFF-MINE-SITE DEPOSIT APPRAISAL STAGE, 1997-2008

	Precious Metals	Base Metals	Nonmetals	Diamonds	Others (1)	Total Projects
	(number)					
1997	46	24	21	0	21	112
1998	32	24	20	0	20	96
1999	27	22	25	4	14	92
2000	32	21	18	5	10	86
2001	19	27	11	4	6	67
2002	19	21	11	6	13	70
2003	27	19	16	6	16	84
2004	26	15	18	5	14	78
2005	15	14	13	2	12	56
2006	17	16	9	3	21	66
2007	19	23	7	2	20	71
2008	22	19	12	1	20	74

Source: Natural Resources Canada, based on the Survey of Mineral Exploration Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes iron, uranium, other metals, and coal.

Notes: In 2002 and 2003, the number of diamond projects included two separate projects at Ekati. Starting with 2004, classification criteria were strengthened, thus making comparisons with previous years difficult.

TABLE 2.15. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES IN CANADA, (1) BY WORK PHASE (ON- AND OFF-MINE-SITE) AND BY TYPE OF COMPANY, 1997-2009

	Exploration		Deposit Appraisal		Exploration and Deposit Appraisal		Exploration and Deposit Appraisal
	On-Mine-Site	Off-Mine-Site	On-Mine-Site	Off-Mine-Site	On-Mine-Site	Off-Mine-Site	On- and Off-Mine-Site
(\$'000)							
1997							
Junior	n.a.	233 231	n.a.	64 730	n.a.	297 961	297 961
Senior	62 383	338 796	105 608	116 222	167 991	455 018	623 009
Total	62 383	572 027	105 608	180 951	167 991	752 979	920 970
1998							
Junior	n.a.	144 970	n.a.	25 573	n.a.	170 544	170 544
Senior	67 875	249 959	61 535	106 018	129 411	355 977	485 387
Total	67 875	394 929	61 535	131 591	129 411	526 520	655 931
1999							
Junior	n.a.	92 926	n.a.	48 498	n.a.	141 424	141 424
Senior	44 471	177 262	42 302	98 889	86 773	276 151	362 924
Total	44 471	270 188	42 302	147 386	86 773	417 575	504 348
2000							
Junior	n.a.	127 901	n.a.	28 109	n.a.	156 010	156 010
Senior	30 743	183 881	42 273	83 744	73 016	267 625	340 641
Total	30 743	311 782	42 273	111 853	73 016	423 635	496 651
2001							
Junior	n.a.	157 913	n.a.	19 820	n.a.	177 733	177 733
Senior	42 297	180 963	29 173	82 704	71 469	263 667	335 136
Total	42 297	338 876	29 173	102 524	71 469	441 400	512 869
2002							
Junior	n.a.	172 402	n.a.	18 391	n.a.	190 793	190 793
Senior	56 408	174 735	23 863	127 621	80 272	302 356	382 628
Total	56 408	347 137	23 863	146 012	80 272	493 149	573 421
2003							
Junior	n.a.	256 578	n.a.	27 110	n.a.	283 688	283 688
Senior	60 203	221 272	25 370	96 203	85 572	317 475	403 047
Total	60 203	477 850	25 370	123 313	85 572	601 163	686 735
2004							
Junior	n.a.	523 104	n.a.	76 614	n.a.	599 718	599 718
Senior	84 431	295 943	52 095	145 598	136 526	441 541	578 067
Total	84 431	819 047	52 095	222 212	136 526	1 041 259	1 177 785
2005							
Junior	n.a.	718 838	n.a.	82 449	n.a.	801 287	801 287
Senior	100 073	301 002	20 780	81 648	120 853	382 650	503 504
Total	100 073	1 019 840	20 780	164 097	120 853	1 183 937	1 304 790
2006							
Junior	n.a.	1 030 516	n.a.	207 514	n.a.	1 238 031	1 238 031
Senior	103 562	369 602	39 157	161 176	142 719	530 777	673 496
Total	103 562	1 400 118	39 157	368 690	142 719	1 768 808	1 911 527
2007							
Junior	n.a.	1 638 204	n.a.	266 159	n.a.	1 904 362	1 904 362
Senior	133 092	502 959	60 186	230 219	193 278	733 178	926 456
Total	133 092	2 141 163	60 186	496 378	193 278	2 637 541	2 830 819
2008							
Junior	n.a.	1 690 338	n.a.	427 475	n.a.	2 117 813	2 117 813
Senior	148 834	565 842	114 106	332 884	262 940	898 726	1 161 666
Total	148 834	2 256 181	114 106	760 359	262 940	3 016 539	3 279 479
2009							
Junior	n.a.	770 204	n.a.	250 372	n.a.	1 020 577	1 020 577
Senior	121 330	366 438	89 969	241 381	211 299	607 819	819 117
Total	121 330	1 136 642	89 969	491 753	211 299	1 628 395	1 839 694

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

n.a. Not applicable.

(1) Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Note: Data for 2009 are revised spending intentions.

TABLE 2.16. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, (1) BY PROVINCE AND TERRITORY AND BY WORK PHASE (OFF- AND ON-MINE-SITE), 2008

Province/Territory	Exploration		Deposit Appraisal		Exploration Plus Deposit Appraisal		Total
	Off-Mine-Site	On-Mine-Site	Off-Mine-Site	On-Mine-Site	Off-Mine-Site	On-Mine-Site	
(\$000)							
Newfoundland and Labrador	126 855	827	5 729	13 248	132 585	14 075	146 660
Nova Scotia	13 920	—	7 477	—	21 397	—	21 397
New Brunswick	31 605	—	1 140	—	32 745	—	32 745
Quebec	420 005	15 077	80 417	10 642	500 422	25 719	526 141
Ontario	499 792	93 739	130 047	75 689	629 838	169 428	799 266
Manitoba	120 497	16 980	14 598	—	135 095	16 980	152 075
Saskatchewan	352 771	—	77 964	—	430 735	—	430 735
Alberta	18 681	—	177	1 900	18 858	1 900	20 758
British Columbia	323 512	6 426	102 155	3 348	425 667	9 774	435 441
Yukon	114 604	4 665	14 098	595	128 702	5 260	133 962
Northwest Territories	91 123	7 755	44 770	4 100	135 894	11 855	147 749
Nunavut	142 816	3 365	281 786	4 584	424 602	7 949	432 551
Total	2 256 181	148 834	760 359	114 106	3 016 539	262 940	3 279 479
Total (off- plus on-mine-site)	2 405 014		874 465		3 279 479		3 279 479

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

— Nil.

(1) Exploration and deposit appraisal expenditures include costs incurred for fieldwork and overhead, plus engineering, economic and feasibility studies, environment, and land access costs.

Note: Numbers may not add to totals due to rounding.

TABLE 2.17. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, (1) BY PROVINCE AND TERRITORY AND BY WORK PHASE (OFF- AND ON-MINE-SITE), 2009

Province/Territory	Exploration		Deposit Appraisal		Exploration Plus Deposit Appraisal		Total
	Off-Mine-Site	On-Mine-Site	Off-Mine-Site	On-Mine-Site	Off-Mine-Site	On-Mine-Site	
(\$000)							
Newfoundland and Labrador	35 398	—	15 432	7 419	50 830	7 419	58 250
Nova Scotia	8 899	78	8 500	—	17 399	78	17 477
New Brunswick	12 636	—	436	—	13 071	—	13 071
Quebec	188 862	17 369	30 610	7 363	219 472	24 733	244 205
Ontario	344 897	64 264	118 393	48 610	463 290	112 874	576 163
Manitoba	43 581	18 650	3 000	13 300	46 581	31 950	78 531
Saskatchewan	241 444	1 160	138 100	25	379 544	1 185	380 729
Alberta	8 586	—	—	2 400	8 586	2 400	10 986
British Columbia	121 605	11 659	53 570	6 564	175 175	18 223	193 398
Yukon	40 531	3 150	17 634	1 287	58 165	4 437	62 602
Northwest Territories	19 334	—	9 350	—	28 684	—	28 684
Nunavut	70 869	5 000	96 729	3 000	167 598	8 000	175 598
Total	1 136 642	121 330	491 753	89 969	1 628 395	211 299	1 839 694
Total (off- plus on-mine-site)	1 257 972		581 722		1 839 694		1 839 694

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

— Nil.

(1) Exploration and deposit appraisal expenditures include costs incurred for fieldwork and overhead, plus engineering, economic and feasibility studies, environment, and land access costs.

Notes: Data for 2009 are revised spending intentions. Numbers may not add to totals due to rounding.

3. Canadian Reserves of Selected Major Metals, and Recent Production Decisions

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RESERVES OF SELECTED MAJOR METALS

In the 28-year period from 1980 to 2008, Canada's reserves of base metals declined continuously at annual average rates varying from -2.5% for nickel to -8% for lead. This period of prolonged decline resulted in reserve levels of less than half of the known ore reserves reported at the end of 1980. Reserves in 2008 were 45% of 1980 reserves for copper, 43% for nickel, 40% for molybdenum, 18% for zinc, 17% for silver, and 7% for lead. Gold has seen an increase of 115%.

During 2008, metal prices for all commodities declined from the highs reached in the previous year, but were still above historical averages. The severe collapse in metal prices was triggered by the financial meltdown in the United States and resultant global recession. Copper averaged US\$3/lb, nickel averaged US\$9.50/lb, and zinc and lead averaged under US\$1/lb each. Gold remained high throughout the economic turmoil to average US\$872/oz and silver averaged US\$15/oz. All metals reached annual peaks in March and declined by year-end. By December 2008, copper was selling for US\$1.39/lb, lead for US\$0.44/lb, zinc for US\$0.50/lb, and nickel for US\$4.39/lb. Gold had declined to US\$750/oz and silver was at US\$9.40/oz.

As a result of this sudden economic downturn, the expansive effects of recent record prices were canceled by the negative, sharp, and quick responses of companies to the crisis. Marginal mines were placed on care and maintenance or closed, development projects were halted, and the anticipated increases in total metal reserves in Canada did not occur. In 2008, only molybdenum reserves (+4%) increased. Decreases were recorded in the reserves of zinc (-16%), silver (-14%), lead (-7%), nickel (-4.5%), gold (-4%), and copper (-1%).

The increase in molybdenum reserves is due to additions from the Gibraltar mine in British Columbia. The Gibraltar mine was also responsible for significant increases in copper reserves. Vale Inco recorded significant decreases in nickel reserves at its producing mines in Sudbury. Increases in lead and zinc reserves from new resources at existing mines were matched by larger declines in reserves at mature operations and mine closures at marginal deposits. **Table 3.1** illustrates the main components of change in Canadian reserves in 2008.

At the time of writing, the deteriorating economic and financial conditions appeared to be improving. According to a July 2009 International Monetary Fund (IMF) report, world output is expected to recover gradually in 2010. As the global economy recovers, the prices of most minerals and metals should rally. In 2010, the prices of most minerals and metals are expected to rise, in part because of growth in the emerging economies, improving consumer demand in developed economies, and constraints on the supply of some commodities.

Reserves Policy

Canadian reserves are estimated from information contained in annual and other corporate reports, and from the responses of mining companies to the annual Federal-Provincial/Territorial Survey of Mines and Concentrators. Reserves reported here include only metal contained in material that is classified by companies as “proven reserves” or “probable reserves” at producing mines and in deposits that are firmly committed to production (**Table 3.2**). Metal contained in mineral resources classified by companies as “measured resources,” “indicated resources,” or “inferred resources” is not included in national totals, nor is metal contained in deposits that have not advanced beyond the deposit appraisal phase (**Figure 3.1**). When available, only metal contained in mineable ore is included in Canadian totals in order to exclude losses inherent in the mining process. Every effort is made to achieve, from year to year, consistency in the reserves reported here; however, consistency ultimately depends on industry practice, which has evolved over the years. Imperial units reported by companies have been converted to metric units and the results have been rounded to the appropriate number of significant digits.

Reserves by Commodity

Gold

There were 947 t of gold contained in Canadian mine reserves in December 2008. This represents a decrease of 4% (40 t) compared to December 2007. In Ontario, the Macassa mine in Kirkland Lake added gold reserves of 30 t while gold reserves decreased by 18 t at the Porcupine Joint Venture in Timmins and by 17 t at the Red Lake mine.

Silver

There were 5665 t of silver contained in Canadian mine reserves in December 2008. This represents a 14% decrease (923 t) compared to December 2007. Silver reserves are estimated to have decreased by approximately 437 t at the Caribou and Restigouche mines in New Brunswick. At the Brunswick No. 12 mine in New Brunswick, silver reserves were reduced by 133 t. Silver reserves at the LaRonde mine in Quebec were reduced by 125 t. At the newly opened Perseverance mine in Quebec, 20.6 t of silver reserves were added, and the Myra Falls mine in British Columbia added 14 t. The Red Lake mine in Ontario contributed an increase of 13 t in silver reserves and the Duck Pond mine in Newfoundland and Labrador added an estimated 8 t.

Zinc

During 2008, Canadian reserves of zinc declined by about 979 000 t (16%) to a year-end total of approximately 5.01 Mt. The greatest reductions in zinc reserves were recorded at the Caribou and Restigouche mines (366 928 t) in New Brunswick, at the Kidd Creek mine (137 150 t) in Ontario, and at the Brunswick No. 12 mine (110 400 t) in New Brunswick. The only increase in zinc reserves occurred at the Myra Falls mine due to the addition of new reserves (13 545 t) by exploration efforts to expand known resources.

Lead

In 2008, Canadian reserves of lead decreased by approximately 7% to a year-end total of 636 000 t. In New Brunswick, lead reserves decreased by 154 930 t at the Caribou-Restigouche mines and by 45 600 t at the Brunswick No. 12 mine. The Kidd Creek mine in Timmins, Ontario, registered a relatively modest increase of 98 410 t and the LaRonde mine increased lead reserves by 53 160 t.

Copper

In December 2008, Canadian reserves of copper were estimated at around 7.456 Mt, a decrease of 1.4% (109 000 t) from one year earlier. The addition of 294 327 t of copper reserves at the Gibraltar

FIGURE 3.1 GENERALIZED MODEL OF MINERAL RESOURCE DEVELOPMENT¹

PHASE	MINERAL RESOURCE ASSESSMENT	MINERAL EXPLORATION					MINERAL DEPOSIT APPRAISAL				MINE COMPLEX DEVELOPMENT	MINE PRODUCTION	ENVIRON- MENTAL RESTORATION
	MRA	GRASS-ROOTS EXPLORATION					DA-1	DA-2	DA-3	DA-4	MCD	MP	ER
		EX-1	EX-2	EX-3	EX-4	EX-5							
STAGE	Various surveys, research and synthesis.	Exploration planning.	Regional reconnaissance and surveys.	Prospecting and ground surveys of anomalies.	Verification of anomalies and showings.	Discovery and delimitation of a mineral deposit.	Mineral deposit definition.	Project engineering.	Project economics.	Feasibility study, production decision.	Mine development, construction of processing plant and infrastructure.	Production, marketing and renewal of reserves.	Mine complex closure and decommissioning site restoration.
OBJECTIVES	Supply information and tools required to develop the mineral potential of the nation for economic benefit, in the perspective of sustainable development.	Select target commodities. Establish exploration objectives and strategies. Select target areas and sites. Acquire claims or permits if appropriate.	Seek anomalies of interest over wide areas by various survey methods. Select the more promising targets. Acquire claims or permits.	Confirm the presence, exact location and characteristics of anomalies. Acquire claims, leases and properties.	Investigate the cause of anomalies. Find mineral showings. Acquire additional claims, leases and properties.	Discover, delimit and interpret grade, quality and tonnage of a new mineral deposit. Determine if it constitutes a mineral resource of "potential economic interest" to justify more intensive and detailed work.	Define the limits, controls and internal distribution of grades, mineralogy and mineral processing characteristics of the deposit. Acquire all data required for project engineering and cost estimation.	Determine, in an iterative fashion, the design, plans, schedules, capital cost and operating cost estimates for all aspects of the project. Establish technical feasibility and costs thoroughly and realistically.	Obtain all the information required and determine, based on corporate objectives, parameters for the economic, financial and social-political evaluation of the project.	Diligently validate and integrate project data, interpretations, plans and evaluations to achieve MCD and production objectives. Decide on whether to undertake the mining project. Obtain permits and financing.	Complete mine development and construction on schedule and within budgets and specifications. Ensure efficient and timely mine complex start-up according to schedule, specifications and cash flow forecasts.	Achieve commercial production on schedule and meet cash flow forecasts and quantity and quality specifications. Achieve mine profitability and company survival in the perspective of sustainable development.	Restore mine site, outside plant and infrastructure to environmentally acceptable condition. Ensure the future quality of the environment.
EVALUATION METHODS	Geoscientific, mineral and economic surveys, research, compilations and synthesis by governments, research institutes, universities and industry.	Metal and mineral market research. Review of geological and ore deposit information and of the legal, fiscal and socio-political context in various areas.	Remote sensing, aerial photography and airborne geophysics. Prospecting, geology and geochemistry. Appraisal, rating and selection of anomalies.	Ground, geological, geochemical and geophysical prospecting and surveys. Compilation, appraisal and selection of significant anomalies.	Geological mapping and other surveys. Trenching, drilling and sampling. Appraisal of results, recommendations for further work, and selection of new targets.	Stripping, trenching, mapping, sampling, drilling and down-hole geophysics. Initial mineral processing tests. Environmental and site surveys. Mineral resource estimation and inventory.	Detailed mapping, sampling and drilling on surface or from underground. Systematic mineralogy and mineral processing tests. Detailed environmental and site surveys. Pre-feasibility studies.	Pilot tests, engineering design and planning. Capital and operating costs for mining, mineral processing, infrastructure, environmental protection and restoration. Technical risk analysis. Pre-feasibility studies.	Market, prices, product development and financial studies. Environmental, economic, financial, and socio-political risk analysis. Pre-feasibility studies.	Exhaustive due diligence review of all data, interpretations, plans and estimates. Evaluation of profitability, given the geological, technical, financial and qualitative risks, and the up-side factors.	Project management methods in a quality assurance perspective. Training program for personnel and detailed start-up plan to meet the requirements of this demanding period.	Production management methods to ensure continuous quality and efficiency improvements. Exploration, deposit appraisal and development of new zones or deposits on-mine-site and off-mine-site.	Mine closure and decommissioning. Environmental restoration and monitoring.
RESULTS	Maps, data bases, tools and models.	Exploration projects.	Regional anomalies.	Local anomalies.	Mineral showings.	Mineral deposit.	Deposit appraisal project.			Mining project.	Mining complex.	Mineral production.	Restored site.
MINERAL INVENTORY	UNDISCOVERED MINERAL POTENTIAL					INFERRED RESOURCE	DELIMITED MINERAL RESOURCE				MINERAL RESERVE		
	SPECULATIVE		HYPOTHETICAL				INDICATED	INDICATED AND MEASURED			PROVEN AND PROBABLE		
ESTIMATION ERROR (targeted margin of error of tonnage/grade estimates at the 90% confidence level)						± 100%	± 50% to ± 30%	Indicated: ± 50 to ± 30% Measured: ± 20 to ± 10% (often several sample grid dimensions are used in each category)			Proven (feasibility: ± 10%; mining: ± 5%)		Full compliance
INVESTMENTS	Moderate	Low, but increasing multiple investments.					Larger and increasing multiple investments.				Very large industrial investment.		
RISK LEVEL	Low	Very high, but decreasing risk of failure and financial loss.					High, but decreasing risk of failure.				Moderate to low industrial risk.		

Sources: Modified by D.A. Cranstone, A. Lemieux and M. Vallée, February 25, 1994, from M. Vallée, 1992, *Guide to the Evaluation of Gold Deposits*, CIM Special Volume 45, p. 4, and *SOQUEM Annual Report*, 1976-77, pp. 4 and 5. Revised by M. Vallée and G. Bouchard, January 2001.

Note: for more information, please contact: Minerals and Mining Statistics Division, Minerals and Metals Sector, Natural Resources Canada, 580 Booth Street, Ottawa, Ontario K1A 0E4; telephone (toll-free): 1-800-267-0452 or fax (toll-free): 1-877-336-3100.

¹ This Generalized Model was being updated at the time of writing.

mine in British Columbia was the largest reserve change. Drilling on newly acquired ground has extended the Gibraltar deposit (Gibraltar Extension) and significantly increased reserves. Increases were also recorded at the Fabie Bay mine (16 999 t) and Kidd Creek mine (5420 t), and small increases were recorded at Duck Pond and at Vale Inco's Manitoba Division. Copper reserves at the Highland Valley mine in British Columbia decreased by 91 280 t and Vale Inco's Ontario Division decreased its reserves by 60 740 t. The Mount Polley mine in British Columbia reported that copper reserves declined by 40 517 t, and the Voisey's Bay mine in Newfoundland and Labrador decreased its copper reserves by 38 030 t.

Molybdenum

Canadian reserves of molybdenum stood at 222 129 t in December 2008, a slight 4% increase from 2007, due principally to expanded reserves at the Gibraltar mine (18 809 t) in British Columbia. Significant decreases were recorded at the Endako mine (6762 t) and also at the Max mine (1327 t) in British Columbia.

Nickel

In December 2008, there were some 3.605 Mt of nickel contained in Canadian mine reserves, a decrease of approximately 4.5% from 2007 levels. The two largest decreases in nickel reserves occurred at Vale Inco operations. Vale Inco's Ontario Division reported nickel reserves of 115 590 t less than in 2007 and Voisey's Bay nickel reserves declined by 80 340 t. Xstrata Nickel reported decreases of 15 410 t in nickel reserves at its Montcalm mine due to lower-grade ore as the mine approaches the end of its life. The Raglan mine in Quebec experienced a decline of 15 110 t. Some 54 097 t of nickel reserves were added from the new Bucko mine in Manitoba.

Nickel reserves in the Sudbury region decreased by approximately 100 000 t resulting from the re-classification of reserves to resources and lower grades at mature operations. In 2007 and early 2008, Vale Inco and Xstrata intended to open/advance new projects in the Sudbury region, but economic conditions brought many of them to a halt. The Copper Cliff South mine, which gave access to the Onaping Deep project, was closed. In February 2009, the Fraser Morgan project was indefinitely deferred. The Craig and Thayer-Lindsley mines were closed in November 2008. Vale Inco's Totten project is still expected to begin production in 2011, and Xstrata's Nickel Rim South project could see production commencing in 2009.

Vale Inco had some 2.9 Mt of nickel in Canadian reserves at the end of 2008, or about 81% of the national total.

Canadian Reserves by Province and Territory

The same four provinces (Ontario, British Columbia, Quebec, and New Brunswick) continued to hold dominant positions in terms of Canada's proven and probable mineable reserves of major metals in December 2008 (**Table 3.4**).

Ontario had 56% of the nickel, 42% of the gold, and 35% of the copper, plus 24% of the silver, 21% of the lead, and 20% of the zinc.

British Columbia had 100% of the molybdenum, 45% of the copper, 16% of the silver, 7% of the zinc, 5% of the lead, and 4% of the gold.

New Brunswick had 53% of the lead, 18% of the silver, 17% of the zinc, and less than 1% of both copper and gold.

Quebec had 35% of the zinc, 34% of the gold, 29% of the silver, 11% of the nickel, and 5% of the copper.

Manitoba had 15% of the zinc, 13% of the nickel, 8% of the silver, 6% of the copper, and 5% of the gold.

Newfoundland and Labrador had 20% of the nickel, 7% of the copper, 4% of the silver, and 3% of the zinc.

Nunavut had 12% of the gold.

Nova Scotia had 12% of the lead and 3% of the zinc.

The Yukon had 2% of the copper, 1% of the silver, and less than 1% of the gold.

Canadian Reserves by Industry Classification

Canadian mines are, to a large extent, polymetallic, a complexity that the North American Industry Classification System (NAICS) tends to oversimplify (**Table 3.5**).

In 2008, mine reserves of gold in Canada were distributed through the various NAICS classes as follows: Gold and Silver Ore Mining, 85%; Copper-Zinc Ore Mining, 10%; and Nickel-Copper Ore Mining, 6%.

In 2008, mine reserves of silver in Canada were distributed through the various NAICS classes as follows: Gold and Silver Ore Mining, 23%; Copper-Zinc Ore Mining, 55%; Nickel-Copper Ore Mining, 4%; and Lead-Zinc Ore Mining, 18%.

Mine reserves of copper in Canada in 2008 were distributed through the various NAICS classes as follows: Gold and Silver Ore Mining, 2%; Copper-Zinc Ore Mining, 61%; and Nickel-Copper Ore Mining, 37%.

Mine reserves of molybdenum in Canada were contained in the NAICS classes as follows: Copper-Zinc Ore Mining, 37%, and Molybdenum Mining, 63%.

Mine reserves of nickel in Canada were contained 100% in the NAICS class of Nickel-Copper Ore Mining.

Mine reserves of lead in Canada were contained in the NAICS classes as follows: Copper-Zinc Ore Mining, 26%; Lead-Zinc Ore Mining, 65%; and Gold and Silver Ore Mining, 8%.

Mine reserves of zinc in Canada were contained in the NAICS classes as follows: Gold and Silver Ore Mining, 12%; Copper-Zinc Ore Mining, 68%; and Lead-Zinc Ore Mining, 20%.

Apparent Life of Canadian Reserves

The apparent life (life index) of mine reserves is usually calculated by dividing the total amount of metals remaining in mine reserves at the end of a given year by the corresponding amount of metals contained in the ores produced during that year. Similar calculations are often applied at the national level.

At the national level, life indices are but a very rough measure of the expected life of aggregate mine reserves and they are often misleading unless abnormal situations are recognized. Life indices based on proven and probable reserves do not make allowances for inferred extensions to reserves at current mines, gross additions that will accrue to current reserves from the likely development, in the foreseeable future, of known orebodies for which a production decision has yet to be made, or expected changes in production rates. Furthermore, life indices tend to overstate the apparent life of reserves when, for example, annual production is abnormally low due to strikes, cutbacks, or suspen-

sions at large establishments, or when significant increases in capacity resulting from new production decisions will be coming on stream, but only several years hence.

The apparent life indices for the major metals in Canada at the end of 2008 were 12 years for nickel, 10 years for copper, 9 years for gold, 7 years for molybdenum, 6 years for zinc, 6 years for silver, and 4 years for lead.

Reserve Trends

Figure 3.2 and **Table 3.6** show how Canadian reserves of copper, nickel, lead, zinc, molybdenum, and silver have declined since the early 1980s. In contrast, gold reserves increased substantially until 1988 before beginning to decline.

Despite higher metal prices in 2007, rapidly escalating costs prevented the anticipated increase in reserves for most of the metals covered in this article. In 2008, the economic crisis dampened metal production and put development and expansion projects on hold. During 2008, molybdenum reserves increased by 4%, copper reserves decreased by 1%, lead reserves decreased by 7%, nickel reserves declined by 5%, silver reserves decreased by 14%, gold reserves decreased by 4%, and zinc reserves decreased by 16%.

The annual aggregate change in Canadian reserves is the net result of three main factors affecting individual mines (**Figure 3.3**): additions to reserves, deletions to reserves, and production. Additions to reserves are the result of new discoveries; new geological, metallurgical, production or other information; a decrease in production costs; or a rise in commodity prices, all of which increase the quantity of mineral resources that is profitable to mine. Deletions to reserves are the result of new geological, metallurgical, production or other information; increases in costs; or decreases in commodity prices, all of which reduce the quantity of mineral resources previously counted in mine reserves that are now expected to be mined at a profit.

The opportunity presented by increased prices over the previous seven years (2001-07) was not enough to offset the impact of escalating costs, labour shortages, and permitting issues/delays, and were exacerbated by a sharp downturn in global economic conditions. Therefore, Canada's level of metal reserves continued its downward trend in 2008.

RECENT PRODUCTION DECISIONS

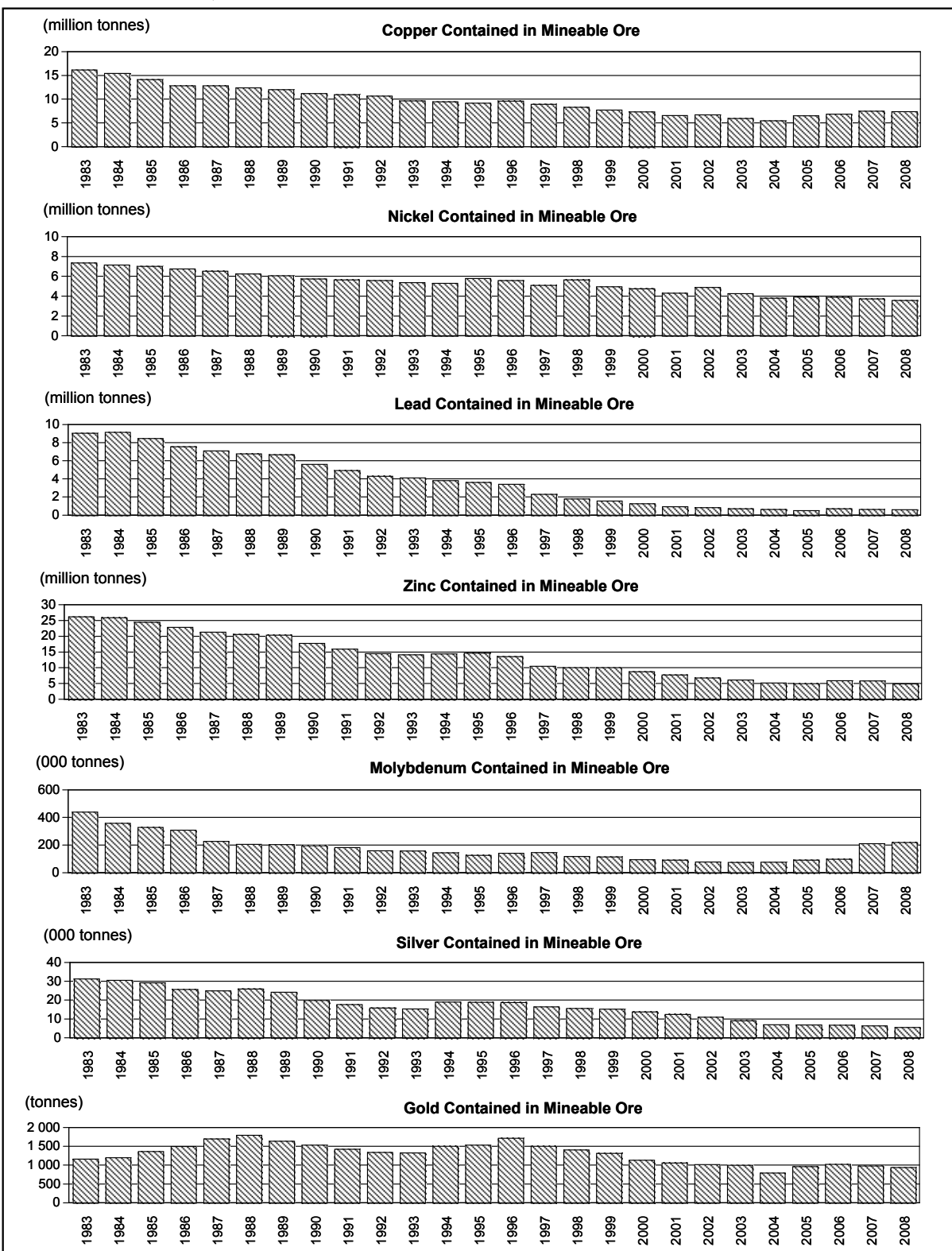
Several criteria need to be met for a project to be considered to have reached the production decision stage for the purposes of this report. In general, there needs to have been a positive production feasibility study, all of the necessary permits must have been obtained, financing must have been arranged, and directors must have approved construction.

Table 3.3 shows the production decisions that added to Canadian reserve totals in 2008.

In 2008, there was one re-opening of a mine with a production decision: the underground Bucko nickel mine in Wabowden, Manitoba.

A production decision made in 2007 for Xstrata's Fraser-Morgan mine was reconsidered in 2008 and the project was put on hold. Nickel Rim South is scheduled for start-up in 2009; however, only resources are currently reported on this nickel-copper-platinum group metals (PGM) project in Sudbury, Ontario.

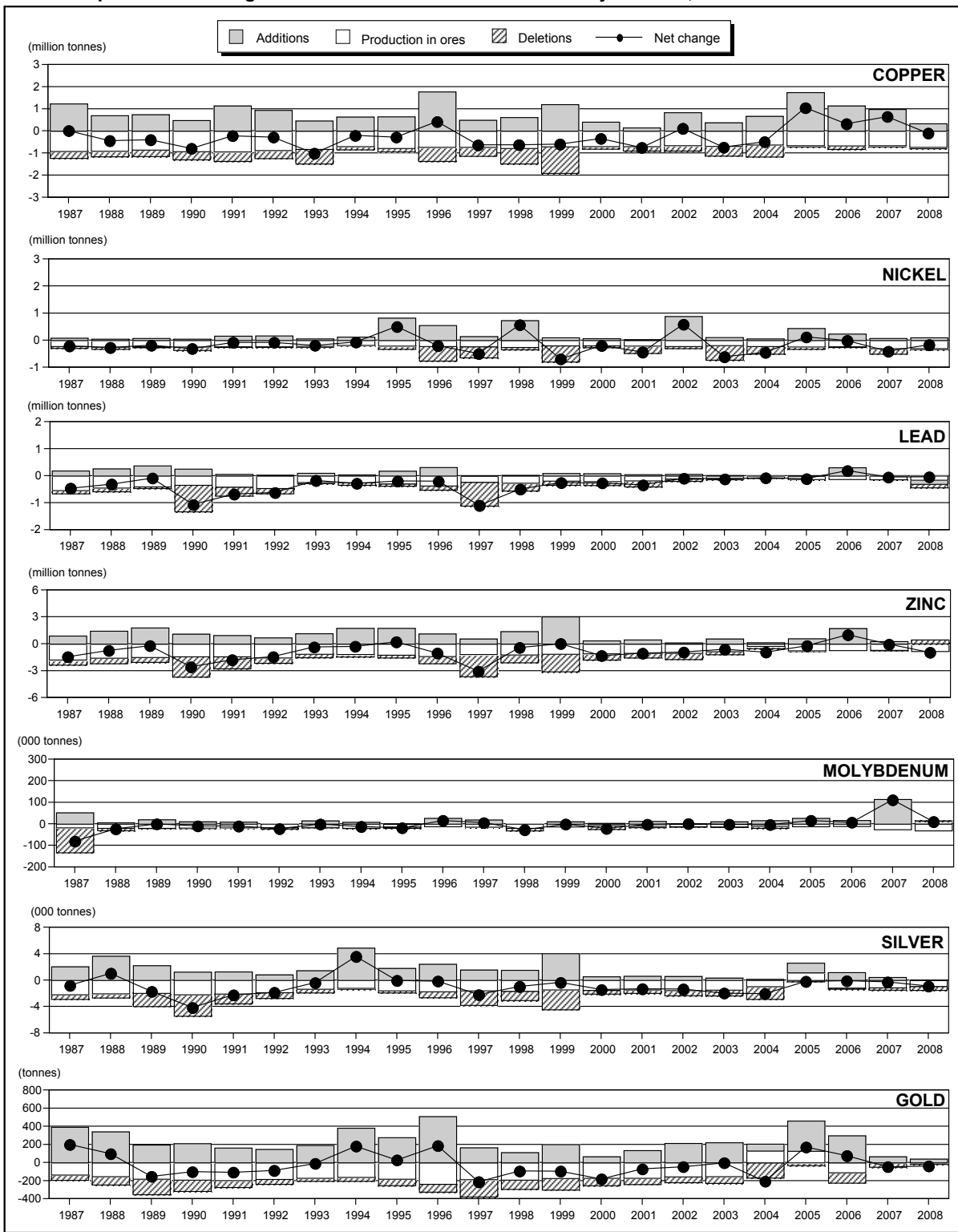
Figure 3.2
Canadian Reserves of Selected Major Metals, 1983-2008
 Metal Contained in Proven and Probable Mineable Ore in Operating Mines and Deposits
 Committed to Production, as at December 31 of Each Year



Source: Natural Resources Canada, based on company reports and the federal-provincial/territorial survey of mines and concentrators.

Note: This series was revised during 1996.

Figure 3.3
Main Components of Change in Canadian Reserves of Selected Major Metals, 1987-2008



Source: Natural Resources Canada.

OUTLOOK

Falling metal prices and economic uncertainty have impeded the advancement of new projects, delayed development and expansion plans, and resulted in financial pressures at marginal operations. The 2009 outlook for Canadian reserves of copper, nickel, zinc, molybdenum, lead, and silver will depend on the timing of the economic recovery and the extent to which metal prices will respond to that recovery. For gold the outlook is more positive as the economic uncertainty continues to put upward pressure on its price and provide impetus for further reserve development activities.

Note: Information in this chapter was current as of December 2009.

NOTE TO READERS

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TABLE 3.1. MAIN COMPONENTS OF CHANGE DURING 2008 IN CANADIAN RESERVES OF SELECTED MAJOR METALS

Metal	Units	Revised Opening Metal Balance, January 2008	Metal in Ore Mined During 2008	Metal Apparently Written Off During 2008	Metal in New Reserves Found During 2008	Net Change During 2008	Closing Metal Balance, December 2008	% Change During 2008
Copper	000 t	7 565	729.343	57.39	335.38	-109.031	7 455.906	-1.44
Nickel	000 t	3 778	302.295	36.322	96.009	-173.199	3 604.633	-4.59
Lead	000 t	682	156.313	0.626	18.809	9.513	635.866	-6.76
Zinc	000 t	5 984	835.378	126.428	154.761	-45.769	5 005.227	-16.36
Molybdenum	000 t	213	31.081	448.604	13.545	-979.04	222.129	4.29
Silver	t	6 588	110.502	18.081	10.885	-70.291	5 664.908	-14.01
Gold	t	987	899.84	590.52	65.506	-923.388	946.777	-4.08

Source: Natural Resources Canada, based on company reports and the federal-provincial/territorial survey of mines and concentrators.

TABLE 3.2. TONNAGES AND GRADES OF OPERATIONS INCLUDED IN CANADIAN RESERVES OF SELECTED MAJOR METALS, AS AT DECEMBER 31, 2008

Tonnages classified by companies as "resources" are not included, nor are tonnages for which there is not a firm production decision. Confidential data have been suppressed from the details of this report.

	Tonnes	Grade					
		Cu	Ni	Pb	Zn	Mo	Au Ag
		(%)	(%)	(%)	(%)	(%)	(g/t) (g/t)
NEWFOUNDLAND AND LABRADOR							
Duck Pond							
Teck Resources Ltd.							
Proven	2 000 000	3.11			4.80		0.75 53.00
Probable	1 500 000	3.03			4.10		0.90 61.90
Pine Cove							
Anaconda Mining Inc.							
New Island Resources Inc.							
Probable	2 332 676						2.76
Voisey's Bay							
Vale Inco (Voisey's Bay Nickel Company Ltd.)							
Proven	23 000 000	1.78	3.03				
Probable	3 000 000	0.38	0.68				
NEW BRUNSWICK							
Brunswick No. 12 Underground							
Xstrata plc							
Proven	7 500 000	0.40		3.50	8.60		. . 107.00
Probable	2 400 000	0.30		3.20	8.20		86.00
NOVA SCOTIA							
Scotia							
Acadian Mining Corporation							
Proven (open pit)	1 750 000			1.30	3.20		
Probable (open pit)	1 690 000			1.00	2.50		
Probable (underground)	1 150 000			3.20	5.70		
QUEBEC							
Beaufor							
Richmont Mines Inc.							
Louvem Mines Inc.							
Proven	96 678						7.17 0.30
Probable	147 385						10.03 0.30
Casa Berardi Ouest							
Aurizon Mines Ltd.							
Proven (open pit)	407 000						4.16
Proven (underground)	880 000						8.18
Probable (open pit)	228 000						3.66
Probable (underground)	2 321 000						8.62
Copper Rand							
Campbell Resources Inc.							
Proven	260 072	1.79					1.80 5.77
Probable	762 035	1.55					3.19 6.00
Doyon							
Iamgold Corp.							
Proven	219 000						10.60 2.00
Probable	46 000						12.00 2.00
Fabie Bay							
First Metals Inc.							
Proven	395 724	2.09					
Probable	205 276	2.69					
Goldex							
Agnico-Eagle Mines Limited							
Proven	437 000						1.95
Probable	23 391 000						2.05
Kiena							
Wesdome Gold Mines Ltd.							
Proven	448 000						4.80
Probable	285 000						3.60
Lac Herbin							
Alexis Minerals Corp.							
Proven	21 057						7.08
Probable	342 609						7.35

TABLE 3.2 (cont'd)

		Tonnes	Grade						
			Cu	Ni	Pb	Zn	Mo	Au	Ag
			(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
QUEBEC (cont'd)									
Langlois									
Breakwater Resources Ltd.									
	Proven	1 469 000	0.50			8.70		0.10	38.00
	Probable	3 626 000	0.70			10.10		0.10	48.00
Lapa									
Agnico-Eagle Mines Limited									
	Proven	23 000						7.53	
	Probable	3 730 000						8.80	
LaRonde									
Agnico-Eagle Mines Limited									
	Proven	4 075 000	0.33		0.37	3.27		2.76	67.87
	Probable	31 735 000	0.28		0.12	1.42		4.52	31.18
Perseverance									
Xstrata plc									
Société de développement de la Baie-James									
	Proven	4 900 000	1.00			13.60		0.30	30.00
	Probable	100 000	1.20			12.10		0.30	36.00
Raglan									
Xstrata plc									
	Proven	6 300 000	0.61	2.16					
	Probable	9 300 000	0.79	2.81					
Sigma-Lamaque									
Century Mining Corporation									
	Proven and probable	7 702 296						4.56	
Troilus									
Inmet Mining Corporation									
	Proven	7 458 000	0.10					0.50	..
	Probable	1 759 000	0.20					1.50	..
ONTARIO									
Vale Inco Ontario									
	Proven	75 600 000	1.43	1.20				0.30	
	Probable	74 800 000	1.27	1.14				0.40	3.00
David Bell									
Barrick Gold Corp.									
Teck Resources Limited									
	Proven	400 000						10.72	..
Eagle River									
Wesdome Gold Mines Ltd.									
	Proven	152 000						10.90	1.00
	Probable	79 000						7.80	1.00
Island Gold									
Patricia Mining Corp.									
Richmont Mines Inc.									
	Proven	308 205						9.08	
	Probable	722 982						8.57	
Kidd Creek									
Xstrata plc									
	Proven	16 100 000	2.06		0.81	5.41			60.00
	Probable	3 800 000	2.02		0.11	3.23			31.00
Levack Complex (includes McCreedy West mine)									
FNX Mining Company Inc.									
	Proven	260 362	0.19	1.58					
	Probable	1 702 604	0.97	1.16				0.01	
Lockerby									
First Nickel Inc.									
	Probable	1 440 000	1.36	2.23					
Macassa									
Kirkland Lake Gold Inc.									
	Proven	1 088 622						15.09	1.16
	Probable	1 182 062						21.26	1.16
Montcalm									
Xstrata plc									
	Proven	2 800 000	0.59	1.26					

3.12 OVERVIEW OF TRENDS IN CANADIAN MINERAL EXPLORATION

TABLE 3.2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Au	Ag
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
ONTARIO (cont'd)								
Musselwhite								
Goldcorp Inc.								
Proven	7 410 000						6.12	
Probable	2 900 000						6.30	
Podolsky								
FNX Mining Company Inc.								
Probable	376 482	4.64	0.42				0.02	
Porcupine Gold Mine								
Goldcorp Inc.								
Proven	28 140 000						1.39	0.20
Probable	15 500 000						2.10	0.20
Red Lake Gold Mine								
Goldcorp Inc.								
Proven	1 170 000						30.99	..
Probable	7 240 000						12.02	..
Shakespeare								
Ursa Major Minerals Inc.								
Probable	11 678 000	0.35	0.33				0.18	
Williams								
Barrick Gold Corporation								
Teck Resources Limited								
Proven (open pit)	8 700 000						1.82	0.15
Proven (underground)	1 700 000						4.82	0.20
Probable (open pit)	900 000						1.73	0.15
Probable (underground)	1 100 000						4.82	0.20
Sudbury Xstrata plc operations								
Proven	1 200 000	2.90	0.94					
Probable	6 500 000	0.76	1.49					
MANITOBA								
777								
HudBay Minerals Inc.								
Proven	4 392 700	3.20			4.10		2.40	27.00
Probable	10 039 800	2.10			4.80		2.30	30.20
Bucko								
Crowflight Minerals Inc.								
Proven	359 000		1.63					
Probable	3 349 100		1.44					
Chisel Lake North								
HudBay Minerals Inc.								
Proven	284 300	0.10			8.70		0.50	20.00
Probable	208 100	0.10			8.90		0.50	20.00
Manitoba Division								
Vale Inco								
Proven	10 100 000	0.13	1.94				..	..
Probable	14 400 000	0.12	1.67				..	..
Rice Lake								
San Gold Corporation								
Proven	159 766						8.91	
Probable	541 680						9.60	
Trout Lake								
HudBay Minerals Inc.								
Proven	1 094 700	1.80			3.80		1.10	11.80
Probable	532 900	2.60			3.20		2.20	10.50
SASKATCHEWAN								
Seabee								
Claude Resources Inc.								
Proven and probable	998 400						6.82	0.25
BRITISH COLUMBIA								
Endako								
Sojitz Moly Resources Inc								
Thompson Creek Metals Company Inc.								
Proven	123 104 969					0.051		
Probable	156 126 494					0.049		

TABLE 3.2 (cont'd)

	Tonnes	Grade					
		Cu	Ni	Pb	Zn	Mo	Au Ag
		(%)	(%)	(%)	(%)	(%)	(g/t) (g/t)
BRITISH COLUMBIA (cont'd)							
Gibraltar Open Pit							
Taseko Mines Ltd.							
Proven connector	36 650 263	0.30				0.010	
Proven G East	60 599 941	0.29				0.008	
Proven G Extension	68 401 729	0.35				0.002	
Proven granite	169 643 546	0.32				0.009	
Probable connector	13 426 334	0.27				0.009	
Probable G East	30 209 252	0.29				0.013	
Probable G Extension	26 580 513	0.30				0.002	
Probable granite	23 314 648	0.32				0.009	
Probable connector (oxide)	11 521 246	0.35				0.151	
Probable G East (oxide)	453 592	0.15				0.121	
Highland Valley							
Teck Resources Ltd.							
Highmont Mining Company							
Proven	416 200 000	0.39				0.007	0.01 1.39
Probable	14 300 000	0.20				0.017	0.01 1.39
Huckleberry							
Imperial Metals Corporation							
Mitsubishi Materials Corporation							
Proven and probable	8 368 000	0.36				0.005	.. ..
Kemess South							
Northgate Minerals Corporation							
Proven	34 192 888	0.17					0.41
Mount Polley							
Imperial Metals Corporation							
Proven and probable	46 150 584	0.34					0.29 0.95
Myra Falls							
Breakwater Resources Ltd.							
Proven	5 422 000	0.90		0.50	5.00		1.20 44.00
Probable	876 000	1.10		0.60	6.50		1.60 44.00
QR							
Cross Lake Minerals Ltd.							
Proven and probable	476 840						5.22
YUKON							
Minto							
Capstone Mining Corp.	7 908 000	1.78					0.77 6.92
Proven	801 000	1.21					0.47 5.61
Probable							
NUNAVUT							
Meadowbank							
Agnico-Eagle Mines Limited							
Probable	32 773 000						3.45

Source: Natural Resources Canada, based on published company reports.

.. Not available in published reports or estimated by author.

Notes: One tonne (t) = 1.1023113 short tons. One gram per tonne (g/t) = 0.02916668 troy oz per short ton.

TABLE 3.3. PRODUCTION DECISIONS ADDED TO CANADIAN RESERVE TOTALS AS AT DECEMBER 31, 2008

Project	Operators and Major Partners	Province	Metals
Bucko	Crowflight Minerals Inc.	Man.	Nickel

Source: Natural Resources Canada, based on company reports.

TABLE 3.4. CANADIAN RESERVES OF SELECTED MAJOR METALS BY PROVINCE AND TERRITORY, AS AT DECEMBER 31, 2008

Metal Contained in Proven and Probable Mineable Ore (1) in Operating Mines (2) and Deposits Committed to Production

Metal	Units (3)	N.L.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	B.C.	Yukon	N.W.T.	Nunavut	Canada (5)
Copper	000 t	528	—	37	342	2 635	416	—	3 347	150	—	—	7 456
Nickel	000 t	717	—	—	397	1 999	490	—	—	—	—	—	3 605
Lead	000 t	—	76	339	53	135	—	—	32	—	—	—	636
Zinc	000 t	158	164	842	1 756	994	764	—	328	—	—	—	5 005
Molybdenum	000 t	—	—	—	—	—	—	—	222	—	—	—	222
Silver	t	199	—	1 009	1 661	1 350	456	—	930	59	—	—	5 665
Gold (4)	t	9	—	1	324	401	43	7	42	6	—	113	947

Source: Natural Resources Canada, based on company reports and the federal-provincial/territorial survey of mines and concentrators.

— Nil or less than one unit.

(1) No allowance is made for losses in milling, smelting and refining. Excludes material classified as "resources." (2) Includes metal in mines where production has been suspended temporarily. (3) One tonne (t) = 1.1023113 short tons = 32 150.746 troy oz. (4) Excludes metal in placer deposits because reserves data are generally unavailable. (5) May not balance due to rounding at the provincial/territorial level.

TABLE 3.5. CANADIAN RESERVES OF SELECTED MAJOR METALS BY INDUSTRY, AS AT DECEMBER 31, 2008
Metal Contained in Proven and Probable, Mineable Ore (1) in Operating Mines (2), and Deposits Committed to Production

Metal Contained in Proven and Probable, Mineable Ore (1) in Operating Mines (2), and Deposits Committed to Production								
		Copper, Copper-Zinc Mines	Nickel-Copper Mines	Zinc- Lead-Silver Mines	Molybdenum Mines	Miscellaneous Metal Mines		
	SIC no. (5)	611	612	613	614	615	619	Canada (6)
	(Units (3))							
Copper	000 t	113	4 516	2 790	37	—	—	7 456
Nickel	000 t	—	—	3 605	—	—	—	3 605
Lead	000 t	53	167	—	416	—	—	636
Zinc	000 t	584	3 416	—	1 006	—	—	5 005
Molybdenum	000 t	—	83	—	—	139	—	222
Silver	t	1 317	3 109	230	1 009	—	—	5 665
Gold (4)	t	801	90	55	1	—	—	947

Source: Natural Resources Canada, based on company reports and the federal-provincial/territorial survey of mines and concentrators.
— Nil or less than one unit.

(1) No allowance is made for losses in milling, smelting and refining. Excludes material classified as "resources." (2) Includes metal in mines where production has been suspended temporarily. (3) One tonne (t) = 1.1023113 short tons = 32 150.746 troy oz. (4) Excludes metal in placer deposits because reserves data are generally unavailable. (5) SIC = Standard Industrial Classification. (6) May not balance due to rounding at the SIC level.

TABLE 3.6. CANADIAN RESERVES OF SELECTED MAJOR METALS AS AT DECEMBER 31 OF EACH YEAR, 1977-2008

Metal Contained in Proven and Probable Mineable Ore (1) in Operating Mines (2) and Deposits Committed to Production

Year	Copper	Nickel	Lead	Zinc	Molybdenum	Silver	Gold (3)
	(000 t)	(000 t)	(000 t)	(000 t)	(000 t)	(t)	(t)
1977	16 914	7 749	8 954	26 953	369	30 991	493
1978	16 184	7 843	8 930	26 721	464	30 995	505
1979	16 721	7 947	8 992	26 581	549	32 124	575
1980	16 714	8 348	9 637	27 742	551	33 804	826
1981	15 511	7 781	9 380	26 833	505	32 092	851
1982	16 889	7 546	9 139	26 216	469	31 204	833
1983	16 214	7 393	9 081	26 313	442	31 425	1 172
1984	15 530	7 191	9 180	26 000	361	30 757	1 208
1985	14 201	7 041	8 503	24 553	331	29 442	1 373
1986	12 918	6 780	7 599	22 936	312	25 914	1 507
1987	12 927	6 562	7 129	21 471	231	25 103	1 705
1988	12 485	6 286	6 811	20 710	208	26 122	1 801
1989	12 082	6 092	6 717	20 479	207	24 393	1 645
1990	11 261	5 776	5 643	17 847	198	20 102	1 542
1991	11 040	5 691	4 957	16 038	186	17 859	1 433
1992	10 755	5 605	4 328	14 584	163	15 974	1 345
1993	9 740	5 409	4 149	14 206	161	15 576	1 333
1994	9 533	5 334	3 861	14 514	148	19 146	1 513
1995	9 250	5 832	3 660	14 712	129	19 073	1 540
1996	9 667	5 623	3 450	13 660	144	18 911	1 724
1997	9 032	5 122	2 344	10 588	149	16 697	1 510
1998	8 402	5 683	1 845	10 159	121	15 738	1 415
1999	7 761	4 983	1 586	10 210	119	15 368	1 326
2000	7 419	4 782	1 315	8 876	97	13 919	1 142
2001	6 666	4 335	970	7 808	95	12 593	1 070
2002	6 774	4 920	872	6 871	82	11 230	1 023
2003	6 037	4 303	749	6 251	78	9 245	1 009
2004	5 546	3 846	667	5 299	80	6 568	787
2005	6 589	3 960	552	5 063	95	6 684	965
2006	6 923	3 940	737	6 055	101	6 873	1 032
2007	7 565	3 778	682	5 984	213	6 588	987
2008	7 456	3 605	636	5 005	222	5 665	947

Source: Natural Resources Canada, based on company reports and the federal-provincial/territorial survey of mines and concentrators.

(1) No allowance is made for losses in milling, smelting and refining. Excludes material classified as "resources."

(2) Includes metal in mines where production has been suspended temporarily. (3) Excludes metal in placer deposits because reserves data are generally unavailable.

Note: One tonne (t) = 1.1023113 short tons = 32 150.746 troy oz.

4. Regional Outlook

INTRODUCTION

In past editions of this report, the Regional Outlook section presented comments from provincial and territorial officials on recent exploration and deposit appraisal activities in their respective jurisdictions and highlighted important fiscal, regulatory, and geoscientific initiatives. With the amount of high-quality information, resources, and tools now available on regularly updated provincial/territorial web sites, the reader has access to a much broader and more comprehensive array of data and knowledge for each of Canada's mining jurisdictions. The Internet links provided below allow the reader to go directly to the source of information (please note that some links may be available in only one language).

PROVINCIAL/TERRITORIAL INFORMATION ON THE INTERNET

Newfoundland and Labrador

Mineral Exploration Overviews:
www.nr.gov.nl.ca/mines&en/exploration/mineral.stm

Exploration Highlights:
www.nr.gov.nl.ca/mines&en/statistics/exp_overview.stm

Geoscience Online:
<http://gis.geosurv.gov.nl.ca>

Nova Scotia

Mineral Resources Branch:
www.gov.ns.ca/natr/meb/default.asp

Mineral Exploration Activities:
www.gov.ns.ca/natr/meb/one/mea-home.asp

New Brunswick

Minerals and Petroleum Program:
www.gnb.ca/0078/minerals/index-e.aspx

Exploration Highlights:
www.gnb.ca/0078/minerals/Exploration_Highlights-e.aspx

Quebec

Ministère des Ressources naturelles et Faune:

www.mrnf.gouv.qc.ca/mines/index.jsp

Institut de la Statistique du Québec:

www.stat.gouv.qc.ca/publications/secteur_minier/mines_en_chiffres2009.pdf

Report on Mineral Exploration Activity:

www.mrnf.gouv.qc.ca/mines/publications/publications-rapports.jsp

Investment and Fiscal Support:

www.mrnf.gouv.qc.ca/mines/fiscalite/index.jsp

Mining Title Management:

<https://gestim.mines.gouv.qc.ca>

Ontario

Mines and Minerals:

www.mndm.gov.on.ca/mines/default_e.asp

Manitoba

Mineral Resources:

www.gov.mb.ca/stem/mrd/index.html

Exploration Activity Tracker:

www.gov.mb.ca/stem/mrd/geo/gis/activity/index.html

Saskatchewan

Mineral Resources:

www.ir.gov.sk.ca/mining

Alberta

Minerals:

www.energy.gov.ab.ca/News/minerals.asp

Alberta Geological Survey:

www.ags.gov.ab.ca

British Columbia

Ministry of Energy, Mines and Petroleum Resources:

www.gov.bc.ca/empr

Mineral Exploration and Mining:

www.empr.gov.bc.ca/Mining/Pages/default.aspx

Overview of Trends:

www.empr.gov.bc.ca/Mining/MineralStatistics/IndustryOverviews/Pages/BCProvTrends2009.aspx

Yukon

Minerals:

www.emr.gov.yk.ca/mining

Yukon Geological Survey:

www.geology.gov.yk.ca

Yukon Mining Recorder:

www.yukonminingrecorder.ca

Northwest Territories

Mining, Oil and Gas:

www.iti.gov.nt.ca/miningoilgas

Diamonds:

www.iti.gov.nt.ca/diamonds

Nunavut

Exploration Overview:

www.nunavutgeoscience.ca/eo/index_e.html

Department of Economic Development and Transportation:

www.edt.gov.nu.ca/apps/authoring/dspPage.aspx?page=home

Notes: (1) Information in this review was current as of December 2009. (2) Various Internet sites have been identified in this chapter. Please note that Natural Resources Canada has no control over the content of the web sites of other organizations, which may be modified, updated, or deleted at any time.

NOTE TO READERS

The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

5. Canadian Global Exploration Activity

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INTRODUCTION

This article provides an overview of Canadian mineral exploration activity¹ abroad. It also highlights the domestic and foreign components of the larger-company exploration market in Canada.

GLOBAL MARKET FOR MINERAL EXPLORATION

The value of exploration programs expected to be undertaken worldwide in 2009 for precious metals, base metals, and diamonds (**Table 5.1**) reached US\$7.3 billion, down by US\$5.3 billion, or almost 42%, from the US\$12.6 billion that companies had planned to spend in 2008.² The value of these programs includes the budgets of both the larger companies and the smaller companies. It also includes estimates for firms that do not disclose their exploration plans and for firms that were likely to spend less than US\$100 000 in 2009. Canada's share of global exploration declined to 16% in 2009 from 19% in 2008 (**Figure 5.1**). For the third year, the Metals Economics Group (MEG) has included uranium in its survey of companies' planned exploration budgets. However, uranium will not be included in this analysis in order to keep the numbers comparable to previous years.

The world's larger companies are defined here as those companies that planned to spend at least US\$3 million on mineral exploration in 2009, while the world's smaller companies are defined as those companies that planned to spend at least US\$100 000, but less than US\$3 million. This definition of larger and smaller companies should not be confused with the MEG definition where the division is based on revenue for the senior companies and equity financing for the juniors. In fact, in recent years, the larger-company category has included an increasing number of "junior" companies as the equity markets were providing juniors with significant financing.

The number of companies that reported mineral exploration budgets of at least US\$100 000 in 2009 decreased to 1844, down by 64 firms, or over 3%, from 1908 firms in the previous year. As a group, these 1844 companies planned to spend US\$7.3 billion in 130 countries, 8 more countries than in the years 2006 to 2008. Of these companies, a total of 991, or over 53%, were based in Canada.³ Exploration budgets, which had increased for six years in a row, were slashed in 2009.

Compared with the previous year, the budgets of companies that planned to spend at least US\$100 000 on mineral exploration in 2009 increased for about 27% of the countries in which they expected to operate. Aggregate year-over-year company budgets grew by US\$19 million for Saudi Arabia, by US\$12 million for Bolivia, by US\$9 million for Iran, by US\$8 million for Ivory Coast, by US\$7 million for Senegal, by US\$6 million for Poland, and by US\$5 million for Yemen. Exploration

increases in Saudi Arabia, Bolivia, and Iran are due almost entirely to spending by either locally headquartered companies or national government organizations. Ivory Coast and Senegal are being targeted for gold exploration, largely by one or two companies. Although amounts are significant for the individual countries in which those increases were recorded, the amounts in question were considerably less in absolute terms than those that were posted for traditional mining countries where spending was expected to decrease.

With respect to the 96 countries where exploration budgets were expected to decrease from 2008 to 2009, the largest decrease was in Canada (down US\$1229 million) and the second largest decrease was in Australia (down US\$795 million). Budgets decreased by US\$434 million in the United States, by US\$406 million in Mexico, by US\$193 million in Peru, by US\$186 million in Russia, by US\$162 million in each of Brazil and Chile, and by US\$158 million in South Africa. According to MEG,¹ the economic crisis has resulted in lower budget allocations for almost every country regardless of risk profile.

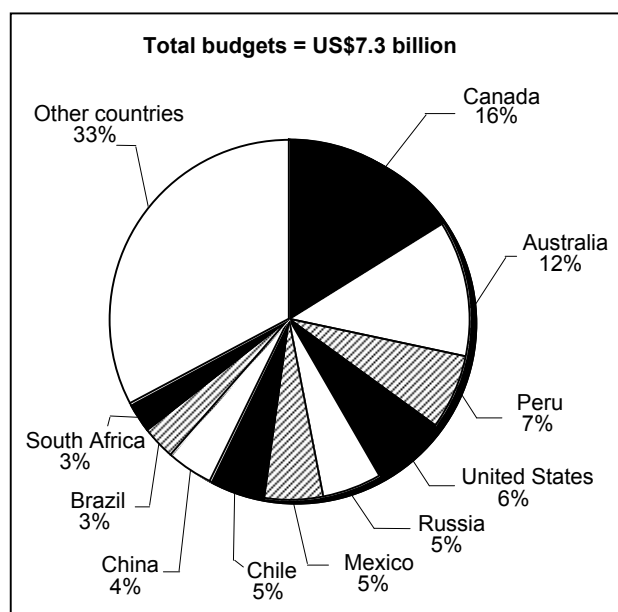
In 2009, total lost budgets were an astonishing US\$5405 million, a clear indication of the damage caused by the economic downturn to the global exploration sector. Junior companies that had record spending in previous years and that held an increasing share of global exploration spending have been especially hard hit by the economic crisis that resulted in equity markets becoming increasingly risk averse and therefore less welcoming to junior issuers. MEG¹ reports a 6% reduction in the number of junior companies in the 2009 survey. These junior companies saw their budgets grow by an average of 60% from 2002 to 2008 and, in 2009, they experienced a 55% decrease. Canada and Australia have a significant portion of their domestic exploration carried out by juniors, so this decline in company numbers and spending has had a huge impact on these two countries.

WORLD'S LARGER COMPANIES

Global trends in mineral exploration are generally based on data for the world's larger companies (companies planning on spending more than US\$3 million). The focus of this chapter is on this group of companies.

During 2009, the world's larger companies were expected to undertake exploration programs with a combined value of US\$6.123 billion in 107 countries, one less country than in 2008. As a result of the global economic crisis, the aggregate budgets of the world's larger companies decreased by almost 46%, down from US\$11.292 billion in the previous year.

Figure 5.1
Distribution of Global Exploration Budgets, by Location, 2009



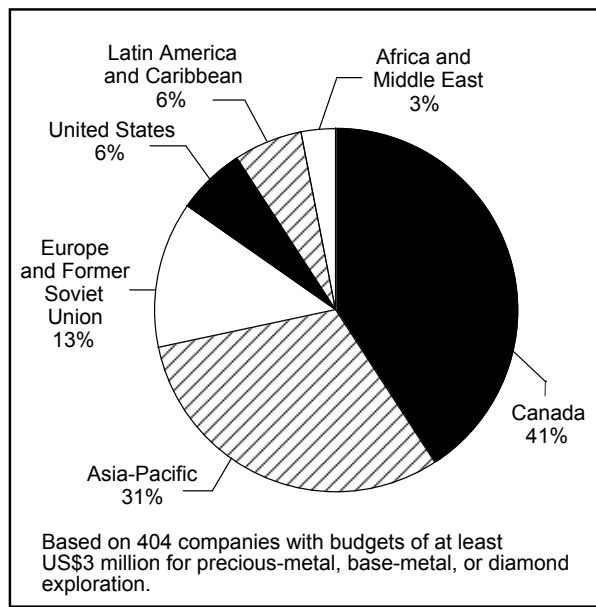
Source: Natural Resources Canada, based on *Corporate Exploration Strategies: Worldwide Analysis*, Metals Economics Group, Halifax Nova Scotia.
Note: Data include base metals, precious metals, diamonds, and some industrial minerals, but not uranium. This figure is based on a sample of 1844 international companies with exploration budgets of at least US\$100 000.

In 2009, the number of companies based around the world that intended to spend at least US\$3 million on mineral exploration plunged to 404 (**Figure 5.2**), a steep decrease after four years of record high numbers. In 2008, 788 companies had planned to spend an equivalent amount.

In 2009, the world's 404 larger companies represented 22% of the 1844 companies that reported exploration budgets of at least US\$100 000. They accounted for about 84% of the value of planned programs (**Table 5.1**). On a commodity basis, the larger companies accounted for 86% of the value of worldwide programs aimed at diamonds, for 87% of those aimed at base metals, for 90% of those aimed at platinum group metals (PGM), and for 83% of those aimed at gold.

On a regional basis, the world's larger companies accounted for 95% of the value of the exploration programs planned for Europe and the former Soviet Union (FSU), for 95% of those planned for Africa and the Middle East, for 98% of those planned for Latin America and the Caribbean, for 89% of those planned for the United States, for 91% of those planned for other Asia-Pacific countries, for 77% of those planned for Australia, and for 74% of those planned for Canada.

Figure 5.2
Distribution of the World's Larger Exploration Companies, by Domicile, 2009



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.

WORLD'S SMALLER COMPANIES

During 2009, the world's smaller companies (companies planning to spend between US\$100 000 and US\$3 million) were expected to undertake exploration programs around the world with a combined value of US\$1.193 billion. About 55% of the budgets of these companies were expected to be spent in Canada. In 2009, 1440 companies were classified as smaller companies, up from 1120 in 2008. Over 57% of these smaller companies were based in Canada.

The smaller companies are significant contributors to mineral exploration and development in many regions of the world. In numerous countries, the smaller companies are the only ones that undertake commercial mineral exploration. In 2009, there were 22 countries where the only firms planning to be active in mineral exploration were smaller companies. This is a significant increase from the previous year when only 8 countries were visited by only small companies.

The smaller companies are a significant component of the exploration activity occurring in Australia and Canada. In 2009, the smaller Canadian-based companies accounted for 26% of the budgets of the smaller and larger Canadian-based companies combined; in Australia, the comparable figure was 23%.

The smaller Canadian companies planned to spend US\$312 million in Canada, or almost 48% of their worldwide budgets of US\$654 million; in Australia, the comparable figures were US\$240 million, or almost 72% of their worldwide budgets of US\$334 million.

Although the world's smaller companies accounted for just over 16% (**Table 5.1**) of the value of all exploration programs expected to be undertaken worldwide during 2009, their activities will not be analyzed further in this chapter.

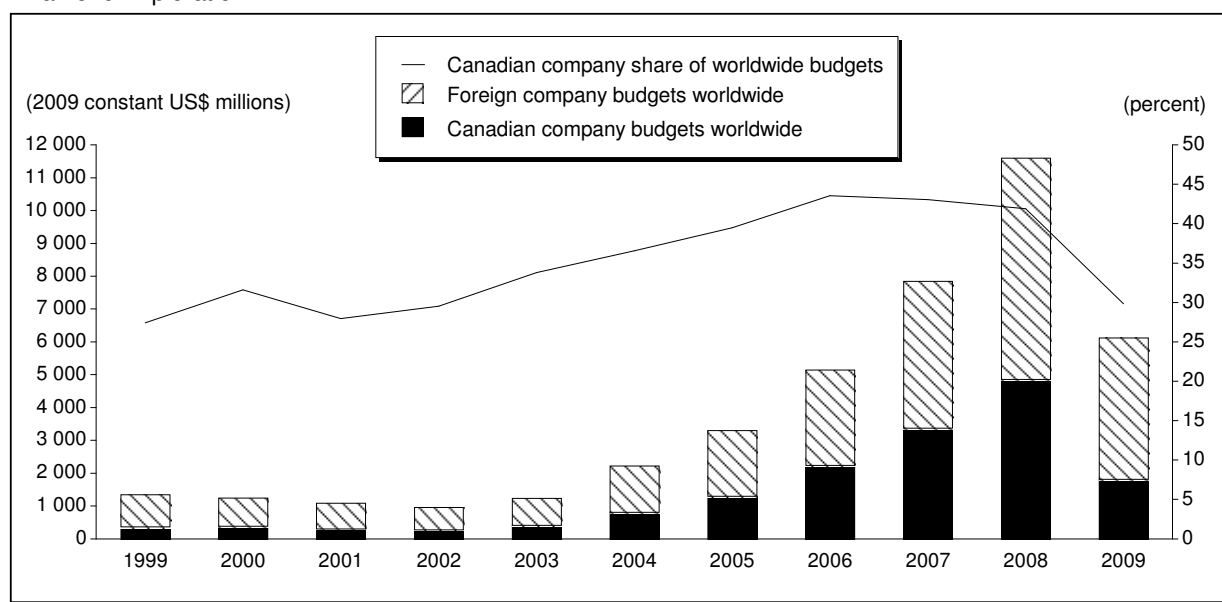
LARGER CANADIAN-BASED COMPANIES

There are more mining companies based in Canada than anywhere else. In 2009, 165 of the world's 404 larger companies (companies planning to spend more than US\$3 million) were based in this country (**Figure 5.2**). In the previous year, 431 of the 788 larger companies were based in Canada. In 2009, the value of the exploration programs that the larger Canadian-based companies planned to undertake in Canada and elsewhere around the world decreased significantly to US\$1.8 billion (**Figure 5.3**), down by US\$2.9 billion, or 61%, from the US\$4.7 billion they had budgeted in 2008.

The larger Canadian-based companies allocated 68% of their budgets to explore for gold, 22% to explore for base metals, 2% to explore for diamonds, and less than 1% to explore for PGM. The proportion of their budgets allocated to gold was larger than in 2008, while the proportions allocated to diamonds, PGM, and base metals decreased. In comparison, the average world proportions allocated to gold, base metals, diamonds, and PGM in 2009 stood at 48%, 36%, 5%, and 2%, respectively.

The value of the programs that the larger Canadian-based companies planned to undertake during 2009 was 30% of the value of all larger-company exploration programs for the entire world, a decrease from 42% in 2008. However, adding the value of the programs of the smaller Canadian-based companies to those of the larger ones raises the proportion of the value of exploration programs planned by Canadian-based companies here and abroad to 34% of all the activity expected worldwide. The budgets of the larger Canadian-based companies dropped by 9% for Canada from

Figure 5.3
Exploration Budgets of the World's Larger Companies, by Domicile, 1999-2009
Companies With Worldwide Budgets of at Least US\$3 Million in 2009 for Precious-Metal, Base-Metal, or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.

Notes: The worldwide exploration budgets of companies that intended to spend less than US\$3 million in 2009 and an equivalent amount in previous years are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

2008 to 2009, compared with a 6% increase in the Asia-Pacific region. From 2006 to 2008, Canada, Mongolia, South Africa, the United States, Brazil, and Mexico all made budgetary gains, but gave those up in 2009 to almost break even or suffer small losses in aggregate budgets. Peru and Chile suffered the least by recording budget gains from 2006 to 2009 despite the economic crisis and declining budgets.

Canadian companies account for the dominant share, by far, of the value of all mineral exploration programs planned worldwide by the larger companies. In contrast, in 2009, the larger companies based in Africa accounted for 8%, those based in Europe-FSU accounted for 20%, those based in Australia accounted for 18%, those based in the United States accounted for over 6%, and Latin America-based companies accounted for almost 11%.

The larger Canadian-based companies typically budget less individually for exploration programs than the industry average worldwide. In 2009, the aggregate exploration budgets of the larger Canadian-based companies had a mean of US\$11 million and a median of US\$6 million. This compared with global averages of US\$15 million and almost US\$7 million, respectively. The largest Canadian mineral exploration budget in 2009 was that of Barrick Gold Corp. (US\$155 million) where 45% of the corporate exploration budget was targeted for the United States, 46% for Latin America, and less than 1% for Canada. The world's largest budget was US\$410.5 million by BHP Billiton plc; 32% of this company's exploration budget was targeted for the Asia-Pacific region (mostly Australia) and 24% was targeted for Canada (mostly for potash exploration in Saskatchewan). The second largest mineral exploration budget by a Canadian-based company in 2009 was US\$101 million by Goldcorp Inc. with 54% of the corporate exploration budget destined for Canada and 40% planned for Mexico.

Recognizing that companies of different sizes based in different regions of the world can have significant variations between exploration budgets and exploration expenditures, the use of aggregate budgets will generally provide a more reliable estimate of the total amount that is likely to be spent in the field.

For 2008, 1719 companies based around the world provided data for both their exploration expenditures and their exploration budgets. Of these 1719 companies, 783 were classified as larger companies and 936 as smaller companies. In total, these 1719 companies had planned to spend US\$12.593 billion on exploration during 2008. However, by the end of the year, they had actually spent US\$12.375 billion, a decrease of \$219 million, or 2%. The 783 larger companies spent US\$233 million less than they had initially planned, or a decrease of about 2%. The 936 smaller companies spent US\$15 million more than they had initially planned, an increase of more than 1%. In comparison, 416 larger Canadian-based companies underspent their aggregate budgets of US\$4.680 billion by US\$295 million, or roughly 6%, while 647 smaller Canadian-based companies underspent their aggregate budgets of US\$623 million by US\$236 million, or by more than 37%. This highlights once again the financing difficulties for smaller companies brought about by the economic downturn. In 2008, the departure of expenditures from the budgets of individual companies ranged between US\$37 million under budget and US\$80 million over budget for the larger companies and between US\$27 million under budget and just over US\$2 million over budget for the smaller ones. In comparison, in 2007, the larger Canadian-based companies underspent their exploration budgets by 4%.⁴

In late 2009, companies of all sizes listed on Canadian stock exchanges held interests in a portfolio of more than 7784 mineral properties located in Canada, or in just under 100 other countries around the world.⁵ Most of this portfolio consists of properties at the early stages of exploration. The number of properties in which these companies held interests worldwide in 2009 decreased by more than 560, or by about 7%, compared with the number that they held at the end of the previous year. The portfolio of mineral property interests decreased by 12% for properties abroad and by over 10% for domestic properties. In reaction to the economic crisis, companies decreased the number of properties they were actively exploring in order to conserve cash.

LARGER-COMPANY EXPLORATION MARKET IN CANADA

In 2009, the larger-company mineral exploration market in Canada was valued at US\$849 million (**Figure 5.4**), down by over US\$1159 million, or 58%, from roughly US\$2008 million in 2008. However, when the exploration programs of the smaller companies are included, Canada remained, for the eighth year in a row, the individual country (as opposed to entire regions) where the global mineral exploration industry expected to be the most active in 2009. Australia held that position from 1992 through 2001.

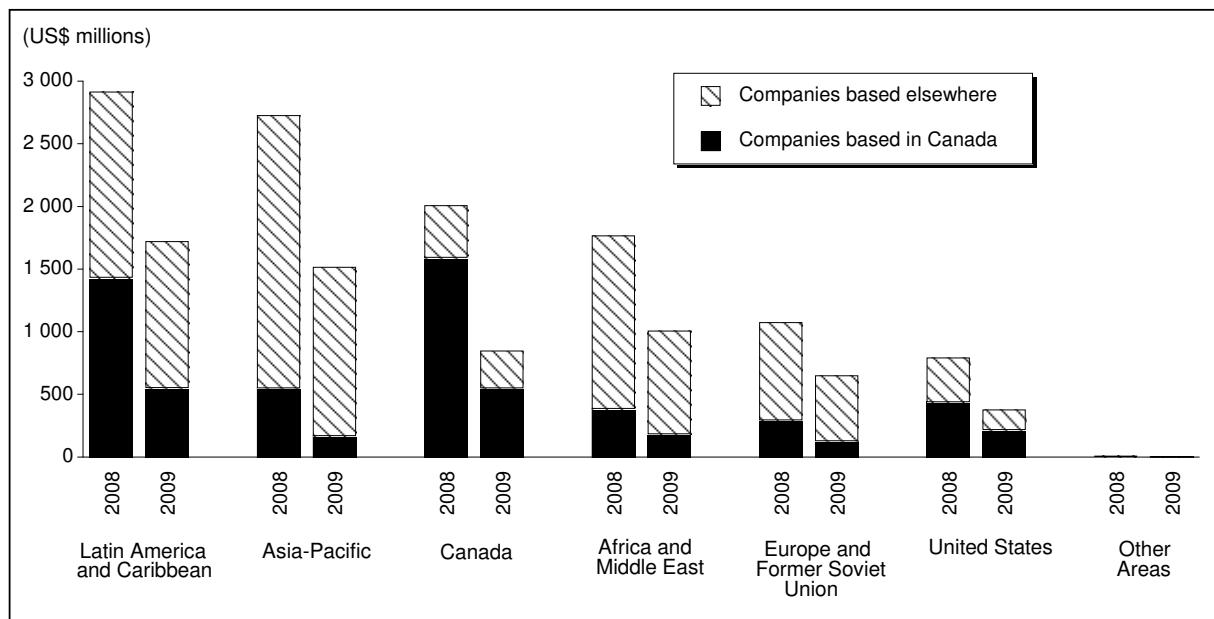
In 2009, 105 of the world's larger domestic-based or foreign-based companies planned to explore for minerals in Canada, down from 249 such companies in 2008. During 2009, almost 14% of the exploration efforts of the world's larger companies were expected to take place in Canada, compared with 18% in 2008 (**Figure 5.5**). However, when the exploration programs of the smaller companies are included with those of the larger ones, the proportion of the world's total exploration activity planned for Canada in 2009 is 16%, still a significant decrease from the 19% level reached in each of 2006 and 2007 (if spending on uranium is included, the Canadian share remains at 16%).

Larger Canadian-Based Companies in Canada

In 2009, 76 of the larger Canadian-based companies allocated, in total, almost US\$554 million for mineral exploration in Canada (**Figure 5.4**). Their budgets were down by about US\$1044 million, or 65%, from the US\$1.6 billion that 219 larger Canadian-based companies allocated in 2008. In 2009, Canadian companies planned to spend more on mineral exploration in a foreign region (Latin America) than they planned to spend in Canada. Also in 2009, the share of the larger-company mineral exploration market in Canada controlled by large Canadian-based companies was 65%, a decrease from the high of 87% in 2006.

Figure 5.4
Exploration Budgets of the World's Larger Companies for Selected Regions of the World, 2008 and 2009

Companies With Worldwide Budgets of at Least US\$3 Million for Precious-Metal, Base-Metal, or Diamond Exploration

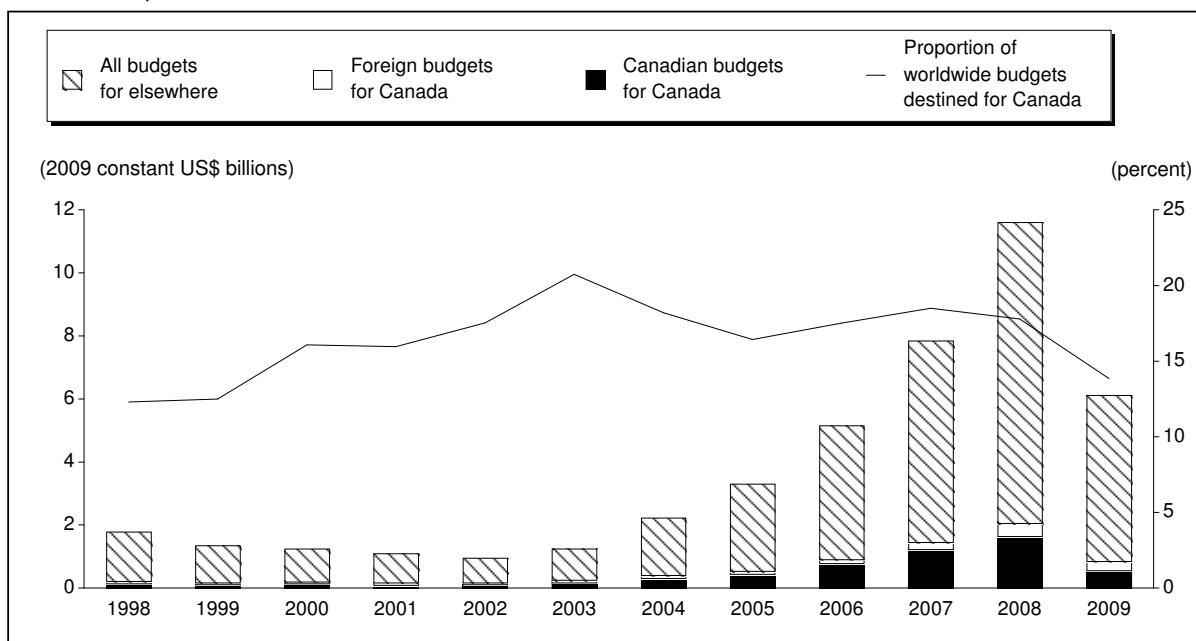


Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.

Notes: The worldwide exploration budgets of companies that intended to spend less than US\$3 million in 2009 are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

Figure 5.5**Exploration Budgets of the World's Larger Companies for Canada and Elsewhere, 1998-2009**

Companies With Worldwide Budgets of at Least US\$3 Million in 2009 for Precious-Metal, Base-Metal, or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.

Notes: The worldwide exploration budgets of companies that intended to spend less than US\$3 million in 2009 and an equivalent amount in previous years are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

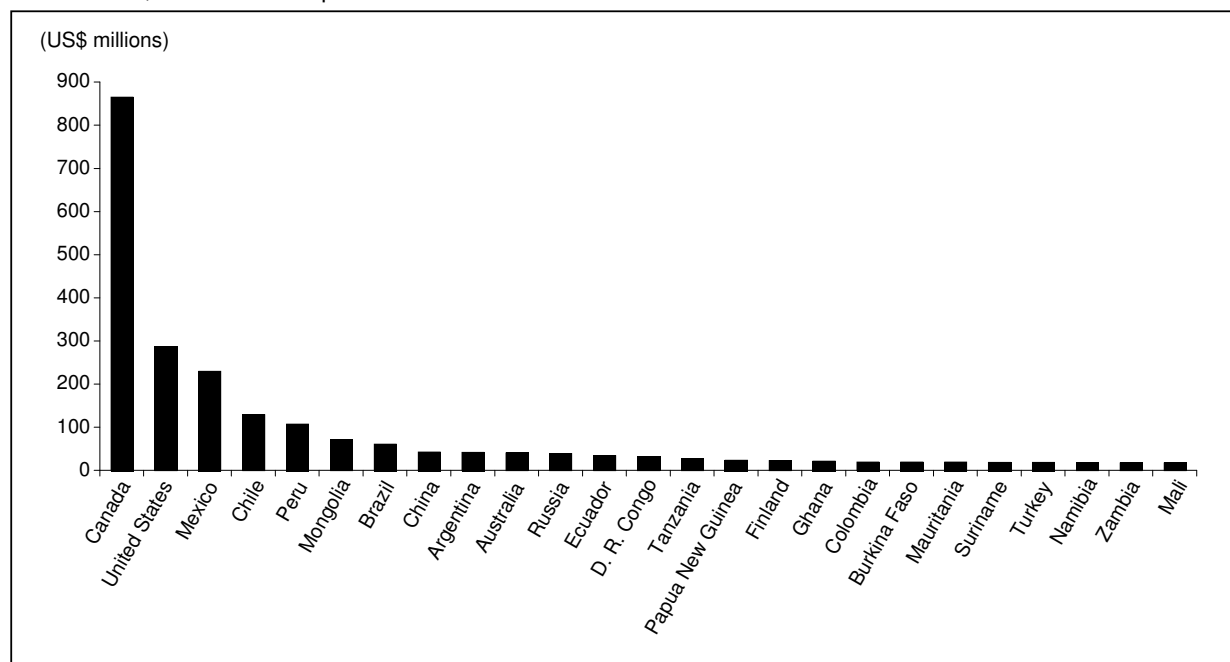
In 2009, the larger Canadian-based companies allocated 30% of their global exploration budgets to programs in Canada, about 4% less than in the previous year. In comparison, in 2009, the larger Australian-based companies allocated almost 40% of their global budgets to domestic exploration while U.S. companies allocated 24%. MEG¹ notes that acquisitions of large Canadian-based companies such as Vale's takeover of Inco and Xstrata's takeover of Falconbridge have moved "Canadian" exploration budgets to overseas locations. So far, any negative effects of this regional re-allocation of exploration spending have been masked by strong junior company spending but, in economically trying times, it may result in decreasing Canadian influence in the exploration market.

Although larger Canadian companies operate all over the world, Canada remains the country where they conduct the largest proportion, by far, of their global mineral exploration programs (Figure 5.6).

Foreign-Based Companies in Canada

During 2009, 29 of the larger foreign-based companies planned to spend, in total, US\$295 million on mineral exploration in Canada (Figure 5.4), compared with US\$411 million in 2008. In 2009, foreign-based companies were expected to undertake over 34% of all larger-company exploration programs planned for this country. Almost 36% of foreign exploration budgets for Canada were aimed at base metals, 15% at gold, 10% at diamonds, and 5% at PGM. The "other" category jumped to 35% of spending targeted for Canada. The companies spending in this category included BHP Billiton plc, Vale S.A., JOCMEG, and Zhongchuan International, with a significant portion of that total directed at potash exploration.

Figure 5.6
Exploration Budgets of the Larger Canadian-Based Companies, 2009 –
Countries Accounting for 90% of Canadian Budgets
 Companies With Worldwide Budgets of at Least US\$3 Million for Precious-Metal,
 Base-Metal, or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.

Notes: The worldwide exploration budgets of companies that intended to spend less than US\$3 million in 2009 are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

The larger foreign-based companies active in mineral exploration in Canada in 2009 included BHP Billiton plc based in the United Kingdom and Australia; Vale S.A. based in Brazil; Newmont Mining Corp. based in the United States; Xstrata plc based in Switzerland; the De Beers Group based in Luxembourg; Jilin Ji'en Nickel Industry Co. Ltd. and Shaanxi Non-Ferrous Metals Group, both based in China; Lonmin Plc, the Rio Tinto group, Anglo Gold Ashanti, and Anglo American plc., all based in the United Kingdom; and Magma Metals Limited based in Australia.

In 2009, BHP Billiton planned to spend roughly US\$100 million on mineral exploration in Canada. Its budget was the largest reported for this country for the year. Of that budget, 94% (US\$94 million) was directed at potash exploration and 6%, or US\$6 million, was directed at diamond exploration.

LARGER CANADIAN-BASED COMPANIES ABROAD

In 2009, the larger Canadian-based companies planned to spend almost US\$1.3 billion on mineral exploration outside of Canada (**Figure 5.4**). Their foreign budgets were down by almost US\$1.9 billion, or over 59%, from the US\$3.1 billion that they planned to spend in 2008.

Two thirds of the worldwide budgets of the larger Canadian-based companies were allocated to programs abroad in 2009, about the same proportion as in each of the previous seven years.

Over 67% of the 165 larger Canadian-based companies planned to work abroad during 2009. Of these 165 companies, 90 (55%) planned to work only abroad while 21 (13%) planned to work in

both Canada and abroad. Only 54 (33%) of the 165 larger Canadian-based companies planned to work only in this country.

Although mining is a global enterprise, undertaking exploration programs in several countries simultaneously is relatively uncommon. In 2009, only 9 (5%) of the 165 larger Canadian-based companies budgeted for programs in five or more countries, 46 (28%) budgeted for programs in two or more countries but in less than five, and 110 (67%) budgeted for programs in only one country.

At the end of 2009, companies of all sizes listed on Canadian stock exchanges held interests in a portfolio of 3662 mineral properties located abroad, down by 513 properties when compared to the number held at the end of the previous year.

United States

In 2009, the larger-company mineral exploration market in the United States was valued at almost US\$377 million (**Figure 5.4**), or roughly 6% of the US\$6.1 billion larger-company market worldwide. Larger-company budgets for the United States were down by US\$416 million, or 53%, compared with those of the previous year. Thirty-seven of the larger Canadian-based companies planned to spend, in total, US\$221 million in the United States, compared to US\$222 million in 2008.

The share of the larger-company mineral exploration market held by Canadian-based companies in the United States in 2009 stood at almost 59%, up slightly from 56% the previous year. The United States regained second place after Canada in terms of countries where Canadian companies are the most active in mineral exploration, after being in third place (after Mexico) in 2008 (**Figure 5.6**).

During 2009, Canadian companies planned to spend twice as much as U.S. firms on mineral exploration in the United States. U.S. companies accounted for almost 26% of the value of exploration programs in their country in 2009.

The United States is likely to remain, for the foreseeable future, one of the top foreign countries where the larger Canadian-based companies hold their largest portfolio of mineral properties.

Latin America and the Caribbean

In 2009, the larger-company mineral exploration market in Latin America and the Caribbean was valued at US\$1.7 billion (**Figure 5.4**), or 28% of the US\$6.1 billion larger-company market worldwide. The larger-company mineral exploration market in the region shrank by US\$1194 million, or 41%. The larger Canadian-based companies planned to spend US\$556 million there, down by more than US\$880 million, or by over 61%, from US\$1437 million in 2008.

Latin America and the Caribbean is the region of the world where Canadian companies are currently the most active in mineral exploration (**Figure 5.4**). Almost 50% of the larger Canadian-based company budgets for Latin America and the Caribbean were targeted at Mexico and Chile.

In 2009, Canadian companies held 32% of the larger-company mineral exploration market in Latin America and the Caribbean, down from 49% the previous year. The Canadian share is the largest, by far, of all international competitors in the region and is roughly US\$59 million more than the amount domestic companies planned to spend there. The share of the exploration market held by local companies in the region increased to 29% in 2009.

Mexico

In 2009, the larger-company mineral exploration market in Mexico was valued at US\$304 million, or roughly 5% of the US\$6.1 billion larger-company market worldwide. Larger-company budgets for Mexico decreased by US\$413 million, or 58%, compared with those of the previous year.

In 2009, Mexico ranked first in Latin America, and third in the world, in terms of countries where Canadian companies were the most active in mineral exploration (**Figure 5.6**). Twenty-eight of the larger Canadian-based companies planned exploration programs for Mexico during 2009. These companies planned to spend, in total, over US\$159 million, which represents 52% of the larger-company market in that country.

South America

In 2009, the larger-company mineral exploration market in South America was valued at almost US\$1.4 billion, or more than 22% of the US\$6.1 billion larger-company market worldwide. From 2008 to 2009, the larger-company mineral exploration market in the region declined by US\$735 million, or by 35%. Thirty-eight of the larger Canadian-based companies planned to spend, in total, US\$370 million in South America, almost US\$497 million less than during the previous year. Their programs accounted for 27% of all larger-company mineral exploration activity planned there, the same share as the South America-based companies. Countries where Canadian companies are the most active in mineral exploration include Chile, Peru, Brazil, Argentina, and Ecuador (**Figure 5.6**).

Central America

In 2009, the larger-company mineral exploration market in Central America was valued at almost US\$23 million, or less than 1% of the \$6.1 billion larger-company market worldwide. From 2008 to 2009, the larger-company mineral exploration market decreased by almost US\$20 million, or about 47%. The larger Canadian-based companies planned to spend almost US\$13 million in the region.

Central America is one of the regions of the world where the smaller companies, and those based in Canada in particular, account for a substantial proportion of the mineral exploration activity that is usually undertaken in the region. In 2009, the smaller Canadian-based companies were expected to account for 90% of the \$5.2 million smaller-company exploration market in that region.

Europe and the Former Soviet Union

In 2009, the larger-company mineral exploration market in Europe and the Former Soviet Union (FSU) was valued at US\$650 million (**Figure 5.4**), or almost 11% of the \$6.1 billion larger-company market worldwide. From 2008 to 2009, the market in the region decreased by US\$424 million, or by 40%. The larger Canadian-based companies planned to spend US\$132 million in the region, about US\$167 million less than they had planned to spend there in 2008.

Western Europe

In 2009, the larger-company mineral exploration market in western Europe was valued at US\$118 million, or roughly 2% of the \$6.1 billion larger-company market worldwide. From 2008 to 2009, the larger-company mineral exploration market in the region shrank by US\$99 million, or almost 46%. The larger Canadian-based companies planned to spend about US\$48 million in the region, almost 59% less than the amount they had planned to spend during the previous year.

Eastern Europe

In 2009, the larger-company mineral exploration market in eastern Europe was valued at US\$56 million, or 1% of the \$6.1 billion larger-company market worldwide. From 2008 to 2009, the market in the region declined by US\$73 million. The larger Canadian-based companies planned to spend approximately US\$32 million there, about 62% less than the amount they had planned to spend the previous year.

Former Soviet Union

In 2009, the larger-company mineral exploration market in the FSU was valued at US\$477 million,⁶ or roughly 8% of the \$6.1 billion larger-company market worldwide. The market in the FSU decreased by US\$253 million. The larger Canadian-based companies planned to spend US\$52 million in the FSU, down from US\$99 million in 2008.

Africa and the Middle East

In 2009, the larger-company mineral exploration market in Africa and the Middle East was valued at US\$1.0 billion (**Figure 5.4**), or more than 16% of the \$6.1 billion larger-company market worldwide. From 2008 to 2009, exploration budgets for the region decreased by US\$760 million, or by 43%. Africa accounts for almost all of the mineral exploration market in Africa and the Middle East.

Africa

In 2009, the larger-company mineral exploration market in Africa was valued at US\$940 million, or more than 15% of the US\$6.1 billion larger-company market worldwide. From 2008 to 2009, the larger-company market there decreased by US\$804 million, or by 46%. The larger Canadian-based companies planned to spend US\$188 million in Africa, equivalent to almost 20% of the larger company market on that continent. From 2008 to 2009, the larger Canadian-based companies budgeted 52% less for Africa.

Middle East

In 2009, the larger-company mineral exploration market in the Middle East was valued at US\$67 million. None of the larger Canadian-based companies planned to explore in that region of the world during 2009.

Asia-Pacific

In 2009, the larger-company mineral exploration market in Asia-Pacific was valued at US\$1.5 billion (**Figure 5.4**), or more than 24% of the US\$6.1 billion larger-company market worldwide. From 2008 to 2009, the larger-company market in the region declined by US\$1.2 billion. The larger Canadian-based companies planned to spend US\$173 million in Asia-Pacific, equivalent to 11% of the market there. In 2008, the larger Canadian-based companies had planned to spend US\$554 million in the region.

Southeast Asia

In 2009, the larger-company mineral exploration market in Southeast Asia was valued at almost US\$227 million, or roughly 4% of the US\$6.1 billion larger-company market worldwide. From 2008 to 2009, the market in the region shrank by US\$123 million.

The larger Canadian-based companies planned to spend about US\$24 million in the region. All budgets were destined for Papua New Guinea.

East Asia

In 2009, the larger-company mineral exploration market in East Asia, which includes China, Mongolia, and South Korea, was valued at US\$359 million,⁷ or almost 6% of the US\$6.1 billion larger-company market worldwide. From 2008 to 2009, the market in East Asia declined by US\$211 million. The larger Canadian-based companies planned to spend almost US\$100 million in the region, equivalent to more than 27% of the market there. They planned to spend almost 70% less than the previous year.

South Pacific

In 2009, the larger-company mineral exploration market in the South Pacific was valued at US\$843 million, or almost 14% of the US\$6.1 billion larger-company market worldwide. From 2008 to 2009, the market in the South Pacific decreased by US\$853 million. The larger Canadian-based companies planned to spend US\$43 million in the region, about 70% less than in 2008. The majority of their budgets for the region were destined for Australia. Australia ranks tenth in the world in terms of countries where the larger Canadian-based companies are the most active in mineral exploration (**Figure 5.6**).

South Asia

In 2009, the larger-company mineral exploration market in South Asia, which includes India and Pakistan, was valued at US\$64 million, or just over 1% of the US\$6.1 billion larger-company market worldwide. In 2009, the size of the market in the region declined by almost US\$43 million compared to the previous year. The larger Canadian-based companies planned to spend 17% less in the region than in 2008.⁶

SUMMARY AND OUTLOOK

The year 2009 started in the midst of a sharp economic downturn that found mining and exploration companies slashing costs, delaying projects, and closing mines in order to survive and conserve financial resources. Total budgeted spending worldwide for base metals, precious metals, diamonds, and PGM was US\$7.3 billion. Gold projects fared the best as the price of gold was an exception to declining metal prices.

Globally, exploration declined by 42% from 2008 values, with the largest decrease recorded in Canada (US\$1.2 billion) followed by declines in Australia (US\$795 million), the United States (US\$434 million), and Mexico (US\$406 million). According to MEG,¹ the economic crisis resulted in lower budget allocations for almost every country regardless of risk profile.

The larger Canadian-based companies planned to spend a total of US\$1.8 billion, a decrease of 61% from 2008 amounts. Smaller Canadian-based companies planned to spend US\$654 million for a Canadian total of US\$2.5 billion (34% of the US\$7.3 billion world total). Despite the significant decrease in market share and exploration budgeting, Canada spent more than any other country or region surveyed.

However, in 2009, Canadian-based companies planned to spend more on mineral exploration in a foreign region (Latin America) than they planned to spend in Canada. Because of the significant number of domestically headquartered junior exploration companies, Canada felt the impact of a significant decrease in the budgets of junior companies.

The US\$1.8 billion planned by the larger Canadian-based companies represented 30% of the total US\$6.1 billion budgeted by all larger companies in the world. Thus, the larger Canadian-based companies continued to hold a dominant share of mineral exploration programs worldwide.

These Canadian-based larger companies planned to spend 35% (US\$866 million) of their budgets in Canada, 12% (US\$288 million) in the United States, and 9% (US\$230 million) in Mexico.

In reaction to the economic crisis, companies decreased the number of properties they were actively exploring in order to preserve their assets and conserve cash. In total, there were 1387 large and small companies listed on Canadian stock exchanges in Canada in late 2009.⁵ At the end of 2009, Canadian companies, both large and small, held interests in more than 7784 mineral properties worldwide.

Altogether, Canadian companies are well positioned to take advantage of improving economic conditions and to advance some of these properties further along the mineral development curve.

ENDNOTES

¹ Most of the statistical data on the larger-company mineral exploration market are based on *Corporate Exploration Strategies: A Worldwide Analysis*, published annually by the Metals Economics Group (MEG) of Halifax, Nova Scotia. MEG defines exploration as work from the earliest stage through perimeter drilling, reconnaissance, and evaluative forays, as well as work to further quantify and define an identified orebody once the target outline stage has been completed. It includes all feasibility work up to the point of a production decision.

² All currencies in this review are expressed in current U.S. dollars, except for the use of constant dollars in some of the figures. Dollar amounts and percentages have been rounded to the nearest significant digit.

³ Companies are defined as being Canadian-based if they are categorized by MEG as headquartered in Canada in the report entitled *Corporate Exploration Strategies: A Worldwide Analysis*.

⁴ See "Canada's Global Exploration Activity" in the 2008 edition of *Overview and Trends in Canadian Mineral Exploration*, Natural Resources Canada, Ottawa (www.nrcan-rncan.gc.ca/mms-smm/busi-indu/pdf/explor/2008/explor-2008-eng.pdf).

⁵ For 1998 through 2009, the data are derived from InfoMine db. These databases are products of Robertson Info-Data Inc. of Vancouver, British Columbia, Canada.

⁶ The size of the mineral exploration market in certain regions of the world is underestimated because there are few data available on the extent of exploration programs undertaken by some private enterprises and state agencies.

⁷ Note: Asia-Pacific categories do not add up as unspecified regional spending was not categorized.

Note: Information in this chapter was current as of December 2009.

NOTE TO READERS

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TABLE 5.1 WORLDWIDE EXPLORATION BUDGETS FOR PRECIOUS METALS, BASE METALS, AND DIAMONDS, BY TYPE OF COMPANY AND BY DOMICILE OF COMPANY, 2009

	Canada	Australia	Africa- Middle East	Europe- FSU	United States	Latin America	Other Asia-Pacific	Total	Proportion of Subtotal
	(\$ millions)								(%)
Larger companies	1 825.8	1 113.6	462.6	1 221.7	395.3	655.3	449.0	6 123.3	83.7
Smaller companies	653.9	334.0	23.6	70.5	48.7	15.9	46.4	1 193.0	16.3
Total	2 479.7	1 447.6	486.2	1 292.2	444.0	671.2	495.4	7 316.3	100.0

Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.

Notes: "Larger companies" are defined here as those with budgets for mineral exploration in 2009 of US\$3 million or more. Numbers may not add to totals due to rounding.

6. Historical Exploration and Deposit Appraisal Statistics

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INTRODUCTION

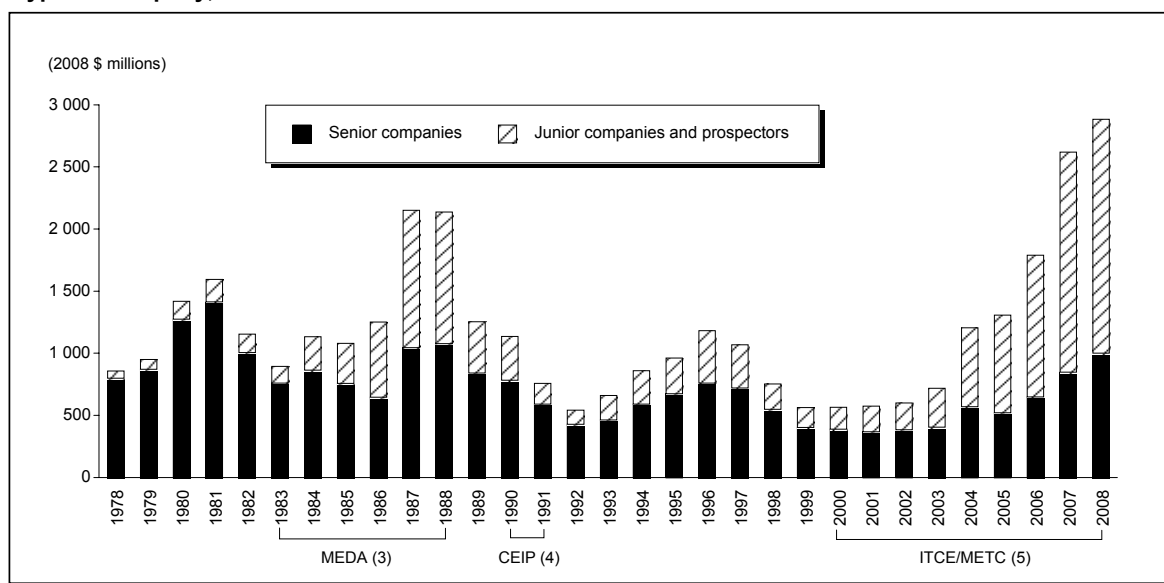
This chapter contains data and analyses that are based on pre-1997 survey definitions when only field and overhead costs were considered. While more restricted by this measure of exploration and deposit appraisal activity, the data are available over a much longer time period. The resulting time series provides useful statistics for studying historical trends in Canadian mineral exploration spending. Dollar amounts quoted in this chapter have been adjusted for inflation (constant 2008 dollars) unless otherwise specified.

HISTORICAL SUMMARY

Figure 6.1 depicts Canadian exploration and deposit appraisal expenditures (field and overhead costs only) in constant 2008 dollars over the period 1978-2008. Above-normal expenditures in the 1980-82 period resulted from high prices for gold, silver, and copper over much of that period. Spending declined somewhat in 1983, but generally rose from 1984 to 1988 as a result of the introduction by the federal government, in 1983, of the Mining Exploration Depletion Allowance (MEDA). MEDA was replaced in 1989 and 1990 by the Canadian Exploration Incentive Program (CEIP). By 1987 and 1988, expenditures had reached unprecedented high levels because of MEDA and the high gold prices that had prevailed until the end of 1987. However, spending fell dramatically after 1988 and decreased until 1992 when it reached its lowest inflation-adjusted level since 1966.

Activity picked up gradually in the 1993-96 period. Expenditures increased by 118% from 1992 to 1996, and the 1996 level of \$1183 million was the highest since 1989. Although exploration and deposit appraisal spending declined to \$1070 million in 1997, it still remained relatively strong by historical standards. However, spending dropped significantly in 1998 to \$756 million, a 29% decline from 1997. After another 25% decline, the 1999 total of \$565 million represented the second-lowest total in almost 40 years. The recovery began almost imperceptibly in 2000 when field and overhead spending increased by \$2 million, and gathered a little momentum in 2001 when spending reached \$576 million. Data on field and overhead spending for the period 2002-07 show an acceleration of the upward trend as field and overhead spending, buoyed by strong metal prices and a number of government-provided incentives like the federal 15% Mineral Exploration Tax Credit (METC), eventually reached successive record levels of \$1791 million in 2006 and \$2621 million in 2007. Another record high (\$2887 million) was reported in 2008, but there was a definite deceleration of the upward trend as this represented only a 10% increase over 2007, compared to the 46% rise that had been recorded from 2006 to 2007. A rough estimate puts 2009 spending at \$1625 million and confirms that

Figure 6.1
Exploration and Deposit Appraisal Expenditures in Canada, (1) Field and Overhead (2) Costs by Type of Company, 1978-2008



Sources: Natural Resources Canada and Statistics Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on-mine-site and off-mine-site activities. (2) Overhead costs include mineral leases, claims and property taxes, and project-related head office expenditures. (3) MEDA: Mining Exploration Depletion Allowance. (4) CEIP: Canadian Exploration Incentive Program. (5) ITCE: Investment Tax Credit for Exploration; METC: Mineral Exploration Tax Credit.

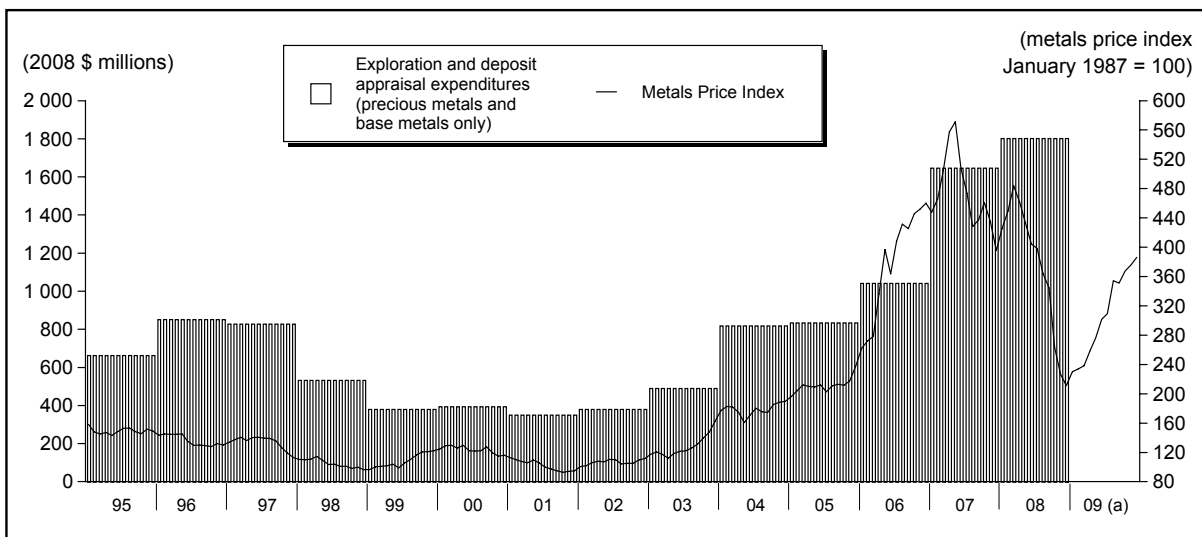
Notes: Total exploration expenditures for 1975-81 are overstated by an average of about 17% relative to previous years because of changes to the methodology used by Statistics Canada over the years. For 1987 and 1988, overhead costs were estimated based on previous years' total costs/field costs ratios. Data for 1997-2008 include both exploration and deposit appraisal expenditures as defined in the 1997 survey reform. Prior to this period, most of the expenditures now reported under the deposit appraisal work phase were reported under exploration (broadly speaking).

a major correction in spending took place during that year. This strong decline in activity shows a strong correlation with the collapse in NRCan's Monthly Metals Price Index¹ that was recorded between April and December of 2008 (**Figure 6.2**).

The above-mentioned fluctuations in spending can be explained by a relatively small number of factors and events. The relatively higher expenditure levels that were recorded from 1993 to 1997 resulted, to a large extent, from important discoveries of diamonds in Canada's North and nickel-copper-cobalt in Labrador. A combination of factors took over after 1997 to bring Canadian mineral exploration and deposit appraisal activity to dangerously low levels where both the resilience of the Canadian junior mining sector and the ore reserve sustainability of a number of mineral producers were tested. Metal prices constituted the primary factor behind this slide as generally low demand for metals was exacerbated by worldwide economic events (i.e., the Asian financial crisis and the September 2001 terrorist attacks in the United States) and by corporate scandals (e.g., the Bre-X affair).

In this generally negative context, the introduction of exploration tax credits and other measures by the federal government and some provincial/territorial governments was welcome news. Along with a rapidly improving metals price outlook across a broad range of commodities, these measures contributed to the recovery and ensuing effervescence that characterized the Canadian mineral exploration sector during the latter years of the record-breaking trend that ended with the collapse of metal markets in the second half of 2008. A rapid deterioration of the situation resulted in a number of mine closures, suspensions, project deferrals, and a general slowdown in exploration and deposit

Figure 6.2
Exploration and Deposit Appraisal Expenditures (Field Work and Overhead) in Canada, and Natural Resources Canada's Monthly Metals Price Index, (1) 1995-2009 (Constant Dollars)



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(a) At the time of writing, no data were available for field and overhead costs in 2009.

(1) The NRCan Monthly Metals Price Index is a Fisher Ideal Index that is based on the prices of six metals: gold, silver, copper, zinc, lead, and nickel.

Notes: Exploration and deposit appraisal data up to 2008 are final. For comparison with pre-1997 years, the data include only field and overhead expenditures.

appraisal activity. While the market outlook improved noticeably in 2009, the investment climate for mineral exploration remained dependent on a fragile world economy in which governments were still applying massive fiscal and monetary stimulus.

EXPLORATION AND DEPOSIT APPRAISAL LEVELS

Metal Prices

Under normal circumstances, metal prices are the most important factor influencing the level of exploration and deposit appraisal activity. In early 1995, metal prices embarked on a generally downward trend, as reflected by NRCan's Monthly Metals Price Index (based on the prices of copper, nickel, lead, zinc, silver, and gold), that lasted until mid-1999 (**Figure 6.2**). The index then recovered for about a year before heading downward again and bottoming out in October 2001 following the September 2001 terrorist attacks in the United States and amid generally low metal prices. The recovery that began afterwards picked up considerable steam in the second half of 2003 and continued towards new heights in 2004 and 2005. In 2006, the Monthly Metals Price Index really took off, reaching an historical high in December. Successive new highs were established in the first four months of 2007 and, in May 2007, NRCan's Monthly Metals Price Index was six times as high as it was in October 2001.

As outlined in previous editions of this report, there is a relationship between the level of spending in a particular year and metal prices in earlier years. For example, when comparing expenditures for precious metals and base metals with the NRCan Monthly Metals Price Index, it can be seen that the decreasing trend in metal prices that began in 1995 was not reflected in spending levels before 1997, partly because of that relationship and also because of the slow decline recorded throughout 1995

and 1996. Expenditures peaked in 1996, started declining in 1997, fell even more in 1998 and 1999, were mostly stable but low in the 2000-2002 period, and began to recover in 2003. They exploded in 2004 after the price outlook really showed signs of improving in the second half of 2003, and continued to improve greatly as prices continued to head higher and higher, pulling exploration spending towards the records already discussed.

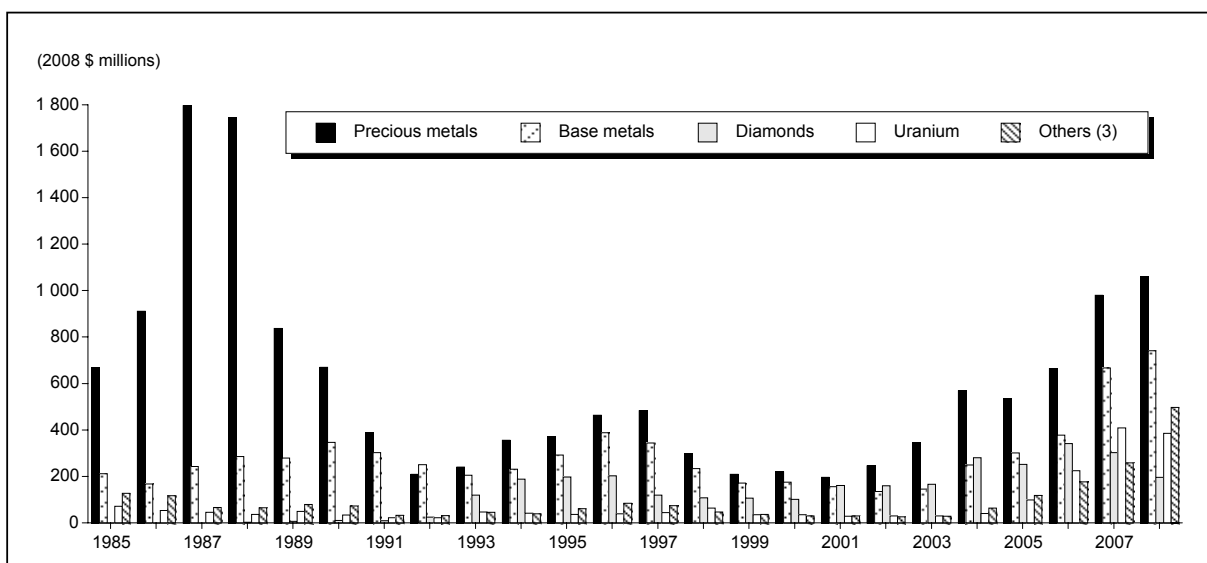
As mentioned above, metal market conditions deteriorated greatly as a result of the economic crisis in the second half of 2008. However, this decline was not apparent in the 2008 exploration and deposit appraisal spending totals as budgets were already secured at the time that the situation began to unfold. Instead, the impact of weaker prices in 2008 was reflected in the 2009 survey results. Companies regularly display an ability to respond to significant fluctuations in metal prices and adjust the scope of their projects in a very short timeframe not only in downturns, but also as conditions improve. Since metal prices recovered in the last seven months of 2009, the year 2010 should unveil a better outlook in terms of exploration and deposit appraisal activity in Canada.

Commodities

Figure 6.3 shows historical exploration and deposit appraisal spending by commodity group. Base-metal expenditures were at a record high in 2008 when they reached \$743 million, a dramatic improvement over the trough of \$136 million recorded in 2002 (the lowest amount since at least 1975). Expenditures for precious metals, usually the most sought after commodity group, peaked at \$1061 million in 2008, marking the seventh year of increase after the trough of \$197 million recorded in 2001. A record high precious-metal spending level was recorded in the 1987-88 period when more than \$1.7 billion was recorded in each of these two years.

In terms of share of total spending, it is interesting to note that precious metals only accounted for 7% of the total in 1975 while base metals accounted for 63%. This changed drastically in 1987-88 when the precious metals' share climbed to 83% and the base metals' share dropped to 11% in 1987

Figure 6.3
Exploration and Deposit Appraisal Expenditures in Canada, (1) Field and Overhead (2) Costs, by Mineral Commodity, 1985-2008



Sources: Natural Resources Canada and Statistics Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on-mine-site plus off-mine-site activities; up to and including 1996, most of the expenditures now included in the deposit appraisal work phase were under exploration (broadly speaking). (2) Overhead includes mineral leases, claims, and project-related head-office expenditures. (3) Others include coal, iron, other metals, nonmetals, and unspecified mineral commodities where applicable.

and 13% in 1988. The proportion of total spending accounted for by precious metals declined progressively to 51% in 1991 and averaged 40% afterward. Similarly, base metals averaged around 30%. These lower percentages coincided with the beginning of more significant diamond and uranium exploration. In 1993, for example, 18% of total spending was dedicated to the search for diamonds and 7% for uranium. In 2001, diamonds reached a peak with 28% of the total while uranium reached its peak in 2007 with 16% of the total expenditures for that year. Diamonds played a particularly important role in keeping the Canadian mineral exploration sector active during the difficult years of 1999-2002 when precious metals and base metals failed to attract much interest.

Companies

As shown in **Figure 6.1**, junior companies have traditionally played an important role in Canadian mineral exploration and deposit appraisal activity. However, their contribution really expanded in 1984, a year after the introduction of MEDA, when their spending accounted for almost 24% of total exploration and deposit appraisal expenditures (field work and overhead). That proportion had more than doubled by 1987 when junior companies accounted for \$1107 million, or 51% of the total of over \$2.0 billion spent during that year. Junior spending was also very important in 1988 with almost 50% (\$1059 million) of total expenditures. The junior companies' proportion of total spending then started to gradually decrease until it reached 21% in 1992.

The spending levels recorded by junior companies in the 1986-88 period are even more impressive when taking into account the fact that, during that period, considerable contributions were made by junior companies to joint-venture projects operated by senior companies. In the Survey, these contributions were counted as part of senior companies' spending, thus overstating senior expenditures and understating junior expenditures.

On a yearly basis, junior spending accounted for approximately 30% of total expenditures (field work and overhead only) over the period 1993-2000 (**Table 6.1**). The discovery of diamonds in Canada's North and nickel-copper-cobalt at Voisey's Bay were the two most important positive factors affecting junior spending during those years. Low metal prices, a slowing world economy, and difficulties in raising financing explain the more difficult years. The introduction of the federal Investment Tax Credit for Exploration (ITCE)² in October 2000 and related provincial tax credits helped junior mining companies, and their expenditures started to recover faster than those of the senior companies. This recovery in junior spending was strong enough to increase their share of total spending (field and overhead costs) to almost 44% in 2003. The momentum continued to build in 2004 as junior mining companies accounted for 53% of all spending, the first time since 1987 (and only the second time in the history of Canadian mineral exploration statistics) that junior spending exceeded that of senior companies. Buoyed by strong metal prices and the eagerness of financial markets to fund mineral exploration activity, junior companies' spending continued to surge at a much faster pace than the expenditures of senior companies in 2005 and 2006. As a result, junior company field and overhead spending represented 60% of total spending in 2005 and 64% in 2006. The proportion of junior company spending continued to increase in 2007, accounting for 68% of total field and overhead expenditures. In 2008, junior expenditures increased by only 11% (compared to a 60% increase in the previous year). In dollar terms, this increase in junior spending was similar to the increase recorded by senior companies. Consequently, junior companies saw their share of total spending decline slightly in 2008 (to 65%). While the 2009 totals for field and overhead expenditures are not yet available, the impact of the economic crisis on the capacity of junior companies to finance their projects is expected to be reflected in these companies' share of total spending, which should fall to around the 55% mark.

Regions

Tables 6.2 and **6.3** show exploration and deposit appraisal expenditures (field and overhead costs only) by province and territory in terms of current dollars and 2008 constant dollars starting in 2003. Furthermore, the major 1997 survey reform has introduced two other layers of statistical data: first, other costs such as engineering, economic and pre- or production feasibility studies, environment,

and land access; and second, the associated capital, and repair and maintenance costs, all collected by property or mine. National totals in each complementary series are presented in these tables. The overhead costs category adds an average of 10% in expenditures to the original field work total, “other costs” add a further 12%, and capital and repair costs add another 10%.

The time series covers two exciting periods in the history of mineral exploration in Canada: the beginning of the diamond rush after the 1992 discovery of the first diamond mine in Canada (Ekati, in the Northwest Territories) followed by the subsequent Snap Lake (Northwest Territories) and Victor (Ontario) diamond mine discoveries in 1996 and 1997, respectively, and the Voisey’s Bay nickel-copper-cobalt discovery of 1994 (Newfoundland and Labrador), which also contributed to a base-metal staking and exploration rush in the surrounding and similar geological domains. These discoveries had an impact not only in terms of total exploration and deposit appraisal expenditures, but also in terms of total investment (as described in Chapter 2) for these jurisdictions.

ENDNOTES

¹ The NRCan Monthly Metals Price Index is a Fisher Ideal Index that is based on the prices of six metals: gold, silver, copper, zinc, lead, and nickel.

² At the time of its introduction in October 2000, the tax credit was called the Investment Tax Credit for Exploration (ITCE). After expiring at the end of 2005, the program was reinstated in the May 2006 Federal Budget as the Mineral Exploration Tax Credit (METC).

Note: Information in this chapter was current as of December 2009.

NOTE TO READERS

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**TABLE 6.1. EXPLORATION AND DEPOSIT APPRAISAL
EXPENDITURES IN CANADA, (1) FIELD WORK AND OVERHEAD, (2)
BY TYPE OF COMPANY, 1969-2008**

Year	Current Dollars				Constant 2008 Dollars		
	Share of Total		Total	% of Total	Share of Total		Total
	Junior	Senior			Junior	Senior	
	(\$ millions)				(%)	(\$ millions)	
1969	44.4	130.5	174.9	25.4	261.0	767.2	1 028.2
1970	39.9	147.2	187.1	21.3	224.7	829.1	1 053.9
1971	24.5	127.5	152.0	16.1	131.9	686.2	818.1
1972	18.3	97.4	115.7	15.8	93.1	495.6	588.7
1973	22.5	121.6	144.1	15.6	104.4	564.2	668.6
1974	21.8	158.5	180.3	12.1	87.7	637.7	725.4
1975	19.5	187.8	207.3	9.4	70.9	683.0	753.9
1976	13.9	192.9	206.8	6.7	46.1	640.0	686.1
1977	12.5	271.0	283.5	4.4	38.9	843.7	882.6
1978	19.8	275.0	294.8	6.7	57.8	802.5	860.2
1979	29.4	329.5	358.9	8.2	77.9	873.1	951.0
1980	60.2	530.0	590.2	10.2	144.9	1 276.0	1 420.9
1981	83.0	651.2	734.2	11.3	180.5	1 415.8	1 596.3
1982	73.8	502.5	576.3	12.8	148.0	1 007.5	1 155.5
1983	71.2	400.6	471.8	15.1	135.4	761.6	896.9
1984	146.9	470.4	617.3	23.8	270.4	865.7	1 136.1
1985	181.1	424.7	605.8	29.9	323.5	758.5	1 082.0
1986	348.6	374.7	723.3	48.2	604.0	649.1	1 253.1
1987	668.2	631.8	1 300.0	51.4	1 107.0	1 046.7	2 153.6
1988	668.3	681.8	1 350.0	49.5	1 059.3	1 080.7	2 139.9
1989	272.6	555.3	827.9	32.9	413.7	842.7	1 256.4
1990	241.0	533.7	774.7	31.1	354.2	784.4	1 138.5
1991	116.1	415.6	532.0	21.8	165.9	593.5	759.7
1992	79.9	305.4	385.3	20.7	112.7	430.5	543.2
1993	142.7	334.5	477.3	29.9	198.2	464.6	662.8
1994	195.8	432.3	628.1	31.2	268.8	593.6	862.4
1995	213.4	504.2	717.6	29.7	286.5	676.9	963.4
1996	318.1	576.7	894.8	35.6	420.5	762.4	1 182.9
1997	266.7	553.5	820.2	32.5	348.0	722.3	1 070.3
1998	155.9	420.0	575.9	27.1	204.5	551.1	755.6
1999	123.3	314.6	437.9	28.2	159.0	405.7	564.7
2000	142.3	315.8	458.1	31.1	176.2	391.1	567.2
2001	167.7	302.4	470.1	35.7	205.3	370.2	575.6
2002	179.0	318.2	497.2	36.0	216.8	385.3	602.1
2003	267.2	347.0	614.2	43.5	313.2	406.8	720.0
2004	560.4	502.6	1 063.0	52.7	636.6	570.9	1 207.5
2005	714.2	476.8	1 191.0	60.0	784.8	523.9	1 308.8
2006	1 063.4	606.4	1 669.8	63.7	1 140.6	650.5	1 791.1
2007	1 702.2	818.7	2 521.0	67.5	1 769.5	851.1	2 620.5
2008	1 884.1	1 002.3	2 886.4	65.3	1 884.1	1 002.3	2 886.4

Sources: Natural Resources Canada and Statistics Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Includes on-mine-site and off-mine-site activities. (2) Includes mineral leases, claims, property taxes, and project-related head office expenditures.

Notes: Total expenditures for 1975-81 are overstated by about 17% relative to earlier years because of changes to the methodology used by Statistics Canada. For 1987 and 1988, overhead costs were estimated based on previous years' ratio of total costs/field costs. Data for 1997-2008 include both exploration and deposit appraisal expenditures as defined in the 1997 survey reform. Previous to this period, most of the expenditures now reported under the deposit appraisal work phase were mostly reported under exploration (broadly speaking).

TABLE 6.2. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, (1) BY PROVINCE AND TERRITORY, 1993-2008 (Current Dollars)

Province/Territory	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	(\$ millions)															
Newfoundland and Labrador	8.9	12.4	71.1	92.5	58.4	40.8	29.3	23.1	20.7	24.0	21.5	30.5	42.6	87.5	136.8	137.2
Nova Scotia	1.8	1.7	2.8	6.9	6.7	4.8	3.6	3.0	1.5	1.8	4.0	6.9	5.6	7.3	19.7	15.8
New Brunswick	11.1	10.0	12.7	14.8	12.2	10.0	10.0	12.0	9.4	3.2	2.5	13.2	9.8	13.3	35.0	30.9
Quebec	106.1	130.3	123.4	137.2	168.6	123.5	103.4	89.9	94.8	104.0	128.0	209.4	199.5	272.7	441.9	489.1
Ontario	75.6	113.0	129.7	194.9	176.5	111.3	81.1	113.7	110.2	121.0	187.4	271.1	283.5	330.3	523.6	742.4
Manitoba	27.4	40.5	32.6	41.2	40.3	29.5	22.6	27.7	28.5	29.6	27.0	35.7	50.0	51.6	97.3	141.9
Saskatchewan	53.1	50.6	43.8	50.6	49.9	57.8	36.0	40.0	34.4	35.2	43.6	63.3	131.0	229.3	297.7	393.0
Alberta	7.3	9.4	10.6	10.8	20.5	21.6	11.4	6.1	4.3	5.6	4.6	4.3	5.0	17.3	9.8	16.8
British Columbia	66.0	85.0	79.4	104.9	95.8	44.3	33.4	29.9	25.6	34.5	52.6	130.6	164.7	236.2	392.1	360.0
Yukon	19.2	25.7	39.3	46.4	40.6	17.5	12.2	9.9	7.3	7.4	11.9	20.8	49.0	99.4	129.1	118.3
Northwest Territories	100.7	149.5	172.2	194.5	150.7	114.8	61.0	45.3	75.2	59.8	45.7	99.6	85.3	153.1	166.4	115.8
Nunavut	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	33.8	57.4	58.1	71.3	85.3	177.7	165.0	172.0	271.4	325.3
Total field work (excluding overhead)	410.1	540.5	608.1	835.9	749.5	522.6	387.6	412.3	415.8	434.8	552.7	966.7	1 107.5	1 560.0	2 384.3	2 693.8
Total (2) field work (including overhead)	477.3	628.1	717.6	894.8	820.2	575.9	437.9	458.1	470.1	497.2	614.2	1 063.0	1 191.0	1 669.8	2 521.0	2 886.4
Total field work, overhead (3) and other costs (4)	..	..	..	..	921.0	655.9	504.3	496.7	512.9	573.4	686.7	1 177.8	1 304.8	1 911.5	2 830.8	3 279.5
Total field work, overhead, other costs, capital and repair costs for non-residential construction, machinery and equipment	..	..	..	..	1 150.0	713.6	559.8	559.0	526.1	618.5	741.6	1 426.8	1 497.8	2 056.2	3 334.3	3 762.0

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

.. Not available; n.a. Not applicable.

(1) Includes on-mine-site and off-mine-site activities. (2) Total in bold represents the sum of the provincial/territorial breakdown listed above. (3) Includes mineral leases, claims, property taxes, and project-related head office expenditures. (4) Other related expenditures were collected as of 1997 and include engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Note: Numbers may not add to totals due to rounding.

TABLE 6.3. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES,⁽¹⁾ BY PROVINCE AND TERRITORY, 1993-2008 (Constant Dollars)

Province/Territory	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
(2008 \$ millions)																
Newfoundland and Labrador	12.4	17.0	95.5	122.3	76.2	53.5	37.8	28.6	25.3	29.1	25.2	34.6	46.8	93.9	142.2	137.2
Nova Scotia	2.5	2.3	3.8	9.1	8.7	6.3	4.6	3.7	1.8	2.2	4.7	7.8	6.2	7.8	20.5	15.8
New Brunswick	15.4	13.7	17.1	19.6	15.9	13.1	12.9	14.9	11.5	3.9	2.9	15.0	10.8	14.3	36.4	30.9
Quebec	147.3	178.9	165.7	181.4	220.0	162.0	133.4	111.3	116.1	125.9	150.1	237.9	219.2	292.5	459.3	489.1
Ontario	105.0	155.2	174.1	257.7	230.3	146.0	104.6	140.8	134.9	146.5	219.7	308.0	311.5	354.3	544.3	742.4
Manitoba	38.1	55.6	43.8	54.5	52.6	38.7	29.1	34.3	34.9	35.8	31.7	40.6	54.9	55.3	101.1	141.9
Saskatchewan	73.7	69.5	58.8	66.9	65.1	75.8	46.4	49.5	42.1	42.6	51.1	71.9	144.0	246.0	309.5	393.0
Alberta	10.1	12.9	14.2	14.3	26.8	28.3	14.7	7.6	5.3	6.8	5.4	4.9	5.5	18.6	10.2	16.8
British Columbia	91.7	116.7	106.6	138.7	125.0	58.1	43.1	37.0	31.3	41.8	61.7	148.4	181.0	253.4	407.6	360.0
Yukon	26.7	35.3	52.8	61.3	53.0	23.0	15.7	12.3	8.9	9.0	14.0	23.6	53.8	106.6	134.2	118.3
Northwest Territories	139.8	205.3	231.2	257.1	196.7	150.6	78.7	56.1	92.1	72.4	53.6	113.1	93.7	164.2	173.0	115.8
Nunavut	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	43.6	71.1	71.1	86.3	100.0	201.9	181.3	184.5	282.1	325.3
Total field work (excluding overhead)	569.5	742.1	816.4	1 105.1	978.1	685.4	499.9	510.5	509.1	526.5	647.9	1 098.2	1 217.0	1 673.3	2 478.4	2 693.8
Total (2) field work (including overhead)	662.9	862.4	963.4	1 183.0	1 070.3	755.6	564.7	567.2	575.6	602.1	720.0	1 207.6	1 308.8	1 791.1	2 620.5	2 886.4
Total field work, overhead (3) and other costs (4)	..	..	..	..	1 201.8	860.6	650.4	615.0	628.0	694.4	805.1	1 338.0	1 433.8	2 050.4	2 942.6	3 279.5
Total field work, overhead, other costs, capital and repair costs for non-residential construction, machinery and equipment.	..	..	..	..	1 500.7	936.2	721.9	692.2	644.2	749.0	869.4	1 620.8	1 646.0	2 205.5	3 466.0	3 762.0

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

.. Not available; n.a. Not applicable.

(1) Includes on-mine-site and off-mine-site activities. (2) Total in bold represents the sum of the provincial/territorial breakdown listed above. (3) Includes mineral leases, claims, property taxes, and project-related head office expenditures. (4) Other related expenditures were collected as of 1997 and include engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Note: Numbers may not add to totals due to rounding.