

# Canadian Reserves of Selected Major Metals, and Recent Production Decisions

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## **RESERVES OF SELECTED MAJOR METALS**

In 2001, Canadian reserves of copper, nickel, lead, zinc, molybdenum, silver and gold decreased because only one small new mine came into production while four producing mines were closed and the amount of new ore discovered at existing mining operations was insufficient to replace the quantity of ore that was mined during the year (Table 1). This continued a trend of declining ore reserves that began in the early 1980s for base metals and in the late 1980s for gold.

The Voisey's Bay nickel-copper-cobalt deposit in Labrador is not included in Canadian reserves at the end of 2001, but a production decision was made in June 2002, resulting in an increase of 524 000 t in the reserves of copper and an increase of 893 000 t in the reserves of nickel.

## **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" or "probable" (or their equivalents) at producing mines and in deposits that are firmly committed to production (Table 2). Metal contained in mineral resources classified by companies as "possible" (or its equivalents) is not included in national totals, nor is metal contained in deposits that have not advanced beyond the deposit appraisal phase (Figure 1). When available, only metal contained in mineable ore is included in Canadian totals 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 1070 t of gold contained in Canadian mine reserves in December 2001. This represents a decrease of 6% (72 t) compared to December 2000. The major components of this decrease were deletions due to continuing low gold prices, together with the depletion of reserves without replacement at most of the gold mines in Canada. The only notable increases in gold reserves were reported at the Red Lake mine (+22 t) and the Williams mine (+13 t) in Ontario.

### **Silver**

There were 12 593 t of silver contained in Canadian mine reserves in December 2001. This represents a decrease of 9% (1326 t) compared to December 2000. None of the silver-producing mines reported significant increases in their reserves during 2001.

### **Zinc**

During 2001, Canadian reserves of zinc declined by about 1.1 Mt (12%) to a year-end total of approximately 7.8 Mt. The Sullivan mine in British Columbia and the Ruttan mine in Manitoba closed permanently and reserves decreased at most of the zinc producers. The only zinc mines to report an increase in ore reserves during 2001 were the 777 mine in Manitoba (46 000 t), the Myra Falls mine in British Columbia (76 000 t), and the Bell Allard mine in Quebec (244 000 t).

### **Lead**

Canadian reserves of lead decreased by approximately 26% during 2001 to 970 000 t. The Sullivan mine in British Columbia closed after 92 years of production. The Brunswick No. 12 mine in New Brunswick has reserves

**Figure 1**  
**Generalized Model of the Mineral Resource Development and Mining Process**

PHASE	MINERAL RESOURCE ASSESSMENT	MINERAL EXPLORATION					MINERAL DEPOSIT APPRAISAL				MINE COMPLEX DEVELOPMENT	MINE PRODUCTION	ENVIRONMENTAL RESTORATION	
		GRASS-ROOTS EXPLORATION					DA-1	DA-2	DA-3	DA-4				
	MRA	EX-1	EX-2	EX-3	EX-4	EX-5								
<b>STAGE</b>	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.	
<b>OBJECTIVES</b>	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, estimations, 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 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.	
<b>EVALUATION METHODS</b>	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, 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.	
<b>RESULTS</b>	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.	
<b>MINERAL INVENTORY</b>	UNDISCOVERED MINERAL POTENTIAL					INFERRED RESOURCE	DELIMITED MINERAL RESOURCE				MINERAL RESERVE			
	SPECULATIVE		HYPOTHETICAL				INDICATED	INDICATED AND MEASURED			PROVEN AND PROBABLE			
<b>ESTIMATION ERROR</b> (targeted margin of error of tonnage/grade estimates at the 90% confidence level)						± 100%	± 50%	Indicated: ± 50 to ± 30% Measured: ± 20 to ± 10% (often several sample grid dimensions are used in each category)			Proven (feasibility: ± 10%; mining: ± 5%)			
<b>INVESTMENTS</b>	Moderate	Low, but increasing multiple investments.					Larger and increasing multiple investments.					Very large industrial investment.		Full compliance
<b>RISK LEVEL</b>	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.

sufficient for six more years of production, but the Polaris and Nanisivik mines closed in 2002.

### **Copper**

In December 2001, Canadian reserves of copper were estimated at about 6.7 Mt, or down by about 10% (-753 000 t) from a year earlier. The reduction in copper reserves was due to production without replacement of ore at almost all of the producing copper mines.

### **Molybdenum**

Canadian reserves of molybdenum stood at 95 000 t in December 2001, or about 2% lower than in the previous year. Reserves at the Highland Valley mine increased slightly while reserves at the Huckleberry mine were maintained at the same level as in 2000, but reserves at the Endako mine were reduced by 13 000 t. All of the molybdenum mines are in British Columbia.

### **Nickel**

In December 2001, there were some 4.3 Mt of nickel contained in Canadian mine reserves, down by approximately 9% from 2000 levels. This decrease is due largely to reserves deleted because of low prices at Inco Limited's Ontario and Manitoba divisions (-243 000 t) and at Falconbridge's Ontario operations. Reserves were increased slightly at Falconbridge's Raglan mine in Quebec.

Inco had some 3.5 Mt of nickel in Canadian reserves at the end of 2001, or about 80% of the national total. It is expected that development of the copper-nickel-cobalt deposits at Voisey's Bay in Labrador (announced in June 2002) will increase Canada's mineable reserves of nickel by 893 000 t.

## **Canadian Reserves by Province and Territory**

Four provinces (Ontario, British Columbia, New Brunswick and Quebec) held dominant positions in terms of Canada's proven and probable mineable reserves of major metals in December 2001 (Table 4).

Ontario had 66% of the nickel, 53% of the gold and 50% of the copper, plus 21% of the silver and 20% of the zinc.

British Columbia had 100% of the molybdenum, 34% of the copper and 27% of the silver, plus 4% of the lead, 7% of the zinc and 16% of the gold.

New Brunswick had 92% of the lead, 29% of the zinc and 21% of the silver, plus 1% of the copper.

Quebec had 29% of the zinc, 22% of the gold, 8% of the copper, 13% of the nickel and 26% of the silver.

Manitoba had 21% of the nickel, 12% of the zinc and 4% of the gold, plus 6% of the copper and 4% of the silver.

Newfoundland and Labrador had less than 1% of the gold.

The Northwest Territories had 2% of the gold.

Nunavut had 3% of the lead, 2% of the zinc, less than 1% of the gold, and less than 1% of the silver.

## **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 5).

Current mine reserves of gold in Canada are distributed through the various NAICS classes as follows: Gold and Silver Ore Mining, 78%; Copper and Zinc Ore Mining, 15%; Nickel-Copper Ore Mining, 5%; Lead-Zinc Ore Mining, 0.5%; and Other Metal Ore Mining, 1%.

Current mine reserves of silver in Canada are distributed through the various NAICS classes as follows: Gold and Silver Ore Mining, 41%; Copper-Zinc Ore Mining, 29%; Nickel-Copper Ore Mining, 8%; and Lead-Zinc Ore Mining, 22%.

Current mine reserves of copper in Canada are distributed through the various NAICS classes as follows: Gold and Silver Ore Mining, 2%; Copper-Zinc Ore Mining, 51%; Nickel-Copper Ore Mining, 45%; Lead-Zinc Ore Mining, 2%; and Other Metal Ore Mining, 1%.

Current mine reserves of molybdenum in Canada are contained in the NAICS classes as follows: Copper-Zinc Ore Mining, 37%; and Other Metal Ore Mining, 63%.

Current mine reserves of nickel in Canada are contained 99% in the NAICS class of Nickel-Copper Ore Mining and 1% in the NAICS class of Other Metal Ore Mining.

Current mine reserves of lead in Canada are contained in the NAICS classes as follows: Copper-Zinc Ore Mining, 6%; and Lead-Zinc Ore Mining, 94%.

Current mine reserves of zinc in Canada are contained in the NAICS classes as follows: Gold and Silver Ore Mining, 17%; Copper-Zinc Ore Mining, 50%; and Lead-Zinc Ore Mining, 33%.

## **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, cut-backs or suspensions 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 2001 were 21 years for nickel, 10.5 years for copper, 9.5 years for molybdenum, 8.8 years for silver, 7 years for zinc, 6 years for gold and 5.5 years for lead.

### Reserve Trends

Figure 2 and Table 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. At the end of 2001, Canadian reserves of copper, nickel, lead, zinc, molybdenum and silver were all lower than at any time since Natural Resources Canada began keeping records (1977) and reserves of gold were lower than in any year since 1982.

The annual aggregate change in Canadian reserves is the net result of three main factors affecting individual mines (Figure 3): additions to reserves, deletions to reserves, and production. Additions to reserves are the result of new discoveries; of new geological, metallurgical, production or other information; of a decrease in production costs; or of a rise in commodity prices, all of which increase the quantity of mineral resources that are profitable to mine. Deletions to reserves are the result of new geological, metallurgical, production or other information; of increases in costs; or of 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. Production is normally the main factor reducing the reserves at individual mines but, in 2001, low metal prices were also a significant factor in the reduction of ore reserves at producing mines.

## RECENT PRODUCTION DECISIONS

Several criteria need to be met for a project to be considered here to have reached the production decision stage. 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.

During 2001, the only new production decision was for the Hammerdown gold deposit in Newfoundland and Labrador (Richmont Mines Inc., 5.9 t).

Inco Limited's Voisey's Bay deposit in Labrador was approved for production in June 2002, resulting in an increase of 524 000 t in the reserves of copper and an increase of 893 000 t in the reserves of nickel.

## OUTLOOK

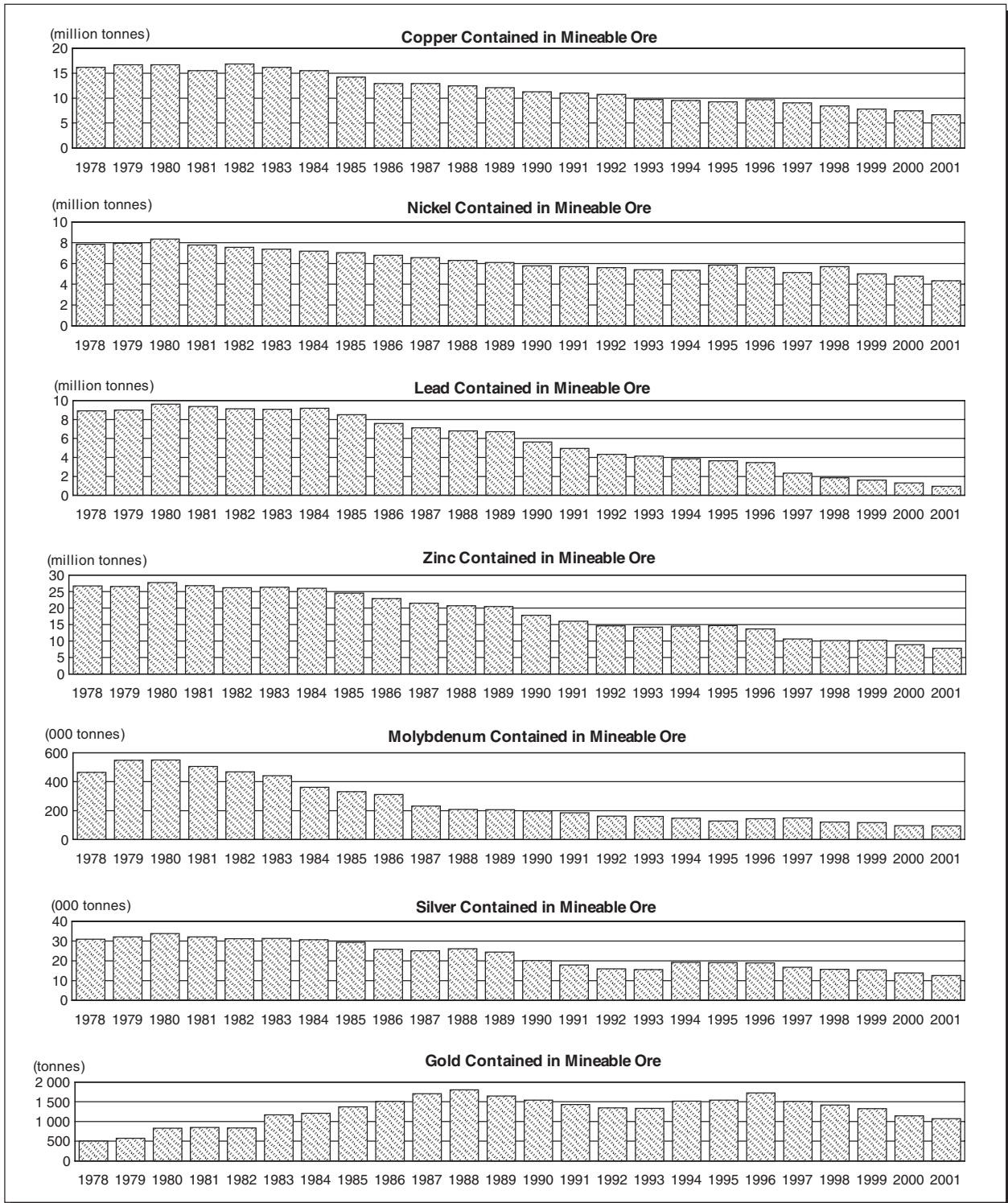
Given that the only new production decision during 2001 was the Hammerdown mine (5.9 t of gold) in Newfoundland and Labrador and that prices of most of the metals covered in this chapter remained low during 2002, it is probable that mine reserves of precious metals and most base metals will decline further during 2002. The decision in June 2002 by Inco Limited to place the Voisey's Bay copper-nickel-cobalt deposit in Labrador into production will increase copper reserves by 8% and nickel reserves by 21%.

*Notes: (1) Information in this review was current as of February 11, 2003. (2) This and other reviews, including previous editions, are available on the Internet at [www.nrcan.gc.ca/mms/cmy/2002CMY\\_e.htm](http://www.nrcan.gc.ca/mms/cmy/2002CMY_e.htm).*

### NOTE TO READERS

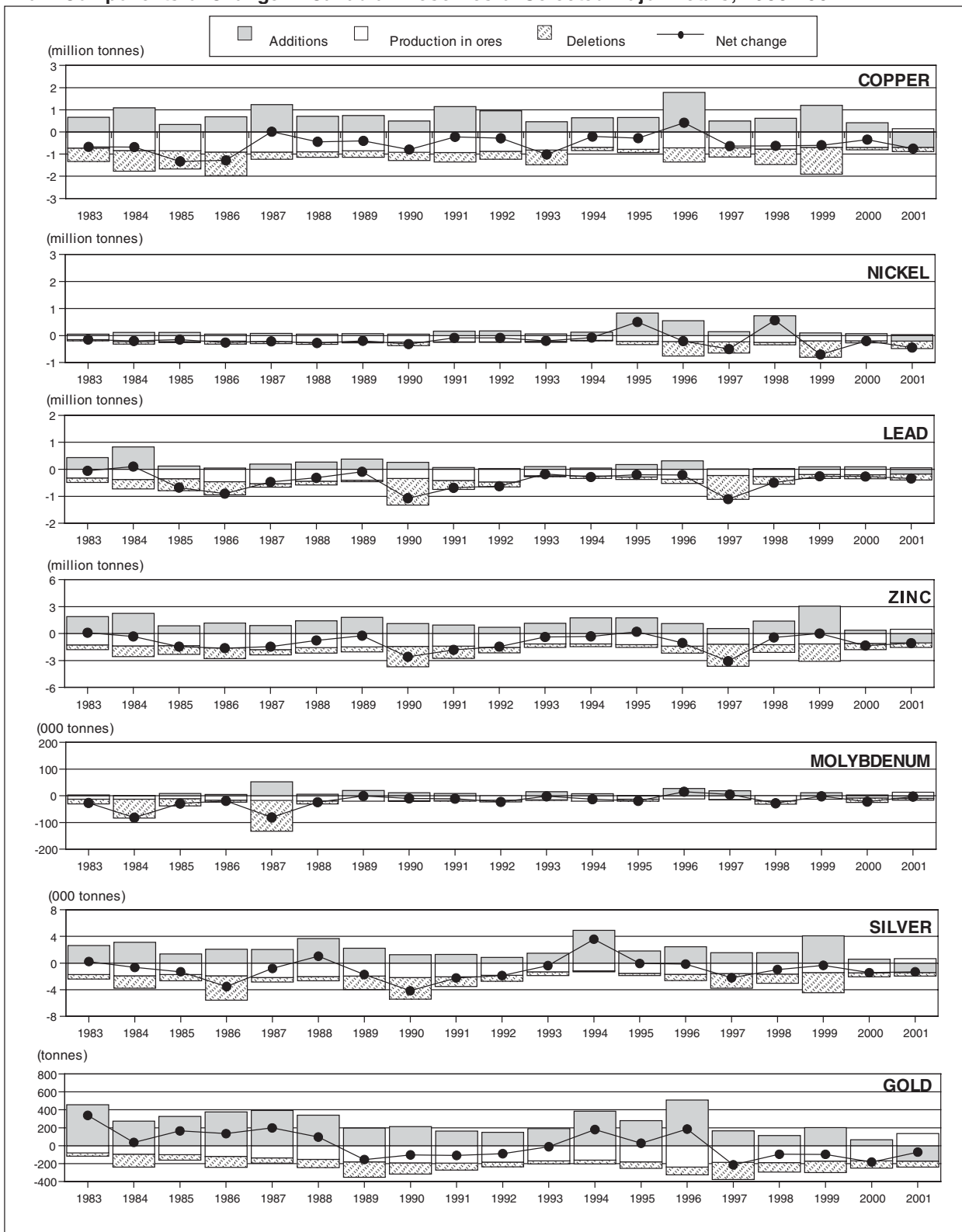
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**Figure 2**  
**Canadian Reserves of Selected Major Metals, 1978-2001**  
 Metal Contained in Proven and Probable Mineable Ore in Operating Mines and Deposits Committed to Production, as at December 31 of Each Year



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**  
**Main Components of Change in Canadian Reserves of Selected Major Metals, 1983-2001**



Source: Natural Resources Canada.

**TABLE 1. MAIN COMPONENTS OF CHANGE DURING 2001 IN CANADIAN RESERVES OF SELECTED MAJOR METALS**

Metal	Units	Revised Opening Metal Balance, January 2001	Metal in Ore Mined During 2001	Metal Apparently Written Off During 2001	Metal in New Reserves Found During 2001	Net Change During 2001	Closing Metal Balance, December 2001	% Change During 2001
Copper	000 t	7 419	-690	-200	151	-753	6 666	-10
Nickel	000 t	4 782	-209	-271	32	-447	4 335	-9
Lead	000 t	1 315	-178	-221	54	-345	970	-26
Zinc	000 t	8 876	-1 034	-502	468	-1 068	7 808	-12
Molybdenum	000 t	97	-10	-6	13	-3	95	-2
Silver	t	13 919	-1 426	-535	635	-1 326	12 593	-10
Gold	t	1 142	-171	-67	136	-72	1 070	-6

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.

Note: May not balance due to rounding.

**TABLE 2. TONNAGES AND GRADES OF OPERATIONS INCLUDED IN CANADIAN RESERVES OF SELECTED MAJOR METALS, AS AT JANUARY 1, 2002**

Tonnages classified by companies as "possible" 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						Au (g/t)
		Cu (%)	Ni (%)	Pb (%)	Zn (%)	Mo (%)	Ag (g/t)	
<b>NEWFOUNDLAND AND LABRADOR</b>								
Hammerdown Richmont Mines Inc. Proven and probable	335 658							17.49
<b>NEW BRUNSWICK</b>								
Brunswick No. 12 Underground Noranda Mining and Exploration Inc. Proven	23 481 000	0.39		3.49	8.82		105.30	..
Probable	1 949 000	0.25		3.62	9.34		94.20	..
<b>QUEBEC</b>								
Beaufor Aurizon Mines Ltd. Louvem Mines Inc. Proven and probable	1 000 625						..	7.20
Bell Allard Noranda Mining and Exploration Inc. Proven	1 853 000	1.23		0.12	12.56		38.50	0.60
Probable	317 000	0.98		0.13	19.59		40.40	0.33
Bouchard-Hébert Breakwater Resources Ltd. Proven and probable	3 219 000	0.60			4.90		33.00	1.00
Bousquet No. 2 Barrick Gold Corporation Proven	800 000	0.23					4.60	5.90
Doyon Barrick Gold Corporation Cambior inc. Proven	3 505 362						..	5.20
Probable	3 929 017						..	5.60
Joe Mann Campbell Resources Inc. Reserves	297 284	..					..	10.42
Kiena McWatters Mining Inc. Proven	476 000						..	3.02
Probable	13 000						..	4.76
Langlois (Grevet) Cambior inc. Proven and probable	2 903 000	0.70			11.20		53.00	0.10
LaRonde (Dumagami) Agnico-Eagle Mines Limited Proven and probable	32 933 528	0.36			4.05		78.86	3.09

TABLE 2 (cont'd)

	Tonnes	Grade						Au (g/t)
		Cu (%)	Ni (%)	Pb (%)	Zn (%)	Mo (%)	Ag (g/t)	
<b>QUEBEC (cont'd)</b>								
Louvicourt								
Aur Resources Inc.								
Novicourt Inc.								
Teck Corporation								
Proven	3 969 000	3.09			1.91		27.80	0.86
Probable	102 000	1.88			3.18		36.00	0.55
Raglan								
Falconbridge Limited								
Proven	7 136 000	0.81	3.05					
Probable	12 404 000	0.78	2.76					
Selbaie (Detour) A1 Open Pit								
Billiton Metals Canada Inc. (Gencor Ltd.)								
Proven	6 200 000	0.30		0.08	1.22		..	0.24
Sigma No. 1								
McWatters Mining Inc.								
Proven	9 600 000						..	2.60
Probable	5 479 000						..	2.64
Sleeping Giant								
Aurizon Mines Ltd.								
Cambior inc.								
Proven	290 000						..	12.30
Probable	125 000						..	10.70
Troilus (Lac Frotet)								
Inmet Mining Corporation								
Proven	9 800 000	0.10					1.10	0.80
Probable	17 700 000	0.10					1.10	1.10
<b>ONTARIO</b>								
Campbell								
Placer Dome Inc.								
Proven	931 000						..	17.60
Probable	1 010 000						..	15.90
David Bell								
Homestake Canada Inc.								
Teck Corporation								
Proven	3 200 000						..	10.44
Dome (including Paymaster)								
Placer Dome Inc.								
Proven	11 179 000						..	1.10
Probable	14 417 000						..	2.00
Eagle River								
River Gold Mines Ltd.								
Proven	428 000						..	11.80
Probable	471 000						0.90	9.40
Edwards								
River Gold Mines Ltd.								
VenCan Gold Corporation								
Stockpile	6 000						0.50	..
Falconbridge Sudbury Integrated Nickel Operations								
Falconbridge Limited								
Proven	9 906 000	1.28	1.51					
Probable	7 113 000	1.32	1.30					
Glimmer								
Apollo Gold Corporation								
Proven	302 538							8.45
Probable	475 244							9.21
Golden Giant								
Newmont Mining Corporation								
Proven and probable	3 229 561						1.03	9.94
Holloway								
Newmont Mining Corporation								
Proven and probable	3 424 605						..	6.51
Holt-McDermott								
Barrick Gold Corporation								
Proven	115 212						..	6.72
Probable	1 128 538						..	7.37
Hoyle Pond								
Kinross Gold Corporation								
Proven	367 000						..	13.31
Probable	554 000						..	14.04
Inco Ontario Division								
Inco Limited								
Proven	107 000 000	1.40	1.40				..	0.24
Probable	89 000 000	1.17	1.23				..	0.34



TABLE 2 (cont'd)

	Tonnes	Grade						Au (g/t)
		Cu (%)	Ni (%)	Pb (%)	Zn (%)	Mo (%)	Ag (g/t)	
<b>ONTARIO (cont'd)</b>								
Kidd Creek total								
Falconbridge Limited								
Proven	14 697 000	2.17			5.85		77.00	
Probable	10 285 000	2.25			6.98		54.00	
Lac des Iles (palladium-platinum)								
North American Palladium Ltd.								
Proven	59 940 000	0.06	0.05					0.12
Probable	33 561 000	0.05	0.05					0.12
Mishi								
River Gold Mines								
Probable	104 000							3.75
Musselwhite								
Placer Dome Inc.								
TVX Gold Inc.								
Proven	6 954 000							5.70
Probable	1 820 000							4.80
Red Lake (Arthur W. White)								
Goldcorp Inc.								
Proven and probable	2 902 991						..	45.94
Williams								
Barrick Gold Corporation								
Teck Corporation								
Proven (underground)	8 830 000						..	5.83
Proven (open pit)	16 560 000						..	1.77
Probable (underground)	6 580 000						..	5.17
Probable (open pit)	4 360 000						..	1.92
<b>MANITOBA</b>								
777								
Hudson Bay Mining and Smelting Co., Limited								
Proven and probable	9 800 000	2.80			4.60		..	..
Callinan								
Hudson Bay Mining and Smelting Co., Limited								
Proven and probable	2 400 000	1.10			4.50		..	..
Chisel Lake North								
Hudson Bay Mining and Smelting Co., Limited								
Proven and probable	2 100 000	..		..	9.60		..	..
Inco Manitoba Division								
Inco Limited								
Proven	22 000 000	0.13	2.08				..	..
Probable	18 000 000	0.16	2.42				..	..
New Britannia (Nor Acme/Snow Lake)								
High River Gold Mines Ltd.								
TVX Gold Inc.								
Reserves	2 292 000						..	4.86
Trout Lake								
Hudson Bay Mining and Smelting Co., Limited								
Proven and probable	4 500 000	1.20			4.40		..	..
<b>SASKATCHEWAN</b>								
Konuto Lake mine								
Hudson Bay Mining and Smelting Co., Limited								
Proven and probable	700 000	4.20			1.60		..	..
Seabee								
Claude Resources Inc.								
Proven	123 400						..	5.76
Probable	486 600						..	8.49
<b>BRITISH COLUMBIA</b>								
Endako								
Nissho Iwai Corporation								
Thompson Creek Mining Company								
Endako pit	55 400 000					0.07		
Denak pit	10 500 000					0.08		
Stockpile	26 400 000					0.05		
Eskay Creek								
Barrick Gold Corporation								
Proven	685 832						..	58.18
Probable	607 814						..	25.17

TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
<b>BRITISH COLUMBIA (cont'd)</b>								
Highland Valley Cominco Ltd. Highmont Mining Company Rio Algom Limited Teck Corporation								
Proven	292 500 000	0.41				0.01	..	..
Probable	53 600 000	0.44				..	..	0.01
Huckleberry Imperial Metals Corporation Mitsubishi-Dowa-Furukawa-Marubeni								
Probable	56 498 000	0.49				0.01	2.81	0.06
Kemess South Imperial Metals Corporation								
Proven	132 587 792	0.23						0.70
Mount Polley Imperial Metals Corporation Sumitomo								
Probable	31 909 452	0.36						0.34
Myra Falls Boliden Limited								
Proven	6 470 000	1.40		0.50	7.50		46.00	1.40
Probable	1 930 000	1.10		0.50	5.20		43.00	1.50
<b>NORTHWEST TERRITORIES</b>								
Con Miramar Mining Corporation								
Proven	258 000						..	11.31
Probable	602 000						..	12.00
Giant Open Pit-Giant Underground Miramar Mining Corporation								
Proven	27 000						..	13.02
Probable	67 000						..	11.52
<b>NUNAVUT</b>								
Lupin Echo Bay Mines Ltd.								
Proven and probable	1 240 122						8.78	..
Nanisivik Breakwater Resources Ltd.								
Proven and probable	772 000			0.40	7.40		30.00	
Polaris Teck Cominco Limited								
Proven	780 000			2.90	12.60			

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. PRODUCTION DECISIONS ADDED TO CANADIAN RESERVE TOTALS  
AS AT DECEMBER 31, 2001**

Project	Operators and Major Partners	Province	Metals
Hammerdown	Richmont Mines Inc.	N.L.	Gold

Source: Natural Resources Canada, based on company reports.

**TABLE 4. CANADIAN RESERVES OF SELECTED MAJOR METALS BY PROVINCE AND TERRITORY, AS AT DECEMBER 31, 2001**Metal Contained in Proven and Probable Mineable Ore <sup>(1)</sup> in Operating Mines <sup>(2)</sup> 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	–	–	96	512	3 363	417	29	2 249	–	–	–	6 666
Nickel	000 t	–	–	–	560	2 882	893	–	–	–	–	–	4 335
Lead	000 t	–	–	890	8	–	4	–	42	–	–	26	970
Zinc	000 t	–	–	2 253	2 266	1 578	958	11	586	–	–	155	7 808
Molybdenum	000 t	–	–	–	–	–	–	–	95	–	–	–	95
Silver	t	–	–	2 656	3 250	2 720	528	11	3 391	–	4	34	12 593
Gold (4)	t	6	–	2	239	572	46	6	178	–	20	2	1 070

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 "possible." Includes geological reserves for some mines that do not report mineable ore. (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 5. CANADIAN RESERVES OF SELECTED MAJOR METALS BY INDUSTRY, AS AT DECEMBER 31, 2001**Metal Contained in Proven and Probable Mineable Ore <sup>(1)</sup> in Operating Mines <sup>(2)</sup> and Deposits Committed to Production

	NAICS no. (5)	Gold and Silver Ore Mining	Copper-Zinc Ore Mining	Nickel-Copper Ore Mining	Lead-Zinc Ore Mining	All Other Metal Ore Mining	Canada (6)
		212220	212233	212232	212231	212299	
	(Units (3))						
Copper	000 t	149	3 377	2 972	116	53	6 666
Nickel	000 t	–	–	4 288	–	47	4 335
Lead	000 t	–	54	–	916	–	970
Zinc	000 t	1 334	3 908	–	2 566	–	7 808
Molybdenum	000 t	–	35	–	–	60	95
Silver	t	5 116	3 695	997	2 786	–	12 593
Gold (4)	t	833	163	58	5	11	1 070

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 "possible." Includes "geological reserves" for some mines that do not report mineable ore. (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) NAICS = North American Industry Classification System. (6) May not balance due to rounding at the NAICS level.

**TABLE 6. CANADIAN RESERVES OF SELECTED MAJOR METALS AS AT DECEMBER 31 OF EACH YEAR, 1977-2001**Metal Contained in Proven and Probable Mineable Ore<sup>(1)</sup> in Operating Mines<sup>(2)</sup> 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

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 "possible." Includes "geological reserves" for some mines that do not report mineable ore. (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.