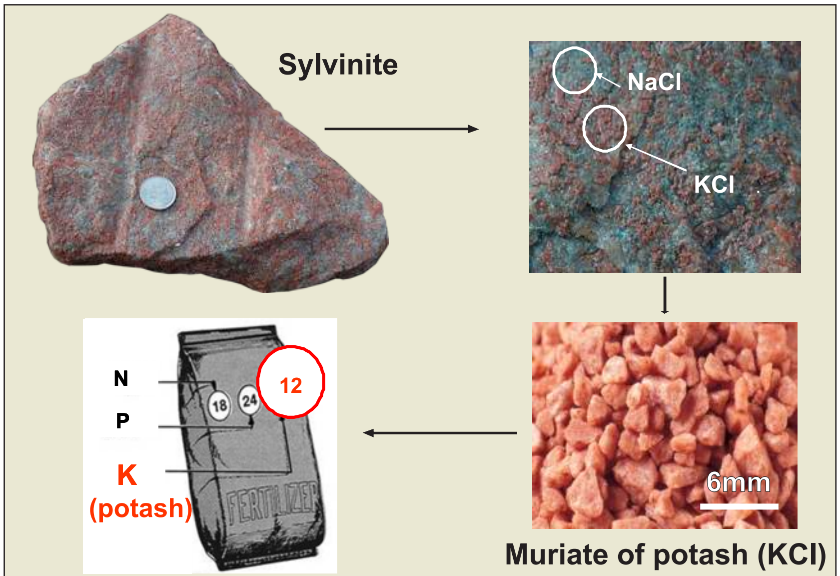
New Brunswick / Nouveau Brunswick

Natural Resources
Lands, Minerals and Petroleum Division

Potash

Mineral Commodity Profile No. 4

Potash is the common name given to a naturally occurring, reddish coloured, mixture of the minerals sylvite (KCl) and halite (NaCl) that form a rock called sylvinite. The commercial products produced from sylvinite are referred to as muriate of potash and often symbolized as "K". Equivalent percentage potassium oxide (K_2O) is the common industry standard for comparing potassium content. Most potash contains about 60% K_2O = 95% KCl. Canada is the world's leading producer and exporter of potash. In 2008, New Brunswick contributed nearly 5% to Canada's 17 million tonne (Mt) potash production total (NRCAN 2008).



- Originally, potash was produced by leaching wood ashes with water and evaporating the solution in an iron pot. The resultant potassium-rich residue left in the pot was "pot-ash", hence the name.
- The discovery of subsurface, potassium salts in Germany in the mid-1800s marked the beginning of the world's potash industry. In Canada, an extensive potash resource was first discovered while exploring for oil in Saskatchewan in the early 1940s. Production has been on-going there for over 40 years. Potash was first discovered in New Brunswick in 1971 and production has been on-going here since 1983.

Uses

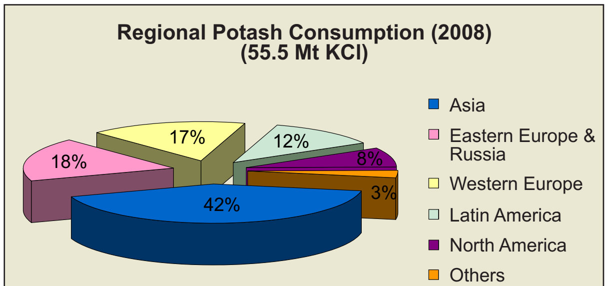
Potassium is the seventh most abundant element in the earth's crust. Experiments by a German chemist in the first half of the 19th century determined potassium, nitrogen, and phosphate as essential nutrients in the growth of plants. These nutrients enhance plant quality, disease resistance and increase crop yield per unit of planted area. The important role potassium plays in plant function cannot be substituted by any other nutrient. Virtually all (95%) potash produced finds its way into the agricultural sector in the form of blended fertilizers. Remaining production is used in consumer goods such as; detergent and soap, glass, pharmaceuticals, and de-icing and water softening agents. Because potash is mined and processed in only 13 countries (Jasinski 2009) and consumed in over 150 countries, it is a strategically important resource.

Demand

Several factors influence the world's demand for potash. The primary driver, guided by population growth and evolving changes in diet, is food. Improved economies in the so-called BRIC (Brazil-Russia-India-China) countries and other developing nations also increase the demand for better quality, higher protein diets. By 2050, it is predicted that the world's population will increase by 40% and exceed nine billion persons (UNDESA 2007). In light of the expanding population and decreasing availability of arable land, the need to grow more on less acreage is becoming a vital concern.

Should this trend continue, expanded demand will emerge for potash-based fertilizers. A burgeoning biofuel industry, dependant on high nutrient absorbing crops like corn, will also put additional pressure on world fertilizer demand.

Increase the demand for better quality, higher protein diets = More meat (e.g., beef) consumption = More grain consumption = Increased fertilizer application.



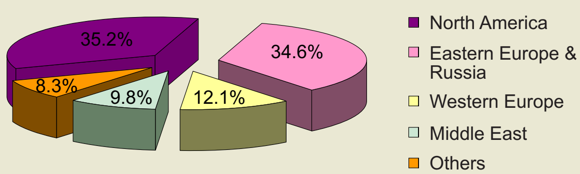
Asia is the world's largest potash consumer. Expecting increased potash demand from the agricultural sectors of Brazil and other Latin American countries, New Brunswick is well positioned to supply this vital crop nutrient. Source: PotashCorp 2008

World Production and Reserves

For nearly 80 years, North America's potash industry has been rooted in New Mexico in the United States, and in Saskatchewan in Canada, where thirteen operations account for the majority of the continent's production capacity. The remainder is derived from operations in New Brunswick, in Canada, and Michigan and Utah in the United States.

Potash deposits in Saskatchewan are the world's largest, richest, and most economic to mine. Canada's political stability and strategic location guarantee long-term supply to consuming countries without major disruptions. PotashCorp (Potash Corporation of Saskatchewan Inc.), an integrated fertilizer and related products company, is the world's largest producer of potash. In 2007, PotashCorp's operations represented 17% of world potash production capacity (PotashCorp 2007a).

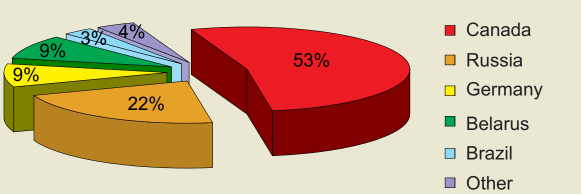
Major Potash Producing Regions (2008)
(54.6 Mt KCl)



Due to the rarity of minable potash deposits around the world, very few countries produce potash. Canada leads world production, followed by Russia, Belarus, Israel, and Germany. Source: PotashCorp 2008

Worldwide potash resources are estimated at 250 billion tonnes (Bt) (K_2O equivalent) with an economic and subeconomic reserve base reported at 18 Bt and economically extractable reserves at 8.3 Bt (Jasinski 2009). Between 1995 and 2000, world potash demand showed modest growth leading to vigorous demand between 2001 and 2006; a reflection of steady increases from China, India and Brazil. World potash markets are expected to remain robust with a predicted annual growth of 4%, roughly equivalent to a new 2 Mt per year potash mine annually. With this predicted growth, the gap between over-supply and demand, a situation that has generally plagued potash producers, will tighten. The industry is fundamentally transforming. When no longer dominated by over-capacity

World Potash: Economically Extractible Reserves (2008)
(8.3 Bt KCl)



Canada, Russia, and Germany account for 84% of the world's economically extractable potash reserves. Source: Jasinski 2009

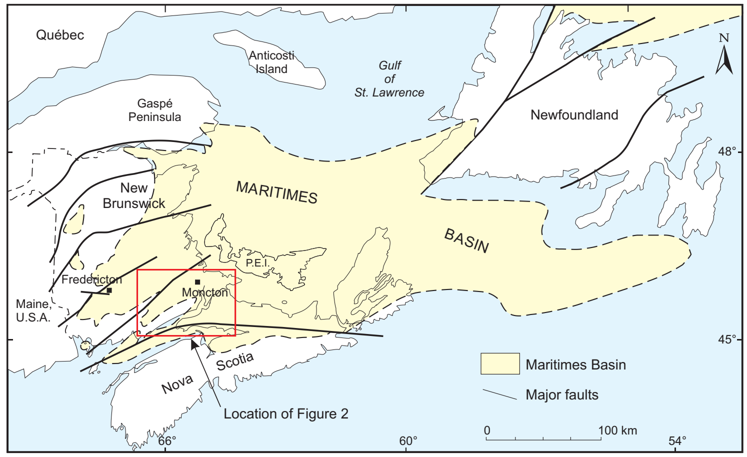


Figure 1. Distribution of the Late Devonian–Permian rocks of the Maritimes Basin, eastern Canada. Modified after St. Peter 2006.

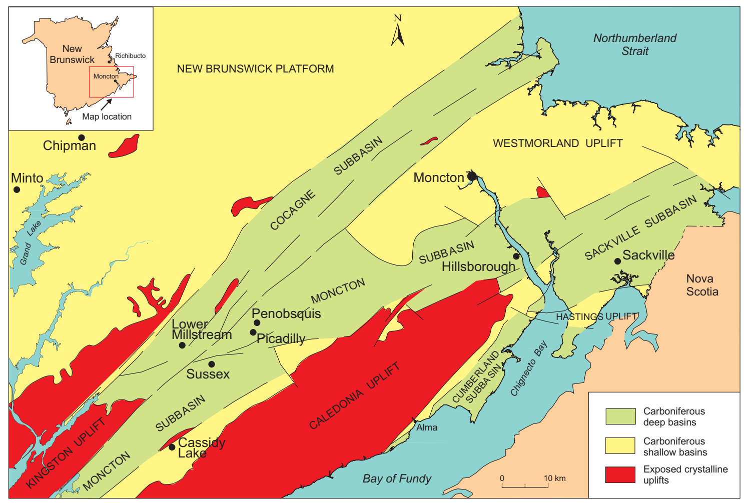


Figure 2. Distribution of subbasins and uplifts of the Maritimes Basin in southeastern New Brunswick. Modified after St. Peter 2006.

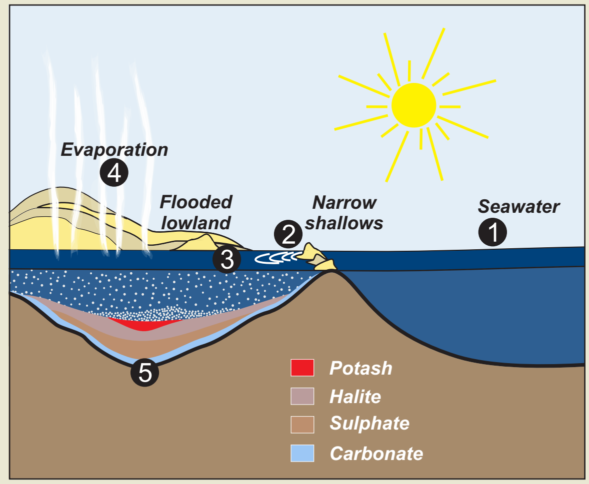
and stringent supply management, the industry will be demand driven.

In 2007 and part of 2008, predictions for an impending supply/demand imbalance triggered expansion projects at several Canadian mines and renewed interest in greenfield potash exploration and development, the likes of which had not been seen in almost 50 years. If the predicted demand situation materializes, potential exists for renewed exploration interest in New Brunswick.

Geologic Setting of Potash in Atlantic Canada

In areas of Atlantic Canada, potash is associated with Early Carboniferous (345-325 Ma) sedimentary rocks deposited in a 75 000 km^2 terrestrial to marine basin, referred to as the Maritimes Basin (Fig. 1). The Basin formed over a time span of approximately 35 million years, beginning in the Late Devonian (375-360 Ma), following a series of tectonic events associated with the episodic collision between two of the earth's crustal plates. The Appalachian Mountains, which extend along the eastern coastline of North America, are a result of these tectonic events. Subsidence within the Maritimes Basin formed a complex series of northeasterly trending uplifted highlands and down-dropped basins, including the Cumberland, Sackville, Moncton, and Cocagne subbasins (Fig. 2).

These subbasins were continually flooded by seawater containing dissolved potassium, sodium and other elements. Under the desert-like conditions believed to exist at the time, a cycle of seawater evaporation and influx precipitated various minerals out of solution onto the sea floor. As a result, extensive evaporite layers formed: first the carbonates, then the sulphates, and then the chloride salts of sodium (halite), potassium (sylvinite) and magnesium (carnallitite, a hydrated potassium magnesium chloride mineral; $KCl{\cdot}MgCl_2{\cdot}6H_2O$). In some areas of the Maritimes Basin, potash has been deposited in large enough quantities to be mined economically.



Formation of a typical potash deposit. Seawater (1) flows over narrow shallows (2) into a shallow basin (3), where it is evaporated (4). Carbonates, sulphates and the chloride salts of sodium (halite), potassium (sylvite) and magnesium (carnallite) precipitate out of solution onto the sea floor forming extensive evaporite layers (5).

Geology of New Brunswick's Potash Deposits

In New Brunswick, the Maritimes Basin is divided into six major rock groups: 1) Late Devonian to Early Carboniferous (Early Tournaisian) clastic sedimentary rocks, including oil-bearing sandstones and shales of the Horton Group; 2) Early Carboniferous (Late Tournaisian) clastic sedimentary rocks and minor evaporites of the Sussex Group; 3) Early Carboniferous (Early to Middle Visean) clastic sedimentary rocks, carbonates, and evaporites of the Windsor Group; 4) Early Carboniferous (Middle Visean to Namurian) clastic sedimentary rocks of the Mabou Group; 5) Late Carboniferous (Namurian to Westphalian) clastic sedimentary rocks of the Cumberland Group; and 6) Late Carboniferous-Early Permian (Westphalian to Asselian) clastic sedimentary rocks of the Pictou Group. (NBDNR 2009a)

Potash deposits in New Brunswick are associated with marine evaporites of the Windsor Group. Among the thickest and most widespread evaporite deposits in eastern North America, these Windsor rocks have a long history of exploration and development and are currently mined for potash, halite (rock salt), sulphate (gypsum/anhydrite), and carbonate (limestone). In places, potash beds in New Brunswick can reach a thickness of 30 m and occur at depths of up to 1000 m. Thinner accumulations of Windsor rocks lie adjacent to the subbasins on the margins of regional highs like the Caledonian, Westmorland, and Hastings uplifts (St. Peter 2006), and parts of the tectonically stable New Brunswick Platform (Fig 2).

Windsor evaporites are characterized by limited compressive strength and limited structural competence. They are particularly susceptible to deformation, typically reacting to stress by being squeezed out of layered depositional sites analogous to squeezing out the contents of a toothpaste tube. This property, combined with lower density and stronger buoyancy compared to that of the surrounding sedimentary rock, often results in highly mobile, semi-fluid evaporite masses moving upward through the overlying sedimentary rock to an equilibrium position forming domes, thickened lenses, diapirs, evaporite cored anticlines, ridges, and walls. The subsurface distributions of Windsor evaporites therefore represent scattered structural remnants of former layered deposits (Fig 3a).

Subsurface characteristics are often effectively delineated by gravity and seismic geophysical methods. Gravity, which measures contrast in the Earth's gravitational field, is a cost-effective and timely method of acquiring preliminary data on prospective evaporite targets. Gravity is therefore a preferred geophysical method in the early stages of exploration. A negative gravity anomaly is commonly, but not always, associated with subsurface evaporite deposits in New Brunswick. Because most evaporite bodies in the Province are deeply buried, a suitable drilling program must follow geophysical exploration.

The evaporites in the Sussex Group include glauberite (a sodium-calcium sulphate) and impure halite associated with the Gautreau Formation. Given the non-marine depositional environment proposed for the Gautreau, (St. Peter 2006) it is unlikely potash would be associated with the Sussex Group.

New Brunswick as a Potash Producer

The discovery of economic potash deposits in the New Brunswick Maritimes Basin resulted in two world-class mining operations and in extended interest in the Province’s potash potential in general. Deposits are known from Penobsquis, Picadilly, and Cassidy Lake in the Moncton Subbasin; and from Lower Millstream in the Cocagne Subbasin (Fig. 2).

Geologists had suspected the existence of potash in areas of southeastern New Brunswick as early as 1840 (Webb 2009). However, it was not until the early 1970s that a jointly funded federal-provincial drill program made a landmark potash discovery near Sussex. Two exploratory boreholes were drilled into an evaporite structure in the Penobsquis area (Fig. 2). One of the boreholes intersected high grade halite (rock salt, herein referred to as salt), and nearly 21 m of sylvinite (potash) averaging 23.7% K_2O. Exploration for salt quickly took second place to a full-scale search for potash. In 1973, three additional government-sponsored boreholes were drilled in geologically favourable target areas, all within 30 km of the Penobsquis area boreholes. Substantial thicknesses of potash, grading 31.6% K_2O at depths near 600 m, were intersected near Cassidy Lake and there were excellent indications of potash below a depth of 900 m at Lower Millstream (Fig. 2). (NBDNRE 1993)

After the initial discovery of potash near Penobsquis, exploration and development rights to the deposit were granted to the Potash Company of America Inc. (PCA) in 1973. Following PCA's expanded exploration program, the Penobsquis mining and processing facility were established and the Port of Saint John potash shipping terminal was constructed. Potash was first shipped from New Brunswick in July 1983.

In 1993, the Penobsquis mine was acquired by the Potash Corporation of Saskatchewan Inc., which now operates under the name PotashCorp (New Brunswick Division), abbreviated herein as PotashCorp (NB). Nearly 6% of PotashCorp's 10.7 Mt annual potash capacity comes from its New Brunswick Division. Over the last decade, annual production of potash at the New Brunswick operation has averaged 731 000 tonnes.

In 2002, while searching for natural gas, exploratory drilling in an area southeast of the present Penobsquis mine revealed a new area of potash. Now referred to as the Picadilly deposit, the indicated potash resource is estimated at 389 Mt with an average grade of 23.5% K_2O (PotashCorp 2007b). A shaft for a 2 Mt per year mine and expanded milling facility is now under construction. PotashCorp is pursuing an ambitious construction schedule for the Picadilly deposit, expecting completion to the pre-development stage by 2011. A three year ramp-up period is expected to follow, with full production realized by 2014 (PotashCorp 2007b). Plans are to keep the Penobsquis mining and processing facility fully operational throughout the new mine's construction and development phases. Once fully developed however, underground operations at Penobsquis will cease.

A second potash deposit, discovered near Cassidy Lake, was brought into production by Denison Mines Limited and Potash Company of Canada Ltd. in 1985. This mine, later known as the Potacan Mining Company, generated approximately 1 Mt of potash products annually. It closed in 1997 after an unmanageable water inflow penetrated the underground workings.


PotashCorp (NB) Penobsquis Mine located approximately 5km east of Sussex.

During the 1980s, BP Resources Canada Ltd. conducted detailed surface exploration and a subsequent feasibility study on a third potash deposit near Lower Millstream. A 500 m thick evaporite section comprising several zones of sylvinite with intervening zones of carnallitite and halite was outlined. An in situ, potash resource was estimated at 256 Mt with an average ore grade of 20.6% K_2O. BP Resources did not study the property beyond the exploration phase and it remains undeveloped.

New Brunswick Potash: Mine to Market

PotashCorp's Penobsquis mining and processing facility is considered somewhat atypical among conventional world potash mining operations. Its most unique feature is, perhaps, its "zero effluent" designation achieved through a totally integrated closed loop configuration of mining, processing, and waste management. This configuration minimizes the impact of the operation on the surrounding environment. There are three key components to the closed loop configuration: 1) mining and transporting potash and salt to the surface processing facility, 2) processing potash to marketable products, and 3) disposing and temporarily storing excess brine and other materials underground.

The potash ore zone is found on the north flank, of a salt-cored anticline extending 25 km to the northeast (Fig. 3a). The ore zone, which varies from less than 10 m in thickness to over 100 m, is presently mined at depths ranging between 400 m and 760 m. The ore zone's steep dip, together it's with variable strike and thickness, dictate a flexible mining method for quick, efficient resource recovery. Mining procedures adopted by PotashCorp at Penobsquis are described as conventional overhand cut and fill stopes in the potash areas (Fig. 3b). This method accommodates the geological complexities of the deposit and the disposal practice of returning waste rock (tailings) from the potash milling process to the underground where it is used as backfill. The disposal practice serves two functions:

(1) it increases mine stability and (2) it allows for tailings storage in an underground setting instead of waste piles on the surface.

The potash and related salt deposits are reached through two, vertical, 600 m long, 5 m diameter, concrete-lined shafts. One serves ore hoisting requirements from the mining operations and the other serves movement of personnel, equipment and supplies, tailings to the mine, excess brine generated from dewatered tailings, and controlled water inflow (Hogan 2006). Twinned, parallel access drifts, established in salt below the potash ore zone, extend eastward from the shafts providing access, via cross-cuts, to the evaporite area where potash and salt deposits are located (Fig. 3a). Potash and salt are extracted from large, cavern-like, stacked excavations called stopes. Stopes are developed both above and below the access drifts and can be several hundred metres long, varying from 24 m to 61 m wide and up to 6.7 m high, bounded to the east and west by sloped "tailings ramps". The block is split in the middle by another sloped ramp, the "central ore ramp" (Fig. 3b).

Potash is removed longitudinally using continuous mining machines to follow the trend of the deposit at various levels.

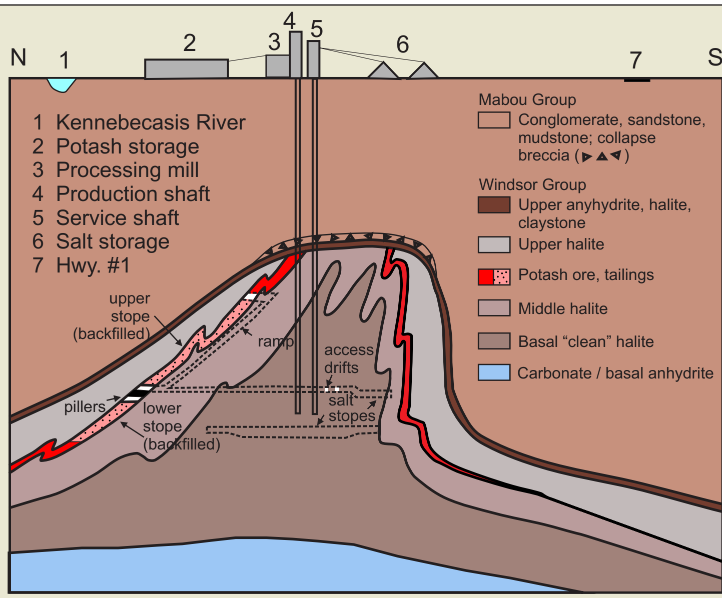


Figure 3a. Schematic overview of PotashCorp (NB) Penobsquis Mine.

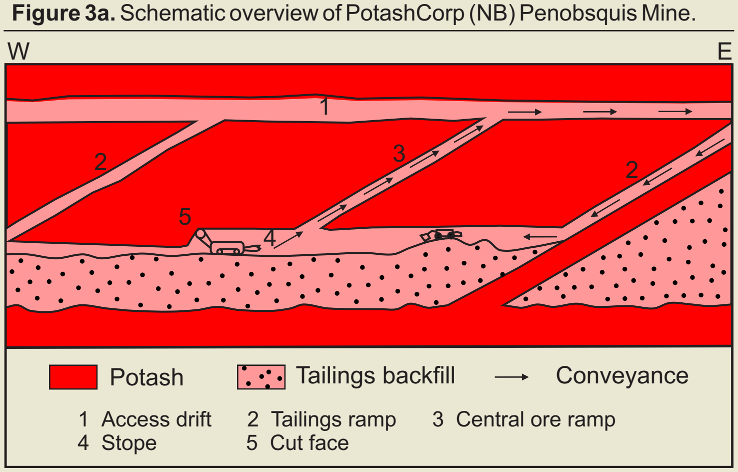
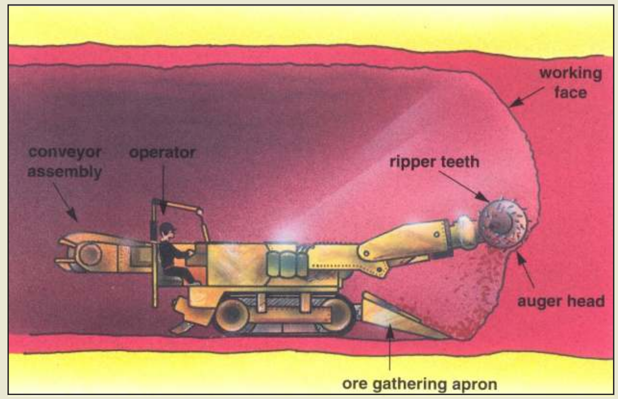


Figure 3b. Overhand cut and fill mining supports a closed loop, zero effluent mining, milling & waste management strategy making PotashCorp (NB) the only potash operation in the world that returns all its tailings and related waste materials underground.



PotashCorp (NB) utilizes several mining machines with boom-mounted, rotating cutting heads for potash mining and related development work. A typical mining machine is capable of excavating up to 6 900 tonnes of ore daily.

Typically, mining a stope cycles from one side to the other, beginning with a track-mounted mining machine cutting a stope east of the central ore ramp. Depending on the variability of the deposit, this process may take one to four months. Where the deposit exceeds a width of 40 m, pillars are developed to assist in the support of progressively higher excavation. The mining machine inches forward along the working face of the stope. Its boom mounted, rotating cutting head can be raised, lowered, and moved from side to side. Broken potash from the cut face is simultaneously gathered onto a 25 km network of temporarily fixed conveyors, which transport it out of the cross-cut to the main drifts. It then goes to the production shaft where it is hoisted to the surface in self-dumping buckets (skips) with 20 to 25 tonne capacities (Hogan 2006).

During the mining process, tailings from the potash refining facility are placed in the west half of the stope to within a few metres of its roof. Tailings provide a suitable floor for the mining machine as it prepares for the next cut in the mining cycle. When the end of the east cut is reached, the mining machine is moved west of the central ore ramp for a return cut while tailing disposal is re-established in the mined east half.

In addition to potash, PotashCorp (NB) produces 600 000 Mt of highly pure salt (>98% NaCl) annually. This mining takes place in the central core of the evaporite structure, south of the access drifts and is an important component of the waste management program. The salt is transported to an underground crusher where it is sized to meet road de-icing and other product standards. Salt fines are integrated into the tailings disposal system from the potash refining process and used as part of the backfill requirement in potash stopes. Salt stopes, typically 300 m long and 20 m wide, are excavated to a depth near 20 m. Their primary functions are as containment vessels for slurried clay slimes and excess brine from the potash refining process. Following the placement of this material, the slimes eventually settle out and the resulting brine, containing residual dissolved potash, is pumped back to the surface where the potash is recovered through evaporation and crystallization.

The potash at PotashCorp (NB) is a mixture of approximately 38% KCl (sylvite) and 60% NaCl (halite), with an insoluble fraction, up to 2%, composed mainly of clay minerals and sulphate (Hogan 2006). Arriving on surface, the potash has an average K_2O content near 23%. Unwanted components must be separated to ensure minimum product standards (i.e., > 60 % K_2O) and various particle size categories are met.

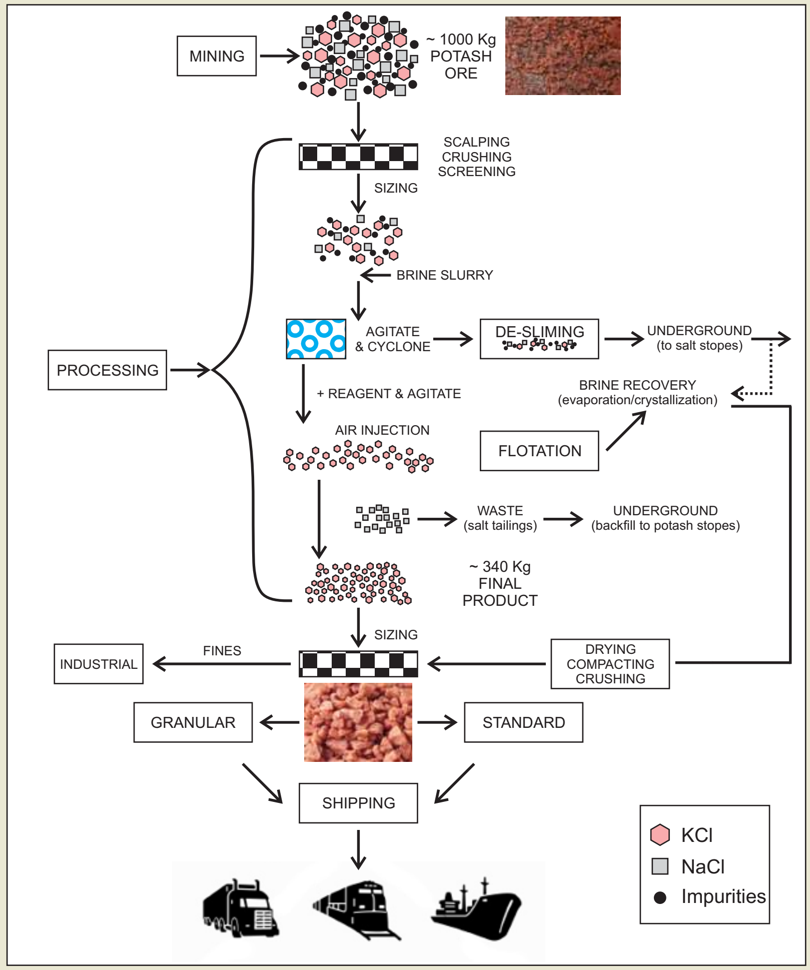
Separation of unwanted components requires a multistage refining process. The first step (scalping), sizes and separates oversized potash from smaller material. Oversized potash is crushed and mixed with brine to create slurry. The slurry, further crushed and sized to liberate KCl particles, is agitated and cycloned to remove clay, fine potash, and salt, a process commonly called desliming. Material from the desliming stage is pumped to the mine for disposal in the excavated salt stopes. Once solids from the slurry settle, the resultant potash and salt laden brines will be returned to surface for further processing (i.e. evaporation, crystallization, compaction, and crushing) and additional potash recovery.

Following desliming, the slurry is mixed with various chemicals to assist in separation additional KCl, a process known as floatation. The treated slurry is placed in a series of cells. When air is circulated through the slurry, particles of KCl attach to rising air bubbles forming a KCl-rich froth on top that is subsequently skimmed off as concentrate. The concentrate is washed with a weak NaCl solution to dissolve any leftover salt, further improving the quality of the KCl product. The salt particles, which do not attach to the air bubbles, sink and are re-ground to further liberate any fine-grained KCl that will be recovered in a final flotation process. The balance of waste materials (salt tailings and clay slimes) are transported underground to active potash stopes.

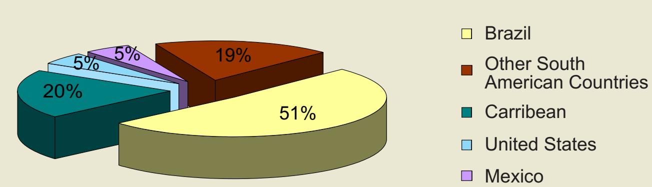
The resultant KCl concentrate is dried and sized to granular and standard grade products. Additional KCl recovered from salt stope brines, is compacted, crushed, sized, and added to product lines.

The KCl products (referred to as muriate of potash) produced in New Brunswick are sent by rail to a

Generalized Potash Processing Flow Chart



New Brunswick Potash Shipments (2007)



Source: PotashCorp 2007b

PotashCorp potash terminal at the Port of Saint where they are shipped by ocean-going vessels to markets in North, Central, and South America.

New Brunswick's Potash Resource Potential

Change in potash consumption and production adjusts the demand from and the supply to world fertilizer markets. A widening potash supply/demand gap is influencing massive production expansions in North American mines and is providing incentive to explore, evaluate, and develop potential resource opportunities. Consequently, in 2007, officials at PotashCorp Inc. announced construction plans for a 2 Mt per year mine at its Picadilly deposit. Successful exploration and development of potash-bearing Windsor evaporite deposits in the Sussex area amply demonstrate the geological attributes and logistical advantages associated with the Province's potash deposits. Several

Potash terminal in southern New Brunswick at the Port of Saint John, on the Bay of Fundy.

potential areas of subsurface Windsor evaporites have been identified (Fig. 4) in the Moncton, Cocagne, Sackville, and Cumberland subbasins, and in southern areas of the New Brunswick Platform. Only a portion of these areas have been explored.

Confirmed potash deposits exist at three locations in the Moncton Subbasin and at one location in the Cocagne Subbasin. The potash discovered the Moncton Subbasin has developed and continues to develop into world-class operations. The sizeable potash deposit in the Cocagne Subbasin, the Lower Millstream deposit, may require re-evaluation because of recent developments to extracting and processing technology. Geotechnical information suggests additional potash resources or related salt resources (e.g., magnesium-bearing carnallitite) occur as extensions of known deposits. Areas adjacent to a former potash mining operation at Clover Hill and areas peripheral to a previously explored area at Lower Millstream also hold untested potash potential. Windsor evaporites are present in the Sackville and Cumberland subbasins, although potash is unconfirmed. The southern and eastern areas of the New Brunswick Platform are also worthy of more detailed investigation. Considering recent developments, potash exploration interest in New Brunswick remains promising. Using modern technology, detailed exploration is required to properly assess areas of interest.

Economic Importance

New Brunswick's potash industry is an important contributor to the Province's economy. PotashCorp (NB) presently employs more than 350 persons on an annual basis. In a typical year, up to 50% of the goods, materials, and services purchased locally by PotashCorp (NB) exceeds $40 million (PotashCorp 2008).

At a projected cost in excess $1.7 billion, the 2 Mt per year Picadilly potash mine represents a tremendous stimulus to the Province's economy. During the construction phase, approximately 2500 person years of employment will be generated. When full production is realized in 2014,

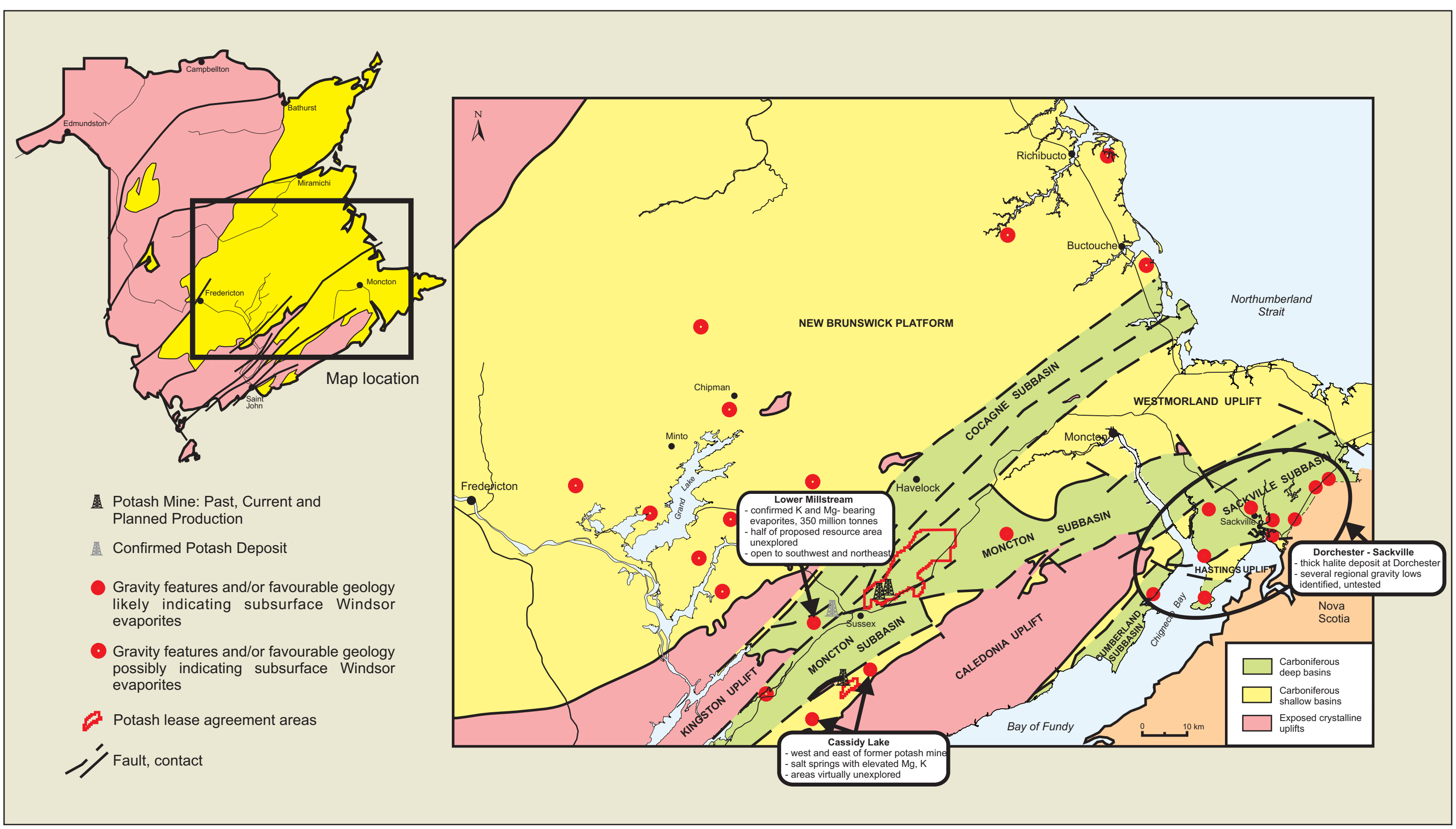


Figure 4. Potash potential: New Brunswick Carboniferous subbasins and potential areas of interest with regard to potash and gravity features indicating the possibility of subsurface Windsor evaporites. Modified after Webb 2009.

present labour requirements of 460 persons will increase with the addition of approximately 140 new, full-time positions.

In 2008, potash accounted for approximately 14% of New Brunswick's mineral production. New Brunswick's royalty revenue collected on potash averages $7 million annually. In 2007, reflective of increasing world market prices, royalties reached an all-time high of $11.6 million (NBDF 2008).

Summary

Several factors are influencing long-time demand and supply trends for potash. Canada continues to be the world-leader in producing and exporting this strategic resource. Apart from extensive potash resources and their associated development in western Canada, New Brunswick is the only other region in the Canada where potash is mined and processed. New Brunswick is also the only potash producer on the east coast of North America.

New Brunswick's potash exploration and subsequent development history spans nearly four decades. Potash resources have served the province well, supporting world-class mining and processing facilities. Not only is the potash industry a significant contributor to the value of the Province's mineral production, it also acts as an important contributor to New Brunswick's economy. The potash industry is a source of considerable revenue and benefit, via taxation and royalties, the purchase of domestic goods and services, and employment for up to 400 persons.

Discovery and exploration of additional potash resources provide for expanded development opportunities in New Brunswick. The construction of a new potash mine, the first in Canada since 1983, reflects this. In other areas of south-central and southeastern New Brunswick, incentives exist in geologically favourable areas that are potentially potash-bearing. Some areas may represent known deposit extensions, while other areas are tentatively favourable pending the collection of additional geologic information.

Selected References

Hogan, M.H. 2006. PCS Potash (New Brunswick Division), Fact Sheet 2006, 12 p.

Jasinski, S.M. 2009. Potash. *In* Mineral Commodity Summaries, United Stated Geological Survey. http://minerals.usgs.gov/minerals/pubs/commodity/potash/mcs-2009-potas.pdf (accessed March 2009).

Natural Resources Canada (NRCAN). 2008. Preliminary estimate of the mineral production of Canada, by province, 2008. http://mmsd.mms.nrcan.gc.ca/stat-stat/prod-prod/PDF/2008p.pdf (accessed March 2009).

New Brunswick Department of Finance (NBDF). 2008. Public Accounts, Volume **2**, Supplementary Information for the fiscal year ended 31 March 2008. http://www.gnb.ca/0087/pubacct/PA08v2.pdf (accessed March 2009).

New Brunswick Department of Natural Resources (NBDNR). 2009a. New Brunswick Bedrock Lexicon Database. http://www1.gnb.ca/0078/GeoscienceDatabase/Lexicon/GeoSearch-e.asp (accessed March 2009).

New Brunswick Department of Natural Resources (NBDNR). 2009b. Mineral Occurrence Database. http://dnre-mrne.gnb.ca/mineraloccurrence (accessed January 2009).

New Brunswick Department of Natural Resources (NBDNR). 2009c. Industrial Mineral Database. http://dnre-mrne.gnb.ca/industrialmineraloccurrence (under development).

New Brunswick Department of Natural Resources and Energy (NBDNRE). 1993. Industrial minerals: an important segment of New Brunswick's mineral industry. New Brunswick Department of Natural Resources and Energy; Mineral Resources Division, Miscellaneous Report No. 10, 52. p.

PotashCorp Inc. 2007a. Yesterday, today and tomorrow. Annual Report of Form 10-K for the year ended December 31, 2007. Part I, p. 4.

PotashCorp Inc. 2007b. Picadilly potash project. A presentation by B.V. Roulston at Exploration and Mining New Brunswick, 2007. New Brunswick Department of Natural Resources; Minerals, Policy and Planning Division, Fredericton, NB, November 4-7, 2007, 38p.

PotashCorp Inc. 2008. Our Facilities. http://www.potashcorp.com/about_potashcorp/operations_map/new_brunswick (accessed March 2009).

St. Peter, C. 2006. Geological relationship between the Cocagne Subbasin and Indian Mountain Deformed Zone, Maritimes Basin, New Brunswick, Canada. *In* Geological Investigations in New Brunswick for 2005. *Edited by* G.L. Martin. New Brunswick Department of Natural Resources; Minerals, Policy and Planning Division, Mineral Resource Report 2006-3, pp. 103-183.

United Nations Department of Economic and Social Affairs (UNDESA). 2007. World Population Prospects: The 2006 Revision. Press Release POP/952. http://www.un.org/News/Press/docs//2007/pop952.doc.htm (accessed March 2009).

Webb, T.C. 2009. New Brunswick Potash: a Review of Developments and Potential Exploration Alternatives. New Brunswick Department of Natural Resources; Minerals, Policy and Planning Division, Information Circular 2008-4 (CD-ROM), 21 p.

For More Information

For more information on potash and other New Brunswick mineral commodities, please see the NBDNR Mineral Occurrence Database (NBDNR 2009b) and Industrial Mineral Database (NBDNR 2009c), or contact:

mpdgs_ermpegweb@gnb.ca

Susan C. Johnson, P. Geo.
Geologist
Susan.Johnson@gnb.ca
Telephone: 506.432.2010

Geological Surveys Branch
Lands, Minerals and Petroleum Division
New Brunswick Department of Natural Resources
PO Box 6000, Fredericton, NB E3B 5H1

Recommended citation: Webb, T.C. and Smith, E.A. 2009. Potash. New Brunswick Department of Natural Resources; Minerals, Policy and Planning Division, Mineral Commodity Profile No. 4, 8 p.