ONTARIO

DEPARTMENT OF MINES

FELDSPAR IN ONTARIO

by

D. F. Hewitt

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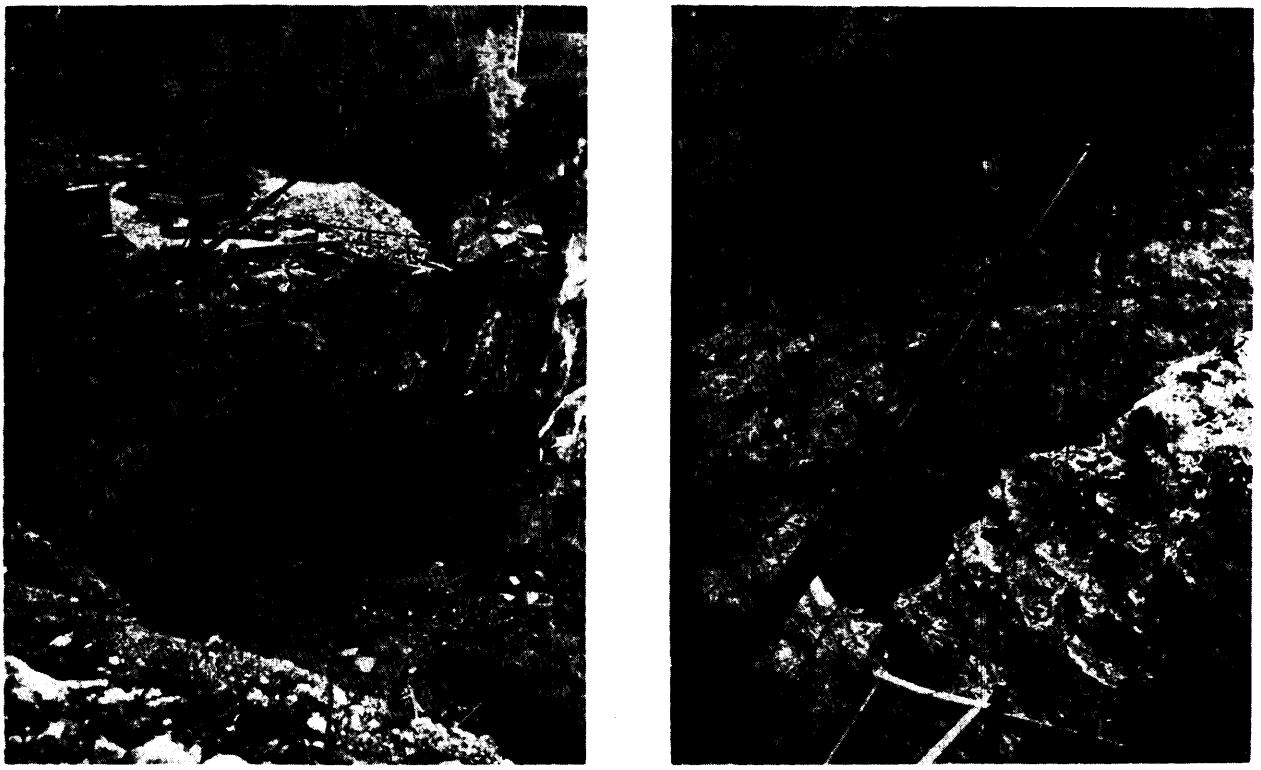

1. Hoisting feldspar trays by derrick, Richardson mine, Bedford township.

2. Loading feldspar directly into truck at Cameron and Aleck mine, Murchison township.

FELDSPAR IN ONTARIO

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INTRODUCTION

Feldspar, used in the manufacture of glass, pottery, and enamels, has been mined from Precambrian pegmatite dikes in Ontario since 1900, when the Richardson mine began production in Bedford township, Frontenac county. Over 170 feldspar mines have been opened in the past 50 years, chiefly in eastern Ontario, with quarrying centres at Verona, Perth, Hybla, Madawaska, Mattawa, Parry Sound, and Sudbury. Most of these have been small operations, but two mines in Ontario have each produced over 100,000 tons of feldspar.

In 1951 there were five feldspar mines in operation, all in eastern Ontario. The entire production is crude feldspar, which is shipped to grinding mills in the United States. Canadian requirements of ground feldspar for the glass and ceramic trade are supplied by a grinding plant at Buckingham, Quebec, drawing its crude feldspar from the mines in the Buckingham area. There is a good market for Grade 1 potash spar.

This circular gives a brief summary of feldspar in Ontario, its mode of occurrence, specifications, and uses, with mining, milling, and marketing information.

COMPOSITION AND PROPERTIES

The name "feldspar" is given to a series of important rock-forming minerals that are aluminium polysilicates of potash, soda, and lime. Commercially the most important members of the feldspar family are the "potash spars", orthoclase and microcline, and the "soda spar", albite.

Principal Types of Feldspar

(after Burgess - see bibliography)

	Orthoclase	Microcline	Albite	Anorthite
	($KAlSi_3O_8$)	($KAlSi_3O_8$)	($NaAlSi_3O_8$)	($CaAl_2Si_2O_8$)
Percentage composition:				
SiO_2	64.7	64.7	68.7	43.2
Al_2O_3	18.4	18.4	19.5	36.7
K_2O	16.9	16.9	-	-
Na_2O	-	-	11.8	-
CaO	-	-	-	20.1
Crystal system	monoclinic	triclinic	triclinic	triclinic
Specific gravity	2.56	2.56	2.60	2.76
Melting point	1200°C.	1200°C.	1110°C.	1532°C.
Usual colour	red,pink	red,pink	white,grey	grey,white

Orthoclase and Microcline

Orthoclase and microcline are both potash spars, identical in chemical composition, but differing in their crystal system, orthoclase being monoclinic, microcline, triclinic.

Potash spars found in Ontario are usually from dark brick-red to pink in colour but may be pure white, green, or grey. Feldspar has excellent cleavage, splits well in two directions, and rather

poorly in a third - all nearly at right angles to one another. The lustre is from vitreous to pearly on cleavage surfaces. Fracture is uneven. The feldspars have a hardness of from 6.0 to 6.5 and can only be scratched by a knife with difficulty. The streak is white.

Perthite

In some cases the potash spars are not pure but have very fine blades of albite feldspar intergrown through them. This type of intergrowth is called "perthite"; all the potash spar commonly produced in Ontario is of this type and therefore contains some soda. Perthite can often be recognized in hand specimen by careful examination of the cleavage surface, where thin lamellae and blades of albite can be seen intergrown in a regular network with the microcline that usually makes up the main part of the perthite.

Graphic Granite or Corduroy Spar

In places feldspar and quartz occur intimately intergrown, with small blebs and blades of from glassy white to colourless quartz distributed in a fairly regular manner through the crystals of feldspar. This intergrowth is known as "graphic granite" or "corduroy spar."

Albite

The soda spar, albite, is a white, grey, green grey, or pinkish feldspar with good cleavage in two directions and poor cleavage in a third. It is similar in physical properties to the potash feldspars but can be distinguished from them by its twinning. If one of the good cleavage surfaces is carefully examined, the twinning shows up as a series of very fine parallel lines running across the cleavage surface at right angles to the cleavage edge. These twinning lines will often show up best when the feldspar is rotated slightly in reflected light.

Anorthite

Albite, the soda feldspar, and anorthite, the lime feldspar, make up an isomorphous series known as the plagioclase feldspars. Plagioclase may range in composition from the high-soda albite member to the high-lime anorthite member. The lime plagioclases are not common in pegmatites and do not constitute a source of commercial feldspar.

GRADES, SPECIFICATIONS, AND USES

Feldspar is used chiefly in the manufacture of glass, whitewares, glazes, and enamels. The fusion point of a feldspar depends on the alkalis present and becomes lower as the percentage of potash decreases, and the percentage of soda increases. Most feldspar used in the ceramic industry fuses at cone 8 - 9, some, however, fuse as low as cone 4, or as high as cone 10.

When added to the glass batch, feldspar is primarily a source of alumina. The addition of 2 percent of alumina strengthens the glass and results in increased resistance to breakage, scratching, and a tendency to devitrify. Feldspar is also a source of alkalis and decreases the amount of soda ash required in the batch.

From 10 to 50 percent of feldspar is used in pottery bodies such as chinaware, electrical porcelains, and floor and wall tile. Feldspar is one of the most commonly used fluxes for all types of ceramic bodies. The softening range of the body and its refractoriness is increased with increased potash, at the expense of soda and lime in the feldspar used.

Soda spar is not used alone in pottery bodies because of its tendency to readily deform and cause warpage of the ware. However, a mixture of potash and soda spar yields a body whose firing behaviour varies slightly from a straight potash body. Both soda and potash spar are used in glazes, but the potash spar makes a more durable glaze.

Feldspar is also used for scouring powders and cleansers, artificial teeth, stucco dash, artificial stone, and poultry grit.

Selling Crude Feldspar in Ontario

Feldspar deposits in Ontario are operated chiefly by independent jobbers selling crude lump feldspar, hand-cobbed and sorted in the pit, in carload lots, to one of the custom grinding mills.

During 1951 there was a good demand for No.1. potash spar. This No.1 spar consists of carefully sorted pure feldspar containing less than 10 percent quartz ("glass") and free from impurities such as pyrite, hornblende, mica, chlorite, iron staining, tourmaline, and garnet. Any minerals containing iron are undesirable. The crude is shipped as lump feldspar, from 1/2 inch and bigger in size. The fines are wasted because soil and other impurities are concentrated in the fines.

No.2 spar is not so well sorted as No.1 spar and may contain more than 10 percent quartz. Iron staining and iron-bearing impurities, present in a shipment of crude feldspar, may take it out of the No.1 grade class. There is very little demand for No.2 potash spar, but the grinding mills will occasionally take a few cars, which can be ground to produce lower grades of glass and pottery material. The demand for No.1 soda spar is light and only a few carloads are produced in Ontario each year as a by-product of the mining of potash spar.

It is customary to make a trial carload shipment of crude feldspar to the grinding mill for valuation and grading. Crude feldspar is largely bought by carload sample, and it is difficult to lay down exact specifications. The ultimate test of whether a ground feldspar is suitable for glass and pottery depends on its behavious on firing. Deformation temperature, rate and range of fusion, and the colour of the fused material, are of primary importance and cannot be determined from a bulk chemical analysis of the crude. Crude feldspar is not, therefore, usually sold on the basis of chemical analysis.

Ground Feldspar

Glass-grade feldspar is primarily a source of alumina, and either soda or potash spar is generally acceptable. Glass spar is used in the granular rather than the powdered state and is usually of -20 mesh size. Chemical specifications usually require at least 17 percent alumina, 11 - 12 percent alkalis (soda plus potash), and not more than 0.1 percent iron oxides.

Pottery-grade feldspar is very finely ground, commonly 98 percent -200 mesh. High-potash spar is preferable and the following composition is common: silica, 65 - 67 percent; potash, 10.5 - 12.5 percent; soda, 1.5 - 3.0 percent; iron oxide, 0.05 - 0.10 percent. The content of free silica and iron must be low.

Ground feldspar suitable for porcelain enamels should have 99 percent -100 mesh and 95 percent -200 mesh. The chemical analysis should be within the following ranges: silica, 65 - 66.5 percent; alumina, 18.75 - 19.75 percent; potash, 12 - 13 percent; soda, 2 - 3 percent; iron oxide, less than 0.10 percent; lime, less than 0.50 percent; magnesia less than 0.10 percent. Impurities such as hornblende, garnet, biotite mica, and tourmaline should not be present, as they do not fuse but show up as black flaws in the enamelled surface.

In 1930, United States producers and consumers of feldspar adopted a commercial standard classification for feldspar. This classification, Commercial Standard, CS23 - 30, may be obtained from the Bureau of Standards, U.S. Department of Commerce, Washington, but does not apply to Canadian production.

ORIGIN AND MODE OF OCCURRENCE

Feldspars are the most common rock-forming minerals; potash and soda spar occur as major constituents of such common igneous rocks as pegmatite, granite, syenite, alaskite, aplite, granodiorite, diorite and feldspar porphyry.

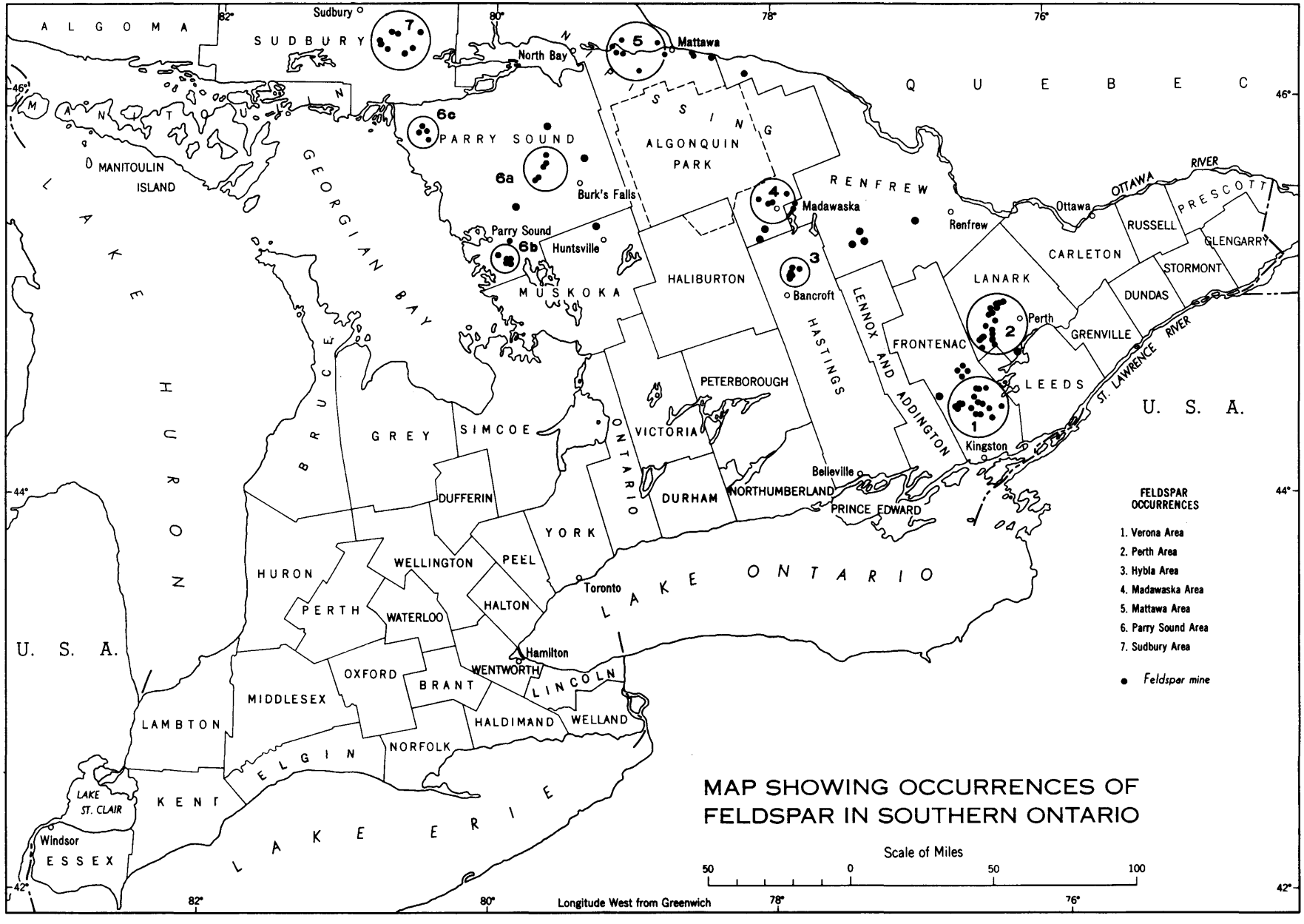
In most of these igneous rocks the feldspars are fine-grained and intimately associated with ferromagnesian minerals and quartz. Flotation is being successfully applied in the United States to separate commercial feldspar from pegmatites too small in crystal grain size to allow hand sorting.

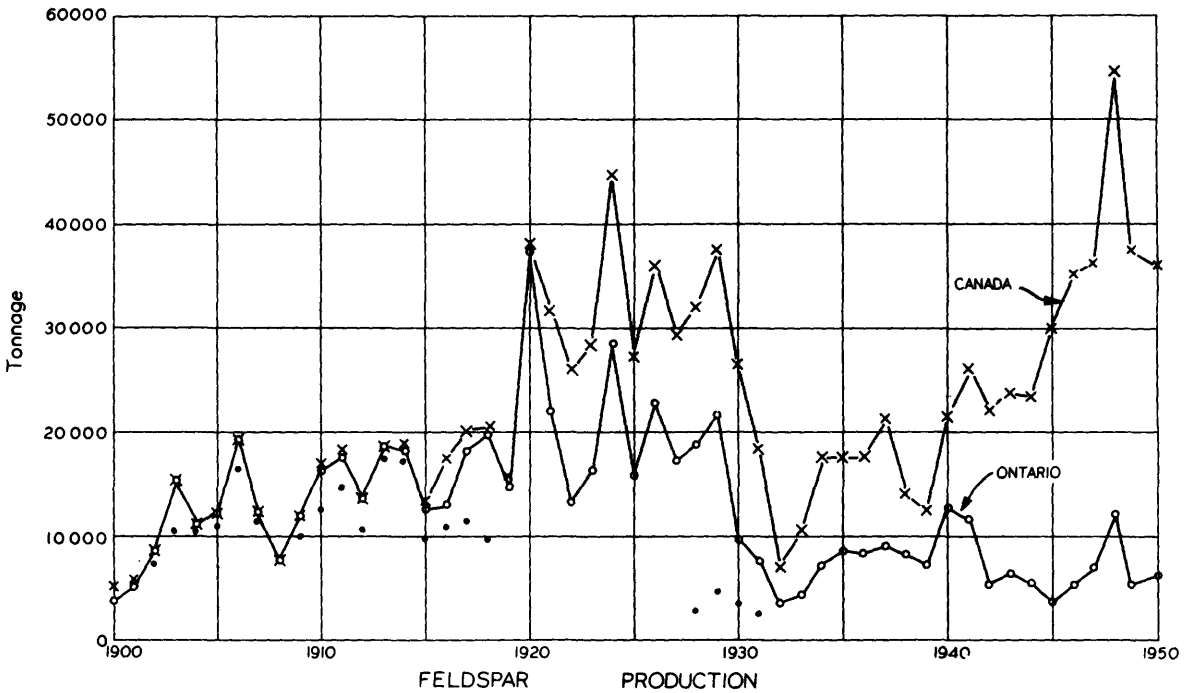
Pegmatites

Pegmatite dikes are the chief source of commercial feldspar; in Ontario they are the only source. These dikes are considered to be the offshoots of a granitic magma or molten rock mass lying at considerable depth below the earth's surface. In eastern Ontario these dikes are found cutting granite, hybrid gneiss, paragneiss, quartzite, and limestone. Some of the deposits appear to have been formed by injection of molten material along fissures and cracks in the rocks, others by the process of replacement of wall rocks.

The chief minerals of the granite pegmatites are orthoclase, microcline, perthite, plagioclase (albite), quartz, and the ferromagnesian minerals, biotite and hornblende. Muscovite mica occurs in many of the granite pegmatites. Zircon, tourmaline, pyrite, sericite, garnet, chlorite, beryl, apatite, and rare-element minerals occur as minor accessory minerals. Graphic granite or "corduroy spar" is common.

Pegmatite dikes are often extremely irregular in size and shape; many of them are of the branching type. In general, they are lenticular, tabular, or pod-shaped. Very few exceed 200 feet in width; the length may range from 100 feet for small dikes up to more than 1,000 feet. The dikes often pinch and swell and send offshoots into the surrounding country rock. Many of the commercial pegmatite dikes in eastern Ontario are vertical or nearly vertical, but flatly dipping dikes are not uncommon.


ALGOMA
SUDBURY
Sudbury
North Bay
Mattawa
QUEBEC
PARRY SOUND
ALGONQUIN PARK
RENFREW
MANITOULIN ISLAND
Burk's Falls
Madawaska
Renfrew
Ottawa
OTTAWA RIVER
PRESCOTT
RUSSELL
GLENGARRY
CARLETON
STORMONT
DUNDAS
GRENVILLE
LANARK
Parry Sound
Huntsville
Bancroft
Perth
FRONTENAC
LEEDS
ST. LAWRENCE RIVER
Kingston
Belleville
HALIBURTON
MUSKOKA
HASTINGS
LENNOX AND ADDINGTON
PETERBOROUGH
VICTORIA
DURHAM
NORTHUMBERLAND
PRINCE EDWARD
GREY
SIMCOE
BRUCE
ONTARIO
DUFFERIN
YORK
PEEL
HURON
WELLINGTON
HALTON
PERTH
WATERLOO
Toronto
Hamilton
WENTWORTH
OXFORD
BRANT
LINCOLN
MIDDLESEX
LAMBTON
HALDIMAND
WELLAND
NORFOLK
ELGIN
KENT
LAKE ST. CLAIR
Windsor
ESSEX
GEORGIAN BAY
LAKE HURON
LAKE ONTARIO
LAKE ERIE
U. S. A.
U. S. A.
FELDSPAR OCCURRENCES
1. Verona Area
2. Perth Area
3. Hybla Area
4. Madawaska Area
5. Mattawa Area
6. Parry Sound Area
7. Sudbury Area
Feldspar mine
MAP SHOWING OCCURRENCES OF FELDSPAR IN SOUTHERN ONTARIO
Scale of Miles
50 0 50 100
Longitude West from Greenwich
82° 80° 78° 76°
46° 44° 42°



Zoning

In the best commercial pegmatites the dikes have apparently cooled slowly, allowing large pure crystals of feldspar and quartz to grow. In some dikes the good feldspar and quartz may be segregated into separate zones. Occasionally single crystals will yield over 50 tons of Grade 1 feldspar. Most pegmatites have a tendency to show zoning of the mineral constituents. The central core of the pegmatite is usually quartz. The border zone, or outer shell of the pegmatite next to the country rock, is often graphic in character. Mica and plagioclase are frequently concentrated near the walls next to the border zone. The intermediate zone, between the walls and core, usually contains the large, pure, segregated crystals of feldspar, often with abundant quartz.

At the Richardson mine, Bedford township, Frontenac county, the pegmatite dike is lenticular in shape and dips steeply to the west. The workings are 500 feet long in a north-south direction, and just over 200 feet wide. At the north end of the pit, the workings are approximately 120 feet deep, The surface of the ground slopes to the south, and at the south end of the workings the pit is about 70 feet deep. In the centre of the workings there is a large mass of quartz, which forms the core of the dike. This has not been mined out, although it contains some feldspar. The potash spar in the intermediate zone around the central core has been largely mined out. This zone contains quartz, some soda spar, and hornblende. As the wall zone is approached, there is more soda spar and the pegmatite becomes graphic.

Pegmatite dikes that have cooled rapidly may have had little chance to develop a zonal character, and in some cases the entire dike may be graphic granite, an intimate intergrowth of quartz and feldspar.

Pegmatite "Provinces"

The pegmatites of one area are often all of the same age and have originated from the same source magma. For this reason they usually have certain distinctive characteristics, such as their content of rare-element minerals, the presence of minerals such as beryl or spodumene, or the prevalence of biotite mica, etc., which separate one group of pegmatites from another. Such a group of pegmatites, all genetically related, belong to a pegmatite "province." The Verona district of Frontenac county has been the centre of a particularly productive pegmatite province. Further investigations of the characteristics of these pegmatite provinces of Ontario, the zoning of the pegmatites, and their structural relations may give us information that will be of value in prospecting for further commercial pegmatites.

FELDSPAR DEPOSITS IN ONTARIO

The map on page 4 shows the seven chief feldspar producing districts in Ontario and the location of a large number of the deposits in these districts. The Verona district in Frontenac county and the Perth district in Lanark county are by far the most important, having produced 77 percent of Ontario's production.

History

Feldspar production began in Ontario in 1900 when the Richardson mine was opened in Bedford township, Frontenac county. The graph on page 5 shows the Canadian and Ontario feldspar production since 1900. From 1900 to 1920, almost the entire Canadian production came from the Verona district, with the Richardson mine being the major producer. During this period feldspar production ranged from 10,000 to 20,000 tons a year.

In the 1920's, deposits in the Perth, Hybla, Mattawa, Parry Sound, and Sudbury areas were opened, and there were a large number of small producers active in these districts. In 1920, feldspar production reached a peak of 37,224 tons, a figure not since equalled. Since 1920, when the important deposits in the Buckingham and Gatineau districts of Quebec began to produce, Quebec feldspar production has made up an increasingly important part of Canadian production.

Total Ontario production from 1900 to 1950 has amounted to 640,721 tons. Of this total amount, the Richardson mine produced 228,690 tons or 35 percent. The Bathurst mine in Bathurst township, Lanark county, a steady producer since 1926, has produced 99,450 tons or 16 percent. These two large mines have dominated the Ontario feldspar mining industry, accounting for 51 percent of the total production.

Location

The table on page 10 gives most of the feldspar deposits in Ontario, their location, the name of the operators (if known), the years of operation, approximate production figures, and references to government reports. For fuller details on specific deposits, the bibliography on page 9 of this circular should be consulted.

The production figures are from the Statistics Branch of the Ontario Department of Mines. For some of the properties, accurate figures cannot be given because, in the case of an operator working several properties, shipments from individual properties were not shown in returns to the Statistics Branch.

Feldspar deposits have been grouped, according to production on the following basis:

Group		Production	Number in Ontario
1	-	Over 100,000 tons	2
2	-	25,000 - 100,000 tons	2
3	-	10,000 - 25,000 tons	3
4	-	1,000 - 10,000 tons	39
5	-	Under 1,000 tons	83
P	-	Prospect	49
		Total	178

It will be noted only seven Ontario Feldspar mines have had a total production exceeding 10,000 tons.

Recent Feldspar Production

The following feldspar deposits have been worked in the period from 1945 to 1951, and include current (1951) producers, which are marked with an asterisk:

Frontenac County:
* Mink Lake mine; lot 1, con. XIII, Loughboro tp; operated 1949-51.
Freeman mine; lot 3, con. XIII, Loughboro tp.; operated 1950.
* Richardson mine; lot 1, con. II, Bedford tp.; operated 1947-8, 1950-51.

Hastings County:
Genesee No.2; lot 14, con. VIII, Monteagle tp.; operated 1948, 1950.
Hickey mine; lot 30, con. IX, Monteagle tp.; operated 1949.
Reeves mine; lot 6, con. XII, Monteagle tp.; operated 1945-6.

Lanark County:
* McDonald mine; lot 12, con. IX, Bathurst tp.; operated 1950-1.
* Bathurst mine; lots 15 and 16, con. VIII; Bathurst tp.; operated 1945-51.
Laurentian Feldspar; operated 1948.
Charles mine; lot 9, con. VIII, Bathurst tp.; operated 1947.

Nipissing District:
* Cameron mine; lot 22, con. VIII, Murchison tp.; operated 1945, 1950-1.
* Cameron and Aleck mine; lot 17, con. VI, Murchison tp.; operated 1949-51.
Five Mile mine; lot 17, con. VII, Dickens tp.; operated 1947-8.

Parry Sound District:
Cecebe Lake mine; lots 20-21, con. I, Chapman tp.; operated 1948.
Brignall mine; lot 7, con. X, Conger tp.; operated 1947-8.
Conger mine; lot 8, con. X, Conger tp.; operated 1946.
Besner mine, lot 5, con. B, Henvey tp.; operated 1948.

Renfrew County:
Quadeville mine; lot 30, con. XV, Lyndoch tp.; operated 1949.

Sudbury District:
Mount Pleasant mine; lot 1, con. III, Burwash tp.; operated 1949.

GRADE AND EVALUATION OF FELDSPAR DEPOSITS

Owing to the irregularities in size, shape, and mineral distribution in pegmatites, it is often difficult to determine the grade and tonnage available in a deposit. In general, the factors to be considered in evaluating a feldspar deposit concern its location and the character of the dike, and can be grouped under the following headings:

1. Location

a) Access by road
b) Proximity to rail transportation
c) Trucking and freight charges
d) Availability of experienced labour

2. Character of the Deposit

a) Size of dike: width, length, depth.
b) Attitude of dike: strike and dip
c) Shape or regularity of the dike: tendency to pinch and swell; lenticular, tabular, pod-shaped, etc.
d) Site: depth of overburden; potentialities of the site for a quarry operation
e) Mineral constituents of the Dike
i) Degree of segregation or zoning of the constituents within the dike
ii) Size, purity, and abundance of large feldspar crystals in the dike
iii) Character of the feldspar itself: colour, chemical purity, potash to soda ratio
iv) Presence of objectionable impurities and staining
v) Presence of marketable accessory minerals in the dike such as beryl, columbite, mica, etc.
vi) Spar to waste ratio, percentage of quartz and graphic granite

1. Location:

a) Access

Most feldspar deposits in eastern Ontario are located within a mile of county or township roads, and it is seldom that more than a mile of road need be built for access to feldspar prospects. It is rarely that the size or production capacity of a feldspar deposit would warrant construction and maintenance of a new mine road of over a mile in length.

b) Proximity to rail transportation
c) Trucking and freight charges

The length of truck haul from mine to rail transportation is a very important factor in evaluating operating costs. Truck costs will vary, depending on loading and unloading facilities available, road maintenance costs, time of round trip, quality of the roads, etc. In general, trucking costs are between 10 and 20 cents per ton-mile and should not normally exceed $1.00 per ton.

It is customary in eastern Ontario for the buyers of crude feldspar to pay prices for feldspar, f.o.b. cars depending on the differential in freight rates. Mines close to a custom-grinding mill may receive preferential prices.

d) Availability of experienced labour

Since the operation of a feldspar deposit requires some knowledge of mining, and since hand sorting of spar and waste in the pit requires some knowledge of feldspar in order to distinguish potash spar from soda spar, it is essential, for an efficient operation, that experienced labour be available, together with proper housing at the property, or transportation facilities.

2. Character of the deposit

a) Size of dike
b) Attitude of dike
c) Shape or regularity of dike

The largest feldspar pegmatite dike mined in Ontario is the Richardson property, in Bedford township, Frontenac county. Here the dike was mined for a length of over 500 feet, to a depth of between 100 and 150 feet. The total width of the dike, including the central core which was not mined, is 200 feet.

The pegmatite dike should have a mining face not less than 30 feet wide; smaller than this, they are not likely to prove of commercial value. Dikes are likely to have some persistence in depth; numerous mines in eastern Ontario have been worked to depths of 100 feet. The deepest workings at present are about 150 feet deep. Feldspar mining in Ontario has all been of the open-cut quarry type and the limitation of 150 feet in depth has been due to the fact that 150 feet is just about the economic limit for hoisting with a derrick rig.

Vertical dikes are much easier to work than inclined dikes: the overhang of the roof becomes a problem in working inclined dikes at depth, and a regular headframe, hoist, and inclined shaft is necessary to raise the spar and muck from deep inclined workings.

Pegmatites are notably irregular in size and shape, and it is difficult to predict whether the dike is likely to widen or narrow vertically and laterally. Diamond-drilling is valuable in determining the size and shape of the dike itself.

d) Mining site

The potentialities of the site should be carefully considered with a view to mining problems to be encountered. For open-pit mining, the overburden must be stripped off, and the surface cleaned. Dirt and soil are objectionable impurities in the product. Where the mining site is on a hill, the dike should be developed, if at all possible, by a lateral cut rather than by sinking, so that there can be truck haulage in and out of the cut from the working face. This method of mining is preferable to sinking a pit on the vein, as it does away with hoisting the ore.

e) Mineral constituents of the dike

To be of commercial value, the pegmatite minerals in the dike should show a high degree of segregation; experience has shown that dikes in which there is pronounced zoning of mineral constituents have the best commercial potentialities. Large, clean feldspar crystals, at least 5 feet in diameter, should make up 50 percent of the mineable portion of the dike. The colour of the feldspar itself is not important and is no indication of its iron content. Both white and red potash feldspars are marketable. A chemical analysis will give the potash to soda ratio of the feldspar. The percentage of quartz in the product should not exceed 10 percent. Graphic intergrowths of finely disseminated quartz within the feldspar are objectionable, as are inclusions of such minerals as hornblende, biotite, magnetite, pyrite, garnet, epidote, hematite, and tourmaline. The feldspar should be free from chlorite seams and iron staining. Iron staining is often more common near the surface of the deposit and may disappear with depth.

If such minerals as muscovite, beryl, columbite-tantalite or spodumene are present in the dike, they may be sorted out during the course of mining and provide an additional source of income.

Although there is a market for silica at 2 - 3 dollars per ton, it is not usually economically feasible to ship it to market.

If the dike runs 50 percent mineable feldspar, the recovery, or spar to waste ratio, may be 1 to 1. If the recovery falls below 1 ton spar to 2 tons waste, the mining is not likely to be economic.

MINING

In eastern Ontario, feldspar mining has been done entirely by open-cut methods. Stripping is done by bulldozer and hand shovel. Equipment necessary for mining includes a compressor, air drills, drill steel and bits, dynamite, fuse and caps.

Selective mining of the face is done as much as possible, so that one round is fired in pure feldspar, the next round in waste, etc., to cut down on sorting. After blasting, spar and waste are sorted by hand and loaded into trays, mine cars, or directly into trucks by hand shovels or large-tined forks. The use of these large-tined forks rids the spar of fines and facilitates sorting.

Where the mining face is advanced laterally along the dike on a hillside site, trucks can be driven to the working face and loaded directly. Where the mining site does not permit access to the working face by truck, the spar is loaded into trays and hoisted by derrick and hoist. Boom derrick rigs may be of wood or steel. A sump and pump is necessary in operations where there is no drainage.

At the present time, the average operator in eastern Ontario tries to produce about 100 tons a week with a crew of 10 men, averaging between 1 and 2 tons per man-day. Spar to waste ratio varies from 1 to 1 - 1 to 2.

MARKETING FELDSPAR

The price paid for No.1 crude-lump potash spar during 1951 was $10.00 per ton f.o.b. cars, for most locations in eastern Ontario. The following companies are buyers of crude feldspar:

1) Canadian Flint and Spar Company,
   512 Victoria Building, Ottawa, Ontario.
2) Shenango Potteries,
   Newcastle, Pa., U.S.A.

The Canadian Flint and Spar Company, Ottawa, is the principal current buyer of crude feldspar, for export to the associated mill of the Consolidated Feldspar Corporation, Rochester, N.Y., U.S.A.

Production

Ontario production in 1951 came from the following properties: the McDonald mine in Bathurst township and the Richardson and Mink Lake mines in Bedford township, both operated by the Canadian Flint and Spar company; the Cameron mine and the Cameron and Aleck mine in Murchison township, operated by Wallace Cameron and Leonard Aleck of Madawaska; and the Bathurst feldspar mine in Bathurst township operated by Bathurst Feldspar Mines, Limited. Total production amounted to 13,690 tons valued at $133,583.

The following table, from the Dominion Bureau of Statistics, gives production of feldspar by provinces:

Feldspar Production, 1941 - 1950

	Quebec		Ontario		Total Canada	
	Tons	$	Tons	$	Tons	$
1941	14,218	137,160	11,822	107,124	26,040	244,284
1942	16,802	164,588	5,468	49,353	22,270	213,941
1943	17,199	176,222	6,659	61,549	23,858	237,771
1944	17,842	177,271	5,667	50,361	23,509	227,632
1945	26,389	247,242	3,857	35,414	30,246	282,656
1946	29,758	330,981	5,485	53,696	35,243	384,677
1947	29,146	320,964	6,958	60,396	36,104	381,360
1948	42,800	464,926	12,051	99,511	54,851	564,437
1949	31,848	384,892	5,100	43,610	36,948	428,502
1950	29,788	378,782	5,760	49,619	35,548	428,401

Consumption of Feldspar

Figures from the Dominion Bureau of Statistics on the consumption of ground feldspar are as follows:

Consumption of Ground Feldspar, 1947 - 1950

	1947	1948	1949	1950
Uses	Tons	Tons	Tons	Tons
Glass	3,267	2,744	2,902	4,286
Scouring powders	4,058	3,817	3,164	2,831
Abrasives	23	42	15	9
Clay products (pottery, tile, insulators, etc.)	6,975	8,443	7,111	6,911
Enamelling	1,690	1,815	1,966	1,849
	16,013	16,861	15,158	15,886
Provinces				
Quebec	7,289	6,846	7,227	8,921
Ontario	7,804	8,853	7,503	5,868
Alberta	920	1,162	428	1,097
	16,013	16,861	15,158	15,886

Exports and Imports of Feldspar

A large percentage of Canadian feldspar production is exported, chiefly to the United States:

Exports and Imports, 1948 - 1950

	1948		1949		1950	
	Tons	Value	Tons	Value	Tons	Value
Imports:						
Crude feldspar	11	$ 309	1	$ 31	2	$ 59
Ground feldspar	196	4,331	227	4,524	142	3,643
Exports	31,467	223,945	17,570	111,915	15,465	112,757

BIBLIOGRAPHY

Ontario Occurrences

Harding, W.D., "Geology of the Olden-Bedford Area," Ont. Dept. Mines, Vol. LVI, 1947, pt.6.

Satterly, J. (1), "Mineral Occurrences in Parry Sound District," Ont. Dept. Mines, Vol. LI, 1942, pt.2.

Satterly, J. (2), "Mineral Occurrences in the Haliburton Area," Ont. Dept. Mines, Vol. LII, 1943, pt.2.

Satterly, J. (3), "Mineral Occurrences in the Renfrew Area," Ont. Dept. Mines, Vol.LIII, 1944, pt.3.

Spence, H.S., "Feldspar," Mines Branch, Dept. Mines, Ottawa, Rept. No.731, 1932.

Thomson, J.E., "Mineral Occurrences in the North Hastings Area," Ont. Dept. Mines, Vol. LII, 1943, pt.3.

General References

Burgess, B.C., "Feldspar" in "Industrial Minerals and Rocks," Amer. Inst. of Min. and Met. Engineers, 2nd. ed., New York, 1949, chap. 15, pp.345 - 373.

Cameron, E.N. and Others, "Internal Structure of Granitic Pegmatites," Econ. Geol., Monograph No.2, 1949.

FELDSPAR DEPOSITS IN ONTARIO

County or District	Township	Location	Name of Mine	Operators	Years of Operation	Approximate Production	Gp.	References (see bibliography)
Carleton	Huntley	Lot 21, con. 2			1901	Prospect	P	Spence, p. 82
	March	Lot 6, con. 2 and 3		O'Brien and Fowler	1919-21	2,538 tons	4	
Frontenac	Bedford	Lot 1, con. 2	Richardson	Kingston Feldspar and Mining Co.	1900-18,	228,690 tons	1	Harding, p.50-51
				Genesee Feldspar Corp.	1928-31, 1941			
				Canadian Flint and Spar Co.	1947-48			
		Lot 3, con. 2		E. Martin	1924	38 tons	5	
		Lot 30, con. 2	Robinson	T. Craig	1927-30	Prospect	P	Harding, p. 51
		Lot 2, con. 3	Hoppins	International Feldspar Co., Ltd.	1919-20	1,940 tons	4	Harding, p. 52
		Lot 3, con. 3	Jenkins or Harris	C. Jenkins	1902-05	2,884 tons	4	Harding, p. 52
		Lot 25, con. 3	Federal	Federal Feldspar Co.	1920-21	4,420 tons	4	Harding, p. 52
		Lot 27, con. 3	Steele	Gardner Feldspar Co.	1920	Small	5	Harding, p. 53
		Lot 32, con. 3		J. M. Stoness	1915-16	3 cars	5	Harding, p. 54
		Lot 4, con. 4		Dick Wilson		Small	5	Harding, p. 54
		Lot 5, con. 4	Wilson	E. M. Chisholm	1904, 1918	300 tons	5	Harding, p. 54
		Lot 28, con. 4	Kennedy	W. Kennedy		Prospect	P	Harding, p. 55
		Lot 28, con. 5	Bobs Lake	Dominion Feldspars, Ltd.	1919	145 tons	5	Harding, p. 55
		Lot 34, con. 5	Patterson	Stoness and Kent		Prospect	P	Harding, p. 55
		Lot 10, con. 7	Noonan	L. E. Austin; G. Hurlburt	1915-18	Small	5	Harding, p. 55
		Lot 17, con. 8		A. Botting		Prospect	P	Harding, p. 56
	Hinchinbrooke	Lot 4, con. 3		A. Kenehan	1915?	Small	5	Harding, p. 48
		Lot 20, con. 4	York		1920	Prospect	P	Harding, p. 49
		Lot 19, con. 7	Cronk		1918-22	Prospect	P	Harding, p. 49
		Lot 3, con. 10		Eureka Flint and Spar Co.	1920	Small	5	Harding, p. 49
		Lot 6, con. 12	Dwyer	P. Dwyer		Prospect	P	Harding, p. 49
	Loughborough	Lot 11, con. 9		O'Brien and Fowler, S. Orser	1920, 1921	1,250 tons	4	Spence, p. 39
		Lots 1, 2, con. 10		T. H. Craig	1926	Small	5	Spence, p. 83
		Lot 1, con. 11		Gardner Feldspar Co.	1920-22, 1925	2,080 tons	4	Spence, p. 39
		Lot 9, con. 11		S. Orser	1921	100 tons	5	Spence, p. 39
		Lots 1, 2, con. 12	Freeman or Imperial	Verona Mining Co.; Dillon and Mills;	1902-3,			
				Feldspar Quarries, Ltd.; T. H. Craig	1922-26	9,660 tons	4	Spence, p. 39
		Lot 3, con. 12		Cronk and Van Luven	1925	500 tons	5	Spence, p. 39
		Lot 5, con. 12	Reynolds		1913-14	8,000 tons	4	
		Lot 1, con. 13	Mink Lake	Verona Quarries, Ltd.; Can. Flint and Spar Co.	1925-29, 1949-50	14,000 tons	3	Spence, p. 40
	Olden	Lot 17, con. 11		MacPherson and Bragg	1920	Prospect	P	Harding, p. 48
	Oso	Lot 10, con. 5		Mills and Cunningham	1904	Prospect	P	Harding, p. 48
	Portland	Lots 1, 2, con. 10	Walker	Pennsylvania Feldspar Co.	1902-3	Small	5	
		Lot 3, con. 10	Burnham	T. H. Craig	1922-25	1,500 tons	4	Spence, p. 39
		Lot 16, con. 10		Feldspar Quarries, Ltd.	1915-19	6,000 tons	4	Spence, p. 40
		W½ Lot 16, con. 11		Eureka Flint and Spar Co.	1915, 1917-21	25,099 tons	2	Spence, p. 40
		E½ Lot 16, con. 11	Card		1917-18, 1920	384 tons	5	Spence, p. 40
		Lot 17, con. 11		Feldspar Quarries, Ltd.	1920-21	Small	5	Spence, p. 40
		Lots 18, 19, con. 11	Bellrock		1907, 1927	600 tons	5	
		Lots 3, 4, con. 12	Huffman		1911, 1919-20			
		Lots 5, 6, con. 12	Gamey		1902, 1906-7, 1910, 1920	6,000 tons	4	
		Lot 11, con. 12			1911, 1914	Small	5	
		Lot 15, con. 13			1913	Few Tons	5	
	Storrington	Lots, 7, 8, 9, con. 13	Rock Lake	Coon and Walton; Storrington Feld Co.	1921-26	2,500 tons	4	Spence, p. 40
Haliburton	Cardiff	Lot 9, con. 12		Canada Radium Mines Ltd.		Prospect	P	Satterly (2), p. 28
	Glamorgan	Lot 31, con. 6		P. J. Dwyer	1918	1 car	5	Satterly (2), p. 29
		Lot 32, con. 6				Prospect	P	Satterly (2), p. 29
		Lot 21, con. 21	Pickens	North American Feldspar Ltd.	1920-21	1,033 tons	4	
	Monmouth	Lot 22, con. 6			1920	990 tons	5	
		Lot 26, con. 11		Ontario Feldspar Ltd.	1922	Prospect	P	Satterly (2), p. 30
		Lot 30, con. 15	Holmes	Industrial Minerals Corp. of Canada	1921-22, 1924-6	534 tons	5	Satterly (2), p. 30
Hastings	Dungannon	Lot 24, con. 9	Tait			Prospect	P	Thomson, p. 24
	Faraday	Lot 6, con. 12		W. Morrison; Dillon and Mills	1920-22	Small	5	Thomson, p. 24
		Lots 8, 9, 10, con. 12	Woods	W. A. Woods	1940, 1942	90 tons	5	
		Lot 31, con. 15			1944	178 tons	5	
	McClure	Lot 14, con. 12	Gunter		1930	Prospect	P	Thomson, p. 25
	Monteagle	Lot 20, con. 6	Plunkett	American Molybdenite Co., S. Orser	1921, 1927	2 cars	5	Thomson, p. 25
		Lots 21, 22, con. 6	Watson	P. J. Dwyer; Consolidated Feld Co.	1919-26, 1932	528 tons	5	Thomson p. 25
		Lot 23, con. 6		Dillon and Mills	1920	1,000 tons	5	

FELDSPAR DEPOSITS IN ONTARIO (CONTINUED)

County or District	Township	Location	Name of Mine	Operators	Years of Operation	Approximate Production	Gp.	References (see bibliography)
Hastings (cont.)	Monteagle (cont.)	N½ Lot, 24, con. 6	McCormick	P. J. Dwyer	1926	Prospect	P	Thomson, p. 25
		S½ Lot 24, con. 6		Dillon and Mills; P. J. Dwyer	1920, 1926	150 tons	5	Thomson, p. 26
		W½ Lot 11, con. 7	Thompson	Feldspar Mines Corp.	1923-25, 1927	2,715 tons	4	Thomson, p. 26
		Lots 18, 19, con. 7	Macdonald	Verona Mining Co., Genesee Feld. Co.	1919-1935	35,048 tons	2	Thomson, p. 26
		Lot 20, con. 7		Dillon and Mills; P. J. Dwyer	1920-24	2 cars	5	Thomson, p. 27
		Lot 12, con. 8			1926	Prospect	P	
		Lot 13, con. 8	Taylor	P. J. Dwyer	1925-26	1 car	5	Thomson, p. 27
		Lot 14, con. 8	Genesee No. 2	Genesee Feldspar Co., D. Vardy, W. Jessup	1926-31, 1948-50	2,846 tons	4	Thomson, p. 28
		Lot 15, con. 8		P. J. Dwyer	1926	Prospect	P	Thomson, p. 29
		Lots 16, 17, con. 8	Woodcox	Feldspar Mines Corp.	1922-23	4,087 tons	4	Thomson, p. 29
		Lot 13, con. 9		Genesee Feldspar Co.	1924	2 cars	5	Thomson, p. 29
		Lot 6, con. 12	Reeves	Bancroft Feldspar Co.	1945-46	1,162 tons	4	
		S½ Lot 30, con. 9	Hickey	W. Jessup	1949	166 tons	5	
Kenora	Lake of the Woods	Falcon Is.		Winnipeg Roofing Co.	1926-27	Few hundred tons	5	
Lanark	Bathurst	Lot 1, con. 1	Mendels		1918	312 tons	5	
		Lot 1, con. 2	O'Halloran	Feldspar Quarries, Ltd.	1920-21	Few cars	5	Spence, p. 41
		Lot 2, con. 3	Burns	S. Orser	1920-22	Small	5	Spence, p. 41
		Lot 5, con. 3	Palmer	Orser-Kraft Feldspar Ltd.	1922	Prospect	P	
		Lot 4, con. 4		S. Orser	1921-22	Small	5	
		Lot 10, con. 6	Truelove	Rock Products Co.	1920	618 tons	5	
		Lots 3, 4, con. 7	Kirkham	R. McConnell	1919-21	3,140 tons	4	
		Lot 9, con. 8	Charles	S. Orser, National Feldspar, T. Craig	1928-29, 1943, 1947	974 tons	5	
		Lot 12, con. 8	Foster	Feldspar Quarries, Ltd.	1929			
		Lots 15, 16, con. 8	Bathurst	Bathurst Feldspar Mines Ltd.	1926-1950	99,450 tons	1	
		E½ Lot 16, con. 8	Bowes	Feldspar Quarries, Ltd.; T. Craig	1929-30, 1944, 1950			
		W½ Lot 12, con. 9	McDonald	T. H. Craig; Can. Flint and Spar Co.	1928-1938, 1940-41, 1950	23,872 tons	3	
		Lot 16, con. 9	Furlong	Feldspar Quarries, Ltd.	1929-30	1,238	4	
		Lot 18, con. 9	Noonan	Rock Products Ltd.	1921	Few cars	5	
		E½ Lot 19, con. 9		Perth Feldspar and Mining Co.	1922-23	2,000 tons	4	
		N½ Lots 20, 21, con. 9	Keays	Rock Products Co.	1921-24, 1925-27	20,841 tons	3	
		S½ Lots 20, 21, con. 9	Perth	Gleason-Campbell Quarries	1922-26	4,685 tons	4	
		Lot 22, con. 9		W. Ennis	1922	Prospect	P	
	N. Burgess	E½ Lot 13, con. 5	Silver Queen	E. Smith	1911-14	2,990 tons	4	
	S. Sherbrooke	Lot 10, con. 4	Morrow	R. McConnell	1919-20	Small	5	
		Lots 12, 13, con. 5 and 6		S. Orser	1916-23	2,836 tons	4	
		Lot 15, con. 6	Patterson	Universal Silicates, Provincial Feld.	1920	100 tons	5	
		Lot 17, con. 6		S. Orser	1916	Prospect	P	
		Lot 11, con. 8	Munroe	J. H. Mendels	1920	Small	5	
Muskoka	Brunel	Lot 16, con. 14				Prospect	P	
	Chaffey	Lot 23, con. 5		International Ceramic Mining Co.		Prospect	P	
		Lot 13, con. 10				Prospect	P	Satterly, (1), p. 61
	Macaulay				1916	18 tons	5	
	Stephenson	Lots 26, 27, con. 2		S. W. Hall	1915	1 car	5	Satterly, (2), p. 30
		Lot 24, con. 14		F. C. Hammond and A. McKay	1941	Prospect	P	Satterly, (2), p. 31
Nipissing	Calvin	Lot 9, con. 1		Mattawa Feldspar Co.	1926-27	250 tons	5	Spence, p. 49
		Lot 14, con. 7		G. Purdy	1926-27	1,000 tons	5	Spence, p. 49, 51
		Lot 22, con. 8		O'Brien and Fowler	1925-26	250 tons	5	Spence, p. 51
		Lot 16, con. 9		O'Brien and Fowler	1926	Prospect	P	Spence, p. 51
		Lot 21, con. 9		Harcourt and Patterson	1925	Prospect	P	Spence, p. 51
		Lots 22, 23, con. 9 and 10		O'Brien and Fowler	1925-26	Prospect	P	Spence, p. 51
	Cameron	Lot 4, con. A		Turcotte	1927	1 car	5	Spence, p. 51
		Lot 31, con. A		J. Norreno	1925	200 tons	5	Spence p. 51
		Lot 7, con. B				Prospect	P	
		Lot 30, con. B		Turcotte	1927	2 cars	5	Spence, p. 51-2

FELDSPAR DEPOSITS IN ONTARIO (CONTINUED)

County or District	Township	Location	Name of Mine	Operators	Years of Operation	Approximate Production	Gp.	References (see bibliography)
Nipissing (cont.)	Dickens	Lot 19, con. 1	Lake	W. B. Cameron			5	
		Lot 14, con. 3		Can. Non-Metallic Minerals' Ltd.	1922-23	500 tons	5	Spence, p. 52
		Lot 27, con. 5		Can. Flint and Spar Co.	1943		5	Satterly (3), p. 122
		Lot 17, con. 7	Five Mile	Keystone Contractors	1947-8	5,116 tons	4	
	Mattawan	Lot 6, con. 2	Purdy	Purdy Mica Mines, Ltd.	1943	197 tons	5	
		Lot 29, con. 3		O'Brien and Fowler	1926	3,084 tons	4	Spence, p. 52
	Murchison	Lot 11, con. 4		J. A. Cameron	1924	18 tons	5	
		Lots 14, 15, con. 4	J. G. Gole	J. G. Gole, D. L. Ross	1937-44	9,643 tons	4	Satterly, (3), p. 120
		Lot 13, con. 5			1943	51 tons	5	
		Lot 22, con. 8	Cameron	W. B. Cameron, Keystone, Bowser Bros.	1940-45, 1950	6,027 tons	4	Satterly, (3), p. 121
		Lot 17, con. 6	Cameron and Aleck	Cameron and Aleck	1949-1950	1,789 tons	4	
	Papineau	Lot 10, con. 9			1925	Few cars	5	
		Lot 18, con. 10		Morin and Neault	1926	250 tons	5	Spence, p. 52
	Sabine	Lots 28, 29, con. 1		Mahoney and Morin	1924-5	200 tons	5	Spence, p. 53
		Lots 26, 27, con. 8		Prince and Prince	1936-39	228 tons	5	
		Lot 27, Hastings Road, W.	Gunter	J. Gunter	1934-37	2,428 tons	4	Spence, p. 53
Parry Sound	Burton	Lot 37, con. 14		Magnetawan Feld. Syndicate	1940-41, 1943	46 tons	5	
	Chapman	Lot 20, con. 1		Burks Falls Feldspar Syndicate, Ltd. J. Bell	1948	2 cars	5	
		Lot 13, con. 2		W. E. Brandt	1949	Prospect	P	
		Lot 26, con. 2		Wheeling Feldspar Co.	1920, 1922-3	868 tons	5	Satterly, (1), p. 56
		Lot 18, con. 4	Hungry Lake	T. B. Tough	1941	Prospect	P	Satterly, (1), p. 56
		Lot 10, con. 8			1942	Prospect	P	
	Christie	Lot 27, con. 6		Industrial Minerals Corp.	1923-24	200 tons	5	Satterly, (1), p. 56
	Conger	Lot 5, con. 8		Standard Feldspar and Silica Co.	1911-12	Prospect	P	Satterly, (1), p. 56
		Lot 4, con. 9		Ojaipee Silica-Feldspar, Ltd.	1910-12	3,890 tons	4	Satterly, (1), p. 57
		Lot 10, con. 9	McQuire	McQuire and Robinson	1925	618 tons	5	Satterly, (1), p. 57
		Lot 7, con. 10	Brignall	McQuire and Robinson	1923-5	4,239	4	Satterly, (1), p. 57
		N½ Lot 6, con. 10		Conger Feldspar Mining Co.	1945	1,000 tons	5	
		Lot 8, con. 10		Conger Feldspar Mining Co.	1946	417 tons	5	
	Foley	Lot 10, con. 3				Prospect	P	Satterly, (1), p. 57
	Harrison	Lots 38, 39, con. 13			1927	Prospect	P	
	Henvey	Lot 3, con. A	Ambeau	Wanup Feldspar Mines, Ltd.	1926-27	1,000 tons	5	Satterly, (1), p. 58
		Lot 5, con. B	Besner	Wanup Feldspar Mines, Ltd.	1926-29	2,500 tons	4	Satterly, (1), p. 58
		Lots 5, 6, con. 4			1929-30	Prospect	P	
	Lount	Lot 3, con. 5			1941	Prospect	P	
	McConkey	Lot 11, con. 2				Prospect	P	Satterly, (1), p. 58
		Lot 20, con. 5				Prospect	P	Satterly, (1), p. 58
		Lot 22, con. 5			1940	Prospect	P	Satterly, (1), p. 59
		Lot 17, con. 6				Prospect	P	Satterly, (1), p. 59
	McDougall	Lot 5, con. 10			1926	Prospect	P	Satterly, (1), p. 59
		Lot 3, con. 11				Prospect	P	Satterly, (1), p. 59
	McKellar	Lot 4, con. 6		C. F. McQuire	1937-38	600 tons	5	Satterly, (1), p. 60
	Machar	Lot 30, con. 6			1942	Prospect	P	
	Nipissing	Lot 30, con. 10		Holden and Waltenbury	1941	Prospect	P	Satterly, (1), p. 60
	Ryerson	Lot 18, con. 13		T. B. Tough	1941	190 tons	5	Satterly, (1), p. 60
	Strong	Lot 19, con. 1			1942	Prospect	P	
		Lot 19, con. 3				Prospect	P	
	Wallbridge	Mill Site A			1930	Few cars	5	
Renfrew	Brudenell	Lots 22, 23, con. 2		T. H. Craig	1942	30 tons	5	Satterly, (3), p. 37
	Clara	Lot 28, con. 6			1924	1 car	5	
	Fraser	N½ Lot 24, con. 16		W. J. Barr	1934-6	1,107 tons	4	Satterly, (3), p. 37
		S½ Lot 24, con. 16		J. Collins		Prospect	P	Satterly, (3), p. 38
	Grattan	Lot 22, con. 8	Keyfortmore	G. Colautti	1943	1,174 tons	4	Satterly, (3), p. 38
	Head	Lot 14, A, Carey			1924-28	3,000 tons	4	
	Jones	Lot 10, con. 11		Raymond and Sawyer	1937	121 tons	5	Satterly, (3), p. 39
		Lot 117, range B, N. Opeongo Road		G. Colautti	1942	260 tons	5	Satterly, (3), p. 39
	Lyndoch	Lot 30, con. 15		Renfrew Minerals, Can. Beryllium Mines and Alloys, Ltd.	1935-36, 1949	675 tons	5	Satterly, (3), p. 39
	South Algona	Lot 19, con. 9		A. Lauzon	1922	Prospect	P	Satterly, (3), p. 39

FELDSPAR DEPOSITS IN ONTARIO (CONTINUED)

County or District	Township	Location	Name of Mine	Operators	Years of Operation	Approximate Production	Gp.	References (see bibliography)
Sudbury	Awrey	Lot 6, con. 5		Donnen Feldspar Co.	1923-4	Few cars	5	Spence, p. 57
	Burwash	Lot 1, con. 3	Mt. Pleasant	S. Charrette	1928, 1934-37, 1949	555 tons	5	Spence, p. 57
	Cleland	Lot 12, con. 2			1928	1 car	5	
		Lots 11, 12, con. 4		Weisman Feldspar Co.	1922-24	20 cars	5	Spence, p. 59
	Davis	Lot 1, con. 1		Wanup Feldspar Mines, Ltd.	1924-5	600 tons	5	Spence, p. 59
	Dill	Lot 2, con. 2		Northern Feldspar Mines, Ltd.	1924-5	800 tons	5	Spence, p. 59
		Lot 2, con. 3		Wanup Feldspar Mines, Ltd.	1925-28	9,914 tons	4	Spence, p. 59
		Lot 1, 2, con. 3 and 4	Elizabeth	Elizabeth Feldspar Mines, Ltd.	1925-26	5,090 tons	4	Spence, p. 60
	Dryden	Lot 9, con. 2		Industrial Minerals Corp.	1922-25	5,985 tons	4	Spence, p. 60
	Hagar	Lot 9, con. 4		Donnen Feldspar Co.	1918	1 car	5	
	Hawley	Lot 6, con. 2		Can. Flint and Spar Co.	1947-8	150 tons stockpiled	5	
	Loughrin	Lot 13, con. 6		Industrial Minerals Corp.	1923-24, 1926-27	8,000 tons	4	Spence, p. 61
	Ratter	Lot 1, con. 2		Consolidated Feldspar, Ltd.	1926-28	905 tons	5	Spence, p. 61