

### Overview

Using maps and online resources students will determine if potash occurs in the ground below their school; what potash mines are in their area; and what mining method is used to extract the potash.

**Duration:** One class

#### Materials:

- Is There Potash Under My Feet Student Map Activity and Questions
- Mineral Resource Map of Saskatchewan Student Map (separate file)
- SMA Dig Deeper online map
- [Saskatchewan Energy and Mines Minerals Resource Map \(SMA website\)](#)
- Saskatchewan Energy and Mines Mineral Resource Map Paper Copy (see Resources)

#### Note to Teacher:

The Saskatchewan Energy and Mines Mineral Resource Map is available on-line as well as in paper copy. It has separated the carnallite (potassium-magnesium chlorite) region (hot pink) from the rest of the potash region. For the purposes of this lesson it is considered as part of the potash region.

#### Instructional Methods:

- Guided inquiry
- Individual learning



#### Prior Knowledge:

- What is potash?

#### Learning Outcomes and Indicators

**RM 4.1 Investigate physical properties of rocks and minerals, including those found in their local environment.**

- b) Document the locations and characteristics of rocks that exist in their local environment.

**RM 4.2 Assess how human uses of rocks and minerals impact self, society and the environment.**

- f) Identify locations where potash is extracted in Saskatchewan.

Source: [Saskatchewan Evergreen Curriculum](#)

#### Other:

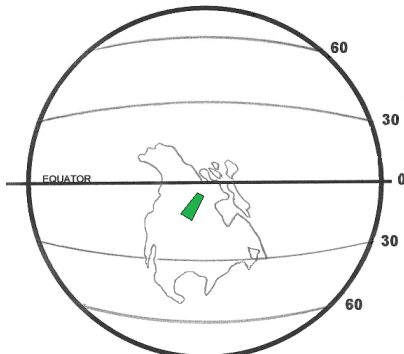
Students will identify how the potash in their area is extracted.

#### Big Picture Questions

1. Where does Potash occur in Saskatchewan?
2. Where are Saskatchewan's potash mines?
3. What method is used to extract potash?

### Background Information

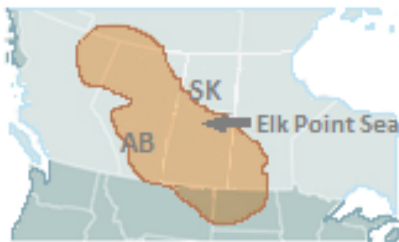
Around 380 million years ago Saskatchewan was located south of the equator.



**Devonian**

(Modified from Storer, J., 1989)

A large salt water sea covered Saskatchewan stretching from the Arctic to the Gulf of Mexico. It was a tropical time with coral reefs forming.



Modified from Globe and Mail, Friday, Nov. 05, 2010

Over time the coral reefs occurring to the west and north of the Elk Point Sea grew and blocked the flow of water from the open ocean to the north. The sea became restricted with little to no influx into the deeper parts of the sea basin (the southern part of Saskatchewan). The warm, dry climate at the time evaporated the water. Concentrations of mineral salts increased until crystal layers began to form on the sea floor, similar to how salt or sugar crystals form in a glass when a saturated solution evaporates (Storer, J., 1989). The evaporites, which include Saskatchewan's potash deposits, formed for over 2 million years until normal circulation of the sea water returned as did sea life. No fossils are found in the Prairie Evaporite unit. It is thought that animals and plants could not live in the sea at that time due to the high salinity (Storer, J., 1989).

The potash deposits occur diagonally across the southern plains of Saskatchewan. They gently slope to the south from a 1,000metre depth along a north-west line through Rocanville, Esterhazy and Saskatoon to more

than a 1,600 metre depth at Belle Plaine and up to 3,000 metres depth in North-eastern Montana and North Dakota (see Mineral Resource Map of Saskatchewan).

In Saskatchewan, potash is extracted from the deep underground deposits (generally 1000 m or 1 km deep) using either conventional (underground tunnels and mining machines) or solution mining (brine is pumped down wells into the potash unit, dissolved and pumped back up to the surface) methods.

A band 40 – 48 km wide at the shallow northern edge of the deposit can be mined by conventional underground methods. At depths greater than 1,000 m in the south solution mining is more economical and safer.

In 2010 there were 10 potash mines in Saskatchewan; two are solution mines, and the remaining 8 are conventional underground mines that use machines to mine the ore.

The largest potash solution mine in the world is located at Belle Plaine, Saskatchewan. It took years of research to develop the solution mining system currently used.

### Vocabulary

Conventional mining	ore
potash	Solution mining

### THE ACTIVITY

#### Is There Potash Under My Feet?

(Modeling, Inquiry) (30 min.)

#### Motivational Set: (5 min.)

Inform students that around 380 million years ago there was a large salt water sea covering Saskatchewan. At that time Saskatchewan was located in the tropics. The hot climate caused the water to evaporate resulting in the growth of the salt minerals which settled in the deepest parts of the bottom of the sea. The layers of salt minerals formed the Prairie Evaporite Unit where Saskatchewan's potash is found.

#### Part A (15 minutes dependent upon online research or use of paper copy of map)

1. Have students look at the Mineral Resource Map of Saskatchewan. This can be done either using a paper

## Grade 4: Rocks, Fossils, Erosion: Is There Potash Under My Feet? continued

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copy or by going on-line to the [Saskatchewan Mining Association site](#).

2. Have students find the legend and locate the potash and salt resource area. Colour the location of the potash deposits on their **Mineral Resource Map of Saskatchewan**. Outlines of the resource potential areas have been put on the map for guidance.

*Students will have to be told that it is alright to colour over the oil and gas pools. Oil and gas deposits occur in the same area as potash in the west and south east of the province. They occur in rocks that are both deeper and shallower than the potash.*

3. Have the students locate where they live on the map.

### Part B (15 minutes)

1. Have students do the **Is There Potash Under My Feet Activity Sheet**.

### Assessment Method and Evidence:

- ✓ Minerals Resource Map of Saskatchewan Map Activity
  - Using mineral resource maps of Saskatchewan students will learn where potash deposits occur and will colour in the corresponding area on their own resource maps.
- ✓ Discussion questions:
  - Students will identify Saskatchewan's potash mines, mines in their area, and how the potash in their area is or could possibly be mined in the future.

### Summary

Using online maps available at the Ministry of Energy and Mines and the Saskatchewan Mining Association sites or using paper copies of the map, students were able to locate where potash deposits and mines are located in Saskatchewan, if potash occurs under their community and the method used to mine the potash in their area.

### Resources

Agrium Website:  
<http://www.agrium.com/sustainability/education.jsp>

Globe and Mail, (Nov. 05, 2010): Riches under the prairie: Where potash comes from. Available at:

<http://www.theglobeandmail.com/globeinvestor/potash/riches-under-the-prairie-wherepotash-comes-from/article1788180/>

Halabura, S.P., Piche, L.M., Gebhardt, E., Soroka, T., (2010): Abstract: Exploration Stage Mineral Resource Estimation of Potash Deposits: A Status Report. Solution Mining Research Institute Fall 2010 Technical Conference. Leipzig Germany. Available at:  
<http://www.northrim.sk.ca/pdf/SMRI%20MR%20Estimation%20Status%20Report%20Poster.pdf>

MacKenzie, J. (2003): Nourishing the Crops of the World: Saskatchewan's Potash Industry; Western Development Museum. Available at:  
<http://wdm.ca/skteacherguide/WDMResearch/Nourishing%20the%20Crops%20of%20the%20World%20-%20Saskatchewan's%20Potash%20Industry%20by%20Janet%20MacKenzie.pdf>

Mining and milling processes used at the PotashCorp mines.  
[http://www.potashcorp.com/media/POT\\_Mini\\_Mine\\_Tour\\_brochure.pdf](http://www.potashcorp.com/media/POT_Mini_Mine_Tour_brochure.pdf)

Mosaic Potash Company Website:  
<http://www.mosaicco.com>

Mosaic Potash Company PowerPoint BellePlaine LINK Potash Corporation of Saskatchewan Website:  
<http://www.potashcorp.com/>

Saskatchewan Energy and Mines Mineral Resource Map. Available at:  
<http://www.er.gov.sk.ca/adx/asp/adxGetMedia.aspx?DocID=5145,4477,3440,3385,5460,2936,Documents&MediaID=31999&Filename=MINRESMap2010.pdf>  
Or purchased at:  
Energy and Resources.  
300 - 2103 11th Avenue and 200 - 2101 Scarth Street  
Regina, SK  
S4P3Z8, Canada  
Tel. (306) 787-2528  
Web Site. <http://www.er.gov.sk.ca/>  
Available as 8.5 x 11 and 31 x 48 maps.  
Mineral posters (free). Available at:  
<http://www.er.gov.sk.ca/Default.aspx?DN=07781866-0b2e-4798-8022-a085766aac4b>

Saskatchewan Mining Association Website:  
<http://www.saskmining.ca>

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Saskatchewan Potash Interpretive Centre:  
<http://www.potashinterpretivecentre.com/index2.htm>

### Book/Report Resources:

Fuzesy, A. (1981): *Potash in Saskatchewan*;  
Saskatchewan Energy and Mines Report No.181, 44p.

Holter, M.E. (1969): *The Middle Devonian Prairie  
Evaporite of Saskatchewan*; Department of Mineral  
Resources-Geological Sciences Branch-Industrial  
Minerals Division-Province of Saskatchewan; Report  
No.123, 134p.

Storer, J. (1989 ): *Geological History of Saskatchewan*;  
Royal Saskatchewan Museum, Regina SK. 90p.

## Vocabulary

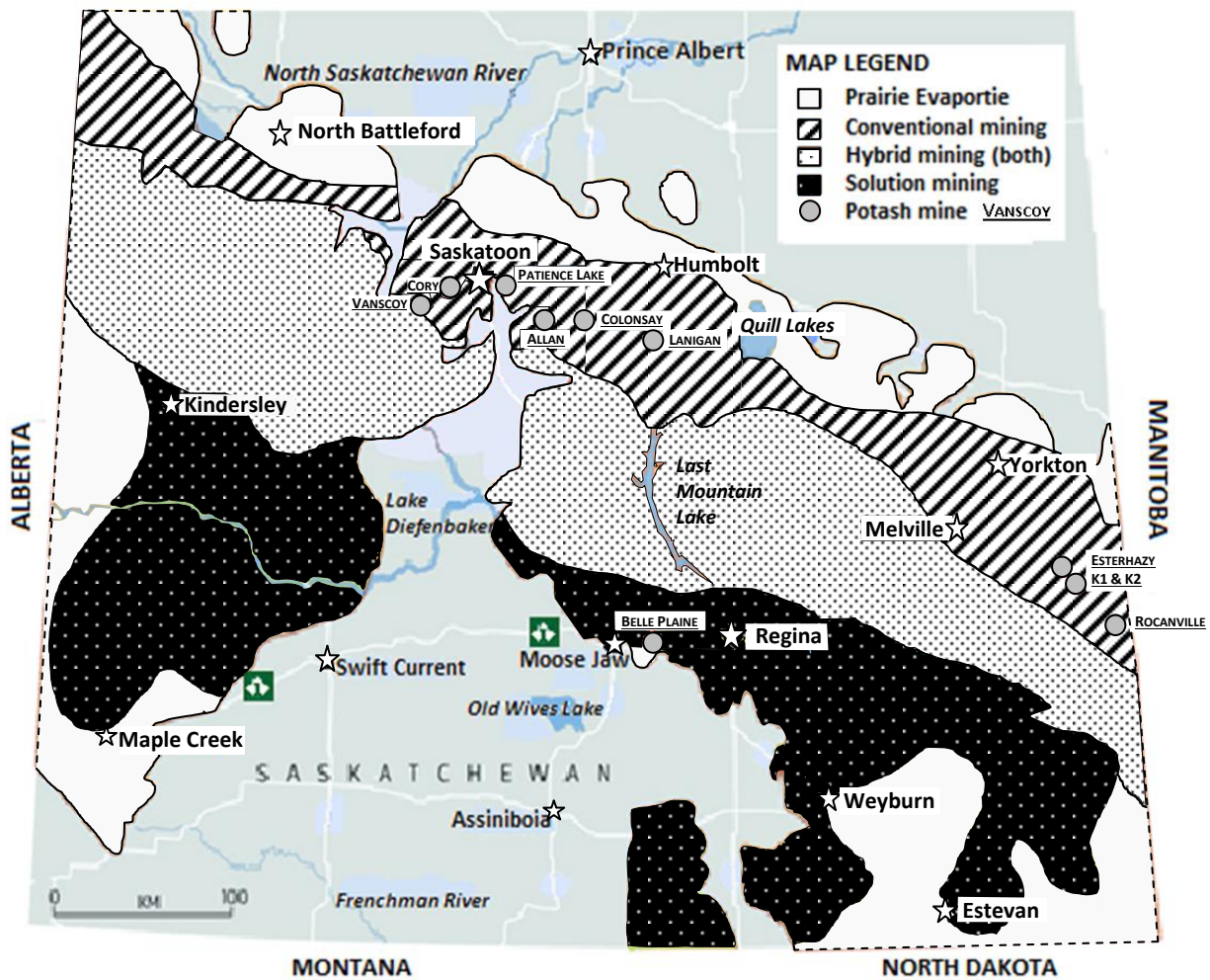
**Conventional mining:** When potash deposits are less than 1.5 kilometres deep mining is done using underground shafts and tunnels into the rock. Ore is lifted to the surface in a container similar to an elevator.

**Ore:** An ore is a type of rock that contains important minerals including metals. The ore is extracted through mining and processed to extract the valuable element(s). Ore contains minerals that can be mined at a profit.

**Potash:** Potash is the common name for the potassium rich ore mined in Saskatchewan. It is made up of the minerals sylvite, halite, sometimes carnallite, clay and iron oxides. Potash is Saskatchewan's provincial mineral.

**Solution mining:** When deposits are more than 1.5 km underground, wells are drilled into the ground. Hot water is pumped into the rocks, dissolving the salt minerals. The salty solution is then pumped back up another well to the surface.

## Is There Potash Under my Feet?



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**No Current Mining:** Saskatchewan does not have a mine in this area right now. When a new mine is developed in this area the company will have to determine which method of mining, conventional or solution mining is best for their mine site.

## Is There Potash Under My Feet Teachers Answers

1. Look at the map showing the location of the potash bearing rocks, potash mines and the type of mining done.

List the names of all the potash mines.

<i>Vanscoy</i>	<i>Colonsay</i>
<i>Cory</i>	<i>Esterhazy K1</i>
<i>Patience Lake</i>	<i>Esterhazy K2</i>
<i>Lanigan</i>	<i>Rocanville</i>
<i>Allen</i>	<i>Belle Plaine</i>

2. Where do most of the mines occur in the potash belt?

*Most of the mines occur along the top edge of the potash belt, between Saskatoon and Rocanville (or the Manitoba border).*

3. Why do you think they occur there?

*They occur in the conventional mining area, where the potash is less than 1,500m deep. It is shallower and can be mined using shafts and tunnels.*

4. Find where you live on the map and put an X.

5. Is there potash under your school?

*Answers will vary.*

6. Is there a mine near you?

List the mine (s).

*Answers will vary*

7. If you were a mining company and you owned the mineral rights under your school what type of mining would be the best method in your area?

*Answers will vary*

## Is There Potash Under My Feet Teachers Answers

Name: \_\_\_\_\_

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# Mineral Resource Map of Saskatchewan

