

What if We Kept on Digging? Stratigraphy Part 2

Subject/Grade: Science 4 & 7

Stage 1: Identify Desired Results

Outcome(s)/Indicator(s)

SCIENCE

Grade 4 Rocks, Minerals and Erosion

RM4.1 Investigate physical properties of rocks and minerals, including those found in their local environment. [CP, SI]

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

RM4.2 Assess how human uses of rocks and minerals impact self, society, and the environment. [DM]

f) Identify locations where minerals, including potash, sodium sulphate, salt, kaolin, uranium, copper, coal, diamond, and gold, are extracted in Saskatchewan.

Grade 7 Earth's Crust and Resources

ECR7.1 Analyze societal and environmental impacts of historical and current catastrophic geological events, and scientific understanding of movements and forces within Earth's crust.

c) Construct a visual representation of the composition of Earth, including the crust, upper and lower mantle, core, and inner core.

ECR7.3 Investigate the characteristics and formation of the surface geology of Saskatchewan, including soil, and identify correlations between surface geology and past, present, and possible future land uses. [DM, SI]

c) Construct a visual representation of the rock cycle (e.g., formation, weathering, sedimentation, and reformation) and relate this representation to the surface geology of Saskatchewan and Canada.

<p>Modified indicator: RM4.1</p> <p>b) Construct a visual representation of rock deposits and use this to determine the age of each stratigraphic level.</p> <p>ECR7.3</p> <p>c) describe the stage in the rock cycle for the formation of each rock unit. What was the environment at the time of deposition – is it sedimentary, igneous or metamorphic?</p>	<p>Essential Questions:</p> <p>What are some ways that we can describe rocks?</p> <p>What minerals can be found in the stratigraphy of Saskatchewan and where can they be found?</p> <p>What do rock deposits look like? How can they be similar or different in various locations?</p> <p>How are rock deposits used to measure the age of rock samples?</p>
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Key Understandings: ('I Can' statements)

Grade 4:

- I can describe the characteristics of rocks in my environment and show where they can be found.
- I can identify where local minerals such as potash, coal, and copper are extracted from the Saskatchewan stratigraphy.

Grade 7:

- I can model the different layers of rock deposits in Saskatchewan geology.
- I can use my model to measure the age of different rock deposits in Saskatchewan.

Teacher Background

Stratigraphy is the study of the Earth's strata or layers. Two basic principles of stratigraphy are:

1) The principle of superposition: states that the oldest layers are found at the base of the formation, and that each successively higher layer is younger than the one below it.

2) The principle of original horizontality: means that sedimentary rocks were originally deposited in horizontal layers.

More Information can be found at: <https://pubs.usgs.gov/gip/fossils/rocks-layers.html>

Because geologists cannot see everything in the ground beneath our feet, they use various techniques to figure it out. One technique for subsurface mapping is to take a core sample. In this way geologists can make educated guesses as to the composition of the earth and the geologic history of an area.

Examining the general stratigraphy of Saskatchewan can lead to discussions and projects regarding Saskatchewan's mineral resources.

Stage 3: Build Learning Plan

Set (Warm-up, Focusing the Learning): Time: 5 min

Introduce the lesson by showing students some rock samples and ask if they know the names of each. Then talk about where they may come from and how old the rocks may be.

Development: Time: 30 min

Hand out the student activity sheets and discuss with the students the meaning of the word Stratigraphy.

Explain that they will be making a scale model of the subsurface near Estevan.

The students will need to determine a scale to be used in order to shrink the more than 3200 metres of rock onto the paper towel tube. *Paper towel tubes are only about 28 cm long! A scale of 1cm:200m would be appropriate.

Students will need to determine how thick each layer will be on their paper towel tube.

Students can then measure each layer onto their paper towel tube starting from the top and working down! This is done because geologists are unsure of the exact depth to which the Precambrian igneous and metamorphic rock extends. To show this uncertainty students can measure 3cm down and then cut a zigzag line. This zigzag shows that there is some data not represented in the model.

Students may then paint each section of their paper towel tube a different colour to represent each layer.

Students can now use the scrap paper to attach labels detailing what type of rock is found in each layer and the ages of the rocks.

Students can answer the questions found on the activity sheets.

Learning Closure: Time: 5 min

To close the activity, students can get together in pairs and talk about one time period that they would have liked to go experience. They should describe what the land would have looked like at that age and explain why they chose this time period.

Materials/Equipment:

- Paper towel tubes
- Paint
- Rulers
- Tape
- Scrap paper
- Student activity sheets
- Geologic time scale

Key Vocabulary:

Stratigraphy: The study of the Earth's strata or layers

Safety Considerations:

Students should be supervised when using scissors.

**Possible Adaptations/
Differentiation**

Stage 4: Determine Evidence for Assessing Learning

Completion of the model to scale and of the activity sheet.
Correct correlation of the strata to the geologic periods during which it was deposited.

Extensions

Extension: Students can correlate each layer to the proper geologic time period using the geologic time scale.

Look at the Digital Geological Highway Map of Saskatchewan (*GeoExplore Saskatchewan*) website for further information and a deeper understanding of the local context:

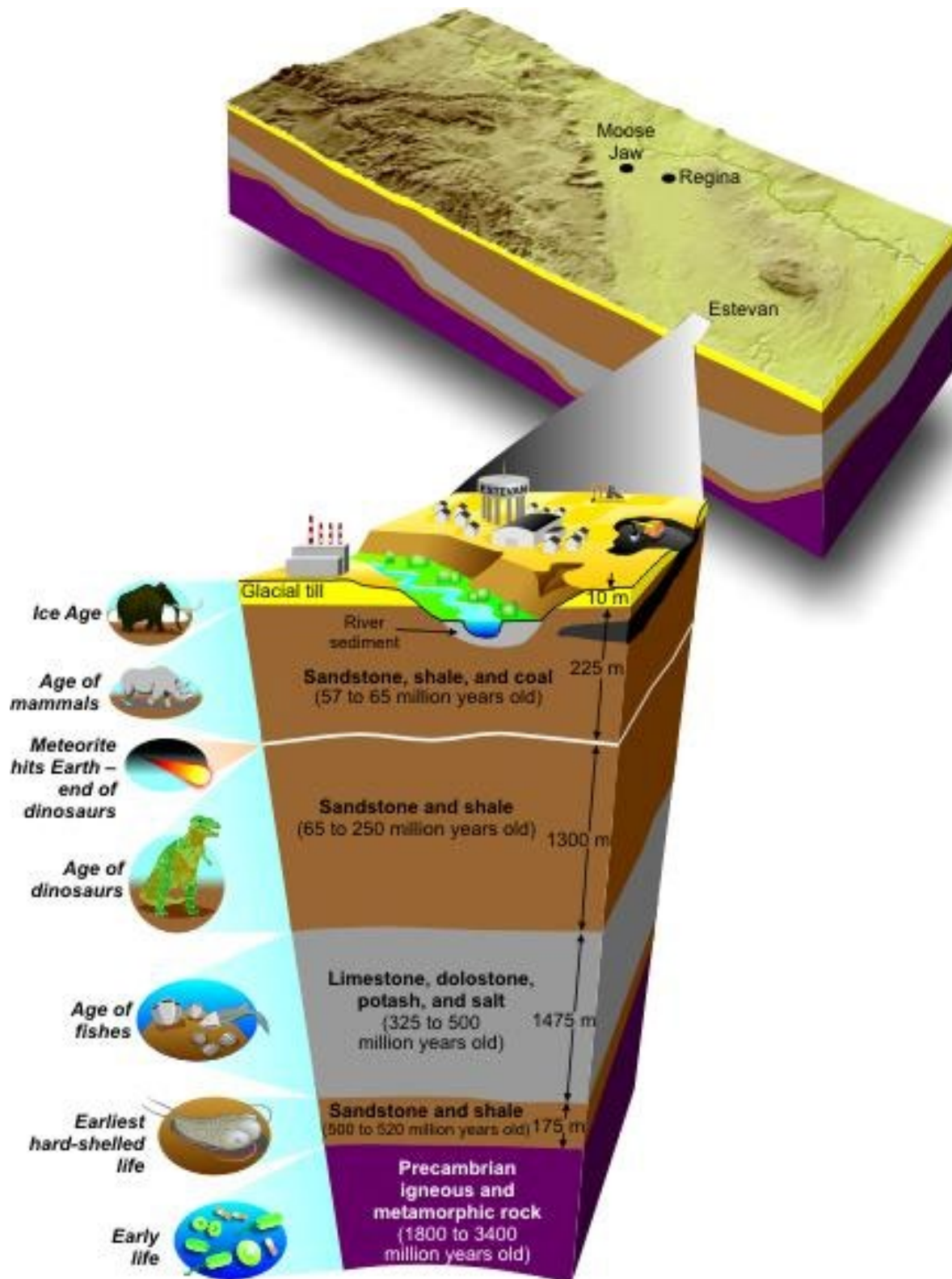
Main Website

<https://skgeolhighwaymap.maps.arcgis.com/apps/MapSeries/index.html?appid=a845cbb370f7401597806887318e2676>

For more background information related to this lesson check out

- Main tab “Geo 101” then subtab “Sask Geology”
- Main tab “Sedimentary Basins.”

Student Activity Sheet



Geoscape Southern Saskatchewan: Geoscience for Prairie Communities.

Deposit (Rock Type)	Depth (m)	Model (cm)
Glacial Till	10	
Sandstone, shale and coal	225	
Sandstone and shale	1300	
Limestone, dolostone, potash and salt.	1475	
Sandstone and shale	175	
Precambrian igneous and metamorphic rock		

1. What does *Stratigraphy* mean?
2. Which are the youngest types of deposits in Saskatchewan? How do you know?
3. Which are the oldest types of rocks in Saskatchewan? How do you know?
4. What was the age of fish?
5. When was the age of dinosaurs?
6. What event may have influenced the extinction of the dinosaurs?
7. When was the age of mammals?
8. How old are the Precambrian igneous and metamorphic rocks?
9. Do you think that the rock layers are really as flat as the picture depicts? Why or why not?
10. What might be different about a similar stratigraphic section in the area where you live?

Extension

Eon	Era	Period	Millions of Years Ago	Rock Type Deposited
Phanerozoic		Quaternary	2	
	Cenozoic	Tertiary	65	
		Cretaceous	144	
		Jurassic	213	
	Mesozoic	Triassic	251	
		Permian	286	
		Carboniferous	302	
		Devonian	408	
		Silurian	438	
		Ordovician	505	
	Paleozoic	Cambrian	544	
Proterozoic			2500	
Archean			4600	

Answers

Deposit (Rock Type)	Depth (m)	Model (cm)
Glacial Till	10	0.05
Sandstone, shale and coal	225	1.13
Sandstone and shale	1300	6.5
Limestone, dolostone, potash and salt.	1475	7.38
Sandstone and shale	175	0.80
Precambrian igneous and metamorphic rock		unknown

- What does *Stratigraphy* mean?
The study of strata, the layers of the Earth.
- Which are the youngest types of deposits in Saskatchewan? How do you know?
Glacial till because it is found at the top of the section. (Principle of superposition)
- Which are the oldest types of rocks in Saskatchewan? How do you know?
Precambrian igneous and metamorphic rocks because they are found at the base of the section. (Principle of superposition)
- What was the age of fish?
325-500 million years ago
- When was the age of dinosaurs?
65-250 million years ago
- What event may have influenced the extinction of the dinosaurs?
Meteorite impact
- When was the age of mammals?
57-65 million years ago
- How old are the Precambrian igneous and metamorphic rocks?
1800-3400 million years old
- Do you think that the rock layers are really as flat as the picture depicts? Why or why not?
No, uplift, erosion and weathering would have changed the original horizontality of the layers as well as any tectonic events such as earthquakes, which cause faulting and tilting of the layers.
- What might be different about a similar stratigraphic section in the area where you live?
If you live in southeastern Saskatchewan they might be quite similar! The thickness of each layer may be slightly Different. If you live farther north or west they might be quite different. In some areas some units might be much thinner or thicker, or possibly even absent.

Extension

Eon	Era	Period	Millions of Years Ago	Rock Type Deposited
Phanerozoic		Quaternary	2	<i>Glacial till</i>
	Cenozoic	Tertiary	65	<i>Sandstone, shale and coal</i>
		Cretaceous	144	<i>Sandstone and shale</i>
		Jurassic	213	<i>Sandstone and shale</i>
	Mesozoic	Triassic	251	<i>Sandstone and shale</i>
		Permian	286	<i>No data</i>
		Carboniferous	302	<i>No data</i>
		Devonian	408	<i>Limestone, dolostone, potash salt</i>
		Silurian	438	<i>Limestone, dolostone, potash salt</i>
		Ordovician	505	<i>Limestone, dolostone, potash salt</i>
	Paleozoic	Cambrian	544	<i>Sandstone and shale</i>
Proterozoic			2500	<i>Igneous and Metamorphic</i>
Archean			4600	<i>Igneous and Metamorphic</i>