Earth History Course, 4.3: Index Fossils
Fossils in the Grand Canyon

• What fossils were found in the Grand Canyon?
Focus question

- When did the Grand Canyon rocks form?
Fossils provide geologists with important evidence about prehistoric environments. Some fossils also provide evidence for the age of rock layers. These fossils are called **index fossils**. Most fossils are not index fossils.
Suggest some examples

1. Which would make a better index fossil, a fern that has lived on Earth since the Pennsylvanian period and isn’t extinct yet, or a trilobite that lived in many areas for only a few million years during the Cambrian period?
2. Imagine a car as an index fossil. You dig up a car from where it sank in a lake and find a Volkswagen Beetle (made from 1938 to 2003) or a DeLorean (made from 1981 to 1982). Which one makes a better index fossil?
“Dating Rock Layers”
Grand Canyon fossils

Notebook sheet 26, Index-Fossil Correlations
Grand Canyon fossils

Turn to “Colorado Plateau Map” in FOSS Science Resources on page 153.
Identify index fossils

Turn to “Index-Fossil Key” in FOSS Science Resources on page 176.
Correlate rocks

Cut the pictures of the rock columns apart.

Line up the columns, matching up the index fossils of the same age.

Affix to a sheet of paper.
Correlate rocks

Earth History Course, 4.3: Index Fossils
Step 10
“Index-Fossil Correlation”
Homework

Notebook sheet 27, *Index-Fossil Correlation Questions*
Have a sense-making discussion

Teacher master W, *Uses for Index Fossils*
Discuss Grand Canyon rocks

Notebook sheet 28, *Rocks over Time*
Discuss Grand Canyon rocks

• If the geologists are right, how long did the Kaibab Sea exist?
Redwall Limestone has an average thickness of about 150 m. Geologists estimate that the Redwall Limestone was deposited over a period of 35 million years.
Present math problem

• For 150 m to be deposited in 35 million years, how much limestone would be deposited during 1000 years? (Remember, 1 m equals 100 cm, or 1000 mm.)
Grand Canyon rocks

Notebook sheet 28, *Rocks over Time*
Discuss time lines

a. Find out during which geologic era the Grand Canyon sedimentary rocks were deposited.

b. Find out the age of the oldest Grand Canyon sedimentary rock layer.
c. Find out which sedimentary rock exposed at the Grand Canyon is the youngest.

d. Find the Kaibab Formation on the poster. Look for rocks on top of that formation.
Discuss time lines

- Why do you think there are no rocks exposed at the Grand Canyon that are younger than the Kaibab Formation?
Some of you noticed the gaps between some of the rock layers as you laid them out on your time line. Where are those gaps?
Contemplate the gaps

Turn to “Grand Canyon Views” in FOSS Science Resources on page 138.
Contemplate the gaps

1. When we look at photographs of the Grand Canyon layers, do we see those gaps?

2. How can you explain those gaps in the record of time?
3. How much time is represented by the gap between the Redwall Limestone and the Temple Butte Limestone?

4. What do you think could have happened in this region during that period of 10 million years?
Geologists call a gap in the rock record like you see here in the Grand Canyon an **unconformity**.
Discuss in your group what could have caused this unconformity.

• If rocks were there at that point in time long ago, what could have happened to them?
Introduce unconformity

Offer a claim and support your claim with information on Earth processes you have studied.
Discuss the Great Unconformity

Turn to “The Great Unconformity” in FOSS Science Resources on page 178.

- What do you notice about the rock layers in this photo?

Earth History Course, 4.3: Index Fossils
Step 22
Add to time line

• Which came first, the Grand Canyon, the Colorado River, or the Colorado Plateau?
Read “Rocks, Fossils, and Time” on page 50.

Rocks, Fossils, and Time
Earth is constantly changing—nothing on its surface is truly permanent. Rocks that are now on top of a mountain may once have been at the bottom of the sea.

To really understand the place we live in, we must include the dimension of time. Yet, time is often difficult to understand. Time is like the calendar. It helps us keep track of events. One sign of Earth’s age is the fossil in the sand. Fossils are the remains of ancient living things. Some of the oldest fossils are over a billion years old. People who study Earth’s history like to use a type of calendar, called the geologic time scale. It looks more like a book than a wall calendar. Each page of this book, sometimes referred to as a geologic time line, is a thousand years. People who study Earth’s history like to use a type of calendar, called the geologic time scale. It looks more like a book than a wall calendar. Each page of this book, sometimes referred to as a geologic time line, is a thousand years.
Review vocabulary

Spend a few minutes reviewing the vocabulary for this part. Update the vocabulary index and table of contents in your notebook.

- epoch
- law of fossil succession
- index fossil
- relative time scale
- stratigraphy
- unconformity
Answer the focus question

• When did the Grand Canyon rocks form?
Answer the focus question

First, it is important to know ______.  
For example, ______. 
From this data, we know that ______. 
We can also figure out ______. 
Together, this information shows that ____.
Homework

Turn to “Floating on a Prehistoric Sea” in FOSS Science Resources on page 64.

Floating on a Prehistoric Sea
For those who know how to read the language of geology, the rocks and landforms of the Grand Canyon contain the words that tell the story of its 1.7-billion-year history.

Changes in Environment
The solutions that became the Grand Canyon’s rocks were deposited by water and wind. We see these same processes of deposition today. Geologists use observations of current processes to infer the evidence in Grand Canyon rocks. The rocks tell a vivid story of how life, weather, and rivers and wind have changed over time in this area.

Today, the Grand Canyon is a rain set of geology and the rock Grand Canyon desert. It is hard to believe that this area was once the floor of a vast inland sea.
Homework

1. How does the sequence of rock layers help you tell the story of a place?

2. How do fossils help you tell the story of a place?
Review notebook entries

Select one key point that summarizes an important finding to share with your group.
Answer the focus question

- What can fossils tell us about Earth’s past?