

## LAB

## 6.2

## MAPPING



# Grand Canyon Formations

**T**he Grand Canyon is not only a famous recreational site, but it is the subject of intense scientific research. The Grand Canyon is composed of many layers of rock, most of which are sedimentary. These rocks often contain fossils that help scientists determine how and when the rock formed. If you were to hike through the Grand Canyon today, you would be exposed to numerous rock layers that represent more than 2 billion years of geologic history.

## PREPARATION

### PROBLEM

How can you use a geologic map of the Grand Canyon to interpret the geologic history of the area?

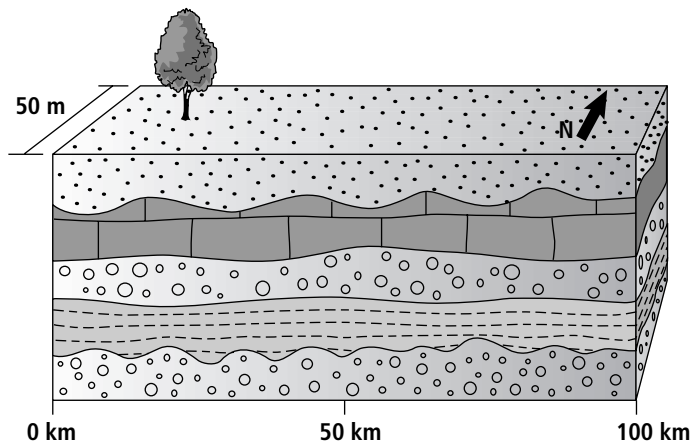
### OBJECTIVES

- **Interpret** information about rock layers in the Grand Canyon.
- **Create** a geologic cross section.
- **Hypothesize** about how rock layers formed.

### MATERIALS

colored pencils

## PROCEDURE



1. Examine the geologic cross section in the figure above.
2. Using the figure above as a guide, construct a cross section of the Grand Canyon rock layers listed in Table 1. Draw the cross section on the grid in Data and Observations.
3. Once you have drawn in the rocks, color each layer to match the colors in Table 1.


**PROCEDURE, continued**
**Table 1**

Rock Layer	Composition	Color	Age (millions of years)	Thickness (feet) East to West
Kaibab Limestone	Sandy limestone	Grayish white	250	300–500
Toroweap Formation	Sandy limestone	Grayish yellow	255	250–450
Coconino Sandstone	Quartz sand	Cream	260	350–50
Hermit Shale	Shale	Rusty red	265	250–1000
Supai Formation	Shale	Red	285	950–1350
Redwall Limestone	Marine limestone	Red	335	450–700
Temple Butte Limestone	Freshwater limestone	Cream	350	0–450
Muav Limestone	Limestone	Gray	515	400–1000
Bright Angel Shale	Mudstone shale	Greenish brown	530	300–450
Tapeats Sandstone	Sandstone	Dark brown	545	250–150
Great Unconformity	Rock layers eroded or never deposited			
Chuar Group	Sandstone Shale Limestone	Tan Black Green	825–1000	6900
Nankoweap Formation	Sandstone	Gray	1050	6900
Cardenas Basalt	Basalt	Dark brown	1100	980
Dox Sandstone	Sandstone	Orange red	1190	3000
Shinumo Quartzite	Sandstone	Purplish brown	1200	1070–1560
Hakatai Shale	Shale	Orange red	1225	430–830
Bass Formation	Limestone	Grayish	1250	120–340
Early Unconformity	Rock layers eroded or never deposited			
Zoroaster Granite	Granite	Dark gray	1700–1900	?
Vishnu Schist	Mica schist	Black	2000	?





## CONCLUDE AND APPLY

1. Over 2 billion years ago, the area that is now to the north of the Grand Canyon in Colorado and Utah was once a mountain range taller and wider than the Rocky Mountains. What happened to those mountains over time?

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2. Scientists have found two spans of geologic time in the Grand Canyon for which no rock layers exist. These are called the Great Unconformity (~550–820 million years ago) and the Early Unconformity (~1255–1695 million years ago). How are the unconformities related to changes in depositional environment?

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Scientists have been able to hypothesize the environmental conditions that existed when the layers of the Grand Canyon formed by examining the characteristics of each layer.

Use Table 2 to answer the following questions.

**Table 2**

Rock Layer	Composition	Fossils
Redwall Limestone	Marine limestone	Brachiopods, clams, snails, corals, fish, trilobites
Coconino Sandstone	Pure quartz sand, basically a petrified sand dune	No bone fossils; invertebrate tracks and burrows
Hermit Shale	Soft, easily eroded shale	Ferns, conifers, other plants; reptile and amphibian tracks; no bones
Zoroaster Granite	Granite	None

3. Hypothesize about the environment that existed when the Coconino Sandstone formed. Give reasons for your hypothesis.

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4. What does the information given about the Hermit Shale suggest about the environment that existed when it formed?

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5. Why do you suppose that no fossils are present in Zoroaster Granite?

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