

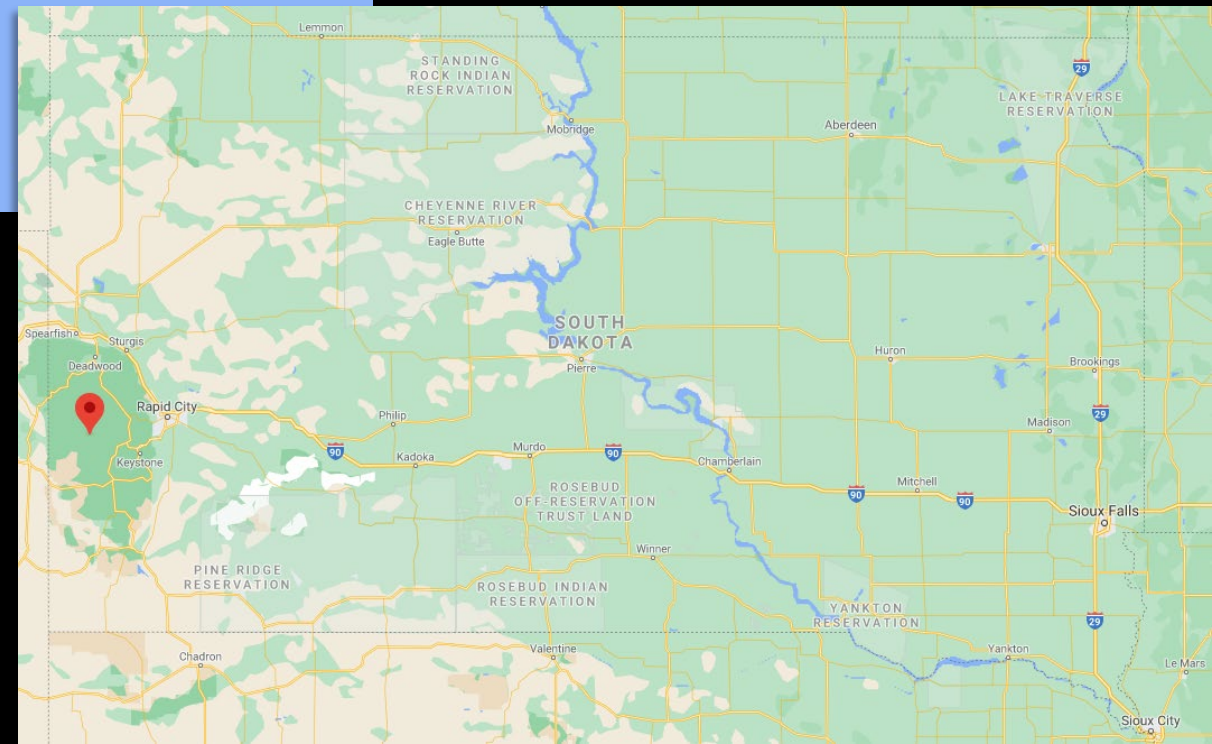
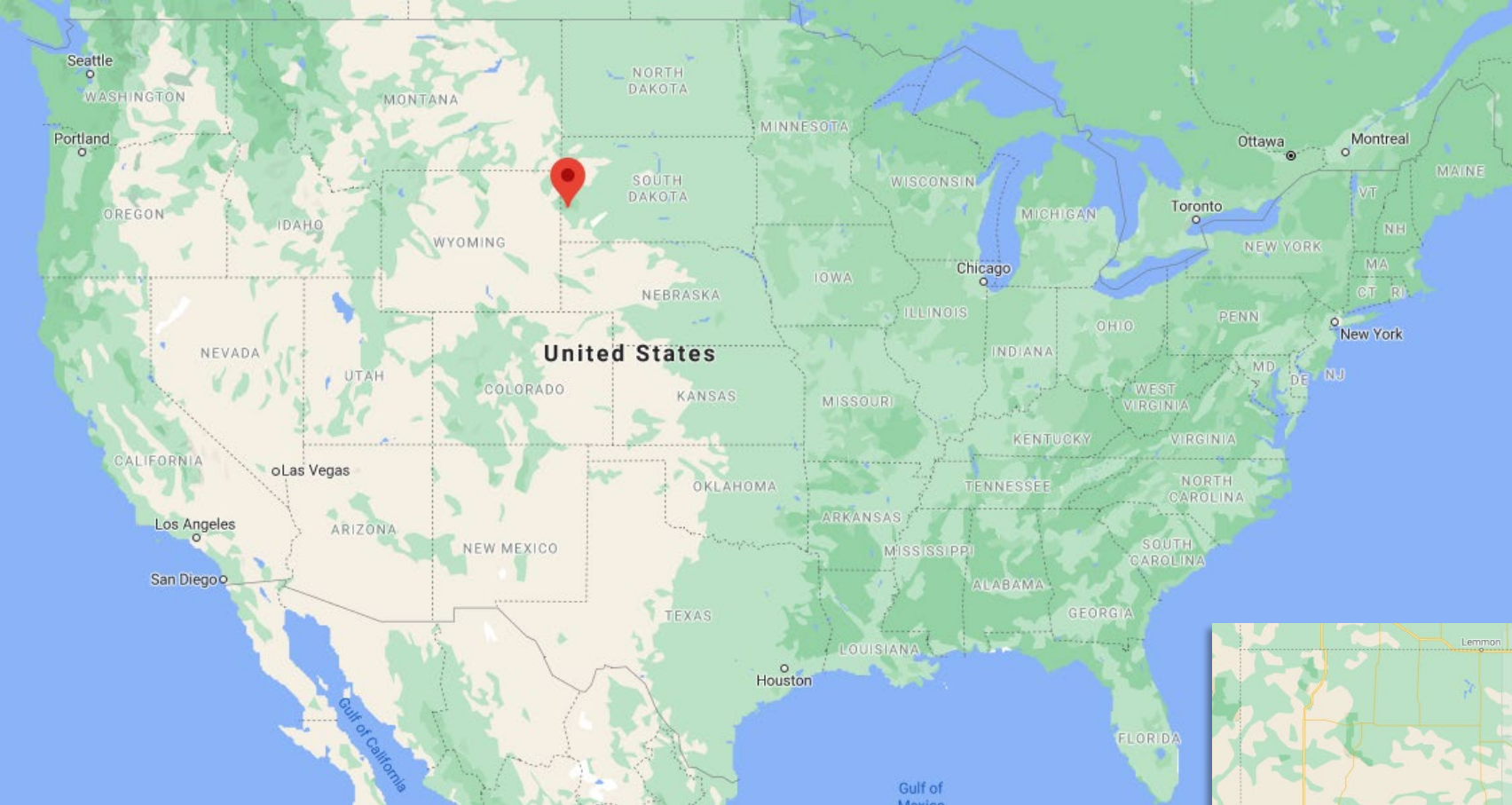


Rushmore Rocks!

Mount Rushmore National Memorial

ROCKS- ROCK CYCLE



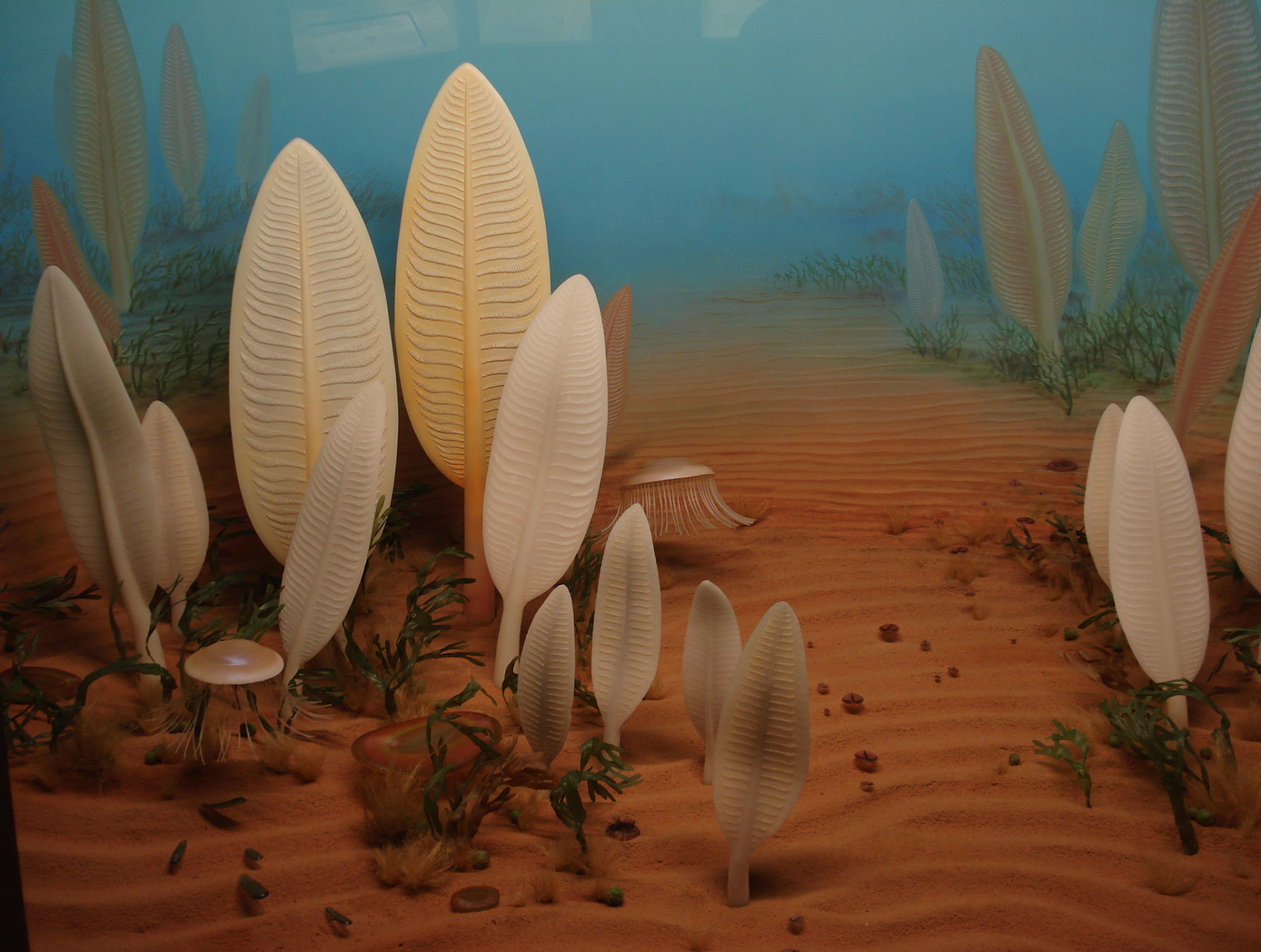




The Black Hills of South Dakota are unique in many ways. One is that their formation includes all three types of rocks:

- Sedimentary
- Igneous
- Metamorphic





What is now western South Dakota was at the edge of a shallow sea during the Precambrian period - sometime between 1.6 and 2.5 billion years ago. Over time, large amounts of sand and clay were washed down into the sea, layer after layer.

The pressure of its own weight eventually turned these many layers of sand and clay into sandstone and shale. This process is how **Sedimentary Rocks** are formed.

Sedimentary Rocks

Sedimentary rocks are formed from pre-existing rocks or pieces of once-living organisms. They are created when many layers of these materials undergo pressure.

Sedimentary rocks often but not always:

- Have smaller visible rock fragments
- Are softer and erode easily



Chalk



Coal



Sandstone



Around the same time, 1.6 billion years ago, a great mass of molten rock began to rise from deep within the earth's crust. As this mass cooled (still underground) it formed many of the features we see around the Black Hills today.



When molten rock cools like this, it creates **Igneous Rocks**. A large block of granite is what forms the upper portion of Mount Rushmore.

Igneous Rocks

Igneous rocks form when hot, molten rock, called magma, hardens. This can take place inside the earth's crust underground, or on the surface. The type of molten rock and how quickly it cools determines what kind of igneous rocks are formed.

Igneous rocks often but not always:

- Have a grainy pattern or appearance
- Are harder and erode slowly



Granite



Basalt



Gabbro



When molten rock rose and met the sedimentary rocks sandstone and shale, the intense heat and pressure melted and changed some of the sedimentary rock into new rock. When existing rocks are changed like this, new **metamorphic rocks** are formed.

The shale became mica schist, which can easily be seen on Mount Rushmore under George Washington because of its dark color and pattern.

Metamorphic Rocks

Metamorphic rocks form when high temperatures and pressure act on a rock to alter it. These conditions often stretch, twist, and fold the rock, leaving noticeable bands. Both sedimentary and igneous rocks can become metamorphic rocks.

Metamorphic rocks often but not always:

- Have a clear stripe pattern or bands
- Are harder than sedimentary rocks



Schist



Gneiss



Marble



As the Black Hills began to rise, the **sedimentary** rocks began to crack, and erode. Today we see only **igneous** and **metamorphic** rocks at Mount Rushmore and in the center of the Black Hills.

Granite, the rock Mount Rushmore is made of, erodes much slower than sedimentary rocks- only about one inch every 10,000 years!

Sedimentary Rocks

Sedimentary rocks are formed from pre-existing rocks or pieces of once-living organisms. They are created when these deposits undergo pressure.

Sedimentary rocks often but not always:

- Have smaller visible rock fragments
- Are softer and erode easily

Examples



Chalk



Coal



Sandstone

Igneous Rocks

Igneous rocks form when hot, molten rock hardens. The type of molten rock and how quickly it cools determines what kind of igneous rocks are formed.

Igneous rocks often but not always:

- Have a grainy pattern or appearance
- Are harder and erode slowly

Examples



Granite



Basalt



Gabbro

Metamorphic Rocks

Metamorphic rocks form when high temperatures and pressure act on a rock to alter it. These conditions often stretch, twist, and fold the rock.

Metamorphic rocks often but not always:

- Have a clear stripe pattern or bands
- Are harder than sedimentary rocks

Examples



Schist



Gneiss



Marble