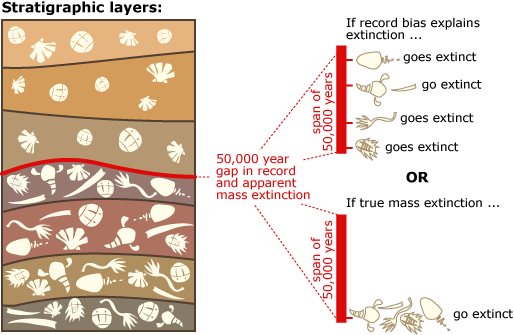
**Resource Card 1: Looking At Layers Of Fossils**



The picture to the right shows layers of Earth, containing different fossils. Record your observations as well as your responses to the following discussion questions in the chart on your student guide:

1. Compare the layers below and above the red line. How are they different?
2. What do you think the red line represents?

Source:

* http://evolution.berkeley.edu/evolibrary/news/120501\_habitatloss

**Resource Card 2: Scientific Descriptions of the Soil and Fossil Data**

Lucky for us, scientists have already analyzed lots of soil and fossil data, so we can also gather evidence from their observations. Read the following excerpt to find out what scientists have gathered from examining soil and fossil data:

Fossils found in soil layers of different ages show a record of slow, gradual changes in species, with simple organisms gradually being replaced by more complex organisms, because of evolutionary processes driven by natural selection.

Ever since the fossil sequence began being mapped around 1800, geologists noticed that striking "breaks" occurred in the sequence, when one group of fossilized species gave way to other groups during short intervals (just like the “break” you saw in Resource Card 1).

While this gave evidence for some sort of mass extinction, scientists were still unsure why this had happened. There are now many lines of evidence to prove that a relatively large asteroid impact happened 65 million years ago.

1. Iridium, a common component of asteroids, can be found in the 65 million year old soil layer at many points around the world. You can see it to the right as the lighter-colored rock layer.
2. The same soil layer contains grains of quartz (a type of rock) that were deformed by high shock pressures, as would occur in a giant explosion.
3. The same soil layer contains enough soot to correspond to burning down all of the forests of the world. This suggests that massive fires were touched off at the time of impact.

Record your observations of this data as well as your responses to the following discussion questions in the chart on your student guide:

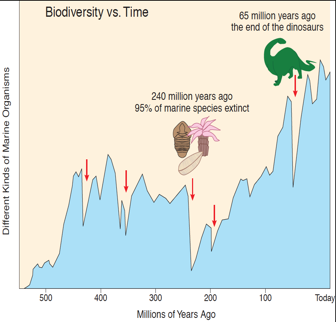
1. What fossil evidence do scientists describe in this excerpt?
2. What soil evidence do scientists give for an asteroid collision?
3. What **cause and effect** relationship can you find between the soil evidence and the fossil evidence?

Sources:

* <https://www.psi.edu/epo/ktimpact/ktimpact.html>
* https://www.sciencenewsforstudents.org/article/dinosaurs-extinction-asteroid-eruptions-doom

**Resource Card 3: Analyzing Biodiversity Over Time**

As scientists analyzed the fossil record, they took all of the data they gathered on marine organisms and created the graph below. It shows the number of different kinds of marine organisms over time.



Number of Species

Record your observations of this data as well as your responses to the following discussion questions in the chart on your student guide:

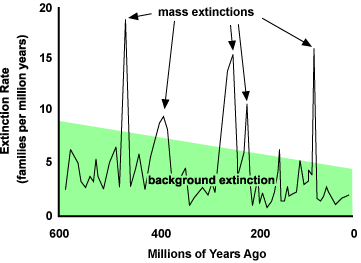
1. Does the number of different kinds of marine organisms stay stable over time?
2. What do the red arrows represent?
   1. What do you think are some possible causes for these dips in biodiversity?
3. The soil data showed added components in the soil layer from 65 million years ago (Resource Card 3). What do you see happening in this graph at 65 million years ago?

Source:

* CA NGSS document

**Resource Card 4: Analyzing Extinction Rates Over Time**

A paleontologist named David Jablonski was very interested in the fossil record and looking at the small and large extinctions that have occurred over time. He traveled up and down the East Coast of the U.S. looking at 65-80 million year old fossil mollusks in order to study the trickle of extinctions that go on constantly throughout Earth's history, which stand in stark contrast to catastrophic mass extinctions. Just as he was finishing this work, a new hypothesis emerged: that the mass extinction which eliminated virtually all dinosaurs 65 million years ago, was triggered by a massive asteroid slamming into Earth and scattering debris across the skies, changing the whole world’s climate.

****He continued to collect data on extinction patterns during the mass extinction and compare them to extinction patterns during the "normal" time that followed — his data is depicted in the graph below:

Record your observations of this data as well as your responses to the following discussion questions in the chart on your student guide:

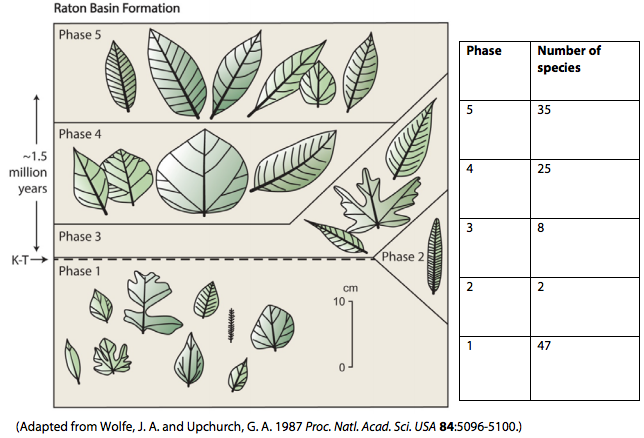
1. How does this connect to the previous graph?
   1. How is extinction connected to biodiversity?
2. What do you think the difference is between mass extinction and background extinction?
   1. Would an asteroid collision cause a mass or background extinction? Why?

Source:

* <http://evolution.berkeley.edu/evolibrary/article/0_0_0/jablonski_04>

**Resource Card 5: Changes in Leaf Diversity 65 Million Years Ago**

There is a theory that the asteroid collision that killed the dinosaurs, as well as many other species, occurred 65 million years ago. The time before is known as the Cretaceous Period (K) and the time after is known as the Teritiary Period (T). The table below shows the diversity of plants in the late Cretaceous and early Tertiary periods as determined by leaf fossils found in rock layers from the Raton Basin formation of Colorado and New Mexico. The fossils have been grouped in “phases” of changing diversity. The rock layers from the late Cretaceous, labeled Phase 1, show fossils of leaves from palm trees, Laurales (an order of flowering plants related to magnolias), and other plant species that live in tropical climates. The K-T clay layer is shown by the dotted line between Phase 1 and Phase 2. Phase 5 corresponds to about 1.5 million years after the K-T boundary.



Record your observations as well as your responses to the following discussion questions in the chart on your student guide:

1. Compare the layers above and below the dotted line. How are they different?
2. Why do you think there are less plant species after the dotted line?
   1. What may have happened at the K-T boundary?
3. Are the fossils in each layer the same as the next? If not, how do they seem to change over time?

Source:

* https://www.hhmi.org/biointeractive/weighing-evidence-mass-extinction-land