

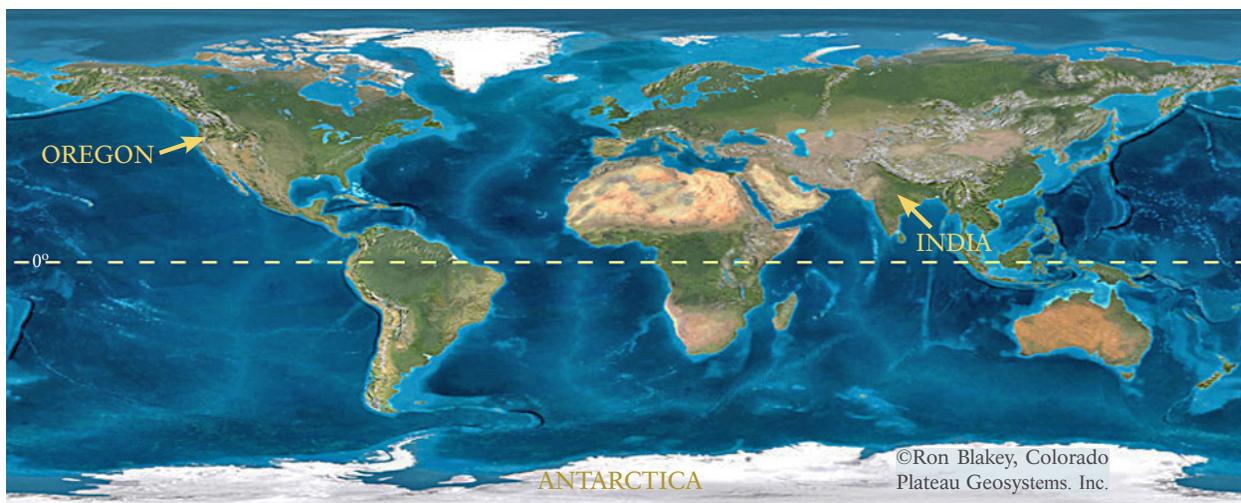
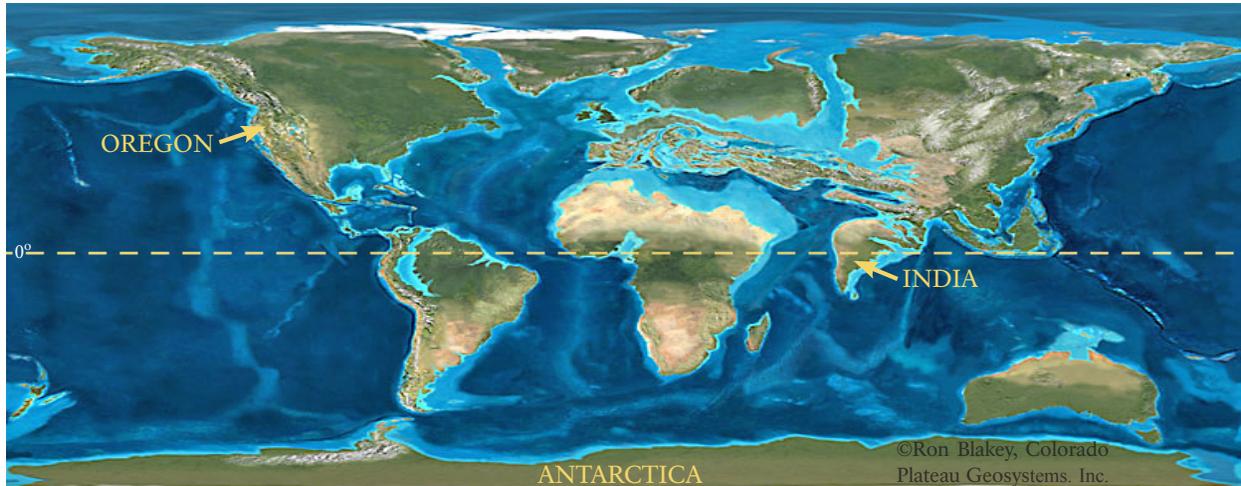
# John Day Fossil Beds

National Park Service  
U.S. Department of the Interior

John Day Fossil Beds  
National Monument



## The Greatest Change: Staying Still



Earth as it appeared 50 million years ago (top) and today (present). The dashed line is the equator. Notice how Oregon has experienced little north and south movement during this time span.

Have you ever thought about how different things were in your life a few years ago? Scientists at John Day Fossil Beds National Monument ponder this question every day, but at an almost unimaginable scale. The fossils they study reveal fifty million years of changes in Oregon's life and climate. This story contains a valuable lesson about what awaits future generations: not all species of life survive climate change.

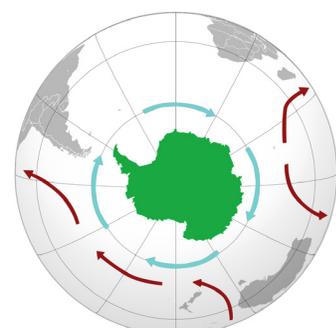
### Watch Out for the Plates!

Throughout geologic time, dramatic changes in eastern Oregon's climate have occurred. In the last 50 million years it has changed from semi-tropical to today's semi-arid conditions! What could cause this? The answer is plate tectonics. Earth's surface is composed of many different moving pieces called plates, which fit together like pieces of a jigsaw puzzle. Surprisingly, the dramatic cooling that occurred in Oregon wasn't due to it moving further from the equator. It was caused by the movement of earth's other plates.

Take a look at the above pictures. The top picture shows earth early in the Cenozoic Era, approximately 50 million years ago. The bottom picture is earth as it appears today. Do you see that Antarctica was much closer to Australia and South America in the top picture? Land bridges connected these two places to Antarctica, blocking the path of ocean currents. The currents turned north, flowed around the equator, and then back to Antarctica, keeping it much warmer than it is today. As the Antarctic plate moved south, the land bridges disappeared, allowing ocean currents to circle the continent. Without warm water from the equator, Antarctica cooled and became ice

covered. This cooled the entire planet, changing earth's global climate.

Compare the pictures again, but this time look at India. In the early Cenozoic Era it was an island. Over time, its plate has slowly moved north, colliding with Asia. This caused the Tibetan Plateau and Himalayan Mountains to rise. The Tibetan Plateau alone has an average elevation of 15,000 ft (4572 m) and is 1/3 the size of the United States! These high elevation areas shifted the flow of air through the atmosphere, which changed the location of high and low pressure areas. As you might have discovered from weather reports, highs and lows affect the weather. As a result, earth's climate changed and Oregon cooled.



Antarctica Ocean Currents:  
Early Cenozoic in Red  
Present Day in Blue

## And Carbon Too!

Earth's climate changed for another reason: carbon. Ancient rocks and fossils reveal that climate changes in response to the amount of carbon in the atmosphere. During the early Cenozoic, a reversed greenhouse effect happened. Large amounts of carbon from the atmosphere, in the form of carbon dioxide and methane, became

trapped in the oceans. Without this extra blanket of carbon, the atmosphere couldn't hold as much heat. This "sequestration" of carbon had the same impact as the plate tectonic events occurring at this time; it cooled earth's climate. These events also had another common impact; they changed life.



Artist rendition of eastern Oregon's ecosystems between 44 million years ago (left) and 7 million years ago (right) based on fossil evidence. Notice the dramatic changes in ecosystems created by climate change.

## Jungles, Forests, & Grasslands. Oh My!

Plants and animals are adapted to the climate where they live. If the climate changes, they must adapt to the new conditions, move to a new area, or become extinct. Fossils unearthed in John Day Fossil Beds confirm this story of life and climate change. Fifty million years ago, this area resembled the present day subtropical jungles of Panama. Compare that with the sagebrush and grasses now dominating this semi-arid place! There are other startling results. Even the most common species face extinction when the climate

changes. For example, oreodonts were numerous and diverse sheep-like mammals that roamed the forests of North America long ago. However, a cooling, drying climate led to trees being replaced by sagebrush and grasses. Despite surviving for more than fifteen million years, oreodonts were unable to adapt to the new, open environment and became extinct. Currently, humans are numerous and successful, but our species has only survived for 200,000 years. How much do you think the current climate change will impact us?



Artist rendition of oreodonts browsing, based on fossil evidence.

## It's the End of World as We Know It!

You might ask, how can humans, with our technology, be greatly impacted by climate change? One example is found in eastern Oregon. Its climate is changing; it is getting warmer. This means its plants and animals will change as well. Do you think hikers and hunters will be affected if elk and deer are no longer able to live in the area? How will local ranchers be impacted if grasses, the main food of their cattle and sheep, become scarce? Climate change affects the species we depend on everyday for survival. This is why we should be concerned that it's changing.

Also causing concern is that today's event is different than previous natural climate changes. Recall the reasons for the previous events. Are there currently land bridges to Antarctica? Have the Himalayas and Tibetan Plateau dropped thousands of feet? The answer to these questions is, of course, no. This means

the amount of carbon in the atmosphere is the cause of the current climate change. Humans are contributing dramatically to it by releasing carbon filled greenhouse gases. Groups as different as automotive corporations and environmental groups recognize the need to reduce these emissions. John Day Fossil Beds National Monument has already taken great steps to achieve this. A highly energy efficient ranger residence that creates more energy than it uses, has been constructed in the Painted Hills district. You can make a difference too. Simple choices can have profound impacts. If all drivers in the U.S. changed their driving habits by carpooling and combining trips, U.S. carbon emissions would be reduced by 25%! Ultimately, we must act together to reduce our greenhouse gas emissions. If not, our children's planet may be as different to them as the environment preserved in the John Day Fossil Beds is to us.

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