The Geological History of Nebraska.

- Has Nebraska always looked this way?
- What did Nebraska look like 10,000 years ago?
- What did Nebraska look like 1,000,000 years ago?
  - Nebraska has gone through many changes over time, in this lesson we'll learn about some of those changes and what factors that caused those changes.

Basic Plate Tectonics

- Throughout Earth's history the surface features have been slowly changing.
- Vulcanism, earthquakes and weather have been three of the driving forces.
- But, the biggest driving force, and a cause of some of the other three, has been Plate Tectonics.
- In 1915, Alfred Wegener, a German geologist, published his theory of plate tectonics.

Basic Plate Tectonics (cont.)

- Wegener proposed that the shapes of the continents was due to them being at one time joined.
- The crust of the Earth is segmented into several large plates, and that these plates move around on the earths surface.
- Modern science has continuously proven this theory to be true.
- The theory proposes that the continents have been moving around for all of earths history.

Basic Plate Tectonics (cont.)

- The movement of the plates, along with the orbital parameters of the earth around the sun, cause gradual changes on, beneath AND above the earth's surface.
- Movement of a plate toward the equator would make it more tropical in today's world. Closer to the poles would make it cooler.
- Separation of plates along fault lines might cause a new ocean or sea to form, causing changes in the local weather.

Basic Plate Tectonics (cont.)

- What would happen to the plants and animals of Nebraska if it became more tropical?
- What would happen if Nebraska become colder, almost arctic?
- What would happen if Nebraska were to become covered with an ocean of water?
- What would happen if large scale vulcanism were to occur?
- All these things HAVE happened in the past, and Nebraska WAS effected by them!

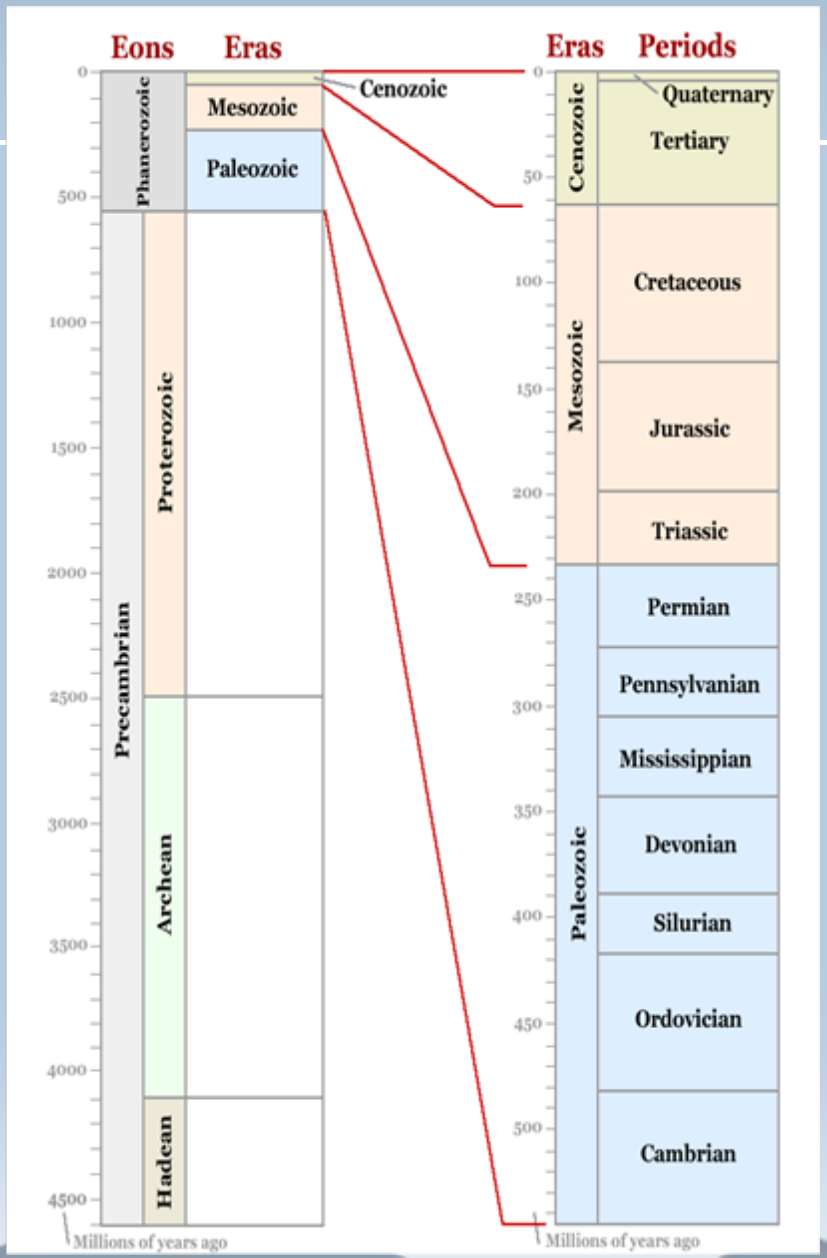
Basic Plate Tectonics (cont.)

- Geologist have tracked the movement of the continents over time by examining physical evidence contained in the rocks.
- Magnetic alignment of minerals show's that the poles have drifted, the very content of rocks can tell whether they formed in arid, tropical or marine environments.
- Fossils contained in the rocks can tell us whether there was a connection between one land mass and another.

Basic Plate Tectonics (cont.)

- In the following presentation/lesson we will track the movement of Nebraska across the Earths surface throughout geologic time. We will see the geologic and environmental changes that have occurred and discuss the way this may have effected the geology and life forms in the state of Nebraska over time.

Geologic Time

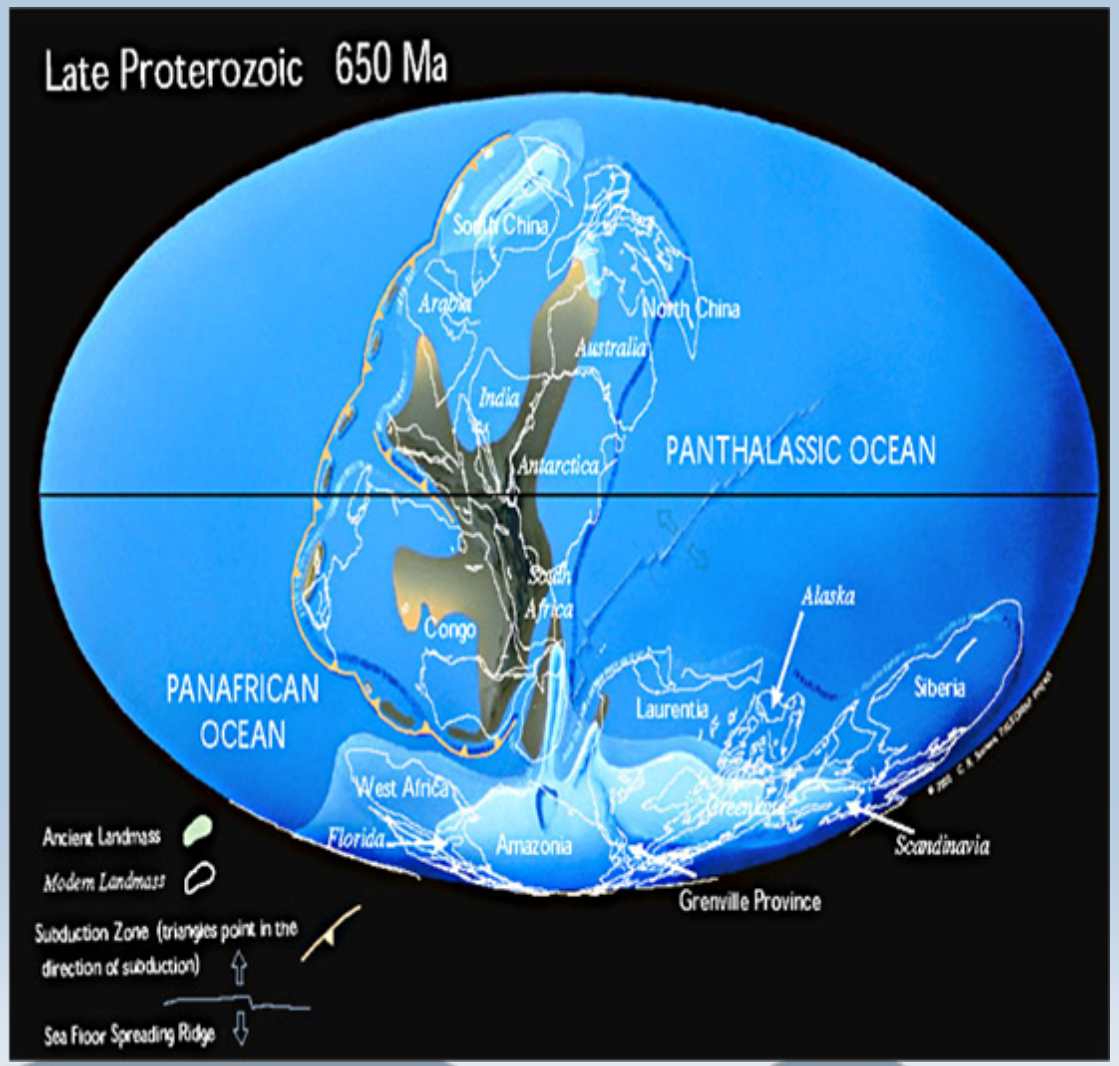


- Scientists divide Earths time line into three main time 'divisions'...
- Eons are Huge chunks of time. The Precambrian 500mya to 4.5 Bya and the Phanerozoic *the Precambrian is sometimes divided into the Proterozoic Archeozoic and Hadean
- Eras are smaller divisions of time. We'll be concerned mainly with three, the Paleozoic (540-248 mya), the Mesozoic (248-65mya) and the Cenozoic (65mya - Present)

Nebraska's Geologic History

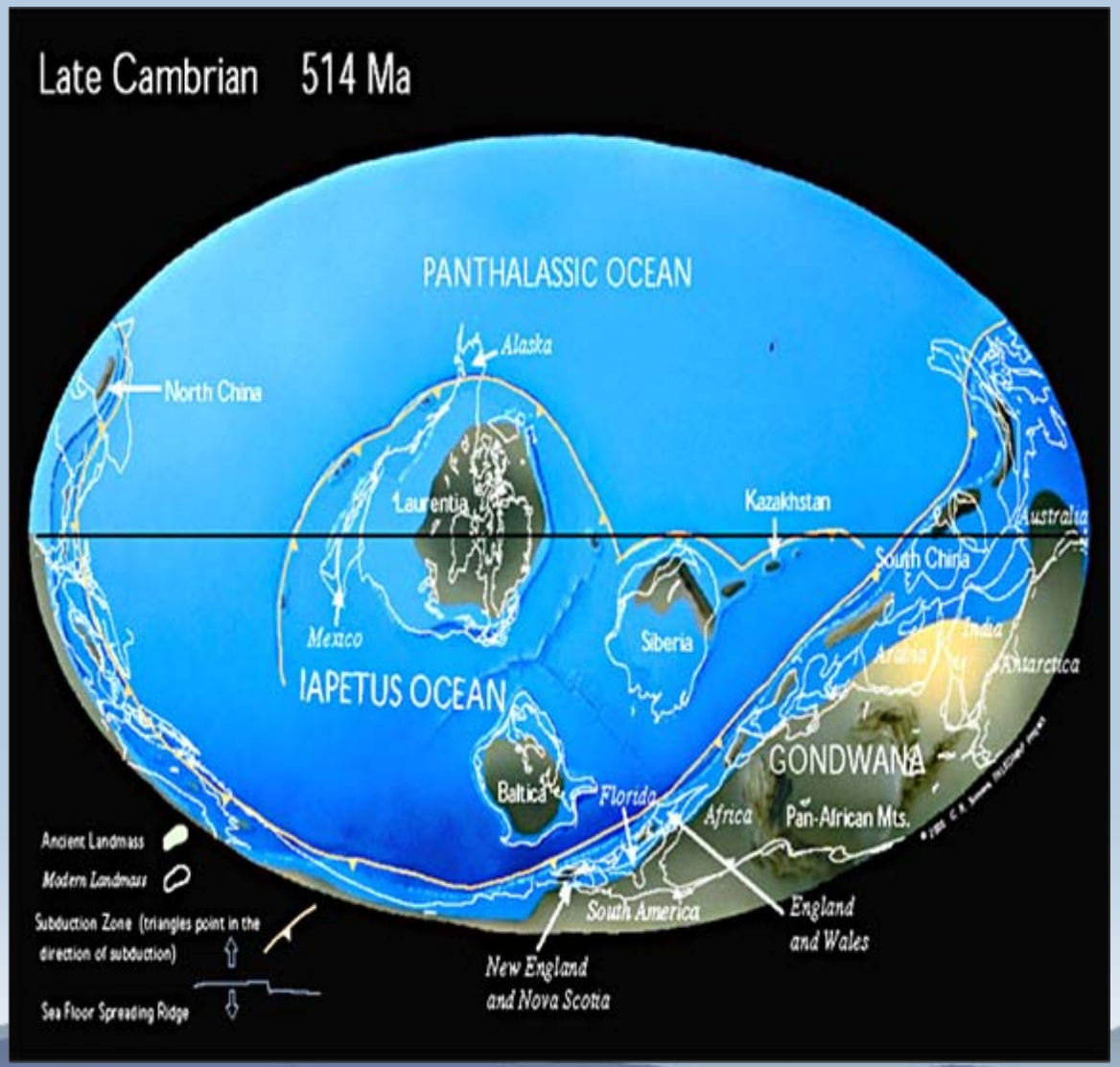
- So, What was Nebraska like during all these time periods?
- What kinds of climate did it have?
- What kinds of rocks were formed here?
- What kinds of organisms were found here?
- What kinds of landforms were present?
- What happened to change it all?
- To find out we'll break it down by time periods.

Nebraska's Geologic History: 650mya



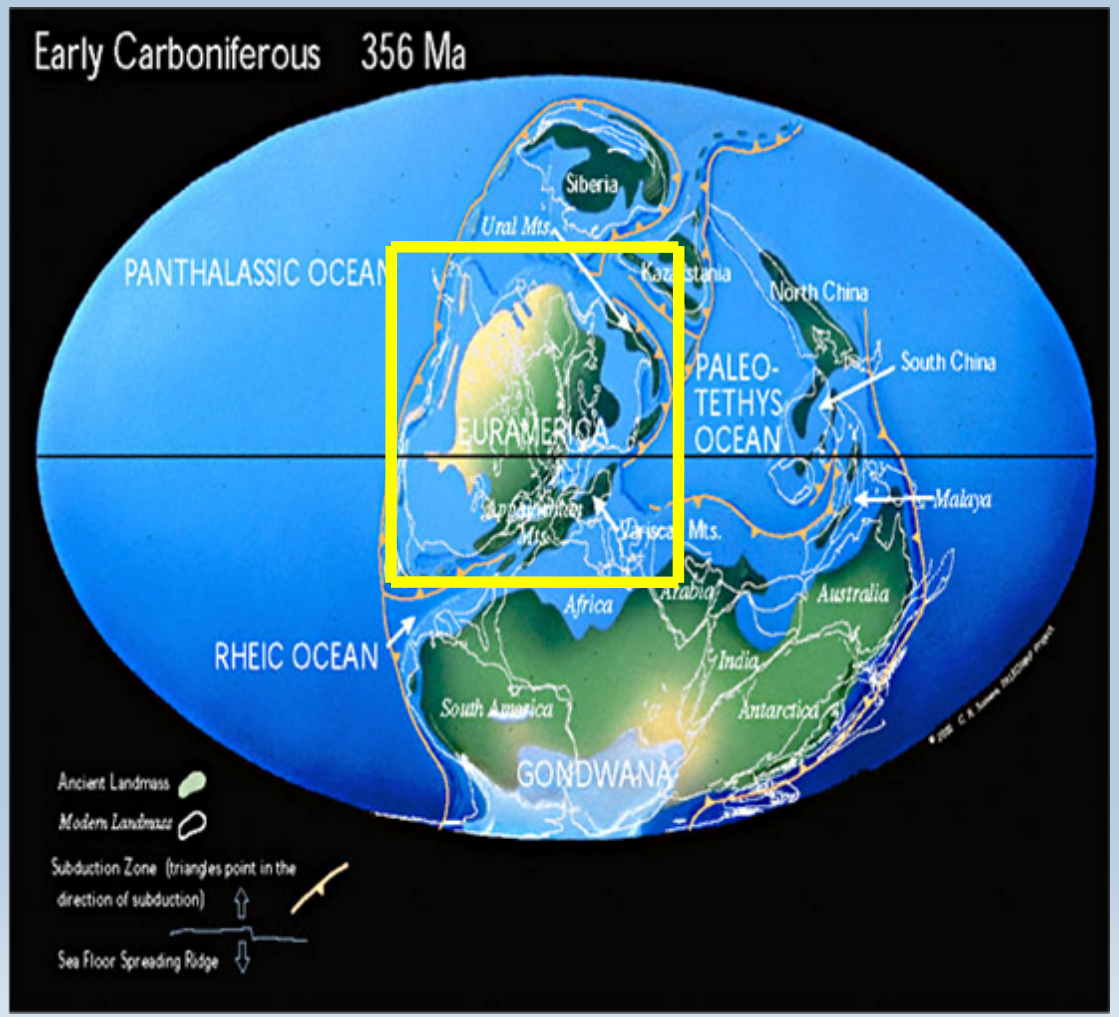
- During this Era Nebraska was not yet truly formed... The world was covered by seas with very little exposed land mass.

Nebraska's Geologic History: 514mya



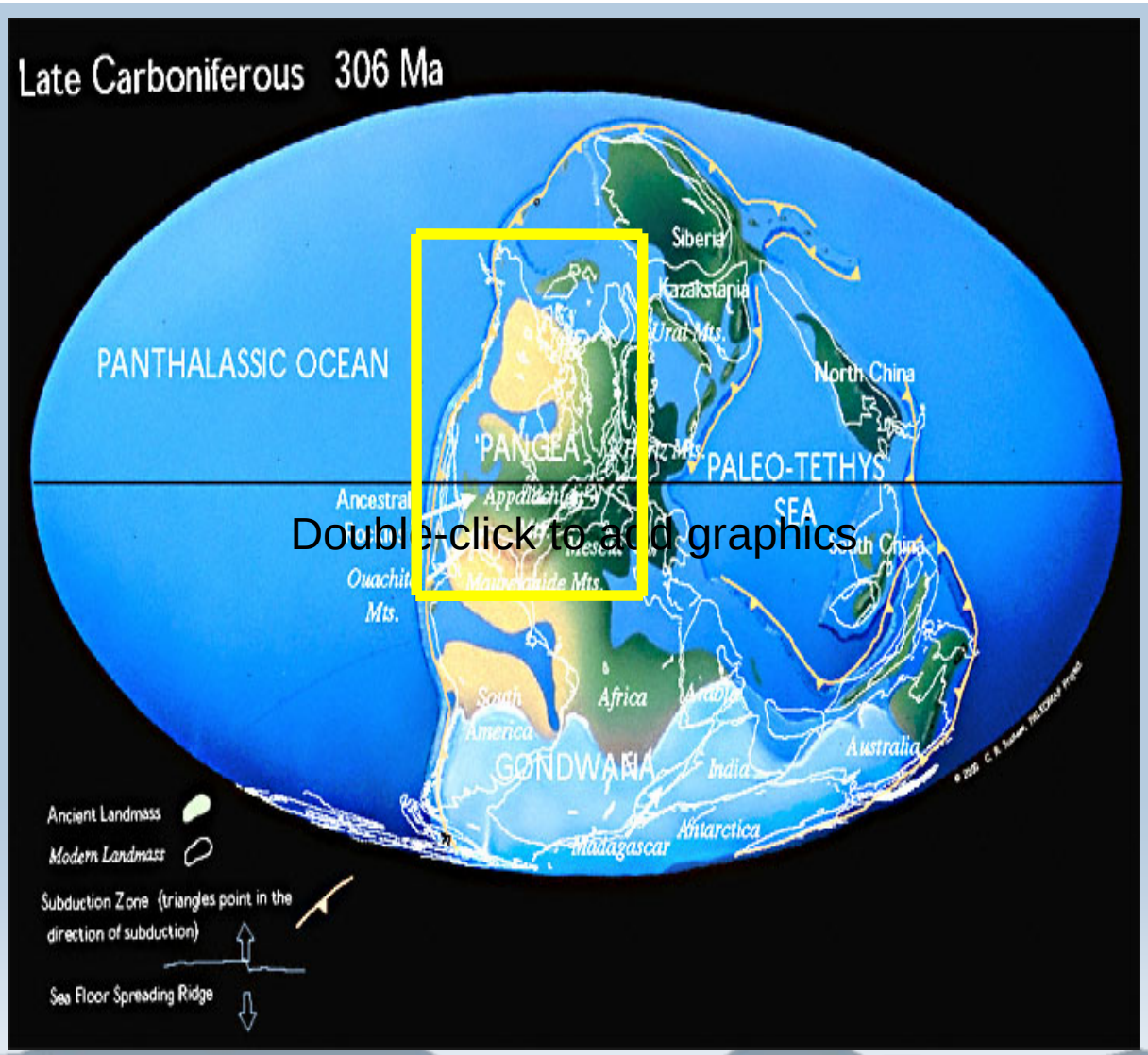
- As time went on the amount of land become greater.
- Gondwana was the first of the 'super-continents'.
- Life forms become more common.
- Nebraska is covered with shallow seas.
- Paleozoic rocks are found in only a couple spots in Nebraska.
- Climate was tropical-sub tropical.

Nebraska's Geologic History: 356mya



- North America (and Nebraska) begins to 'take shape'. (Yellow box)
- Most of continent is still covered by shallow seas.
- Enormous tropical forests and swamps cover NA.
- Nebraska is still covered mostly by shallow seas, swamps.
- Tropical climate.
- Mostly sandstones, shales, clays and limestones. Little coal.

Nebraska's Geologic History: 306mya



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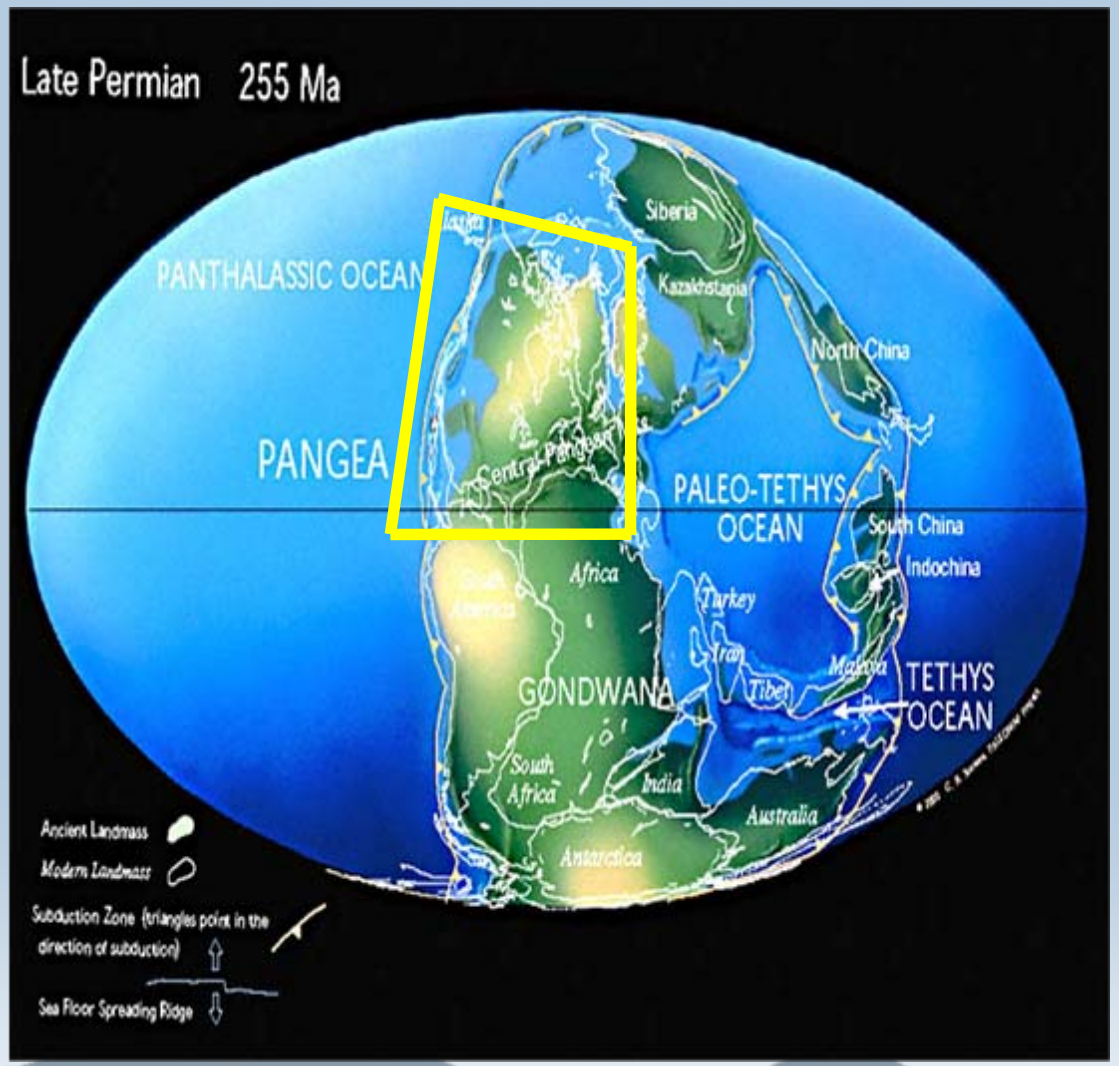
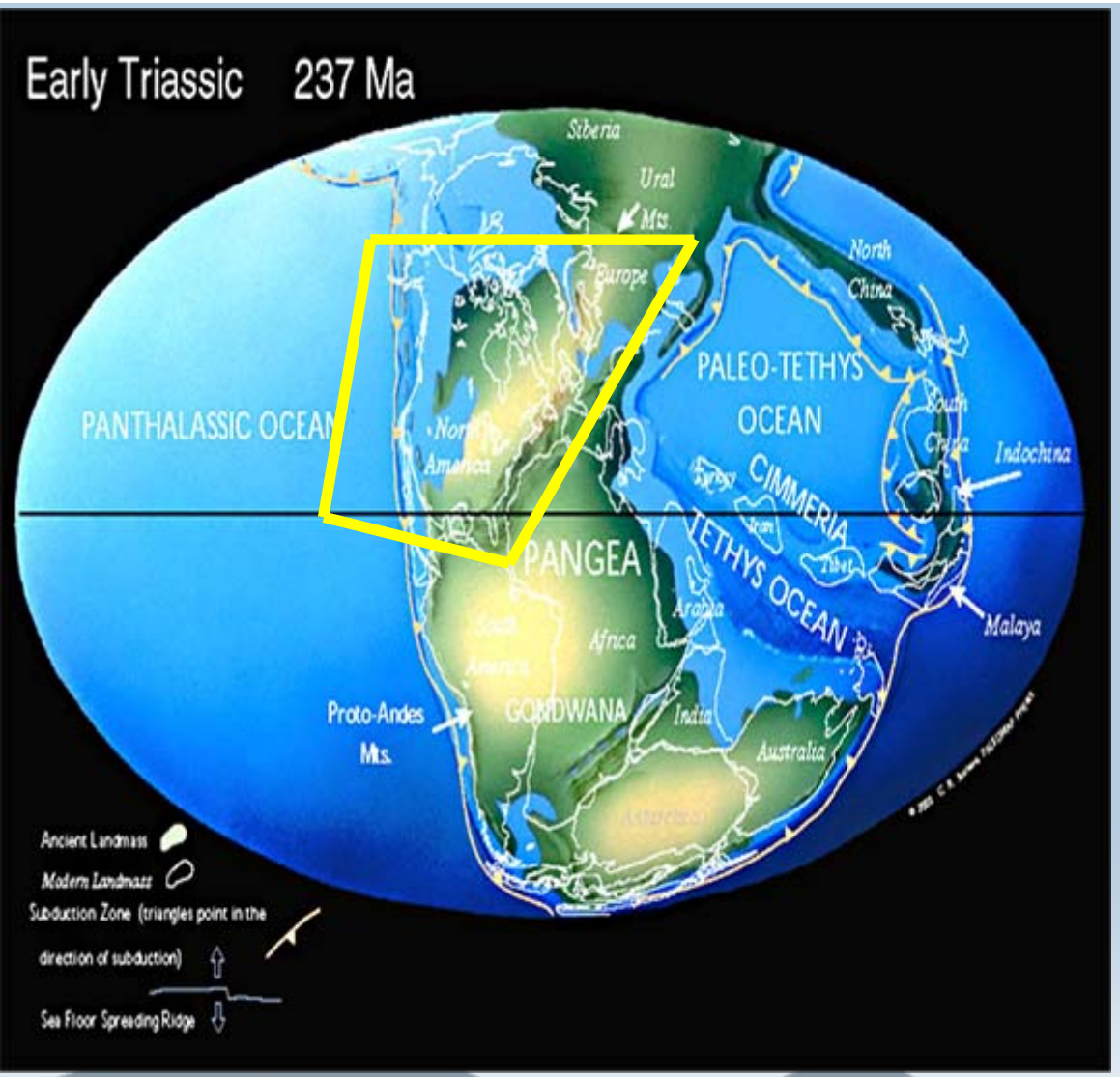
- Later in the Paleozoic, NA is nearly formed.
- Large portions of dry land are present.
- Swamps and shallow seas cover most of the world and Nebraska.
- Local life included corals, molluscs, trilobites and fishes.
- Rocks formed were coal, limestones, sandstones and clays.

Nebraska's Geologic History:255mya



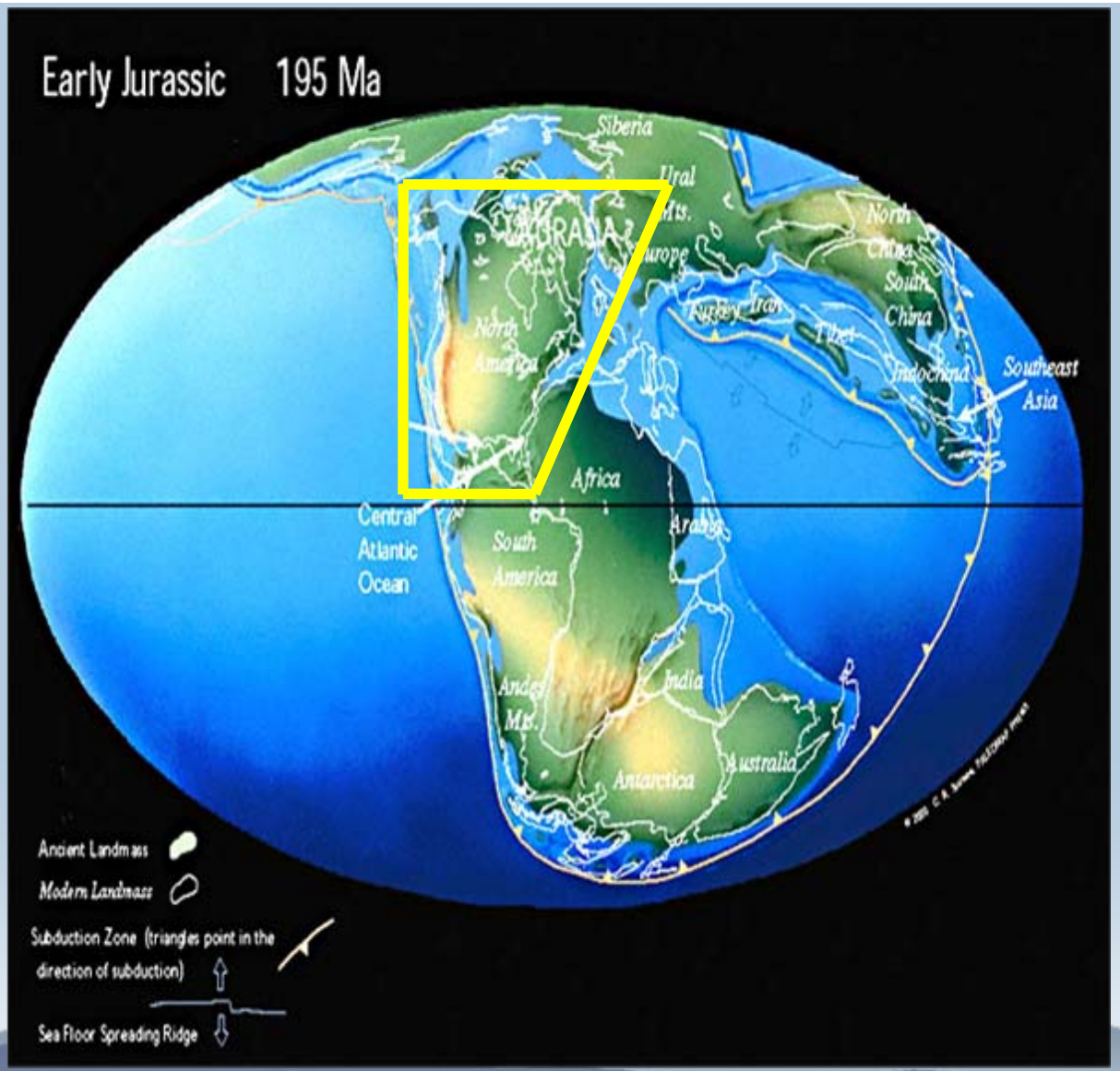
- NA mostly formed, separating from Europe and SA. Inland seas drained.
- Nebraska became more arid, and the fauna changed to suit the new environment.
- Climate became more seasonal.
- Plants and animals adapted to the new world.
- Some limestones, clays formed during this period.

Nebraska's Geologic History: 237mya



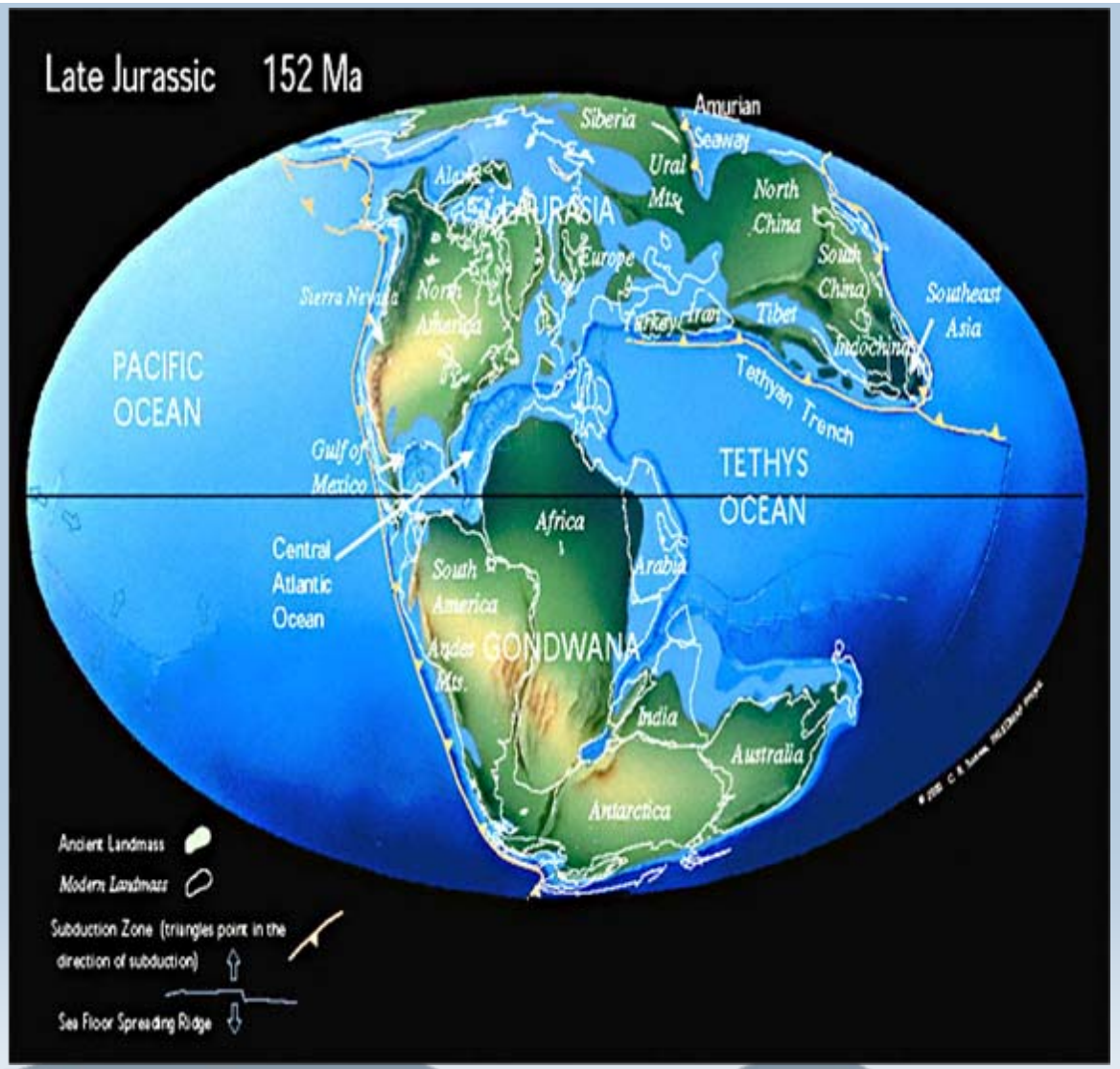
- Once again seas encroach on NA .
- Nebraska is an upland region, dry and eroding.
- Climate was hot and arid.
- Plants included conifers, tree ferns and cycads.
- Animals included the new reptiles, fish and early mammals.
- NO Triassic rocks are visible in Nebraska. Mostly sandstones, shales formed.

Nebraska's Geologic History: 196mya



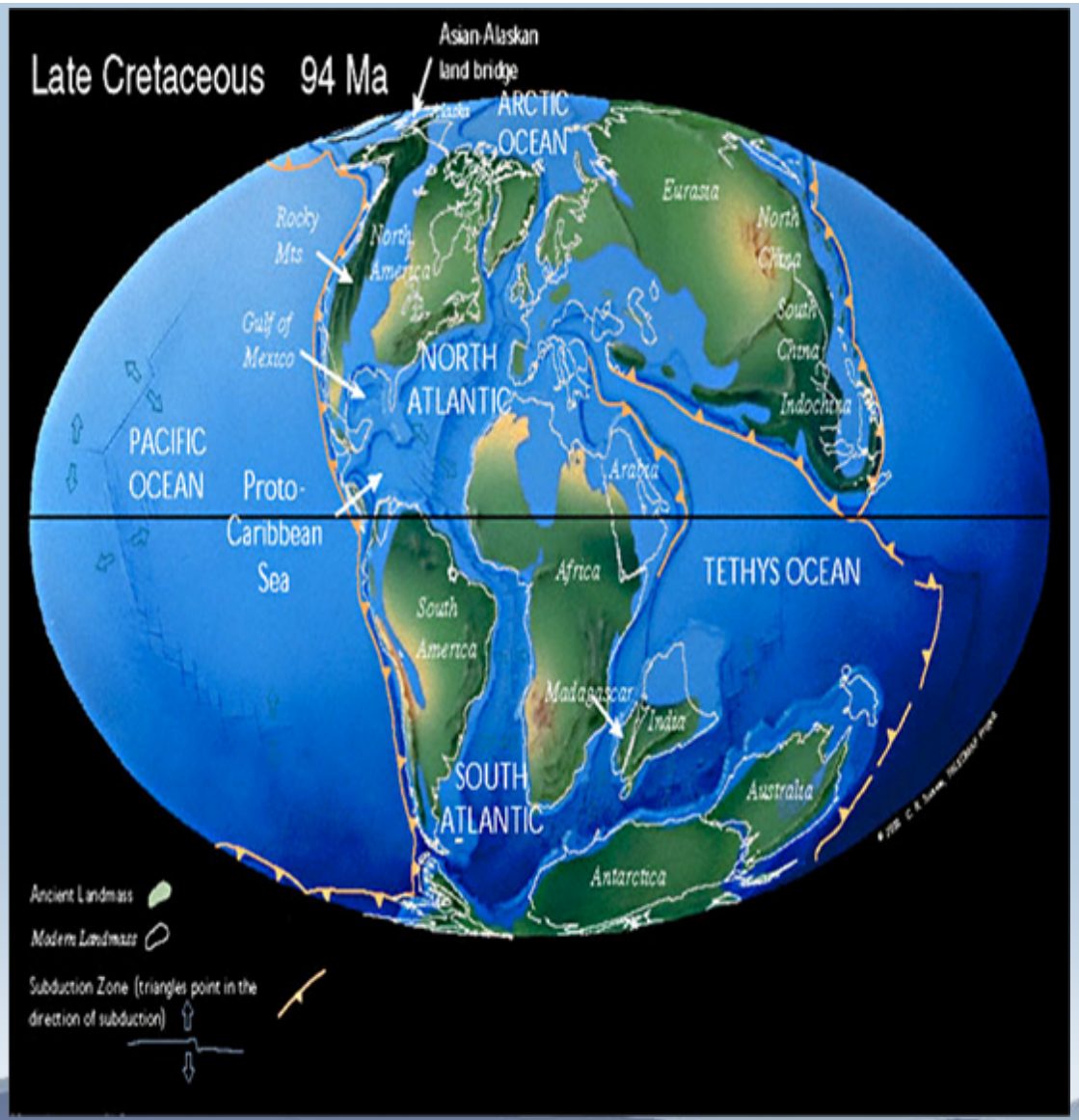
- Late Jurassic, mid Mesozoic, NA mostly upland and dry land.
- Climate begins to cool and become drier
- Reptiles become more prevalent also birds and small mammals. Conifers, cycads become most common.
- Seasonal changes become more pronounced.
- Sandstones, shales are formed.

Nebraska's Geologic History: 152mya



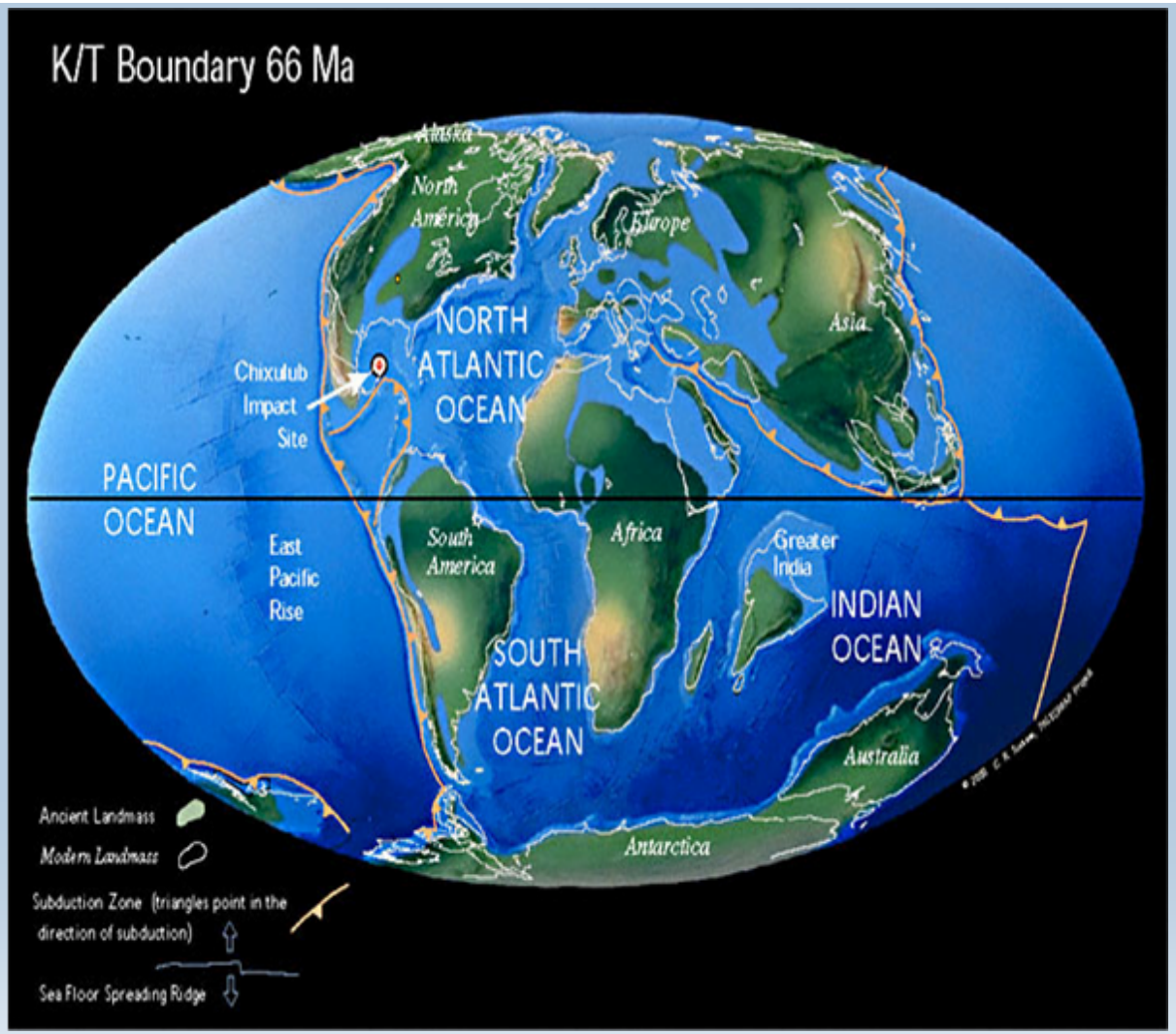
- NA almost complete and is mostly dry land now.
- First Dinosaurs appear, giant sauropods, first birds, and flowering plants.
- Climate was hot and humid.
- Dinosaurs, birds and small mammals become common.
- Modern trees, plants begin to spread.
- Rocks formed are sandstones, and shales.

Nebraska's Geologic History: 94mya



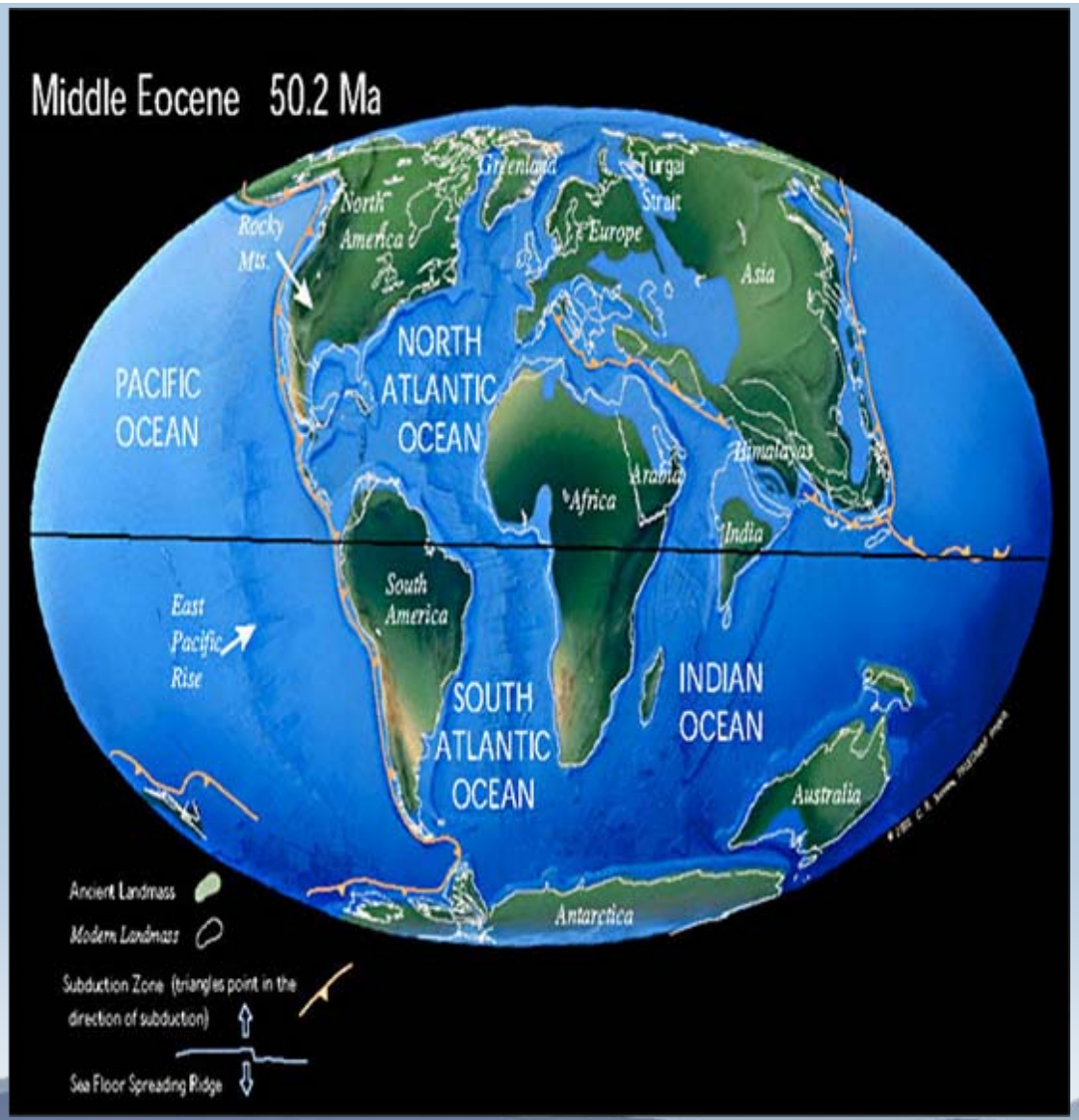
- Mid Cretaceous, Late Mesozoic.
- Dinosaurs now 'rule', mammals and birds are small, modern trees and plants are prevalent.
- A new seaway opens from Gulf of Mexico to Arctic Ocean.
- Climate is warm and humid.
- Shallow seaway covers western NE.
- Some chalks, limestones, and sandstones formed now.

Nebraska's Geologic History: 66mya



- The END of the Cretaceous.
- Extinction of dinosaurs.
- Seas are beginning to recede.
- Most of Nebr covered by ocean (no dino fossils :( )
- Dakota Group is laid down consisting of sandstones, shales and some chalks.
- A 7mile long meteorite strikes Gulf of Mexico, forming Chixulub crater and causing massive extinction.
- Climate temperate marine.

Nebraska's Geologic History: 50mya



- Middle Eocene epoch, early Cenozoic period.
- NA almost as it is today.
- Mammals are becoming more common.
- Climate is moist temperate to subtropical over most of NA but in the center of the continent it is getting drier.
- Eocene age rocks are not visible in Nebraska

Nebraska's Geologic History: 15mya

North America 15mya

- Middle of Miocene epoch.
- NA mostly dry uplands, similar to today. Climate was warm and temperate. Large lakes formed in mid-continent regions. Grasslands take over what were forests.
- Rocks of this age are fine sandstones and some limestone plentiful in NE!
- Many modern plants arose including true grasses.
- Mammals take over the plains, horses, camels, rhinos, a new form called titanothere and carnivores.
- One of the most abundant was the Oreodont.

Ashfall Animals from Nebraska

This mural on display at Ashfall State Park shows many of the animals that were common to Nebraska during the Miocene. It includes four species of horse, rhinos, elephants, camels, deer and several species of birds. All were found at Ashfall. And all met their demise 12 mya. BUT this event was localized, the ash was from a Yellowstone eruption.

Nebraska's Geologic History: 8mya

- Late Miocene, Periods of glaciation occur during this time.
- Climate is temperate, warm summers and cool winters.
- Mega Fauna is booming, >500 lbs.
- Sandstones, some limestones, sand and loess deposits become common.
- Vulcanism in the west was almost constant.

Nebraska's Geologic History: mya

- The Pleistocene, this is the most recent time period before the present.
- Continental drift continues, but the Earth looked much as it does today.
- Mega fauna is everywhere, modern bison, birds and horses, elephants and mammoths to.
- Glaciation causes climate to become arid and colder.
- Sandhills sand dunes are in motion, and loess deposits form...

Nebraska's Geologic History: 0.125mya

- 'Modern' time, Pleistocene/Hologene Epoch.
- Intermittent iceages, glaciers cover Most of NA. Glaciers as far as northern NE.
- Climate in NE is dry, cool.
- Sandhills dunes are still moving around. Loess deposits from along side the dune fields.
- Glacial till and morraines are left as evidence.
- Organisms move or adapt to the harsh conditions.
- A pathway opens between the glaciers from Alaska into the middle of NA... MAN ARRIVES!!

Nebraska's Geologic History: Today

- Today....
- Nebraskas climate is seasonal warm summers cold winters.
- No new rocks forming in Nebr sandhills stabilize (@ 600 ya)
- Organisms are what we see today.
- The continents continue to move and life continues to evolve.
- The Megafauna disappears... did man do that???