

# Glen Canyon Rainbow Bridge

National Park Service  
U.S. Department of the Interior

Glen Canyon National Recreation Area  
Rainbow Bridge National Monument



# Educators Guide to the Therizinosaur Exhibit



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## Therizinosaurus

Though closely related to the meat-eating velociraptors, *Nothronychus graffami* (pronounced NOTH- row-Nik-us, meaning 'Sloth-clawed' GRAF-fam-eye) belongs to an unusual group of plant-eating dinosaurs called therizinosaurus. The bodies of these animals radically changed to accommodate their vegetarian lifestyle. Unlike their meat-eating cousins, therizinosaurus had the peg-like teeth of an herbivore. Even stranger, the anterior part of their muzzle became modified into a toothless, bill-like structure that is similar to a bird's beak.

They may have been plant-eaters, but therizinosaurus we still an animal to be feared. Their three-fingered hands bore enormous sickle-like claws. Not only were these claws an excellent tool for stripping vegetation from trees to bring it into their mouth, or possibly even clawing through termite hills for a small crunchy snack (some paleontologists believe it was an insectivore), but they were also a lethal defense against predators. A necessity perhaps because they would not have been a fast runner.

Though therizinosaurus were bipedal like most other theropods, their hips were much wider than other raptors. Their pubis was swept backward like a bird's to make room for a large belly that was needed to digest plant matter. Because of its tremendous gut, the center of balance of a therizinosaurus was shifted backward along its spine, allowing these creatures to squat like sumo wrestlers.

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## Nothronychus Quick Facts

*Order:* Saurischia

*Suborder:* Segnosauria

*Family:* Therizinosauridae

*Height:* 8-10 feet tall

*Length:* 16-18 feet from head to tail

*Diet:* Plants (herbivore)

*Lived during:* Mesozoic Era, Late Cretaceous Period

*Age:* Approximately 93 million years ago (mya)

*Where skeleton was found:* Tropic Shale, Kaiparowits Plateau, near Big Water, UT

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## Late Cretaceous Period

The Cretaceous Period lasted from 145-65 million years ago (mya) and is divided into two parts: the Early Cretaceous Period (from 145-100 mya) and the Late Cretaceous Period (from 100-65 mya). This period is known as the "Age of Dinosaurs" because of their abundance. They weren't alone in this world though; dinosaurs were surrounded by flying reptiles such as pterosaurs, birds, marine life, small mammals and a diversity of other creatures. One of the most important changes during this period was the evolution of flowering plants.

Earth's climate was much warmer 93 mya when *Nothronychus graffami* lived. There were higher ocean levels and no ice caps on the poles. The vast Western Interior Seaway stretched all the way from the Arctic Ocean to the Gulf of Mexico, dividing North America. *Nothronychus* lived in the swampy coastal plains along side this seaway. Similar to the Louisiana bayous of today, these swamps supported cypress, redwoods, magnolias, palms, horsetails and other plants.

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## The Discovery

In 2000, Bureau of Land Management (BLM) Park Ranger Merle Graffam located a fossilized toe bone in the Tropic Shale outside Big Water, UT. The amateur paleontologist took his find to David Gillette who was finishing the excavation nearby of a plesiosaur skeleton. They looked at the toe bone and decided that it didn't belong to any of the marine creatures that they had excavated up until that point, but instead looked like the bone of a dinosaur. In 2001 the remaining bones of the skeleton were excavated with nearly all the bones present. Piecing together the information from their find with that of another similar find in New Mexico as well as discoveries of therizinosaurus in Asia, the team was able to identify the skeletal remains and continue research. These fossilized bones still make up the most complete therizinosaurus skeleton known to paleontologists.

# Glossary of Terms

**Adaptation:** a special characteristic, or the way an animal or plant species has developed over time resulting in an improved relationship to its environment (It is important when teaching this concept to stress that adaptations are not ways that organisms/species have decidedly adjusted to their environments but instead that adaptations are the results of a long process, natural selection, which weeds out less successful variations of body plans thereby resulting in the success of organisms that have characteristics more in-tune with their environmental conditions.)

**Carnivore:** An organism that eats meat.

**Cretaceous Period:** The third and last geologic time period during the Mesozoic Era. It took place between 145 and 65 million years ago. The type of rock deposited at that time was known as chalk, which in Latin is called 'creta', thus the term Cretaceous. We divide this period into 2 parts, the Early (Lower) Cretaceous which took place from 145 to 100 million years ago and the Late (Upper) Cretaceous that took place between 100 and 65 million years ago.

**Environment:** The air, water, and land in and on which organisms live.

**Evolution:** The theory that the various present types of animals and plants on Earth developed from simple organisms and that the distinguishable differences are due to modifications in successive generations.

**Extinction:** The disappearance of a plant or animal species; no longer in existence or living.

**Fossil:** The remains or imprints of organisms which lived in the geologic past (>10,000 years ago) and have been preserved in the earth's crust.

**Geologic time:** The vast amount of time (4.6 billion years) interpreted to represent the Earth's history.

**Herbivore:** An organism that eats plants.

**Mesozoic Era:** The second and middle era of the Phanerozoic, after the Paleozoic and before the Cenozoic; known as the Age of the Reptiles. This era lasted from 250 to 65 million years ago and is broken into 3 periods: the Triassic Period, the Jurassic Period and the Cretaceous Period.

**Omnivore:** An organism that eats a mixed diet of plants and meat.

**Paleontologist:** The scientist that specializes in paleontology.

**Paleontology:** The study of ancient life through the examination and interpretation of fossils.

**Plate tectonics:** The theory that the earth's crust is divided into nine plates that slowly move over the mantle. The study of these plates helps to explain continental drift, seafloor spreading, volcanoes and the formation of mountains.

**Prehistoric:** Relating to the times before recorded/written history began.

**Tropic Shale:** A geologic layer (in this case within the Kaiparowits Plateau) composed of very fine grains from the bottom of the Cretaceous Sea floor, where the Therizinosaur remains were discovered.

**Western Interior Sea (Seaway):** A large, inland sea that split the continent of what is now North America into two parts during most of the early and late Cretaceous period; also called the Cretaceous Seaway, the Niobrara Sea or the North American Inland Sea.

# Additional Resources

- **Glen Canyon National Recreation Area** – Our park website will soon be updated to include information about our new exhibit. Just visit <http://www.nps.gov/glca/forteachers/therizinosaur.htm>.
- **National Fossil Day Website** – A very extensive website dedicated to the 230+ “fossil parks” or National Parks containing fossil resources— just like Glen Canyon! You will find dozens of links to educator resources for paleontology here. Visit <http://nature.nps.gov/geology/nationalfossilday/>.
- **Earth Science Literacy** – This site is a comprehensive guide to earth science. All the major questions regarding what we know about the earth are answered here. Go to <http://www.earthscienceliteracy.org/>
- **Museum of Northern Arizona** – Located in Flagstaff, Arizona this museum was the first location of the Therizinosaur Exhibit. Their lead paleontologist Dr. Dave Gillette oversaw the excavation of our dinosaur from the Big Water Tropic Shale. See [www.musnaz.org](http://www.musnaz.org).

## Local contact information:

- Glen Canyon National Recreation Area – Education Program Department
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  - Katie Couch – [Katie\\_Couch@nps.gov](mailto:Katie_Couch@nps.gov) (928)608-6352
- Carl Hayden Visitor Center
  - NPS Park Rangers, exhibit information (928)608-6404
  - Tours of Glen Canyon Dam (928)608-6072
- Big Water Visitor Center
  - BLM Park Rangers, more dinosaur info (435)675-3200