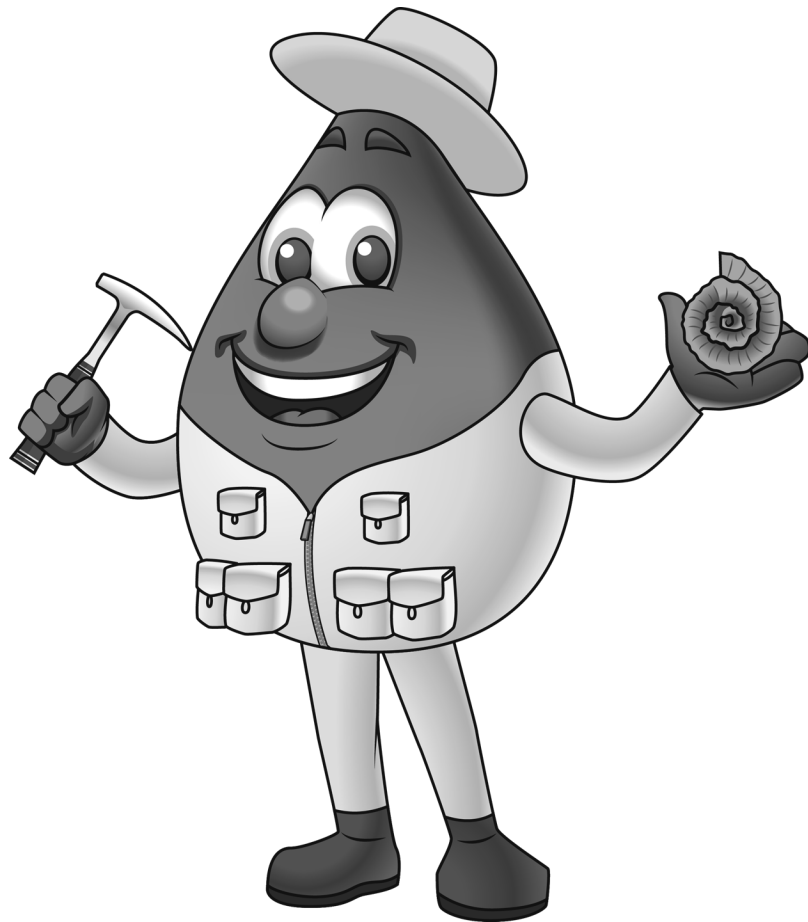
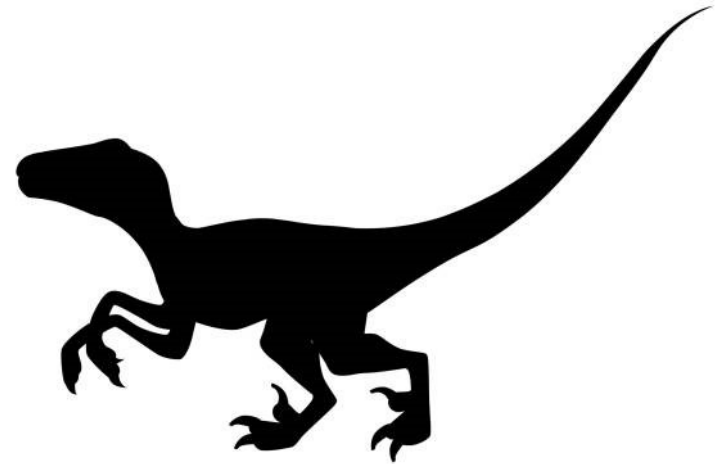


# Keep Exploring!



# WHAT DID UTAH LOOK LIKE?



Name: \_\_\_\_\_

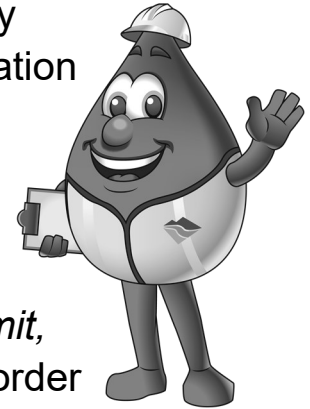
To explore other curriculum and activities developed by  
Central Utah Water Conservancy District head to:  
<https://cuwcd.com/education.html>

 Central Utah Water STEM Club Passport

# Who is Central Utah Water?



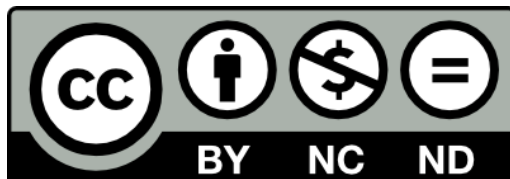
Central Utah Water Conservancy District is a government organization with the mission to move water across county boundaries. We have 8 counties located within the District (*Duchesne, Juab, Salt Lake, Sanpete, Summit, Uintah, Utah, and Wasatch*). In order to meet our mission of moving water, Central Utah Water stores water in 9 reservoirs, maintains over 180 miles of large diameter pipelines, and runs 3 regional drinking water treatment plants.



In addition to our primary responsibility to move water, Central Utah Water is the second largest producer of hydropower in the State of Utah, works to protect endangered species, supports community based water conservation projects, and is a regional leader in water education.

To learn more about Central Utah Water and our work in the community go to [CUWCD.com](http://CUWCD.com)

This curriculum is released by  
Central Utah Water Conservancy District  
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## Further Adventures



Just because this club is done, doesn't mean you have to end the fun! H<sub>2</sub>Joe has done his research and found you a bunch of geology activities you can do on your own.

### Science Trek: Fossil Games

<https://sciencetrek.org/sciencetrek/topics/fossils/games.cfm>

### American Museum of Natural History: Paleontology

<https://www.amnh.org/explore/ology/paleontology>

### Smithsonian: National Museum of Natural History Virtual Tours

<https://naturalhistory.si.edu/visit/virtual-tour>


### Dinosaur National Monument: Junior Ranger

<https://www.nps.gov/dino/learn/kidsyouth/beajuniorranger.htm>

Welcome to the 'What Did Utah Look Like' Club! Together we will be exploring Utah's earth history and geology with our guide H<sub>2</sub>Joe. So let's start to learn about the rock beneath our feet!

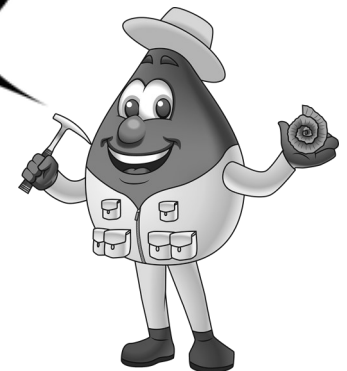
 **Activity 1** - Where Did Water Come From?

 **Activity 2** - Why Can I Find Shark Teeth?

 **Activity 3** - What Becomes A Fossil?

 **Activity 4** - Where Did Lake Bonneville Go?

Hi, I'm H<sub>2</sub>Joe.  
I am looking forward to exploring rocks and fossils with you!





## Where Did Water Come From?

When we look back at geologic history, Utah has looked very different from today. By looking at the rock and fossil record we are able to catch a glimpse of what it might have been like in the past. The oldest rocks in the state tell a story of an giant, ancient ocean. But that brings up the question, where did the water for this ocean come from?

### For The Precambrian Activities I Need...

- |           |               |
|-----------|---------------|
| Pie Tin   | Flour         |
| Sprinkles | Small Pebbles |
| Wet Rocks | Ice           |
| Scale     | Heat Source   |

### WHERE TO VISIT PRECAMBRIAN ROCKS

Good places to see Precambrian rocks include:

- Antelope Island State Park - Browns Park Refuge -
- Timpanogos Cave National Monument -

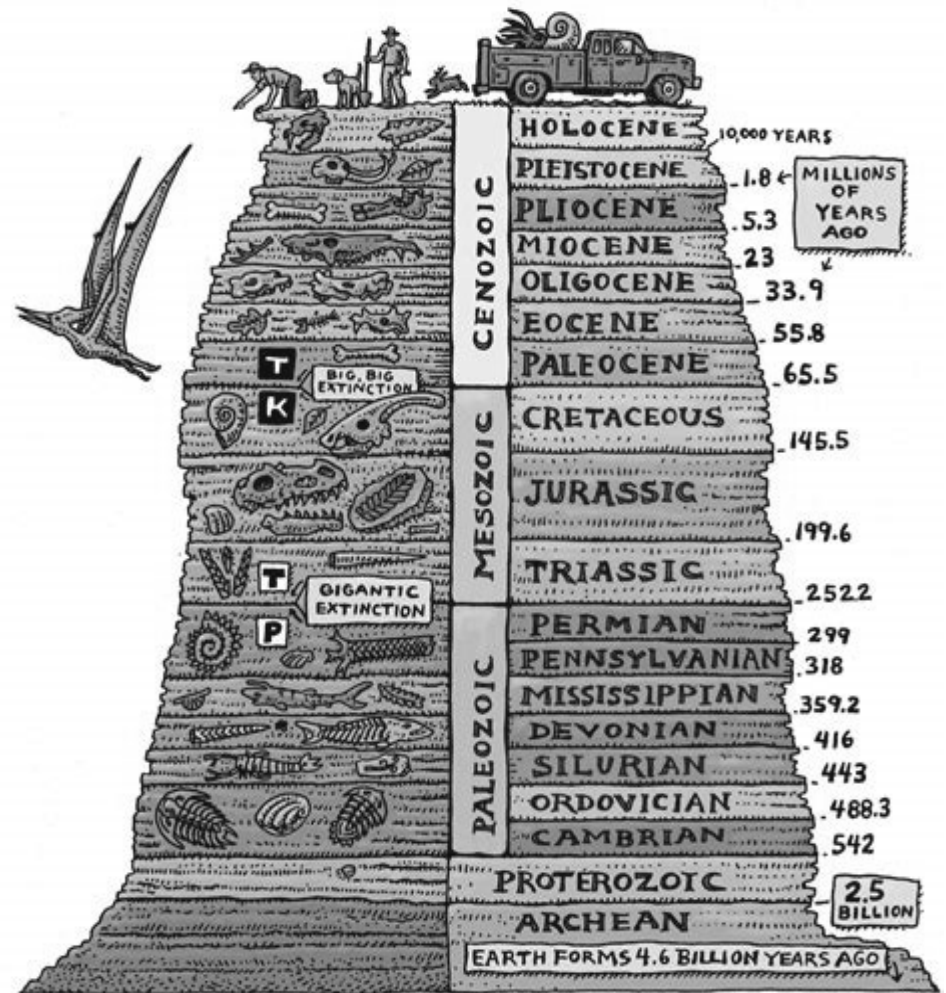


2

## Geology References



Geologist have given names to different periods of geologic history to help them share their research with others.

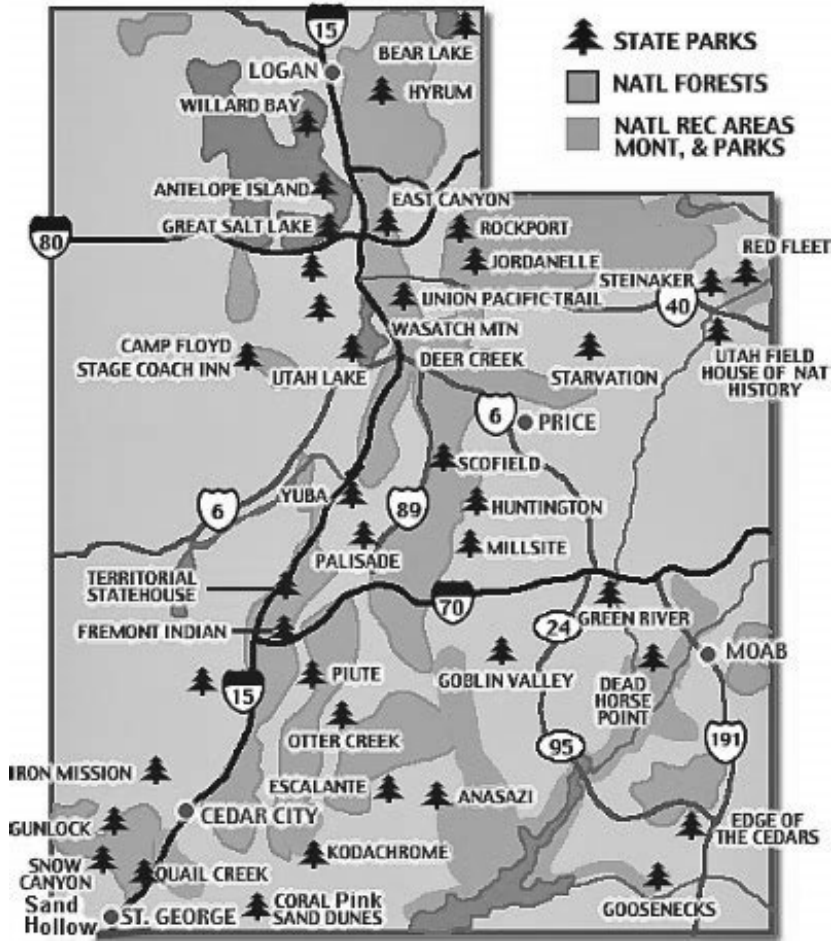


19



## Geology References

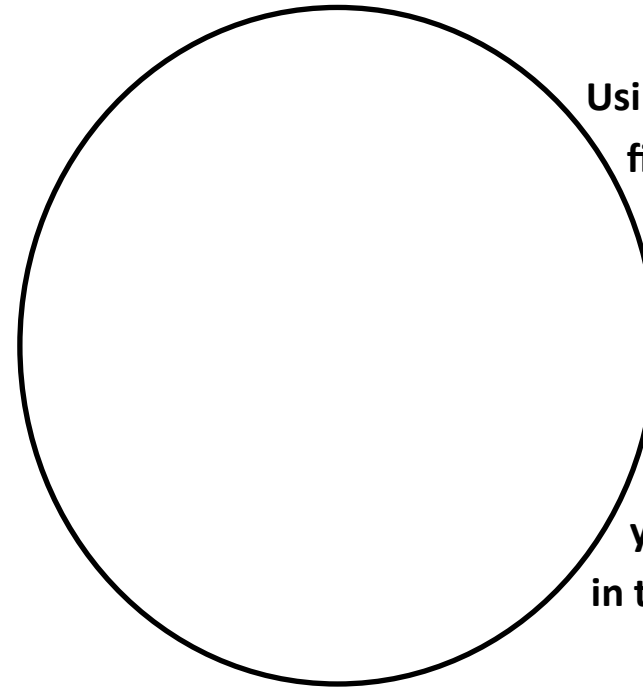
Utah is an amazing place to explore geology. State Parks, National Forests, and National Parks are a great place to start.



## Where Did Water Come From?



An important source of water on planet earth were the asteroids and comets that hit the earth when the planet was forming. In fact, earth is still receives a few teaspoons of water every years when rocks from space enter our planet's atmosphere. While this amount seems tiny, it really adds up over billions of years.



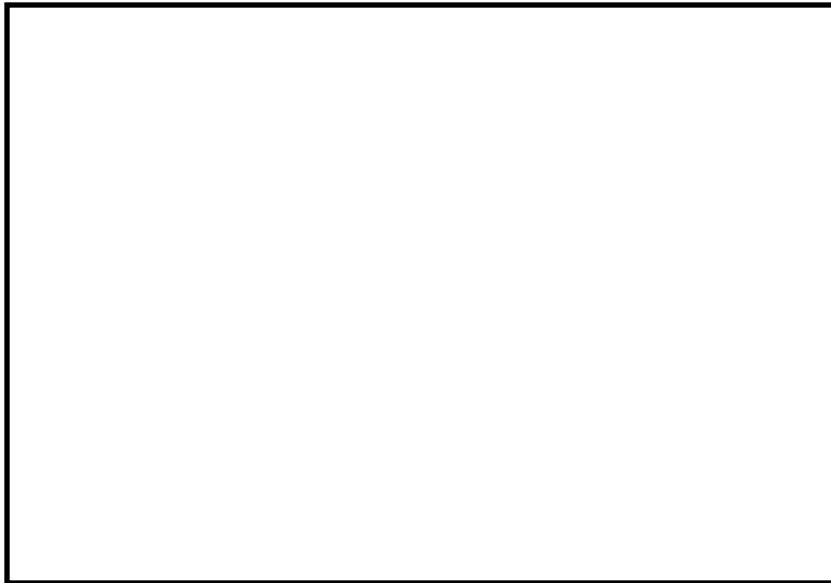
Using the flour filled pie tin and pebble, simulate a meteor strike, then draw your results in the circle.





## Where Did Water Come From?

Some of the water in asteroids and comets is in the form of ice, but most of it is locked up in water bearing minerals. This water can't be released into our atmosphere and oceans without help. Luckily the Earth has volcanoes which can melt the rock and release the water from these minerals.



**Draw and describe what happens to the rocks when they are heated in the box above.**



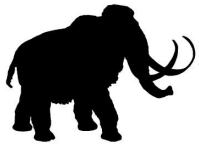
## Where Did Lake Bonneville Go?

The Cenozoic Era is a geologic period that has been defined by the rise of mammals. It's climate has varied from extreme warm periods to the extreme cold of the ice ages. These swings in climate helped the species we see today evolve.



We know what at least part of the Cenozoic Era looks like, because it is the geologic period that we are living through right now! When you have a chance head outside and see if you can spot the forces that help our landscape and climate continue to change.





## Where Did Lake Bonneville Go?

The changes in temperature and precipitation that occurred in the Cenozoic helped to create a diverse collection of mammals. Some of these mammals are related to each other. Some are not related, but look similar.

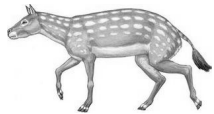
Are They Related?



Manatee



Humpback Whale



Hyracotherium



Horse



Uintatherium



Brontotherium



Machaeroides



Saber-Toothed Cat



16



## Where Did Water Come From?

The Earth's oceans took a long time to form and even longer to develop life. Geologists call this period of Earth's history the Precambrian Supereon. Our planet looked very different from what it looks like today. There were no plants or land animals, but by the end of the Precambrian simple animals like jellyfish and reef-forming algae mats called Stromatolites appear in the fossil record.

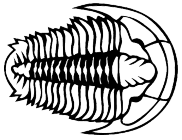


Photo from the Great Salt Lake Institute

Stromatolites aren't just found in the fossil record, a few still exist in places too extreme for normal types of coral reefs to survive. One of the places you can visit these living fossils in the Great Salt Lake!



5



## Why Can I Find Sharks Teeth?

The story that Utah's rocks tell about an about a world that looked very different from what it does now. When we dig through the fossil record, paleontologist ask questions to figure out why we can find fossil shark teeth and sea shells in the middle of Utah's driest deserts.

### For The Paleozoic Activities I Need...

Supercontinent Cards

Prehistoric Creature Cards

### WHERE TO VISIT PALEOZOIC ROCKS

Good places to see Paleozoic rocks include:

- BLM Trilobite Quarry - Wellsville Mountains -
- Timpanogos Cave National Monument -



## Where Did Lake Bonneville Go?



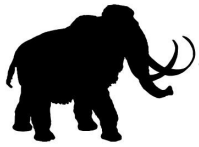
In Utah one of the most important geologic stories that took place during the Cenozoic was the formation of Mega Lakes. From ancient Lake Uinta in the Uintah Basin to the famous Lake Bonneville, these giant lakes tell us a lot about how the climate changed through out the Cenozoic.

Record evaporation rates for your two lake models.

Warm Lake	Cold Lake
Starting Amount of Water	Starting Amount of Water
Ending Amount of Water	Ending Amount of Water
Water Lost to Evaporation	Water Lost To Evaporation







## Where Did Lake Bonneville Go?

Utah's dinosaurs may get the spotlight, but the state's is also a treasure trove of fossils from the Cenozoic Era that help scientists better understand where our modern mammals and current climate come from.

### For The Cenozoic Activities I Need...

- 2 Bowls
- Cold Water
- Ice
- A Measuring Cup
- Hot Water
- Who's Related Cards

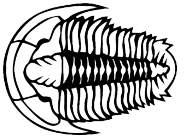
### WHERE TO VISIT CENOZOIC ROCKS

Good places to see Cenozoic rocks include:

- Starvation Reservoir - Bonneville Shoreline Trail -
- Antelope Island State Park -

14

## Why Can I Find Shark Teeth?

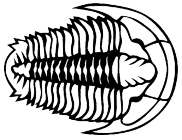


One reason we find ocean fossils on dry land is because the earth's crust is constantly moving. This process is called continental drift. By using fossils and rock strata, geologists are able to piece together where continents have been in the past and even figure out when and where super continents occurred.

Use the fossil and rock strata evidence to piece together these supercontinents from Earth's past.

Pangaea	Gondwana
Pannotia	Rodinia





7



## Why Can I Find Sharks Teeth?

Another important reasons why we can find shark fossils in Utah, but no living sharks are changes in the environment. All living things have need a specific environment to survive. If their habitat changes too quickly they can go extinct.

Try To Identify Why Each Animal Below Went Extinct:

 <b>Trilobite</b>	
 <b>Edaphosaurus</b>	
 <b>Eurypterid</b>	
 <b>Pederpes</b>	



8

## What Becomes A Fossil?



The Mesozoic Era, means the era of middle life. During this period many of the types of plants and animals we see to day started to evolve, but they were not able to take over many ecological niches because dinosaurs dominated the planet's ecosystems from the equator all the way to the poles.



During most of the Mesozoic Era, Utah experienced uplift. This means that Utah has examples of several different terrestrial (land) ecosystems like this artist interpretation of the landscape at Utahraptor State Park during the Cretaceous Period.



13



## What Becomes A Fossil?

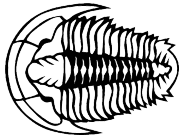
We have learned about types of fossil, created a model fossil, now let's play a game to help us understand the probability of an organism becoming part of the fossil record.

	Yes	No
Was it the 'right' type of organism?		
Did it die at the 'right' place?		
Was it preserved?		
Did it stay buried until the 'right' time?		
Was it discovered?		



12

## Why Can I Find Shark Teeth?



During the Paleozoic Era, Earth developed all sorts of unique plants and animals. Some animals such as sharks, crinoids, coelacanths, and the nautilus swim our oceans today. Other animals like trilobites disappeared during one of the four mass extinction events that occurred during the Paleozoic.



During most of the Paleozoic Era, Utah was on the edge of the continent. This means most of the rock deposits from this period are from beach and shallow ocean ecosystems like the one pictured in this diorama at Thanksgiving Point's Museum of Ancient Life.



9



## What Becomes A Fossil?

While Utah is rich in fossils from through out earth's history, it is most famous for its fossils from the Mesozoic. From the first flowering plants to the emergence of mammal, there is a lot to get excited about, but it is the vast variety of dinosaurs that tend to capture most peoples imagination. But that brings up the question...what parts of an ecosystem becomes a fossil?

### For The Mesozoic Activities I Need...

Paper Cup

Sculpting Clay

Seashell

Plaster of Paris

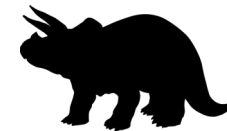
20 Sided Dice

### WHERE TO VISIT MESOZOIC ROCKS

Good places to see Mesozoic rocks include:

- Dinosaur National Monument - Utahraptor State Park -
- Jurassic National Monument -

10



## What Becomes A Fossil?

Most living things die and decompose without leaving a trace on the geologic record, but once every blue moon an organism dies at the right place, time, and of the right causes to allow their remains to become a fossil.

Describe each type of fossil in the spaces below:

Trace



Cast/Mold



Permineralization



Amber



Preserved/  
Mummified




11