

What Happened at Cleveland-Lloyd Dinosaur Quarry?

Research Assistant Notebook

Student Name

QUARRY MAP: WHAT DO YOU SEE?

On your own or with your partner, discuss the following questions as you explore the map.

1. What are some of the things you noticed first about the quarry map? What could they mean? Write at least one question that would help you investigate these observations further.

2. What do you notice about way the fossils are laid out? Assuming that natural laws operate the same today as they did in the past, what could this mean? Write at least one question that would help you investigate this further.

3. What do you notice about the proportion of carnivores (Theropods) to herbivores (Ornithischians and Sauropods)? Based on what you know about modern day predator-prey relationships, what might this mean? Write at least one question that would help you investigate this further.

4. List other observations and/or questions that you have about Cleveland-Lloyd Dinosaur Quarry based on your observations of the quarry map.

CARRIE'S FIELD NOTES FROM CLEVELAND-LLOYD DINOSAUR QUARRY

INSTRUCTIONS

1. On your own or with your partner, read and discuss **at least six facts** about Cleveland-Lloyd Dinosaur Quarry from Carrie's field notes. Remember, the more evidence you analyze the more you have for creating your theory.
2. Analyze and interpret the fact. Does it provide evidence for what might have happened?

Here is an example of how Carrie analyzed one of the facts from Cleveland-Lloyd Dinosaur Quarry:

FACT: 4% of all the bones at Cleveland-Lloyd showed signs of weathering.

ANALYZE & INTERPRET: If 4% of the bones were weathered, that means that 96% were not weathered. If most bones were not weathered, it means that they must have been covered up by something soon after death. Water might cover it up, or sediment could have gotten blown over it.

SKELETAL DATA

FACT: 37% of the bones showed signs of abrasion.

ANALYZE & INTERPRET:

FACT: 4% of the bones had surface traces.

ANALYZE & INTERPRET:

FACT: 30% of the bones had fractures that formed after death.

ANALYZE & INTERPRET:

THE BONEBED

FACT: The bonebed at Cleveland-Lloyd Dinosaur Quarry is made up of siltstone and claystone.

ANALYZE & INTERPRET:

FACT: Limestone was found above the bonebed, with some fossils even sticking up into the limestone layer.

ANALYZE & INTERPRET:

FACT: The fossils appear to be deposited in three different horizontal sections within the bonebed.

ANALYZE & INTERPRET:

CARRIE'S FIELD NOTES FROM CLEVELAND-LLOYD DINOSAUR QUARRY (Continued)

FACT: Most of the fossils were found disarticulated.

ANALYZE & INTERPRET:

FACT: The remains of two turtles were found.

ANALYZE & INTERPRET:

FACT: One crocodile tooth and a piece of osteoderm was found.

ANALYZE & INTERPRET:

FACT: Approximately 75% of animals found were carnivorous.

ANALYZE & INTERPRET:

FACT: 66% of all the dinosaurs found are *Allosaurus fragilis*.

ANALYZE & INTERPRET:

FACT: 80% of the *Allosaurus fragilis* fossils are juveniles.

ANALYZE & INTERPRET:

ENVIRONMENTAL DATA

FACT: Sediment samples show that ponds, lakes, and rivers existed nearby.

ANALYZE & INTERPRET:

FACT: On average, this area was a drier habitat than other areas nearby.

ANALYZE & INTERPRET:

FACT: There is no evidence of fish or amphibians in the bonebed.

ANALYZE & INTERPRET:

CARRIE'S FIELD NOTES FROM CLEVELAND-LLOYD DINOSAUR QUARRY *(Continued)*

FACT: One dinosaur egg, with an extra layer of eggshell, was found in the area.

ANALYZE & INTERPRET:

FACT: The closest active volcanoes during this time were located several hundred miles away.

ANALYZE & INTERPRET:

COMPARE TO MODERN EXAMPLES

Now that you've analyzed and interpreted the field notes, it's time to compare and contrast the field notes with modern examples.

INSTRUCTIONS

1. With your partner, explore the "modern examples" on **STEP 4** of the website.
2. Discuss whether there is evidence from Cleveland-Lloyd Dinosaur Quarry that any of these modern examples did or didn't happen.

MODERN EXAMPLES	EVIDENCE THAT THIS MAY HAVE HAPPENED	EVIDENCE THAT THIS DIDN'T HAPPEN
Hidden Tar Pits		
Flood		
Earthquake		
Landslide		
Volcano		
Harmful Algal Bloom		
Drought		

Reflect on Carrie's Field Notes and the modern examples provided. What does your evidence suggest may have happened at Cleveland-Lloyd Dinosaur Quarry? Discuss this with your partner (or group) and then write down two possible explanations that are supported by the evidence.

EXPLANATION 1:

EXPLANATION 2:

EVALUATE THE EVIDENCE

INSTRUCTIONS

1. Write down the two possible explanations you came up with for what might have happened at Cleveland-Lloyd Dinosaur Quarry.
2. List the evidence for each explanation.
(HINT: This should come from your observations of the quarry map, analysis and interpretations of Carrie's Field Notes, and comparisons between Cleveland-Lloyd Dinosaur Quarry and modern examples of mass animal deaths.)
3. Evaluate the strength of all your evidence for that specific explanation.
4. Discuss: Which explanation is best supported by evidence, and why?

Explanation 1: _____

EVIDENCE	Is this strong, weak, or disconfirming?
1.	
2.	
3.	
4.	
5.	

Explanation 2: _____

EVIDENCE	Is this strong, weak, or disconfirming?
1.	
2.	
3.	
4.	
5.	

CONSTRUCT AN ARGUMENT: WHAT HAPPENED AT CLEVELAND-LLOYD DINOSAUR QUARRY?

Prepare to share your explanation and the evidence that supports it by filling out the sections below. When you are done, you will be ready to discuss your argument with your fellow research assistants.

Our explanation for what happened at Cleveland-Lloyd Dinosaur Quarry is...

STRONG EVIDENCE		
	How this supports our explanation	Questions that might help us gather more information.
WEAK EVIDENCE		
	How this supports our explanation (and what other explanations it could support)	Questions that might help us gather more information.
DISCONFIRMING EVIDENCE		
	How this supports our explanation	Questions that might help us gather more information.