Thank you for participating in this field exploration at Petrified Forest National Park! We hope you learned not only how to conduct a scientific study but that you learned something new about *your* national park.

The mission statement of Petrified Forest National Park:

Petrified Forest National Park preserves, protects, and interprets a globally significant examle of a Late Triassic ecosystem and a continuum of human use in a high desert/ short grass prairie environment. It preserves wilderness values for recreation, solitude, natural quiet, long distance views, and night skies. It provides outstanding opportunities for scientific research and education.

The mission statement of the National Park Service:

The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The park service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

Rockin' through the Ages: from Fossils to Petroglyphs

Petrified Tree Orientation

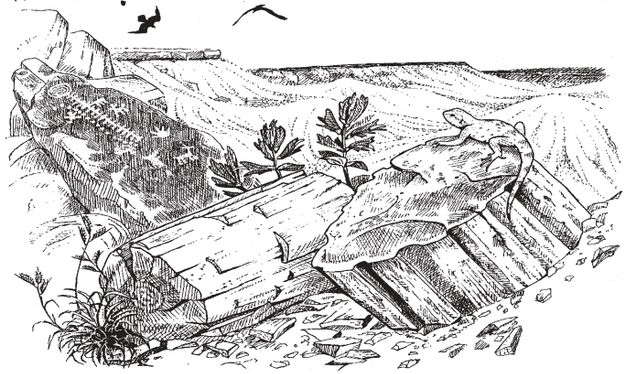
Field Guide

Date_____

Name_____

Petrified Forest National Park

Rules, Regulations, and Safety Points



- All natural and cultural resources within national parks are protected by federal law. **Collection of park resources is illegal and subject to a $275.00 minimum fine.** This includes petrified wood, archeological artifacts, rocks, plants, and animals. Even the smallest pieces count!

- If you pick up petrified wood, rocks, sticks, or other materials to have a close look at them, be sure to put them back where you found them.

- Even though petrified wood is a rock, it is still a fragile, nonrenewable fossil. Do not break, chip, or otherwise damage the petrified wood pieces, large or small.

- Watch your step! Plants in this environment grow by the inch and are destroyed by the foot. Don't let it be your foot!

- Be respectful of other visitors. Try to keep noise levels down and don't yell to each other across open areas.

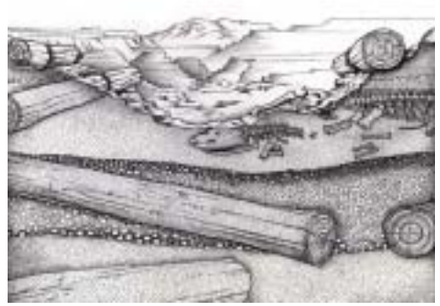
- Wear your yellow vest so other visitors know you are doing a scientific study.

Summary

Geologists describe the ancient environment of the Late Triassic Period as a low lying flood plain. Large, fast moving rivers entered the area from the south and slowed down as they split into smaller rivers and streams. They ended in lakes and swampy areas.

The petrified trees you see today were once long trunks of dead trees carried by the rivers into this area. They were washed up onto the sides of the rivers or into lakes and swamps during times of big floods. Because the river also carried lots of *sediment* (dirt, rocks, sand, volcanic ash), the trees were buried as they piled up in large log jams. Buried, without oxygen, the wood was preserved and did not rot away. Over time, minerals replaced the wood, leaving the rock replica (the petrified wood) we see today.

Fossils are nonrenewable resources that need our protection. Paleontologists use fossils as crime scene detectives use evidence - to recreate a past event or time period. Just as disturbing evidence in a crime investigation may destroy the evidence, removing or relocating fossils may destroy evidence of the ancient past. It is not only the fossils that are important but their *context*. Context is the position of the fossils in the rock and in relation to other fossils and geological features. It can provide as much evidence of the past environment and events as the fossils themselves. Help us protect and preserve our fossil evidence by not disturbing fossils during your visit. This includes removing and relocating petrified wood.



Additional Field Notes

Use this space for any additional notes, poems, drawings, thoughts, or feelings you have about today.

Field Exploration Goals

During this field exploration you will:

- learn about the science of paleontology, specifically the interpretation of fossils and geology;
- develop scientific research skills;
- develop mapping and measuring skills; and
- learn about the National Park Service and how paleontological resources are protected.

Materials Needed

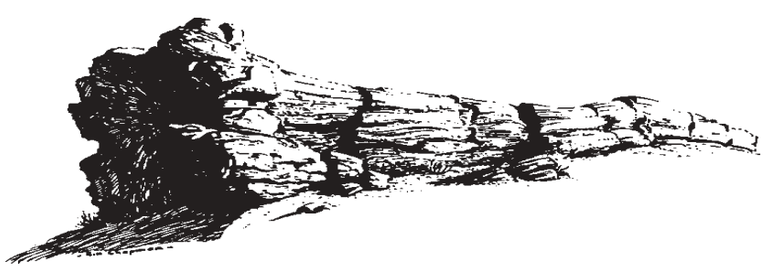
- field guide
- pencil
- compass
- metric measuring tape
- Giant Logs Trail map
- flags
- clipboard
- magnifying lens
- yellow vest

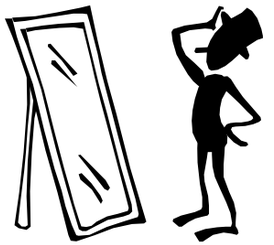
Introduction

In this field exploration you will study petrified logs along the Giant Logs Trail of the Rainbow Forest. You will determine which is the root end of a tree and find the compass direction in which it is lying. You will also measure and map the petrified trees. You will examine the rock and dirt around the trees to determine what the ancient environment may have been like when the trees were buried. Using all this information, you will develop an *hypothesis* (educated guess) on how the trees were buried before they were fossilized.

Petrified means fossilized. Minerals replaced once living material, such as wood, creating a rock replica. For petrified wood in the Rainbow Forest, the main mineral was quartz. The quartz came from volcanic ash out of distant volcanoes. Other minerals, such as iron oxides, manganese, and carbon, created the rainbow of colors within the petrified wood.

The petrified trees you will be studying are *Araucarioxylon arizonicum*, a cone-bearing tree of the Triassic Period, alive over 200 million years ago. These trees may have reached heights of over 61 meters (200 feet) and over 3 meters (9 feet) in diameter. They grew with straight trunks and had branches from the bottom to the top of the tree trunk. This area was once a low lying flood plain with lots of different plants and many kinds of animal life. The petrified wood found today is only one example of ancient life found in this area.





Reflections

What is the most important thing you learned today?

Why do you think petrified wood in the park should be protected?

Did you notice how few small pieces of petrified wood were scattered on the ground around the larger tree trunks? Small pieces are often stolen by visitors who do not think taking one small piece will make a difference. But it does! All the small pieces add up to a very large part of the story about the trees and the Triassic environment. Can you think of ways to prevent petrified wood theft?

Sediment found around marked petrified trees along the Giant Logs Trail.

From the largest to the smallest in size:

GRAVEL

SAND

SILT

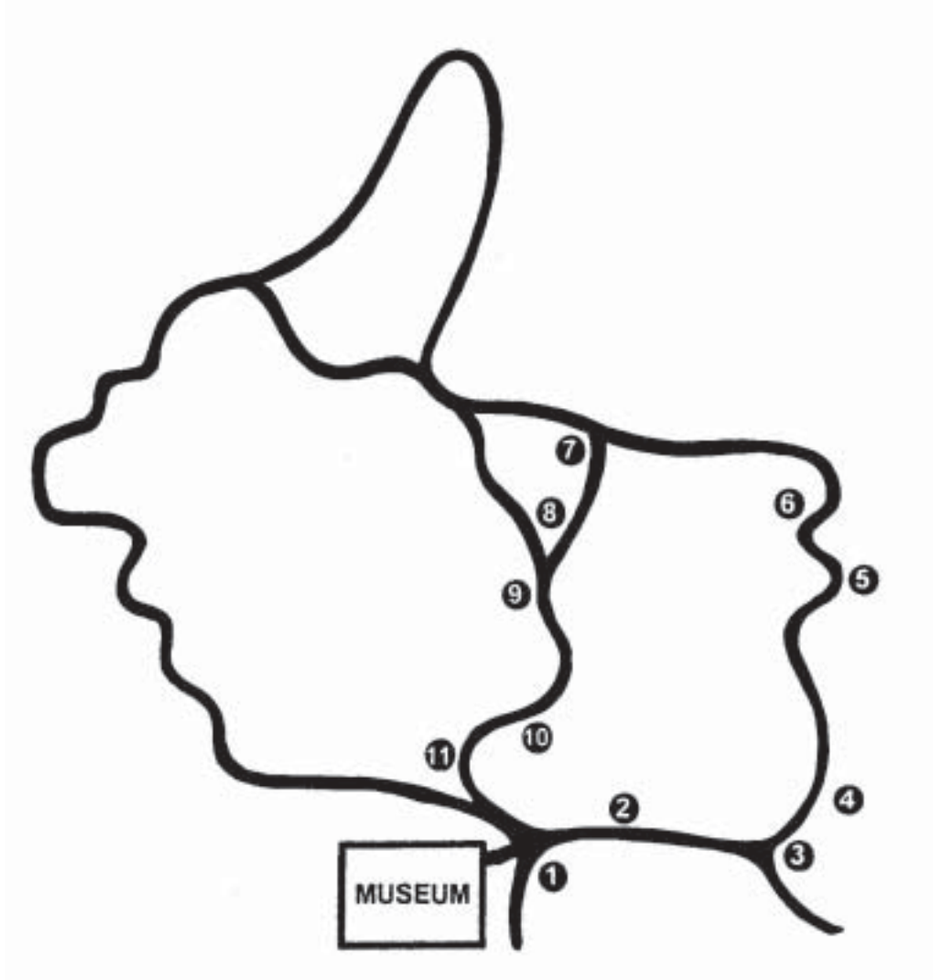
clay

Marked Tree	Sediment Type (gravel, sand, silt, clay)
A	
B	
C	
D	
E	
F	
G	
H	

Conclusions Write down your *hypothesis* (educated guess) about how the trees got here before they were fossilized.

Giant Logs Trail

Below is a map of the Giant Logs Trail. The numbers show where posts along the trail match the numbers in a trail guide available inside Rainbow Forest Museum. You will be given a section of this map to use during this field exploration.



Definitions

clay - fine-grained dirt, slippery when wet, used to make bricks, tiles, and pottery; particle size is < 1/256 millimeters; has a melted chocolate flavor and texture when you put it in your mouth; found in mudstone and shale; you cannot see a grain of clay without a powerful microscope

conglomerate - rock made up of pebbles and gravel in a loosely cementing material

depositional environment - the environment in which the dirt in sedimentary rock was laid down by water, wind, gravity or ice movements

fossilization - a process by which plant and animal remains or their impressions are preserved in rock; often rock replicas of the original plant or animal material

petrification - fossilization by the complete replacement of organic material and the filling in of spaces by minerals

sand - tiny, broken pieces of rock, finer than gravel, most commonly made of silica; particle size is 1/16-2 millimeters; found in sandstone; you can see a single grain of sand even without a magnifying lense!

sediment - material dissolved in water or air that settles out in layers, for example mud in a mud puddle

silt - fine-grained dirt, in between sand and clay in size; particle size is 1/256-1/16 millimeters; has a fine, gritty texture when you put it in your mouth; you cannot see a grain of silt without a microscope

Triassic Period - the first geologic timespan within the Mesozoic Era, dating from 248-206 million years ago

Frequency count of orientation from root end up trunk of marked petrified trees along the Giant Logs Trail.

North	
South	
East	
West	
Northeast	
Northwest	
Southeast	
Southwest	

What is the overall direction that the logs along the trail are found lying in? Add up the counts above. The direction with the highest number of counts is the "overall direction."

Length of each marked petrified tree along the Giant Logs Trail.

log	total length in **centimeters**	total length in **meters**
A		
B		
C		
D		
E		
F		
G		
H		

Field Report

Introduction Why did you do this scientific study?

Observations Describe the area where you have been working.

Procedure How did you do this scientific study?

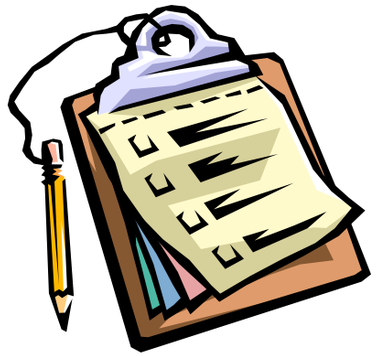
Data Complete the tables on the next two pages as you collect your data. The map you make is part of your data, so you will take it back to school with you.

Study the example of a *frequency count* below. Use the table on the next page to record the data you are collecting.

N	III	(3 logs were oriented north)
S	I	(1 log was oriented south)
E	IIIII	(5 logs were oriented east)
W	II	(2 logs were oriented west)

*In this example, the compass direction was found for petrified trees from the root end up the trunk. The **overall direction** was east.*

Field Exploration Procedures



1. Meet a park ranger at Rainbow Forest Museum.

2. Listen to the park ranger's introduction and review of your field guide.

3. Divide into your groups and collect the materials provided.

4. Follow the park ranger up the trail and listen to the ranger's discussion of procedures.

5. **On the map of the Giant Logs Trail you are given, write the date and the names of everyone in your group**.

6. **Find north** using the compass. Mark north, south, east, and west on your trail map. Remember that north may not always be at the top of the page!

7. **Answer the Observations questions on page 9.**

8. Go to your first marked tree. Each group will begin at a different tree, but will move to each one until all marked trees have been studied by each group.

9. Using the compass, **find the compass direction that the tree is lying in from the root end** (the fattest end) **up the trunk**. **Fill in the table on page 11.**

10. **Measure the length of the tree** using the metric measuring tape. **Fill in the table on page 11**.

11. **Draw the tree where and how it belongs on your trail map**. Label the first tree A, the next tree B, the next tree C, etc. Make sure you check the compass direction, using the north, south, east, and west directions you wrote onto your trail map!

12. Look at the dirt around the petrified tree. Pick some up and use the magnifying lens. **What kind of dirt is it:** gravel, sand, silt, clay? You can taste it to see if it's clay or silt. Clay melts in your mouth like chocolate, but silt is gritty and tastes like dirt. You don't need to taste sand! You can actually see single sand grains if you look closely. **Fill in the table on page 12**.

13. **Move to the next tree and repeat steps 9-12.** Keep moving from tree to tree until you have measured and mapped all the marked trees.

14. Discuss with your group what you have found. What is the *overall direction* of the trees? For example, **in which compass direction are most of the trees oriented? Fill in the box on page 11.**

15. Discuss the dirt you examined around each tree. Finding more clay and silt means the trees were in slow moving water. Finding more sand and gravel means the trees were in faster moving water. **Were the trees you studied in slow or fast moving water?**

16. **Develop an *hypothesis*** (educated guess) about how the trees got here before they were fossilized. Read the the Introduction on page 4 and the Summary on page 15 for more information.

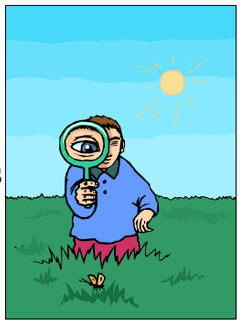
17. **Complete the Field Report on pages 10, 11, and 12**.

18. **Present your findings** to the rest of the class.

19. **Complete the Reflections questions on page 13**.

20. Use the results of this field study to help develop a final project to be presented at school.

Observations



Scientists write field observations before beginning work. This records *variables* (things that can change) that might change the results of a study.

How do you feel today?

Describe the weather today. Is it hot, cold, cloudy, sunny?

Look around you at the environment. What do you see? Rocks, sand, plants, animals or signs of animals like burrows or tracks?