

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 example 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

STUDYING FOSSILS IN THE LABORATORY

LABORATORY JOURNAL

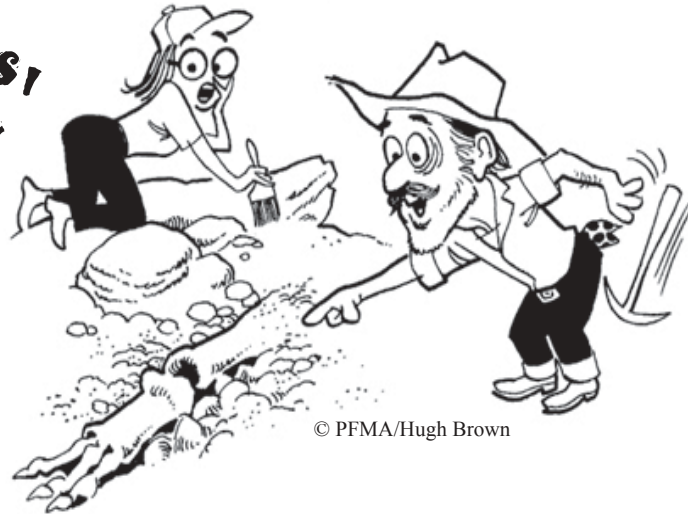
Date _____

Name _____

Petrified Forest National Park



RULES, REGULATIONS, AND SAFETY POINTS



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- 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 not only petrified wood, archeological artifacts, rocks, plants, and animals. Even the smallest pieces count!
- Follow the instructions of the park ranger very carefully for your own safety and the safety of your classmates.
- Use extreme caution when working with the tools provided. Some of them are very sharp and can hurt you if you use them in the wrong way.
- The laboratory is an area for serious scientific study. Yelling, pushing, running, or inappropriate tool use will not be tolerated.
- Be respectful of other people. Try to keep noise levels down when working with your group.

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.

Paleontologists believe that lush plant growth along the rivers allowed for abundant animal life. Fossils of reptiles, amphibians, fish, clams and early dinosaurs are found with plants such as conifers, horsetails, ferns, and cycads. Petrified Forest National Park and the larger Painted Desert region receives worldwide attention for its plant and animal fossils. The fossils found here provide the most complete picture of the Late Triassic in the world.

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.



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ADDITIONAL NOTES

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



LABORATORY STUDY GOALS

During this field exploration you will:

- learn about the science of paleontology, specifically laboratory preparation and museum curation techniques;
- develop scientific research skills;
- use your creativity to design an interpretive exhibit; and
- learn about the National Park Service and how paleontological resources are protected.

MATERIALS NEEDED

- | | |
|----------------------|------------------|
| • laboratory journal | • graph paper |
| • pencil | • toothbrush |
| • metric ruler | • fossil samples |
| • table lamp | • weight scale |
| • metal tray | • labels |
| • curation box | • catalog sheets |
| • water tub | • sponge |
| • magnifying lens | • dental tools |



INTRODUCTION

In this field exploration you will clean, analyze, identify, and catalog fossils using museum *curation* (putting items into a museum collection) techniques. You will design an exhibit to display the fossils and the ancient environment they were once a part of.



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Paleontology is more than the hunt for fossils in the field. If fossils are *excavated* (removed from the Earth), they must be cleaned and fixed so that they don't fall apart when studied. The cleaning process must be done with extreme care. Attached rock can be taken off chemically or physically. Chemicals can be dangerous to the laboratory worker and damaging to the fossils. Scraping away material is careful work done with powerful magnifying lenses and small tools such as those used by a dentist.

Cleaned fossils can be identified and studied. Fossils are identified to a specific species and then to a specific part of an organism. For example, specific identifications might read: "the upper stem of *Equisetites bradyii*" or "the 2nd caudal vertebra of *Leptosuchus gregorii*." Label and catalog sheets are made for every fossil to give information about where the fossil was found and its details. Labels are kept with the fossils. Catalog sheets are kept separately, as part of a larger record.

The following two pages describe the most common fossils found at Petrified Forest National Park. This will be useful information when you are designing your museum exhibits.



REFLECTIONS

What is the most important thing you learned today?

Why do you think fossils in the park should be protected?

Petrified wood is an important fossil within the park. Small pieces of petrified wood 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?

MUSEUM EXHIBIT DESIGN

Design an exhibit for your fossils as if they were going to be displayed in a museum. You can describe the exhibit in words or draw a diagram of what it will look like.



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DEFINITIONS

Chinle Formation - rock formation within Petrified Forest National Park and the entire Painted Desert, containing several different rock layers, dating to the Late Triassic Period over 200 million years ago

context - where and how fossils are found and explained; context provides evidence as important as the fossils themselves

coprolites - fossilized poop, or scat, of ancient animals which may contain seeds or pieces of bone as evidence of what the animal ate

excavation - careful digging for fossils of ancient plants and animals to use for scientific study

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

mudstone or shale - fine grained sedimentary rock composed of tiny silt and clay sized particles

petrification - fossilization by the complete replacement of organic material and the infilling of pore spaces by minerals carried by water

sandstone - sedimentary rock composed of cemented sand grains

Triassic Period - the first geologic timespan within the Mesozoic Era, dating from 248-206 million years ago; the Late Triassic Period is well represented at Petrified Forest National Park.



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LABORATORY STUDY PROCEDURES

1. Meet a park ranger at the Painted Desert Visitor Center.
2. Listen to the park ranger's introduction and review of your laboratory journal guide.
3. Divide into your groups and follow the ranger to the laboratory.
4. **Answer the Observations questions on page 8.**
5. **Divide up your box of fossils** between each group member.
6. **Clean the fossils**, first in a water bath, then CAREFULLY using the toothbrush and dental tools.
7. **Identify the fossils** to *type*, for example bone, clam, tooth. Use the magnifying equipment to closely look at the fossils. **Fill in this information on the label and catalog sheet.**
8. **Measure each fossil** with the ruler provided. **Fill in this information on the label and catalog sheet.**



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LABORATORY REPORT



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INTRODUCTION Why did you do this laboratory study?

OBSERVATIONS Describe the area where you have been working.

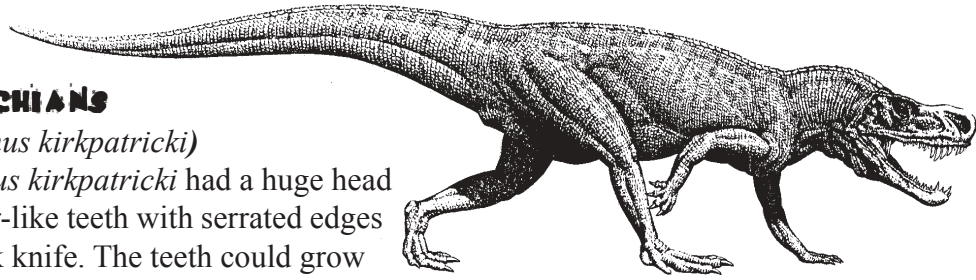
METHODS What work did you do with the fossils?

DATA The labels and catalog sheets are the data for this study. You will take them back to school with you.

CONCLUSIONS Were all the fossils from the same organism? What do they tell you about the lifestyle of the organism? Do they give you clues about what the ancient environment was like?

RAUISUCHIANS*(Postosuchus kirkpatricki)*

Postosuchus kirkpatricki had a huge head and dagger-like teeth with serrated edges like a steak knife. The teeth could grow up to 8 cm (3 inch) long! Teeth like these were used for tearing large chunks of flesh from prey. *Postosuchus kirkpatricki* moved like a dinosaur with its back legs tucked under its body so that it walked on its toes rather than flat-footed like most other reptiles. Each hand had a large, curved claw - an efficient and deadly weapon. An average sized *Postosuchus kirkpatricki* was about 4 meters (13 feet) long.

**CLAMS***(Antediplodon thomasi)*

Paleontologists discovered a bed of clams 61 cm (2 feet) deep and over 305 meters (1000 feet) long in Petrified Forest National Park. Individual clams averaged about 8 cm (3 inches) long. The clams probably spent their time half-buried in the sand at the bottom of lakes and ponds, filtering food from the water around them. Paleontologists believe that many of the Triassic creatures must have eaten these clams for breakfast, lunch, and dinner.



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PETRIFIED WOOD*(Araucarioxylon arizonicum)*

Araucarioxylon arizonicum was a large cone-bearing tree that grew near this area during the Triassic Period and is what you will find petrified as you travel through the park. Scientists debate about whether these trees grew in great forests or in less concentrated groups. Some *Araucarioxylon arizonicum* grew to almost 61 meters (200 feet) in height. Two other cone-bearing trees, *Woodworthia* and *Schilderia*, can be found in small amounts in the Painted Desert.



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9. Weigh each fossil using the scales provided at the front of the room. Fill in this information on the label and catalog sheet.

10. Read through the field notes collected by the field paleontologist. Completely fill in any missing information on the label and catalog sheet. If you need help, ask the park ranger.

11. Draw the fossils 4 times their size on the graph paper provided. Write down the scale you used onto the graph paper, for example, 4 squares = 1 centimeter. The drawings should be included with the catalog sheets.

12. Complete the Laboratory Report on page 11.

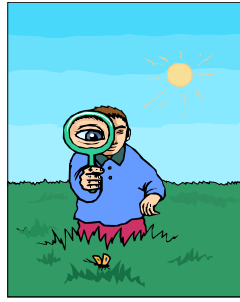
13. Working in your group, design an exhibit for all the fossils as if they were going on display in a museum. Use page 12 to write a description or draw a diagram of what your exhibit would look like. You can use the information on pages 9 and 10 to help you.

14. Present your findings and describe your exhibit to the rest of the class.

15. Complete the Reflections questions on page 13.

16. Use the results of this laboratory study to develop a final project to be presented at school.

OBSERVATIONS



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

How do you feel today?

Describe the conditions in the laboratory. Is it hot, cold, dirty, clean, crowded?

Look into the box of fossils you will be working with:

- How many are there?
- What do they look like?
- How else would you describe them?

DICYNODONTS

(*Placerias hesternus*)

Placerias hesternus and its relative dicynodonts were once the most abundant land dwelling vertebrates on earth. *Placerias hesternus* was over 2 meters (8 feet) long and could weigh as much as 2 tons. These animals might remind you of a rhinoceros with their huge head on a short, heavy neck, barrel-shaped body, and tiny tail. The mouth looked like a turtle's beak and helped to tear tough plants and dig through soil for roots. On the upper jaw was a pair of tusks which were larger on the males. Because fossils of *Placerias hesternus* are often found with many individuals together, it is thought that they may have traveled in herds.



PHYTOSAURS

(*Leptosuchus gregorii*)

Phytosaurs lived along rivers and streams. Even though they resembled modern day crocodiles, they are only very distant relatives. Nostrils on a phytosaur were high up on its head near its eyes, but the nostrils on a crocodile are at the end of its long nose. Phytosaurs were the largest of all the Triassic reptiles. An average sized animal was about 5 meters (17 feet) long, but some fossils are from animals 9 meters (30 feet) long! The body and tail were protected by bony plates. These plates are commonly found in the park. The long, slim jaws had an awesome set of sharp teeth made for catching prey.



AETOSAURS

(*Desmotosuchus haplocerus*)

Aetosaurs looked like an armadillo with a long, pig-like snout. They dug in the soil for roots and tender new plants to eat. Aetosaurs can be identified by their *scutes* (bony plates). *Desmotosuchus haplocerus* had shoulder spikes up to 61 cm (2 feet) long. From its nose to the tip of its tail, it could reach over 6 meters (20 feet) in length.

