



## *Hadrosaurs to Humans: A Geological Walk Through Time*

**Program Description:** In this field study, students discover evidence of landscapes past and use this evidence to reconstruct the paleo-geologic timeline of our desert home. Following an introduction to basic geological processes, students take a short hike to uncover the Sonoran Desert's 'buried' past. Students look for, collect and unscramble evidence revealing what our region looked like, what plants and animals have lived here and learn how landscape and lifeforms influence one another.

**Duration:** 2.5 hours

### **Objectives:**

- Recognize that the Earth's history is characterized by change over a variety of time scales.
- Understand that our environment (local, regional and global) is always changing. Some changes are small, others large; some changes are fast, others slow.
- Recognize that some changes are too slow or fast to be easily observed.
- Understand the geologic processes that reshape landscapes.
- Understand how scientist create models of past times.
- Understand that the environment consists of both biotic and abiotic elements, and that these elements effect each other.
- Understand that different environments support different lifeforms.
- Interpret and draw inferences from evidence.
- Describe the constructive and destructive processes that drive the rock cycle.
- Describe evidence that can be used to reconstruct past.
- Explain how Earth's materials, such as rock, fossils, and ice, show that Earth has changed over time.

### **Vocabulary:**

Abiotic	Deposition	Paleontology
Adaptation	Erosion	Paleozoic
Aquifer	Erupt	Permineralization
Basin and Range	Extrusive	Plate Tectonics
Biome	Fossil	Precambrian
Biotic	Geologic Time	Rocks, igneous
Cementation	Intrusive	Rocks, metamorphic
Cenozoic	Lava	Rocks, sedimentary
Context	Magma	Stratigraphy
Dating, relative	Mesozoic	Volcanic
Dating, absolute	Paleo-geology	Weathering

### **Equipment and Materials:**

1. Geology Walking Stick representing Earth's timeline with pivotal events highlighted
2. Viewing scope
3. Team Backpacks for collection of evidence (6)
4. Evidence boxes with geologic evidence for each of 6 time periods (6)
5. "Puzzle" Posters (each with one or more pieces missing) representing select periods of Earth's geologic history (6).
6. Mini-poster to complete larger poster (6)
7. Flipchart of Earth's continental history with Arizona outlined for perspective
8. Laptop, projector and speakers

### **Activity Description:**

#### **Preparation:**

The teacher groups students into (6) teams (ideally this would be done before arriving for the program).

#### **Introduction:**

Students participate in an on-site introductory session about basic geological and paleontological processes. During this session, student learn how scientists use this understanding along with evidence in the field to reconstruct the past. Group will also discuss change and the drivers of change over different timescales.

#### **Geology Walk:**

Students participate in a guided walk searching for evidence of past plant and animal life as well as geologic events. At each of 6 stops, the group will discuss evidence discovered and 'locate' that evidence in time. Group will, as a whole, piece together the scrambled evidence creating a chronological timeline to reconstruct what our landscape looked like throughout time.

#### **Wrap-up:**

Group will imagine possible future changes to the landscape and discuss what evidence of the current time period might be left behind for future inhabitants to discover and decode.

### **Extensions:**

- Recreate the timeline introduced in the field study program and have students do research to fill in the gaps.
- Have students create individual timeline, highlighting pivotal events in their lives.
- Compare the geology of the Tucson Mountains with that of the Catalina Mountains.
- Compare the geology of Saguaro National Park Tucson Mountain District with that of Saguaro National Park Rincon Mountain District (background material can be found at <https://www.nps.gov/sagu/planyourvisit/brochures.htm>).
- Create a timeline of human activity within the Tucson basin and discuss biotic and abiotic influences that may have impacted settlements.

### **Late Arrivals:**

This field study program is designed for 2.5 hours of instruction. If the group arrives late or needs to leave early there will be less time allocated to the wrap up activities.

**Linked to Arizona State Standards:**

Science S1:C1 – G3PO1; G4PO1; S3:C1 – G3PO2; G4PO1-PO2; G5PO1; HSPO1-PO2, HSPO4; S4:C3 – G3PO5; G7PO5; HSPO2; C4 – G4PO3; HSPO4-PO5; S6:C1 – G3PO2-PO5; G7PO1; G7PO3; HSPO1-PO3; C2 – G4PO1-PO6; G6PO3-4; G7PO1-PO2; G7PO5; PO3; HSPO5; HSPO15-PO17; C3 – HSPO4-PO9

**Next Generation Science Standards:**

**Practices:**

This Field Study naturally supports the following Science and Engineering Practices: Asking questions (for science) and defining problems (for engineering), Developing and using models, Analyzing and interpreting data, Using mathematics and computational thinking, Constructing explanations (for science) and designing solutions (for engineering), Engaging in argument from evidence.

**Crosscutting Concepts:**

This Field Study naturally supports the following Crosscutting Concepts: Systems and System Models, Cause and Effect, Stability and Change, Scale, Proportion and Quantity, and Patterns.

**Disciplinary Core Ideas:**

This Field Study addresses the following Disciplinary Core Ideas: PS1.A: Structure and Properties of Matter, PS1.B: Chemical Reactions, PS2.A: Forces and Motion, PS2.B: Types of Interactions, PS2.C: Stability and Instability in Physical Systems, LS2.A Interdependent Relationships in Ecosystems, LS2.C Ecosystem Dynamics, Functioning, and Resilience, LS4.C: Adaptation, ESS1.C: The History of Planet Earth, ESS2.A: Earth Materials and Systems, ESS2.B: Plate Tectonics and Large-Scale System Interactions, ESS2.C: The Roles of Water in Earth's Surface Processes, ESS2.E: Biogeology