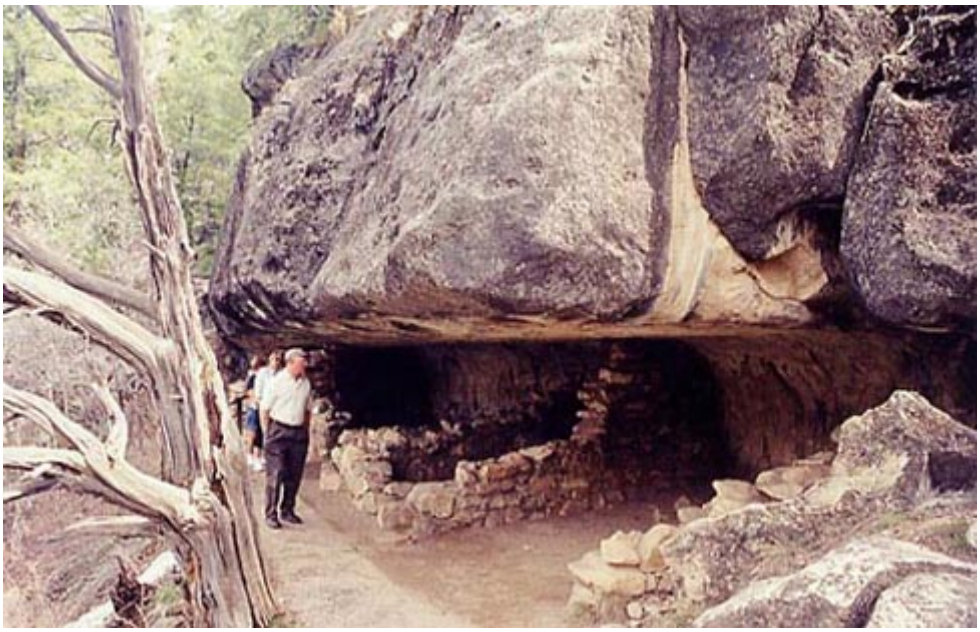
SCIENCE IN OUR PARKS: CULTURAL AND NATURAL HISTORY OF THE COLORADO PLATEAU



Island Trail Exploration

(A Nature Study)

Teacher Edition

Walnut Canyon National Monument

The Sinagua, as the people who lived in Walnut Canyon are now called by archaeologists, lived from A.D. 1100 through A.D. 1250, almost 900 years ago. The term "Sinagua" comes from the Spanish language and means "without water". The first Spanish people to come through the land around the San Francisco Peaks referred to the mountain as Sierra Sinagua, or the mountain without water.

Thus when early anthropologists were studying these ancient people, they decided to name them the Sinagua. The Sinagua are the ancestors of the Hopi people who call the people Hisatsinom.

Years later, in the 1880's, people first laid down railroad tracks in Northern Arizona. The railroad made it possible for people to visit places like Walnut Canyon. These early tourists loved the place so much that they carried away the things that the ancient dwellers had left behind.

The first caretaker or ranger of Walnut Canyon in more modern times was William H. Pierce. He was a Civil War veteran who moved to the area in 1904 with his wife. At that time Walnut Canyon was not a National Monument. It became one in 1915 after President Woodrow Wilson agreed to protect the area from visitors stealing artifacts from the area.

Today, the canyon still inspires wonder in visitors who want to learn how the Sinagua built their homes, farmed the canyon lands, and used every natural resource available to them. You will investigate these questions today, adding to the knowledge about this beautiful, unique place.

Goals:

1. Study the natural resources along the Island Trail at Walnut Canyon National Monument

2. Assess the current air and soil conditions along the Island Trail at Walnut Canyon National Monument

3. Interpret the geology within the canyon

Field Exploration Procedure:

***Insert science standards web link here**

1. Research teams will record plant and animal observations at two stations along the Island Trail.

2. Research teams will collect data about the temperature, wind speed, soil, and noise to help put together a picture of current natural conditions.

3. Research teams will make observations about the geology and interpret how different rock layers formed.

4. Each team will prepare and deliver a three-minute presentation on their findings.

Natural Resources in Walnut Canyon

You may mention that water and building materials are natural resources as well.

Common Plants

Ponderosa Pines
Pinyon Pines
Juniper
Douglas Fir
Boxelder Maple
Arizona Walnut
Quaking Aspen
Gambel Oak
Yucca
Mormon Tea

Common Mammals

Bobcat
Coyote
Elk
Mule Deer
Gray Fox
Blacktailed Jackrabbit
Mountain Lion
Porcupine
Abert's Squirrel
Striped / Spotted Skunk
Javelina
Chipmunk
Ground Squirrel

Common Birds

Common Flicker, Steller's Jay, Pinyon Jay, Common Raven, Turkey Vulture, American Kestrel, Pygmy Nuthatch Townsend's Solitaire
Sparrow Hawk, Red Tail Hawk
Mourning Dove
Broad-tailed Hummingbird
Rufous Hummingbird
Violet-Green Swallow
American Robin
Western Bluebird
Mountain Bluebird
Western Meadowlark
Dark-eyed Junco

Common Amphibians and Reptiles

Arizona Treefrog
Collared Lizard
Tree Lizard
Gopher Snake
Wandering Garter Snake
Short Horned Lizard
Rattlesnake
King Snake

Important Data About Walnut Canyon

Weather

The average daily temperature at Walnut Canyon ranges from 52° F to 86° F in the summer and 17° F to 44° F in the winter. The average annual precipitation is 18 inches. July and August are the wettest months of the year during the monsoon season. Snowfall provides the rest of the moisture. Walnut Canyon receives an average of 63 1/2 inches of snow each winter.

Noise Pollution

Walnut Canyon is situated close to Interstate Highway 40. As a result the canyon experiences constant highway noise from passing cars and trucks. Those are not the only noise makers. It is believed that visitors, including school groups, create a significant amount of noise pollution at Walnut Canyon. Noise affects wildlife and the quality experience of students and visitors.

Noise is unwanted sound. Sound is a form of energy from vibration. Sounds travels and is measured in decibels. A decibel is the amount of energy in sound. Sounds above 120 decibels (jetplanes) can hurt. Sounds over 90 decibels for long periods of time can cause hearing loss. Some groups will measure the amount of noise in the canyon, collecting data for the park service on the amount of noise pollution at Walnut Canyon.

These are some common sounds and their decibels:

Secret whispered in ear	10 decibels
Running faucet	20 decibels
Classroom activity	50 decibels
Lawn mower	100 decibels
Jackhammer	120 decibels

Prehistory of Walnut Canyon (1100 - 1300)

Who were the Sinagua people who lived in the shadow of the San Francisco peaks 900 years ago? We find clues to their lives from the things they left behind in places like Walnut Canyon.

The Sinagua who lived in Walnut Canyon were good farmers, gatherers, hunters, potters, and builders. They grew corn, beans, and squash along the rim of the canyon in washes and sometimes in the bottom of the canyon. They gathered and ate pine nuts and leaves and berries of plants. They used bark, leaves, stems, and roots for making clothing, baskets, and rope. They used wood to make arrows and spears, and firewood for heat and cooking. They hunted the animals, using every part of their bodies from muscle sinew for twine to skins for clothing and blankets. The Sinagua made their own tools for hunting from the local natural resources.

The Sinagua made beautiful plainware and corrugated pottery to store water and food and to cook and eat out of. They traded with other people in the region for other types of pottery including painted black-on-white pottery. They also traded for exotic artifacts like turquoise and shell jewelry.

One of the most amazing aspects of Walnut Canyon is the stone homes built on limestone ledges. Imagine the work and skill of the people to shape the rocks, mix the mud, and put the walls together!

The Sinagua people did not disappear. They left Walnut Canyon around A.D. 1300 to continue their migrations. Many Hopi people believe that their ancestors, the *Hisatsinom*, came from areas like Walnut Canyon. There is still much to learn here; so keep your eyes and mind open.

History of Walnut Canyon (1880's – 1970's)

Walnut Canyon has been a popular tourist attraction since the 1880's. Unfortunately, these visitors loved the canyon so much that they carried away many artifacts. In the process, they destroyed, even dynamited, much of the scientific data that could have added to our understanding of the Sinagua and their environment.

To fight against the vandalism of Walnut Canyon, the Bureau of Forestry (now the US Forest Service), hired a ranger in 1904 to protect the ruins. The ranger's name was William Henry Pierce, a Civil War veteran. He camped in a tent along the rim of Walnut Canyon with his wife Mattie until their one-room ranger cabin was built. His presence did little to stop the looting of resources.

A Flagstaff Catholic priest, Father Cyprian Vabre, led a group of citizens to further protect Walnut Canyon. They saw the benefit of encouraging visitors to the Flagstaff area and wanted there to be resources for the visitors to see. On November 30, 1915, President Woodrow Wilson established Walnut Canyon as a national monument.

In 1934, a new ranger, Paul Beaubien, was assigned to Walnut Canyon. He was an archaeologist and worked hard to protect the canyon from looting and vandalism by sharing his knowledge with visitors on their journeys into the canyon. In 1938, Walnut Canyon expanded. By the 1940's the area was fenced and a new Visitor Center was built on the rim above the Island Trail. The old ranger cabin first lived in by Mr. Pierce was used until 1967 as a place where rangers lived.

FIELD EXPLORATION

Field Notes Record

Have students complete the following questions before descending stairs of the island trail.

Please use this page to record your field notes.

Begin by describing the type of day it is. How do you feel today?

Record your observations and first impressions.

What questions do you have about this place?

FIELD EXPLORATION

Station One (west side of island)

Begin west study area here at base of stairs (view to the south).

End west area here (view to the north).

- Divide students into groups of 4. Each group should be assigned a study area along the Island Trail (size of study area dependent on class size) marked by pinflags provided in the equipment bins in the visitor center. Students should try to stay on the trail as much as possible, but may have to step off to see certain vegetation.

- Use the 'Field Exploration in Progress' sandwich sign. Place at the top of the trail head before stairs begin.

Your task is to examine the marked plot and record all evidence of plants, animals, geology, and humans. You will also take noise and weather measurements.

1. Look at a small amount of soil through the hand lens. (This works best if you put the soil on a piece of paper first.) Describe the soil.

Spend time in class prior to the field visit to teach soil properties

Soil color:

Soil particle size: CLAY SILT SAND GRAVEL
(circle all sizes you see)

Soil moisture (circle one): WET DRY

Geologic layer of soil: KAIBAB TOROWEAP/COCONINO
(circle one; see pgs 12 & 13 for reference)
(pgs 13 & 14 in teacher guide)

2. What evidence do you see of animal life? (For example, do you see any tracks, droppings, browsing, gnawing?) Identify the type of animal if you can.

Bring the animal field guides from the storage bin in the visitor center

Plant Identification Key

Snowberry	***Douglas Fir***	***Ponderosa Pine***	***Gamble Oak***	***Wax Currant***
Arizona Black Walnut	***Fremont Barberry***	***Wolfberry***	***Rocky Mountain Juniper***	***Hoptree***
One-seed Juniper	***Mormon Tea***	***Pinyon Pine***	***Squawbush***	***Fernbush***
Lichen	***Prickly Pear***	***Yucca***		

3. Using the chart on page 9 (page 10 in the teacher edition), identify the plants that are in the area.

Plant Category (Shrub, tree, etc.)	**Identify Plant**

4. Do you see any evidence of humans here? (modern trash, artifacts, dwellings) Write down what you see.

5. List your observations about the weather.

6. Record the following measurements:

   Air Temperature: Time of Day:

   Wind Speed: Time of Day:

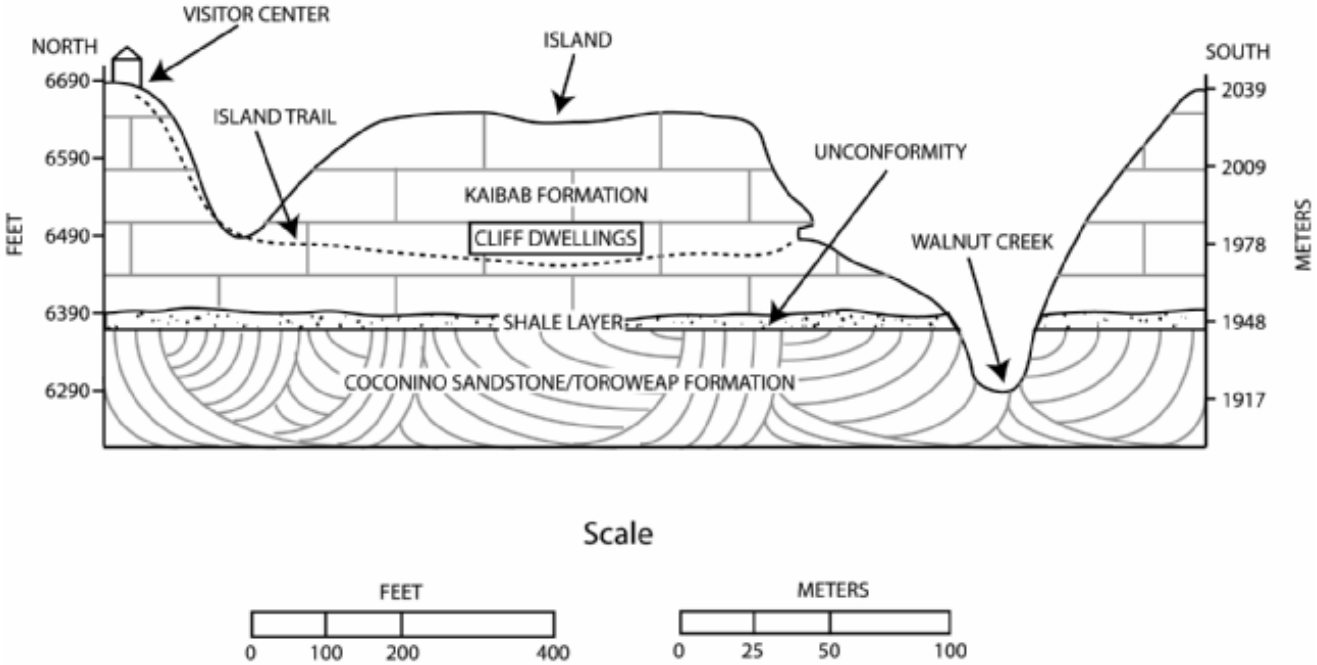
   Noise Level: Time of Day:

   Print out page 25 for more suggestions on how to appreciate sound in nature.

   What is this noise level comparable to? (see pg 4)

Geology of Walnut Canyon

Geologic Cross Section
Walnut Canyon National Monument
Flagstaff, AZ



Walnut Canyon

Time Period	Formation	Rock Description	Environment	Special Features
Permian Period 235-280 Million Years Ago	***Kaibab Formation*** 277-275 Million Years Ago	White, light gray blocky formation. Mostly limestone and chemically altered limestone (dolomite) with a layer of shale at base used as mortar by the Sinagua.	Formed in a warm shallow ocean as marine animals died and their skeletons accumulated at the bottom becoming limestone	Abundant brachiopod fossils. The softer limestone beds erode easily to form alcoves below the harder dolomite beds.
	Erosion (missing time) 275-272 Million Years Ago	Desert sand or sandstone like the Coconino/ Toroweap below once existed here, but was eroded away before the deposition of the Kaibab	Unknown because the rock record was eroded away	Gaps in the rock record are called *unconformities* and often define boundaries between rock formations
	Toroweap Formation/ Coconino Sandstone 272-271 Million Years Ago	White to off-white colored sand – look for the cross-bedding or lines in the rock. This rock forms steep cliffs.	Formed by the hardening of desert sand dunes along the sea coast	Some geologists believe the sandstone here is part of the Coconino Sandstone while others think it's Toroweap Formation

FIELD EXPLORATION

Geology overlook (south end of island)

View from the southern tip of the island. Note the layered Kaibab Limestone above the cross-bedded Coconino Sandstone below

1. Draw the rock layers you see on the far side of the canyon.

2. Describe how you think each of the rock layers you drew were formed.

3. What do you think the environment of Walnut Canyon was like when each of the rock layers was being deposited?

4. What type of rock did the Sinagua people use to build their structures on the Walnut Canyon island?

FIELD EXPLORATION

Station Two (east side of island)

Begin east study area after trail wraps around the southern tip of the island (view is to the south).

End east study area at the stairway. (view is to the north)

- Divide students into groups of 4. Each group should be assigned a study area along the Island Trail (size of study area dependent on class size) marked by pinflags provided in the equipment bins in the visitor center. Students should try to stay on the trail as much as possible, but may have to step off to see certain vegetation.

Your task is to examine the marked plot and record all evidence of plants, animals, geology, and humans. You will also take noise and weather measurements.

1. Look at a small amount of soil through the hand lens. (This works best if you put the soil on a piece of paper first.) Describe the soil.

Soil color:

Soil particle size: CLAY SILT SAND GRAVEL
(circle all sizes you see)

Soil moisture (circle one): WET DRY

Geologic layer of soil: KAIBAB TOROWEAP/COCONINO
(circle one)

2. What kind of evidence do you see of animal life? (For example, do you see any tracks, droppings, browsing, gnawing?) Identify the type of animal if you can.

3. Using the chart on page 9 (page 10 in the teacher edition), identify the plants that are in the area.

Plant Category (Shrub, tree, etc.)	**Identify Plant**

4. Do you see any evidence of humans here? (modern trash, artifacts, dwellings) Write down what you see.

5. List your observations about the weather:

6. Record the following measurements:

   Air Temperature: Time of Day:

   Wind Speed: Time of Day:

   Noise Level: Time of Day:

   What is this noise level comparable to?

FIELD EXPLORATION

Compare the two stations:

1. How were they similar?

2. How were they different?

3. What can you say about the natural resources in the two areas?

4. Prepare your three minute presentation about these findings for the group.

FIELD EXPLORATION

Reflection Questions

- **What do you think is the most important thing you learned today?**

- **Why do you think the Sinagua chose this place to live?**

- **What problems or challenges does the National Park Service face in protecting Walnut Canyon?**

- **What new questions do you have about Walnut Canyon or the research you did today?**

FIELD EXPLORATION

Express your experience at Walnut Canyon in writing. For example you could write a story or a poem.

FIELD EXPLORATION

Draw a picture to illustrate your writing.

Simple Ways to Enjoy Natural Sound

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Sound Sense

Stop. Listen to what's around you. Now close your eyes. Do you hear other sounds? Do you hear more with your eyes closed?

Sound Count

Close your eyes. Lift a finger for each sound you hear. Can you hear ten different sounds? Now use your left hand for natural sounds and your right hand for human-made sounds. Lift a finger for each type of sound you hear. Which type of sound reaches five first?

Sound Walk

Walk and listen. Do you hear your footsteps? Do you hear your clothes rustle? Can you walk without making any sound?

Sound Draw

Take a moment to hear one sound around you. Use your finger to draw the sound in the air. Have a friend guess the sound.

Sound Pleasure

What is the most beautiful sound you hear? What is the ugliest?

Wind Blown

Try to hear the wind's sound blowing through different plants.

Water Sounds

Find a stream or waterfall and listen carefully with your eyes shut until the sound separates into single notes.

Landscape Listening

How does the shape of the land affect the way sound travels to your ear? Where is the source of each sound? Are there any echoes? What is the closest sound you hear?

Animal Chat

Listen for an animal. What sound does the animal make? Can you make its sound? Can you communicate with the animal?

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