Natural History along the Natchez Trace Parkway

On-Site Lesson:

Scenic Trail Discovery Hike: (code HSST)

- **Grade Level:** 9th-12th
- **Subject Areas:** Biology, Environmental Science, Ecology
- **Setting:** Scenic Trail on Natchez Trace Parkway
- **Duration:** Two hours in the field with options for more time in class or at home.
- **Skills:** Observation, recording data, Deduction, inference
- **Vocabulary:** ecosystem, terrain, watershed, sign, organic

Summary: Students will walk a trail and record information from observations. They will investigate the different living and non-living elements that make up one section of their local environment.

Materials Needed: A clipboard and pencil for every student. A set of Data Set sheets for each stop on the trail (see below). Each group of students needs four flagged dowel markers. (See directions for making functional markers). Measuring tapes would be advantageous but are not necessary. (If using the photo option: one single use or other digital camera for every group of students).
Data Sheets:
-Each group will need only one Trail Location and General Information Data Sheet.
-For every stop, <u>each group</u> should have one Data Set General Information and one Soils data sheet (number of groups X number of stops = number of each of these sheets needed).
-For each stop, <u>each student</u> should have one of each Botanical Herbaceous and Botanical Woody data collection sheets (number of stops X number of students = number of each of these sheets needed).

Instructional Information

Tennessee Learning Expectations:
Secondary Science:
Inquiry:
CLE 3260.Inq.3 Use appropriate tools and technology to collect precise and accurate data.
CLE 3260.Inq.4 Apply qualitative and quantitative measures to analyze data and draw conclusions that are free of bias.
CLE 3260.Inq.5 Compare experimental evidence and conclusions with those drawn by others about the same testable question.

Environmental Science:

- **The Living World:**

CLE 3260.2.2 Discuss the roles of biodiversity and coevolution in ecosystems.

- **Water and Land Resources:**

CLE 3260.4.1 Examine common resource use practices in agriculture, forestry, urban/suburban development, mining, and fishing.

Biology 1:
CLE 3210.2.1 Investigate how the dynamic equilibrium of an ecological community is associated with interactions among its organisms.

- **Biodiversity and Change:**

CLE 3210.5.1 Associate structural, functional, and behavioral adaptations with the ability of organisms to survive under various environmental conditions.

Biology 2:

- Interdependence:

CLE 3216.2.1 Describe how the stability of an ecosystem is maintained.
CLE 3216.2.2 Investigate the major factors that influence population size and age distribution.
CLE 3216.2.3 Describe the varying degrees to which individual organisms are able to accommodate changes in the environment.
CLE 3216.2.4 Distinguish between the accommodation of individual organisms and the adaptation of a population to environmental change.

Botany:
CLE 3216.7.1 Describe different plant types plants based on their anatomy and physiology.
Ecology:

- Individuals:

CLE 3255.1.1 Analyze strategies for classifying organisms.
CLE 3255.1.2 Identify organisms based on how they obtain energy.
CLE 3255.1.3 Relate specific animal behaviors and plant tropisms to survival.
CLE 3255.1.4 Investigate various approaches to maintain biodiversity.

- Populations:

CLE 3255.2.1 Cite examples of populations limited by natural factors, humans or both.
CLE 3255.2.2 Explain population growth patterns and rates.
CLE 3255.2.3 Summarize how natural selection influences a population over time.

- Communities:

CLE 3255.3.1 Explain ecological niches within various habitats.
CLE 3255.3.2 Relate species interactions such as competition, predation and symbiosis to coevolution.
CLE 3255.3.3 Apply the first and second laws of thermodynamics to explain the flow of energy through a food chain or web.
CLE 3255.3.4 Analyze how biomass is related to trophic levels.

Teacher Set: The purpose of this lesson is three-fold. First it is to get student familiar with making observations in a natural setting. Second it is to help them see the diversity in one area of a trail. The third is to get them to think about why it is important to protect natural areas. This lesson encourages both creative thinking well as environmental investigation. Students can draw and circle data sheet information and do further research in the class or at home. Review field trip safety precautions before this field trip.

Teacher Overview: This is a guided inquiry lesson that takes place preferably on a National Scenic Trail along Natchez Trace Parkway. The lesson has several options depending on how in-depth the teacher would like to pursue the lesson.

The teacher should allow for about 20 minutes per stop; five minutes walking and 15 minutes data recording. About 5 stops can be done in about one and a half hours. Allow for time to return to the trailhead.

The data sheets can be filled out using subjective judgment to record observations so there are frequently no right or wrong answers. Most students can answer most of the questions by reading the information on the data sheets and by using common knowledge. Some terms such as “slope” are technical but can be understood from their common use. Sometimes short definitions are listed on the data sheets. Other concepts that may be new are listed under vocabulary.

Definitions:
Ecosystem: A complex relationship among the living and non-living elements in an area.
Terrain: An area of land or ground.
Watershed: All of the land and streams that drain into a particular water body. This can be large such as all of the land and water that drain into the Gulf of Mexico or small, such as the water that

drains into someone's backyard. Exact watershed information can be found at
(http://cfpub.epa.gov/surf/state.cfm?statepostal=MS)
(http://cfpub.epa.gov/surf/state.cfm?statepostal=AL)
(http://cfpub.epa.gov/surf/state.cfm?statepostal=TN)
Sign: An indication that something has been there although that something may not be currently in the area.

Student Instruction: Students will be walking the trail as a large group but will make observations and fill out data sheets in small groups. The Before the field trip: Divide the students into groups of up to four students and assign a group number. Have them pre-label their data sheets with group number and the date. The **Trail Location and General Information Data Sheet** may also be filled out as a class discussion. They should also fill out the Group Number on all of their data sheets. Tell students as they complete the data sheets, they may circle as many descriptors as is necessary in each category and take notes or make additional sketches on the backs of the data sheets

The students will enter the trailhead, place their markers, write the Stop Number on the collection sheets and record observations for that Stop Number. When all students have recorded all observations and removed their markers, the teacher will signal them to walk for five minutes then stop, and record Stop Number 2. This will continue until all data sets are finished. (Option, if the students need a lot of direction, make the first stop before you enter the trailhead and after they have recorded their information have a class discussion about the observations and encourage appropriate entries.)

Student Task:
Enter the trailhead and choose an area on the trail to mark a section of the trail about 5' long and about 3' feet back. CAREFULLY and only IF it is SAFE, place the markers at the corners of the observation area. If it is too hard to get to an area, just visually determine where the marker should go. This plot will be used for all observations with the exception of sounds that are heard or animals or insects that fly through the area. Justification is that the sounds do travel through the plot and flying animals/insects could possibly fly through the plot. When making observations, students should be encouraged to look upwards as well as on the ground.

At each stop:
First: Each small group collectively fills out a Data Set General Information sheet. This gives a general overview of the area. They MUST fill out all of the header information first. One student may record information but all students should contribute observations to be recorded on that sheet. They may make additions to the sheet as long as they are on that stop.

Second: Each small group collectively fills out a Soils sheet. This sheet gives a general indication of the geology of the area.

Third: Each student should fill out one each of the Botanical Data Sheets, Woody Plants and Herbaceous Plants. Each student in a group should record information about a DIFFERENT type of plant. See example answer sheet for more details.

When back in the classroom or for homework, students may complete the Field Trip Review worksheet.

Students may make group notebooks or one collective class notebook using their data sets.

Teacher Closure: Explain to the students that the place they visited is just a small part of the world and even a small part of the United States. The National Park Service manages over 390 locations both large and small that our country is preserving and protecting for us and future generations. Diversity is important both on and off National Park properties. It is the duty of the citizens of the USA to support efforts that include perpetuation the diversity of life on this planet.

Student Assessment: Participation in the field trip, analysis of answers on the Field Trip Review worksheet.

Suggestions for re-teaching: Review field trip results when teaching diversity or protection of the environment.

Extension: Photo option: Have the students photograph the terrain and plant communities and complete notebooks about the trail.
Other:
Students could research and report on National Scenic Trails.
Students could research and report on preservation.
Students could research and report on how green areas affect mental well being.

Trail Location and General Information Data Sheet

Trail Name:

Physical Location (state/address/GPS/map, etc.)**:**

Ecosystem Type:

Climate:

Forest type:

Terrain:

Watershed:

Data Set General Information

1. A plant community is made up of different kinds of plants. How many DIFFERENT types of plants do you see in your marked area? (Don't forget to look up to see plants that overhang your plot.)

How many plants are "new" plants you had not yet observed on this trail?

2. Were there one or more plants that were more abundant in this area?

3. Is the ground generally wet or dry? Describe any water or sign water has been there.

4. What kind of insects or insect sign do you see/hear? Look for: galls on leaves, holes in leaves, shed exoskeletons, webs, chewed on wood, other. If you don't know the name, then describe or sketch it.

5. What kinds of animals or animal sign do you see/hear/smell? Look closely at the understory for signs of small game trails. Listen for birds. Look for tracks, nests, holes and partially eaten plants.

6. What kind of people sign do you see?

Soil

Mixed soils:	Fine	Medium	Course	Hard packed	
Silt: (silky/flour-like)		Loose	Medium	Tight	
Clay: (smallest particles usually hard)	Brown	Gray	Red	Yellow	
Sand: (gritty)		Large	Mixed	Small	
Loam: (organic material)	100%	75%	50%	25%	0%
Peat: (organic material from mosses)	100%	75%	50%	25%	

If soil is rocky:

Rock: (size)	Boulder	Softball	Golf ball	Pebble
Rock: (amount)	100%	75%	50%	25%

Moisture:	Wet	Moist	Medium	Dry	
Water Erosion:	100%	75%	50%	25%	0%
Land Erosion:	100%	75%	50%	25%	0%

Slope: Nearly level Gently Sloping Sloping Moderately Steep Steep Very Steep

Slope Shape: Linear Concave Convex

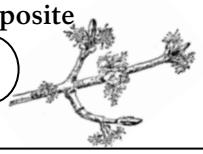
If you find a place where erosion has exposed layers make a sketch with labels to illustrate the different soil layers.

Botanical Worksheet -Woody Plants

Family_____ Date/Location_____

Common Name _____

Scientific Name _____

Branching: Opposite  Alternate

Approximate Height: _____

seedling	growing	mature
shrub	vine	other
tall tree	medium tree	small tree

Leaf Shape

Leaf Size_____ Leaf Color_____

Bark Rubbing and/or plant shape

Kind of Bark:

smooth big scales small scales rough

bumpy thick lines thin lines

other_____

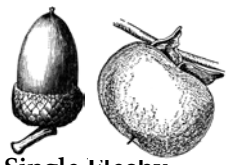
Color of Bark:

gray red brown black green white

light medium dark multicolor other _____

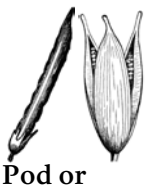
Abundance Rank: Only Plant Extremely Abundant Common Sparse Rare

Fruit Type:



Single Fleshy Fruit

Aggregate Fruit



Pod or Capsule

Dry Seed Achene
(Seeds on the "outside")

Cone

Other

Landscape: ridge slope flat

Light: shade part shade sun other_____

Other: field forest permanent water temporary water

Clipart courtesy FCIT

Botanical Worksheet- Herbaceous Plant

Family_____ Date/Location_____

Common Name _____

Scientific Name _____

Plant Growth Habit:

Forb/Herb (broad leaves) Grass-like Lichen-like (flat moss-like) Moss-like Mushroom-like Vine

Plant Shape:

Climbing Vertical Horizontal Irregular Fountain-like Rounded

Foliage Color:

Dark Green Green Gray-green Red White-gray Yellow-green Natural-spotted

Habitat:

Light: Full Sun Part Sun Full Shade

Ground: Slope Flat Some Wet Wet

Soil: Sand Clay Mixed Loam

Sketch or describe the plant shape.

Sketch or describe flower or fruit or seed.

Sketch or describe the leaf shape. Include veins and leaf margin.

Abundance Rank: Only Plant Extremely Abundant Common Sparse Rare

Field Trip Review:

1. **In general, did you plots have a lot of different kinds of plants or just a couple of different kinds of plants?**

2. **Did the natural community look healthy? Why or why not?**

3. **What features on the trail that you visited do you think will be different 100 years from now?**

4. **Why?**

5. **What are some things that may have been different on the trail 200 years ago?**

6. **Why do you think it is important for forested areas to be protected?**

7. **Did you see any evidence that the trail is currently undergoing changes? What?**

8. **What would happen if you removed or modified one of the elements that you investigated?**

9. **As a citizen what is your responsibility to make sure that all of the elements you investigated remain functional for the environment?**

Biology Questions Option

1. Name the biotic elements you saw on the field trip.

2. Name the abotic elements that you saw on the field trip.

3. How are the plants that grow on this trail adapted to grow in this region?

4. Name four elements all of the plants have in common?

5. Name three differences among the plants you saw.

6. Why are did some plants grow in the shade and others do not?

7. Did you see one or more plants that were more abundant in one area than another? Why?

8. Make class graphs using all students' data.

9. What would happen if there were only one type of plant along the trail?

Botany Questions Option

1. Which of the plants on you data sheets were dicots?

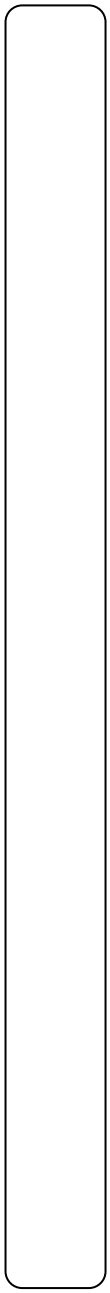
2. Which of the plants on your data sheets are monocots?

3. What adaptations did you observe that helped the plant survive in this biome?

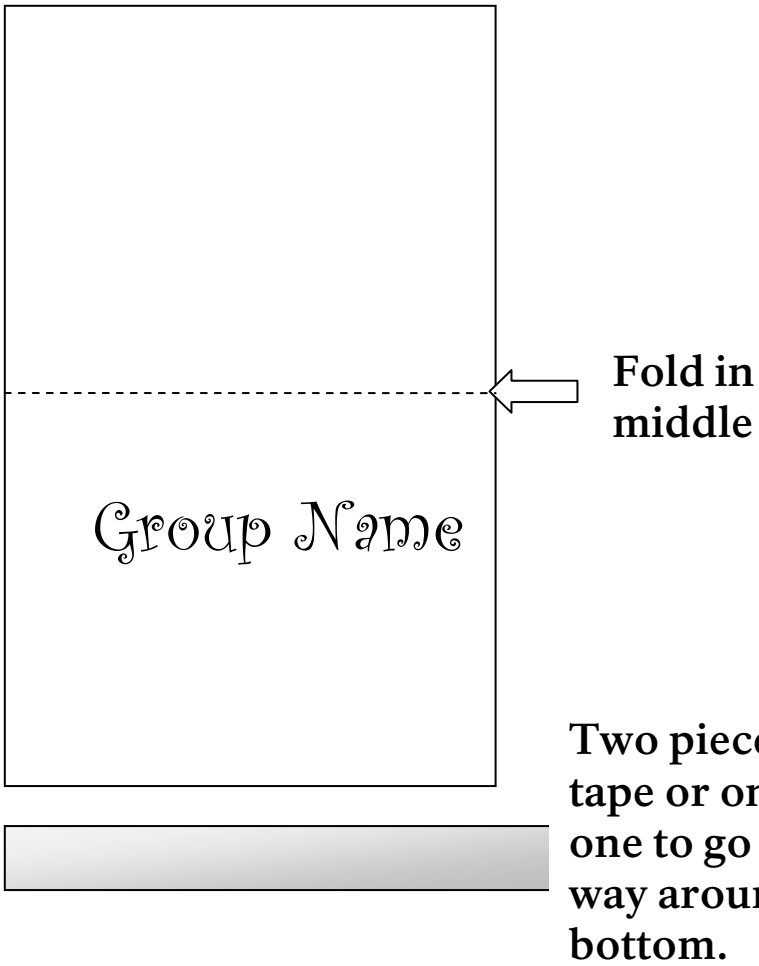
4. Name a biome where the plants from this trail could not live and explain why.

Easy Plot Markers:

Craft



3 x 5 card



1. Fold
2. Place over end of craft stick
3. Tape across bottom

Even easier alternative

Write group number on the end of the craft stick