

Earth's Water: Upland Karst Features

Teacher's Guide

Subject: Integrated Science (Life; Earth-Space; Physical)

Topic: Karst Topography, Erosion, Dissolution

Summary: Students will use GPS units to locate, map, and distinguish patterns in Karst topography within a selected area along the Ichetucknee River. Students will also measure specific features identified as Karst and categorize them based on those measurements.

Objective(s): After completing the field lab, students will be able to:

1. Identify different kinds of Karst features
2. Explain how each Karst feature was formed

Ecosystem(s): Rivers/Springs

Equipment:

- GPS
- Reference Chart: Karst Features
- Data Sheet, Clipboard, Pencils
- Digital Camera (optional)
- Compass (optional)
- Tape Measure

Background:

- **Reference Material:** chemical reactions in limestone; groundwater flow; www.exploreflorida.org/karst; McDougal Littell chapter 2; *Water's Journey* curriculum
- **Vocabulary:** upland karst, karst, swallet, fissure, chimney, outcropping, depression or sink hole, limestone, permeable/impermeable, erosion, spring vent, spring, aquifer, groundwater, surface water, water table, watershed/spring basin, runoff

Procedure (Engage; Explore; Explain)

1. Hook: A geologist has been out to survey land at the Park in order to build a new building for the park biologist. He surveyed several sites including the one we are at (which has several Karst features). Based on your knowledge, do you think he recommended this site for the construction of the building?
2. Students assemble at the ISSP Education Center and transport to the Mill Pond Spring/ Grassy Hole Spring area along the east bank of the Ichetucknee River.
3. Review aspects of chemical reactions of water and limestone as the water cycles through precipitation and surface water flow. Ask students to imagine if they were a volume of water how they would flow into and through the limestone on a journey deep into the Florida aquifer and out perhaps through a spring vent. How would they react with the limestone and force change upon it over a long period of time? How would the changes they initiate in the limestone be revealed in nearby surface features?
4. Demonstrate proper use of the GPS units; discuss various features in the Karst topography the students may encounter during the exercise.
5. Divide students into groups and distribute clipboards, data sheets, and measuring tapes among the groups.
6. Space the groups at intervals between the Ichetucknee River bluffs and Mill Pond Road. Starting at Mill Pond Spring and Run, instruct the groups to move north, ending at Grassy Hole Spring and Slough.
7. As each group encounters distinctive Karst features, students will measure various characteristics of the features. Characteristics will include GPS location, proximity to a water body (e.g., the Ichetucknee River), water movement within feature if water is present, size of feature opening or aperture, depth, elevation, shape, and students' consensus on identity of feature (e.g., spring vent, sinkhole, swallet, chimney, fissure, outcropping, depression, etc.).
8. After 30 minutes, students will reconvene at meeting point and answer the assessment questions.

Sunshine State Standards:

Science: SC.D.1.3.1; SC.D.1.3.4; SC.H.2.3.1

Language Arts: LA.A.1.3.3; LA.B.2.3.1; LA.C.1.3.1

Mathematics: MA.B.1.3.3; MA.B.3.3.1; MA.B.4.3.1-2; MA.D.2.3.1

Social Studies: SS.A.2.3.4; SS.A.3.3.3; SS.A.6.3.5

Earth's Water- Upland Karst Features Station

Data Sheet

General Information

Full Name:		Date:	
School (teacher):		Time:	
Latitude:	<i>Enter in tables below</i>	Longitude:	<i>Enter in tables below</i>

Hypothesis: If a park biologists office was going to be built, than this location (choose one: would/ would not) be a good site for the biologists office because...

Field Observations/Measurements/Data

Parameter	Karst Feature 1	Karst Feature 2	Karst Feature 3
Latitude			
Longitude			
Does it have a well-defined opening, like a shaft or crack?(Y/N)	Y N	Y N	Y N
Is limestone obvious and present?(Y/N)	Y N	Y N	Y N
Shape of opening, if present			
Width of opening (in meters), if present			
Length of opening(in meters), if present			
Depth of opening(in meters), if present			
Is water visible within the feature?(Y/N)	Y N	Y N	Y N
If water is visible, is it moving or stagnant?			
If water flowing, what is the direction-into, out of, or through the feature?			
Classification of feature based on reference chart, observations, and definitions			

Upland Karst Features

Assessment

1. Which feature or features had a flow of water associated with it?

2. What was the volume of one of the chimney features you observed? Use the formula $V = \text{Length} \times \text{Width} \times \text{Depth}$. Show all your work in the space below

3. Consider a feature you measured that has a flow of water. Do you think this flow is derived from direct runoff from rainfall (precipitation), from groundwater flow (the water table), or from another source? Why?

4. Acid rain is a by-product from factories in industrialized regions in which sulfuric acids are present in precipitation. Although acid rain is presently not a concern in northern Florida, if it did occur here, how would the Karst features you have observed change?

5. A geologist, Dr. Shay E. Spear, has made a recommendation. The question is to build or not to build an educational facility on the site you studied. Based on your observations, what did he recommend?

Lab Performance	EXCELLENT	GOOD	FAIR	POOR
Follows lab procedures carefully and fully.	10 - 9	8 - 7 - 6	5 - 4 - 3	2 - 1 - 0
Uses laboratory time productively and stays on task.	10 - 9	8 - 7 - 6	5 - 4 - 3	2 - 1 - 0
Works well with partners.	10 - 9	8 - 7 - 6	5 - 4 - 3	2 - 1 - 0
Facilitator Signature:				

Upland Karst Features

Reference Chart



Depression or Sinkhole: a slump at the ground surface, with an irregular opening or very wide at the top with a bowl-shaped floor; stagnant water may be present at the bottom; limestone may or may not be present.



Outcropping: visible limestone jutting out from the surface with no water and no obvious opening.



Fissure: a horizontal (sideways) crack in limestone with a measurable length and depth; water may be present inside.



Chimney: a vertical (up-and-down), very narrow, shaft-like opening in limestone, circular or oval at the top and sometimes very deep; water may



Swallet:an opening in the limestone with various-sized dimensions, in which water flows or disappears.



Spring Vent: an opening in the limestone with various-sized dimensions, out of which water flows.