

Activity: Pollen Analysis

Grade Level: 7-12

Time Required: 45-60 minutes

Curriculum Areas: Science, math
Curriculum Connections

(KY Academic Expectations):

1.3, 1.9, 1.11, 1.12, 2.19, Goals 5 and 6, and especially 2.1-2.3

Students will

- examine interrelationships and interdependencies of organisms in ecosystems and the factors that influence the interactions between organisms.
- explore how human activities alter ecosystems

Materials:

For each student:

Copy of FORESTS, FOREST FIRES AND THEIR MAKERS: The Story of Cliff Palace Pond, Jackson County, Kentucky (schools may copy pages as needed)
Pollen Change Over 10,000 Years
activity sheet

For teacher:

Magnified Pollen Grains copied on a transparency
Samples of plants, if possible

Introduction:

Ask students to discuss the importance of the study of pollen samples after reading page 5 through the third paragraph of page 7 in FORESTS, FOREST FIRES, AND THEIR MAKERS.

Procedure:

Using the projected master of Magnified Pollen Grains, review from which plant each pollen grain comes. If possible, bring examples of the plants to the classroom. Distribute copies of FORESTS, FOREST FIRES AND THEIR MAKERS. Ask students to scan the book to find pictures of the pollen grains and information about the time and conditions in which they flourished

List this information on the board.

- Northern white cedar (*Thuja occidentalis*) and red spruce (*Picea rubens*): Both grew in the cool, temperate climate of the Early Archaic Period after the close of the Ice Age.
- Cat-tail (*Typha latifolia*): Grew in ridge top marsh in Early Archaic Period.
- Buttonbush (*Cephalanthus occidentalis*): Replaced cat-tail as Cliff Palace Pond became an open pool due to increased rainfall during the Middle Archaic Period.
- Eastern hemlock (*Tsuga canadensis*): Flourished in warmer climate of Middle Archaic, but then attacked by hemlock looper moth and destroyed in catastrophic wildfire around 3,000 years ago.

- Eastern Red Cedar (*Juniperus virginiana*): This was the first tree to return after the devastation of the hemlock wildfire, but it was quickly replaced by oak.
- Oak (*Quercus* spp.): During Middle Archaic, oaks and other warmth-loving trees made up much of the forest. Oak returned after the widespread devastation of the hemlock wildfire. Oak and other fire-tolerant trees continued to thrive during the Late Archaic as prehistoric peoples began to use low-intensity fires to manage the forests.
- Pine (*Pinus* spp.): Pines grew in profusion during Late Archaic as recurring fires transformed the forests.
- Chestnut (*Castanea dentata*): Chestnuts are fire tolerant and thrived from the Late Archaic into the 20th century, when the species was destroyed by blight. Chestnuts were a prime source of food for people and wildlife.
- Goosefoot (*Chenopodium* spp.): Pollen from this plant appeared with greater frequency as people during the latter part of the Late Archaic domesticated these wild plants in their gardens. It was cultivated throughout the Woodland Period and

during the Late Prehistoric Period.

- Dock (*Rumex* spp.): The appearance of the pollen from this non-native plant in pond sediment indicates the arrival of European settlers (and their plants) about 200 years ago.

Distribute the Pollen Change Over 10,000 Years activity sheet. Make sure students understand that the vertical line on the left indicates time and that the graph shows an increase in amounts moving from left to right.

Ask them to identify the pollen grains and interpret the graph. Specifically,

- how was the forest changing over the ten thousand years and what were the reasons?
- How did the climate effect change?
- What changes were induced by insects?
- In what way did the native peoples cause changes?

You may ask students to work individually or in small groups to answer these questions. You may ask them to share their conclusions in written or oral format.

Closure:

Ask students to summarize what kinds of information can be learned from studying pollen in layers at

the bottom of ponds.

- Why is it important that the pond layers were undisturbed?
- What would happen to this ecological record if the pond site were bulldozed?

Assessment Suggestions:

Assess students on the basis of their identification of the pollen grains and the application of their knowledge to interpreting the pollen change graph.

Extensions:

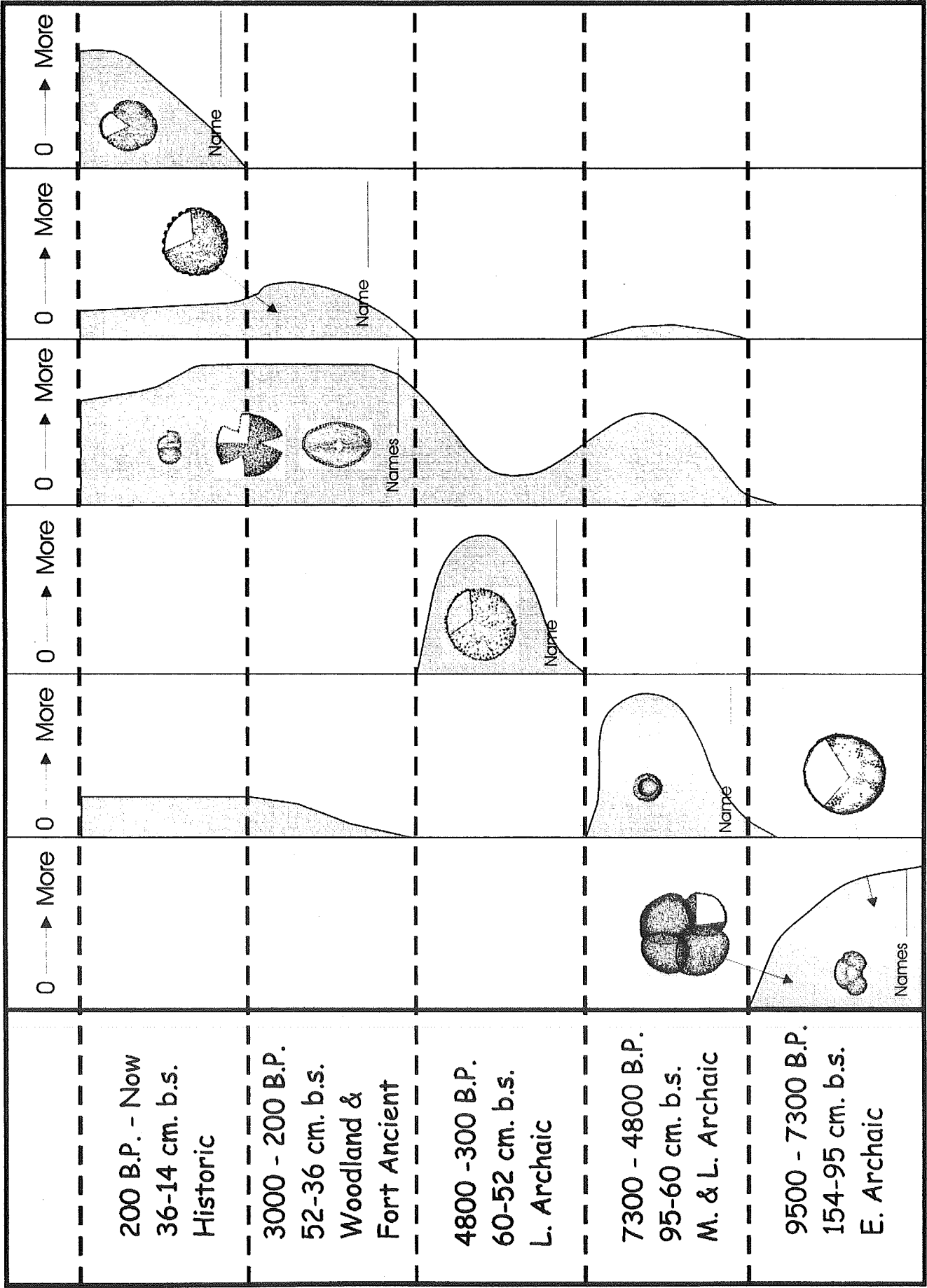
Read pages 7-9 in *FOREST, FOREST FIRES AND THEIR*

MAKERS. Ask students to compare and contrast the methods used by paleo-ecologists and archaeologists to develop a picture of the past at Keener Point Knob. Ask them to include at least three similarities and three differences.

Note to the Teacher: This activity has been adapted (with permission) from *INTRIGUE OF THE PAST*. It is a lesson in the Kentucky Archaeological Survey's video education series: *ANCIENT FIRES AT CLIFF PALACE POND: A COMPANION GUIDE FOR TEACHERS* by Judy Sizemore and Cathy Townsend.

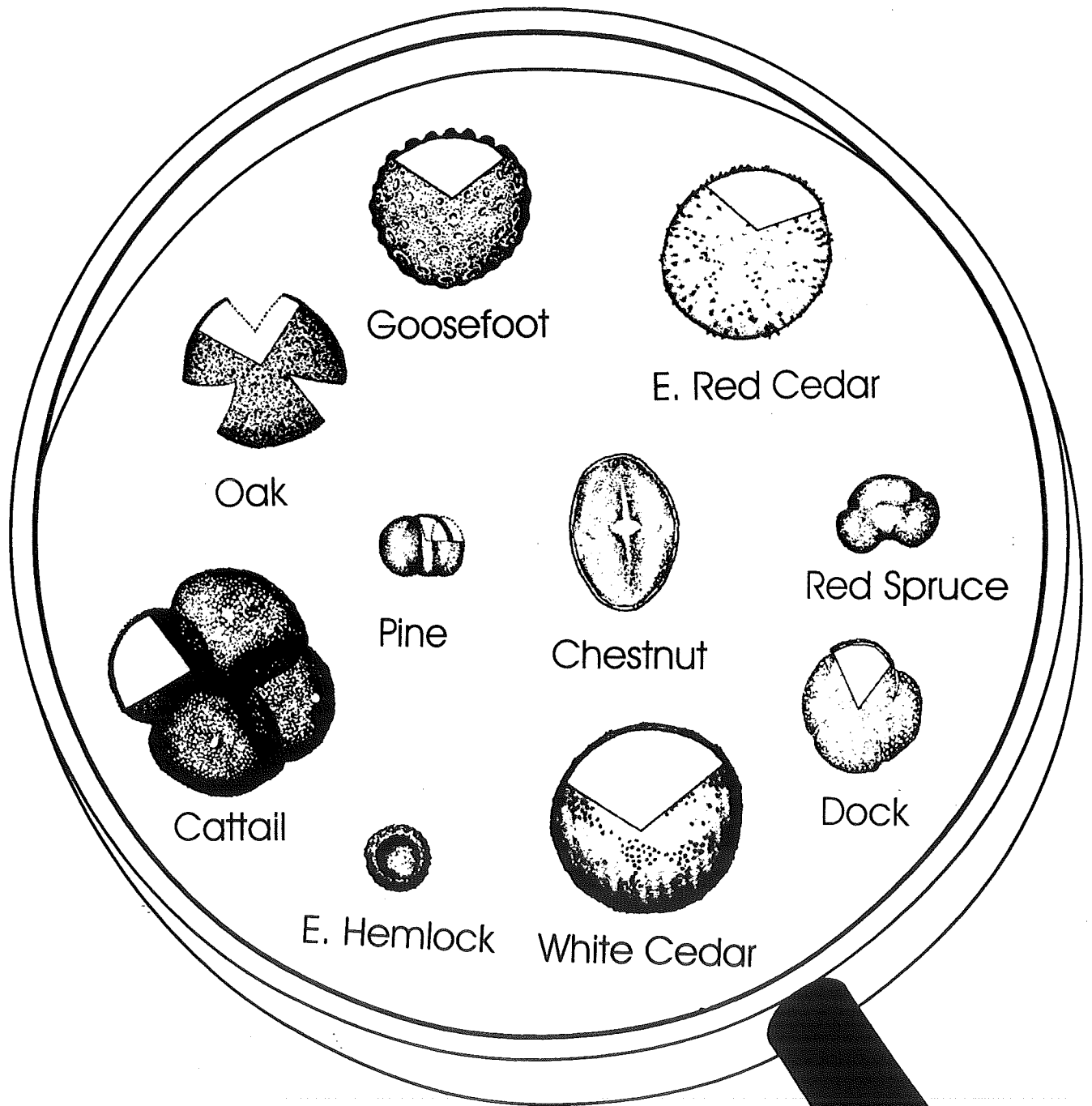
Pollen Changes Over 10,000 Years

Name: _____



B.P. = Before Present
cm. b.s. = centimeters below water surface

Magnified Pollen Grains



Scale = 10 microns

Illustrations taken from How To Know Your Pollen and Spores
by Ronald O. Kapp. Wm. C. Brown Co., Dubuque, Iowa. 1969.