
Lesson 2.5

ARCHAEOBOTANY

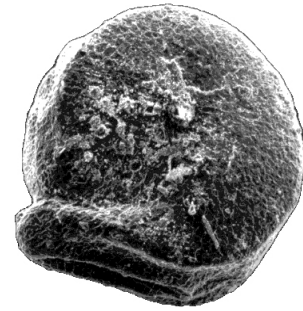
Subjects: science, mathematics, language arts.

Skills: knowledge, comprehension, application, analysis, synthesis, evaluation.

Strategies: brainstorming, forecasting, discussion, problem solving, writing, graphing, classification, scientific inquiry.

Duration: 45 to 60 minutes.

Class Size: any.



Magnified goosefoot seed from an archaeological site, ca. AD 300.

Objectives

In their study of archaeobotany, students will use pictures of seeds, an activity sheet, and a graph to:

- identify seven seeds and the conditions in which they grow;
- infer ancient plant use by interpreting archaeobotanical samples;
- determine changing plant use by Native North Carolinians by interpreting a graph of seed frequency over time.

Materials

For the teacher, transparency of “Magnified Seeds” master. If possible, pictures or examples of plants and actual seeds of domesticated plants (e.g., squash, corn, or grape). For each student, “Two Seed Samples” and “Seed Change Over 3,500 Years at the Warren Wilson Site” activity sheets.

Vocabulary

Archaeobotanist: a specialist who studies seeds and other plant remains from archaeological sites in order to understand the relationships between plants and people in past cultures.

Carbonize: to turn a seed or other organic item into charcoal through burning.

Cultivate: to promote or improve the growth of a plant or crop by labor and attention.

Domesticate: to modify, by selective breeding, the characteristics of plants or animals for human use.

Flotation: a method used to recover seeds from archaeological sites. Soil is placed into a large container of water. The soil falls to the container’s bottom, while the seeds remain floating on the water’s surface.

Hypothesize: to propose a hypothesis, an explanation, or interpretation that can be tested by further investigation.

Maize: another name for corn.

Seed: a fertilized plant egg that has the capacity to produce a new plant.

Background

Seeds have several valuable features that make them useful for archaeologists to study. They

can be preserved over enormous time spans if they are *carbonized* and maintained in fairly constant environmental conditions. Carbonization occurs when a seed is burned and turned to charcoal, such as in a cooking fire. Other plant parts, such as leaves, flowers, or roots, are far less likely to be preserved.

Different types of plants produce different looking seeds. This distinctiveness allows researchers to identify seeds. Scientists called *archaeobotanists* study seeds and other plant evidence to analyze the relationships between plants and people.

Carbonized seeds become deposited in the ground through people's activities. Seeds show up in areas of the site where people prepared and used plants, such as in hearths and refuse pits. When archaeologists excavate a site, they regularly collect small bags of soil to examine for the presence of seeds. Seeds are recovered through a procedure called *flotation*, which involves placing the soil samples in a container of swirling water. The soil, which is heavy, drops to the bottom of the container, while the seeds float to the top, where they can be scooped off and set aside to dry. The seeds and fragments of seeds are examined closely under a microscope and compared with modern identified seeds and illustrations of seeds. Archaeobotanists use the size, shape, and surface texture of a seed to help identify it.

Archaeologists use seed analysis to understand plant use and past climates. They study seeds from archaeological sites to learn if people were growing their own food, relying upon wild plant foods or some combination of both. Through their studies, they have determined that the food resources of American Indian North Carolinians changed over time. During earlier times, people relied on gathering wild plants. They ate the leaves, fruits, or roots of many plants that are generally not thought of as food today, such as violets, acorns, ferns, and knotweed. While wild food continued to play an important part in their diet, Indians began to *cultivate* certain plants about 2000 BC. For example, goosefoot is a weedy plant which grows wild in open fields and along riverbanks. Archaeologists *hypothesize* that goosefoot, which produces large quantities of starchy seeds that Native Americans used as food, was being cultivated as early as 4,000 years ago. As it was cultivated over the course of many years, goosefoot seeds became larger and more numerous as American Indians harvested the seeds for eating and replanting.

Archaeological evidence suggests that by 1,000 years ago, *maize* was an important part of the diet of southeastern Indians. Native Mesoamericans were the first to *domesticate* maize, and by deliberately planting this grain along with other domesticates such as squash and pumpkin, they could rely less on gathering wild plant foods. The reliance on domesticated plants did not mean American Indians stopped eating wild foods, however. For example, in southeastern sites, archaeologists find carbonized seeds of maypop, which have a lemon-like fruit. They know from settlers' letters and diaries that Indians in North Carolina ate maypop fruit. Maypop grows wild in disturbed soils, like those around places where people live. The Indians then probably picked the fruit from wild maypop plants that grew around their villages instead of planting it in their gardens.

Because every plant species has specific requirements for temperature and moisture, it is possible to learn about past climates and environmental conditions. For example, if an archaeologist working along a coastal site dating to about 8,000 years ago finds mainly seeds from plants that grow in wooded areas, such as walnuts or hickory nuts, she would probably conclude that the area had once been forested. Using seed analysis, archaeologists can also infer what the climate had been in order to support the plants found through archaeology. Some plants grow better in cool, wet climates, while others like drier and warmer weather. For example, birch, spruce, and hemlock trees are found in moist, cool mountain areas, while oak and hickory grow better in warmer, drier climates.

Sites that have been dug up by looters looking for artifacts have lost their potential to tell us about past climates and past food use. Looters mix layers from earlier times with those from later times and expose previously sealed layers to contamination with modern seeds. They probably do not even realize they are destroying this fascinating evidence of the past. It is up to everyone to preserve our past.

Setting the Stage

Project the master of “Magnified Seeds,” covering the title. Ask the students to guess what they are seeing.

Procedure

1. Using the projected master of “Magnified Seeds,” review from which plant each seed comes. If possible, bring examples or pictures of the plants to the classroom. Try to bring in seeds from the domesticated plants (squash, corn, grape) if possible. List on the board what students know about the conditions where that plant typically grows.

- Squash: this domesticated plant is primarily tropical and sub-tropical, and produces edible gourds. They are low-growing vines that need sunlight and warmth. Squash plants produce vegetables during the summer and early fall.
- Maize: also known as corn, this is a domesticated plant that grows in cleared areas with full sunlight. Fresh corn is a summer crop, but dried corn can be stored for months.
- Knotweed: this plant is almost always associated with disturbed habitats, including places of human activities, and along rivers and streams. It likes warmth, light, and moisture. Knotweed was cultivated by American Indians for its starchy seeds.
- Goosefoot: goosefoot is found in weedy places, such as roadsides, disturbed fields, and well-drained floodplains. It ripens in late summer and early fall. American Indians domesticated goosefoot for its starchy seeds.
- Maypop: this wild plant grows best in disturbed, sunny areas, such as cleared lots and edges of streams. Written accounts about American Indian gardens usually describe maypops growing around the gardens. Maypop fruits ripen in the fall.
- Hickory: this tree grows in deciduous forests and produces nuts that ripen in the fall.
- Grape: this plant is a vine whose fruit ripens in the summer.

2. Ask students to imagine uses for the listed plants. Supplement their list with the following information about how early Indians living in North Carolina used them, or research on how early people in your locality used these or other plants.

- Squash: rind, flesh, and seeds used as food; dried rind used as containers.
- Maize: fresh kernels used as food; dried kernels ground to make meal for bread; cobs used as fuel and for smoking hides.
- Knotweed: greens and seeds used as food.
- Goosefoot: greens and seeds used as food, possibly also used as medicine.
- Maypop: fruit used as food.
- Hickory: nut used as food; shells could be used as fuel.
- Grape: fruit used as food.

3. Present background information about how seed analysis is done and how archaeologists use seed analysis to learn about plant use and early environments.

4. Distribute the “Two Seed Samples” activity sheet. This is a very simplified version of what actual seed analysis might look like. Explain that the activity sheet reports the results of two seed

sample analyses: one is a sample from a 500-year-old ditch where people discarded their household garbage, and the other sample is taken from a 500-year-old hearth from the same site. Tell the students that all of the seeds represented found their way into the ground through human activity at the Warren Wilson Site. This site, located in the western part of North Carolina, contains the remains of a stratified Indian village that was occupied over a span of 3,500 years, from 2000 BC to AD 1450. It is situated at the eastern edge of the Blue Ridge mountains, on the floodplain of the Swannanoa River. Edible foods from forests and more open areas in and near the river basins were used by the persons living at the Warren Wilson site. An archaeological study of the seeds recovered from the site showed that the diet of the people who lived there changed over time.

5. Matching seeds from the site to those on the “Magnified Seeds” handout, students identify the plants for each seed and write a paragraph interpreting the results from each sample. (For example: “Seeds from both samples were very similar, with each including grape and goosefoot. This could indicate that people were discarding ashes from the cooking fires in the ditch. Because the plants represented in both the ditch and hearth were plants that ripened in the summer and early fall, it is likely that the seeds were discarded during that time of year.”)

6. Distribute the “Seed Change over 3,500 Years at the Warren Wilson Site” activity sheet. Be sure students understand that the page is divided horizontally into three sections, with each section indicating a time period. Archaeologists give different periods names, like Archaic, Woodland, and Mississippian; these names are listed on the chart. Ask students to identify the seeds and interpret the graph. Specifically, how did the diet of the people who lived at the Warren Wilson Site change over time? (For example: “Between 2000 and 500 BC, people at the Warren Wilson Site ate a lot of hickory nuts, which they were getting from the forests. They were also using the greens and seeds of goosefoot, which grew in open areas near the village and on the floodplain of the river. Goosefoot continued to play a meaningful role in the diet until the site was abandoned, but nuts became less important as people began to grow corn. Maypops grew wild around the gardens of corn, and people ate the lemon-like fruits of the maypop, as well. It appears the villagers’ dependence on the forest’s food resources declined over time as the people of Warren Wilson began to grow their own food.”)

Closure

In summary, what two kinds of information can seeds from archaeological sites tell us? Why is it important for sites to be left undisturbed if archaeologists are to use seed analysis to learn about past climates and how people lived?

Evaluation

Evaluate students on their identification of the seeds and the application of their knowledge to interpreting the seed sample results.

Extension

People used plant material for purposes other than food. For example, some furniture is made from wood. Have students think about the types of plants that were available for American Indians in North Carolina to use. For example, Indians of the southeastern United States made a beverage from the leaves of yaupon holly and drank it in ceremonies. You may want to suggest some of the plants listed below. What are some ways these plants could have been used?

- Trees and saplings: used for fuel; used to make boats, baskets, and handles for hoes and

other tools; used as house or stockade posts. Bark used on roofs and sides of houses for weather protection; bark processed for making cordage.

- Dried grasses: used as thatch for roofs of houses.
- Gourds: dried and hollowed out, used for containers.
- Corncobs and nutshells: used as fuel.
- Herbaceous plants: used as medicine.

Links

Lesson 1.3: “Observation and Inference.”

Sources

Fritz, Gayle J. 1998. “The Development of Native Agricultural Economies in the Lower Mississippi Valley.” In *The Natchez District in the Old, Old South*, edited by Vincas P. Steponaitis, pp. 23-47. Southern Research Report 11. Chapel Hill: Center for the Study of the American South, University of North Carolina at Chapel Hill. [The image in this lesson’s main heading is taken from Figure 4, courtesy of the author.]

Simpkins, Daniel L. 1984. *An Ethnobotanical Study of Plant Food Remains from the Warren Wilson Site (31Bn29), North Carolina: A Biocultural Approach*. Unpublished Master’s thesis, Department of Anthropology, University of North Carolina, Chapel Hill.

Smith, Shelley J., Jeanne M. Moe, Kelly A. Letts, and Danielle M. Paterson. 1993. *Intrigue of the Past: A Teacher’s Activity Guide for Fourth through Seventh Grades*. Washington, D.C.: Bureau of Land Management, U.S. Department of the Interior. [This lesson is adapted from “Pollen Analysis” on pp. 63–69, courtesy of the Bureau of Land Management.]

Ward, H. Trawick, and R. P. Stephen Davis, Jr. 1999. *Time Before History: The Archaeology of North Carolina*. Chapel Hill: University of North Carolina Press.

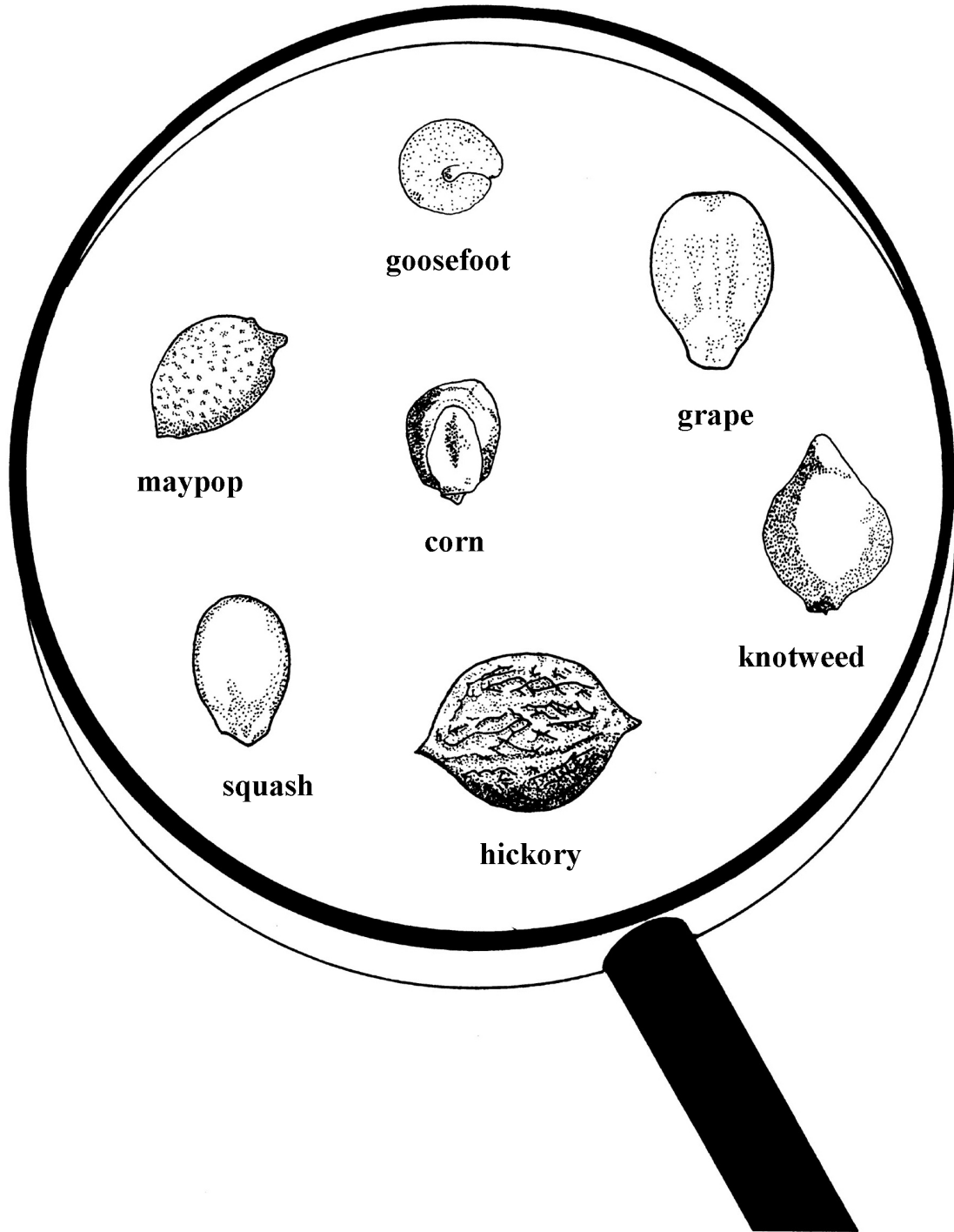
“Two Seed Samples” Activity Sheet Answers:

1, maypop; 2, grape; 3, goosefoot; 4, goosefoot; 5, corn; 6, grape.

“Seed Change Over 3,500 Years at the Warren Wilson Site” Activity Sheet Answers:

From left to right, the plants represented on the chart are hickory, goosefoot, corn, and maypop. The evidence summarized in the chart may be interpreted as follows: During the Late Archaic period, hickory and goosefoot were the principal plants used for food. In the Early Woodland period, the use of hickory declined. Finally, during the Mississippian period, the use of goosefoot increased, and both corn and maypop were added to the diet.

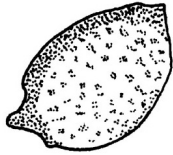
Magnified Seeds



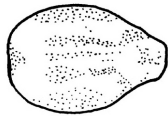
Two Seed Samples

Name:

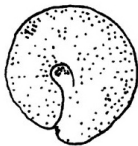
Sample from a 500-year-old ditch,
used as a place to discard garbage



1. Name of plant:

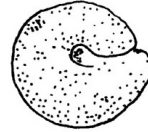


2. Name of plant:



3. Name of plant:

Sample from a 500-year-old hearth,
used for cooking food



4. Name of plant:



5. Name of plant:

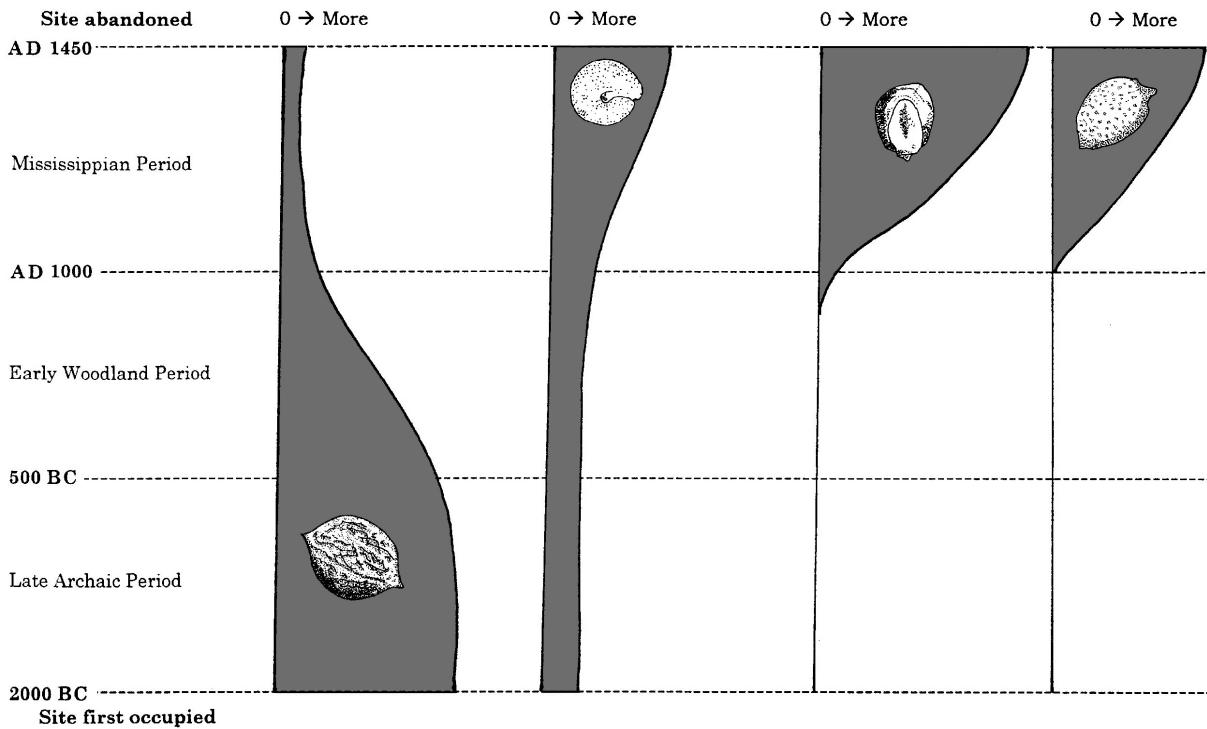


6. Name of plant:

Seed Change over 3,500 Years at the Warren Wilson Site

Name: _____

In the chart below, the widths of the shaded areas indicate the relative abundances of different kinds of seeds found in the refuse from each period. Identify the plants represented, and write each plant's name directly above the corresponding column.



Write your interpretation of what this evidence shows. What were the changes in plant use through time?