

Impacts on the Environment

Science, social studies, mathematics, language arts

SKILLS.....Knowledge, comprehension, application, analysis, evaluation
STRATEGIES.....Reading, discussion, scientific inquiry, brainstorming, writing, computation
DURATION.....2 class periods, optional field trip to Aztec Ruins
CLASS SIZE.....Any; work in pairs, then individually

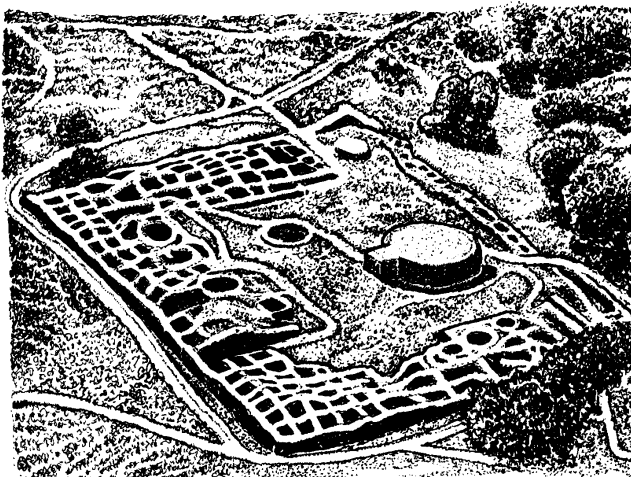
OBJECTIVES

After viewing the trunk of replica artifacts from Aztec Ruins, students will:

1. Infer the amount of materials needed for household use and for construction of the West Ruin.
2. Assess the environmental impacts of the Ancestral Pueblo use of resources for artifacts and construction.

MATERIALS

- Trunk of replica artifacts
- "Prehistoric Buildings" WORKSHEET
- "Settlement Areas" MAP



VOCABULARY

artifact: any object made or used by humans.

chinks: small stones stuffed into the mortar of the walls, sometimes placed in decorative patterns.

core and veneer: a wall using a central core of mud and stones, sandwiched by outer facings of stones in mud mortar.

inference: a conclusion derived from observations.

mortar: the mud used around stones in walls.

niche: a rectangular or irregular recess on a wall face.

observation: recognizing or noting a fact or occurrence.

piñon: a type of pine tree valued for its nutritious nuts.

vent: small rectangular opening in a wall, usually placed just below the roof, that allowed passage of air.

BACKGROUND

Today, most people realize that resources such as water, aluminum, electricity, and gasoline are depletable and should be conserved or recycled. In the same way, prehistoric people needed to be careful when harvesting or collecting raw materials so as not to destroy their supply. For example, they needed to leave younger trees to replace the older ones they harvested. They avoided using piñon trees in their construction, reserving them so they could harvest their nutritious nuts instead. They had to hunt animals at the proper time of year to ensure that young ones would survive and be available for future hunting.

Some of the materials were non-renewable, such as stone and clay. The people had to be aware of these limited supplies, and use them efficiently.

Some archeologists surmise that the Ancestral Puebloans moved from areas that they had occupied for a generation or longer because they depleted the resources that they needed to survive. Repeatedly farming the same fields would deplete the nutrients needed to enable productive growth of corn, beans, and squash. Years of collecting firewood from the same area would force them to travel farther and farther to find more. Over-harvesting of trees, animals, and wild plants could exhaust the dependable supply all too quickly. If a natural disaster, such as several years of drought, occurred, conditions would worsen to the degree that moving to a different area would be more desirable than living with nearby marginal conditions.

People used the buildings at Aztec Ruins and occupied the nearby areas off and on for nearly 200 years. The population of the West Ruin alone could have ranged from 100 to 300 or

more people at any one time, depending on the season and time period. During that time span, many people also lived nearby in smaller dwellings. They also required materials and resources from their environment to survive. Some archeologists believe that a severe prolonged drought near the end of the occupation (around AD 1276-1300), combined with the cumulative impacts that the people made on their environment, encouraged them to move to a place with more favorable conditions.

SETTING THE STAGE

In what ways do we impact our environment by using its resources? Consider one resource that we commonly use, such as gasoline or water. How do we obtain it? Is it a renewable or depletable resource? How do we impact our environment by obtaining and using it? What would happen if we depleted that resource?

The Ancestral Pueblo people also made impacts on their environment. These impacts may ultimately have contributed to their migration from this area.

PROCEDURE

1. Review BACKGROUND information with the students regarding the population at Aztec Ruins and the time period during which they were in the area. Show them the “Settlement Areas” MAP indicating the extent of settlement in the area.
2. Examine the replica artifacts from the trunk, using the information provided with the trunk to discuss the function of each.
3. Students choose the names of 10 artifacts from the replica artifact trunk, and list them on a piece of paper.

- For each item, students infer and write how long each item may have lasted, and explain their reasoning. Consider how many a household (4-8 people) might need, how often a household would use it, and how often it would need replacing. Consider how long an item would last, or get used up, broken, or lost.
- Distribute the "Prehistoric Buildings" WORKSHEET to students. Review the introductory information on the WORKSHEET with students. Students answer each question individually or in pairs.
- Discuss students' answers taken from their written work.

CLOSURE

Students individually form and write an inference, or conclusion, about the impact that the people who lived in and around Aztec Ruins made on their environment. Compare and discuss students' statements. Could the inhabitant have been influenced to move because of the impacts they made in the environment? How?

EVALUATION

Evaluate students' inferences regarding how long artifacts last and impacts on the environment, and answers to WORKSHEET questions.

EXTENSIONS

- Take a field trip to Aztec Ruins. Examine the artifacts on display, and infer about household use of these items as in PROCEDURE 4. Field-check room measurements and sizes of stones, and modify calculations on the "Prehistoric Buildings" WORKSHEET to reflect a better estimate of the materials

used. Modify inferences regarding impacts to the environment based on observations made during the field trip.

- To shorten the lesson, the teacher chooses a sampling of artifacts from the trunk for examination. Students then choose up to 5 artifacts from which to infer longevity.

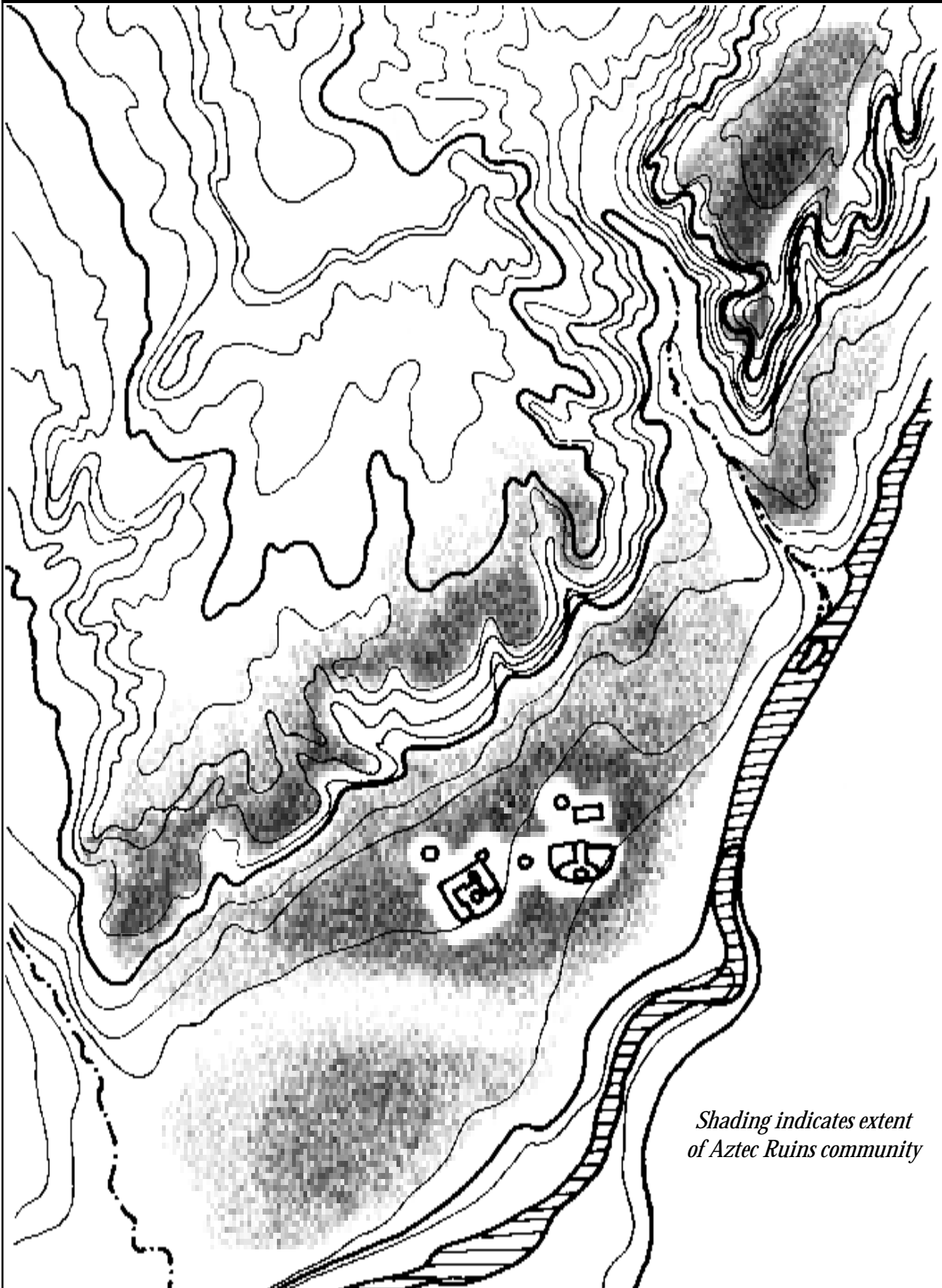
REFERENCES

Lekson, Steve, et al., "The Chaco Canyon Community," *Scientific American*, Vol. 259, No. 1, pp 100-109, July 1988.

Answers to Prehistoric Buildings WORKSHEET

- 2 vigas per room 2 vigas = 1 tree
450 rooms x 1 tree = 450 trees
- For length: 10 feet = 120 inches
120 inches ÷ 8 inches = 15 blocks
For width: 2 feet = 24 inches
24 inches ÷ 8 inches = 3 blocks
15 x 3 (Length x width) = 45 blocks
- 8 feet = 96 inches
96 inches ÷ 8 inch blocks = 12 blocks
- 45 blocks x 12 blocks = 540 blocks
- 4 walls x 540 blocks = 2160 blocks
- 2160 blocks x 7 pounds = 15,120 pounds
- 2160 blocks ÷ number of rocks hauled in one day

SETTLEMENT AREAS



*Shading indicates extent
of Aztec Ruins community*

PREHISTORIC BUILDINGS

The West Ruin at Aztec Ruins had about 450 rooms. Stones, mud, and wood were used for its construction. How much of these materials did the builders need to build the structure? Make the following calculations to estimate how many rocks and trees they might have used.

Hint: Your answers will be estimates because there are so many variables that affect them. Walls varied in thickness throughout the building, and the rocks used varied from very small chinking stones to large shaped, or *dressed*, stones. Sometimes the people shaped them into loaf forms, sometimes into thin tabular forms. In addition, the walls were laid in a core and veneer construction. Veneers of carefully laid dressed stone sandwiched an inner core of unshaped sandstones and cobbles embedded in a large quantity of mud mortar. As a result, mud was a major part of the wall. Walls were shared between rooms, and many walls had doorways, vents, niches, and other features built into them. All these factors will affect a realistic calculation of resources needed to construct the building.

1. Each roof required an average of 2 vigas, (large support beams). If 2 vigas came from 1 tree, how many trees were needed for 450 rooms?
2. An average size room was 10 ft. by 10 ft. To make a strip of wall that was 10 ft. long by 2 ft. wide, how many 8-inch-square rocks were needed to make one layer?
3. If the Puebloans used individual rocks that were cube-shaped with 8-inch sides, how many rocks would it take to stack, one on top of the other, until the wall reached 8 ft. high?
4. How many 8-inch cube-shaped rocks would they need to build one section of wall that measured 10 ft. long, 2 ft. wide, and 8 ft. high?
5. Each room had 4 walls. How many rocks would they need to build the walls in one room?
6. If each rock in a room weighed 7 pounds, how many pounds of rocks would they have hauled to build one room?
7. Estimate the number of rocks you could haul one mile in a single 8-hour work day. Use your answer from number 5 to determine how many days you would need to build one room in the building by yourself.

FIRE DRILL

Depressing the cross bar spins the main shaft rapidly. The friction on a dry piece of tinder wood eventually causes enough heat to ignite dry leaves to create a fire.

The same tool technique, using a hard, cut stone like obsidian, was used to drill holes in turquoise and shell to create jewelry.

