



Teacher's Guide to Cultural Findings at Meadowcroft Rockshelter

A Component of First Peoples: Archaeology at Meadowcroft Rockshelter

Content for exploring the technologies, occupation patterns, cultural periods, and implications of examining the lives of the First Peoples at Meadowcroft Rockshelter

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Contents

Teaching Cultural Findings	3
Intersection of Cultural Findings with First Peoples Themes	4
Cultural Findings GigaPan Inquiry	5
Major Terms and Concepts	6
Prehistoric Technology at Meadowcroft.....	7
Lithic Artifacts from Meadowcroft Rockshelter and the Cross Creek Drainage.....	8
Perishable Artifacts from Meadowcroft Rockshelter.....	9
Ceramics From Meadowcroft Rockshelter.....	1
Additional Inquiry for Exploring Prehistoric Technologies at Meadowcroft Rockshelter	13
Cultural Periods Represented at Meadowcroft Rockshelter.....	15
Paleo-Indian (pre-10,000 B.P.)	16
Archaic Period (10,000 B.P. to 3000 B.P.)	18
Woodland Period (3000 to 450 B.P.).....	21
Historic Period (450 B.P. to Present).....	23
Additional Inquiry for Exploring Cultural Periods at Meadowcroft Rockshelter	24
General Characteristics of Site Utilization.....	26
Additional Inquiry for Exploring Site Visitation	29
Cultural Significance of Meadowcroft Rockshelter	31
Disputing Clovis First Theories	32
Meadowcroft and The Peopling of North America	33
Conclusion.....	34
Additional Inquiry for Exploring the Cultural Significance of Meadowcroft Rockshelter.....	35
Bibliography	36

Teaching Cultural Findings

Artifacts, features, and contexts are the product of **archaeological excavation**. During **excavation**, **archaeologists** remove material slowly so that they can document the **contexts** of any evidence, creating a map of the occupational floor of the site. They create a map for each subsequent floor they encounter. At Meadowcroft, this resulted in at least 11 occupational floor maps: one for every stratigraphic layer. Using the laws of superposition (that oldest is deepest and newest is uppermost); **archaeologists** establish a **sequence** or **chronology** of **cultural activity** at the site. **Relative** and **scientific dating** methods support the chronology. By analyzing **artifacts, features** and **contexts** as they occur throughout time (**stratigraphy**), **archaeologists** can begin to interpret the cultural significance of the site.

For the purposes of the *First Peoples* curriculum, the “Cultural Findings” theme differentiates between raw **archaeological** data and more conclusive interpretations about the people at Meadowcroft. For information about the **excavation** process and **methodologies**, visit the *First Peoples Archaeology* materials.

The essays below will help educators understand the classification of prehistoric technology at Meadowcroft and the cultural **sequence** as based on **stratigraphy** and **radiocarbon dating**. Later essays elaborate on the general characteristics of visitation to Meadowcroft Rockshelter and, ultimately, the cultural significance of the site. These essays are all drawn from the original or subsequent published works by Meadowcroft’s **multi-disciplinary** research team. Many are available only in print from through conference proceedings that are difficult to procure outside of academic libraries. For this reason, they are transcribed or paraphrased below. A complete list of references cited and consulted is listed in the bibliography.

Intersection of Cultural Findings with First Peoples Themes

The table below summarizes how the Cultural Findings theme of the *First Peoples: Archaeology at Meadowcroft Rockshelter* curriculum can be used to explore various academic disciplines. **Archaeology** is included since it teaches the process by which **cultural evidence** is recovered.

Cultural Findings Inquiry in <i>First Peoples: Archaeology at Meadowcroft Rockshelter</i>					
	Science	History	Environment and Ecology	Geography	Technology and Engineering
Cultural Findings	Eleven naturally occurring strata (geology) and 52 radiocarbon assays indicate a continuous human presence at Meadowcroft over 16,000 years.	All known New-World cultural periods are represented at Meadowcroft. Archaeological evidence explains how these cultures changed over time and the significance of these changes.	The abundant natural resources and a relatively stable climate resulted in continuous but intermittent human use of Meadowcroft over 16,000 years. Prehistoric peoples adapted to minor climatic episodes and modified their activity at the site based on the seasons.	Throughout 16,000 years, humans have modified the Cross Creek watershed to meet their evolving needs and in response to changing environments .	Prehistoric people adapted new technologies and practices in response to natural and cultural evolution.
Archaeology	Although often grouped with social sciences, archaeology uses scientific methodology and procedures to understand the lives of humans in the past. Attrition of the sandstone cliff and deposition of sediments created the stratigraphy of Meadowcroft Rockshelter (geology). Radiocarbon assay was used to scientifically date	The purpose of archaeological investigation is to reveal patterns about human culture over periods of time.	Geofacts and ecofacts contribute evidence to the study of archaeology , particularly regarding the availability of natural resources and human response to environmental conditions.	Geography contributes evidence about the movement of humans through the landscape, resource distribution, human characteristics of the landscape, and the interactions between people and the environment .	Archaeological evidence and stratigraphy can be used to demonstrate how prehistoric technologies and practices changed over time at Meadowcroft. Field Schools at Meadowcroft in the 1970s utilized early computer technologies in the systematic organization of data during the excavation .

	cultural evidence at the site.				
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Cultural Findings GigaPan Inquiry

The First Peoples Cultural Findings GigaPan Explorations demonstrate some of the objectives for this curriculum and states possible indicators of mastery.

Grade band	Objectives Students will . . .	Indicators of Mastery Students will be able to . . .
11 th - 12 th Grades	<ul style="list-style-type: none"> Evaluate the methods used for establishing a chronology at Meadowcroft Analyze and Evaluate cultural patterns of continuity and change over time at Meadowcroft Rockshelter Evaluate the cultural implications of artifacts, features, and other data from Meadowcroft Evaluate the impact of artifacts and data from Meadowcroft Rockshelter on the study of archaeology in the United States and the world 	<ul style="list-style-type: none"> Demonstrate how archaeologists at Meadowcroft used relative and scientific dating to document the cultural sequence; give examples of how stratigraphy and radiocarbon dates support the sequence; evaluate the value of this methodology Explain nuances in the artifact record and stratigraphy that evidence continuity and change; draw inferences about occupational patterns and site use over time. Evaluate the significance of Pre-Clovis findings; explain how these resulted in a rethinking of peopling theories Evaluate Meadowcroft’s significance in prehistoric American archaeology
8 th - 10 th Grades	<ul style="list-style-type: none"> Describe the methods used for establishing a chronology at Meadowcroft Describe and Evaluate cultural patterns of continuity and change over time at Meadowcroft Rockshelter Describe the cultural implications of artifacts, features, and other data from Meadowcroft Evaluate the impact of artifacts and data from Meadowcroft Rockshelter on the study of archaeology in the United States and the world Conduct research on Meadowcroft Rockshelter using a thesis statement and demonstrate use of appropriate sources 	<ul style="list-style-type: none"> Demonstrate how archaeologists at Meadowcroft used relative and scientific dating to document the cultural sequence; give examples of how stratigraphy and radiocarbon dates support the sequence. Explain nuances in the artifact record and stratigraphy that evidence continuity and change; draw inferences about occupational patterns and site use over time. Explain how the discovery of the Miller complex upset Clovis theories Evaluate the significance of Pre-Clovis findings; explain how these resulted in a rethinking of peopling theories

		<ul style="list-style-type: none"> • Explain Meadowcroft’s significance in prehistoric American archaeology
5 th - 7 th Grades	<ul style="list-style-type: none"> • Recognize that relative and scientific dating methods are used to support the chronology of life at Meadowcroft • Recognize that technology can be used to understand continuity and change between cultural periods at Meadowcroft • Describe how the location of artifacts within a site can help archeologists understand the time when they were used; recognize that the oldest artifacts are deepest • Identify Meadowcroft Rockshelter as a significant prehistoric cultural site 	<ul style="list-style-type: none"> • Explain the cultural sequence at Meadowcroft and give examples of how relative or scientific dating contribute to this sequence • Identify examples of technology and explain how they correspond to cultural continuity or change • Describe the age of the Miller lanceolate point based on its location at Meadowcroft; explain the cultural significance of the point • Describe why Meadowcroft Rockshelter is a significant prehistoric cultural site
K- 4 th Grades	<ul style="list-style-type: none"> • Recognize that people who lived at Meadowcroft in the past had the same basic needs as people today • Recognize that artifacts and features are evidence of prehistoric cultural groups • Identify and describe how geography and climate have influenced continuity and change over time at Meadowcroft • Recognize that archaeologists use the location of artifacts in a site to describe how old they are • Recognize that Meadowcroft Rockshelter is a prehistoric archaeological site in Pennsylvania 	<ul style="list-style-type: none"> • Describe how prehistoric people used the Rockshelter; give an example of cultural evidence that shows an activity related to food acquisition • Describe an artifact and tell how it was used and give an example of a feature and the type of activity it represents • Describe the environment of the Cross Creek watershed; identify two species that are found in the Paleo- and modern environment at Meadowcroft • Identify the Miller lanceolate point as the oldest artifact from Meadowcroft because it is deepest in the site • Identify Meadowcroft Rockshelter and describe it as a prehistoric archaeological site in Pennsylvania

Major Terms and Concepts

Scattered throughout the curriculum guide and GigaPan exploration are terms highlighted in bold. These include key vocabulary terms, concepts, and items of significance. Teachers can incorporate the terms in vocabulary and spelling lists.

Terms	Concepts/ Theories	Identification Significance
Assemblage Basketry	Law of Superposition Continuity and Change	Meadowcroft Rockshelter Woodland Period

Ceramics Lithics Perishables Radiocarbon Dating Sequence Stratigraphy Technology	Scientific and Relative Dating Peopling Theories: Clovis First Theory Solutrean hypotheses	Archaic Period Paleo-Indian Period Clovis Pre-Clovis Miller Complex
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Prehistoric Technology at Meadowcroft

Meadowcroft Rockshelter contains critical **artifacts** that **archaeologists** used to understand life at the site during the prehistoric occupations. These **artifact assemblages** can also be used to compare life at Meadowcroft to life at other local **archaeological** sites. Three categories of **artifacts** were recovered from Meadowcroft, including **lithics**, **perishables**, and **ceramics**.

Lithic analysis is the study of stone tools using scientific techniques. It seeks to explain the morphology, or form, of the **artifact**, through an investigation of physical attributes and **features**. Meadowcroft Rockshelter contained **artifacts** produced through **lithic reduction**, or the flaking/ knapping of stone, and **ground stones**, or tools made through a combination of techniques that result in hammers, mortars, axes, etc. A sizeable amount of **debitage** (by products of lithic reduction) was also recovered from the site.

Perishable technologies are technologies created from softer organic materials such as wood, fiber, and even bone. **Perishable technologies** were found in every **stratum** at Meadowcroft, including some of the earliest **basketry** fragments in North America.

GigaPan Notes

The artifacts recovered from Meadowcroft Rockshelter were removed during the **excavation** process. At the close of every **field school**, all recovered evidence was taken to the laboratories for analysis. There are a few exceptions; some mollusk shells and deer bones remain visible in profiles of the site. As your students examine the GigaPan images, they will not “discover” any artifacts. However, many of the interest points contain photographs or multimedia that will satisfy student curiosity about the “stuff”.

Use the Cultural Evidence GigaMap in the Cultural Findings GigaPan Explorations Guide to learn more.

Ceramics, or vessels made from clay, were found in small numbers at Meadowcroft. However, these fragments are among the earliest yet excavated in the Upper Ohio valley.

Together the prehistoric technologies at Meadowcroft support theories of short-term occupations of the Rockshelter, centered on the acquisition of food by native peoples.

Lithic Artifacts from Meadowcroft Rockshelter and the Cross Creek Drainage

Compiled from P.T. Fitzgibbons, J. Herbstritt, W.C. Johnson, and C. Robbins, "Lithic Artifacts from Meadowcroft Rockshelter and the Cross Creek Drainage," in *Meadowcroft: Collected Papers on the Archaeology of Meadowcroft Rockshelter and the Cross Creek Drainage*. Pittsburgh: University of Pittsburgh Press, 1982.

Lithic artifacts comprise the largest **artifact assemblage** recovered from Meadowcroft Rockshelter and the **archaeological** surveys of the Cross Creek valley. Several types of tools were classified and analyzed, including projectile points (points attached to a projectile such as a spear, dart, or arrow, or used as a knife), **bifaces** (implements flaked on both sides), **unifaces** (implements flaked on one face), ground stone **artifacts**, and debitage.

Flaked or knapped technologies, including the Miller lanceolate projectile point and Mungai knife, are some of the most recognizable **lithics** recovered from Meadowcroft. These tools were intentionally formed by reducing a larger piece of raw flint, chert, or other type of stone through striking or chipping action. The shaping is intentional and reduces the initial core to a shape designed to achieve a specific task. The resulting chips are referred to as **debitage**. A total of 2,498 flaked stone **artifacts** and ca. 22,840 pieces of debitage were recovered during the 1973-78 Meadowcroft Project. Meadowcroft Rockshelter alone yielded 555 flaked stone **artifacts** and ca. 5,163 pieces of debitage (Fitzgibbons 1982).

Archaeologists performed two sets of interrelated analyses on the **assemblage**. The first established the **typologies** for all classes of flaked stone tools and debitage (e.g. projectile points, bifaces, blades, bifacial thinning flakes, etc.) through attribute analysis. A typology is a classification according to general characteristics, including **morphology**, measurements, and existing **features**; classes of typologies include tools, production and debitage categories. The second type of analysis attempted to develop functional typologies, or examinations of the use of the tools, through microwear examination of surface and edgewear patterns using magnification (from 80X magnification on the low end to 500X magnification on the high end). Functional typologies examine use-wear patterns, such as polished areas or damage that result from the tool being used.

Based on the analyses, **archaeologists** determined that the entire **lithic assemblage** at Meadowcroft appears to represent the results of generally small, short-term occupations with relatively low **artifact** frequencies for each successive occupation. The presence of finished **artifacts** and debitage indicate that people were transitory, meaning they were visiting with complete toolkits for seasonal hunting and food processing.

These individuals left abundant evidence of **lithic** tool maintenance and rejuvenation (or resharpening) in the form of secondary and tertiary flaking debitage (small flakes that demonstrate that a piece was reworked). However, there is little evidence that **lithic** tools were manufactured at Meadowcroft, only few cores of chert and flint were found. To make a **lithic** tool, a person begins with a core and strikes it to reduce the material into the desired shape. These initial large flakes are called primary flaking debitage. Low frequencies of primary flaking debitage and the relative absence of cores or core fragments indicate that people were not making tools at Meadowcroft. **Archaeologists** did recover bifacial thinning flakes, a type of debitage that results from the reduction of preforms or blanks, indicating that people brought unfinished projects to work on (just as someone might carry their knitting with them). However, based on the evidence, **archaeologists** deduced that **lithic** manipulation at Meadowcroft was primarily the repair of tools used during food acquisition.

The Rockshelter contains one of the most securely dated flaked stone **assemblages** in the New World from Paleo-Indian through Late Prehistoric times. While some levels lack “typical” **diagnostic artifacts**, most (including the latest and earliest) do contain some time marker/index **artifacts** that can be correlated with similar, dated specimens from other sites. Local, regional, and extra-regional comparisons of the Meadowcroft **lithics**, particularly those from Stratum IIa, have been undertaken. Local comparisons with sites such as 35WH351 (a multicomponent **lithic** workshop located on the very edge of the Cross Creek drainage) revealed prehistoric cultural continuities within the Cross Creek drainage. 36WH351 has produced fluted points that are nearly identical duplicated of the Miller Lanceolate point found in Meadowcroft Stratum IIa. These points, microblade cores, and microblades indicate that the Stratum IIa **lithics** at Meadowcroft are not restricted to the site.

Similar analyses were conducted for the flaked stone **artifacts** from the 236 sites recorded in the Cross Creek drainage during the drainage surveys. As at Meadowcroft Rockshelter, all time periods of prehistoric occupation are represented at the sites. In general, these sites served as short-term **habitation** or special activity areas. They are situated in a wide variety of geographic and topographic settings that vary from **uplands** and ridgetops to the Cross Creek **floodplain**.

Last, a total of 12 complete and fragmentary **ground stone artifacts** were recovered from Meadowcroft Rockshelter and an additional 60-70 such specimens from several sites in the Cross Creek survey. Ground stone typically refers to any tool made by a combination of flaking, pecking, pounding, grinding, drilling, or incising. Ground stone technologies can be as simple as a round cobble used as a nutting stone, or as complicated as a mortar for holding materials to be ground. At Meadowcroft, ground stones were classified as pitted cobbles and slabs, hammerstones, manos, celts, **adzes**, full and three-quarter-grooved axes, gorgets, etc. Raw materials used in the manufacture of these items include locally available **sandstone** and **limestone** as well as exotic igneous and metamorphic rocks (Fitzgibbons: 1982, 91-129).

Perishable Artifacts from Meadowcroft Rockshelter

Compiled from T.E. Stile, "Perishable Artifacts from Meadowcroft Rockshelter, Washington County, Southwestern Pennsylvania," in *Meadowcroft: Collected Papers on the Archaeology of Meadowcroft Rockshelter and the Cross Creek Drainage*. Pittsburgh: University of Pittsburgh Press, 1982.

Ninety-one specimens from four classes of **perishable artifacts** were recovered from Meadowcroft Rockshelter: **basketry**, cordage, modified wood, and modified bone (Stile 1982). Though scarce when compared with the numbers of **lithic artifacts**, "**perishables**" occur in all occupational **strata** at the site except in Stratum IX, including the lowest and earliest cultural levels. One **basketry** fragment is found in Stratum IIa lower, one in IIa middle, and three carbonized **basketry** fragments derive from Stratum IIb. A portion of the fragment from Stratum IIa lower was radiocarbon dated to 17,650±2400 BC (19,600 B.P.), making this a rare survival of a Paleo-Indian basket. The remaining fragments are ascribable to the Middle to Late Archaic and Early/ Middle Woodland occupations at the Rockshelter. All specimens represent simple plaiting and appear to be portions of rectangular or circular containers.

Basketry encompasses several distinct types of items, including rigid and semi-rigid containers or baskets proper, matting, and bags. Matting includes items that are two-dimensional or flat, while baskets are three-dimensional. Bags are viewed as intermediate forms because they are two-dimensional when empty and three-dimensional when filled. However, the technique of manufacture is the same for **basketry**, matting, and bags. Specifically, all forms are manually woven without any frame or loom. Since all **basketry** is woven, it is technically a class of textile although that term is usually restricted to cloth fabrics.

Thirteen **basketry** fragments were recovered. All appear to have been made of a cut, birch-like bark. In each specimen, the plaiting strips appear to have been cut to equal size. The largest fragment appears to have been a substantial container, with the fragment measuring 2 feet X 1 foot 2 inches. The baskets were simply produced by cutting the material to size, immersing it in water to ensure flexibility, and then plaiting it. A rim could be produced by folding the material over a rod and then lacing it to the body of the basket. When properly woven, plaited baskets of this type can be watertight without the addition of pitch or resin.

The **basketry** fragments are directly associated with hackberry seeds, raspberries and a variety of nuts, suggesting that the baskets were used for collecting wild plant foods. They may also have been used to transport freshwater mussels from Cross Creek or the Ohio River. The large fragment described above is not directly associated with foodstuffs, though it appears to be part of a complete vessel that collapsed in upon itself. Inside the vessel are several pieces of **limestone** which may offer mute testimony to the Indian practice of boiling or cooking with hot stones.

Basketry occurs in Paleo-Indian, Archaic, and Woodland levels at Meadowcroft Rockshelter. It is more represented in stratigraphic units like Stratum IV during which time Meadowcroft was most certainly a base camp for bands of foraging groups that almost certainly included women. This is supported by the concentration of modified bone in Stratum III and to a much greater extent in Stratum IV. The

disappearance of **basketry** above Stratum V parallels a decrease in the numbers of recovered hackberries (previously a heavily exploited food source), as well as nuts and freshwater mussels. Some of the specialized cooking/ boiling functions of plaited **basketry** were replaced by **ceramics**, while flexible twined bags (evidenced as impressions on the surfaces of Woodland period **ceramics**) replaced baskets in carrying and transportation functions.

Two **cordage** remains from Meadowcroft are restricted to the driest portions of the upper levels of the site (Strata VIII and XI). Cordage is a type of string or rope made from fiber. The cordage specimens recovered from Meadowcroft are tiny (less than 1 cm. in length) and are nearly disintegrated. No conclusive statements can therefore be made about cordage at the site. It probably existed in much greater quantities, evidence by the presence of **basketry** and cord-marked pottery. However, conditions in the Rockshelter were not conducive to the survival of cordage.

A small number of **modified artifacts** were made from wood and bone. Natural materials such as bone and wood are described as modified when they display signs of intentional shaping. Excluded from the modified **artifact** category are bones that show marks of butchering but not evidence of shaping to create a tool. Modified wooden **artifacts** include peg-like items that are sharpened on one end and a single bipoint foreshaft from a dart or spear that was recovered from lower Stratum IIa.

Modified Bone tools of several types and configurations include bone awls, a delicately carved trigger snare, a modified antler base, bone beamers, and many tools related to **basketry** manufacture were uncovered in various **strata**. Awls were the single most common modified bone tool. Most of the samples were created from white tailed deer and wild turkey bones. Edge wear on the tips of awls explains two types of use: flatter specimens that were thrust in and out of a yielding soft material and specimens with round cross sections exhibiting “in and out” and rotary wear. Given the evidence, awls were used to perforate hides or skins and to sew rims on baskets at Meadowcroft.

Bone **basketry** tools include a bone chiseloid (presumably used as a plane) found in direct association with a basket fragment in Stratum IIb (the basket containing the form was partially finished) and several bone shuttles from Strata IIb and III. Given the abundance of bone (including thin splinters) recovered from most **strata** at Meadowcroft, it is not unlikely that bone tools were manufactured on the site though direct evidence in the form of work areas is lacking. Bone tools were also used as perforators or pressure flakers in **lithic** reductions. Three punches made from white-tailed deer antler tines include one from Stratum IIa lower which is directly associated with the snapped end of a **lithic** blade.

A special subclass of modified bone from Meadowcroft includes modified tortoise carapaces which were made into cups and appear in modest numbers.

Collectively, the **perishables** from Meadowcroft provide insight into the non-lithic tool kit and technologies of prehistoric peoples but also into the changing character of site utilization throughout the long occupational **sequence**.

Ceramics from Meadowcroft Rockshelter

Compiled from W.C. Johnson. (1982). *Ceramics from Meadowcroft Rockshelter: A Re-Evaluation and Interpretation. Meadowcroft: Collected Papers on the Archaeology of Meadowcroft Rockshelter and the Cross Creek Drainage* (pp. 142-162). Pittsburgh: University of Pittsburgh Press.

Ceramics are defined as vessels made of fired clay, complete or fragments. Two primary attributes of prehistoric **ceramics** are used by **archaeologists** to: 1) the material the pot is made from and 2) the form or shape of a pot. The clay material of a pot and its inclusions can help tell where the pot was made, as well as how it was made and sometimes a date of when it was made. The form of a vessel can indicate when and how it was used as well as suggesting the cultural preferences of the people who made it.

The 1973-1977 **excavations** at Meadowcroft produced 393 ceramic **sherds** and spalls (Johnson 1982). All **ceramics** are restricted to Stratum III and above. Four types of ceramic ware are represented, including grit-tempered Half-Moon ware, **limestone** tempered Watson ware, shell-tempered Monongahela ware and a few **sherds** of ochre and fine grit/sand tempered ware. The **sherds** and spalls were reduced to 39 reconstructed vessel “clusters”. The ceramic **assemblage** is small, but it conforms with general ceramic and textile patterns established for the Upper Ohio valley.

Ceramic Analysis and Hypothetical Vessel Reconstruction Techniques

Ceramics found in **archaeological** sites, including Meadowcroft Rockshelter, are not often whole vessels. Rather, they are found as clusters of broken **sherds** that were discarded in middens or trash pits. The goal of studying ceramic **assemblages** is not to reconstruct forms, but to gain understanding of the greater patterns of ceramic use at a site. Meadowcroft **sherds** tended to cluster horizontally and vertically throughout the **excavation** units. **Sherds** with similar combinations of attributes generally cluster in contiguous **excavation** units both vertically and horizontally. Hypothetical vessel or **sherd** clusters are defined by their paste, temper type, size and density, **sherd** thickness, primary and secondary surface treatment.

Rather than limiting their analysis to **sherd** counts, **archaeologists** at Meadowcroft analyzed each ceramic fragment for **gram weight**, a method for quantifying **archaeological** remains by their mass. Various wares differ in temper which reflects different **ceramics** technologies, each of which could produce wares that were more **friable**, or prone to crumbling. Differences in the friability of wares allows more resistant wares to withstand damage from weathering, frost, and animal or human activity, while less resistant wares fragment into smaller **sherds** giving the illusion of having been originally more numerous at the site. Bias in ceramic patterns can also be introduced by native people’s garbage disposal habits and differences in the intensity and location of occupation over time in the Rockshelter. Measuring the gram weight of **sherds** eliminated some of the natural bias in basing ceramic use simply on the quantity of **sherds**.

Sherds were measured for thickness, and grit size and were sorted into plain-finished and **cordmarked** categories. Cord-marking references **ceramics** that have clear cordage impressions in their exterior surfaces. These impressions can be used to discuss textile production by a cultural group, however, **ceramics** makers also sometimes smoothed cordage impressions before firing **ceramics**. Cord-marked pottery or the absence of does not provide a reliable means of gauging a group's textile technology. Based on gram weight and the attributes described above, **archaeologists** reduced the 393 **sherds** to 39 hypothetical clusters.

Ceramics Summary

Meadowcroft produced some of the earliest dated **ceramics** for the Upper Ohio Valley. Feature 60B, part of a gigantic firepit with its base in Stratum III, yielded a Half-Moon cord-marked vessel and an associated radiocarbon date of 865±85 B.C. (2815 B.P.). A second Half-Moon cord-marked vessel elsewhere in Feature 60 at a slightly deeper level has an associated date of 1115±80 B.C. (3065 B.P.). Half-Moon ware is restricted to uppermost Stratum II and Stratum IV at the Rockshelter indicating that it is the first ceramic type for the Cross Creek drainage.

Limestone-tempered Watson wares are the most common ceramic type at Meadowcroft and are represented by 325 **sherds** and a maximum of 36 vessel clusters. Final Z and S twist cordage impressions are both present in surface treatments on these pots. Significantly, 72.73% of the Watson vessels are clustered in Late Woodland Period Strata VIII through XI. The Monongahela shell-tempered wares demonstrate direct evolution out of the earlier Watson wares.

The final category, represented by four small **sherds** of a single ochre and fine grit/ sand tempered vessel, was found in Stratum XI and can be attributed to the Late Woodland/ early Historic Period use of the Rockshelter.

The **ceramics** recovered from Meadowcroft Rockshelter represent the remains of many brief human occupations over an extended period. These remains disproportionately represent the original "universe" of ceramic use at Meadowcroft.

Additional Inquiry for Exploring Prehistoric Technologies at Meadowcroft Rockshelter

Things to Do

- Have students research the various technologies discussed in this guide. Ask them to find pictures of the different point types, **basketry**, and **ceramics**. Use the images to create a timeline that represents **cultural activity** at Meadowcroft.
- Create a timeline that compares prehistoric technologies with Old World technologies that your students have studied. How are these technologies similar? Different? Can students infer anything about cultural values or beliefs based on the appearance or function of the objects?
- **Archaeologists** use typology charts to classify **artifacts** according to their physical characteristics. **Lithic** typology charts display variations in **lithic** tools, which are often viewed as deviations from a specific form. Similarly, ceramic typologies classify types of **ceramics** based on attributes that are often obvious to even an untrained eye. Secure some typology charts for your students to analyze. What are the benefits of organizing information this way? What are the limits?
- Secure some of the basic materials that prehistoric people used to create their tools. Discuss the properties of the materials. How might the properties of a material determine its use?
- Explore the concept of **artifact** deviation. Sometimes **archaeologists** find an **artifact** that does not fit securely into a typology chart. **Archaeologists** speculate that many of the deviations may be from differences in raw materials or the technical competency of the maker. Distribute clay to each student and ask them to create a small pot. Compare pots. Ask students to create a list of factors which might contribute to why the pots are different. How can this inform **archaeological** investigations?

Things to Read

Adovasio, J. M., Olga Soffer, and Jake Page. 2007. *The Invisible Sex: Uncovering the True Roles of Women in Prehistory*. New York: Smithsonian Books.

Cultural Periods Represented at Meadowcroft Rockshelter

Ecofact Data: Is it Cultural?

Tremendous amounts of natural materials such as bone, fish scales, crustacean shells, eggshells, seeds, etc. appear in the site, often as tiny fragments that were recovered from constant volume samples (CVS) and flotation. Some of these materials occur because of human activity and some are due to the activities of animals, primarily raptor feeding habits. Much of the anthropogenically (human) deposited materials are associated with cultural features like firepits, or they display modifications from fire. Archaeologists and related specialists are still in the process of drawing patterns and interpreting the data. Future technologies may help clarify the depositional sources of ecofact material.

Archaeologists are interested in how **cultures** changed over time. Sites like Meadowcroft, with deep, continuous **stratigraphy**, are useful for understanding cultural change and adaptation. Meadowcroft Rockshelter's **stratigraphy** contains a continuous record of every major cultural period in the eastern United States from the time of the Ice Age until the arrival of Europeans. Prehistoric occupations of Meadowcroft Rockshelter can be assigned to the Paleo-Indian (pre-10,000 B.P.), Archaic (10,000 to 3000 B.P.), Woodland (3000 to 450 B.P.) and Historic Periods (450 B.P. to Present). These findings align with generally accepted periods for prehistoric **archaeological** sites in Pennsylvania, the upper Ohio valley, and most of North America.

How we know what we know

Meadowcroft's **stratigraphy** is the key to interpreting how **cultures** at the site changed over time. The **stratigraphy** provides a basic **chronology** of human activity at Meadowcroft. **Excavations** revealed eleven (11) natural **strata**, labeled numerically from the oldest and deepest (Stratum I) to the latest and uppermost (Stratum XI). Each **depositional** layer varies in thickness, composition, and texture and many include numerous, often very thin microstrata. The majority of these microstrata reflect discrete occupation/visitation events. Significantly, no **depositional** disconformities are noted across the site and **stratigraphy** is continuous. Applying the **Law of Superposition**,

GigaPan Exploration

Use the "Cultural Sequence" GigaMap in the Cultural Findings GigaPan Explorations Guide to learn more.

archaeologists safely assume that any **cultural evidence** is where it was deposited by prehistoric peoples, with the oldest evidence being deepest and the newest on top. With eleven natural **strata** reaching to a maximum excavated thickness of 4m (13 ft.) Meadowcroft Rockshelter has produced the longest continuous (although not continually occupied) stratified **sequence** of cultural remains in Pennsylvania and the northeastern United States.

Fifty-two **radiocarbon dates** anchor the stratigraphic **sequence**. The calibrated ages for these assays indicate a Woodland period ascription for Strata XI-IV (upper), an Archaic ascription for Strata IV (middle)-IIb, and a predominately Paleo-Indian ascription for Stratum IIa. This placed the range of calibrated dates within the accepted ranges of cultural periods recognized for Pennsylvania and the upper Ohio River **watershed**. However, the lower levels of Stratum IIa contained materials with calibrated dates that register a human presence at Meadowcroft several millennia *earlier* than other accepted Paleo-Indian sites. This discrepancy has resulted in nearly 40 years of debate in the **archaeological** community about the possibility of Pre-Clovis peoples in North America.

Interpreting the Evidence

The information below provides a snapshot of human activity at Meadowcroft for each cultural period based on the data gathered during the Meadowcroft Project. The discussion summarizes key findings from the **archaeological excavation** at Meadowcroft Rockshelter and the **archaeological** surveys the Cross Creek drainage conducted as part of the greater Meadowcroft Project. The **environment**, technology, settlement patterns, and subsistence for each period are outlined.

Throughout its long **history** of human occupation, Meadowcroft was a bivouac or a campsite used for short durations by people visiting to exploit natural resources before moving on. As such, **archaeologists** did not find the usual hallmarks of advanced settlement patterns and increasing populations that can be discerned from larger sites. Some evidence of settlement and population growth has been possible due to the presence of other **archaeological** sites in the Cross Creek drainage that were surveyed as part of the Meadowcroft Project. However, even these sites, apart from the Avella Mound and Cross Creek Village, do not provide conclusive evidence about the cultural patterns of these groups. Data from the Meadowcroft Project (or any single **archaeological** site for that matter), cannot be used to make sweeping claims about the lifeways of any specific cultural groups in any of the cultural periods: there simply is not enough evidence.

Paleo-Indian (pre-10,000 B.P.)

The earliest occupations of Meadowcroft are assigned to the Paleo-Indian period, represented by Stratum IIa. No **cultural evidence** is found below this layer, making the Paleo-Indians the “First People” to use the site.

Environment

Although only fifty-two miles from the Wisconsinan Glacial Maxim, the Cross Creek drainage had a **temperate, Carolinian ecology** dominated by **floral and faunal species**, some can still be found in the area today. The conditions of Stratum IIa were somewhat harsh, limiting the amount of recoverable **ecological data**. **Floral** remains are generally representative of **temperate climate species**, such as walnut and oak wood charcoal and walnut nutshells (Cushman 1982). Cross Creek was at its highest level during this time, indicated in the gastropod record by **species** that thrive on very moist conditions on flood plains (Lord 1982).

Few bone fragments survived the conditions of Stratum IIa lower, but of the eleven recovered specimens, white-tailed deer, eastern chipmunk, southern flying squirrel, deer mouse, passenger pigeon, toad and colubrid snake (Parmalee 1982) were identified. The chipmunk and possibly the deer mouse probably burrowed down into these levels. These **species** support the conclusions about a **temperate ecology**.

Technology

The Paleo-Indian toolkit at Meadowcroft is characterized by blade tools, including standardized tool shapes such as knives or wedges and fluted projectile points. These tools tend to be fashioned from high-quality stones such as cherts and **jaspers**. There were one hundred and twenty-three chipped stone **artifacts** recovered from lower and middle Stratum IIa including one unfluted lanceolate point named the Miller Lanceolate, several unhafted bifaces unifaces (including two “Mungai Knives”), prismatic blades and fragments of prismatic blade cores, utilized flakes and debitage flakes (Fitzgibbons 1982). Elsewhere in the Cross Creek valley, the



Paleo-Indians are represented by scattered surface finds of fluted Clovis-like points that were either lost or discarded presumably at short-term hunting camps (Fryman 1982).

The earliest **perishable artifacts** at Meadowcroft are Paleo-Indian. The oldest bone tool from the shelter was from lower Stratum IIa and is a cut and charred fragment from a white-tailed deer antler base. It was recovered in a firepit/hearth that also provided a radiocarbon sample dated to 16,175 B.P. \pm 975 year (14,225 B.C., uncorrected; SI-2354). A bipoint wooden tool was recovered from lower Stratum IIa It resembles a foreshaft for a compound dart or spear shaft. Stratum IIa lower and Stratum IIa middle each contained a **basketry** specimen. The fragment from Stratum IIa lower was radiocarbon dated to 17,650 \pm 2400 BC (19,600 B.P.), making this one of the oldest plaited **basketry** in the Americas. While it is uncertain what specific functions they served at that time, the occurrence of the wood

bipoint, **basketry**, and modified bone in the most ancient occupational **stratum** attests to at least the production and use of all the **perishable** classes well before the end of the Pleistocene (Stile 1982).

Settlement Patterns and Populations

A survey of the Cross Creek drainage found seven sites, besides Meadowcroft Rockshelter, with surface evidence of Paleo-Indian occupations. These components were classified as one base camp, which produced multiple Paleo-Indian points and other related Paleo-Indian tools, and six bivouacs/short term campsites. Based on this data and comparisons with similarly dated sites, it appears that the Paleo-Indian inhabitants of the Upper Ohio valley consisted of small groups or bands of people that may have roamed over a wide territory and exploited whatever foods and natural resources they could find (Fryman 1982).

Subsistence

One fact of Pale-Indian life does emerge from the record: people were coming to Meadowcroft in search of food. All the **artifacts** and **features** found at Meadowcroft and the other Cross Creek **watershed** sites for the Paleo-Indian period relate to food acquisition, preparation, or storage. At Meadowcroft, most of this food came from foraging and hunting. A total of thirty-eight **cultural features** were identified in this layer. They were classified as twenty-six firepits/hearths, five refuse/storage pits, one roasting pit, one fire floor, one ash/charcoal lens and four specialized activity areas (Stuckenrath 1982)). All the **lithic** technologies recovered from the site were hunting tools or related to the processing of game. However, the **artifact** record likely skews the true picture of subsistence at the site: the ground conditions at this deepest layer of the site were not conducive to the survival of **perishable technologies** (i.e. baskets, nets, cordage) that were used in foraging.

Surviving evidence does not point to an exact diet for Paleo-Indians at Meadowcroft, but the diet likely consisted of large and small game, fish, and foraged seeds, nuts, berries, and roots. The presence of numerous walnut shells associated with **cultural features** indicates that autumn occupation of the Rockshelter was common. Based on this evidence from Meadowcroft, Paleo-Indians moved frequently and seasonally in search of food.

Archaic Period (10,000 B.P. to 3000 B.P.)

The Archaic Period is subdivided into Early, Middle and Late Archaic based largely on differences in **lithic** technologies. Evidence for the Archaic Period at Meadowcroft is found in Stratum IIa Upper (Early Archaic, 8011-10950 B.P.), Stratum IIb (Middle Archaic, 6670 B.P.), and Stratum III (Terminal Archaic, 3255 B.P.) Changes in stone **artifacts**, an increased variety of **perishable artifacts** (including **basketry**), and the appearance of **ceramics** indicate an intensified exploitation of natural resources. Populations likely expanded, made possible by improved technologies in food acquisition, processing, and storage.

An increased number and variety of **features** appear in Archaic **strata**, particularly in the form of fire floors, ash lenses, and hearths (Stuckenrath 1982). Twenty-five **cultural features** appear in Stratum IIb (Middle Archaic) and fifty-four in Stratum III (Transitional/ Terminal Archaic). Most **features** in both **strata** are fire-related (20 of the features in Stratum IIb and 51 of those in Stratum III), which may indicate that Archaic cultural groups were using Meadowcroft Rockshelter on a more frequent basis than their Paleo-Indian counterparts. By contrast, twenty- nine of the thirty- eight Paleo-Indian **features** were fire-related.

Environment

The Sub-Boreal climatic episode during the Early Archaic period resulted in warm and dry conditions for much of the time represented by Stratum IIb and Stratum III. Oaks remained common near the Rockshelter, with hickory nuts and butternuts appearing in the **archaeological** record as pine trees disappeared. These **species** were likely accompanied by a variety of understory plants bearing seeds, roots and berries (Cushman 1982). The **flora** would have supported a relatively modern **fauna**, like those **species** living around Meadowcroft in Paleo-Indian times. Based on **ecological** data, conditions near Meadowcroft became very moist toward the end of the period (Late Archaic/ Transitional, 3,255 B.P.-2,930 B.P.). Levels of Cross Creek were likely higher, resulting in the moist conditions preferred by willows and maples which joined the oaks, walnuts, and hickories of the forest. Higher levels of Cross Creek likely explain the increased presence of terrestrial gastropods and riverine **species** such as freshwater mussels in the **ecological** record (Lord 1982).

Technology

Archaic period tools were quite similar to Paleo-Indian tools, except for spearpoints that were notched instead of fluted. A wide variety of **lithic** technologies characterize the Archaic sub-periods at Meadowcroft. Eight (8) different point types and a second Mungai Knife were among the **assemblage**.

Archaic people who occupied Meadowcroft used local **lithic** resources in addition to exotic stones. Microscopic analysis of **lithic** raw materials employed in these **artifacts** indicated 31 specimens (31.6% of the **assemblage** that could be identified) were made from Brush Creek

Archaic Period Components of the Cross Creek Drainage		
Sub-Period	Total Sites (excluding Meadowcroft)	Type of sites (excluding Meadowcroft)
Early Archaic	10	<ul style="list-style-type: none"> • 1 base camp • 9 bivouacs/ short-term campsites
Middle Archaic	2	<ul style="list-style-type: none"> • 1 base camp • 1 bivouac/ short-term campsite
Late Archaic/ Terminal Archaic	20	<ul style="list-style-type: none"> • 3 base camps • 17 bivouacs/ short-term campsites

Chert, a locally available chert (Vento and Donahue 1982:124). However, significant portions of the

assemblage were made from exotic **lithic** materials including seventeen specimens (17.3%) made from Flint Ridge Chalcedony/Vanport Chert and 16 specimens (16.3%) made from Kanawha Chert (Vento and Donahue 1982:124). The nearest sources of Flint Ridge Chalcedony/Vanport Chert is located 70 miles northwest of Meadowcroft Rockshelter, while Kanawha Chert is found 114 miles southwest of the site (Vento and Donahue 1982:116). The **lithic** raw material data indicate the Archaic inhabitants of Meadowcroft Rockshelter had been in the region long enough to discover local chert sources, but also used materials from a much larger territory than just the local region. Alternatively, the exotic **lithic** materials may indicate trade with neighboring groups, if they were present at that time.

The number and variety of **artifacts** made from **perishable materials** similarly increases, with five plaited **basketry** fragments, wooden tools, and bone awls, weaving needles, and tines. The presence of Half Moon and Watson Cordmarked **ceramics** in Stratum III indicates some **ceramics** production.

Settlement Patterns and Populations

Throughout the period, Archaic peoples were living in bands, and the bands probably controlled well-established territories within the region. The number of base camps in the Cross Creek drainage most likely remained stable until the Late Archaic/ Terminal Archaic Period (Fryman 1982:63). However, the number of components decreased during the Middle Archaic Period. This does not suggest a decrease in local populations, but **archaeologists'** inability to accurately identify Middle Archaic short-term campsites. The numbers of base camps in the Cross Creek drainage increased during the Late Archaic/ Terminal Archaic Period, suggesting an expansion of the population. One of the base camps, Cross Creek Village (36WH293), was excavated and produced at least four roughly oval wood post structures associated with Late/Terminal Archaic remains (Applegarth and Cowin: 1982). This campsite was not occupied on a year-round basis. The remains suggest a summer through fall utilization of the site.

Subsistence

Materials from Meadowcroft demonstrate a continued hunting and gathering existence during the Archaic Period. However, investigations also indicate an increase in the exploitation of wild plants and riverine resources.

Freshwater mussel shells appear in the **archaeological** record during the Late Archaic Period (Stratum III) and continue as a food source through the Early Woodland period (Strata IV and V). Compared with shell middens at other local sites, Meadowcroft has a limited number of shells, perhaps because Archaic people occupied the site for very short intervals, indicating that while mussels were a food source, mussel collection was not a primary activity at the Rockshelter. Two **species** of mussels were consumed as food: a Cross Creek **species** and a **species** from the Ohio River. The Cross Creek **species** dominates the record, reflecting what the malacologists deemed "The Principle of Least Effort", meaning it simply took less effort for people at the Rockshelter to collect mussels from the local source, rather than the

distant river. These findings are consistent with large shell middens found in other Archaic sites in the Ohio valley; freshwater mussels seemed to be a regular part of people's diets.

The acquisition of plant foods probably dominated much of the Archaic activity at Meadowcroft. Several **species** of plant remains recovered from Meadowcroft represent probable human foods. These include acorns, hackberries, walnuts, hickory nuts, blackberries/ raspberries, cherries, grapes, and goosefoot. Uppermost Stratum III and Stratum IV produced the earliest domesticated plants yet known for the Upper Ohio valley: *Cucurbita* sp. (squash) and 16 row *Zea* mays (corn). Many of these plant foods are directly associated with storage pits and hearths. By contrast, few animal bones from these **strata** can be directly associated with food acquisition. This is not to say that meat was not vital to the diet of Archaic people, but rather that most of occupations at Meadowcroft were related to foraging and gathering foodstuffs, particularly plants. Plant foods tend to preserve longer than animal foods, supported in the **artifact** record by the presence of plaited baskets containing plant residue and seeds. Throughout the period, evidence suggests that populations gradually increased as technologies improved the efficiency of food gathering, processing, and storage.

Woodland Period (3000 to 450 B.P.)

The Woodland Period is subdivided into Early (3000 to 2000 B.P.), Middle (2000 to 1000 B.P.) and Late Woodland (1000 to 450 B.P.) Periods. The Woodland Period at Meadowcroft is represented by part of Stratum III (Early Woodland) and Strata IV (Early Woodland), V (Early- Middle Woodland), VI (Late Middle Woodland), VII, VIII, IX, and X (all Late Woodland). An explosion of data, consistent with the explosion of Woodland data from other Pennsylvania sites, characterizes the Woodland period **strata** at Meadowcroft.

Archaeological sites located in the Cross Creek drainage during the Meadowcroft Project, the Rockshelter included, display a remarkable break with earlier patterns by the time of the Middle Woodland Period. Cultural patterns during the Paleo-Indian and Archaic Periods were like those observed among cultural groups in the Susquehanna and Delaware drainage systems. However, as Woodland Period populations in the Cross Creek drainage approach the Historic Period, they demonstrate an increasing similarity to Midwestern **cultures**. Specifically, they incorporate Adena systems, a set of traditions that extend from the upper Mississippi valley through the upper Ohio drainage into Western New York, with already existing technologies and behavior patterns.

Environment

Occupants of Meadowcroft Rockshelter experienced a generally warm **temperate climate**, like the **climate** today. Oak-elm-hickory forest dominates the period. Early on (3050 B.P.- 2290 B.P.), conditions were moister and slightly cooler than today, with maples and willows thriving along the **floodplain** of Cross Creek. These conditions continued through Strata IV, V, and VI (approximately 3050 B.P. – 1290

B.P.). By 685 B.P., conditions became drier with open woods. These conditions prevailed to the Historic Period.

Technology

A series of diagnostic points, Jack's Reef Corner Notched, Jack's Reef Pentagonal, Kiski Notched and Levanna, indicate that the spear thrower (atlatl) was gradually replaced by the bow-and-arrow during the late Middle Woodland. The earliest **ceramics**, Half-Moon Ware, found in the region are from this period with the characteristic point styles in the stemmed forms like Adena, Cresap, and Robbins, etc.

Settlement Patterns and Populations

Work in the Cross Creek drainage found eleven Early Woodland components besides those at Meadowcroft Rockshelter (Fryman 1982:65). These components were classified as at least two and possibly three base camps and eight or nine bivouacs/short-term campsites. No Early Woodland burial mounds or village sites were identified in the Cross Creek drainage.

A surface survey of the Cross Creek Drainage recorded sites with 15 Middle Woodland Period components excluding Meadowcroft Rockshelter (Fryman 1982:65). No village sites were identified, but 1 base camp, 4 mounds and 10 bivouacs/short-term campsites were recorded. The Avella Mound (36Wh415), located in the town of Avella and about 3 km (1.9 mi) east of Meadowcroft Rockshelter, represents a typical late Middle Woodland Mound (Applegarth and Cowin 1982). Avella Mound is a low, 1 m high mound that had stone crypts. There were no single "typical" burial type and the mound contained extended, flexed and cremation burials, most lacking any associated grave goods. Avella Mound was located on a knoll at the end of a bench overlooking the modern town of Avella. Unfortunately, coal mining conducted adjacent to Avella Mound prior to its **excavation** had eliminated any evidence of nearby associated **habitations** or **features**. The construction of mounds and probably the construction of wood post domestic houses indicate Early Woodland peoples lived a more settled or sedentary existence. The time needed to build the mounds and the energy expended in construction of wood pole houses is not characteristic of a nomadic lifestyle.

Late Woodland sites are not particularly numerous in the Cross Creek Drainage. Excluding Meadowcroft Rockshelter, only three other sites had Late Woodland components (Fryman 1982:65). All three sites were classified as bivouacs/short-term campsites. The lack of Late Woodland sites in the drainage is probably related to Monongahela preferences for situating villages in **upland** settings on ridge saddles and benches along stream divides.

Subsistence

The early portion of the Woodland Period is characterized by a more sedentary lifestyle focused on extensive exploitation of wild plant, animal and riverine resources that are supplemented by domesticated plant foods. By the end of the Woodland Period, people are living in permanent year-round villages, domesticated plants provide most of the food and are supplemented by wild resources.

The late Middle Woodland (1400 to 1000 B.P.) is not as well documented in terms of excavated sites. However, it is during this period that maize horticulture develops into an important part of the local economy.

The Late Woodland (1100 to 450 B.P.), also referred to as the Late Prehistoric Period, is characterized by the development of the Monongahela **culture**. Monongahela peoples lived in hamlets (early) and oval villages with central plazas. Larger Monongahela sites were usually located on saddles or benches along major stream drainage divides. Many villages were surrounded by an exterior palisade. The houses were circular and often had an attached storage appendage. Monongahela **ceramics** may be **limestone** tempered (usually early forms) or shell tempered. The diagnostic projectile point form was the small triangular Madison Point and it was an arrow point. Maize agriculture was the predominant economic activity. The maize diet was supplemented by wild plant, animal, fish and shellfish. Domesticated beans appear in the region toward the middle of the period and are another dietary supplement.

Historic Period (450 B.P. to Present)

The early portion of the Historic Period sees the demise of the Monongahela **culture** and the movement through the area of various historic Native American tribes (e.g., Delaware, Shawnee, etc.) who were being pushed west by the expanding European populations. The Monongahela could obtain European trade goods (e.g., glass beads, brass kettles, brass ornaments, etc.) at the Foley Farm (36GR52, Herbstritt, personal communication) and Throckmorton (Michael 1983) sites in the upper Ohio valley. However, the Monongahela apparently acquired European trade materials through Native American intermediaries since there are no definitive records of direct European contact with them. The Monongahela left southwestern Pennsylvania during the early 17th century. Richardson et al. (2002) has proposed that a series of severe droughts and attacks from the Iroquois forced the Monongahela to abandoned southwestern Pennsylvania circa A.D. 1635. Some Monongahela refugees apparently resettled in Halifax County, south-central Virginia (Wells 2002). After A.D. 1730, the Delaware, Shawnee and other Native American tribes, were pushed through western Pennsylvania, because of the expanding European settlements along the eastern seaboard (Kent et al., 1981). There currently is no direct evidence of historic Native American use of the Cross Creek drainage.

European settlers started to move into southwestern Pennsylvania in the middle of the 18th Century A.D. and all Native American peoples had been pushed out of southwestern Pennsylvania by the later portion of the 18th Century. The 19th Century A.D. was a period of expanding European populations in the region. Early European migrants into the area were primarily farmers. By the middle of the 19th Century, the iron industry started to develop. By the end of the 19th Century the area was noted for its coal mines, coke furnaces and steel mills. Small towns and villages, like Avella in the Cross Creek Drainage, developed in response to these industries. These continued to be the main industries in the region through the middle of the 20th Century A.D. when the steel industry went into decline. Today, southwestern Pennsylvania remains a largely rural area. The small towns and villages associated with the coal and steel industries are also in decline. Coal mining, particularly longwall deep mining, remains the primary industry in the region, and cattle and sheep farms are still common businesses in the rural areas. The early years of the 21st century have seen rise to the natural gas industry, again altering the character of the landscape.

Additional Inquiry for Exploring Cultural Periods at Meadowcroft Rockshelter

Things to Do

- Assign each student a cultural period. Ask them to draw a picture of life at Meadowcroft during this period using information from this Teacher’s Guide. Ask students to display their work and have other students guess which period the image represents. Discuss what is different about the images or arrange them in chronological order to create a visual timeline of life at the site.
- Create a timeline of prehistoric life at Meadowcroft. Create a parallel timeline with known events from the Old World.
- Assign each student a cultural period. Ask them to write a story from the perspective of a person at Meadowcroft during their assigned cultural period. Use information from this guide or evidence from the **archaeological excavation** at Meadowcroft to support the details of the story.
- Play cultural charades: create a series of cards describing a Cultural Period and an appropriate activity. Ask each student or groups of students to act out what is written on their card. Have the other students guess the time period and activity.
- Conduct the “Locating Archaeological Sites: Surveying for Cultural Evidence” activity listed with the First Peoples Materials. Have students survey an **environment** to see what types of **cultural evidence** they can find. How does this procedure help **archaeologists** understand **cultural activity** at a site?

- Ask students to create a “Paleo” recipe based on information from Meadowcroft Rockshelter. Students should write the recipe, including a list of appropriate ingredients, methods, tools, etc. How might changing technologies impact the recipe?

Things to Read

Carr, Kurt W., and Roger W. Moeller. 2015. *First Pennsylvanians: The Archaeology of Native Americans in Pennsylvania*.

This is an extremely accessible, profusely illustrated exploration of **archaeology** and prehistoric **cultures** in Pennsylvania. The chapters on Cultural Periods explore the **environment**, tools and technologies, subsistence, settlement patterns, social organizations and belief systems for native peoples in the three primary Pennsylvania **watersheds** (the Ohio, the Susquehanna, and the Delaware). A variety of visual materials, including projectile **sequences**, maps, tables and charts, photographs of **artifacts**, and diagrams, would make excellent projections or copies for classroom use. The text itself would be excellent for high school students. Teachers will find a variety of information to use in making comparisons between Pennsylvania cultural groups throughout the period represented at Meadowcroft. 246 pages, including color and black and white images.

GigaPan Exploration

Throughout the cultural history of the site, people visited Meadowcroft on a seasonal basis to acquire foodstuffs. Discover more about the evidence they left behind by exploring the GigaPan images.

Use the Foodways GigaMap in the Cultural Findings GigaPan Exploration Guide to learn more.

General Characteristics of Site Utilization

Adapted from Adovasio, J. A. and Pedler, David R. (2012). Meadowcroft Rockshelter: Retrospect 2012. *Pre-Clovis in the Americas* (pp. 63-75). Washington D.C.: Smithsonian Institution.

Subsistence and Seasonality

Despite the long record of aboriginal visitation to Meadowcroft Rockshelter, it is clear from a variety of data sets that the primary function of the site remained essentially constant through time. Specifically, the data recovered from Meadowcroft to date strongly argue that throughout its **history** the site served as a temporary locus for broad-spectrum hunting, collecting, and food processing activities. The predominance of utilized flakes along with projectile points showing multifunctional use- in combination with limits number of bifaces and unifaces, the relative abundance of food bone, voluminous edible plant remains and, at certain times, invertebrate resources plus the presence of **perishable artifacts** used in the acquisition, transport, or processing of these remains-all support this conclusion. In marked contrasts, the general absence of extensive in situ manufacture of **lithic**, ceramic, or shell **artifacts** as well as other categories of evidence militate strongly against a longer term or permanent occupation of the site.

Although 115,166 identifiable bones and bone fragments representing more than one hundred and forty **species** have been recovered from the site, only eleven identifiable specimens and less than 11.9 grams of plant remains derive from middle and lower Stratum IIa. If all the identified **faunal** remains from these levels represent food remains, which is highly unlikely, then the earliest visitors to the site exploited white-tailed deer and perhaps much smaller game. The meager **floral assemblage** suggests the possible gathering of hickory, walnut, and hackberry (*Celtis* sp.). It is conceivable and likely that these populations might have exploited now-extinct Pleistocene big game animals, notably mastodon, but no evidence of such predation was observed at the site. The later site deposits directly indicate that the primary subsistence modes of the various post-10,600BP Meadowcroft populations included the hunting of deer, elk, and turkey augmented by the taking of a wide range of smaller game and, at various times, by the exploitation of riverine **fauna**, notably mussels. The intensive collection of hackberries, nuts, and a variety of other fruits and seeds is also consistently indicated.

Examination of the constituents of the dietary modes of the Meadowcroft populations reveals some interesting trends. The hunting mode seems to have been constant throughout the occupational **sequence**, while the other subsistence modes mirror several potentially significant changes. Hackberry exploitation sharply diminished after 925±65BP (cal AD993-1225 [1σ]) along with the collection of *Rubus* sp. And *Vaccinium* sp. Conversely, the gathering of other nuts and seeds remained constant. Similarly, exploitation of riverine resources was relatively insignificant before the Later Archaic when it became important immediately thereafter and remained so until ca. 1665±65BP (cal AD236-543 [1σ]), when it virtually ceased. Finally, the addition of cultigens toward the end of the long Meadowcroft **sequence** does appear to correlate with a diminution in collection of certain wild plants, though it does not seem to have altered the basic character or function of site use.

Based on the availability of the principal plant food exploited at Meadowcroft, the principal time of site visitation was late summer through middle to late autumn. A small quantity of bird eggs in **cultural features** also suggests brief episodes of spring visitation during Archaic and Woodland Times.

Intensity of Site Use

Even though the primary function of Meadowcroft remained consistent through time, the intensity of site use appears to vary significantly. It should be emphasized that intensity of site use is a difficult parameter to define precisely. It may refer to the length of the aboriginal visitation interval measured in days or weeks, the frequency or timing between separate visitation events, the number of persons per visit, or any combination of the foregoing. Whatever its defining properties, however, several discrete and complementary proxies may be used—with caution—to measure this phenomenon. These include: (1) the number and kind of **cultural features** per **stratum** or attendant time period, (2) **artifacts** of various compositional classes or types by **stratum** or chronological interlude, (3) frequency and density of **ecofactual** materials through time, and (4) the spatial and temporal distribution of selected constituents of **constant volume samples** (CVS) selectively collected from across the site and throughout the deposits.

The frequency and types of **cultural features** at Meadowcroft are plotted by **stratum** and cultural period in Table 1. As that table indicates, the densest concentration of **cultural features** occurs in Strata III (Late Archaic/ Transitional) and IV (Early Woodland), with reduced or markedly lower concentrations before and after these periods. Significantly, the greatest concentration of more carefully prepared (i.e., lined, rimmed, etc.) firepits, re-used fire **features**, specialized activity areas, thick ash and charcoal lenses, and extensive burned areas or fire-floors—which may represent the intentional incineration of trash by its aboriginal inhabitants—also occur during this time segment.

Stratum (Field Designation)	Fire Pits	Refuse/ Storage Pits	Roasting Pits	Fire Floors	Ash/Charcoal Lenses	Specialized Activity Areas	Total
XI (F3, F8)	4	-	-	-	-	-	4
X (F25)	1	-	-	-	-	-	1

IX (F9)	2	-	-	-	-	-	2
VIII (F12)	1	-	-	-	-	-	1
VII (F13)	9	-	-	-	1	1	11
VI (F63, F129)	9	-	-	1	2	-	12
V-IX (F4) (outside dripline)	5	1	-	2	2	-	10
V (F14)	20	1	1	2	6	4	34
IV (F16)	35	9	3	13	15	3	78
III (F18)	26	2	-	8	17	1	54
IIb (F46)	6	3	-	6	8	2	25
IIa (F46)	26	5	1	1	1	4	38
I/IIa interface (F85)	3	-	-	-	-	1	4
I (F99)	-	-	-	-	-	-	-
Total	147	21	5	33	52	16	274

Source: Stuckenrath, Adovasio, Donahue, and Carlisle (1982: Table 1).

Interestingly, the incidence of discrete microstrata which may represent individual seasonal visitation is far more numerous during the emplacement of Strata III and IV than at any other time in the site's occupational trajectory. Not coincidentally, this index of differential visitation is also reflected in a wide array of other proxy intensity indices. Though space precludes a reproduction of the complex tables which detail those distributions, suffice to note that the occurrence of temporally diagnostic projectile points (cf. Fitzgibbons 1982: Table 2), all other classes of **lithic artifacts** (cf. Fitzgibbons 1982: Table 1), **floral** remains (e.g. Cushman 1982: Tables 1 – 4) as well as vertebrate and invertebrate **faunal** remains (Guilday and Parmalee 1982; Lord 1982) mirror the concentration of **cultural features** above.

While all of these distributions clearly indicate that the moments of most intensive site use all into the Late Archaic or Transitional through Early Woodland periods, this conclusion is also etched in yet sharper relief by scrutiny of the CVS flotation data from Meadowcroft. Six vertical columns of heavy and light fractions from the flotation sampling have been sorted and their components identified and quantified (Skirboll 1982). Three of these columns derive from inside the modern **dripline** and three from outside. As detailed by Skirboll (1982: 224 – 228), two of the heavy fraction columns from inside the modern **dripline** span every excavated **stratum**, microstratum, and level from the modern ground surface to the base of the **excavation** in culturally sterile Stratum I. Examination of the distribution of select components from these columns – which are principally attributable to **anthropogenic** agency such as **lithic** flakes, charcoal, burned bone, mussel shell, fish scales, and thermally altered hackberry seeds – indicates that these materials are differentially distributed through time and exhibit a marked tendency to co-cluster in different time periods.

A relatively low frequency of **anthropogenically** introduced material is found in Paleo-Indian Stratum IIa which is late Pleistocene in age. However, the amounts of all classes of flotation components attributable to human origin increase during the Early and Middle Archaic represented in Stratum IIb. Significantly, all classes of material are most abundant in Strata III and IV, which encompasses the Late Archaic or Transitional and Early Woodland period occupations at the site. Moreover, with few exceptions, the occurrence of these intensity proxies falls off markedly on either side of this ca. 1400 radiocarbon year interval.

Earlier publications (Adovasio et. al. 1977; Skirboll 1982: 224) noted that there have been some questions as to whether the large amounts of bones, eggshells, and (especially) hackberries recovered at the Rockshelter are attributable to human origin transport or some other non-human vector. While it is certain that numerous birds (explicitly including raptors) and other animal predators doubtless occupied the site throughout its long **history**, there is strong evidence to support the view that at the very least the burned materials were associated with human occupation.

Again, as detailed by Skirboll (1982: 228), there is a positive correlation between burned bone, hackberries, eggshells, and other classes of material certainly or highly likely to have been **anthropogenically** deposited at the site. The incidence of tertiary flakes, crustacean shell, and fish scales correlate congruently with burned eggshell, bone, and thermally altered hackberries. Additionally, and significantly, the unburned fraction of the large hackberry sample does not correlate well with either the burned specimens or with the **lithic** flakes, crustacean shell or fish scales. (For this reason, unburned hackberries are not included in Figure 6.)

Unburned hackberries are most abundant in Paleo-Indian Stratum IIa while burned hackberries are most common in Late Archaic/ Transitional Stratum III. Finally, while unburned hackberries could represent materials introduced by animals, their condition may also reflect differential food processing procedures by humans.

Additional Inquiry for Exploring Site Visitation

Things to Do

- Work as a class to create a chart that reflects the seasonal availability of plants, animals, and other resources used by Native Peoples at Meadowcroft. Can students predict the high visitation periods based on the chart? How does classroom thinking correlate with findings from Meadowcroft?
- Ask students to create a chart of the Meadowcroft Stratigraphy. Label how the **strata** relate to cultural periods. Ask them to find images that reflect the **anthropogenic** materials recovered from Meadowcroft; paste the images onto the correct **strata**. What images might reflect

consistencies throughout cultural periods? How can they represent any discrepancies? Why is charcoal consistent in all **strata**? Which is more important in discussing prehistoric life: continuity or change? Why?

Things to Explore on First Peoples GigaPans

- Use the zoom functions on any of the interior images to examine the **stratigraphy** of the Meadowcroft Rockshelter. Match the **Stratum** with the **Field Designation tags** (white tags with the letter f followed by a number).
- Search the images for evidence of prehistoric subsistence: can you locate plant and animal remains? Can you tell just by looking if these are associated with **cultural features**? Is there any other evidence in the images that can help you determine if these things are indeed **anthropogenically** deposited? What scientific procedures or methods could help you learn more to draw your conclusions?
- Analyze the First Peoples GigaPan images for evidence of technologies. What evidence remains in the Rockshelter? Where might the other evidence be? Why do you think it was removed from the site (destructive science)?
- Analyze Table 1 above. Search the interior First Peoples GigaPan images for evidence of these **cultural features**. What do they look like in situ? What can you observe that suggests the presence of a **feature**. Remember that **archaeology** is a destructive science and not all **features** found still exist at the site.

Cultural Significance of Meadowcroft Rockshelter

Many visitors to Meadowcroft Rockshelter, particularly school students, are keen to know exactly who the prehistoric people were and what they did. They want Meadowcroft staff to weave a story of Native American life that plays like a movie with characters and settings and plots. They want to be able to associate these early individuals with a specific group; they want to have a name for their **culture**. However, the nature of prehistoric **archaeology** makes this desire impossible to fulfill because only the evidence left behind speaks to the lives of the people who camped here so long ago. There are no narratives, no paintings, no biological information to pinpoint the identities of these people and their daily activities. Instead, staff members present the evidence found during the **excavations** and guide students to use their imaginations to create a story based in **archaeological** fact.

What we know:

- **How** long they visited the site: The earliest visitors came over 16,000 years ago, and the most recent **radiocarbon dates** associated with aboriginal human materials is A.D. 1265 ± 80 (685 YBP. Diagnostic **artifacts**, **stratigraphy**, and **radiocarbon dating** all suggest that all the major cultural groups known in prehistoric Pennsylvania visited Meadowcroft Rockshelter.
- **Why** they came here: The **environment** and **ecology** of the Cross Creek **watershed** remained relatively stable from the end of the Pleistocene through the present day, with only minor climatic events impacting temperatures and **precipitation**. This resulted in diverse but stable **ecology** that offered a variety of natural resources, particularly food sources for native peoples.
- **When** they came here: Prehistoric occupations of the Rockshelter occurred on a seasonal basis, primarily autumn with occasional spring visits.
- **What** they did here: **Archaeologists** know that native peoples primarily visited to hunt and gather food. All material **culture** recovered from the site deals with tools used to acquire, prepare, and preserve food. There is only minor evidence of the manufacture of tools, and the limited evidence is debitage consistent with the reworking of existing **lithic** tools (such as sharpening or repointing).

What we do not know:

- **Who** they were: There is not enough evidence to determine the lineage of the prehistoric people who camped at Meadowcroft, or the modern descendants of those people
- **Where** these people came from and *where* they went: Some evidence suggests that the earliest people at Meadowcroft came from eastern Pennsylvania, while later groups were more closely

aligned with mid-western Adena peoples. However, evidence does not conclusively point to the origins of the native peoples at Meadowcroft. After A.D. 1265 ± 80 (685 YBP), there is little aboriginal evidence at the site. We do not know where they went. Nor is there any conclusive information about where they went.

- **Why they stopped visiting:** **Archaeologists** know that **cultural evidence** from upper **stratum** at Meadowcroft diminishes in quantity and diversity. **Archaeologists** offer several theories on why native peoples no longer visited Meadowcroft: perhaps agricultural practices resulted in stable food supplies that made foraging and hunting trips to Meadowcroft unnecessary; perhaps the encroachment of European people made visits unsafe. However, there is no conclusive evidence to demonstrate why they stopped coming.

In short, **cultural evidence** from Meadowcroft supplies more “Big” questions than it does answers. The site is, to use an analogy first offered by Albert Miller upon his discovery of the Meadowcroft Rockshelter, a single chapter in the book of prehistoric life. From the **archaeological** record, the prehistoric occupants of Meadowcroft Rockshelter from the late-Paleo-Indian through the Historic periods were not all that different than their counterparts elsewhere in Pennsylvania. From the evidence recovered from Meadowcroft, we can relatively safely reconstruct the **environments** through which prehistoric people walked, the animals and plants they encountered, the raw foods they acquired, the way they disposed of their rubbish, and the frequency of their visits. Where the story deviates however, is with those earliest inhabitants of the Rockshelter, the groups associated with **cultural activity** in Strata IIa lower, nicknamed the Miller complex after Albert Miller, and radiocarbon dated to between 16,175 and 11,300 years ago. Prior to Meadowcroft, the accepted “First Peoples” were the Paleo-Indian Clovis **cultures**, named for a set of distinctive stone tools associated with Pleistocene **fauna** discovered near Clovis, New Mexico, and radiocarbon dated between 11,500 and 11,000 YBP. Here, then, in Stratum IIa lies the cultural significance of Meadowcroft Rockshelter.

Disputing Clovis First Theories

The discovery of Paleo-Indian **artifacts** in Stratum IIa at Meadowcroft included bladelike tools that did not resemble the typical fluted stone tools of the Paleo-Indian Period. These tools were associated with **anthropogenic** materials radiocarbon dated between 16,175 and 11,300 years ago (Adovasio et al. 1990). The Pre-Clovis **artifacts** from Meadowcroft Rockshelter include a lanceolate point (named the Miller Lanceolate), bifaces, unifaces, prismatic blades, core fragments, and debitage. These materials provided the first well-dated Pre-Clovis component in good stratified **contexts** in the United States. The dates, **stratigraphy**, and tool forms revealed a 5,000-year gap between Clovis **artifacts** from the American southwest and the older discovery at Meadowcroft, suggesting that Clovis people were not the first cultural group to populate North America.

GigaPan Exploration

The publication of the Miller Complex Pre-Clovis Paleo-Indian materials from Stratum IIa forced archaeologists to confront evidence that the Clovis theory did not likely explain the peopling of the Americas.

Use the Peopling Theories GigaMap in the Cultural Findings GigaPan Explorations Guide to learn more.

When Dr. Adovasio published the initial set of radiocarbon dates from Meadowcroft Rockshelter in 1975, there were no other Meadowcroft's. At first, the **archaeological** world rocked at the proclamation of Pre-Clovis Paleo-Indian **cultures**. However, gradually, widespread recognition of Pre-Clovis **cultures** came with the discovery and publishing of remains from other Pre-Clovis sites (e.g., Monte Verde in Chile, Cactus Hill and Saltville in Virginia, Miles Point in Maryland and Topper in South Carolina). The **excavations** of these sites, except Monte Verde, have produced **lithic assemblages** that are closer in technological affinity to those recovered from lower and middle Stratum IIa at Meadowcroft.

Meadowcroft and The Peopling of North America

Proponents of the Clovis First theory speculates that people moved from Siberia to Beringia and Alaska into the continental United States via an ice-free corridor or land bridge after 12,500 years ago. Supposedly, these first inhabitants south of the glaciers in the United States were members of the Clovis **Culture**. The discovery of even earlier people at Meadowcroft Rockshelter necessitated a paradigm shift, since the arrival of the First Americans could now be placed somewhere before 12,500 years ago and prior to the establishment of Clovis **Culture**. The data from Meadowcroft Rockshelter forced anthropologists to think about alternative methods for peopling the New World.

Currently, there is no single accepted hypothesis concerning how people first arrived in the New World. Scholars do accept that Meadowcroft is a key component in the formation of any new peopling theories. Meadowcroft holds the potential to yield additional information about both New and Old World connections as it is compared to new discoveries in Siberia, Europe and Pre-Clovis sites in New World. Some hypotheses suggest that Pre-Clovis peoples may have avoided crossing between or over the Wisconsinan ice sheets by taking boats around the unglaciated coastlines of North America during glacial maximum or perhaps even migrated by foot into the New World prior to the Wisconsinan glacial maximum. Other scholars have suggested a Pre-Clovis/**Solutrean** connection between Iberia in the Old World and the New World, based in part on the blade technology found at Meadowcroft Rockshelter and Cactus Hill. At the very least, the early materials from Meadowcroft Rockshelter have initiated discussions about the

peopling of the New World in times or ways not seriously considered before its **excavation**.

The Pre-Clovis cultural remains from Meadowcroft Rockshelter provide researchers with the best evidence for migration of the earliest peoples into the Eastern United States. Analyses of these materials have provided insight into when these people arrived (before 16,000 years ago), what they did after arrival and how large a territory they may have exploited. The unexcavated portions of Meadowcroft Rockshelter also mean that further work and analyses to confirm or refute arguments concerning when the first people migrated into the United States and from what direction they arrived can be conducted at the site in the future. If the large rock falls in the excavated northern side of the shelter are safely removed, Meadowcroft could produce additional early remains in sealed **contexts** that answer questions concerning world-wide relationships. There also are unexcavated sections of the shelter along the eastern side that have the potential to produce additional early remains in good stratigraphic **contexts**.

Conclusion

Meadowcroft Rockshelter is one of the most important sites excavated in the Eastern United States. The reasons for this are simple. No other site in Pennsylvania, or, indeed, the rest of the United States, has provided such a well-dated **sequence** of cultural occupations at one location. Because of its exposure in the trade and popular presses, Meadowcroft Rockshelter's importance is recognized worldwide by both **archaeologists** and the public. Meadowcroft revolutionized how **archaeologists** view the peopling of the New World. It has resulted in **archaeologists** actively looking for stratified Pre-Clovis sites when they previously would have stopped or completed their **excavations**. There now has been a paradigm shift because of this site. Because of the work at Meadowcroft Rockshelter, Clovis is no longer considered by most New World **archaeologists** as the first American **culture**.

The origins of the First Peoples cannot be determined by Meadowcroft or any single other Pre-Clovis site. Together these sites do indicate that people were in North America much earlier than previously accepted. We do not know where they departed from, how they got here, or when they arrived, but we know they were here during the ice ages of the Pleistocene. Meadowcroft and the other Pre-Clovis sites demonstrate that more than one model must be used to answer these questions. With new **archaeological** sites being discovered and published all the time, the dialogue will continue to grow. New students will ask the questions and examine the data, exploring theories about multiple homelands (e.g. Iberia rather than Siberia), multiple sequential or contemporaneous peopling pulses (and multiple entry routes) by populations with different genetic profiles, linguistic backgrounds, technologies, and subsistence orientations.

Additional Inquiry for Exploring the Cultural Significance of Meadowcroft Rockshelter

Things to Do

- Research the numerous theories about the peopling of the Americas: The Clovis First Theory,
- Examine a map that shows North and South America. Ask students to label **archaeological excavation** sites that are critical to the discussion of how the first people arrived in the Americas. Ask students to develop theories about the possible migrations of these different groups. You might choose to draw arrows to demonstrate how the students think people arrived at the sites. Discuss each migration and the evidence for each theory. Which explanation seems most logical to your students?
- When people travel long distances, there are common needs that they must deal with. They need to get food and water, choose a path or road to follow, and find shelter or a safe place to sleep. Today when people travel, they often stay at a hotel or campground located near the road they are driving on and they eat at local restaurants. How was travel different for Native People? How are the needs of Native Peoples like our own needs when we travel? Discuss how prehistoric peoples following proposed migration routes might have met their basic needs given the **environmental** conditions of the times.

Things to Discuss

- Have students discuss or write (3-5 sentences) about why the announcement of 16,000 years of human presence in North America might alarm **archaeologists**. They should base their answers on both the **excavation** and research processes of **archaeology**.

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