

Culture periods indicated by green font

The Pleistocene or Ice Age
1.8 million – 11,700 years ago



By 15,000 years ago, as the glaciers continued to melt, very small groups of people spread over North and South America. This was known as the **Paleoindian period**. The Meadowcroft Rockshelter in Washington County, Pennsylvania is an example of where and how people lived during this period. By 13,200 years ago, the population had increased and there are many sites dating to this time. The majority of these sites represent relatively small camps used by hunter/gatherer families who moved frequently, mainly exploiting animals, but also roots, seeds, nuts and berries. However, at 12,900, the start of the Younger Dryas episode, the climate suddenly turned very cold and dry, similar to full glacial conditions. In Pennsylvania, there is some evidence that there was a decrease in human population. It is assumed that some groups moved south to warmer climates where food resources were more plentiful.

Holocene Period
11,700 years ago – 1800 AD

The Pleistocene ends at approximately 11,800 years ago when the Younger Dryas episode ends abruptly. The Holocene is divided into several climatic episodes based on changes in temperature and precipitation.

Pre-Boreal and Boreal Episodes
11,800 – 9500 years ago

Temperatures increase to near present levels but precipitation remained low. Many of the game animals common during the Pleistocene went extinct and were replaced by modern mammals such as deer, elk and bear. Although the climate was similar to current conditions, another thousand years passed before the modern forest overtook the region. Initially, the forest consisted of mainly spruce and pine trees. This type of forest does not contain the diversity of foods for animals to eat as the nut bearing trees in an oak/hickory forest and offers fewer foods for humans. This time is called the **Early Archaic period** and represents a time of very slow population growth over the Paleoindian period. The **Middle Archaic period** begins at 10,200 years ago and corresponds to the emergence of nut-bearing trees of the deciduous forest, such as oak, walnut and butternut. Under these improved conditions, the Native American population nearly triples.



Atlantic Episode
9500 – 5800 years ago

Temperatures remain warm and precipitation increases. Throughout the **Middle and Late Archaic periods**, Native Americans were adapting to a very plentiful environment and their population grew dramatically.



Illustration courtesy of Lenape Lifeways Inc

More food was required to support the increased population. Native Americans reacted to this situation by making small technological improvements to their hunting and gathering adaptation. They developed more efficient tools for chopping down trees, more effective spear points for hunting and fishing, grinding stones for the more efficient processing of seeds and nuts and fish weirs and netsinkers for catching fish.

High quality stone was part of a trade and exchange system that served to increase communication and cooperation among groups from adjacent river valleys. Once regional alliances were formed, food resources could be more easily shared. A system of trade partnering functioned as a quasi-insurance policy in a climate where food procurement was less predictable. Native American societies were changing and likely became more structured. Increased social structure allowed for a more efficient exploitation of the environment.



Jonathan Frazier

Sub-Boreal Episode or the Mid-Holocene Maximum Warm and Dry Period
5800 – 2850 years ago

By 5800 years ago, Pennsylvania was filled with groups occupying all of the major stream valleys. Archaic populations probably reached a tipping point in terms of their ability to extract food from the environment using a simple hunting and gathering strategy. They could no longer simply move when over-crowding occurred or make simple improvements to their technology. Compounding this problem, was climate change. Beginning at approximately 5800 years ago, the temperatures continued on a warming trend but precipitation decreased. Wetlands containing foods used by Native Americans, decreased in size and some dried up altogether.

This is known as the **Transitional period** and is characterized by radical changes in technology and social organization. Stone tools were made from high quality stone that held their edges longer. They were



more effective in an unpredictable environment because they could be easily sharpened for whatever use necessary. Bowls, carved from stone and later fired clay pottery, served as the first portable cooking containers and represent a more efficient method for processing certain foods. By the end of this period, there is evidence that people were gathering more seeds from plants such as maygrass, knotweed and goose foot. These types of plant foods were available in large quantities and the seeds were more easily preserved for longer periods of time compared to more perishable foods such as meat and fish.

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Sub-Atlantic Episode
2850 years ago – 900 AD

This time represents a return to warm and wet conditions. With this improvement, food resources increased and populations grew. Known as the Eastern Agricultural Complex, maygrass, knotweed, goose foot, and sunflower was grown in small gardens. This supplemented meat protein such as elk, deer, migratory fish, as well as nut bearing trees such as butternuts, walnuts and acorns. This is the beginning of the **Woodland period** and is characterized by a growing dependence on gardening, requiring a more settled lifestyle. Gradually, pottery becomes much more common and styles reflect social differences between several different social groups or tribes living in Pennsylvania.



Jonathan Frazier

Medieval Warming and Little Ice Age
900 AD – 1800 AD

The foods of the Eastern Agricultural Complex were no longer sufficient to support expanding populations. Beginning around 900 AD, the Medieval Warming episode began and this increased the number of frost-free days in northern regions. Maize agriculture expands into the Upper Ohio Valley of western Pennsylvania and the Susquehanna and Delaware Valleys of eastern Pennsylvania. This climate is reversed beginning around 1350 AD with the onset of the Little Ice Age. The severity of cold temperatures varied but generally the growing season was more unpredictable. In Pennsylvania, there was some movement of farming villages to topographic settings having slightly longer growing seasons, such as hill tops, rather than valley floors. The cooler temperatures resulted in periodic crop failures and there was a need to occupy the most productive farmland. Native Americans began to compete with neighboring tribes and feuding (low level warfare) was common. Villages grew in size for protection. They were usually fortified and the tribes were organized into matrilineal or patrilineal societies.



Jim Herbristrit and Kim Stone

Summary of cultural responses to climate change

In the Paleoindian and Early Archaic periods, characterized by low population density, humans responded to changes in climate by moving to more favorable regions. During the Middle and Late Archaic periods families occupied all of the river valleys and movement was not an option to offset population growth. Instead, technological improvements were made to gather food resources more efficiently. The decrease in precipitation and relatively high population densities during the Sub-Boreal episode required significant changes in Native American technological systems. Technology was not the only solution and changes occurred in social structure that resulted in groups that exploited the environment in a

more organized and efficient manner. Hunting and gathering was supplemented with the domestication of seed plants of the Eastern Agricultural Complex. By 900 AD, gardens could not maintain pace with the growing population and maize based agriculture became the dominant subsistence pattern. After 1350 AD, the Little Ice Age created some level of stress among Native American farmers, especially those occupying the northern regions of Pennsylvania. Highly fertile soils and settings with more frost free days became very important in this environment and competition for these settings likely contributed to



regional based feuding seen during the Late Woodland period.

In the 21st century, our high population density, a global economy and a highly technical society are part of a delicate interrelated cultural system. Climate is part of that system. Global warming causes sea

levels to rise. Populations will be displaced inland. Some cities may be abandoned. In the United States, a drop in rainfall is predicted for the central corn belt and that will result in reduced food production. An increase in hurricane activity is predicted along the East coast which will result in costly disasters. Competition for agricultural land and resources to farm this land will rise and result in social stress. As in the past, we will have to develop technological and economic solutions to produce more food that results in new social systems not previously experienced. Societies must prepare and plan for these changes.





Climate change and the archaeological record: Implications for the 21st Century

Climate: Long term changes in weather patterns
Weather: Short term changes in temperature, precipitation, humidity and wind.

Climate affects human cultures in terms of food and shelter, where we live, and the nature of our families, government, society, and even religion.

Most scientists agree that our climate is warming. They do not agree on why temperatures are increasing, but they do agree that sea levels are rising because of melting ice caps, and will continue to do so in the future. Other changes have been predicted and all of these will in some way affect our lives. This brochure examines the complex relationship between climate and cultural change using the evolution of Native American culture in Pennsylvania as a case study. Their adaptation to change helps us understand and prepare for the future.

Our climate has changed over hundreds, thousands, and millions of years in response to changes in the earth's inclination and orbit around the sun, continental drift, changes in ocean currents and volcanic activity. Some of these changes occur in cycles.

In Pennsylvania, and the Middle Atlantic region in general, specialists in climatic conditions, paleo-climatologists, have identified several different episodes of climate over the past 20,000 years and these all affected how humans lived. Climate impacts human culture in terms of food and shelter, but also in terms of where we live, the nature of our families, our social organization and even religious practices.

The Pleistocene or Ice Age 1.8 million – 11,700 years ago

Characterized by a series of warm and cold periods.

Glacial periods - when temperatures dropped 6-10 degrees and glaciers covered much of New England and all of Canada.

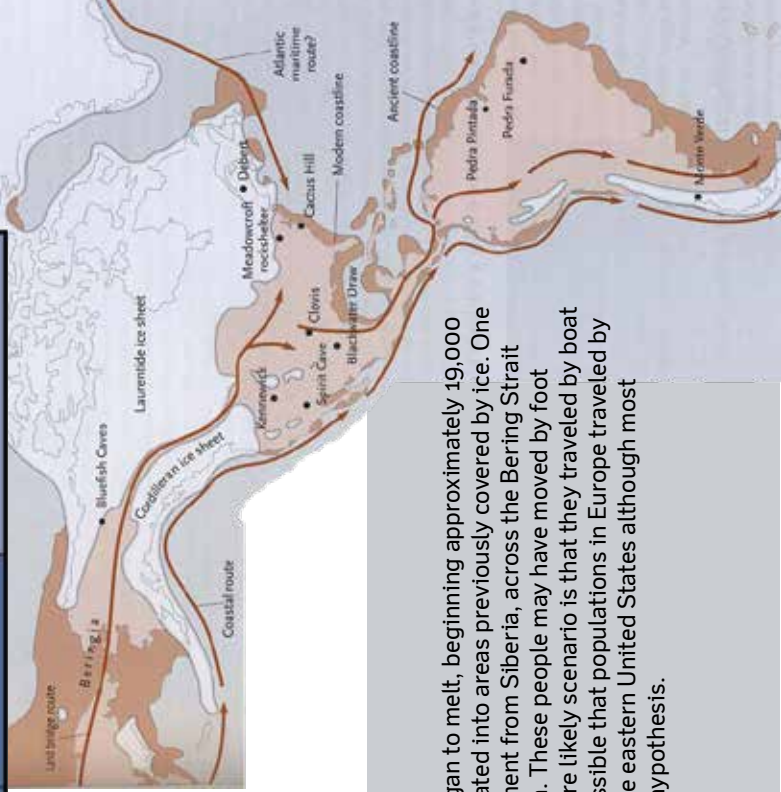
Inter-glacial periods – when temperatures returned to current levels or slightly warmer and the glaciers melted to their present size or even smaller.



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In Pennsylvania, the forest also alternated between an open spruce/pine forest and a densely wooded oak/hickory forest. During much of this time, the region was inhabited by very large animals such as woolly mammoths, mastodons, musk ox, caribou, horses, and camel. Although the environment in northern latitudes was harsh during glacial times, these animals supplied humans with sufficient quantities of meat to survive and prosper.

In the Old World, as the glaciers began to melt, beginning approximately 19,000 years ago, human populations migrated into areas previously covered by ice. One of these migrations included movement from Siberia, across the Bering Strait Land Bridge and into North America. These people may have moved by foot between Siberia and Alaska or a more likely scenario is that they traveled by boat down the Pacific coast. It is also possible that populations in Europe traveled by boat across the Atlantic Ocean to the eastern United States although most archaeologists do not support this hypothesis.



Climatic Episodes	Culture Period	Years Ago	Population	
			All dates are calibrated	Population
Pleistocene				
Late Glacial - Cold and Wet	Pre-Clovis	13,100 - 19,800	1	1
Younger Dryas - Sudden Cold and Dry	Clovis	12,750 - 13,100	11	11
Holocene				
Pre-Boreal - Warm and Slightly Dry	Middle Paleolithic	12,150 - 12,750	11	11
Boreal	Late Paleolithic	11,700 - 12,150	11	11
Sub-Boreal - Very Warm and Dry	Early Archaic	10,200 - 11,700	11	11
Mid-Holocene	Middle Archaic	6,850 - 10,200	11	11
	Late Archaic	4,850 - 6,850	11	11
	Transitional	2,800 - 4,850	11	11
	Early Woodland	2,100 - 2,800	11	11
	Middle Woodland	1,000 - 2,100	11	11
	Late Woodland	1550 AD - 1,000 BP	11	11
	Anthropocene	1800 AD - Future	11	11
			12,773,801	2013 - Pennsylvania Population

Preserving Archaeology

Archaeological sites enhance and enrich our lives. Prehistoric and historic sites are non-renewable resources. Unfortunately, sites are destroyed daily due to development and urban sprawl. When a site is ruined, information about the past is lost forever. Unrecorded archaeological sites are those most often destroyed. Every effort must be made to locate, evaluate and record their content for the future, before development projects are undertaken. If you know of locations where artifacts have been found and wish to assist with the preservation of archaeological sites, we encourage you to record these locations with the Pennsylvania Archaeological Site Survey (PASS). We also encourage you to donate your collections to an accredited facility. These artifacts represent our connection to the past and should be preserved. Information, recording forms, instructions and additional resources about Pennsylvania archaeology can be obtained at

www.paarchaeology.state.pa.us
www.pennsylvaniaarchaeology.com
http://twipa.blogspot.com

The State Museum of Pennsylvania's Archaeology and Anthropology Gallery

Archaeologists preserve the past and educate the public about the role of archaeology in preserving our heritage. In Harrisburg, The State Museum of Pennsylvania's Archaeology and Anthropology Gallery focuses on the cultural heritage of Pennsylvanians. Visitors can explore nearly 16,000 years of human occupation, from Native American prehistory through European colonization. The museum is also the official repository for collections resulting from state and federal archaeological investigations and curates these collections for future generations.

The State Museum OF PENNSYLVANIA



PHMC/PHOTO BY DON GILES

Adjacent to the Pennsylvania State Capitol in Harrisburg, The State Museum of Pennsylvania offers extensive collections interpreting the state's fascinating heritage. With exhibits examining the dawn of geologic time, the Native American experience, the colonial and Revolutionary eras, a pivotal American Civil War battleground and the Commonwealth's vast industrial age, The State Museum demonstrates that Pennsylvania's story is America's story.

THE COMMONWEALTH'S OFFICIAL MUSEUM

MUSEUM HOURS: Wednesday through Saturday
9 a.m.–5 p.m., Sunday noon–5 p.m. Closed major holidays.
Hours may be subject to change.
Admission charged.

The State Museum of Pennsylvania
300 North St. (Third St. between North and Forster Sts.)
Harrisburg, PA 17120
717-787-4980 www.statemuseumpa.org

The State Museum of Pennsylvania is one of 25 historic sites and museums on the Pennsylvania Trails of History® administered by the Pennsylvania Historical and Museum Commission.



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