

The Indian Crossing Site in Chicopee, Massachusetts

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Preface

The Indian Crossing Site is of vital importance in New England prehistory. Not only is it concerned with a little-known period in prehistory. Of far more importance is that this little-known period covers a crossroads of paramount interest in that prehistory: it was the period when the very lifestyle, the means of subsistence, changed from hunting, gathering, and fishing to one that included horticulture. The change was basic and vital to the course of New England prehistory, and to much of the early history of colonial America. As such, it demands all the efforts that can be mustered to understand it.

- Thomas Ulrich's concluding remarks in his report summarizing the preliminary analysis of the Indian Crossing site, April 1, 1977.

The Indian Crossing site is located on a small island at the confluence of the Chicopee and Connecticut Rivers in Chicopee, Massachusetts. The site is one of

the first in the region to be excavated with modern scientific methods. These included three stages of investigation initiated by proposed highway plans for today's Route 391. Relatively new federal and state regulations guaranteed that the area of the proposed highway had to be checked for the presence of sensitive natural and historic resources before construction could begin. The Indian Crossing site was first discovered during preliminary investigations in 1975. Additional testing to determine the size and significance of the site was undertaken in 1976 and 1977. In 1979, the Institute for Conservation Archaeology at the Peabody Museum, Harvard worked with students from the University of Massachusetts Amherst to examine the site as thoroughly as possible before construction began. During the course of the work, over 200 individual one-by-one meter excavation areas were carefully explored. About 750 Native American pottery fragments, over 2,000 stone artifacts (mostly chipping debris), and 2,000 burned stones from cooking features were carefully exposed, documented and collected. Fifty wood charcoal samples were saved for future radiocarbon dating and about 500 soil samples were collected so that minute plant

remains could be found during examination in the laboratory. While the work proceeded, data from the excavation were entered into the University's computer, providing a digital record of finds that has proven useful 30 years after the archaeologists left the site.

Like many sites excavated during this time, most of the funding provided by the Federal Highway Administration was spent on the excavation itself, leaving little for later analysis and publication. Because of this, information from the site has remained relatively difficult to access by the general public. A recent Federal Highway Administration grant (through the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA, nicknamed "ICE TEA")) received by the University of Massachusetts provided funding for the reorganization and evaluation of old collections related to federal highway projects, including the material from the Indian Crossing Site. Part of that grant required the production of this document for the general public. This report is written so that more people can become familiar with the Indian Crossing Site, and with archaeology and the importance of heritage preservation in general.

This booklet begins with a brief

summary of the natural history of the central Connecticut River Valley that describes the geological formation of the central valley and its subsequent reshaping by glacial and post-glacial events. The following section discusses the arrival of the first people to the region at the end of the Ice-Age and how they adapted to drastic changes in their environment that occurred as the planet warmed to its modern condition. The next section talks about the science of archaeology, discussing some of its methods and terms used to describe types of finds, such as artifacts and features. The Indian Crossing site is then examined more closely, first describing why and how the site was excavated, followed by a summary of what was discovered. The authors examine in detail the Native pottery, stone tools and features found on site and what these tell us about Native life in the region between about 600 and 1500 AD. The booklet concludes with a summary of the significance of the site in terms of its ability to tell us more about the crucial period of time when hunting and gathering people began to first grow maize (corn) in our area. This was the beginning of a large-scale process that was occurring across most of North America as people's food base became increasingly dependent upon farming.

This booklet was written to teach you something about the geology and natural history of the central Connecticut

River Valley. You will develop a better appreciation for the antiquity of people living in the region and of their ability to successfully adapt to challenges brought by environmental change, as well as changes in the ways human communities were organized. You will learn details about the Indian Crossing Site and will gain an appreciation for Native technologies including pottery manufacture, stone tool making and cooking methods. Finally, you will have a chance to think about what it would be like to change your way of life

from hunting and gathering to farming, and how this would affect your day-to-day interaction with the environment and other people around you. We hope you enjoy the journey!

Archaeologists screen sediments during the 1979 excavation of the Indian Crossing site.



A Brief History of the Central Connecticut River Valley

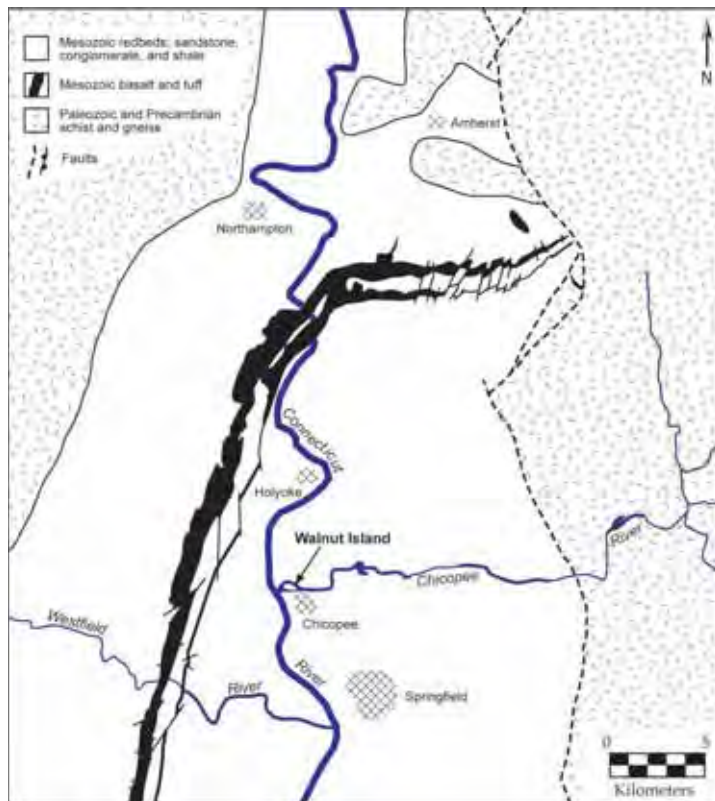
The Central Connecticut River Valley, as discussed in this booklet, is the broad river basin stretching between Springfield and Holyoke, Massachusetts. This valley is formed from ancient, relatively soft sedimentary rocks that were once part of a vast lake system enjoyed by late Triassic and early Jurassic dinosaurs about 200 million years ago. Their footprints can still

be seen where these rocks are exposed in South Hadley. The valley's notable hills, such as Mount Tom were formed by volcanic activity that thrust igneous basalts up through the soft sandstones. These rocks are much harder than the surrounding stones of the valley basin and have survived numerous episodes of glacial erosion.

The last of the area's glacial episodes peaked about 20,000 years ago. At that time, the Central Valley was covered by up to a mile of ice. Beneath the ice was rock, gravel, and sand and no life could survive here. As the planet began to warm, the glaciers started to recede north from their fronts along Long Island and Martha's Vineyard. The ice front had reached the area of today's Chicopee River by about 18,000 years ago. A large dam of sand and gravel had developed in the lower valley in Rocky Hill, Connecticut. This dam produced a large glacial lake that continued to grow northwards as the glaciers

retreated. As sediments eroded into this lake expansive sand flats developed at the approximate water level. These are referred to as deltas. The largest of these is the Chicopee delta that developed between 18,000 and about 16,000 years ago. At that time, the Rocky Hill dam failed and the southern portion of the lake drained as far north as the Mount Holyoke Range. Further north, the remnants of Lake Hitchcock persisted until about 14,000 years ago.

The Central Valley, choked with lake-bottom silt and sand, was slowly cut down by the developing Connecticut River as it drained the upper lake system. This process of "incision" was aided by the fact that the land had been artificially depressed by the weight of the glaciers. As the glaciers retreated farther north, this weight was lifted and the land gradually bounced back, probably attaining something close to its modern elevation shortly after about 10,000 years ago. As the land rose, the river was forced to erode the valley lake-bottom sediments ever more deeply. This is why the Chicopee delta is now about 150 feet above the Willimansett plain that marks the final Ice-Age elevation of the river. Since the end of the ice age, the river has continued to cut



The bedrock geology of the Chicopee Region

into the underlying sediments until it hit bedrock points which it could not easily erode, such as those at Hadley Falls. The modern river elevation in Massachusetts is controlled largely by these bedrock limits.

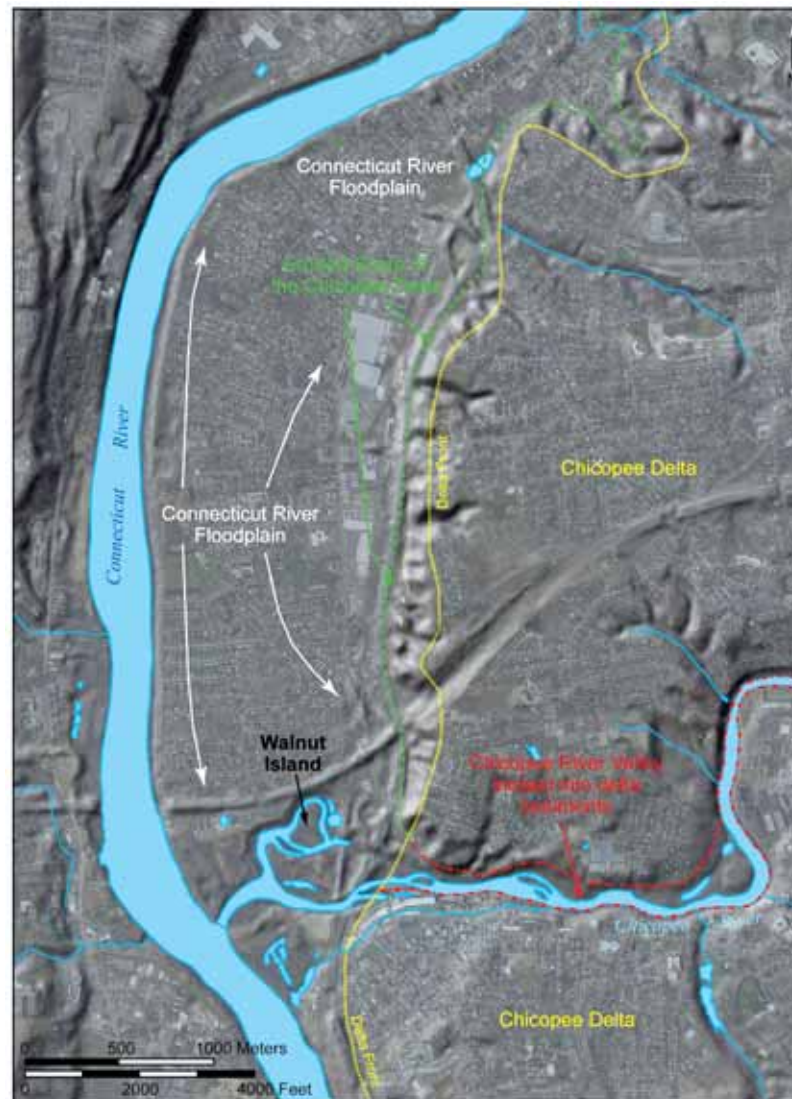
The gentle bend of the Connecticut River south of the Holyoke Range at Mount Tom through Springfield was established shortly after the Ice-Age and is controlled largely by the massive and rather resistant delta deposits. The relatively high terraces along the river in this area are developed with houses and commercial and industrial areas because they are not prone to flooding and river meanders. This is very different from the area north of Mount Tom where expansive floodplains are used extensively by farmers, but the land is too prone to flooding to build on. This portion of the river is constantly altered by active river meanders that can form large ox-bows. Such active meandering is caused by the restriction of the river as it cuts through the Holyoke Range. Slowing a river causes it to decrease its energy and deposit sediments. When rivers become choked in this manner, they will begin to meander and develop broad floodplains. Globally, such meander systems occur most often after about 6,000 years ago, and it is likely that the Northampton and Hadley area floodplain is about that old as well.

The environment of today's Central Connecticut River Valley has been seriously altered by four centuries of intensive

agricultural use, logging and two centuries of industrial activity and housing developments. Prior to 400 years ago, when only Native Americans lived in the valley, the forests were comprised of an oak-chestnut ecological community that

included hickory, beech, sugar maple, birch, hemlock and pines. Oak and chestnut in particular are fire-resistant species, and there is good evidence that Native Americans in the region managed the productivity of the forests through the

controlled use of fire. Through the regular destruction of low, brushy plants, fires can help maintain healthy open forests that are easier to travel through and provide young shoots and leaves for deer and other game that were important food resources to humans. Fires also created open patches in the forest canopy that supported other important plants such as milkweed and dogbane that were used for making string and rope, and Jerusalem artichoke and ground nut that have nutritious potato-like tubers. By reducing combustible materials in the forests, the regular use of fire can also prevent the occurrence of large-scale



Glacial landforms of the Chicopee Region

catastrophic fires that were dangerous to people and the plants and animals they depended on.

The differing river dynamics north and south of Mount Tom resulted in two habitat types with varied resources for humans in the area. The stable Holyoke and Willimansett terraces, and the higher Chicopee delta bluffs supported mature forest ecosystems, probably managed by humans with regular controlled burns. These relatively dry oak-chestnut forests also included a variety of nutritious hickory nuts, as well as hazelnut, wild cherry, blueberry and huckleberry shrubs. Animals in these forests included small game such as turkey, porcupine, fox, squirrel and rabbit, as well as larger game such as deer and bear. Fishing was lucrative at Hadley Falls and along the Chicopee River.

The floodplain habitats to the north were likely dominated by sycamore, cottonwood, silver maple, white ash and slippery elm. Bulrush, cattail, wild rice, water lily, nutsedge, arrowhead, and water plantain represent some of the most useful plants that would have been available.



A portion of the 1635 map of Willem Blaeu "Nova Belgica et Anglia Nova" ("New Netherlands and New England"). The map emphasizes the abundance of game.

The rich wetland habitats of the oxbows supported beaver, muskrat, waterfowl, snapping turtle, as well as moose and deer. Fishing was also important in these habitats, especially after flooding stranded many fish in small ponds on the floodplains. The adjacent floodplains became an even more

significant habitat when Native people began farming in the area about 1,000 years ago. Native occupants of the Indian Crossing site had ready access to both of these habitats.

The Indian Crossing site is located on Walnut Island, a small island at the Mouth of the Chicopee River just above its confluence with the Connecticut River. The Chicopee River formed in the late Ice-Age when glacial Lake Hitchcock drained and meltwater streams began to incise the exposed bluff face and develop a deep gully. As the Connecticut River became entrenched and deepened its course, the early Chicopee cut a fan-shaped channel through the Willimansett terrace. The confluence of the Chicopee and Connecticut Rivers has been a geologically active zone ever since. Coarse, sandy and gravelly sediments carried downstream by the Chicopee become deposited in thick sand bars as the river slows

and meanders at its confluence with the Connecticut. As the meanders shift slowly across the mouth of the Chicopee, old channels are abandoned and new ones are created. This has resulted in the continuous formation and erosion of numerous small islands at this location. During flood stages

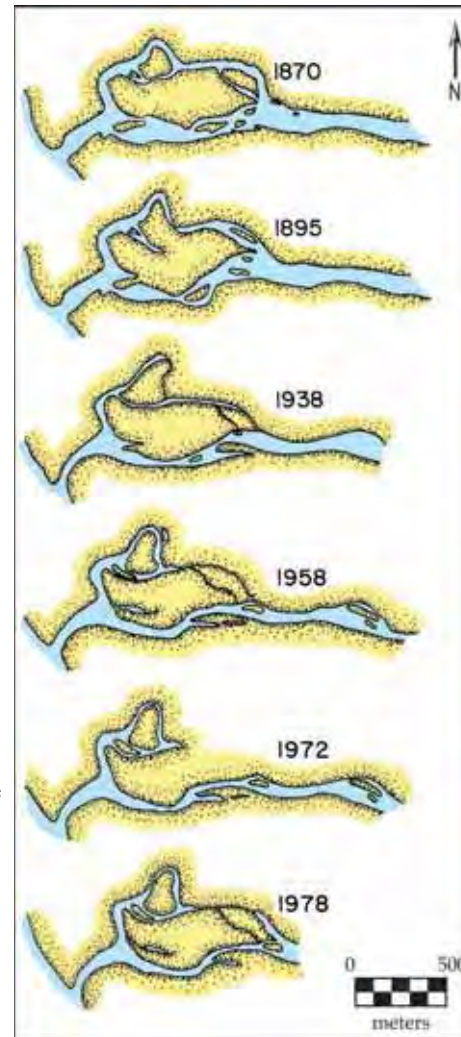
of the Connecticut River, especially in the spring, silty floodplain sediments are deposited across the islands and sand bars. This process of island formation, floodplain silt deposition and erosion, has been going on since the end of the Ice-Age.

Walnut Island is the largest of the existing islands in this location. Geologists who examined the area in the 1970s, when the Indian Crossing Site was first investigated, determined that the Island probably formed between 3,000 and 2,000 years ago. Six to ten feet of floodplain sediments covering the underlying sandbar was deposited over that period. As much as three feet of those sediments were dropped during the major floods of 1936, 1938 and 1955. These severe floods were probably atypical, and may be related to increased erosion into the Connecticut River associated with intensified land-clearing, farming and lumber operations of the nineteenth-century. In fact, artifacts from the Indian Crossing Site were concentrated within a dark buried soil horizon and the underlying subsoils directly beneath these recent flood deposits. This soil horizon could only have developed during fairly stable conditions across the surface of the island, at a time when flooding was uncommon.

In the past, the Chicopee River's main course probably flowed along Walnut Island's north side, creating the channel that is still visible today. Sometime later, this

northern channel was abandoned and the river took on its modern configuration, running along the south. Prior to the construction of a railroad bridge across the island in the 1860s, water still flowed in this old channel. Today, the channel is no longer active and consists of low, swampy ground and Walnut Island is no longer separated from the land to the north. Because of constant erosion and reconfiguration, it is difficult to say for sure how the island looked when it was used by Native Americans a thousand years ago. In fact, the area may not have been an island at all. We know the name "Indian Crossing" (Algonquian

"Scanunganunk") was used for this area of the lower Chicopee River by colonists who presumably referred to



Changes in the course of the Chicopee River at Walnut Island between 1870 and 1978.

provided an excellent location to take fish such as shad and salmon during their spring spawning runs.

ledge. It is therefore likely that the area associated with Walnut Island fell along a traditional footpath along the east bank of the Connecticut River and was well trafficked by Native people of the region. In fact, the Chicopee, the largest eastern watercourse entering the Connecticut River, intersects the valley just a few miles north of the Westfield River, which itself provides access deep into western Massachusetts. So, in addition to its position along a north-south path, the site very likely lay along a major east-west passage that linked the eastern and western highlands of Massachusetts. The use of this crossroads location was likely further promoted by the bedrock ford itself that

The Human History of the Central Valley

Many New England Native groups believe that their people have lived in the region since the dawn of time. The archaeological perspective is different, but has established that the ancestors of the Algonquian tribes of the region arrived a very, very long time ago. The arrival of people to New England is a part of the story of the peopling of the New World. While there is still controversy regarding the exact timing and nature of that arrival, most archaeologists today believe that people from Northeast Asia crossed into the Americas about 15,000 years ago. This small population explored the continent, grew and divided, so that by 13,500 years ago a culture referred to as Paleoindian was present across most of the non-glaciated portions of North America. New England was still a harsh, cold place to live at the end of the Ice-Age, but the colonizers' descendants settled here by about 13,000 years ago or shortly thereafter. By this time glacial Lake Hitchcock had drained, and in fact there are early Paleoindian sites located on the lake-bottom plain.



Paleoindian family at work.

Image courtesy of the Illinois State Museum.

Paleoindians of the Ice-Age

Southern New England suffered very cold winters at this time, but summers may have been relatively warm. Forests had already established themselves, but they were relatively sparse and open, consisting of spruce and jack pine, with lesser quantities of fir, birch, poplar, ash, larch, elm, ironwood and even oak in protected environments. The warmer coastal regions

were covered in denser pine-oak forests. Principal game animals included elk, moose, black bear and in particular caribou. Familiar small game, such as beaver, muskrat, porcupine, weasel, and otter, were also common. Some Ice-Age occupants of the region that are long since extinct might have been hunted as well. These include mastodon, giant beaver, giant stag, ground sloth and peccary. The late Ice-Age forests

also harbored potentially dangerous predators, such as the fast-running giant short-faced bear, cougars, and gray wolf. Though hard evidence is lacking, Paleoindians also likely netted water fowl, fished the rivers and hunted some sea mammals such as seal, and perhaps even walrus.

Paleoindian sites are rare in Massachusetts. This is in part because there were relatively few people living in the state

to produce archaeological remnants of their daily lives. Time has also played a part – thousands of years of erosion, river movement, and rising sea levels have either destroyed or deeply buried most of the sites that once existed. The Bull Brook site in Ipswich, Massachusetts was one of the first discovered in the region and remains one of the largest Paleoindian sites in North America. This site contained evidence of over forty concentrations of artifacts, each

believed to be associated with a family household, probably living in a hide tent similar to a teepee. It may have been the location of a relatively large gathering of people preparing for a caribou hunt on the now submerged peninsula known as Jeffreys Ledge, an extension of modern Cape Ann. Closer to home, the DEDIC site, located just below the prominent Mount Sugarloaf also represents a large Paleoindian site, perhaps reflecting a similar community hunting camp. The site was known to collectors who had discovered Paleoindian artifacts from the plowed tobacco fields. Archaeologists examined the site in the 1970s and it was decided that the best course of action was to bury the site and preserve it for future analysis.

Archaeological Period	Years Ago	Radiocarbon Age	Major Traits
Early Paleoindian	12,900-12,750	11,000-10,600	Colonization of New England
Middle Paleoindian	12,750-11,500	10,600-10,000	Diversification of fluted point traditions
Late Paleoindian	11,500-10,800	10,000-9500	Lanceolate point manufacture
Early Archaic	10,800-9000	9500-8000	Adaptation to early post-glacial habitats, especially wetlands
Middle Archaic	9000-5800	8000-5000	Adaptation to mixed oak forest hunting and fishing
Late Archaic	5800-3250	5000-3000	Population growth and increased regional exchange
Early Woodland	3250-2000	3000-2000	Intensification of food processing – pottery, tobacco
Middle Woodland	2000-1000	2000-950	Introduction of bow and arrow, probable horticulture of local plants
Late Woodland	1000-400	950-300	Introduction of maize, beans and squash gardening

New England's Archaeological Chronology

Archaeologists in New England have subdivided the past into three major divisions: the Paleoindian, Archaic and Woodland periods. Each of these has early, middle and late subdivisions that generally reflect some type of change in technology or economic focus. The following table outlines these major subdivisions and provides their radiocarbon ages and calibrated (corrected) calendar date ranges.

The Great Beaver

I herewith furnish you with a record of such traditions as are distinct in my recollection, relating to the Indians...The Great Beaver, whose pond flowed over the whole basin of Mt. Tom, made havoc among the fish and when these failed he would come ashore and devour Indians. A pow-wow was held and Hobomock raised, who came to their relief. With a great stake in hand, he waded the river until he found the beaver, and so hotly chased him that he sought to escape by digging into the ground. Hobomock saw his plan and his whereabouts, and with his great stake jammed the beaver's head off. The earth over the beaver's head we call Sugarloaf, his body lies just to the north of it.

Native scholar and storyteller Marge Bruchac believes this story, written down in 1890, reflects an ancient Algonquian legend.

Specifically she feels it discusses the geographic creation legend of the people called the Amiskwôlowôkoiak (beaver-tail-hill people) whom the colonists referred to as the Pocomtuck of Deerfield. Bruchac suggests the story, though multi-layered, may relate an ancient cultural memory of interaction with the giant 900 pound beaver of the Ice Age that once inhabited the region. The story also suggests a deep Native awareness of the formation of the Central Valley as an ancient lake and strongly ties the Amiskwôlowôkoiak to the landscape.



– Field 1890 quoted in Bruchac 2005 “Earthshapers and Placemakers: Algonkian Indian Stories and the Landscape.” Image from Herman Moll's 1715 map of the Americas.

Despite the occurrence of some large sites such as Bull Brook and DEDIC, most Paleoindian sites are small, with evidence of just one to three families occupying a location for only a period of weeks. Life at this time involved a great deal of travel by foot to areas where the richest food resources could be found. Sub-arctic climates like that of New England's late Ice-Age tend to produce biological communities low in species diversity, but high in abundance. Thus in the season of the waterfowl migrations, and particularly during the molt of feathers, Paleoindians could have captured large numbers of ducks and geese with limited effort. Seals, salmon and caribou both form large groups during the breeding season and would have represented excellent targets for mass hunting events. Collecting food in this manner suggests that smoking or drying meat was a necessary method of preserving food for leaner months when animals were more dispersed. The archaeological record indicates that the Paleoindians thrived in New England; their communities grew and expanded further north into the Canadian Maritimes region. Their descendants still occupy the region today.

Archaic Foragers

The Ice-Age came to an end about 11,500 years ago and the planet began a slow transition to its modern conditions. During

An Algonquian Creation Story

Glooskap came first of all into this country, into Nova Scotia, Maine, Canada, into the land of the Wabanaki, next to sunrise. There were no Indians here then (only wild Indians very far to the west). First born were the Mikumwess, the small Elves, little men, dwellers in rocks. And in this way he made Man: He took his bow and arrows and shot at trees, the basket-trees, the Ash. Then Indians came out of the bark of the Ash trees. And then Glooskap made all the animals. He made them at first very large. Then he said to Moose, the great Moose who was as tall as the trees, "What would you do should you see an Indian coming?" Moose replied, "I would tear down the trees on him." Then Glooskap saw that the Moose was too strong, and made him smaller, so that Indians could kill him. Then he said to the Squirrel, who was of the size of a Wolf, "What would you do if you should meet an Indian?" And the Squirrel answered, "I would scratch down trees on him." Then Glooskap said, "You also are too strong," and he made him little. Then he asked the great White Bear what he would do if he met an Indian; and the Bear said, "Eat him." And the Master bade him go and live among rocks and ice, where he would see no Indians. So he questioned all the beasts, changing their size or allotting their lives according to their answers."

This story, like that of the giant beaver, suggests a living cultural memory of ancient giant animals on the landscape of New England. Native Scholars such as Roger Echohawk (2000) have argued that ancient memories, retold in western North America reflect similar Ice-Age memories. Other Algonquian peoples also saw themselves as born of the trees and the landscape. Another recent account states the following "Our life began with the creation and transformation of this land, passed down to countless generations in the oral tradition. For those of us from Missisquoi and other Western Abenaki places, we were made near Bitawbagok, Lake Champlain, by Tabaldak: the Creator on aki, the earth. We were created out of the wood of a tree that still thrives here. We have always been here, kin to the ancient forests." - Robtoy et al. quoted in Bruchac 2005.

Adapted from *The Algonquin Legends of New England Or Myths and Folk Lore of the Micmac, Passamaquoddy, and Penobscot Tribes* by Charles G. Leland. Houghton, Mifflin and company Boston, 1884, pages 18-19.

the first 2500 years of this transition, Massachusetts shifted to a rich pine-oak forest that included fir, birch, poplar, ash, larch, ironwood, elm, maple and hemlock. Lakes, bogs and ponds were common throughout the region as glacial kettle holes transitioned to wetland swamps. Elk, black bear and moose probably represented prime large game, but may not have been plentiful. More likely, Early Archaic foragers focused increasingly on hunting smaller game such as beaver, muskrat, otter, squirrel and turtles. Very few sites are known from this period, and it was once thought that the land was largely abandoned. Today we know this is not the case, but most sites probably post-date about 9500 years ago and are better represented by isolated discoveries of "bifurcate" spear points than camps with a full range of associated artifacts.

The Sandy Hill Site on the Mashantucket Pequot Reservation in Connecticut represents an important exception. The site was discovered in the late 1990s and over the course of a decade of excavations proved to be a very large residential base camp with evidence of multiple house floors dug into the side of a sandy, south-facing slope. Based on a large number of radiocarbon dates, the site was in use between about 10,000 and 9500 years ago. Rather than having a hunting focus, the Sandy Hill people appear to have had an economy based on wetland plant foods such as cattail, water plantain, bulrush, and water-

lily. They also collected hazelnuts and the small roots of nutsedge. There is little evidence for the manufacture of spear points for hunting large animals. Instead, the occupants of the site made small scrapers and cores from locally collected quartz. Sites with a similar technology are now known across much of New England and appear to reflect a culture well-adapted to harvesting the rich resources of the region's abundant wetlands.

After about 9000 years ago evidence of Native life in the region becomes more abundant. During the Middle Archaic



A scene titled "Florida Indians, disguised under deerskins, hunting deer", by Theodor de Bry, 1591.

period, stone tool making traditions with a distinctive mid-Atlantic style appear in the region. The makers of bifurcate points represent the first appearance of this connection to cultures further south, but by 9000 years ago, this more southern hunting tradition was well-established across southern New England. It is probably not a coincidence that deer and turkey became more common in the region as oak forests began to dominate the landscape (acorns are an important part of the diet of both of these animals). Small camp sites are fairly common in southern New England, though

few have been found in the Central Valley. Some sites, like the Neville Site along the Merrimac River in southern New Hampshire, appear to represent large fishing stations, probably revisited for centuries.

By about 6000 years ago, hickory trees became more common in the oak forests, providing an even richer resource base for humans and many animals they depended on. This

period marks the beginning of the Late Archaic, a time very well-documented by numerous archaeological sites across the region. The abundance of archaeological remains indicates that the human population had grown significantly by this time. Groups became more tied to specific regions and by about 4500 years ago, cemeteries became more common. The presence of cemeteries is usually interpreted as an indication that communities had developed strong ties to specific landscapes and were not as mobile throughout the year as their ancestors had been. Nevertheless, most sites remain relatively small and appear to reflect the foraging activities of relatively small groups of people.

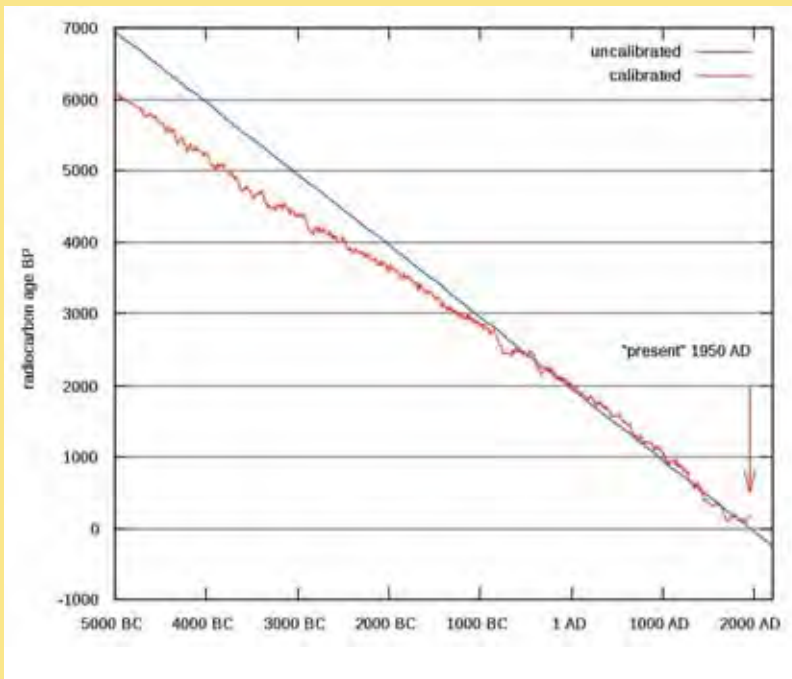
After 3700 years ago, some burials, now often of cremated individuals, include special grave items that probably reflect formal trade relationships with other regional groups. These stone tools, manufactured from non-local materials, likely represent the small surviving portion of traded items that included other elaborately manufactured goods that have not survived the millennia of decomposition. Formalized trade not only moved goods to places they were needed, but helped to anchor alliances and prevent conflict with other groups. Trade between groups may have developed as an adaptation to increased resource stress because of the growing number of individuals. Evidence of

Radiocarbon Dating

Radiocarbon dating is the most common way archaeologists date materials from their sites. Plants and animals absorb carbon dioxide from the atmosphere during their lives. When they die, radioactive carbon-14 and common carbon-12 are both trapped in their bones and tissues. Because of this, only organic matter formed from once living things can be dated this way. The most common material dated by the radiocarbon method is wood charcoal found in ancient cooking hearths. Inorganic things like rocks, glass, pottery and metals, however, do not absorb carbon dioxide so they cannot be dated with the radiocarbon method.

Radiocarbon is an unstable, radioactive element. Half of the radiocarbon in a sample reverts back into stable Nitrogen every 5730 years. Radiocarbon analysis uses high-tech equipment to measure the ratio of radiocarbon (carbon-14) to regular carbon (carbon-12) in a sample. Knowing this ratio, a technician can determine its age. Radiocarbon dates are provided with statistical ranges that indicate the probability that the actual age of a sample falls within a certain period of time. Typically a “one-sigma range” is provided and indicates that the measured age has about a 68% chance of falling within the stated period. For example, a date of 3000 \pm 50 radiocarbon years means that there is a 68% probability that the actual age of the sample falls between 3050 and 2950 radiocarbon years ago. At two-sigma, the probability increases to about 95%, but the range of time is greater. For example the above sample would have a 95% chance of actually being between 3100 and 2900 radiocarbon years old.

There is one final complication regarding radiocarbon dating. The fact is that radiocarbon years, though an excellent



approximation, do not match actual calendar years perfectly. This has to do with the fact that the proportion of radiocarbon in the atmosphere has fluctuated over time. Therefore, at certain times, plants and animals absorbed a little more or a little less radiocarbon than they would have today, and this affects the radiocarbon age of a sample.

This problem increases with a sample's age, so that radiocarbon dates on Paleoindian sites are about 2000 years younger than their actual calendar age. That means a radiocarbon date of 11,000 years ago means the sample is actually about 13,000 years old. By 9000 radiocarbon years ago this error is about 1250 years, and by 4000 years ago the error is about 500 years. Radiocarbon dates of about 2000 years are very close to 2000 actual calendar years old. Radiocarbon dates can be corrected (or "calibrated") to reflect actual calendar years with computer software. This can lead to confusion if writers do not clarify whether they are referring to measured radiocarbon years or calibrated dates from a sample. All dates in this booklet have been calibrated to reflect actual calendar years unless explicitly stated otherwise.

Chipped and Groundstone Stone Technologies

Stone tools are made in two fundamental ways: chipping and grinding. Chipped stone tools are struck with a hammerstone or antler hammer (or *billet*) to remove flakes along an edge. This chipping is called “flint knapping” because it is usually produced on brittle, glassy stones such as flint. Flakes are repeatedly struck from the tool blank until the desired form is achieved. Most chipped stone tools can be produced relatively quickly, but they also break easily and need to be replaced often.

Groundstone tools are typically manufactured from tough stones, such as basalts. These are usually heavy-duty woodworking implements such as axes and adzes. The raw material for groundstone tools may be roughly chipped into shape, then carefully pecked with another stone to produce the final desired shape. The tool is finished by grinding and polishing the working edges with a whetstone to produce a hard, sharp edge. Groundstone manufacture is a very time-consuming process and produces tools that are meant to last a long time. Because fewer were made in the past, they are less common on archaeological sites than chipped tools.

the use of small seedy plant foods such as goosefoot indicates that new methods of food collection and processing were developed as more desirable food types became less accessible. One important new technology was the manufacture of soapstone bowls and platters, probably used for cooking and parching seeds and nut meats.

Woodland Farmers

The Woodland period begins about 3200 years ago. The Early and Middle Woodland stages (3200 – 1000 years ago) remain rather poorly understood. Sites are relatively uncommon, and some archaeologists have suggested human populations may have declined for an unknown reason. This period marks an important transition in the way of life of the people of southern New England, however. First, pottery was manufactured for the first time and largely replaced the use of heavy soapstone vessels. Second, coastal sites provide evidence of the increased use of shellfish in the diet at this time. And third, it was during this time that Native groups probably began small-scale gardening of local species such as goosefoot and introduced, culturally significant plants like tobacco. All of these changes are actually expected to be associated with resource stress and a need for more complex food-production and processing technologies,

which appears to contradict the theory of a reduced population.

This is the period of the rise of the Adena and Hopewell cultures of the Midwest. These people practiced more intensive horticulture of a variety of indigenous plants, such as goosefoot, marshelder, maygrass, and sunflower. While they produced elaborate mounds and earthwork constructions that we do not find in New England, there is clear evidence of contact between the two regions. This is best expressed in the presence of similar tubular and platform pipe styles, and the rare occurrence of imported copper beads. The discovery of caches of as many as 500 nearly identical spear points indicates that formal trade systems continued, supported by new levels of specialized production.

It was not until the Late Woodland period that Native New Englanders began growing maize in their gardens. Maize provided a reliable starchy supplement to a diet still based primarily on hunting and gathering wild foods. It was probably not until the introduction of beans about 1300 AD, providing a better nutritional balance, that maize became more of a staple in the diet. Villages are rare in the region, and it is likely that most people lived in very small communities or hamlets containing a small number of related families. These hamlets would have shifted location frequently as the soil in the area was depleted of its

The Three Sisters

According to the beliefs of southern New England Natives, the creator, Cautantowwit, sent his messenger, crow, from his house in the southwest to deliver maize, beans and squash to his people. These three crops are known as the “three sisters” and are traditionally planted together in Native gardens. The maize stalk provides a climbing pole for the beans, beans provide nitrogen to the soil for the maize, and the broad squash leaves shade the ground, helping to retain moisture and slow the growth of weeds.

Archaeologists have dated the arrival of these important food crops and found that they likely entered the Native diet at different times, rather than as a complete package.

Squash is one of the earliest plants gardened in eastern North America and was likely domesticated by 4000 years ago in some areas. Maize does not appear on archaeological sites in New England until about 1000 AD, while beans arrived about 300 years later. The three sisters thus became complete by about 1300 AD and formed part of a very nutritious diet, with beans providing the important amino acids lysine and tryptophan that maize lacks. It is not surprising that the use of maize appears to intensify with the arrival of beans, and Native communities in some areas grew larger and more permanent.



A scene titled "Their mode of tilling" by Theodor de Bry, 1591.

nutrients. Some archaeologists believe these small settlements were not even occupied year-round by all members of the community, but rather served as central places for individual families that spent much of the year pursuing traditional foraging practices. The use of large cleared fields, more intensive farming and the development of permanent villages appears not to have developed across most of the region until shortly before the

arrival of Europeans to the area between 1500 and 1600 AD. There are still many questions to be answered about this critical phase that marks the shift from a foraging to a farming way of life. The Indian Crossing site provides some insights into this important period of time.

The Arrival of Europeans

In the spring of 1636 William Pynchon, along with a dozen families, from Roxbury established the settlement of Agawam (renamed Springfield in 1640) on a large tract of land described in the original deed of sale with the Native Americans dating to July 15, 1636 as being “4 or 5 miles in Length, from the north end of Masaksicke [Longmeadow] up to Chickuppe River” (Greene 1888:12). This location advantageously placed Pynchon, who had “an eye for trade,” at an important crossroads with Native American tribes to the west along the Westfield River, east along the Chicopee and north up the Connecticut. It also meant that his was the northernmost European outpost in the Connecticut River valley, allowing him control of the corn and fur trade coming down river from the interior of the country. The settlement’s first families were each provided a house-lot, an allotment of planting-grounds, pasture, meadow, marsh, and timber land laid out across the plain

Cleaning the Connecticut River

In the 18th century, the productive farms along the Connecticut River fed New England's growing cities and other colonial centers throughout the Atlantic. But deforestation and farming resulted in severe soil erosion. Meanwhile, hundreds of small-scale mills dammed the river's tributaries, blocked the passage of migratory fish and began dumping waste downstream. Larger-scale industrialization and urbanization along the river increased these problems throughout the 19th century. By the 20th century heavy industries were dumping toxic chemical waste directly into the river, farmers increased their use of pesticides and fertilizers, and communities funneled unwanted raw sewage into its waters. By the 1950s the Connecticut River was described as "the world's best landscaped sewer." At this point, groups, such as the Connecticut River Watershed Council organized to promote new legislation to help save the river.

Federal legislation in the 1960s and 1970s such as the Clean Water and Endangered Species Acts promoted cleanup efforts and the creation of fish ladders at major dams. The river made a rapid recovery and collapsed migratory fish populations began to grow. By 1989, the bald eagle returned, symbolizing the river's recovery. The U.S. Fish and Wildlife Service opened the Conte Anadromous Fish Research Center at Turners Falls and 60,000 American shad passed the counting station the following year. In 1995, the Silvio O. Conte National Fish and Wildlife Refuge was established within the river's entire watershed and in 1998 the Connecticut River received "American Heritage River" status. With the efforts of many tireless individuals, the Connecticut River has recovered greatly from the misuse of the past three centuries, but the fishing and species diversity near the Indian Crossing Site along the Chicopee will probably never be what it was prior to the arrival of the first Europeans to the area. (Image source:

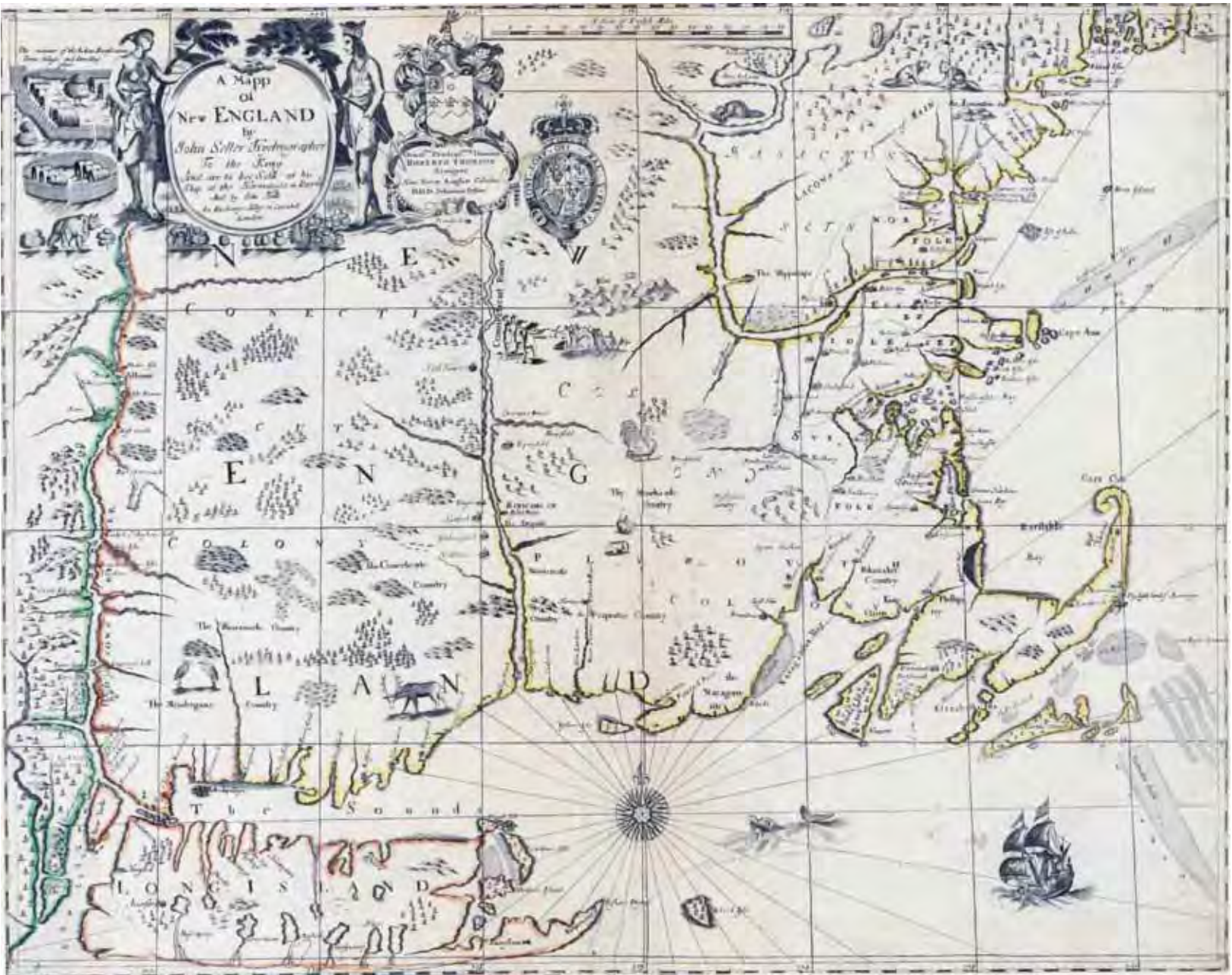


http://www.ctriver.org/our_region_and_rivers/about_our_rivers/index.html).

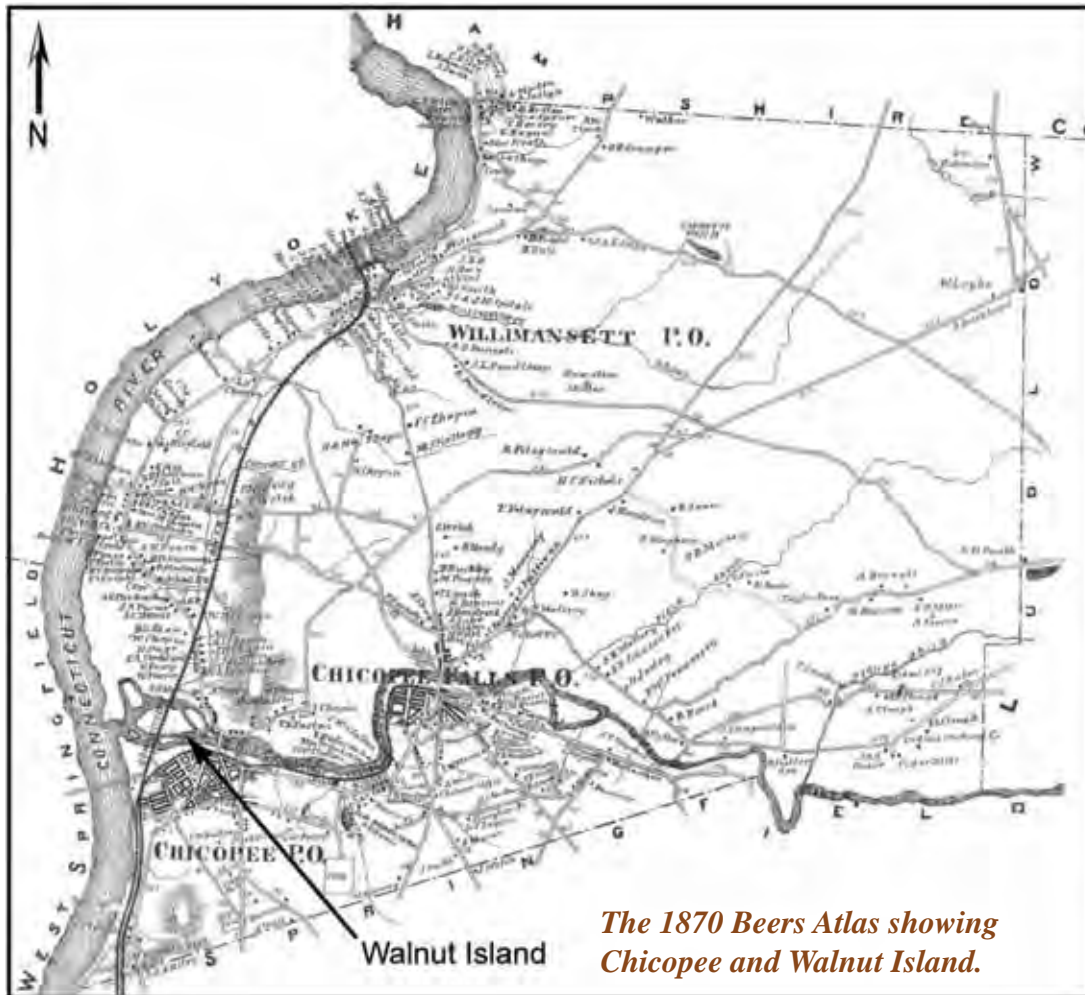
from the river bank to the uplands eastward.

At the time of the early Springfield plantation the area around Chicopee was known as Nayasset, while the name Chicopee is said to originate from the Algonquin word meaning "birch bark place" (Szetela 1948). Early settlers from the Springfield plantation began moving into the area on the south side of the Chicopee River by the late 1650's (Binzen and Kelly 2001). Around 1657 Rowland Thomas, James Warriner and Jeremy Horton had been granted land and permission to build houses near Skipmuck at Chicopee Falls. In 1660 several more land grants were given and houses were erected. The Chapin family acquired land in Chicopee in the 1650's from John Pynchon (William's son). By 1677 the brothers Henry and Japhet Chapin built their houses in Chicopee; Henry on the western end of present Exchange Street in Chicopee Center, while Japhet built his house north of the Chicopee River near Chicopee Street.

In 1685 fishing licenses were awarded to several Springfield residents on the "Chikuppi River", and in 1687 a privileged few were allowed to fish up the Chicopee River as far as the "Schonungonuck falls" where they could also build fishing weirs. The Schonungonuck falls (Chicopee Falls) are located approximately 2.8 miles upstream from the confluence of the Chicopee and



John Seller's 1675 "Mapp of New England". The Chicopee River is shown in the center of the image branching east just north of Springfield.



The 1870 Beers Atlas showing Chicopee and Walnut Island.

Connecticut Rivers. In 1687 Japhet Chapin, John Hitchcock, Nathaniel Foot, and others were authorized to build a sawmill there.

The granting of these licenses and permits suggests that most local Native communities had moved north or west by this time, probably as a result of the terrible disruption

to their lives caused by the recent events of King Philips War in 1675.

The Settlement of Chicopee

Through the eighteenth century settlement in Chicopee continued in pace with the other growing towns along the Connecticut River.

Population growth centered in the Cabotville area south of the confluence of the Connecticut and Chicopee Rivers, the area around Chicopee Falls, and “Skipmuck” east of the falls. School precincts were established in the area in 1716. In 1749 Chicopee had nearly 49 voters and in 1750 had successfully petitioned to become Springfield’s Fifth Parish, but it wasn’t until 1848 that Chicopee separated from Springfield and was formally incorporated (Szetela 1948). In 1783 a bridge over the Chicopee River was completed just below the Lower Falls, at the present crossing of Chicopee Street (State Route 116). Although several gristmills and sawmills were built on tributary streams of the Chicopee River from the late seventeenth century onward, agriculture and animal husbandry remained the central economic activities through much of the eighteenth century.

The reliable flow of the Chicopee spurred the rapid growth of water-powered industries in the first quarter of the nineteenth century. Beginning in 1801 cotton mills were built along the river by the Chapin family, and Gustave Pinney. The first paper mill was erected at Chicopee Falls by William Bowman, and Benjamin and Lemuel Cox in 1806, which was then enlarged and mechanized by David Ames in 1827 . What was to become one of the largest cotton mills, the Chicopee

Manufacturing Company, began operating in 1822. The first dam across the bedrock ledge at Chicopee Falls, and a canal to power its cotton mills, were built by the Boston & Springfield Manufacturing Company in 1823 . By 1826 their factory consisted of two brick five-story buildings, with 7,000 spindles and 240 looms.

There were at least twenty nearby tenement houses for its factory workers that housed 54 families. By 1831 the company had added two more mills to their factory, and began to expand their capitol into the Springfield Canal Company in order to attract new manufactories into Chicopee. In

1832 cotton mills on the Chicopee River employed nearly 2,000 people. Also in 1832 a canal was completed that extended for one-third of a mile along the south bank of the Chicopee River and cotton mills powered by the canal were built by the Cabot Manufacturing Company. By 1832 the D. & J. Ames paper mill had a capacity of 39,324 reams of paper valued at \$150,000. The Ames Manufacturing Company made knives and small tools beginning in 1830, and in 1845 had expanded as a foreign contractor in the manufacture of swords, cutlery, machinery, firearms, cannon and bronze and brass casting, employing 130

men. An extension of a railroad line into Chicopee Falls in 1846 created a wider market for goods produced in Chicopee. The construction of the railroad bridge across Walnut Island at this time was the first time the Indian Crossing Site was affected by the industrial growth of the area. Luckily, the bridge passed just west of the site, and its construction may actually have helped to safely bury the site in floodplain sediments trapped by the railroad berm that filled the northern river channel.

Industrial expansion continued into the 1850's and 1860's and included manufacturers of friction matches, boots and shoes, saddles and harnesses, brushes and brooms, iron works, hardware, and agricultural tools. The influx of immigrant workers from Ireland, Canada and Poland in the second half of the nineteenth century doubled the town's population to 14,050 persons in 1890. As a result of the industrial and population growth, Chicopee was granted a new charter by the Massachusetts General Court for a city form of government in 1891, choosing the motto "Industriae Variiae" for its City Seal . In just 200 years, between 1700 and 1900, the Chicopee was transformed from an important fishing location and travel route to one of the busiest industrial centers in the state. Amazingly, despite all of this change and construction, Walnut Island and the Indian Crossing Site were left largely intact and forgotten.



Nineteenth century mills along the lower Chicopee River. Walnut Island and the Indian Crossing site are in the lower right corner..

The Archaeology of the Central Valley

Archaeology is the study of the human past through the physical remains left behind by people going about their day-to-day lives. Archaeology is therefore limited to the period of time during which humans have made tools, that is the last 2 million or so years. Archaeology is often confused with paleontology, because both fields use similar methods to excavate the materials they are concerned with. Paleontology, however, is focused on the study of ancient fossils that in most cases far predate the evolution of humans. In short, archaeology has nothing to do with dinosaurs! Because archaeologists are primarily concerned with better understanding the activities of daily life, most excavations focus on the debris discarded by people who have lived or worked at a certain place. While archaeologists are still often associated with the excavation of human burials, the examination of human remains occurs very rarely and only when absolutely necessary. Most archaeology is actually focused on the careful examination of people's garbage. A good archaeologist can learn a lot about you from what you throw away!

Most archaeologists today consider themselves scientists. This is not necessarily



An archaeologist excavating a one-by-one meter square at the Indian Crossing site.

because we sometimes use high-tech equipment and spend a lot of time in laboratories. It is primarily because archaeologists, like other scientists, develop hypotheses and test them against information they carefully gather. For archaeologists, that information is excavated from the ground. An hypothesis is a proposed explanation of something you observe. The goal is to test this explanation

against additional information and see if it continues to explain your observations. If it does not, it is time to go back to the drawing board and develop a new explanation. Therefore, as in the other sciences, archaeology is based on initial observations, hypothesis-making, testing the hypothesis through additional observation in a controlled setting, and then abandoning or further modifying one's hypothesis to better explain new data.

The process of archaeology is actually destructive

- it removes artifacts from their original resting place and destroys their relationships to other artifacts on the site. This is why archaeologists have to very carefully record everything that happens during their field work. For example, archaeologists almost always dig using square holes and keep careful track of their depth. These holes are carefully laid out in a pattern so that the

Features and Artifacts

Features represent a special class of finds that are different from artifacts. Features are any type of find that one cannot easily excavate, pick up and put in a bag to take back to the lab. Features on New England Native American sites usually consist of ancient cooking hearths, storage pits and trash pits. Sometimes archaeologists find small round soil stains that mark the location of an ancient post in the ground. These are called post molds because they retain the shape of the object that once occupied them. Alignments of post molds are important because they may represent the remnants of a wigwam or other type of structure. Features require special attention in the field because they must be carefully drawn in their exact position, and because they may contain very delicate small items of great importance, such as burned seeds and nutshells, or burned animal bone fragments. While artifacts are often interesting, it is features that usually provide the most information about people's daily lives, such as the type of house they lived in and what they had for dinner.



A post mold feature found at the Indian Crossing site.

location of each has been precisely measured. This allows archaeologists to record the exact position, in three dimensions, of anything they discover while they excavate a site. Without that information, an artifact loses its scientific value and is just an object that can no longer tell its story about its relationship to other objects on the site.

The relationship between artifacts and features (see sidebar) can be used to develop a narrative about site use. Depending upon how common artifacts and features are, and how they are organized across a site, an archaeologist might be able to determine approximately how many people

lived there and for how long. The types and variety of tools used also provide important information about the kinds of activities that took place at a location. If one half of a snapped stone drill is found near a hearth and the other half in a trash pit ten feet away, we can interpret the information to suggest that the drill was used by the hearth

until it broke. Afterwards, someone might have cleaned the area and swept away half the tool into a trash pit, leaving the other piece where it fell. Much of archaeology is about developing such simple narratives about the past. They seem fairly ordinary, but in this way we begin to visualize the people and events that made up their lives much better than we can just by looking at the tools they left behind.

Archaeology in the Springfield – Holyoke Region

Despite more than one hundred years of archaeology in the central Connecticut River valley, few projects have been completed in the Springfield-Holyoke area. Some of the early archaeology of the late 19th century provides vivid evidence of the

Cultural Resource Management

In America today, most archaeology is not conducted by museums and universities, but by private Cultural Resource Management firms. Cultural Resource Management is the term used to describe the protection of significant historical sites as written into federal and state laws. There are a variety of such laws, but the most important is the National Historic Preservation Act of 1966. Since this law was enacted, all federal construction projects must go through a review process to determine whether significant archaeological or historical sites might be destroyed. With



CRM archaeology for a state highway project.

the passing of this law, states were also required to create their own State Historic Preservation Offices and many have developed similar regulations to protect sites from state-funded construction projects. Since the passage of the National Historic Preservation Act an increasing number of archaeologists have been needed to perform the field testing required to ensure that no important sites would be inadvertently destroyed through state and federal projects, such as highway, dam and sewer line construction. At first, the staff of universities and museums took on these tasks, but soon there was too much work and private professional archaeology companies established themselves to meet the growing need.

spectacular nature of some of the valley's sites, but these initial projects were poorly reported. For instance, the Holyoke Depot site was investigated in 1868, and provides evidence of a connection to the Early Woodland Adena culture of the Ohio River valley. The site included rolled copper and

stone tubular pipes, soapstone, shell, bone and copper necklaces (Wright 1949). The Long Hill site was excavated in Springfield in 1895, and found to be a Contact period palisaded village, with Native artifacts made on European materials (projectile points made of cut sheet brass and chipped ballast

flint), as well as Native manufacture of European items, such as an English mug of local ceramic manufacture (Young 1969). But the information remaining from these early projects is limited, as much of the documentation has been lost (Dincauze 1975).

During the first half of the 20th century, local archaeology enthusiasts amassed private collections, and information on the location of some sites was recorded by early members of the Massachusetts Archaeological Society. Excavation of the Guida Site was completed in 1952 on the Westfield River, upstream from its junction with the Connecticut near West Springfield. The site was a possible ceramic production area during the Middle to Late Woodland period, and expresses a variety of decorative styles used during this time. The site also included some early Contact period styles, along with glass beads and kettle copper acquired through trade with early European settlers (Byers and Rouse 1960).

Many more sites are known from surface collections and have not been excavated. This includes a Paleoindian site in Chicopee at Westover Air Base, just east of the Indian Crossing Site (Young 1969). Other surface finds are scattered throughout the valley and hint at the wide variety of stone tools manufactured and discarded over thousands of years. The huge Agawam Village site is known from surface finds spanning more than a mile along the

Connecticut River. The site includes a wide variety of tools and ceramics from the Woodland period.

Beginning in the 1970s, archaeologists started conducting tests before some construction projects, to make sure that undocumented sites were not entirely lost. The Indian Crossing site is one such type of project. Several other important sites have been found in this way. Just to the south, along the Westfield River, the Agawam Meadow site was first investigated in 2001. The site contained a large pit feature with multiple layers of animal bone, seeds, grasses, and waste flakes from making stone tools. The pit was radiocarbon dated to about 1000 AD, and a triangular projectile point was found that is typical of that time period (Donta 2008). Over 1,200 artifacts were recovered there, including stone tools and sherds of Native pottery. The site is large and ongoing investigations promise to shed more light on how Native people of this time period lived.

The importance of the Indian Crossing Site

The Indian Crossing site was recognized immediately as one of great potential significance to better understanding past Native American lifeways. Once the first artifacts of known age were discovered, it became evident that the site might provide answers to the poorly understood story regarding the effects of the transition to a farming way of life on the people of Southern New England. This question, raised



One of the larger "block excavations" at Indian Crossing. Portions of the site where artifacts and features were especially dense were examined more extensively.

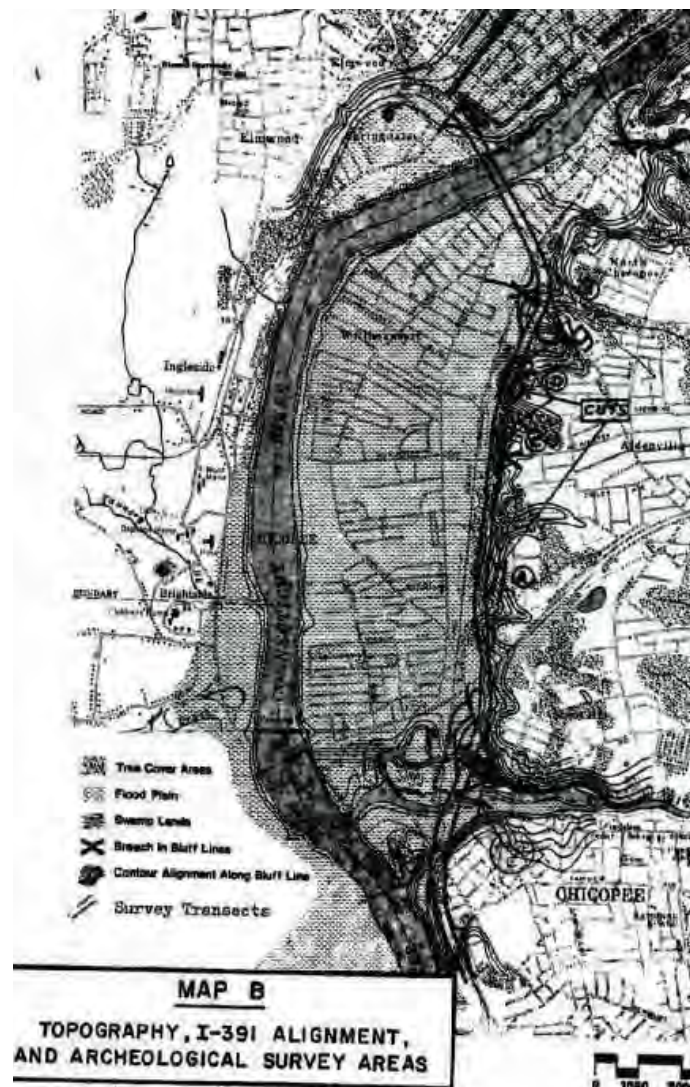
globally, was one of the most important questions in all of archaeology. People working in the Near East and Europe in particular had pondered the role the transition to farming made on the social, economic and political lives of those caught up in the change. Another basic question that archaeologists wanted to better understand was what prompted people to make the change from hunting and gathering to

farming? Was it just a clever invention? Did an increased population put a strain on local wild food supplies? Was there a need for a more predictable food base? Or was there a desire to live in the safety of larger communities, perhaps because of increased warfare in the region? Archaeologists hoped that new information from the Indian Crossing site might answer some of these questions.

The Indian Crossing Site

The Indian Crossing site was discovered during a federally mandated archaeological survey of an area proposed for the construction of I-391. The I-391 project began in 1965 when funding from the Federal Highway Administration prompted planning for a short stretch of new interstate highway between Chicopee and Holyoke. After hearings, environmental impact studies and negotiations with local towns a final route for the highway was planned. The use of federal funds for this project required that money be provided for an assessment of potentially significant historical and cultural resources within the proposed area of highway construction. Protection of historically significant sites had been written into various federal and state laws between 1966 and 1974. The most important of these is referred to as Section 106 of the National Historic Preservation Act passed in 1966. While these laws were on the books, they were not yet regularly implemented, and the archaeological work undertaken for the I-391 project was one of the first large-scale projects of its kind in the state of Massachusetts.

In 1975, Robert Paynter and Peter Thorbahn at the Department of Anthropology, University of Massachusetts in



Survey areas from the original Paynter and Thorbahn investigation in 1975.

Amherst received funding to undertake a preliminary evaluation of the archaeological sensitivity of the proposed I-391 corridor. This type of assessment is based on the presence of previously documented archaeological sites, as well as on the probability that other undocumented sites might exist. Paynter and Thorbahn developed a model of Native American settlement organization that described the types of sites expected to be associated with specific habitats. These site types varied depending on the season and nature of the local resources, and whether people planted gardens. They divided the project area into seven major habitats, each associated with an expected type of Native American seasonal use. Some habitats were considered very likely to contain unknown sites, such as the bluff tops, and along the Chicopee River. Other areas were considered less likely to contain sites, such as the bases of the bluffs, and low plains along the Connecticut River (the latter in large part because of the high degree of modern development that had likely already destroyed many sites).

In June of 1975, they explored the corridor by foot with a small team of students, and talked to landowners about artifacts they may have collected. They also took soil probes to examine the soil stratigraphy (primarily to assess the degree of prior disturbance), excavated a number of shovel test pits to look for artifacts and features, and excavated two test trenches. They also took soil chemistry samples to test for concentrations of phosphates. This was a relatively new method, and one that is no longer widely used in the region, but phosphate concentrations can be used to identify areas of dense human activity where organic waste was discarded and had decomposed, altering the soil chemistry.

Although they located no sites along the bluff tops or in zones considered to have low archaeological potential, Paynter and Thorbahn did successfully locate the Indian Crossing site with their test pits and trenches. They recovered just a small number of artifacts, including a hammerstone used for manufacturing stone tools, a single flake of argillite (mudstone), two probable post molds, concentrations of charcoal and soil stains, and large transported cobbles. They also learned that the site was covered by 50 – 60cm of recent floodplain deposits that had safely buried the site and prevented disturbance. They suggested the site might be stratified into at least two layers reflecting different periods



Areas of the site excavated by Thomas Ulrich and his crew in 1979. The site covers a 120 by 80 meter area (about 400 by 250 feet).

of use. Together, these factors meant that Indian Crossing was an ideal site to examine changing patterns of Native daily life along the Connecticut and Chicopee Rivers. They also noted that the protection of the site was in accordance with the National Environmental Protection Act's goals of improving and protecting both the natural and cultural resources of the region.

In 1977, approval and funding were granted to Thomas Ulrich of UMass to further assess the Indian Crossing site. This assessment's primary goals were to determine the site's horizontal and vertical extent (how large it was and how deeply it was buried), to increase the sample of artifacts and features from the site to establish its periods of use, and to determine whether or not

the site was eligible to be listed on the National Register of Historic Places. Ulrich relocated Paynter and Thorbahn's areas of initial testing and began excavating small test pits within the zone of proposed highway construction.

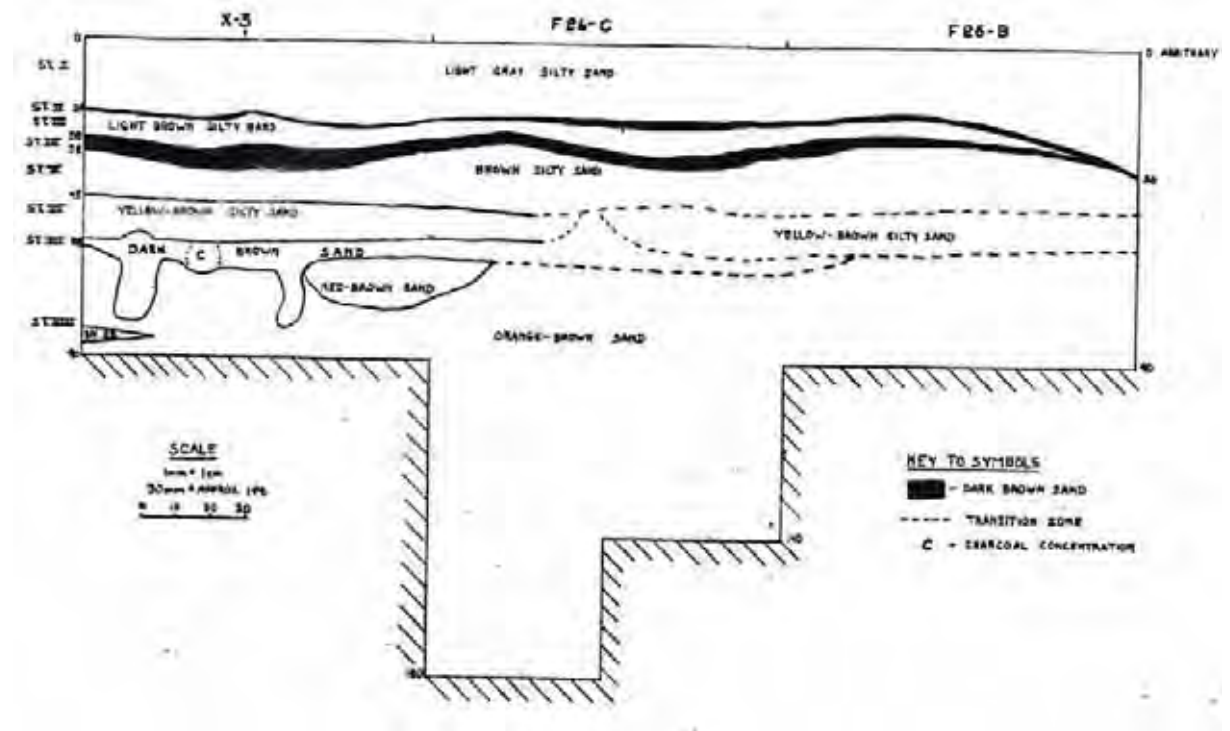
Ironically, it was a test pit at the far northeastern end of the site along the steeply eroded bank along the island's edge that produced the most abundant archaeological material. Native potsherds, stone flakes from tool manufacture, burnt stone and the tip of a broken arrow point were uncovered. The test pit was expanded into a one by three meter trench, portions of which were excavated to over five feet in depth. This trench became the starting point for a north-south east-west grid system across the site area. Ulrich and his crew excavated thirty-eight shovel test pits and eight larger one-meter square excavation units across the site to determine its overall extent. These test pits resulted in the discovery of additional tool-making debris, potsherds and a cooking hearth with burnt stone.

Artifacts were found in two main stratigraphic horizons. The upper was at a depth of 65cm (25 inches). Shell tempered pottery from this horizon suggested a date sometime after AD 750 based on data from other known sites in New England. The lower horizon was about 90cm (35 inches) deep and included only grit-tempered potsherds, stone flakes and burnt rock. Decoration of this pottery (described in more detail below) suggested a potentially earlier range of time of about 700 AD. The data strongly suggested the site contained at least two occupation horizons and that materials were focused largely along the island's edge. The

time period reflected by the artifacts was important because it marked the transition between a hunting and gathering way of life and one in which farming became increasingly important. Ulrich concluded that the site was eligible for listing on the National Register of Historic Places because it had the potential to yield significant new information regarding this important period of Native history. He strongly recommended

further work be undertaken before construction of the highway began.

Archaeologists Robert Paynter, Peter Thorbahn and Thomas Ulrich, authors of the reports based on the site's preliminary investigations, had strong academic backgrounds in world prehistory and archaeological theory and saw the potential that the Indian Crossing Site had to approach these questions that were of global significance.



A stratigraphic profile recorded at the site showing strata one through eight.

These investigators realized that the site probably functioned primarily as a fishing station, perhaps supporting larger base camps or hamlets on the bluffs above. Ulrich, however, decided it was worth investigating whether the site might have also functioned as a place where people lived and farmed as well after maize was introduced to the diet. To explore this hypothesis, he developed a series of expectations based on differing seasonal use of the island by hunter-gatherers and farmers. Different types of use were expected to produce different types of artifacts and features. In this way he proposed to test his hypothesized changes in land use through additional, more intensive excavations at the site. Ulrich's model of seasonal site use for the Indian Crossing looked like this:

Season	Hunting and Gathering	Farming
May-June	Base camps located on the bluffs, fishing at Indian Crossing	Base camps located on the bluffs, fishing and planting at Indian Crossing
July-September	Small family camps dispersed across the bluffs and flood plain, some at Indian Crossing	Small family camps dispersed across the bluffs and flood plain, some at Indian Crossing
September-November	Groups return to Indian Crossing for fall fish runs	Groups return to the site for fall fishing and to harvest gardens. Crops stored in dry sandy soils along the bluffs
November-April	Families disperse in small winter hunting camps across the bluffs	Families disperse in small winter hunting camps across the bluffs, small protected camps along the bluff near food storage areas

Thomas Ulrich's hypothesis of seasonal site use. He carefully considered the possible environmental resources available in the region throughout the year.

Ulrich's expectations based on the model were the following: There should be evidence at Indian Crossing for 1) small camps occupied on a regular basis throughout time, 2) indications of fishing throughout time, 3) later evidence of open landscapes suitable to crop cultivation, and 4) direct evidence of farming such as seeds and kernels during the Late Woodland period. Ulrich hoped to use data from the Indian Crossing Site to learn more about many issues. First was whether or not and for how long people might have practiced farming on the island itself. Second, what was the overall use of the site as an aspect of the broader use of the Central Valley region, and the changing nature of activities that occurred there? Third, could the site



Archaeologist drags the ground-penetrating radar sled across the site looking for features.

help to explain why farming appears to have arrived so slowly in New England – for example, was the environment already so rich that farming was not really necessary? Fourth, could new excavation and sampling strategies being developed in the Midwest be applied to the archaeology of New England (especially those focused on finding evidence of early farming)? One of these methods included the use of a recent invention called ground penetrating radar that could be used to detect subtle changes in the soil below the ground without excavating. It was hoped that this device could be used to locate features such as cooking hearths.

These expectations and goals derived from the model then determined how the site should best be excavated to guarantee the collection of the type of information that would be able to support or disprove the model of hypothesized land use. In addition to a lot more excavation to collect additional information, Ulrich proposed that large numbers of soil samples be



The Indian Crossing location adjacent to the first falls on the Chicopee River promoted the hypothesis that the site had been used for seasonal fishing. A scene from "Their manner of fishynge in Virginia" by Theodor de Bry, 1591.

collected from the features found. The soil was to be processed in the lab using a method referred to as flotation. Flotation requires running soil samples through very fine meshed screens in tubs of water. Small charred plant remains, kernels, nuts and seed fragments float up to the surface and are skimmed off in nets. The heavier portion is also collected to look for very small artifacts and animal remains, including fish scales and small bone fragments that would otherwise not be noted in the field. These

samples are left to dry for a number of days and then are painstakingly sorted through in the lab, a process that can take many hours per sample. Flotation was a relatively new method in archaeology at the time, and the team at Indian Crossing was among the first to implement it in New England.

Other soil samples were taken to specifically target pollen and phytolith remains. Pollen and phytoliths (small crystal structures that strengthen plant cells) can be identified to plant type in many cases and are potential indicators of vegetation communities in the area and of the general climate. If only tree pollen is found in a sample, one can interpret the local habitat as well-forested. If pollen and phytoliths show a high proportion of grasses and weedy species, the landscape was more open. This could mean humans were maintaining open fields for planting. When the planning, methods and theory behind the Indian Crossing excavation are considered together, the site must be seen as one of the first modern, scientific excavations to take place in the region. Excavation at Indian Crossing set a high standard for future work across New England and changed the way archaeologists thought about and went about their work forever.

Excavation at Indian Crossing

Full-scale excavation to recover information and test the proposed



The Indian Crossing site area superimposed on the proposed construction of I-391.

archaeological model began June 27, 1979. Photographs of the crew indicate that it was a hot summer to be out in the blazing sun without much cover. Initially, a ten-meter grid was carefully laid out with surveying equipment so that all excavation areas could

be precisely mapped. Work proceeded by excavating 1 meter square excavation units spaced 10 meters (33 feet) apart across the area where finds were made during the preliminary investigations. This area formed a triangular shape along the island's northeastern bank measuring 120 meters (390 feet) north-south and 80 meters (260 feet) east-west. Finds from these 79 small excavation areas helped to determine where additional work should proceed. Anywhere features or artifacts were especially abundant, additional excavation units were placed. Excavation continued through October 17, 1979 under pressure to complete the work so highway construction could begin. The archaeological team supervised by Ulrich consisted primarily of University of

Massachusetts students – some no doubt experiencing their first hands-on field work. Excavation proceeded for one hundred and four days nearly straight. Records indicate that crews stayed on site and worked through the weekends. A remarkable two hundred and two square meters of earth were uncovered by hand, often to depths of a meter and a half (five feet).

Regional scholars visited the site throughout the investigation to keep tabs on

the new information coming from the ground (see photo). The archaeologists organized a number of public presentations and tours, with large crowds in attendance. If you were a New England archaeologist, Indian Crossing was the place to be in the summer of 1979! While they worked, data were continuously updated into the UMass mainframe computer and printed out so Ulrich and his team could strategize their next move. If one includes all of the material recovered from the site, some of it non-artifact items such as pebbles and recent historic materials, the finds total nearly 75,000 pieces. Among these, the most common artifact class was small stone waste flakes from the manufacture of tools. These alone numbered 9455. Historic materials, mostly modern, numbered 9278 finds. Over 13,000 fragments of charcoal were collected for identification and possible radiocarbon dating, in addition to 1672 unidentified plant remains and 2680 seeds (most of which were determined to be of modern origin). Features containing burnt stone were numerous, and one in particular was quite large. Over 1200 fire-cracked rocks were brought back to the lab for further examination.

Over four hundred small bone fragments representing meal refuse were found. Perhaps more exciting was the recovery of 2767 Native pottery sherds, mostly quite fragmented, but some with



Harvard archaeologist K. C. Chang (right) and colleagues visit the site in 1979.

elaborate decorations (see below). Among the stone tools, the most common implements were simple flake tools such as utilized and retouched flakes and scrapers which numbered 117. Thirty-three fragmented bifacially-worked tools were

recovered, most perhaps discarded before completion. Twenty five arrow tips or fragments were found, nearly all of which were triangular and related to the Levanna type of the final Middle and Late Woodland periods. A fascinating cache of 19 purposefully buried whelk *columella* (the inner spiral column of the shell that could be made into shell beads) was also uncovered. Another oddity included two stones with natural hollows that might have been used as paint pots. Other interesting finds included six stone drill bits, a polished narrow slate chisel and half of a stone hoe. The latter is important because it strongly suggests that at least some cultivation took place on the island, as had been hypothesized by Ulrich.

A nalysis of the Artifacts

Native Pottery

Clay pottery became an important part of the food-processing tool kit in New England about 3000 years ago. It was at this time that pottery began to replace the heavy soapstone bowls and platters of the Archaic period. While we usually think of the incorporation of new technologies as “breakthroughs,” it is more likely that people in the region were aware of pottery for a much longer period of time, but only chose to use it when it became necessary to process new types of foods, and to process some traditional foods more thoroughly to increase their nutritional yield. While pottery vessels can be used for storage, above all, they provide a way to boil foods for an extended period of time. This is very helpful for making small seeds and tough plant roots palatable. Globally, this transition tends to occur when populations become restricted to more limited resource areas and must make do with foods of lesser desirability to survive. The reasons such restrictions in movement occur may be political in nature (such as increasing conflict with neighbors), or may simply reflect an increased number of people on the land.



Native pottery expressed great stylistic variation at the site.

Potters in New England built their pots by hand. Instead of throwing pottery on a wheel, a technology that developed elsewhere in the world, Native craftsmen (usually women) rolled out long coils of clay and wound them into bowl forms. The

coiled pots were then smoothed and paddled, so that the pot was strengthened and the original coiled surface was worked smooth. Most New England pottery was utilitarian and rather plain, but decorative surface treatments were sometimes used and

these changed slowly over time, generally becoming more elaborate. The most common surface treatment was applied during the paddling process. This simple approach required only that one wrapped the paddle with string, or paddled the impression of a piece of hand-woven fabric into the pot. A simple means of creating short decorative line segments was to use the cord-wrapped paddle's edge in a series of strokes, often along the rim or collar of the pot. More elaborate decorative elements were stamped or incised with a narrow wooden stylus. Incised decorations occur during the Late Woodland period, and become more common over time. Most incisions were comprised of simple lines running parallel to the rim, or forming oblique "hanging triangles" around the collar portion of the pot. Design motifs in general focused on geometric rather than naturalistic patterns.

Pottery decoration is important to archaeologists for two main reasons. First, it can provide clues to the date of the manufacture of a pot. For example, large, thick-walled pots with pointy ("conoidal") bottoms and brushed interiors are usually associated with the earliest ceramic tradition of the Early Woodland period. Pots typical of the Middle Woodland period often have rows of small stamped impressions referred to as "dentate stamped" because they were made with a comb-like "toothed" tool. The



Fragments of a large pottery vessel were carefully exposed, drawn, labeled and then removed with the surrounding soil to be analyzed in the lab at UMass.

second reason decorations are important is that they provide clues to the social organization of the people who applied them. The general assumption is that one learned a particular tradition of pottery decoration from one's family or close relatives. Your family might be part of a specific lineage, that was part of a clan, that might be associated with one or more villages, that might have ties to others

within a broader region. As such, stylistic traditions express something about one's identity and relationship to other groups around you at a variety of scales. For this reason, some archaeologists spend their lifetimes trying to piece together subtle changes in design elements over time and space within a region.

Pottery at the Indian Crossing Site

Among the 2767 pottery sherds recovered from the Indian Crossing Site, only about 100 were large enough to examine in detail (over about an inch across). Among these, only twenty-three had any remnant decoration. Despite the rather small number of decorated sherds, they expressed a great range of stylistic variation. Among the twenty-three decorated fragments, two had cord-wrapped paddle impressions, two had deep round punctures (possibly repair holes), two had dentate stamp impressions and seventeen expressed a variety of incised linear decorations. One of the sherds expressed a possible “castellated” rim. This elaborate, sinuous rim form developed toward the end of the Late Woodland period throughout the region. Based on a variety of attributes, the sherds reflect sixty-four “vessel lots” or individual pottery vessels.

The diversity of styles represented has two probable causes. The first is time depth. Occupation of the site is estimated to have occurred between about 700 and 1500 AD. This 800 year period marks the transition from the end of the Middle Woodland period through the Late Woodland period. During this time design elements changed gradually, with dentate stamping falling out of fashion and linear



Reconstructed sherds of the pot from the previous page. This proved to be a small portion of a very large vessel.

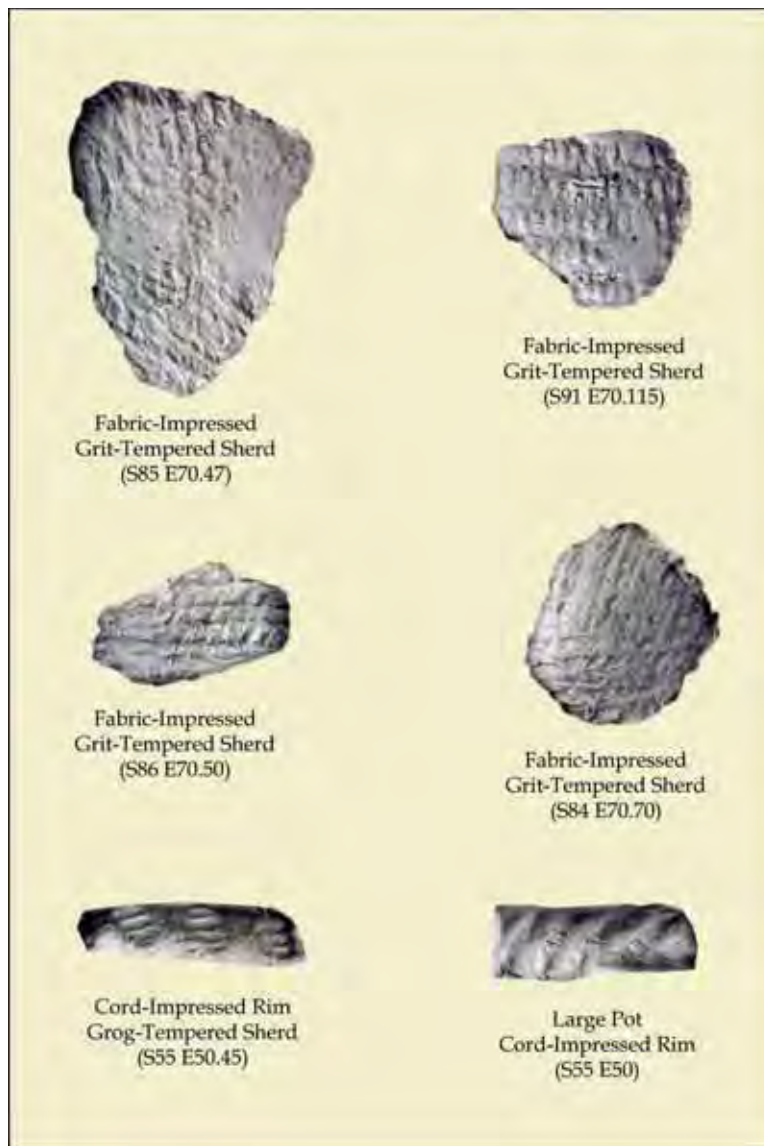
incisions becoming more common. Based on the small sample of decorated finds, this suggests that most of the decorated materials date to the Late Woodland period. The second reason design elements might vary relates to interactions between social groups and the size of the core social unit that defined stylistic traditions. If this social unit was very small, such as the size of a

family or local lineage group, we would expect a high degree of stylistic variation if a site was used by many different families. If these small families followed a rather mobile lifestyle and shared a large territory, different groups probably used Indian Crossing as a short-term settlement during their seasonal travels. Even during just a century or so of regular site visits, they might have left behind a variety of mixed styles. Sorting out which of the above explanations is the best one for the observed variety of design elements is something archaeologists in the region will likely discuss for decades to come.

“Temper” is any material used by potters to increase the stability of the clay. Pure clay is generally too soft to work effectively and produces a more brittle pot, prone to easy breakage. The most common tempers used by Native New Englanders were crushed shell and “grit.” Both types of temper were used in pottery found at the site, although the most common was grit tempered. Grit temper is composed of angular mineral particles derived from crushed heated stone. A variety of minerals common in local upland bedrocks were used, including quartz, micas, feldspar, and sandstone fragments. Shell tempers were produced by burning shell to remove any moisture and then crushing it. In general, shell-tempered pots perform better as cooking vessels than most grit-tempered

Cordage Impressions

One of the most interesting things about the ceramics from Indian Crossing was the number of excellent fabric and cord impressions that were still visible on the exterior of some of the pot sherds. Fabric and cord covered paddles were commonly used to decorate pots and provide them with a texture that was both pleasing to the eye and functional. Native hand-woven fabrics and cordage are seldom directly preserved in the archaeological record of the Northeast, but it turns out pottery is one of the best ways to learn about their manufacture. While we generally picture Native people dressed in tailored deer skin wraps, it is easy to forget that the textile arts were well developed in the region. A variety of materials were available for fabric and cordage manufacture, including Indian hemp (dogbane), milkweed, nettle, and basswood fibers. To gather the materials necessary to make string, fishing line, rope, nets and clothing, many thousands of individual plant stalks were required by a family annually. This strongly suggests that the most important fibrous plants were well-managed in semi-wild gardens.



Fabric and cordage impressions used as pottery decoration provides important information about native textile technology.

pots because the shell (calcium carbonate) tends to expand at the same rate as the clay of the pot itself when heated. Most grit tempers have a tendency to expand more rapidly than the clay, resulting in possible cracks. Pots with grit tempers, though often used for cooking, probably had shorter life-spans and may often have been intended for use as storage vessels. An interesting aspect of tempers from Indian Crossing was the presence of grog temper in some sherds. Grog is comprised of crushed discarded pottery fragments. Because it is made of fired clay itself, it also lends itself well to pots that are intended for use in cooking.

Archaeologists noted a change in temper use over time at Indian Crossing. While about 1000 sherds of grit-tempered pottery were found in each of the main stratigraphic horizons from the site, the number of shell-tempered sherds nearly doubled from the lower stratum

9 (44 sherds) to the upper stratum 8 (78 sherds). This is a further indication of time depth at the site. The small number of shell-

tempered sherds from the lower level indicates that most of this material was deposited during the very early part of the Late Woodland period and perhaps the end of the Middle Woodland. The horizon above reflects an increased use in shell temper during the Late Woodland, probably as pots were used more intensively for cooking and required better resistance to heat stress. Interestingly, examination of the very small sherd fragments from the site indicates that the majority are shell-tempered. The conclusion drawn is that the shell-tempered pots, though resistant to heat-stress, did not stand up well to centuries of burial in the ground after they were discarded. This is likely because in most cases the shell had weathered away in the acidic soils, leaving voids (hollow spaces) that became saturated with moisture over time. Centuries of freezing and thawing caused these sherds to burst apart into small fragments more rapidly than the grit-tempered ones. This is a good example of what archaeologists refer to as "taphonomy." Taphonomy reflects forces that act on archaeological materials over time that result in artifact decomposition and destruction. The effects of uneven weathering can result in a skewed interpretation of finds from a site and it is important that these effects be considered during site analysis.

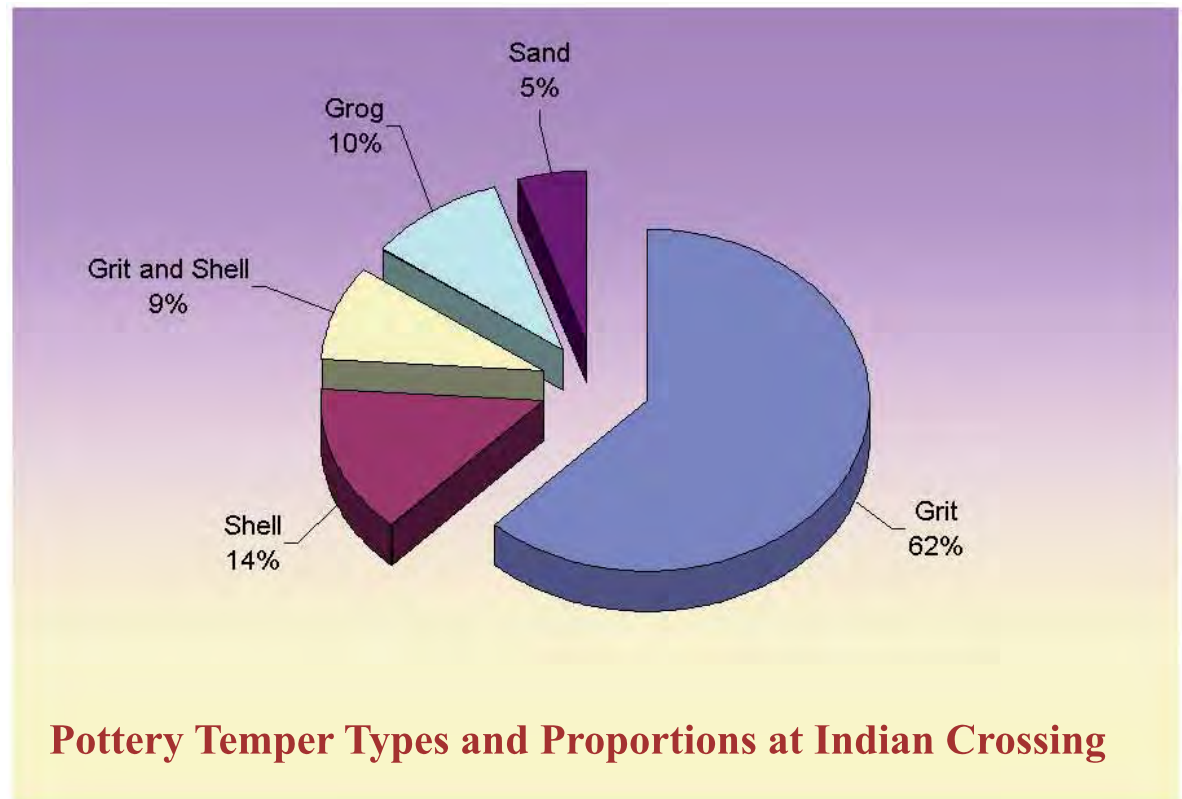
Grit and shell-tempered pottery do not express any notable correlation in their

overall distribution across the site, suggesting that these types were deposited at different times during various episodes of site use (see map, page 37). The distribution of grit-tempered pottery indicates at least ten separate site uses that resulted in the discard of broken pots at the site. Though much less common, shell-tempered pottery is concentrated in five separate locations, each also likely representing a different period of site use. Generally, pottery is most common along the northeastern bank of the island, where most of the other artifacts

were found as well. It is evident that this part of the site was repeatedly favored for occupation over the duration of site use.

Conclusions Regarding the Site's Pottery

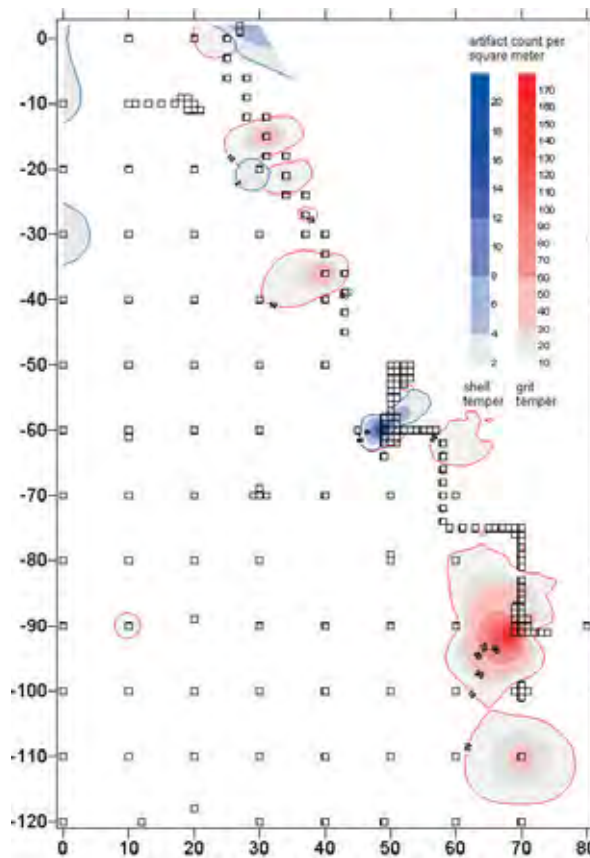
Native pottery from the Indian Crossing Site indicates an 800 year period of use. During that time a variety of pottery styles and manufacturing methods were used to make the pots that were discarded at the site. The diversity expressed at the site



surprises some archaeologists. Much of this diversity is probably simply a reflection of the depth of time and changes in style that occurred while the site was used. Some, however, probably reflects the small-scale social organization of the Algonquian people who lived in the region shortly before the arrival of European settlers. Indian Crossing is similar to other sites in the region in this expression of great ceramic diversity. Excavated sites like Guida Farm on the Westfield River and Pine Hill along the Deerfield River share this trait. These sites have been used to develop a model of a Native way of life in the central Connecticut River Valley that remained rooted in a very mobile settlement system, even well after maize was introduced to the diet. Archaeologist Elizabeth Chilton at the University of Massachusetts has referred to these peoples as mobile farmers who utilized a variety of small camps and hamlets throughout the year, much as their ancestors had for thousands of years before them.

Stone Artifacts

Stone was an important raw material for the manufacture of many useful tools for Native people since Paleoindian times. As such, Native Americans shared the ancient tradition of stone tool manufacture that has been an aspect of human technology



Grit and Shell Temper Distributions at Indian Crossing

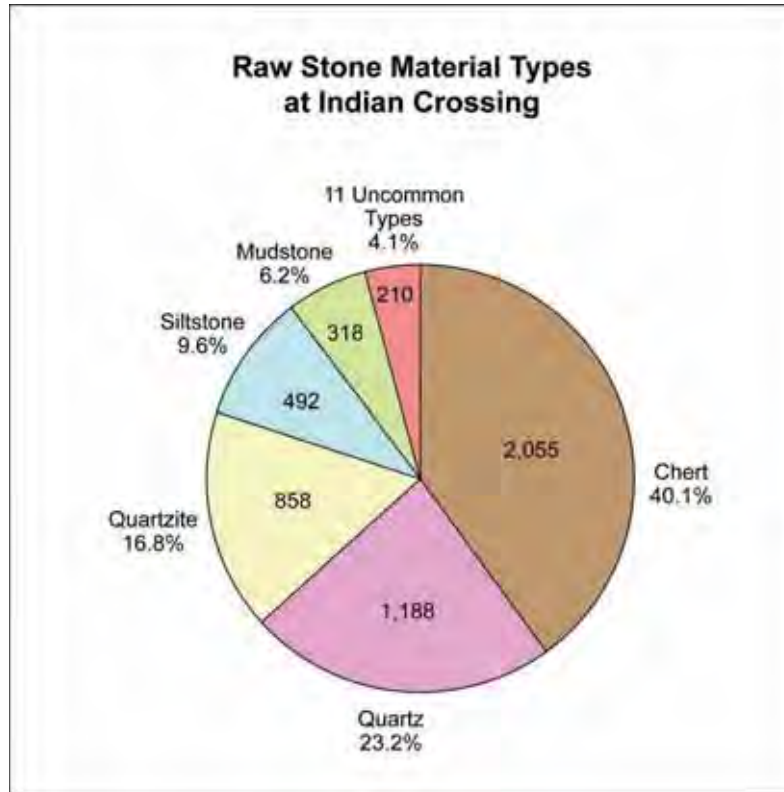
for two million years. In some parts of the world, metal began to replace stone tools about 5,000 years ago. In New England, some copper tools were hammered from raw nodules as early as 3,500 years ago, but these were very uncommon. Stone suitable

for making tools, especially more intricate ones, is not available everywhere. Raw materials for stone tool manufacture should have a smooth, relatively glassy texture. The best material in the region is chert, a glassy mineral that occurs in a variety of colors ranging from greens to grays to black, depending on its chemical makeup. (The more common term “flint” is usually reserved for very fine, lustrous cherts of European origin.) All chert is not alike, though, and the materials most commonly used derived from just a few sources – all of them outside of Massachusetts. These include the Coxsackie, New York mines south of Albany, Mount Independence in the lower Champlain Valley of Vermont, and Onondaga sources, most abundant in western New York. Jasper is a related material that includes a high iron content that gives it a yellow hue. Jaspers often redden when purposefully heated (to improve their flaking quality) or when fragments are cast in a fire. The largest outcrops of jasper are found in eastern Pennsylvania, and it is likely that most of the jasper found in New England comes from that region.

Rhyolite is a hard volcanic stone that can have a fine crystalline structure. Rhyolite sources are most abundant in the greater Boston area. These materials can vary widely in color from gray to red-brown to purplish. Greenish varieties have a source

in Maine. Rhyolites tend to be rather coarse-grained compared to cherts, but the finest-grained materials were used from Paleoindian times on in New England. Quartzites are metamorphosed (heat and pressure-altered) sandstones. Most outcrops are too coarse-grained to be used for tool-making, but finer materials exist east of Lake Chaubunagungamaug in Webster and in western Massachusetts running north-south approximately along Rte. 7 and north into Vermont. Lower quality, often softer materials such as hornfels and a variety of siltstones were likely available from more local sources. Quartz, a very abundant mineral, was also commonly used. Better quality quartz usually came from specific sources, but local stream cobbles were often split and tested for their potential use. Basalt is a very hard volcanic mineral that is very tough, but rather grainy, and can be worked into chipped stone tools. More often, however, it was pecked and ground to shape to manufacture axes, adzes, pestles and similar heavy-duty tools (see sidebar, p. 15).

Sixteen different stone materials were used by the occupants of the Indian Crossing site. Most of these occurred in very small proportions, however. The most common raw material used was chert. Most of this was gray to black and has a probable source in the Albany New York area, and possibly further west along the Mohawk River into Iroquois country. Some may also



have been acquired from the Mount Independence source near Lake Champlain. It is noteworthy that these non-local materials represent 40% of the identifiable raw materials from the site. They indicate strong economic ties to the west and possibly northwest. Most of the artifacts were probably acquired through trade in roughed out form (as bifaces and large flake spalls), rather than mined directly by the Indian Crossing occupants at their source. This emphasis on materials from such

distant regions may seem odd, but it is characteristic of sites along the Connecticut River during the Late Woodland period. This seems to have been a time during which reliable trade with neighboring groups to the west was common. This suggests a period of relative political stability in the region and limited conflict. Political instability would have likely disrupted trade relationships and prevented the movement of such desired materials over such distances.

The next most common raw material used at the site was quartz. About 23% of the stone artifacts recovered were

manufactured from this material that was probably gathered fairly locally. While quartz cobbles could have been collected in the nearby Chicopee, only a single quartz core fragment with a smooth, water-worn surface was found at the site. This suggests that the roughly 1200 quartz flakes were primarily struck from prepared blanks or preforms carried to the site. This may sound like a lot of artifacts, but a stone tool maker can produce flakes at a rate of about thirty a minute, so this amount probably reflects less

than an hour of actual work. Of course, when one considers that only about 3% of the total site area was excavated, the use of quartz was significantly greater. Statistically, the sample recovered reflects an estimated 22 hours of quartz tool manufacture across the entire site area over time.

Over 800 quartzite artifacts were found (reflecting about 17% of the total). These include both white, tan and some greenish varieties. Tan and green quartzites are associated with the Plainfield Formation outcrops to the east, near the Massachusetts-Connecticut-Rhode Island border. White quartzite is more common from sources in far western Massachusetts and north into Vermont. During the early colonial period, these areas were occupied by the Nipmuc and Mahican respectively. The presence of significant quantities of this material likely express relationships between the Natives of the river valley with the ancestors of both of these communities.

Siltstones and mudstones are names given to a variety of relatively soft, easily weathered materials. The most workable of these were probably found adjacent to basalt outcrops that heated and metamorphosed these materials into harder stone types that grade into hornfels. Possible sources for the siltstones and mudstones can be found throughout the Holyoke Range not far from the site. The Chicopee River also cuts through bedrock ledge of Chicopee Shale

The Economics of Reciprocity

The concept of “reciprocity” underlies all traditional economic systems around the world. Prior to the development of market-based systems, person-to-person reciprocity functioned as a means of moving resources across large regions. The idea of reciprocity was also deeply tied to the formation and maintenance of social relationships within a society. Reciprocity involves gifting items to others with the expectation that one will receive a similar gift in kind, perhaps at a future date. In this way it establishes relationships of social indebtedness between individuals and groups. Traditional relationships of reciprocity are generally so complex and intertwined that everyone is both indebted to and is owed to many others. These ties of indebtedness are actually a form of economic insurance that provides a social safety net in times of need. As societies become more complex, systems of reciprocity may become formalized and linked to specific ritualized gift-giving and feasting events that form lasting bonds between communities. These rituals often act as a means of establishing alliances and reducing the threat of violence.

just upstream of the site. Some of this material may have been used as well. The peculiar “paint pot,” a chunk of shale with a natural void in it, was found on the site and was probably selected by one of the site’s occupants from gravel bar materials weathered from the local shale formation.

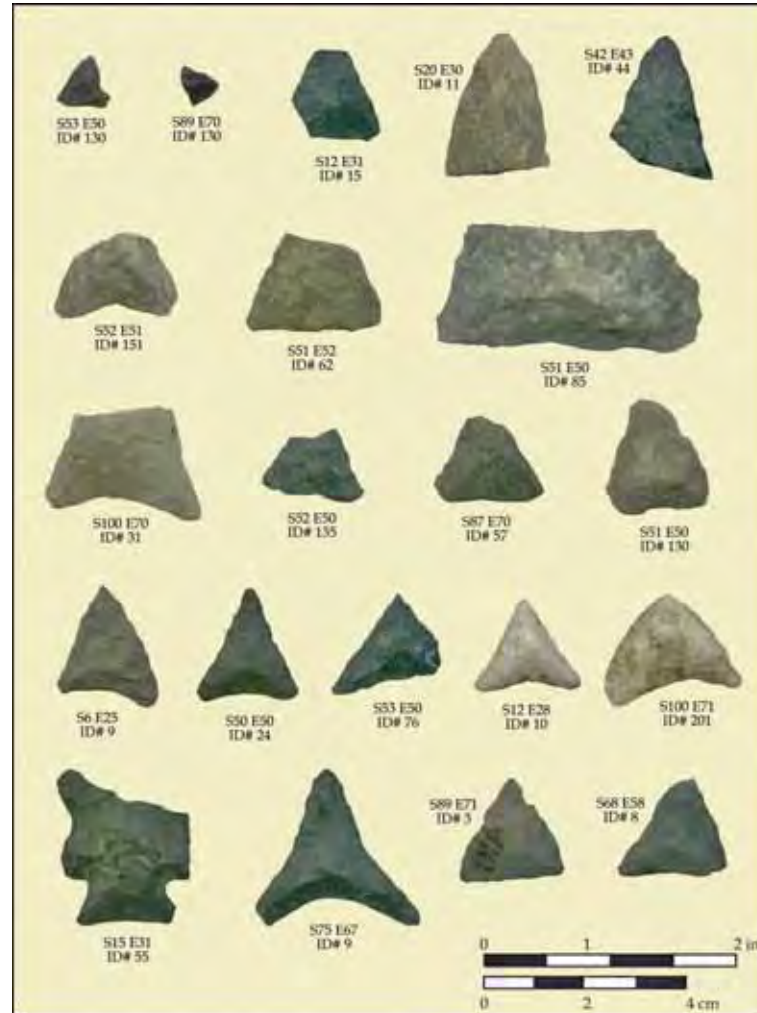
The final 4% of raw materials are represented by eleven different types of stone. These include (in descending order) shale, argillite, chalcedony, possible graphite, quartz crystal, jasper, slate, sandstone, gneiss, rhyolite, and diabase. These reflect a mix of local and non-local sources. The most distant among these was jasper, which was probably acquired

through a series of trade interactions from eastern Pennsylvania. The gray argillite (some of which may be varieties of more local siltstones or mudstones) was extensively quarried at mines in northern New Jersey. Slate and rhyolite had probable sources in eastern Massachusetts. The remaining materials were probably acquired locally. Together, the stone raw materials recovered from the Indian Crossing site reflect wide-ranging contacts with other groups in the region, but the strongest ties appear to have been to the west.

Stone Tools

As noted above, the most common stone tools identified at Indian Crossing were simple flake tools. These include a variety of forms such as utilized and retouched flakes and scrapers. Utilized flakes show often subtle evidence of edge damage indicating use in a cutting or scraping manner, while retouched flakes have been slightly modified by a few light blows to shape the tool's working edge. Scrapers include a number of varieties and usually indicate more purposeful, planned edge modification and shaping. All of these are considered expedient tools, because they can be manufactured in a matter of seconds and may only be used for a few moments for a quick task before being discarded. Tasks that require flake tools range from gutting a fish, whittling, butchering small game, or scraping hides. The 117 flake tools found at Indian Crossing reflect a fair amount of this type of short term cutting and scraping work.

The thirty-three fragmented bifacially-worked artifacts represent tools that required more careful effort to manufacture. Most of these small fragments probably came from items being worked into arrow tips that broke during manufacture. Others might have been intended for use as drills or knives. Most of the large number of flakes and fragments found at the site were produced during the manufacture of such bifacial tools. The high



Projectile (arrow) points from the Indian Crossing site. The triangular points are a Late Woodland type called Levanna. The notched point is a Middle Woodland Jack's Reef type.

ratio of tool-making waste to broken, discarded tools indicates that the tool-

makers at Indian Crossing were both quite skilled at their task (not many tools were broken during manufacture) and that they probably took most of their finished products away with them when they left the site.

Twenty five arrow tips or fragments were found. Nearly all of these were small and triangular in shape. Most fit into the classic, concave-based, equilateral form of the Levanna type of the final Middle and Late Woodland periods. Others are harder to classify, but likely represent variants of the type. These points were made across the Northeast between about 800 and 1650 AD. They are believed by most archaeologists to represent the first true arrow tips used in the region. Prior points probably acted as dart tips associated with the use of the spear-thrower (or *atlatl*), used widely before the introduction of the bow and arrow. The seventeen Levanna points and related triangles are manufactured from chert (47%), quartzite (35%) and quartz (18%). These ratios are similar to, but somewhat higher than those expressed for

Flake Tools and Bifaces

Chipped (or flaked) stone tools come in two typical classes: flake tools and bifaces. Flake tools are typically very simple, expedient (disposable) tools manufactured with little additional edge working to a flake struck from a stone core. The simplest flake tools are actually unmodified flakes which have very sharp, razor-like edges. With evidence of use (visible edge damage) such tools become classed as “utilized flakes.” “Retouched flakes” have some evidence of purposeful delicate flake removals along the working edge. This may be done to make the cutting or scraping edge more regular, but does not really sharpen the tool. “Scrapers” are tools with continuous edge reworking. Often this may be done to strengthen the working edge for more heavy-duty scraping activities on hide, bone, antler or wood.

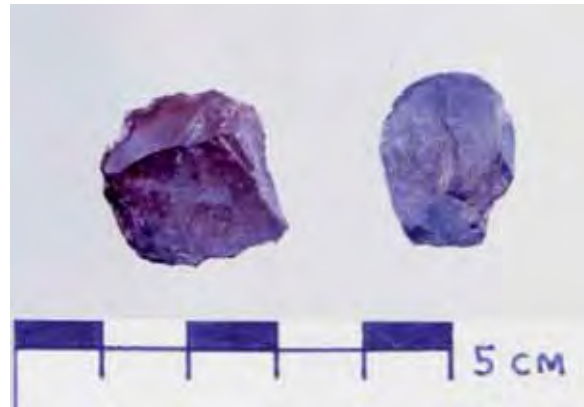
Bifaces are tools that have evidence of more extensive flake removals from both surfaces of the tool. While bifaces are typically produced from rough flake “blanks,” as the tool is further shaped, evidence of the original flake form is often lost. Bifaces are robust tools designed to have an extended period of use. They include projectile points (like spear and arrow tips), knives and drills.

first two centuries that the Levanna type was being manufactured. In addition to this point, a pentagonal point preform typical of the Jack’s Reef tradition was also found. Both artifacts were manufactured from chert. Elsewhere in the Northeast, Jack’s Reef points are commonly manufactured from jasper as well, and it is likely that the small number of jasper flakes found at the site are associated with this earliest phase of site use.

The majority of artifacts were associated with stratigraphic levels 8 and 9 (ca. 95% of all identified stone materials). Stratum 8 represented the buried topsoil horizon associated with the ground surface prior to historic-era flooding. Stratum 9 represents the zone just beneath this buried soil horizon and is therefore older. The nature of the ceramics and stone tools from these two horizons suggest the difference in age between them may be only one or two centuries. The lowest horizon (10) contained a single chert small Levanna point. Thirteen additional Levanna points and related triangular types occurred in level 9, as well as the Jack’s Reef point and preform. Above these, in stratum 8, just three Levanna points were found, as well as a single example in level 7. The concentration of projectile points in level 9 is somewhat difficult to explain in light of the overall occurrence of stone artifacts by level which are much more similar. The variation from the

all stone artifacts from the site. This indicates a preferential use of these raw materials over other softer, local lithics, such as siltstones. Again, the strongest regional link is toward the west.

Just one point is associated with a potentially earlier period. This Jack’s Reef corner notched point is typical of the late Middle Woodland period and was used in the region between about 700 and 900 AD where it is commonly associated with cord-wrapped decorated ceramics (Seeman 1992). In fact, Jack’s Reef points are often associated with Levanna points, and they appear to have overlapped in use during the



Jasper and chert end scrapers from the site. Mounted in a handle, such tools could have been used for hide working.

expected proportion could be due to chance, but it may reflect an actual shift in site use towards a de-emphasis on hunting-related activities over time. It is worth noting that the stone hoe was found in stratum 8, suggesting a shift toward some degree of farming in this level.

Compared to the overall proportions of each material type listed in the table below, it is evident that a higher than expected amount of chert occurs in the lower stratum 9 than the overlying stratum 8. Quartzite and the catch-all category of the other minority raw materials are also more abundant in this lower level. This is balanced by an increase in the use of quartz, mudstone, and in particular siltstone in the overlying level. These are all materials available locally, and this trend, though somewhat subtle, indicates a decreasing degree of mobility across the landscape or a reduction in contact with neighboring regions. This change might be associated

Making Stone Tools

Stone tools are manufactured by chipping flakes from a chunk of raw material called a “core.” Cores require preparation before useful flakes can be driven off them. This usually involves the removal of the smooth, cortical surface, some shaping and the creation of a large “striking platform.” The striking platform is a flat surface that the flint knapper strikes with a hammerstone or antler billet. A careful blow along the margin of the striking platform will produce a large flake, useful for making a variety of flake tools or bifaces.

with a shift to farming, but may also reflect unknown political and economic changes in the valley at this time.

Stone Tool Distribution

The horizontal distribution of artifacts can tell us something about how the area of the site was organized and used by people during its period of occupation. As a general rule, the greatest concentration of artifacts was located along the northeastern bank of the island, along the abandoned river channel. Within this area, stone flakes, tools and ceramic sherds were most common. The examination of the distributions of arrow points, biface fragments, drills and flake tools suggests that in addition to this general northeastern focus, three areas appear to reflect more concentrated tool-making and tool-using locations. The largest of these is contained in the excavation area near unit S50E50. A high-density of arrow points, biface fragments and flake tools were found in this area, as well as a single drill fragment. This area also contains a large quantity of

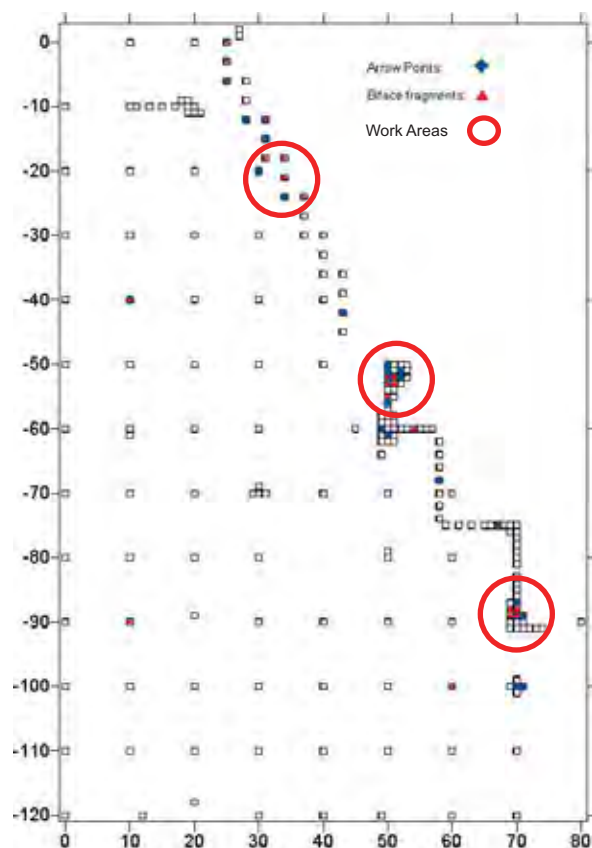
The Proportions of raw stone materials used by stratum. Chert use declines sharply between strata 9 and 8 while siltstone use increases.

Stratum	Sum	Chert	Quartz	Quartzite	Siltstone	Mudstone	other	total
7	4%	1%	1%	1%	23%	10%	3%	188
8	41%	36%	48%	34%	55%	46%	26%	2075
9	54%	61%	51%	64%	22%	39%	71%	2784
10	1%	2%	0%	1%	0%	5%	0%	72
Total	100%	2054	1187	858	492	318	210	5119

discarded stone flakes from both upper and lower strata (8 and 9) suggesting that repeated use of this location in part explains the abundance of materials found here. A similar, but somewhat smaller activity area was located near excavation unit S90E70. This area contained a very similar assortment of tools and is strongly associated with discarded chert and quartz flakes from the upper horizon (8). The area around S20E35 also produced many arrow points, bifaces, and flake tools. Had more excavation occurred here, it probably would have produced as many tools as the better examined activity area near S50E50. Like that area, S20E35 also produced an abundance of discarded flakes from both the upper and lower horizons of the site, indicating repeated occupation of this particular spot.

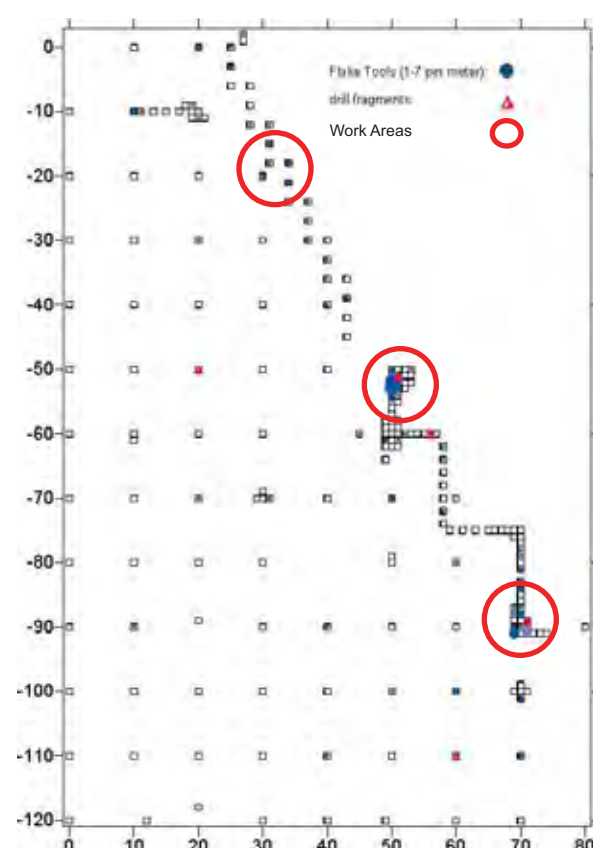
Conclusions

The stone tools and discarded waste materials found at the Indian Crossing site have a story to tell. First, the sheer quantity of material indicates a relatively high level of activity at the site. However, this view must be balanced by the fact the site was occupied for an 800 or so year period. This is a very long time for a place to accumulate the debris people left behind. Even very modest, short-term tasks such as sharpening a flake tool, or repairing an arrow point repeated over the centuries will



The Distribution of Arrow Points and Bifaces at the Indian Crossing Site

have resulted in the accumulation of thousands of discarded flakes and many dozens of tools. So, while people appear to have visited the site often, most occupants were probably small families that performed their daily activities for just a few weeks before moving on to their next camp or a larger hamlet.



The Distribution of Flake Tools and Drills at the Indian Crossing Site

The types of tools found also tell us a bit about the nature of the activities that occurred at Indian Crossing. While it is difficult to be specific, the most abundant tool types consisted of simple flake tools designed for a variety of simple cutting and scraping tasks. These probably ranged from gutting fish to whittling to preparing plant

foods for cooking. These could all be common daily tasks performed by a variety of family members. The drills found scattered across the site indicate that now and then, wood, bone or antler tools needed perforations in them, perhaps for use as netting or weaving implements, or to make decorative objects to be sewn to one's clothing or to hang around the neck. About two dozen arrow points were found. Based on the 3% sample excavated from the site, this suggests that as many as 700 or so total points were discarded at Indian Crossing over its 800 years of use. Though this seems like a lot, it really only amounts to people leaving just one point a year behind at the site. The decrease in the number of points noted in the upper horizon does suggest that hunting-related tasks became less common at the site over time.

Finally, the raw stone materials themselves tell a story about communication and the interaction of groups across a wide part of the Northeast. It is fascinating that chert, most of which had a likely source in the Albany area, was the most common stone material used at the site. It is quite likely that this material was acquired through trade with neighboring groups, perhaps those who had access to the quarries themselves. The abundance of this material over such a long period attests to the fact that the source was consistent and secure enough for people to rely on quite heavily.



Perhaps trade was an important aspect of the social lives of these Algonquian peoples. Maintaining positive relations through regular trade contacts, and perhaps even during special occasions linked to shared regional ceremonies, would have prevented inter-personal conflict and perhaps even reduced the chance for inter-regional warfare. The reduction in the use of chert noted during the later occupation of the site may indicate that these social relations became stressed – though chert remained the

Archaeologists review computer logs of recently catalogued artifacts on site.

most abundant material used. Perhaps the slight change was simply an expression of the fact that families were somewhat less on the move as maize became increasingly important in the diet.

Analysis of the Features

Types and Functions of Features

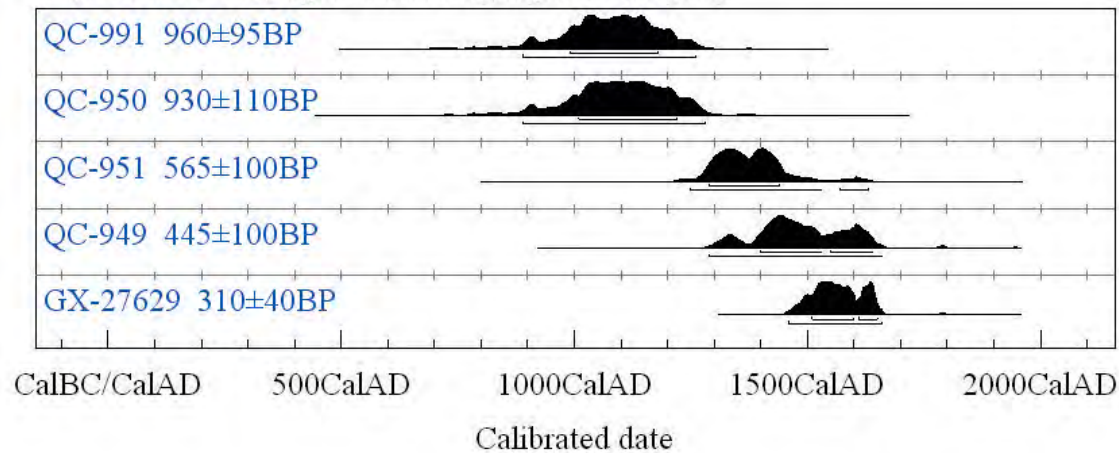
As discussed above, archaeologists use the term "feature" to describe finds that cannot be easily stored in a bag and returned to the laboratory. Features most often consist of soil stains caused by an enrichment of organic matter or the addition of charred material, such as wood charcoal from a cooking hearth. However, the term feature can also be used to describe an associated pattern of artifacts, such as a cache of stone tools, or a cluster of burned fire-cracked stone.

Over sixty features were documented at the Indian Crossing site. Feature designations started with "AA" and ended with "CI". About twenty of these were clearly human-produced. The others were later judged to be natural soil abnormalities. The archaeological features consist of soil stains, charcoal deposits, a raw material cache, post molds, fire hearths, storage and cooking pits, and a large stone pavement. Some of the most interesting and important features are discussed below.



Stone Pavement Feature "BR" at the Indian Crossing Site

Atmospheric data from Reimer et al (2004); OxCal v3.10 Bronk Ramsey (2005); cub r:5 sd:12 prob usp[cluon]



Radiocarbon dates associated with Feature "BR" at the Indian Crossing Site



An archaeologist exposing Feature "BR" at the Indian Crossing Site

Feature BR

A large circular stone pavement was found in the vicinity of units S51E51 and S51E53. The location was discovered on the bank immediately overlooking an abandoned channel of the Chicopee River. Thousands of stones were piled in a donut-shaped ring that was approximately two feet deep and four meters (twelve feet) in diameter. The offset interior of the ring (the "hole" in the donut) was bare sand. Excavation revealed that there were no stones in this open area, all of the way down to its base. No evidence of posts was observed in this interior "hole." The stones in the pavement were burned repeatedly, and a large amount of charcoal was found in

between them. The ring is believed to have been inside a circular shelter.

Radiocarbon analysis from the rich charcoal samples provided four dates. These dates were produced at a laboratory at Queen College in New York in 1980. The calibrated dates span a 500 year period between 1100 and 1600 AD, suggesting that the feature had been used on several occasions. In 2001 a fifth date was returned on a burned maize kernel also associated with this feature. At the time, Dr. Elizabeth Chilton of UMass Amherst was developing a database of maize dates throughout New England. Maize predating the arrival of Europeans was rare in New England, but she remembered some had been found at Indian Crossing. This date fell between about AD 1500 and 1650, during the time of the final use of the feature. This was one of just two maize fragments found at the site. The other was located only eight meters to the south.

The archaeologists interpreted the feature as the remains of a sweat lodge, but similar features in the Northeast were also used for roasting tubers, such as those derived from cattails. As a sweat lodge, the open area of the ring may have held a container or leather-lined pit with water to create steam by dropping heated stones into it. A large area of black, charcoal-rich soil was found just outside the stone ring. Though the black stain outside of the

possible sweat lodge had no stones, the charcoal concentration suggests that stones were heated there in a fire just outside of the lodge, after which they were brought inside for use. It is a complex feature, and the stone ring may have actually had multiple functions.

The location on the raised bank immediately overlooking the river channel places the lodge in an area where flooding scour may have removed overlying silt and sand periodically revealing the large stone pavement for use at a later time. Over time numerous layers of stone would have accumulated as the spot was reused. This would explain the different time periods indicated by the radiocarbon dates.

Feature AJ

Evidence of a round pit was found partly truncated (cut-off) by the plowzone. The pit was located in excavation units S79E50 and S80E50. The feature consisted of a large 60 by 40 cm charcoal stain, and a 10 by 10 cm cache of tightly concentrated whelk (*Buccinidae*) shells. The cache of whelk shells was likely contained in a small organic bag, although evidence of the bag itself was no longer visible. The shell consisted of the central columella (inner coil) of whelk, heaped parallel to each other. It is from this type of whelk that Native Americans made beads for wampum and other uses. Seventeen columellae were



The concentration of whelk columellae in Feature "AJ" at the Indian Crossing site.

found in the pit in the center of the charcoal stain. The shells were not burned and were probably added after the fire was extinguished. The shell fragments originated in salt water, and were probably acquired through trade. They may have come from Long Island Sound via the Connecticut River. A large chert scraper was found 3 cm above the deposit of shell.

Feature BK

This interesting feature is a cache of chert fragments to be used in stone tool making. It was found in excavation units S60E53 and S60E54. The material is probably Mount Independence chert derived from Vermont, and was likely obtained by the site's inhabitants through trade with other groups to the north. In all, 93 pieces of chert were found in the cache and were excavated carefully with a dental pick and



Archaeologists "shovel shave" Area A to expose post mold features.



The small storage pit feature "CH" found within the wigwam structure in Area A.

brush. Some pieces were cores, some were just small fragments, like a small retouch flake from tool manufacture. No charcoal was found above the cache, suggesting that the stones were not buried for heat treatment (heat treating was sometimes done to improve the workability of the stone). Archaeologists noted a dark stain below the artifacts. This feature is interpreted as a cache of chert raw material, stored for future use in stone tool making. The dark stain may be the remnants of the bag or soft container that once held the stones.



These whelk columellae from the "AJ" cache feature were probably purposely saved for later use for manufacturing wampum beads. Whoever hid them at the site never returned to reclaim them.

Area A – Feature CH

In the last days of the excavation of the Indian Crossing site, a backhoe was brought in to dig a trench across the entire site to allow the evaluation of its stratigraphy. During this operation, the backhoe removed the historic overburden

from one area in the west part of the site. This area, called Area A, was then skimmed with flat shovels to reveal a portion of a shelter or wigwam that may have been approximately 20 feet long by 10 feet wide. Postmolds were observed in an arc that represent saplings that once supported

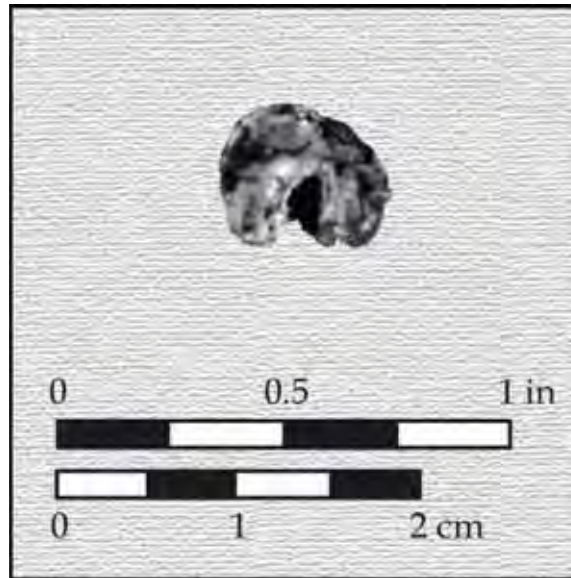
approximately one half of the wigwam structure. Several of the postmolds are located within the interpreted structure, and represent interior furniture and cooking supports. Feature CH is a pit that was dug into a living floor included within a ring of postmolds. The feature is a small storage pit located near the south wall of the wigwam. Three tiny postmolds are located to the east of Feature CH but their function is unclear. The interior of Feature CH consists of dark brown sediments that easily stood out from the surrounding light brown sandy silt around it. The storage pit extended from 73 to 93 cm below the ground surface.

Plant and Animal Remains

In New England, plant and animal remains are rarely preserved on archaeological sites. This is primarily because of the region's very acidic soils that tend to degrade organic matter very quickly. The exception is materials that have been burned, and thus partially mineralized. Both burned bone and plant matter can survive for thousands of years in the soil. Most such remains can only be found in and around features, such as cooking hearths where discarded materials were burned, either inadvertently or intentionally. For this reason, features are critical to the preservation of organic remains that can tell archaeologists about ancient food resources.

The whelk columellae from feature AJ were noted above. These objects may represent raw material rather than food, but in either case they assert a clear connection to the coastal waters of Long Island Sound. Other shell fragments were not uncommon, across the site, but most were too fragmentary to identify. The three exceptions are represented by two quahog (*Mercenaria*) fragments and an oyster shell (*Crassostrea*). These fragments more likely represent food remains, perhaps gathered down the Connecticut River in Long Island Sound, which raises the question how the shellfish were transported so far without going bad. Their presence suggests native people had ways of packing shellfish for transport so that it would not spoil. The lack of identifiable fresh water shellfish at the site is surprising. Fresh water mussels are more delicate than their salt water relatives, so it may simply be that their remains degraded more rapidly. However, if fresh water mussels had been a common aspect of the diet on the site, shell discard areas or "middens" should have developed. The high pH levels found in such shell concentrations would have likely preserved at least some specimens.

Over 150 animal bone fragments were recovered during the excavation of the site. Most were too fragmentary to identify specifically, so they were classed



A burned maize kernel associated with Feature BH at Indian Crossing. It was dated to 310 +/- 40 BP, or 1500-1650 AD.

simply as turtle, bird, small mammal, medium mammal, and large mammal. There are some differences in the identifications of animal classes between the main levels, eight and nine, at the site. The proportions of turtle and small mammal/bird are not significantly different, but those of medium and large mammal are. It turns out that many of the large mammal bones in the buried plowzone stratum eight include sawn fragments and cow ribs. These are clearly historic-era materials, perhaps scattered across Walnut Island as fertilizer when the land was being plowed. While large

mammal bone makes up nearly 50% of the animal bone from stratum eight, it comprises only about 15% of the underlying, clearly pre-European stratum nine. Medium-sized mammal remains are much less common in upper stratum eight than stratum nine, suggesting that small game was an important part of the Native diet when the site was occupied.

Only preliminary studies were conducted on the plant remains recovered from the flotation of soil samples taken from the site. Items identified included elderberry (*Sambucus*), raspberry (*Rubus*), choke cherry, possible sumac (*Rhus*), and possible hickory nut shell (*Carya*). Two maize kernels were found in addition to these wild edible plants. It is likely that the remaining soil samples still in storage at UMass Amherst contain many unexamined plant remains that may yet provide important information to the region's archaeologists.

What Archaeologists Learned from the Indian Crossing Site

Based on the types of stone tools and ceramics, as well as the radiocarbon dates, the Indian Crossing site was occupied on and off during an 800 year period between about 700 AD and 1500 AD. The site is stratified into two main horizons, both of which were buried by about three feet of primarily 20th century flood deposits. The upper horizon consisted of an old ground surface and buried topsoil or plowzone. The horizon beneath it was a lightly-weathered subsoil horizon. Both zones contained generally similar artifacts, but the oldest tool style (the late Middle Woodland Jacks' Reef points) were found in the lower horizon, while most Late Woodland shell-tempered pottery was found in the upper buried topsoil horizon. The five radiocarbon dates, though from a limited portion of the site, span a period of time between about 1080 and as late as 1570 AD. This period is important to archaeologists in New England because it spans the transition of a hunting and gathering way of life to one that included farming.

The site lies along the

Chicopee River at a location known to have been used as a river crossing. The mouth of the Chicopee is a crossroads between main north-south and east-west travel routes in the Central Valley. One of the site's main functions may have been simply to act as an important way-point – a convenient place for families to relax for a few days as they went about their seasonal movements between camps and hamlets. Even such



short-term occupations may be enough to explain the amount of stone tool-making debris left at the site. However, the abundance of simple flake tools at the site suggest that quite a bit of work went on there. This might have included gutting fish and small game, making bone and antler tools, and preparing food. Arrow points were also manufactured and repaired. This level of activity is suggestive of at least some longer-term occupations.

The relative abundance of pottery and presence of some large features also indicates that the site was sometimes occupied for longer periods, perhaps for full seasons. The 68 vessel lots identified in the relatively small portion of the site excavated suggest that over 2,000 pots may have been discarded at the site over time. If the site was used as a base camp for seasonal fish runs, it might have been a very busy location during the shad and salmon runs. Finally, the presence of a broken hoe and a few kernels of maize indicate that at least some farming

An archaeologist gently exposes the stone pavement Feature "BR".

occurred nearby, perhaps on the island itself. Even small-scale farming would have required a longer-term commitment to the site. Clearing ground, preparing the soil, planting, weeding, protecting the crop from animals, and harvesting required someone to be on-site nearly continuously between the spring and autumn.

It is difficult to estimate how many people used the site. First, site use likely varied seasonally and second, the use of the site probably changed somewhat over time. We can say that the site does not represent a large village or centralized community location occupied by hundreds of people at the same time throughout the year. While Indian Crossing produced many artifacts and features, village sites produce a wider array and greater number of each. In particular, one would expect to find a large communal refuse area associated with a village, and nothing like this was encountered at Indian Crossing. Instead, Indian Crossing appears to have been a location usually occupied for just weeks or months at a time by one or two small family groups. At other times, the site may have been used as a convenient place to camp for a night or two by a small hunting or fishing party.

The number of artifacts recovered from the upper and lower horizons at the site is remarkably similar. This suggests that the general intensity of site use did not



Archaeologists discuss excavation strategy with the crew in 1979.

vary much between about 700 and 1500 AD. A few notable things did change, however. First, we discussed the transition to an increased use of shell-tempered pottery between the lower and upper horizons. While this is part of a general Late Woodland trend, it indicates that locally, a greater emphasis was placed on pots manufactured for extended periods of cooking. This may have something to do with the increasing importance of maize in the diet over time because dried maize

kernels require hours of cooking to soften them. Second, the amount of raw material acquired through trade reduced significantly between the two horizons. This suggests that inter-regional trade had broken down somewhat either because of reduced mobility or because of conflict with western neighbors that limited the flow of raw materials to the east. Third, far fewer arrow points were recovered from the upper horizon, suggesting that the site was being

used less often as a hunting camp. It is not entirely clear what activities began to displace hunting at the site, but a reasonable hypothesis might be that fishing and gardening activities were becoming more common. The discovery of a hoe in the upper horizon provides anecdotal support of this. Finally, the maize kernel provides the latest radiocarbon date of site use and suggests that at least one family was actually farming on or very near the island in the 1500s, shortly before the arrival of the first European colonists to the area.

One of Ulrich's most important research questions during his initial investigation of Indian Crossing was whether or not the introduction of farming had a significant impact on the lives of people living in the Central Valley. This question has proven to be an important topic of discussion across much of the Northeast since that time. While it was generally assumed that the transition to a farming way of life would quickly result in the development of large, settled villages and more complex levels of political organization (like the existence of inherited positions of power) clear evidence of these changes are not observed in New England. At the time archaeological work elsewhere in the world suggested that such major social transformations were inevitable and were a direct outcome of the transition to a farming way of life. Since then some



UMass graduate students from the Geology Department helped evaluate the site's soils.

archaeologists have begun to rethink this important issue, and the data from New England are increasingly relevant to this discussion.

In the Near East, for example, better dating of sites has led to the conclusion that, in many cases, large, settled communities actually developed before the transition to farming. This suggests that many of the simple generalizations about this process

need to be re-evaluated. The case in New England now appears to be the opposite. Here, hunting and gathering people acquired maize from neighbors to the west and started planting it in small gardens by about 1000 AD. Maize probably became a somewhat more significant part of the diet about 1300 AD with the introduction of beans, but it remains extremely uncommon in the archaeological record until the time of

European contact. During this time, most sites in the region remain small and are best referred to as hamlets rather than villages.

The conclusion that must be drawn from the existing archaeological record is that the Algonquian people of southern New England used maize to supplement their hunting and gathering way of life. This foraging lifestyle was grounded in thousands of years of experience with the region's many natural resources. The strategy preferred by most Native New Englanders was to hold onto the freedom permitted by a mobile way of life in which one lived with one's closest family members in small communities. Unlike their Iroquois neighbors who lived in large well-defended palisaded villages, the Algonquian people appear to have valued their independence at the family level. Conflicts between individuals could be resolved by moving settlements, rather than by settling in and defending oneself. This is the core of the hypothesis presented by Elizabeth Chilton based on her model of "mobile farmers," and so far it seems to fit the data better than any other (Chilton 1999).

The materials from Indian Crossing support these new ideas about the effects of the introduction of farming on the Natives of southern New England. While the site spans the critical period of time during which this transition occurred, changes in site-use are relatively minor. Despite some



Waiting out the rain with the surveying theodolite.

subtle changes in raw material sources and pottery type, the degree and intensity of site use appears to have been relatively constant. Prior to the final excavations at the site Ulrich had hoped he would be able to discuss changes in site size, or the sizes of individual house structures over time. This was in keeping with the types of analyses performed elsewhere in the world, such as Mesoamerica and the Near East, that had examined the effects of farming on community organization. In the end, Indian Crossing could not provide this type of information. We now understand that this was in large part because such transformations simply did not occur in this region. Instead, archaeologists recovered a picture of a very traditional Algonquian way of life, one that held tightly to its values focused on small-scale community living, mobility and independence. When maize, and eventually beans became available to these groups, they developed farming strategies that allowed them to maintain a relationship with the land and to each other that was thousands of years old.

What one archaeologist learned about archaeology of the 1970s

Looking back over the details of a site excavated thirty years ago not only provides a chance to reinterpret its data, it offers an opportunity to look back at the history of the field of archaeology in New England. While archaeology at the Indian Crossing site of the late 1970s introduced a number of innovative technologies, methods and strategies that are commonly used today, changes in technology, historic preservation and environmental law, and the political landscape have made archaeology, particularly CRM archaeology, a more complicated endeavor. In addition to knowing and implementing the newest methods and latest research, archaeologists must be part “investigative reporter” when gathering information from surveys, part “planner” in helping engineers design less environmentally damaging projects, part “diplomat” in dealing with diverse and sometimes hostile groups, and part “educator” in conveying the results of their work to engineers, federal, state and local officials and an interested tax-paying public.

Nevertheless, as someone not involved in the site when it was first researched, my first impression going over the records was one of admiration for the archaeologists who had not only



A short break for the camera.

accomplished so much, but had achieved their goals in a rigorous, scientific manner. The thought behind the research questions for the initial investigation of sites along the proposed I-395 corridor, and how these were successfully carried through the

excavation of Indian Crossing remain impressive. The efforts of Paynter, Thorbahn and Ulrich truly mark a shift to a much more scientific approach by archaeologists in the region.

I continued to be impressed by many



Unpacking the field bag at the start of the day.

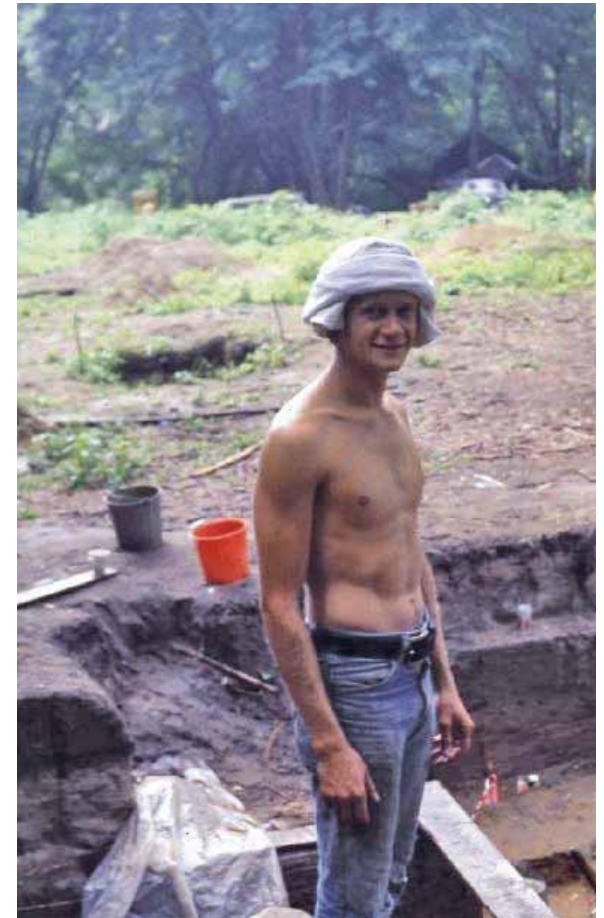
of the details of their approach as I moved further through the site records. Simple things, like the use of screens to sift all of the soil at the site are taken for granted now, but at the time, were not always used, especially during survey work. More significantly, however, the excavators applied a number of new methods to their work. Some of these are now standard

practice, others are less commonly used. Among these was the use of early ground-penetrating radar and magnetometry devices to locate buried features. It turns out the results were enigmatic, but use of such equipment marks a very early trend. Today, the use of ground penetrating radar and magnetometry systems are becoming increasingly common as these devices have become more sophisticated and sensitive.

The researchers also had a strong desire to study the ancient environment. They not only collected copious charcoal samples, but gathered soil samples specifically to search for pollen and phytolith remains and even hoped to find otoliths – the small ear bones of fish that can help identify species. Today such remains are not commonly analyzed from archaeological sites, but the pollen record, better preserved in nearby wetlands, is sometimes used, and the examination of tools for phytoliths, and increasingly starch residues, is again quite in vogue. Ulrich also invited a geologist to the site and had him prepare a detailed report regarding the formation of Walnut Island so that he could better understand the geological context of the site.

Another impressive aspect of the site excavation was the use of a surveying transit to very accurately measure not only the site grid, but many individual artifacts that were recovered. Today such “piece plotting” with

surveying instruments is not very common in the U.S. – instead archaeologists have found it easier to record artifact locations on detailed individual plans as they work. However, most archaeologists do use modern electronic “total stations” to lay out excavation areas and make site maps.



Some improvised protection from the sun.

In a similarly modern move, the archaeologists transferred their data to an early main-frame computer at the university. At the time, this meant having information entered onto punched cards to be fed into a reader. Luckily, this data was later transferred to a floppy disk so that I could import it into modern database software that permitted much of the analysis presented above. This early use of computer technology was well ahead of its time and meant that the data remained very accessible over the years, despite some changes in storage format.

Overall, I am convinced that the observations made at the Indian Crossing Site had a very strong influence on the direction taken by archaeologists in southern New England, and especially at the University of Massachusetts, Amherst. Dr. Dena Dincauze, UMass Professor Emeritus and the unspoken mother of New England archaeology, knew quite a bit about Indian Crossing, especially after she had students do a series of analyses on the pottery found there in the late 1980s. In a short summary of their work, she notes the diversity of ceramic stylistic traits and difficulty in applying regional typological schemes to clearly sort or date them. While similar observations had been made regarding the large collection from the Guida Farm site, the material from Indian Crossing appears to have anchored this perspective. I believe

Dena Dincauze's view had a strong influence on one of her students in particular, Elizabeth Chilton, now chair of the Anthropology Department at UMass. Chilton's own dissertation, written in 1996, emphasizes the same issues regarding ceramic diversity in the region. The model of mobile farmers of the Late Woodland period she has developed over the last decade is based largely on these observations.

Finally, I was very impressed by the dedication of the crew and their hard work throughout the summer and fall of 1979. Based on the field records it is clear that many individuals rarely left the site during the four months of work. Most people camped out on the island during the week, preparing their own food and putting up with the heat and insects. Some people even maintained a presence over the weekends to keep the site safe from looters, and continued working! Their dedication to the site is humbling. Today, some university field schools still camp on site, but most



Sheltering from the rain - good spirits despite bad weather.

archaeologists working as cultural resource management specialists are put up in nearby hotels and provided a per diem for meals out. They still deal with the heat and insects, but in many ways their lives have become easier as the profession has matured. In sum, the work at Indian Crossing really represents one of the first modern excavations in Southern New England. Paynter, Thorbahn and Ulrich set a high bar at the time, but it is one that has been maintained ever since.

– Brian Jones, UMass Amherst, July 2010

Glossary of Key Words

Archaic Period: The period between 10,800 to 3250 years ago during which Native Americans pursued a foraging way of life as the environment warmed after the Ice Age.

Artifact: Any object used or manufactured by a human in the past.

Biface: A stone tool that is worked across both surfaces, such as a knife or spear point.

Billet: A hammer used to strike stone when making stone tools, usually made from antler.

Cache: A purposefully buried or hidden collection of artifacts, most often stone tools or raw materials.

Cordage: String manufactured by hand by twisting fibrous plant strands, such as those from dogbane or milkweed.

Core: A large piece of raw stone material struck with a hammer to produce flakes.

Cultural Resource Management: Archaeology undertaken prior to construction to prevent the destruction of archaeological sites.

Feature: An archaeological find that can be mapped, but is not an object, such as the remains of cooking or storage pits

Flake tool: A simple tool manufactured from a flake struck from a stone core, such as utilized and retouched flakes and scrapers.

Flotation: A method using water-screening to recover very small plant and animal remains from soil samples.

Forager: A person whose daily foods consists of wild resources, a hunter-fisher-gatherer.

Glacial Lake Hitchcock: A vast glacial lake filling the Connecticut River Valley from Rocky Hill, Connecticut to St. Johnsbury, Vermont.

Ground-penetrating radar: A device, usually dragged on a sled, that sends radar pulses into the earth to detect changes in soil density, usually used to locate buried features.

Ox-bow: A river meander that loops back on itself often forming a pond and wetland area rich in plant foods and game.

Paleoindian Period: The period between 12,900 and 10,800 years ago during which Native Americans were adapted to living in cold, late-glacial conditions.

Temper: An additive to clay used to make pots more durable.

Three Sisters: The most important three plants farmed by Late Woodland Period Native Americans: maize, beans and squash.

Uniface: A stone tool that is worked across only one surface, usually simple scraping and cutting tools.

Wampum: Shell beads produced from quahog and whelk that were used by Northeastern Native Americans to signify important social relationships between individuals and groups.

Woodland Period: The period between 3250 and 300 years ago during which pottery was first manufactured and gardening developed.

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