Recent Testing at the Kings Jasper Quarry, Lehigh County, Pennsylvania

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Abstract

The King's Quarry Site (36LH2), located in the Reading Prong region of eastern Pennsylvania, is one of six remaining jasper quarries mapped by the late James Hatch and reported in 1994. A housing development has been proposed for this site and the Commonwealth Archaeology Program conducted archaeological testing at this site over a three week period during the spring of 2003. These investigations included controlled surface collections and developing profiles of prehistorically excavated quarry pits in what appeared to be the most intensively mined area of the site. Several charcoal samples were collected from the profile which documented a prehistoric excavation over eight meters deep. A Paleoindian fluted preform along with other typical Paleoindian tools were recovered from the perimeter of the quarry pit. This talk will present the initial results of the investigation and will focus on describing the profile and the activities of the prehistoric miners.

Introduction

SLIDE 1

The following presentation describes a project conducted by the Pennsylvania Historical and Museum Commission's Bureau for Historic Preservation in the spring of 2003. The work was conducted at King's Quarry (36LH2), a prehistoric jasper quarry in Lehigh County, Pennsylvania. Also known as Weider Farm, this site is one of six remaining jasper quarries first reported by Henry Mercer in the 1890's and later mapped by the late James Hatch and reported in 1993. A housing development has been proposed for this site and we conducted limited testing over a discontinuous four-week period —that is, periods of work alternating with monsoon-like rains. The investigations included controlled surface collections and developing profiles of quarry pits in what appeared to be the most intensively mined area of the site. This presentation will present the initial results of the investigation and will focus on describing the profile and the activities of the prehistoric miners.

Jasper is a siliceous, iron-rich cryptocrystalline material that was widely used in the Middle Atlantic area. It was especially common during **(slide 2)** Paleoindian times with 25% of all fluted points in Pennsylvania being made in jasper but, it was probably most often used in the production of **(slide 3)** broadspears during the Terminal Archaic. Many of the most significant sources are in and **(slide 4)** adjacent to the Ridge and Valley section such as: the Houserville quarries in Centre County, Pennsylvania, the Hardyston formation quarries of eastern Pennsylvania—which is our focus here—and the Flint Run quarries of the well known Thunderbird complex in the Great Valley of Virginia.

The jaspers of eastern Pennsylvania are located in the Reading Prong section of the New England Province. Geologically, the region is characterized by sedimentary and metamorphic formations of Ordovician, Cambrian and Precambrian age. The jasper is associated with the Hardyston formation which mainly consists of sandstone and quartzites. As with the Flint Run jasper of Virginia (Fanale 1974), the jasper in the Hardyston formation at <u>King's Quarry</u> developed near the contact with adjacent Ordovician limestone formations. However, based on recent investigations by Frank Vento at the Kings Quarry, the origin of the jasper may be related to adjacent schist formations rather than the limestone formations.

(slide 5) In 1891 and 1892, Henry Mercer (1894) conducted the initial investigations of the Hardyston formation and documented 10 quarries. He focused his work on the largest quarries which were located near the communities of Vera Cruz and Macungie in Lehigh County. Here, he found these sites littered with layers of jasper flakes and pock-marked with 60 to over 100 prehistoric mining pits over areas of six to ten acres. He and some of his informants tested some of these to depths in excess of 30 feet and concluded that the prehistoric miners first removed jasper in near-surface context and then, as needed, began to dig deeper, gradually enlarging the excavations outward and downward. Notice the sloping layers of jasper flakes. One of his informants reported putting shafts to 40 feet in a crater with a 100-foot diameter. Mercer's mapping and publications introduced these sites into the archaeological literature and represented the major work on the quarries for nearly a century.

Recently, the most significant research has been conducted by Anthony and Roberts in 1988 and James Hatch and his associates during the 1980's and 90's. Anthony and Roberts conducted significant and extensive research in the region in advance of the I-78 highway project. An end product of this project was the development of the Hardyston Jasper Prehistoric Archaeological District. **(slide 6)** The District includes both quarry and non-quarry sites and is identified by sites with predominantly jasper artifacts. Anthony and Roberts (1988) tested numerous workshop sites but none of the actual quarries.

(slide 7) Jim Hatch conducted significant research during the 1980's and 1990's and this slide shows the study area with the jasper quarries depicted. Hatch was concerned with documenting how the quarries were used, the distribution of the mined jasper, and developing sourcing signatures. He mapped six of these quarries in detail: Vera Cruz, Mast Farm, King's, Urffer' Farm, Lyons and Longswamp. He could not map Macungie, Leinbach's Mills, Frankenfield or Durham due to 20th century development. He conducted limited controlled surface collections at Vera Cruz, Lyons and Kings quarries and, at Vera Cruz, he also hand-excavated quarry pits and developed deep backhoe profiles.

(slide 8) Based on this work, Hatch (1993) developed a model for how the quarries were used. First, he identified two types of reduction sequences at the quarries; one produced prismatic blades—and was rare—and the other— which was by far the most common—focused on the production of bifacial cores and performs. He then identified four types of flakes or byproducts that were the result of bifacial reduction: primary trimming flakes, crude biface trimming flakes, preform biface trimming flakes and fine biface trimming flakes. To a large extent, his reduction sequence was similar to that developed by Erritt Callahan (1979) **(slide 9).**

Hatch used these artifact types to identify two types of activity areas at the quarry sites. He found that both rough bifaces and later preforms were produced on site, but in most cases the two stages were made at two different locations. The actual quarry showed a high frequency of primary trimming flakes and crude biface trimming flakes while a second area, the workshop, contained fine biface trimming flakes and intermediate and final preforms. Hatch and Miller also hypothesized that the material was regularly heat treated. Noting red flakes and fire features, they found that (1985:226) the late stage flakes were more frequently heat treated than flakes resulting from earlier stage reduction.

Based on this analysis, Hatch developed a model for the evolution and use of quarries (1993). To this end, he proposed a three-stage use and three types of quarries. Class I quarries consist of working only the surface material. Primary and final flakes would be found all over the site. Essentially the natives would completely work a nodule wherever it was found and, as a result, all types of debitage would be found across the site. Class II quarries would involve digging shallow pits. This category would begin to develop distinctive activity areas that separated the early stage quarry material from the later stage workshop areas. Based on his surface sampling of King's quarry, Hatch believed that this site was a Class II quarry. **(slide 10)** Class III quarries involved the digging of very deep pits through previous back dirt which created filled, nested and intersecting craters. His example of a class III quarry was the Vera Cruz site where he documented pits that were over 10 feet deep. **(slide 11)** Based on the waste material from these quarries, it appeared that a considerable amount of time was spent examining and testing, and throwing away the inferior material. And, obviously, each class of quarry would involve an increasing amount of labor on the part of the miners.

King's Quarry is located about four miles southeast of the Vera Cruz/Macungie area along the upper reaches of Saucon Creek, a swampy low order stream adjacent to the site. The area mapped by Hatch consists of a two-acre grove of trees with quarry pits and an adjacent two-acre field to the south of the grove. The grove contains approximately 25 pits. A very wet area exists at the south end of the site, and water almost constantly flows in a drainage ditch to the west and south; so obviously, there may have been a spring here before modern road and drainage alterations.

(slide 12) Hatch (1993) mapped the site and conducted limited controlled surface collections but no excavation. He collected over 2300 artifacts and characterized them as resulting mainly from quarrying rather than workshop activities. He predicted, instead, that the main workshop was located in nearby fields.

Considering Hatch's previous testing at this site, and his profile at Vera Cruz, we were most concerned with recovering a representative sample of artifacts to show the horizontal variation at this site and to identify the nature of the quarry pits. Although the grove of trees was covered with small pits, the situation was similar to Vera Cruz where these pits were underlain by very large and deep quarry pits. Therefore, our testing at this site consisted of, first, a controlled surface collection from a 5% sample of micro-topographic zones within the plowed field and **(slide 13) ,** second, a series of backhoe cuts to explore and document the quarry pit profiles.

(slide 14) The first backhoe profile was dug through the grove of trees to a depth of five to eight feet. Due to the density and girth of the trees, it was difficult for the machine to maneuver and impossible to create a safe, stepped excavation to any depth. Although in some places, it was difficult to determine, it is unlikely that undisturbed soils were reached anywhere in this profile. **(slide 15)** So, it would appear that the area we tested within the grove of trees had been almost completely excavated and the visible pits were, in fact, later excavations, possibly an attempt to scavenge large jasper flakes left behind by earlier miners **(slide 16).**

(slide 17) The second profile was conducted just outside and south of the grove of trees where a large circular depression approximately 80 feet across was observed in the open field. The depression was barley discernable and was less that 18 inches deeper that the surrounding topography. Our first attempts to test this area were with a small exploratory trench which indicated well developed soil with flaking debris to 8.5 feet, followed by a zone of mixed clays and jasper primary debitage that was still going down at 12.5 feet. **(slide 18)** The only solution was to excavate a massive step-block after our surface collections were done. In this block trench, excavation was mechanically stepped down at four-foot intervals and it reached a maximum depth of 23 feet to the bottom of the deepest part of the pit.

In general the profile seems to reflect the same activities as those documented by Hatch at Vera Cruz, but deeper. This depth was difficult to manage. Due to rain and collapsing walls and the fact that the entire profile was stepped, the profile was difficult to depict, and the final version has yet to be completed. **(slide 19)** From eight to ten feet below the surface, there was a relatively uniform soil which seems to represent the recent historic backfilling of a pit or series of pits. **(slide 20)** Below ten feet, there are a series of distinct but discontinuous layers and deposits seemingly representing a series of excavated pit features and backfilling episodes. **(slide 21)** The east wall encountered saprolite at 10 feet below the surface and **(slide 22)** there is an obvious five foot deep pit into the saprolite. **(slide 23)** On the west wall, there were several sloping layers of jasper flakes and broken jasper blocks probably resulting from the reduction of large pieces. **(slide 24)** It is assumed that these layers of flakes represent surfaces which were open for some time. Mercer's profile also seems to document these flake layers. The identification of what Hatch defined as "nested pits" demonstrates that there were deep excavations through previously excavated pits. Also as stated by Hatch (1993:24), this suggests the "blind search" for usable lithic material.

The bottom of our excavation trench cut through two pits which extended approximately 11 feet below the upper backfill event or 23 feet below the surface and these pits were separated by undisturbed saprolite. **(slide 25)** One of these pits was partially filled with thin layers that appeared to be alluvial deposits, that is, water **(slide 26)** deposited silts and sands from the surrounding slopes that ponded until the hole drained. The sides of these pits were relatively steep, on the order of 60 degrees. On the south and east edge of our profile, we exposed saprolite near the surface and we assume that we were at or near the edge of the quarry pit. **(slide 27)** The north wall leading into the grove of trees encountered saprolite at a depth of 14 feet so either the pits in the grove are not as deep or there is an undisturbed bulkhead between the two quarrying areas. The west wall has all been disturbed by quarrying and the large pit extends to the west for an unknown distance. As shown by the wash deposits, we assume that some of the pit was backfilled through natural processes but humans digging adjacent pits also contributed to the backfill. **(slide 28)** A heavy, 10-inch long, shovel shaped and soil-polished piece of diabase which we think was a digging implement, was uncovered from the pit.

We were able to collect 4 radiocarbon samples **(slide 29)** and they were all from definable strata just inside the outer margin of the Indian quarry pit **(slide 30)**. We expected that the maximum size of the quarry pit would correlate to the maximum use of jasper in the region which we assume to occur during the Transitional Archaic or Transitional Broadspear time. There after the steep sided quarry pit would have naturally filled through colluvial processes. As you can see the dates near the quarry pit edge fall between AD 66 and AD669 and are Middle Woodland in age. This means that the maximum size of the pit was reached prior to the Middle Woodland conceivably during the Early Woodland; although we are reasonably confident that the deepest pit, the one filled with alluvial lenses, was dug during the Middle Woodland period.

(slide 31) Within the field next to the wooded quarry-pit area, and adjacent to the larger, unforested crater, was a small topographic rise about 60 by 80 feet across. This area, which was extremely dense in lithic materials, produced a collection of Paleoindian tools which I will discuss shortly. After the open field was re-plowed and rain-washed, the area where these particular surface finds had been recovered was then gridded into 10-foot squares and collected entirely. Following this collection, the remainder of the newly plowed field was divided into 10-foot squares within micro-topographic zones, and a stratified 5-pecent random sample of each of them was obtained. This should prove interesting to analyze, as there appeared to be spatial differences in types of debitage, and in quality and coloration of material, across the greater plowed area.

One of the most interesting aspects of the controlled surface collection assemblage is the range of colors and textures (**slide 32)**. Without going into the details or getting on my soap box, these could easily be confused with materials from other quarries. This variation in this one source demonstrates the need for more lithic sourcing studies such as those conducted by Hatch and Miller (1985) or King and Hatch (1997). **(slide 33)**The black variety could easily be mistaken for cherts of the Ridge and Valley Province and the green (**slide 34)** could be attributed to the Coxsackie quarries of eastern New York. Red was present, although, not overly common and most showed thermal alteration rather than the original natural color. But, certainly, the variety found at this site has implications for sourcing studies, and identifications of so-called "exotic" materials in local assemblages. In addition, the extreme range of variation from this one source further frustrates attempts to confidently define materials through casual visual examination only.

As expected, the overall artifact density from the controlled surface was very high. Based on a cursory inspection of the collection, the two most common artifact types **(slide 35)** were blocky fragments **(slide 36)** and fragments of large "primary flakes" **(slide 37).** Some of this was of poor quality and much had some cortex. We found a few very large blocks of poor quality jasper, approximately three feet in diameter. We assume the good quality material was found in similar-sized blocks and these pieces represent the initial working to remove poor quality material prior to transport. **(slide 38)** Flakes with thick bulbs of percussion, no cortex and few dorsal flake scars were also common and we assume these were from direct hammerstone blows used in preparing large bifacial cores for tool preforms. **(slide 39)** Hammerstones of all sizes were common, although they were all generally smaller than a softball. Granitic and diabase rock hammerstones were the most common lithic types, although there are some jasper examples as well. **(slide 40)** Bipolar cores (or wedges) were also present

(slide 41) Bifaces and biface fragments were not particularly common, although the total range from **(slide 42)** Callahan's early stage biface to nearly **(slide 43)** complete projectile points were recovered. **(slide 44)** Biface thinning flakes from the production of preforms seem to be rare. **(slide 45)** This was one of the horizontal artifact patterns that we suspect is present. In our cursory examination of the bags, many did not contain any biface thinning flakes but some contained twenty or more. One of these units also contained a broken Lehigh broadspear suggesting that this piece was being made on site **(slide 46)**. Distinct workshop areas, characterized by intermediate and late stage biface production may be present.

The site has been heavily collected and diagnostic projectile points were relatively rare. **(slide 47)**. Considering the size of the site, we assume it has been used throughout prehistory and one indication of its antiquity was the recovery of a broken fluted biface, that we assume represents a Paleoindian occupation. **(slide 48)** The fluted biface **(slide 49)** is very similar to those excavated from Clovis chipping clusters at the Thunderbird site adjacent to the Flint Run jasper quarries. In the vicinity of this piece, we also found eight extensively retouched flake tools including an end scraper, and this slide **(slide 50)** shows some of these flake tools. These pieces cover an area approximately 60 by 80 feet across and they seem to represent a small Clovis visit to the quarry. Testing showed the plowzone is immediately underlain by a thin but well developed, B horizon, followed by the undisturbed C horizon. It does not appear that this spot was ever quarried. The amazing aspect is that this occupation is on the edge of the large quarry pit and in 11,000 years of quarry activity, no one ever tested this spot and yet there was a 23 foot deep hole just next to it.

In conclusion, as documented by Mercer and Hatch, the Reading Prong jasper quarries are more complex than they initially appear. For some distance around the grove of trees, the King's quarry is underlain by very deep quarry pits. These deep pits represent the initial recovery of lithic raw material. This activity eventually resulted in 20 to 30 foot deep quarry pits and these were backfilled by both natural and cultural activity. Finally, the surface of these backfilled areas was re-mined in a desperate search for material that was found unsuitable by the original miners. Hatch proposed a three stage process for the evolution of the Reading Prong quarries; Class I - working the existing surface material, Class II digging shallow pits, and Class III - digging very deep pits through previous back dirt creating filled, nested and intersecting craters. We would suggest, his Class II quarries represent the re-mining of the backfill areas. This is represented by the current pits across these sites.

Jasper from this quarry has been used since Paleoindian times. **(slide 51)** We assume that Paleoindian peoples created Stage I quarries and essentially mined jasper from surfacial deposits. Their mining activity was obliterated by subsequent Archaic **(slide 52)** mining. However, the Paleoindian activity area was on the edge of the quarry and amazingly, preserved. (**slide 53)** Throughout the Archaic period they began to create Stage II quarries by digging ever deeper quarry pits. We assume the (**slide 54)** Transitional period and the production of broadspears was the most intensive use of jasper. After Transitional times **(slide 55),** alluvial and colluvial processes were more rapid than human excavation processes and the pits began to backfill by both natural and cultural processes. The current set **(slide 56)** of pits in the wooded area's surface, probably represent Late Woodland re-mining of disturbed soils. The material in this backfill area is generally small (fist sized) but more than sufficient for Late Woodland expedient tool technologies **(slide 57).**

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