CHERT AVAILABILITY AND ABORIGINAL UTILIZATION IN WEST CENTRAL ILLINOIS - A GEOGRAPHIC OVERVIEW

by

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ABSTRACT

Locations and descriptions of cherts and chert sources known to be aboriginally relevant are coupled with a comprehensive regional summary of their potential availability in a large segment of west central Illinois. The distribution and quality of Burlington and Keokuk Limestone cherts are the primary foci of this effort, as they supplied the major aboriginal needs for chipped stone in the area. Until now, commonly held notions of Burlington chert availability in the area have been both restricted in regional scope and limited in qualitative understanding. Although the one well known Burlington chert source (the Avon source) is a more heavily used and higher quality chert than often thought, its importance for the area outside of the Spoon River Drainage and adjacent central Illinois River Valley has been overestimated. Locally available cherts present in the other drainages of this area greatly diminish the probable importance of the Avon source for the region as a whole.

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INTRODUCTION

This study will in general restrict itself to that portion of Illinois bounded on the west and east by the Mississippi and Illinois Rivers, respectively; on the south by 40 degrees north, and on the north by just above 41 degrees north latitude. Although this is a semi-artificially circumscribed zone, it nevertheless lends itself very well to the study of prehistoric chert utilization in west central Illinois. The primary chert bearing strata present are the limestones of the Mississippian System which also appear to have supplied the major portion of prehistorically utilized chert for this study area. South of approximately 39 degrees 45 minutes north latitude, outcrops containing high quality chert become ubiquitous in western Illinois, while north of 41 degrees north latitude only a very few Mississippian System outcrops are present (although some other chert bearing strata of lesser importance are present). Since chert bearing limestones outcrop only within limited, readily defined zones in the study area, identifying the various outcrop zones, along with the grades and characteristics of associated chert, and discussing what is known of prehistoric utilization is a manageable task which stands to contribute much to our understanding of the area's archaeology.

Before proceeding it is necessary to discuss a few key concepts. The most important concept in a study of chert resources is the differentiation between chert availability and utilization. Essentially, this means that the simple demonstration of the availability of a chert source does not testify to its prehistoric use. This distinction is especially necessary since the most logical and efficient method of studying chert requires a thorough understanding of the geological literature (i.e. knowing what the chert resource possibilities are). Comprehensive arcnaeological survey of an area large enough to reliably identify all relevant sources of archaeological chert procurement would be very expensive. Likewise, unless availability is quite limited, visiting all potential locations of procurement for evidence of utilization is also not likely to be possible. Thus, lacking comprehensive information of utilization and given an area in which the resource potential can to a large degree be identified, it is best to depend upon those inferences which can be drawn from a combination of geological availability, field inspections and available archaeological information. For this reason the distinction between availablity and utilization is necessary.

Other archaeologists wishing to make this distinction have developed formal use of the terms "archaeological chert type," "geological chert type," "archaeological source area," and "geological source area". Understanding the

underlying concepts for these terms is important to a chert resource study, since almost any such study with an articulation to the geological literature and a region's archaeology will have examples of archaeologically known chert not definitely linked to a geological source and/or chert known to be available, but not known to have archaeological relevance. For a more in-depth discussion of these concepts, the reader is referred to May (1979:1-4). Suffice it here to say that archaeological chert type and archaeological source area refer to chert and sources of chert actually used in prehistory, while geological chert type and geological source area are applied to chert and chert sources known through non-archaeological means (literature or field inspection of outcrops) with no implications of prehistoric use or non-use. These distinctions are necessary to adequately insulate use of the geological literature and to allow for continued controlled use of "chert types" in archaeological discussion.

With these distinctions in mind, we may safely embark on a discussion of chert availability and prehistoric use in the study area. The data base is, of course, partly archaeological and partly geological. Data available for actual prehistoric utilization is discussed below on a "source by source" basis which is then followed by presentation of a geological framework within which to view the significance of those procurement sites presently known

(i.e. not only what they are geologically, but also the potential for other similar procurement locations). The most expedient means of viewing the availability of this resource in an area of limited occurrence such as this part of west central Illinois, will be in terms of "potential outcrop zones" (P.O.Z.). It is possible to delimit these outcrop zones due to the fairly simple interaction between the generally obscured bedrock and the present surface which characterizes this region. Use of the concept of potential outcrop zones and the information found in geological literature will allow us to determine how little is known about sources of archaeological chert. Lastly, what is known of minor archaeological chert types from the area will be discussed.

KNOWN PROCUREMENT IN WEST CENTRAL ILLINOIS

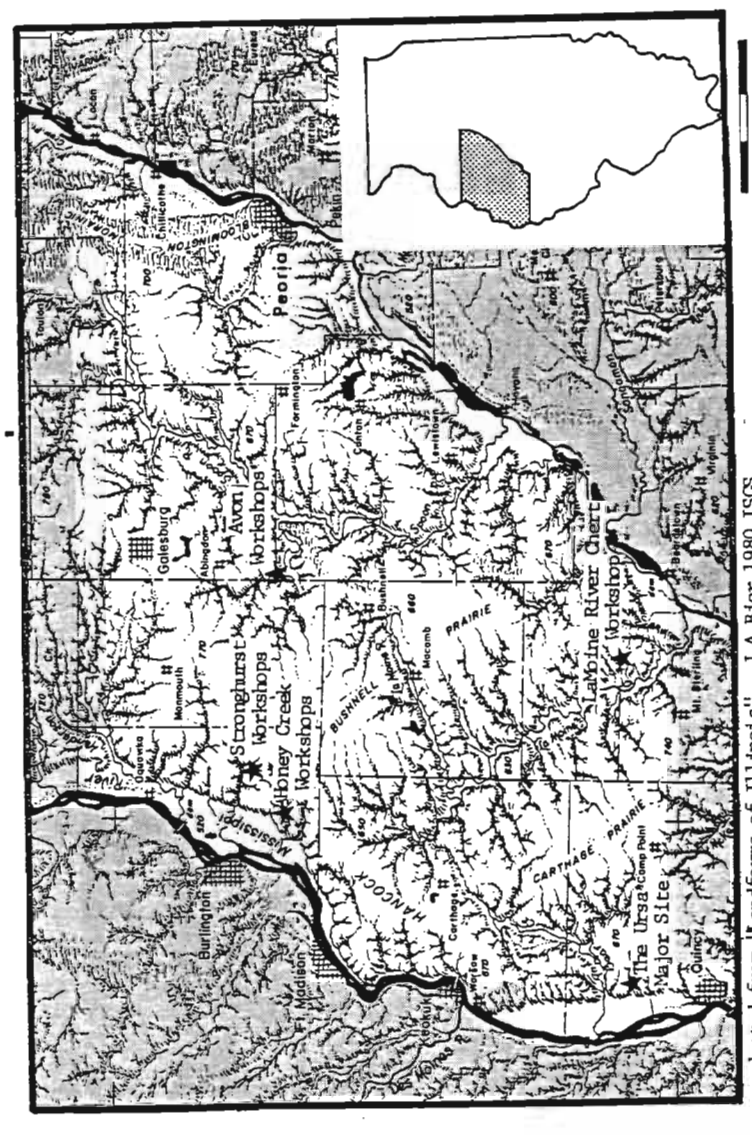
Discussion

Characterizations of local chert availability in west central Illinois to date have been subject to vast oversimplification. This is so not only because portions of the area have remained essentially archaeologically "terra incognito" until recently (or are still so), but because a willingness of archaeologists studying the area to accept locational and descriptive data of an anecdotal casualness has existed. There has been a decided tendency among archaeologists to accept a "common knowledge" evaluation of a specific archaeological or geological chert type's availability, quality and appearance. Perhaps the best case illustrating these points is previous archaeological discussion of the Avon source. These outcrops are located along Cedar Creek in the northwest part of the upper Spoon River Drainage. To date nearly all archaeological specimens in west central Illinois resembling the chert from this source have been designated as Avon Chert.

Not only has the Avon source been the only Burlington chert outcrop location in west central Illinois north of Pike County discussed in the archaeological literature as a source for aboriginal chert, but it also has been subject to much error and oversimplification with regards to both archaeological and geological details. Although Avon Chert

was probably of considerable regional importance in the areas to its south and east, it is not likely that it was of any significance in that part of west central Illinois on the Mississippi Slope. Similarly, the proximity of the Mississippi sources and the presence of other chert sources (albeit generally inferior) in the LaMoine River Drainage probably severely limited the importance of Avon Chert in the core of the study area.

The chert sources to be discussed below are not of a single type of archaeological phenomenon. Knowledge of prehistoric procurement activities varies for each given area so that some are known only as a single site whereas others are known as groups of sites or even "quarry districts". The use of the term quarry in this region is a convenient misnomer for a procurement location. In general, the available cherts are present in bedrock exposures and associated streambeds. Little, if any, actual quarrying such as occurred at the Crescent Quarries (e.g. Ives 1975) likely occurred in west central Illinois; it is hard to imagine that anyone would waste much time and energy excavating for chert or working a bedrock exposure when large pieces of the desired chert were lying all around in the streambeds. Most chert in this area is likely to have been procured from such contexts. Meyers (1970:34) and Birmingham and VanDyke (1981:355) have come to similar conclusions in studies of chert resources to the immediate



adapted from "Landforms of Illinois", J.A.Bier 1980 ISGS

Figure 1

The Study Area and Known Aboriginal Chert Procurement Locations

south and north of the study area. The locations of known archaeological source areas are presented in Figure 1, and are described below.

Avon Outcrops and Associated Workshops.

Although the Avon source area has been visited at various times by archaeologists, no true understanding of its utilization has been developed in the literature. In addition, recent work has done much to distort the picture of Avon Chert utilization. Harn (1971:3) initially stated that 95% of chert used (by the Late Woodland and Mississippian occupations) at Dickson Mounds came from the Avon quarries, and states that "an abundance of fairly high grade chert is available at this quarry which appears to have been worked extensively." In Harn (1980:4) this estimate of usage has been revised to 92%. Cantwell (1980:20), however, references Harn (1980) as saying Avon Chert supplied 94% of the Mississippian period chert utilized at Dickson Mounds and that Avon Chert is coarsely crystalline and very fossiliferous. Likewise, she references Savage (1921:14-15) as saying "outcrops of Burlington Limestone. . . occur along Swan and Cedar creeks," and that the chert is coarsely crystalline and very fossiliferous. Specifically, she cites outcrops in which, "The Burlington formation, of the Osage group, is found in layers from three to seven inches thick on the west bank of Cedar Creek and three to nine inches on the east bank and

along Swan Creek." She also unequivocally states "the flawed fossiliferous Avon Chert with its unpredictable fracture planes was not. . . practical for producing lamellar flake artifacts. . . ".

There are a number of major problems with Cantwell's research. First, the outcrops discussed by Savage are in Sections 31 and 30 of Indian Point Township (T9N, R1E) in Cedar Creek and a small unnamed tributary. No mention of Swan Creek is made. Second, the actual thickness of the Burlington Limestone for the described outcrops is eleven and eight feet, respectively; it is the chert layers which are present in three to seven and three to nine inch thicknesses. Third, Savage makes no evaluation of chert quality. Cantwell's error in this case may stem from Savage's Plate I where the legend for the Burlington Limestone says, "cherty, coarsely crystalline, crinoidal limestone". This is a description of the limestone, not the chert. Cantwell goes on to say without documentation that the Avon Chert is heavily flawed by the stresses of glacial activity. Last, although the chert type frequencies at Camp and Pond may be as Cantwell describes, a character assassination of Avon Chert is not necessary to explain them. The distance (72 kilometers) to the area between Naples and Meredosia (where Burlington chert first becomes available when going downstream) is not much further away from Camp and Pond than the Avon outcrop area (55

kilometers). The ease of travel (in both physical and cultural terms) in the former direction easily makes Avon Chert no better return for the procurement effort than lower Illinois Valley Burlington chert (which is in the author's opinion of little better quality). Middle Woodland period use of the Avon source is documented by the presence of a Manker point and several Havana Ware sherds at one workshop location, where much more material was reported to have been present prior to bulldozer work. On a visit to this location the author recovered a polyhedral blade core and observed several flake blades. Several other Snyders-like and Dickson-like points were reportedly found in this location as well. As Avon Chert was not unsuitable for the manufacture of the numerous finely made, parallel flaked, Early Archaic projectile points found at these workshops, it was hardly unsuitable for Middle Woodland period technology either.

Savage (1921:14-15 and Plate 1) documents three outcrops of Burlington Limestone (in Sections 30 and 31 of Indian Point Township). H.A. Green (1870b:292) documents another small Burlington outcrop just over one mile upstream from the northernmost of these three (just outside Savage's Avon Quadrangle). Inspection of the gravel bars of the stream bed in the area of Savage's outcrops has indicated that large pieces of very workable chert are readily available.

Chert collections and associated notes from the Avon source inspected at the Dickson Mounds Branch of the Illinois State Museum have shed light on some of the problems which have been associated with understanding Avon as a chert source area. A visit to the area by Gary VanDyke in March 1966 yielded a small (about 10 lbs.) collection of chert from "lowland on the east bank of Cedar Creek, SE quarter of the SW quarter of Section 30, T9N, R1W". This collection is dominated by a disproportionate amount of bluish tinted and coarse chert. This location subsequently became known to local researchers as the "Avon quarry", but no apparent effort was made to support a delimitation of these workshop deposits by investigating for "negative evidence" (which admittedly would have been hard to find.)

Another visit to the Avon source area for the Illinois State Museum was made in August 1973 by a group consisting of T. Gephart, T. Powell, D. Roper and J. Stephens. They visited what they designated "a secondary quarry one quarter mile east of the Avon quarry" and collected a large amount (50 to 75 lbs.) of unworked, cortex-covered chert, which apparently was directly from geological context since no workmanship was noted. Also collected at this time and location were samples from "the workshop above the creek bank and quarry". This collection consisted of about 30 pounds of workshop debris. Although this collection would probably constitute a good sample of the range of

aboriginally acceptable chert from the Avon source, it was still unwashed when inspected. It appears that most of the commonly held concepts regarding the Avon source were derived from these visits. More recent investigators (e.g. Moore and Burge 1981:149) have recognized the inaccuracy of describing Avon as coarsely crystalline and fossiliferous, but have still achieved no understanding of the extent of the workshop deposits.

Incredibly dense workshop debris (often appearing to be only slightly less than what would preclude cultivation) covers large tracts of the uplands surrounding all of the area of availability. The full extent of these workshops is not completely known, but Timothy Hook and Kelvin Sampson of London Mills, Illinois, have conducted a partial reconnaissance of the source area. They have identified easily in excess of 1200 acres (about 485 hectares) of intensive workshop debris with only partial coverage of the tracts adjacent to the outcrops. A likely projection of total workshop areas for the Avon source (given Hook and Sampson's coverage) would necessarily exceed 2000 acres (about 800 hectares) and may even exceed 2500 acres (about 1000 hectares).

The debris in these dense workshop scatters consists predominately of chert shatter, flakes of various production stages, many bifacial blanks, finished tools, chert and glacial cobble hammerstones, cracked rock, anvils, metates,

and occasionally, pottery. As well as being heavy adjacent to the streambeds and actual outcrops, debris is located at some distance (on level forest soils more favorable for sedentary occupations) onto the uplands. This, plus the existence of such items as occasional pottery, sandstone metates, and much heat treated chert indicate that occupations of the source area may have been of more than an ephemeral nature. It would be quite conceivable that lengthy stays at the quarry area were part of a seasonal round for many hunter/gatherer groups or perhaps even that during certain periods of prehistory, specialists in production and export of this material (to the "chert starved" central Illinois Valley and points eastward?) were in semi-permanent residence in the area. Projectile points collected by Hook and Sampson from workshop areas indicate continued and intensive usage of the Avon source chert by nearly all known cultures ranging from Clovis to Mississippian.

The chert can be described as ranging from crystalline to cryptocrystalline. Although it is commonly in the microcrystalline range, many other specimens can match the consistency and quality of lower Illinois Valley and even Crescent cherts. A fairly distinctive grayish-blue streaking and mottling with a graying appearance may be one of the hallmarks of Avon Chert, but it is by no means present in all Avon Chert or confined to chert of this

source. Unheated color ranges from pure white to bluish-gray as well as white with bands and splotches of light brown. This light brown may become quite pervasive on some specimens (and incidently, can be seen on chert from other Burlington sources in the study area). Patches, bands and tints of yellow and blue are also common. The following array of colors have been noted on heated samples from the workshop areas: dark gray and gray blue, green, pinkish brown, brown, orange, dark red, red, and pink.

LaMoine River Chert Workshop

An intensively utilized chert workshop was visited by the author and Lawrence Conrad along Stony Creek two and one half miles upstream from its juncture with the LaMoine River. The type of chert at this workshop was first documented by Green (1977a:49). He dubbed a distinctive chert present on sites in the Rushville/Littleton area "LaMoine River Chert" and described it as "a generally rough-textured chert with scattered white fossil inclusions. The color is usually gray to dark reddish gray. . . and occasionally dark gray to reddish gray." The fossils inclusions are often crinoid stem sections. Green noted that "identical chert outcrops along Stony Creek" (which drains into the LaMoine River west of Rushville), and reported that a similar chert may outcrop near Beardstown and Monmouth. The Stony Creek source is now known to be accompanied by at least this one heavily utilized workshop

and most sites in the immediate area show a high percentage of this type of chert (e.g. Perazio 1981a:4). Many more workshops are probably present in this area.

The workshop visited consisted of an intensive scatter (of about 20 acres/8 hectares), on a blufftop point between the main branch of Stony Creek and a major tributary from the south. The bottomland church camp at this location is often referred to as "Rattlesnake Ranch". The workshop is located in the southwest quarter of Section 17, Buena Vista Township (T2N, R2W). Glen Hanning of rural Huntsville reports adjoining areas of the valley floors have heavy workshop deposits as well. A two and one half gallon bucket of chert flakes was collected within a few minutes at the bluff top location. One hundred percent of the chert in this collection was LaMoine River Chert and is essentially as Green describes it from the Littleton Field site samples.

Another variety of LaMoine River Chert is known from a recent survey. Perazio (1981b) collected samples of a chert similar to the Stony Creek variety from many archaeological sites along the bluff base between Browning and Marbletown, Illinois. This variant has cherty swirled and straight inclusions as opposed to the short chalky fossil inclusions of the Stony Creek variety. Texture tends to be noticeably finer than the Stony Creek variety, extending into the microcrystalline range. No effort to locate sources or possible workshops for this variety has yet been made but a

field inspection of the streambeds and other exposed strata adjacent to the Stony Creek workshop finally succeeded in observing LaMoine River Chert in situ.

After walking approximately one mile of the bed of the southern tributary of Stony Creek and locating no LaMoine River Chert outcrops, a pattern of its occurrence in the stream bed was noticed. LaMoine River Chert occurred in the stream bed predominately at the mouths of very steep gullies. Reconnaissance of several steep gullies still produced no visible outcrops, although large blocks of the chert persisted upward until glacial till was encountered. A prominent bed (one to one and one half feet thick?) of coal with a one to two foot thick greenish underclay at approximately 520 feet A.S.L. was observed in the main bed of the Stony Creek tributary, while the chert persisted up above until approximately 550 feet A.S.L. Finally, on a bulldozed road cut up the bluff above Rattlesnake Ranch, levels of LaMoine River Chert were observed. The chert lay in an approximately two foot thick bed at the top of a decomposed limestone at approximately 550 feet A.S.L. with two thinner beds within the next ten feet below. The uppermost bed was capped by glacial till and was about 40 feet below the upland surface. Given these observations it seems most likely that the coal observed was the Colchester (Number 2) coal of the Carbondale Formation and that the limestone member from which LaMoine River Chert derives is

the basal limestone of the Oak Grove beds or more specifically, Member 68 as described by Wanless (1957:91). In the adjoining Beardstown Quadrangle, Wanless describes this limestone as achieving a one to ten foot thickness and as having two feet of chert at its top when it is more than six feet thick. Moreover, in some locations, the vertical distance between the Colchester (Number 2) coal and Member 68 is in the 25 to 35 foot range in the outcrops described by Wanless. This closely corresponds with the approximately 30 foot elevation difference noted in the Stony Creek location. No observation of the intervening members was made. This portion of the Carbondale Formation and the upper portion of the Spoon Formation correspond to the Liverpool cyclothem as it is described in Wanless (1957) (e.g. see Table 3 in Willman, et.al. 1975:174-175).

Ursa Major Site

An investigation is currently underway by Western Illinois University on a major Late Archaic habitation site (IAS #11-A-1006) on the floodplain of Ursa Creek near Ursa, Illinois (Esarey 1982). This site shows evidence for processing of chert deriving from the Keokuk Limestone. Since some of the available chert in this particular location is undesirable, this description will focus on the range of chert which was selected for aboriginal use (i.e. chert debris and tools from 11-A-1006). The chert utilized at the Ursa Major site is generally coarser than the Avon

Chert. Quarry blanks are smaller and the site's debris appears to contain a much larger proportion of shatter than at the Avon workshops. A tendency towards shattering is reinforced by an examination of chert in the adjacent streambed which is quite prone to angular breakage. Even the highest quality chert artifacts are of about the average texture of Avon Chert. A common color is a bluish-gray to light gray, although yellow, tan, off-white, and white are also common. Heated specimens can turn pink to dark red, but the bluish-gray to light gray chert does not show as much color change as the others. These generalizations are necessarily specific to this location and this site, of course. Investigation of nearby outcrops in other similar Mississippi River tributaries shows a variety of colors and textures, although all along the same general lines. There would be no justification for formulating an archaeological "Ursa Chert" type on the basis of this site, since outcrops of the Burlington and Keokuk limestones in this region appear to be quite common. A comprehensive search for workshops in the area has not been done, although chert quality has been assessed at various outcrops.

Honey Creek Workshop

Savage and Nebel (1921:25-27 and Plate 1) document extensive outcrops of Burlington Limestone in the Honey and Ellison creek drainages in the LaHarpe Quadrangle. A workshop is known (from the Dickson Mounds comparative

collection) to be located along Honey Creek in the southeast quarter of Section 7 and the northeast quarter of Section 18 in Terre Haute Township. A field inspection of streambeds in this immediate locality yielded many large (ca. 8 to 12 inch) blocks of chert which appear to range from light grayish blue and fairly translucent to grayish white and opaque. The majority of this chert is of an excellent grade, and is readily fashioned into tools.

A personal survey of bluff top fields in the south half of Section 8, Terre Haute Township (just east of workshops known from the Dickson Mounds collection) revealed very heavy concentrations of debris in the southwest quarter section but much lesser concentrations in the southeast quarter section (which is further back from the bluff edge). A collection of about 75 items of workshop debris consisting of unretouched flakes, cores, blanks and finished projectile points (a Thebes and a Dovetail) were collected from the southwest quarter of Section 8. These indicate that the utilized chert is generally opaque white to semi-translucent blue/gray. Splotches and bands of non-white colors are more rare than the Avon and Stronghurst derived samples. However, the Thebes point (which is exceedingly large) is a speckled blue with brown splotches.

The workshop material in the possession of the Dickson Mounds Branch of the Illinois State Museum consists of approximately 40 large chert blanks, and ten thin bifaces

and large flakes. The overwhelming majority of the sample was semi-translucent to opaque white chert with less than 10% having gray mottled bands or occasional blues or browns. Given the excellent quality of this chert and the ubiquity of Burlington Limestone outcrops along Honey Creek, it seems likely that many additional workshops are present along this drainage.

Stronghurst Workshop

Although only a few tributaries to Ellison Creek are within the LaHarpe Quadrangle, and thus have been documented by Savage and Nebel (1921), extensive contact with the Burlington Limestone is present in its upper tributaries. A workshop investigated by Western Illinois University at the west edge of Stronghurst, Illinois, (the Linbaugh Site) verifies aboriginal use of chert from these deposits. Very dense debris on the surface of a one quarter acre building lot was collected in controlled squares. This workshop is immediately adjacent to Burlington Limestone outcrops in a tributary to Dixon Creek. Chert from this specific site is often white with light brown splotches and bands (identical to some Avon Chert). Texturally, the Burlington chert from the Linbaugh site is of slightly lower quality than the best Avon Chert. Collections were not large enough to evaluate temporal aspects of utilization, however many thin bifaces, a Graham Cave point, and a Late Woodland sherd were recovered from the workshop (the projectile point being

donated by Mr. Linbaugh).

On the opposite side of this small creek a band of workshop deposits follow the entire length of the creek adjacent to the town. A large sample of chert debris was collected from these deposits which displayed a much wider range of chert variety and a more typical workshop assemblage. For some reason, the assemblage of the Linbaugh Site was dominated by thin bifaces. In this latter area, the worked chert sample was dominated by large heavy bifaces (blanks). Again, chert quality was good and appearance ranged from plain, chalky white to light grayish blue translucent. A white, heavily mottled variety with brown splotches was very common, while white covered with light and dark gray and white, brown, and grayish blue streaked chert were also present. This grayish blue is identical to that noted as the putative hallmark of Avon Chert.

The chert source areas discussed above are simply what little is known of chert procurement in the study area to date. Most are likely to be only a single known procurement site within a larger pattern of sites exploiting the chert of a particular outcrop area. Generation of a framework with which to "know how much we don't know" will be accomplished by using the geological literature and the results of limited field reconnaissance to identify the location and extent of the potential resources. In

addition, several chert types which are present in lower frequencies in documented archaeological collections for the area will be discussed.

BURLINGTON AND KEOKUK LIMESTONE POTENTIAL OUTCROP ZONES

Discussion

First of all, it is advisable to repeat May's cautions regarding use of the geological literature. He states, "the presence of a chert source area does not necessarily mean that it was prehistorically exploited. . . (or that) it was present in that area during prehistoric times." He goes on to warn, ". . . some archaeologists use geologic maps to determine the location of limestone formations, and therefore the location of chert types. This is a very dangerous procedure since the presence of a limestone does not mean that the available chert is present in sufficient quantity and quality to have been prehistorically exploited" (May 1979:3-4).

These are exactly the qualifications required for viewing the following presentation of potential outcrop zones in the proper light. The availability of fairly complete coverage in the geological literature of the outcrops in specific areas (e.g. quadrangle studies, bedrock topography and outcrop maps such as Bulletin 73 Plate 1, and specialized limestone distribution studies) hopefully can do much to mitigate May's reservations regarding actual outcrops or the presence of chert in them. Similarly, in this portion of Illinois we are dealing with only a few key formations which are generally very cherty (specifically the

Burlington and Keokuk Limestones). Questions regarding quality of the chert and aboriginal utilization can only be resolved by field inspection and reference to site collections from the area. Although present versus prehistoric availability is not projected to be much of a problem in this region and at this stage of study, it is expected that a few specific outcrop locations within a potential outcrop zone may have been recently uncovered while others have become obscured. Stoltman and Behm (1981) have documented such a case for a procurement site in southwest Wisconsin which was utilized almost exclusively by Early Archaic people making Hardin Barbed projectile points, following which the resource was postulated to have become obscured. What must be emphasized is that a potential outcrop method of exploring chert resources for this area is felt to be acceptable due to both the large portions of the study area that have little or no potential for chert resources and the large proportion of chert used in the study area which apparently derives from only a few source formations.

Sources for the maps and discussion below derive primarily from quadrangle studies for west central Illinois. Studies have been done for the following fifteen minute quadrangles in the study area: Alexis, Avon, Beardstown, Canton, Colchester, Glasford, Good Hope, Havana, LaHarpe, Macomb and Vermont. Discussions therein of exposed sections

and the maps showing outcrop locations have been very valuable to this study. The Geologic Map of Illinois (Willman, et. al. 1967) can be used to provide approximate potential outcrop zones based on the premise that in order to outcrop, a formation must be at or near the surface of the bedrock, although this is no guarantee of outcrop. This assumption (although obviously questionable on a technical basis) has proved to be quite serviceable to date. Plate 1 of Bulletin 73 (Horberg 1950) illustrates locations of some of the major bedrock exposures (in addition to bedrock surface contours) that can be correlated to current drainage maps and potential outcrop zones. Use of this source is cautioned, however, as its compilation of outcrops is quite incomplete and its contour interval is 50 feet. (For example, it lists no outcrops at the Avon source area.) Volumes One, Four and Five of the Geological Survey of Illinois (Worthen 1866a,1866b, 1870a, 1870b, 1873; Worthen and Shaw 1873; and H.A. Green 1870a, 1870b)and the Handbook of Illinois Stratigraphy (Willman, et.al. 1975) are very valuable sources of data. Localized and/or technical studies such as Harvey (1964), Rexroad and Collinson (1965) or Currier (1922) have proven valuable as well. Lastly, I.S.G.S. Bulletin 92 (Willman, et.al. 1968) has proven infinitely valuable in locating sources for geological information in the literature up through 1965 (e.g. sections described, technical or regional studies, and

miscellaneous data on any given formation or location).

As discussed above, most chert utilized in western Illinois is from the Mississippian System limestones. Of these, it is the Burlington and Keokuk Limestones of the Lower Valmeyeran Series which are most significant. The Lower Valmeyeran Series includes the Keokuk, Burlington, Fern Glen and Sedalia limestones. However, the Fern Glen and Sedalia limestones are not present in the study area (Willman, et.al. 1975:137; Weller and Sutton 1940:793-794). The Burlington and Keokuk limestones are overlain first of all by other Mississippian System strata. These consist of the Warsaw, Sonora and St. Louis (Willman, et.al. 1975:137-141; and Figures M-16 and M-21). The St. Louis Limestone and the Warsaw Shale contain limited chert. The overlying Pennsylvanian System ranges from non-existent (eroded) to over 600 feet thick within the study area. It thins substantially towards the north and west, with lower units progressively pinching out (Willman, et.al. 1975:163-164). The Pennsylvanian System contains only a few chert bearing limestones in the study area.

In addition to being partially covered by other bedrock formations, Mississippian strata in the study area are blanketed by various Quaternary deposits. The most common of these are tills from the Illinoian, Kansan and Nebraskan Stage glaciers and various loess falls. In most of the area

the Quaternary deposits are situated directly on the bedrock, although occasional patches of the Pliocene-Pleistocene Grover Gravel have been located (Willman, et.al. 1975:209 and Figure T-1). Depth of the Quaternary deposits in this portion of Illinois varies, but generally ranges from less than 50 to as much as 200 feet, only occasionally exceeding 200 feet (Willman, et.al. 1975: Figure Q-3). Thus, a bedrock stratum might well be uppermost in a given area and yet be buried deeply. Such would especially be the case for bedrock surfaces of those drainages which were not re-established following the glacial intervals (buried bedrock valleys). These preglacial drainages are deeply filled with Quaternary deposits. Horberg (1950:31 and 74-77) discusses this portion of Illinois as a drift plain in which the topography is reflective of only the major bedrock surfaces' features. So, although many streams are re-established in the bedrock valleys at their entrance to the Illinois or Mississippi valleys, their upper reaches are dependent upon the drainage network formed on the till plain surface. The only outcrops encountered in the lower courses of some of these streams, therefore, are from contact with the "walls" of the buried preglacial valleys. Conversely, smaller drainages and the upper portions of the larger drainages are usually incised upon the preglacial "upland" surfaces and can have extensive contact with the underlying bedrock strata. Portions of the

potential outcrop zones discussed below amply illustrate the effect of the preglacial valleys.

Three basic zones of potential outcrop (P.O.Z., hereafter) for the Burlington and Keokuk limestones are present in the study area. These will be referred to as the Central LaMoine P.O.Z. (Figure 2), the Bear Creek P.O.Z. (Figure 3) and the Henderson Creek P.O.Z. (Figure 4). In addition, these limestones make up the bedrock surface in a narrow band between the Henderson Creek P.O.Z. and the Bear Creek P.O.Z. In the northerly part of the study area several small outlying occurrences (including the Avon source) are also present, which are all lumped together with the Henderson Creek P.O.Z. for the sake of convenience.

The narrow band of Burlington/Keokuk Limestone at the bedrock surface between the Henderson Creek P.O.Z. and the Bear Creek P.O.Z. is an excellent example of the effects of buried valleys. Although the Burlington and Keokuk Limestones are the uppermost bedrock here, their distribution in this case represents the deeply buried preglacial Carthage Valley (Horberg 1950:Plate 2). The elevation of the floor of this bedrock valley is only approximately 350 to 400 feet A.S.L. near Carthage (Horberg 1950:Plate 1), which is more than 200 feet below the present ground surface. An eastern arm of the Carthage Bedrock Valley is likewise responsible for a portion of the distribution of the Central LaMoine P.O.Z. (although the

LaMoine River has intersected and exposed the Keokuk Limestone both north and south of this buried channel). The far eastern and middle western extensions of the Central LaMoine P.O.Z. (marked in Figure 2) are formed by this deeply buried valley floor, rather than bedrock exposed by post-Illinoian stage erosion. Similarly, the buried Kirkwood Valley in the center of Warren County is responsible for a central portion of the Henderson Creek P.O.Z. The buried Henderson Creek Valley has a slight effect on the northern portion of the Henderson Creek P.O.Z., but the present Cedar Creek north of Monmouth has eroded well into Mississippian System bedrock, also.

Varying amounts of outcrop data are present for each potential outcrop zone. Quadrangle studies are the only source for comprehensive coverage of outcrops in an area. For the Central LaMoine P.O.Z. the entire outcrop area has been documented by Hinds (1919), so all known outcrops are on this map. In the Bear Creek P.O.Z., a single local study was carried out (Currier 1922) but since it did not comprehensively locate outcrops, no attempt at portraying individual outcrops was made. On the Henderson Creek P.O.Z. map (Figure 4) those portions covered by various quadrangle studies are outlined and labeled. All Burlington or Keokuk exposures within these quadrangles are marked and the rest of this map is supplemented only by those exposures found in other geological literature.

The Central LaMoine P.O.Z.

Workshops for this source area (Figure 2) have been reported to the author by two reliable sources, but none have yet been visited. A visit was made to two Central LaMoine P.O.Z. outcrops to collect chert samples. The outcrop Harvey describes as M-19 (three and one half miles northeast of Plymouth and two and one half miles southeast of Colmar) yielded chert (sample A on Figure 2) ranging from crystalline to microcrystalline. Although this chert is of generally low quality, it is certainly tool grade. Colors range from a light orange tint to gray and grayish white with increasingly fine texture, respectively. However, it is the somewhat coarser, light orange colored chert which apparently works best. Harvey (1964:22) calls this a Burlington-Keokuk outcrop while Hinds (1919) had indicated it was Keokuk. Worthen (1873:261) indicates that only the Keokuk Limestone outcrops in McDonough County and in this part of Hancock County (1866b:339).

The other outcrop visited was in the west bank of the LaMoine River due west of Colmar. Since it is in Hancock County, this outcrop was not covered by Harvey. The chert procured from this outcrop (sample B on Figure 2) is distinct from that of the exposure described above. Overall, this chert is coarser, but more uniform. The majority is in the crystalline range. Color is limited to blue gray, gray and whitish gray. Since this outcrop is on

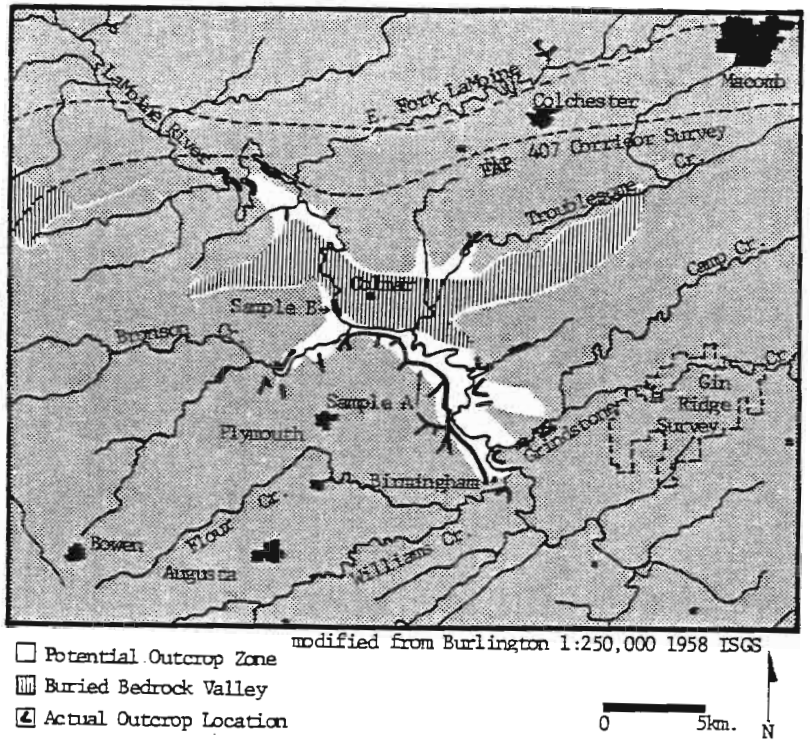


Figure 2

The Central LaMoine Potential Outcrop Zone

the southern edge of the buried Carthage Valley, no outcrop is possible further upstream for some distance. Hinds (1919) documents no further Keokuk exposures upstream until the mouth of Rattlesnake Den Hollow (about two and one half miles north). Extensive Keokuk outcrops continue to occur downstream until Birmingham, as well as in Bronson Creek. Limited Keokuk outcrops are also present in Troublesome and Camp creeks and in the two "hollows" between them. With regards to what has been seen of the chert from this outcrop zone, it is certain that it is represented in artifacts from the archaeological collections of the immediate area. Although little work has been carried out in the vicinity of the Central LaMoine P.O.Z., the FAP 407 corridor survey (Conrad 1981) made an east/west transect within one half mile of its northernmost outcrops. FAP 407 sites and local collections have many specimens which are Keokuk chert. A survey of part of the uplands between Grindstone and Willow creeks (known locally as Gin Ridge) was carried out for Freeman United Coal Mining Companies (Conrad 1978). In this survey, which covered an area within approximately one and one half to two miles of the nearest known Keokuk outcrop, a total of 44 chipped stone projectile points were recovered. Not enough is known of Central LaMoine P.O.Z. chert variability to conclusively sort out all points manufactured from it, but at least eleven points from Gin Ridge are clearly of this chert type (and are similar especially to

the chert from our sample A outcrop which is nine miles distant).

In summary, although no workshops or other procurement locations have yet been examined for the Keokuk Limestone derived cherts in the Central LaMoine P.O.Z., a number of outcrops are present. There is some disagreement over whether the Keokuk, Burlington or both formations are represented in these outcrops, but it seems most likely that only Keokuk outcrops are present. The chert is generally of medium to low quality, but it was definitely used by Indians. Since it is felt that this chert probably cannot be visually or texturally sorted from similar chert occurring to the west in Mississippi Slope drainages, no chert type variant should be assigned.

The Bear Creek P.O.Z.

This outcrop area (Figure 3) consists of a relatively narrow band of Lower Valmeyeran exposures along the Mississippi Bluff and a small distance up each of the small, steep tributaries that characterize the Mississippi Slope in this area (e.g. Rock, Ursa, Jenkins, and White Oak creeks). The Lower Valmeyeran exposures in this area are generally the Keokuk Limestone. Worthen (1866a:103-104) stated that from the Hancock/Henderson County line south to just a few miles north of Quincy , the Burlington Limestone does not outcrop. He later added to his statement (1870a:56-57), indicating that Burlington Limestone outcrops in the

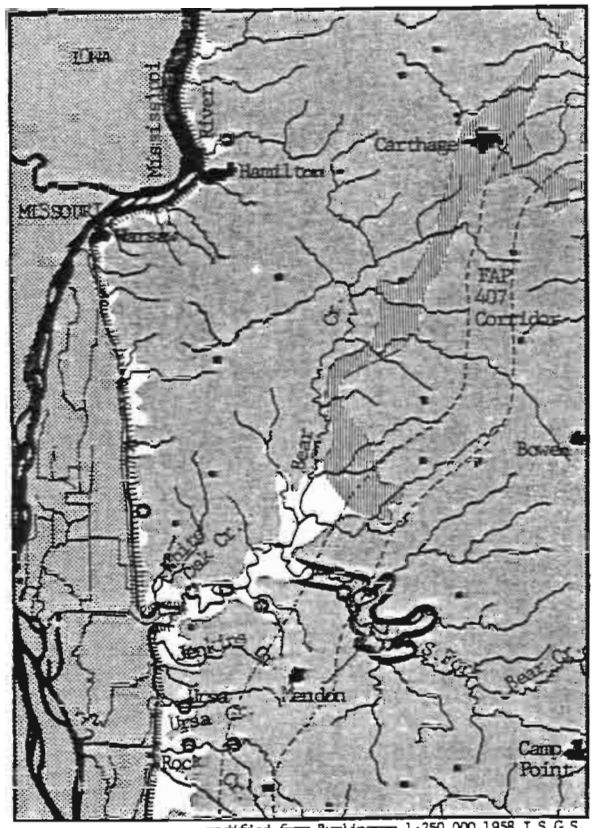


Figure 3

The Bear Creek Potential Outcrop Zone

southwest part of Adams County and is "found at the base of the bluffs, for a few miles north of Quincy, but at so low a level as to be seldom exposed by the natural outcrop of the strata." From Quincy north to the Hancock County line, the Keokuk Limestone outcrops at various points along the river bluffs and is well exposed in Bear Creek (Worthen 1870a:54). Exposures are probably present only two to three miles up the smaller streambeds, but on nearly every stream.

This narrow band of outcrops continues up the eastern Mississippi bluff edge in much the same fashion from Warsaw to Dallas City, Illinois, where it joins with the Henderson Creek P.O.Z. This transition to predominately Burlington exposures occurs at approximately the Henderson County line. In the Bear Creek P.O.Z. , the only exception to this narrow band of availability is in the lower reaches of Bear Creek itself (approximately from the Hancock County line southward), where it has re-established itself within the course of the buried Carthage Valley. Here, outcrops are apparently limited to intersections with the buried valley walls, since the floor of the preglacial Carthage Valley is below 400 feet A.S.L. (Horberg 1950:Plate 1) and the valley floor of Bear Creek in this area is between 480 and 520 feet A.S.L. Outcrops of the Keokuk Limestone in Bear Creek are not likely to occur any more than one or two miles north of the Hancock County line. This is the location at which Bear Creek climbs above the Lower Valmeyeran limestones and is

cutting into the higher Mississippian strata on the western buried valley edge rather than being within its limits.

Although no comprehensive quadrangle studies have been done for this area, some Bear Creek P.O.Z. outcrops have been described in the literature. Rexroad and Collinson (1965:6-7) present outcrop profiles for Buel Branch, Bear Creek, and Sand Branch. In Buel Branch the upper portion of the Keokuk Limestone has extensive chert beds with chert more sparsely scattered throughout the lower portion of the profile. In the Ursa North (Bear Creek) profile, Keokuk Limestone cherts are again present in moderate amounts. The Sand Branch outcrop is upstream from the projected outcrop zone and has been documented as "Salem" Limestone. It is of note that this classification is not substantiated by the Willman, et.al. (1975:140) distribution of Salem Limestone. One other Keokuk outcrop is described northward along the Mississippi Bluff near Hamilton.

Especially interesting is Currier's (1922:17-18) discussion of Keokuk exposures along the South Fork of Bear Creek and its tributaries which are over three miles upstream from the P.O.Z. limits. The one Keokuk outcrop specifically located by Currier (Section 30, T2N, R7W) is within the FAP 407 survey corridor and was informally checked against archaeological sites located in that area. At least two of the sites within that section (11-A-460 and 11-A-480) are probably workshops as evidenced by many pieces

of blocky fracture, large flakes, blanks and hammerstones. Willman, et.al. (1967) do not carry the lower Valmeyeran strata this far upstream, implying that it must be continuously overlain by other bedrock strata. However, this disagrees with Currier's Plate VI which shows Keokuk Limestone for much of the valley floor in this area. Currier states that perhaps only the upper 25 to 30 feet of the Keokuk is exposed in northeastern Adams County and that chert layers are prominent.

Several exposures have been visited and samples collected for the southern end of the Bear Creek P.O.Z. Samples collected from Rock Creek are generally similar to those of Ursa Creek, but are of superior quality. The two outcrops vary less than 20 feet in elevation and are ony two miles apart. A site which yielded a Lincoln Hills Fluted point and is situated at the intersection of Sand Branch and Rock Creek has been discussed by Conrad (1981:32) as possibly being a workshop.

Sample locations in Bear Creek were also visited. Very little variation was noted for these outcrops. This chert appeared similar to the chert described for Ursa Creek except that the more microcrystalline, whitish varieties seem to be absent at these locations. This chert is generally of a uniform crystalline to microcrystalline texture and ranges only from light gray to orangish gray in color. It is however, quite workable. In recent excavations

at the Deer Track Site on Bear Creek it was the opinion of one of the investigators (Charles R. McGimsey, personal communication) that most of the chert was derived from the local outcrops. Rexroad and Collinson's (1965) "Ursa North" Keokuk outcrop is situated only a few hundred yards northeast of this site.

A spot check of several sites (surveyed as part of FAP 407, Conrad 1981) generally adjacent to the Bear Creek P.O.Z. in its South Fork and Grindstone Creek tributaries, also revealed substantial use of Keokuk chert. The many large thinning flakes, blanks, and much other chert debris collected from several sites immediately adjacent to Grindstone Creek and the South Fork of Bear Creek are assuredly workshop debris. It is likely that a great many workshop sites are present in the lower Bear Creek Drainage.

In summary, the Bear Creek P.O.Z. consists of a band of primarily Keokuk Limestone outcrops occurring in the Mississippi River bluffs and short distances up the small tributary streams cut into these bluffs. The only substantial drainage of the area (Bear Creek) contains Keokuk outcrops for only approximately the lower ten miles of its drainage system. Chert from this outcrop region was definitely used aboriginally. Numerous workshops are likely to be present, and some have been tentatively identified. Chert is generally blue-gray to gray although with much variation, and is crystalline to microcrystalline in

texture.

To the south of the study area, outcrops of the Burlington Limestone become increasingly common and extend further up tributary streams. South of the Adams/Pike county line, Burlington is the predominate bedrock and, as in the study area, was the source of most prehistorically utilized chert (e.g. Meyers 1970). To the north of the Bear Creek outcrop zone, along the Mississippi River bluffs, a narrow band of potential outcrops continue to occur until north and east of Dallas City, Illinois. At this point, a wide band of Lower Valmeyeran strata form the uppermost bedrock (Henderson Creek P.O.Z.) in which both the Burlington and Keokuk Limestones outcrop.

The Henderson Creek P.O.Z.

The Henderson Creek P.O.Z. (Figure 4) consists of a relatively large area compared to the Central LaMoine and the Bear Creek outcrop zones. The predominate Lower Valmeyeran formation is this area is the Burlington Limestone, although the Keokuk Limestone outcrops in the southern portion. The preglacial drainage pattern has caused the exposure of several areas of Lower Valmeyeran strata in areas generally covered by the Pennsylvanian System deposits (e.g. the Avon source area), as well as causing the presence of "fingers" and "islands" of Pennsylvanian System strata left above the Lower Valmeyeran area of bedrock. Data for outcrops in this P.O.Z. is

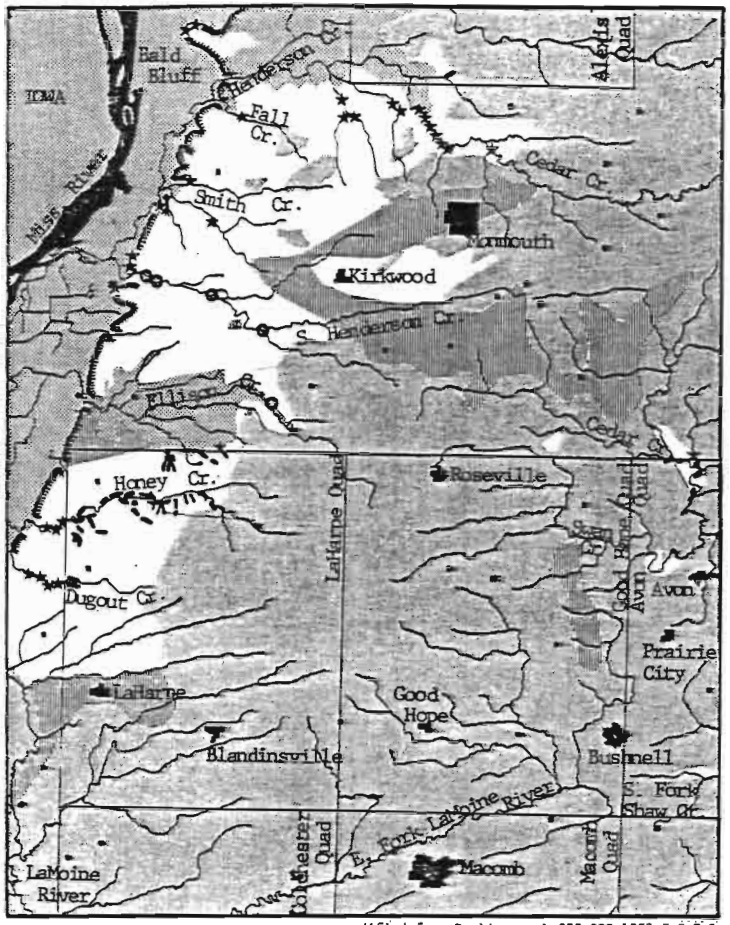


Figure 4

The Henderson Creek Potential Outcrop Zone

variable since portions have been covered by quadrangle studies (LaHarpe, Good Hope, Avon, and Alexis quadrangles). For this reason, quadrangle boundaries have been added to Figure 4. Actual outcrops are shown only within the quad study areas, while crosses indicate other outcrops discussed in the literature.

The geology of the LaHarpe and Good Hope quadrangles has been documented by Savage and Nebel (1921). They indicate extensive outcrops of Burlington Limestone on Honey Creek and the upper, southern tributaries to Ellison Creek, as well as a single Keokuk Limestone outcrop for that portion of Dugout Creek within the LaHarpe Quadrangle. The Avon Quadrangle has been covered by Savage (1921), who documented the three Avon source outcrops discussed previously. In the Alexis Quadrangle, Wanless (1929) documented only a single Burlington outcrop (approximately six miles north of Monmouth on a small tributary to Cedar Creek). Wanless (1929:45) states that he believes this is the northern limit of the Burlington Limestone. However, Worthen (1866a:103) correctly stated that the northernmost Burlington outcrop is Bald Bluff, where twenty to twenty-five feet are exposed. He describes this bed as being "brown arenaceous limestone, thin bedded and full of cherty nodules." He indicates that the Burlington Limestone forms the Mississippi River bluffs from here to the Hancock County line (near Dallas City), and also outcrops in

Henderson "River" and Honey Creek. In this and later Geological Survey of Ilinois accounts, outcrops are discussed on a county by county basis, and it is these descriptions which best fill in the gaps left by the quadrangle studies.

Just south of the Hancock County line, H.A. Green (1870:279-280) indicated that the Keokuk Limestone forms the bluffs of Camp Creek, but that it soon "runs out" and the lower levels exposed are Burlington. He also documents Keokuk exposures in Ellison and South Henderson creeks. Many Burlington outcrops are located along the Mississippi from Dallas City northward (H.A. Green 1870:281-284) both in the bluff and the Camp, Dugout, Honey, (the upper reaches of) Ellison, South Henderson, Smith, and Fall creek drainages, as well as along that portion of Henderson "River" fronting the Mississippi River bluffs. He notes that there are no exposures in the Mississippi bluffs from Dugout Creek to several miles north of Honey Creek and none in Ellison Creek until "the east part of Township 9, Range 4" (although outcropping in some of its branches).

H.A. Green (1870b:295-297) also discussed Burlington outcrops in Warren County, stating that no St. Louis or Keokuk Limestone outcrops are present. Many Burlington outcrops are present (in John's, David's and Cedar creeks) in Sumner Township (T12N, R3W) and in Spring Grove Township (T12N, R2W), being overlain by thin strata of the "coal

measures" in the latter location. One of these outcrops (in Section 30, T12N, R2W) is the one later documented by Wanless (1929:45). H.A. Green (1870b:297) indicated that the Burlington Limestone outcrops almost continuously from Rockwell's Mill (Section 35, T12N, R3W) to Olmstead's Mill on Cedar Creek, but does not outcrop upstream from the southeast quarter of Section 9 of Monmouth Township (T11N,R2W). Likewise, the Illinois State Geological Survey Guide Leaflet for the Monmouth area (1954b:4-9) documents several Burlington exposures between Section 35 of Sumner Township and the NE quarter of Section 16 of Monmouth Township. As indicated by H.A. Green (1870a,1870b) and Savage (1921:15) the Keokuk Limestone is not present in this area, as it is eroded away well to the south. To the southeast, H.A. Green (1870b:293-294) has stated that a few feet of Burlington Limestone are exposed in the southwest quarter of Section 24 of Berwick Township (T9N, R1W) in Warren County. This is a little over one mile upstream from the three Avon source Burlington outcrops documented in Sections 30 and 31 of Indian Point Township by Savage (1921:14-15).

Only one apparent potential outcrop area is present in Fulton County (along the upper reaches of the South Fork of Shaw Creek). Worthen (1870b:90-110) made no mention of any Keokuk or Burlington outcrops for Fulton County. Savage (1921) likewise covers this area with no indication of

outcrop. A personal inspection by the author supports a lack of chert at this location. Two small outliers of Lower Valmeyeran strata shown as the uppermost bedrock unit are also present in the Swan Creek portion of the Spoon River Drainage (one just west of the town of Avon and another further into the uplands along Swan Creek's northernmost tributary). These were also inspected and no chert was noted. Thus the "Avon Quarries" are very likely the only Burlington Limestone outcrops present in the Spoon River Drainage.

That portion of the upper LaMoine River Drainage within the Henderson Creek P.O.Z. also does not seem to have outcrops. Worthen (1866b:334-339) noted no Keokuk nor Burlington outcrops for Hancock County in the upper LaMoine Drainage,and Savage and Nebel (1921) confirm this for that portion of the drainage within the LaHarpe Quadrangle.

From the above cited literature, the locations of naturally occurring Burlington and Keokuk outcrops in the Henderson Creek P.O.Z. are presented in Figure 4. Doubtless, these are only a few of the outcrops, but they give an indication of where other outcrops may and may not occur. The Geological Survey of Illnois was much more concerned with the location and potential location of limestone quarries than outcrops, and often simply noted that outcrops were present along a given stream. Outcrops were not entered in Figure 4 unless their location was given

at least to the section.

In summary, Burlington outcrops dominate the Henderson Creek P.O.Z. High quality chert is common to ubiquitous in these outcrops, which are occasionally present along the Mississippi from Dallas City to Bald Bluff and to varying degrees in the Mississippi tributaries within this same area. Several known aboriginal workshop locations indicate that this chert was definitely utilized and it is felt that the quality of the outcrops examined is fairly representative of the other available chert. Outcrops of Keokuk Limestone in this same area are fewer and are restricted to South Henderson Creek and southward. Neither the Keokuk nor the Burlington are known to outcrop in the upper LaMoine River Drainage portion of the potential outcrop zone and only a very few outcrops are known to occur in the Spoon River Drainage. Preliminary examinations of the Henderson Creek P.O.Z. Burlington cherts indicate that they overlap somewhat with the visual and textural attributes of "Avon Chert" as well as that of "Lower Illinois Valley Burlington".

OTHER CHERTS AND CHERT SOURCES

Mississippian Sources and Cherts

Several of the bedrock formations other than the Burlington and Keokuk limestones which outcrop in the study area are also actual or potential sources of aborignally utilized cherts. Within the Mississippian System the Warsaw Shale may occasionally contain chert as evidenced by Rexroad and Collinson's (1965) description of the Warsaw type site. Most of a sample of chert collected from the Warsaw Shale at Geode Glen Park in Warsaw, Illinois, closely resembles Keokuk chert but is more blue with a finer texture. A small portion of this sample is pure white and somewhat shatter-prone, but is also a very good chert. A description of this outcrop in the Illinois State Geological Survey Guide leaflet for the Hamilton-Warsaw area (1970-E and 1971-B:15) indicates that the strata from which the chert was obtained is a fossiliferous dolomite which overlays the about twelve foot thick basal unit of the Warsaw Shale. Although this chert is certainly an acceptable raw material for toolmaking, it may be difficult to sort from Keokuk chert.

The St. Louis Limestone may also have served as an aboriginal chert source. Worthen (1870b:103) stated that the St. Louis Limestone was restricted in Fulton County to the valley of Spoon River between Seville and Bernadotte,

being well exosed in only a few points. Wanless (1957:49, and in geologic sections 33, 34, and 35) corroborates the Seville area outcrops and describes three of them. Wanless describes only one of these as "cherty" (geologic section 34). The author has visited this outcrop and adjacent streambed, but only a single specimen of very low grade chert was found. Certainly, this was not a procurement location. Harvey, however describes two of these (same?) outcrops as cherty (1964:20,F-8 and F-9).

In the upper LaMoine River Drainage multiple outcrops of cherty St. Louis Limestone are documented by Savage and Nebel (1921:30-34) in the southwest portion of the LaHarpe Quadrangle (northeast Hancock County). Hinds (1919:5) states that the St. Louis is well shown in many outcrops in the East Fork, Flour, Camp, Panther, Cedar and Rock creeks in the Colchester Quadrangle (the central LaMoine River area) and on Grindstone Creek in both the Colchester and Macomb quadrangles. Hinds notes that it contains chert at some outcrops. Harvey (1964:14) corroborates St. Louis Limestone outcrops documented by Hinds for that part of the Colchester Quadrangle within McDonough County and adds one small cherty St. Louis Limestone outcrop (M-26) in the upper reaches of Baptist Creek south of Blandinsville. He describes outcrop M-8 in the East Fork of the LaMoine River as having some chert (1964:21). Harvey also documents a cherty St. Louis outcrop (M-12) on the upper reaches of a

tributary to Troublesome Creek. Other cherty outcrops of St. Louis Limestone are located on the lower reaches of the LaMoine River and 20 kilometers to the east along the Illinois River bluff front (Harvey 1964:21-27, sections S-1,S-44 and S-49). Little else has been documented for the lower reaches of the LaMoine River. Wanless (1957:201-202) has described two St. Louis outcrops along the Ilinois River bluff front but makes no mention of chert.

On the Mississippi Slope, Worthen (1866b:333) discusses an occasionally outcropping portion of the St. Louis Limestone as a concretionary and brecciated limestone with irregular seams and crevices filled with green marly clay and nodules of chert. This green clay is noted to co-occur with the chert in the St. Louis Limestone at other locations as well. Worthen (1870a:53) likewise states that the St. Louis Limestone outcrops occasionally near Mendon and is well exposed in Bear Creek but makes no mention of chert. Currier (1922:15-16) indicates that the St. Louis outcrops only in the west portion of his study area (northeast Adams County), and makes no mention of chert. North of the Hancock and McDonough county northern boundaries, on both the Mississippi Slope and other drainages, the St. Louis Limestone does not outcrop.

In summary, St. Louis Limestone outcrops are fairly ubiquitous throughout the lower half of the study area. The presence of chert within those outcrops is erratic and

little presently can be said about its quality or description. Unless this chert is the same as the "Illinois Agate" discussed later in this paper as being probably of St. Louis Limestone derivation, it was probably of little prehistoric importantance.

Below the Mississippian System strata the Middle to Upper Devonian System outcroppings in the study area are unlikely to produce aboriginally relevant cherts. None of the chert bearing strata below this portion of the Devonian System outcrop in the study area although they are present to the north and to some degree (as part of the Lincoln Fold) to the immediate south.

Pennsylvanian Sources and Cherts

Above the Mississippian System, a few portions of the Pennsylvanian System produce chert. Several descriptions of a cherty, Pennsylvanian limestone overlying the Rock Island (No. 1) Coal are present in the literature for the study area. The "Moline" archaeological chert type may derive from such outcrops in the Moline area. References to a band of chert capping a level of shales and/or limestone have long been referred to as a guide to the identification of the Number 1 coal. Worthen and Shaw (1873:220-221 and 229-230) described this chert as being light gray to black in color, having conchoidal fracturing properties and being "used by the Indians for the manufacture of their implements. . .". They described profiles deriving from

both outcrops and drilling records near Hampton and Carbon Cliff which contain bands of chert from four inches to a foot and four inches to two feet, respectively. Similar outcrops are described from Coal Valley, near which they indicate that "the beds of the little runs are full of its broken fragments" (1873:230). They considered the immediately underlying coal as identical to the "Seaville" coal of Fulton County (1873:221). It seems very likely that this light gray to black chert is the Moline Chert which was heavily used prehistorically in the Rock Island and lower Rock River area. The correlation of the underlying coal to the "Seaville" coal identifies it as the Rock Island (Number 1) coal (Willman, et.al. 1975:184) and thus of the Spoon Formation. A composite natural exposure/road cut profile shown in a geological field trip leaflet for the Milan area (Illinois State Geological Survey Guide Leaflet 1974-C and 1975-B:21) has a solid layer of light gray to mottled gray chert at the top of a bed of "dense siliceous claystone to bedded nodular chert. . .". This occurs at about the middle of the Spoon Formation as it is exposed in this location, although no Rock Island coal is present.

Behm (1981:41) states that Moline Chert was first identified in outcrops near Moline and is tentatively assigned to the Spoon Formation. Birmingham and VanDyke (1981:348-353) have visited nine exposures containing Moline Chert, including the one described in I.S.G.S Guide Leaflet

1974-C and 1975-B but do not identify any particular member within the Spoon Formation as the source. Although Moore and Burge (1981:150) suggest the Curlew or Creal Springs members of the Spoon Formation as potential sources of Moline Chert, their exclusively southern distributions clearly make this impossible. The limestone which immediately overlies the Rock Island Coal is the Seville Limestone (which is, however, correlated with the Curlew Limestone). Thus, the Seville Limestone Member of the Spoon Formation is almost certainly the limestone to which Worthen and Shaw refer and also may well be the source of Moline Chert type. That Moline Chert does not derive from the Devonian System, as Springer (1982:346) has recently stated, is demonstrated not only by Birmingham and VanDyke's <u>in situ</u> observations and the fact that 75% of their 56 workshops occur in areas of Spoon Formation outcrop (1981:355), but by the fact that those portions of the Devonian which occur in the northern area (the Cedar Valley and Wapsipinicon formations) contain chert only in the Coggan Member, which does not outcrop in Illinois (Willman, et.al. 1975:114-116).

Moline Chert is present only occasionally in archaeological collections of the study area, although portions of the Seville Limestone are present and do outcrop. Wanless (1929:71-73, 164-171) documents a chert bed in the Alexis Quadrangle which is very similar in color and situation to that discussed for the Moline area. He

notes outcrops in Edwards River, Pope Creek and South Henderson Creek which have a chert layer varying from one inch to one foot in thickness, capping a limestone above the Rock Island (Number 1) coal. This chert is described in one case as gray and in another as dark blue. This is probably the southernmost distribution of Moline Chert availability.

The geographical distribution of LaMoine River Chert and its variants is not well known but a few notes on its occurrences may be relevant in trying to further refine our understanding of its geological source and potential outcrops. As noted in the description of the Stony Creek workshop, many sites in the lower LaMoine River have varying quantities of LaMoine River Chert on them. Sources for chert usage in this area such as the Gin Ridge survey (Conrad 1978), the Camden to Littleton survey (Perazio 1981a), the Glen and Mary Hanning collection (Huntsville, Illinois), and the Ike Billingsley collection (Camden, Illinois) all have frequent occurrences of this type of chert.

The Littleton Field survey and tests (Green 1977a; Esarey, et.al. 1982), the Browning to Marbletown waterline survey (Perazio 1981b) and personal inspection of the collection of chert tools from the Illinois State Museum's Sugar Creek survey (reported in Holstein 1978) also indicate substantial use of this chert type and its varieties in the Sugar Creek Drainage and adjacent sections of the Illinois

River Valley. A much lower incidence of LaMoine River Chert usage is projected for the rest of the study area. The Spoon River Drainage portion of the F.A.P. 407 survey (Conrad 1981), the Ipava Field survey (Green 1977b) and the Historic Sites Survey of sections of the Illinois River bluffs from Duck Creek to Mapleton (collected by the Upper Mississippi Valley Archaeological Research Foundation and now curated by Western Illinois University) recovered only a very low percentage of LaMoine River Chert artifacts while the upper LaMoine Drainage and Mississippi River tributaries on the west end of the F.A.P 407 survey recovered almost no LaMoine River Chert artifacts.

Geological sources for LaMoine River Chert have been investigated at the Stony Creek workshop as described herein and in nearby Spring Creek. The chert type collection at the Dickson Mounds Branch of the Illinois State Museum has specimens identical to the Stony Creek chert which were collected three and one half miles north of Erwin in the bed of Spring Creek. These specimens were attributed to the Liverpool cyclothem of the Pennsylvanian System, but were not observed in situ. Also present in this collection was a similar but blacker specimen with more linear and cherty white fossil inclusions, as opposed to the short and chalky inclusions of the Spring and Stony creek specimens. This was collected from a streambed north of Camden (Cedar Creek?). A few pieces of an only slighly similar chert

deriving from Pennsylvanian strata was procured for the Dickson Mounds Branch of the Illinois State Museum by Glen Wright, in 1972, from Bluff Springs Township (NW, NE, SW, Section 12, T18N, R11W) which he described as coming from the "Liverpool cyclothem, Oak Grove beds, Member 68". This chert is a light blue hue with blue-gray and whitish streaks, and is generally good quality. The author has noted no such chert from sites within the study area, however. Elsewhere, Currier (1922:12-13) has described a Carbondale Formation limestone in northeastern Adams County with much chert in its upper half. He notes that "This limestone would serve as an excellent key horizon. . . but outcrops of it are scarce in this region."

Thus, by an intuitive designation in the Dickson Mounds Museum chert type collection and an in situ observation by the author it seems that LaMoine River Chert and its variants derive from the basal limestone of the Oak Grove beds of the Carbondale Formation (Wanless 1957:188), since Wanless' Member 68 constitutes only the lowest member of that unit. This basal limestone member is erratic in its occurrence as well as its production of aboriginally acceptable grades of chert. This is supported by a low incidence of LaMoine River Chert in archaeological contexts outside the lower LaMoine, the Sugar Creek Drainage, and adjacent sections of the Illinois River Valley, in spite of the generally widespread availability of the Carbondale

Formation. Wanless (1957:91) states that this specific member is discontinuous and contains chert only when over six feet thick. Outcrop thicknesses over two feet six inches are described only in the Beardstown Quadrangle of Wanless' four quadrangle study.

There are few, if any, other Pennsylvanian System, chert bearing limestones, of archaeological significance in the study area. Outcrop F-1 described by Harvey (1965:20) has a clayey and cherty Pennsylvanian Limestone, although Wanless (1957:201) makes no mention of chert in apparently describing the same outcrop (geologic section 33). This also appears to be the same chert collected by Young and Brooks for the State Museum in 1971 from the "Seville quarry" and Harvey's F-4 outcrop. Again, the small proportion of this chert that may have been suitable for aboriginal utilization has not been noted in local collections.

Other Sources and Cherts

Grover Gravel is generally thought to be a relict gravel of Pliocene age with speculation that some portions may have been reworked during the early Pleistocene. Willman and Frye (1970:18-22) tend to favor a glacial origin, although they note that this explanation has generally "been rejected . . . because of the assumption that if the deep valleys are preglacial the gravels must be Tertiary". Thus, the origin and the age of the gravels is

at present undecided and must be left at Pliocene-Pleistocene. These gravels are present in western and northern Illinois in isolated patches immediately above the bedrock and were sporadically used aboriginally. Moore and Burge (1981:18, 149-150) indicated use of Grover Gravel cherts to a minor extent in the Cedar Creek Drainage east of Monmouth, although they are rather unclear about its tool making suitability. They state that "The Grover Gravel contains two types of chert pebbles ." and that "Both varieties are suitable for tool manufacturing." Later they say that the red, hematitic variety "is unfit for tool manufacture."

Apparently, cobbles of Grover Gravel can attain a maximum diameter of about 12 inches. In addition to caramel or red, the chert may be white, gray, and black. Sometimes the brown color is restricted to a thin surficial coating or rind with interiors being gray or white (Illinois State Geological Survey Guide Leaflet 1970-E and 1971-B:6-7).

In addition to Cedar Creek near Monmouth, the caramel colored variety of Grover Gravel is also present, in very small quantities, in debitage collections from other sites in the study area, but seldom occurring as tools. It has been noted on sites in the Littleton Field near Littleton, Illinois, (in one case as a small, but definite, lamellar blade core on a Late Woodland site situated on a terrace remnant). At this point, little more is known of Grover

Gravel utilization in the study area.

Cherts derived from the Illinoian, Nebraskan or Kansan till deposits were also used to a varying, but usually small, extent within the study area. Glacial chert is likely to be quite varied in characteristics and difficult to deal with in the sense of definitive identification. This, plus a preponderance of potential sources and a generally low amount of utilization would make an attempted discussion of glacial cherts unrewarding.

Two aboriginally utilized cherts of unknown or unsure sources have been noted in the study area. One is a chert which has been collected from the bed of Ursa Creek adjacent to the Ursa Major site. It is of an overall brownish hue, but so fossiliferous that it takes on a brown and white speckled or swirled appearance. Flaking properties are excellent and at least minimal aboriginal utilization is attested to by a heat treated, contracting stemmed, barbed projectile point collected from the Ursa Minor site (adjacent to the streambed). Heat treatment has rendered this projectile point a uniform maroon color, making the fossil inclusions stand out even more clearly. Ursa Creek intersects only Mississippian System bedrock in its course.

The final utilized raw material to be discussed is commonly known as "Illinois Agate." This often quartz-like material appears to varying extents in archaeological collections of much of the same distribution as LaMoine

River Chert (i.e. lower LaMoine River, Sugar Creek Drainage, etc.). It is apparently nodular (sometimes appearing concentric) and has a thick, extremely weathered, crust-like cortex. Texture can be fine grained, but usually tends towards a rather grainy, even crystalline structure. Colors are generally white or pinkish orange, but some pieces appear red, blue, or gray. Glen Hanning (personal communication) states that nodules of this material can be readily procured in some streambeds in the Camden area, and is in possession of a debitage collection from a site several miles upstream from the mouth of Missouri Creek (south of Camden), which illustrates usage of this chert. "Illinois Agate" debris is present in approximately equal amounts with LaMoine River Chert, Keokuk chert and Burlington chert on this site. This raw material is usually found in much lesser amounts for most sites in this area and seldom is found to the north.

The comparative chert collection at Dickson Mounds State Museum has samples of "Illinois Agate" which were collected in streambeds in Sections 2, 5 and 6 of Camden Township (T.2N, R.3W) and Section 10 of Cooperstown Township (T.1S, R.2W). Glen Hanning (personal communication) states that the nodules can be observed in a stratum of shale or heavy clays immediately underlying till at a location near the mouth of Cedar Creek (northeast of Camden). Likewise, the source noted in Section 2 of Camden Township (in Spring

Creek) is described as containing the nodules in a green shale overlain by sandstone.

Section 2 of Camden Township is apparently located sufficiently upstream on Spring Creek to intersect only Pennsylvanian bedrock. This, and the fact that a bed of sandstone overlays the green shale, tend to indicate the Spoon or lower Carbondale formation as the potential source. However, Dr. David Hess of the Western Illinois University Geology Department has stated that these nodules appear very similar to pink and orangish nodules of wide distribution throughout southeast Iowa and western Illinois which are often called "Sunglow Agate". These are thought to derive from the St. Louis Limestone. Dr. Hess stated that there are some green clay partings in the St. Louis Limestone (see the description of "green marly clay" in the discussion of St. Louis Limestone) but the presence of the sandstone would necessitate the observed section being at the unconformity at the top of the Mississippian System, if the St. Louis were the source. Within the Spoon and lower Carbondale formations a few shales described as greenish and capped by sandstone are described by Wanless (1957). These are Member 52, which is the last member in the Spoon Formation and is capped by the Isabel Sandstone of the Carbondale Formation; Member 59, which is capped by the Browning Sandstone (which may be a channel facies of the Isabel Sandstone); and possibly Member 64, which is the Francis Creek Shale capped

by the only locally present Jake Creek Sandstone (Wanless 1957:82, 85, 88). None of these members are described as containing chert nodules, which are apparently quite prominent in the source locations described.

Two descriptions in the literature strongly support the St. Louis Limestone as a source. In the Illinois State Geological Survey Guide Leaflet for the Mt. Sterling area (1971-E:26-27), a description of an abandoned quarry seven miles south of Mt. Sterling on McKee Creek lists a one half foot to two foot thick measure of bright red, weathered limestone with "opalescent chert in and under the limestone". Below this is a three foot bed of green silty shale with irregular nodules of chert. Overlying the Mississippian limestone is ten inches of green clay and then one foot and five inches of sandstone in the Pennsylvanian System. A similar description is present in the Illinois State Geological Survey Guide Leaflet for the Hamilton/Warsaw area (1970-E and 1971-B:14). This natural outcrop of St. Louis Limestone is in a branch of Shuhart Creek less than one mile from the Mississippi Bluff. A few fossils and "many pink chalcedony nodules and fragments" are present in the three to four feet of St. Louis Limestone exposed. Thus, it seems quite likely that the "Illinois Agate" raw material (also known as Fredrick Chert or "Sunglow Agate") derives from the St. Louis Limestone. This raw material, although apparently available in much of the

study area, was frequently used only in the southeast portion (due most probably to factors of superior chert availability elsewhere).

SUMMARY

This work has centered predominantly on the utilization and potential availability of chert from the Burlington and Keokuk limestones within the study area. These formations supplied the vast majority of chert utilized aboriginally for this portion of Illinois and their availability is judged to have been the major controlling factor in local use of cherts of lesser quality. Three potential outcrop zones are present for these two formations which allow for at least limited Burlington or Keokuk chert availability in each of the study area's major drainge systems. Several other chert bearing formations and/or archaeological chert types for the area have also been discussed in limited scope.

Since archaeological information of chert utilization is sketchy at best, "potential" for utilization has been developed using geological and archaeological information. This study has been carried out at this stage of understanding, as opposed to after gathering further evidence of utilization, primarily to shift the focus of upland west central Illinois archaeology away from a restrictive and "anecdotal" focus. Although the distributional information presented here may appear self evident to the geologically inclined, archaeologists simply have not taken into account the possibility of these

resources. For example, Conrad (personal communication) has noted that he consistently identified the Keokuk chert material, which predominates in the Adams, Hancock, and parts of McDonough county portions of the FAP 407 corridor, as Burlington chert. Moore and Burge (1981:18, 148-149) discuss only the lower Illinois Valley (80 miles overland) and the Avon source (20 miles overland) as potential sources of the Burlington chert on sites along Cedar Creek east of Monmouth (less than 10 miles from extensive Burlington outcrops in the same drainage and only a little over 30 miles northeast from the type site of the Burlington Limestone). Problems have arisen not only from a misunderstanding of the distribution, but the utilization of chert resources in the area. The assumption that all "big, white spearheads" in the study area are Avon Chert has not been unusual, but erroneous conclusions of utilization have been arrived at by more exacting means as well. Based on a misconception that Avon Chert is very fossiliferous, coarse grained and flawed, as well as much of it being easily distinguished from the lower Illinois Valley Burlington cherts, Cantwell (1980) has arrived at improperly derived, if not necessarily incorrect, conclusions.

The need for shifting from this restricted focus for the archaeology of upland west central Ilinois and correcting the myths and misconceptions in the literature is immediate. Cantwell (1980) and Harn (1980) at present are

the archaeological references cited for the Avon source. The importance of resource studies to an understanding of the area's prehistory requires that archaeologists develop a comprehensive, geographically based knowledge of resources and their location. This regional base-line study of chert availability and use hopefully has put us closer to that understanding.

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