

CLOVIS PROJECTILE POINT MANUFACTURE: A PERSPECTIVE FROM THE READY/LINCOLN HILLS SITE, 11JY46, JERSEY COUNTY, ILLINOIS

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Introduction

While many lithic analyses have documented various aspects of Clovis lithic technology from a variety of archaeological contexts in widely scattered locations across North America (e.g., Bradley 1982, 1993; Green 1953; Young and Collins 1989; Collins 1990; Sanders 1990; Willig 1993), much of our current understanding of Clovis biface manufacture is based primarily on information derived from artifact caches from western North America (Frison 1991; Gramly 1993; Woods and Titmus 1985; Lahren and Bonnichsen 1974; Wilke, Flenniken, and Ozbun 1994; Stanford and Jodry 1988). Some of these researchers have observed that Clovis knappers *employed a* highly distinctive biface reduction strategy. This being the case, Clovis lithic assemblages should be easily recognized wherever they occur. Defined technologically, the Clovis complex is represented in many localities across eastern North America. One of these localities is the Ready site, which contains an extensive early Paleoindian habitation/workshop component.

The large assemblage of Paleoindian chipped stone artifacts collected from the Ready site (11JY46) in Jersey County, Illinois, contains the full range of Clovis fluted biface manufacturing steps. As such, the assemblage allows one to document in detail *the* fluted point manufacturing sequence employed at the site. This study discusses the sequence of Clovis fluted biface production as interpreted from the Ready site assemblage. More detailed analyses of the Ready *site* assemblage are planned, and the present study should be seen as a preliminary view of the site.

The Ready site is perhaps better known to the professional archaeological community as the Lincoln Hills site. Although the site was recorded as the Scenic Hill site in 1958 by Patrick Munson (Illinois Site Files), archaeologists soon referred to it as the Lincoln Hills site, presumably based on its location within the Lincoln Hills physiographic area (see Howard 1988; Koldehoff

1983; Wiant and Winters 1991). The Lincoln Hills physiographic area is a section of the Ozark Plateau province that extends into Illinois along the Mississippi River (Willman et al. 1975). Herein the site is referred to simply as Ready in honor of Jesse Ready, who discovered the site and surface collected there for many years, and also because the site is best known locally as the Ready site.

The Ready site is situated atop a high upland plateau intersected by the head-water drainages of several small first-order streams north of Grafton, Illinois (Fig. 1). The site once covered at least 2 ha in area and exhibited dense concentrations of chipped stone flaking debris and rejected bifaces. Portions of the site have been disturbed by recent construction, but much of it remains as fallow cropland. To date, no formal geomorphological or archaeological testing has been conducted on the Ready site, but much information can be derived from artifacts recovered by various individuals over many years of surface collecting. Most notable among these surface collections is that of Jesse Ready.

Ready began surface collecting the site in the late 1960s. He continued to collect it for approximately ten years until the property was sold and he was denied access to the site. Ready's collection from the site (n=588 pieces) consists almost entirely of worked chipped stone artifacts. Aware of the significance of the site early on, he was careful to keep all the artifacts he had surface collected from the site separate from material recovered from other locations.

The Jesse Ready collection was studied by Howard Winters and Michael Wiant in the 1970s (Wiant and Winters 1991). All of the artifacts from the site in Ready's possession were labeled with sequential catalog numbers, and a general inventory of the collection was assembled in 1981 by Brad Koldehoff, who describes the site in his discussion (1983) of Paleoindian lithic raw material utilization in southwestern Illinois. Calvin Howard (1988) has also examined the Ready collection and published an article discussing the fluting technology, and Greg Perdun (1988) has written a brief description of the site accompanied by photographs of some of the artifacts in Ready's collection.

In order to collect data for my doctoral research on Paleoindian lithic technology, I visited Ready in 1992 to record detailed morphological and metric data on all of his artifacts from the site. In addition to most of the artifacts that had been previously listed on Koldehoff's inventory, there were many artifacts that Ready had recovered since his collection was cataloged in 1981. These new specimens, as well as twenty-two specimens from the site in the collection of Greg Perdun, were also recorded. Thanks in large part to the efforts of Perdun, I examined four additional collections from the site and *have* included them in my data sample.

A total of 694 artifacts from the Ready site in six individual collections have been recorded. These artifacts consist almost entirely of *whole* and fragmentary projectile points and bifaces in all stages of manufacture, as well as formal

flake tools (e.g., end scrapers, side scrapers). Considered in their totality, these collections contain hundreds of Paleoindian artifacts. Also represented in these collections are a minority of artifacts (n=30 projectile points/knives) diagnostic of later prehistoric periods ranging from Early Archaic to Mississippian. Based on typological comparison with western Clovis bifaces and bifacial preforms, the majority of artifacts recovered from the Ready site appears to relate to the Early Paleoindian period, ca. 11,200 to 10,900 B.P. (Tankersley and Morrow 1993; Morrow and Morrow 1993).

Lithic Raw Material Sources

Several chert-bearing bedrock formations of Mississippian age are exposed near the Ready site. The bluffs and dissected stream valleys located a short distance from the site cut through the Burlington limestone, a bedrock unit containing large nodules and thick beds of generally white to light gray or cream-colored chert with slight to moderate translucency (Meyers 1970; Willman et al. 1975). This chert varies in quality, but it can be, and often is, very finely textured and readily knappable. Residual or lag deposits of high-quality Burlington chert are particularly common in the headwaters of secondary drainages in the uplands of southern Jersey County.

Closer to the bluff bases and in the lower portions of the secondary side valleys, both the Fern Glen Formation (underlying the Burlington) and Chouteau Formation (underlying the Fern Glen) are exposed. While chert is available from both of these formations (Rubey 1952; Willman et al. 1975), it is generally less abundant and routinely occurs in smaller nodules than the chert in the Burlington. Fern Glen chert typically ranges from pale gray to *greenish or* pale bluish gray and is opaque to slightly translucent. The chert derived from the Chouteau formation is almost uniformly light to medium gray in color and opaque.

The Cape Aux Gres faulted flexure cuts across this area of western Illinois (Rubey 1952) a short distance south of the Ready site. Along the up-thrust side of this fault line, various Devonian and Silurian formations are exposed. These earlier Paleozoic formations generally contain little, if any, knappable chert. Within the down-thrust portions of the bedrock south of the fault, the St. Louis Formation is exposed, particularly in neighboring Madison County. Various forms of bedded and nodular chert are sporadically available from this formation. Sinkholes developed into the St. Louis limestone are widely scattered in the uplands of southern Jersey and southern Madison counties.

Lithic Raw Material Use

Since the artifacts collected from the Ready site were recovered exclusively

from the surface, and because the site is clearly multicomponent, the following discussion of the lithic raw materials represented in the site assemblage makes particular reference to those specimens that are most unquestionably associated with the Paleoindian use of the site: fluted points and fluted preforms. The majority of the 224 fluted bifaces recorded from the Ready site are manufacturing rejects. Finished fluted points are comparatively uncommon (Table 1).

Due to the proximity of the Ready site to residual or lag deposits of high-quality Burlington chert, it is not surprising that this material dominates the entire site assemblage. Considering only the fluted points and preforms from the site, some 86.5 percent are made of Burlington chert. An occasional fluted biface in the collection will exhibit traces of incidental (unintentional) exposure to heat but not one of these artifacts appears to have been intentionally heat treated. Judging from the large numbers of unfluted, but potentially Early Paleoindian stage 2 and 3 bifaces recovered from the site, all stages of point production are well represented in this local raw material.

The second most common lithic raw material in the Ready site assemblage is an unidentified *moderately* translucent, lustrous, medium gray to dark bluish gray chert with mottled brownish and/or grayish streaks and scattered microfossils. This "icy-blue" chert appears to be restricted to the Paleoindian assemblage. It represents 6.7 percent of the fluted biface assemblage and also occurs in the form of unfluted stage 2 and 3 bifaces. This lithic material conforms closely to the range of manufacturing stages represented by Burlington chert and may have been derived from a local source area. The translucency, mottling, luster, and color of this unidentified chert is virtually identical to chert of the Carbondale Formation, also known as Blair or St. David chert (Brad Koldehoff, personal communication 1994). Outcrops of Carbondale Formation in closest proximity to the Ready site occur in eastern Jersey and southern Calhoun Counties, but whether or not these outcrops contain knappable chert is not yet known. The nearest known outcrops of the Carbondale Formation are located roughly 120 km to the south of the Ready site, in Randolph County, Illinois.

Fluted bifaces manufactured from other locally available cherts are present, but far less common, in the site assemblage. Chouteau, Fern Glen, and St. Louis chert are represented by a mere handful of specimens comprising only 4 percent of the assemblage. Like the Burlington and "icy-blue" cherts, these local and semi-local cherts occur in the form of both finished implements and manufacturing rejects.

Exotic lithic raw materials are even less common among the fluted bifaces. Two finished fluted points of Kincaid chert derived from source areas in southern Illinois and a single finished and heavily resharpened point of Attica chert from western Indiana are present in the assemblage (see Fig. 1).

Other exotic lithic raw materials are represented among the various flake

tools recovered from the site, and these may also be related to the Paleoindian occupation. These include a unifacially retouched flake of Cobden chert from southern Illinois, a unifacially retouched flake of what may be St. Genevieve (cf. Munfordville or Kentucky Blue) chert from western Kentucky, and two end scrapers (and possibly two late-stage biface fragments) of Kaolin chert from southern Illinois. It is worth noting that all of these exotic raw materials occur predominantly in the form of *finished* lithic implements.

Typology of the Ready Site Fluted Points

A total of twenty-eight finished/nearly finished fluted projectile points were recovered from the Ready site. Twenty of these fluted points *conform closely* to descriptions of the Clovis type (Haynes 1980; Howard 1990; Roosa 1955; Wormington 1957). These points exhibit slightly excurvate to parallel sides; slightly to moderately concave bases; and simple, multiple, or composite flutes that usually extend about one-fourth to one-half of the length of the point (Fig. 2c, d, e). All specimens are fluted on both faces, and half of these specimens exhibit slightly flaring basal ears. The lower portions of the lateral and basal edges are typically moderately to heavily ground. Unresharpened or minimally resharpened points in this group average 71 mm in length, 27 mm in width, and 7.8 mm in thickness.

The remaining eight finished or nearly finished fluted points exhibit various morphologies. One specimen exhibits a more deeply concave base and more markedly excurvate *sides*. One small, very thin point is fluted on one face nearly to the tip and exhibits very slightly flaring basal ears. This point resembles those described as Barnes points in the Great Lakes region (Dellar and Ellis 1988). A similar small, very thin point with much shorter flutes is also represented in the Ready site assemblage. Four of the remaining fluted points are very small (38 to 49 mm in length) with triangular to ovate outlines. In some typologies, these points might be interpreted as representing post-Clovis (e.g., Holcombe) use of the site (*see* Fitting et al. 1965; Dellar 1989). However, the presence of three reworked broken tips of finished fluted points (one with a fluting platform prepared on a newly refashioned basal edge) suggests an alternative interpretation (Fig. 3). I propose that at least some of these small and distinctively shaped fluted points may represent recycled Clovis point tips. *This model* for recycling broken tips could account for the small "Clovis Type 11" points excavated from Blackwater Draw Locality No. 1 (Nester 1972:97). The final remaining fluted point is also comparatively short (54 mm in length) and exhibits a steeply retouched basal edge with a single small flute removed from one face. This latter point may also represent a reworked point tip.

Fluted Point Manufacture at the Ready Site

The manufacture of fluted projectile points is a subject that has commanded a great deal of attention from both archaeologists and modern flintknappers. Various researchers have described the reduction sequence employed in making fluted Clovis points based both on archaeological assemblages and replication experiments (e.g., Bradley 1991; Callahan 1979; Roosa 1965; Sanders 1990; Whitthoft 1952). Traditionally, fluting has been seen as one of the last steps in the manufacture of Clovis points (Callahan 1979:116, 164; Sanders 1990:44). Several researchers assert that Clovis points were fluted from a "beveled" base without an isolated striking platform (e.g., Collins 1990; Roosa 1965). Although Howard (1988:396) states that there are several Ready site specimens that "apparently were fluted from beveled basal striking platforms," the channel flake scar attributes on these specimens indicate removal from a well isolated striking platform. Data generated from the Ready site assemblage offer an alternative model for Clovis fluted biface manufacture. The following description of this reduction sequence uses terminology comparable to the manufacturing stages established by Callahan (1979).

Stage 1: Tabular and Flake Blanks

The initial blanks selected for fluted point manufacture (stage 1) at the Ready site are not well represented in the surface collections examined for this study, since the collections consist almost entirely of modified specimens. However, based on remnants of the original blank surfaces present on several early-stage bifaces, both naturally occurring tabular spalls as well as flake blanks appear to have been used. Both of these reduction strategies were employed in order to accommodate the characteristics of the locally available Burlington chert, which occurs naturally in the form of flat spalls and large blocks.

Bifaces made on selected flake blanks are generally smaller and often required minimal percussion to reach the approximate shape and proportions of a stage 3 or even stage 4 biface. Flake blanks enable the flintknapper to skip many of the traditionally recognized "early stage" biface manufacturing steps. Using selective and localized soft hammer percussion thinning and trimming, most flake blanks can assume the size and shape of a point preform while retaining patches of the original flake blank surface.

Stage 2: Initial Edging and Trimming

Large, tabular spalls furnished the initial blanks for several of the large stage 2 bifaces in the assemblage. The first step toward reducing these large spalls into bifaces involved the removal of prominent ridges and humps. In concert with this, a roughly bifacial edge was established over all or most of the piece's

periphery. Large patches of the original spall surface frequently remain on one or both sides of stage 2 bifaces from the Ready site. Based on flake scar characteristics and experimental replication, stage 2 biface reduction was probably accomplished using hard and perhaps some soft hammer percussion (T. Morrow 1992).

Stage 3: Primary Thinning and Shaping

It is during the primary thinning stage, stage 3, that the Clovis biface begins to take on its distinctive appearance. Following the initial edging and trimming, stage 2 bifaces were further reduced by the removal of deep, transverse percussion thinning flakes. This primary thinning produced large, fully flaked stage 3 bifacial blanks with a regularized cross-section and a roughly ovate outline (Fig. 2g, h). In some cases, the flake removals were on opposing faces from opposite edges, as seen on many Western Clovis bifaces (Bradley 1982, Frison 1991, Gramly 1993), and in others they appear to have been more random. This type of intensive biface thinning produces broad bifaces with flattened cross sections and a flaking pattern consisting of several very large, relatively widely spaced, long, deep flake scars. This biface thinning strategy is a hallmark of Clovis lithic technology and is perhaps no less diagnostic of Clovis lithic assemblages than the Clovis point itself.

The key to Clovis biface thinning lies in specially prepared striking platforms. Preparation of striking platforms was a critical step in the successful removal of biface thinning flakes. Isolation of the striking platform focuses the **percussion blow precisely** where the knapper chooses to remove a flake and channels the energy into a specific path behind the flake removal. Striking platforms may be oriented in both the vertical and horizontal dimension. Placement of the striking platform in relation to the center plane of the biface determines the depth of the flake initiation and influences the subsequent length **and mass of** the flake removed (cf. Callahan 1979). Experimental replication indicates that the removal of large biface thinning flakes from an edge that lies near the center plane of the biface quite frequently results in lateral fracture (T. Morrow 1992).

According to Callahan (1979:34, table 11c), centered platforms are "ideal for primary thinning" because flakes struck off such platforms may travel to the center of the biface and there is less chance of breakage. Platforms "below center" are "ideal for secondary thinning" because flakes can span the entire width of the biface and there is minimal chance of breakage. It appears that Clovis knappers mitigated the risk of **breakage** that would normally have occurred through the use of center plane striking platforms by extensively isolating them in the horizontal dimension.

Clovis striking platforms are well isolated lobes that are positioned in the

center plane of the biface and typically project at least 2 to 3 mm from the biface edge. These isolated lobes occur around the entire circumference of the biface at fairly widely spaced intervals and typically are aligned with prominent ridge crests located between previous flake removals. Good *examples of* these isolated platform lobes can be seen on the Badger Mountain fluted biface found near Fast Wenatchee, Washington (Gramly 1993:51), as well as some of the Richey cache fluted bifaces (Gramly 1993:27, 32, 33; see Johnson 1993). Soft hammer percussion flakes detached using this type of striking platform have deep, narrow initiations (Fig. 4) and often span a large portion of the width of the biface, sometimes terminating in an *outré posse*, wherein a portion of the opposite edge of the biface is also removed. Using this flaking technique, it is possible to greatly reduce the thickness of a biface with a minimum number of flake removals (T. Morrow 1992; Johnson 1993).

This biface thinning strategy is characteristic of large Clovis bifaces and large Clovis points recovered from the Anzick site (Lahren and Bonnicksen 1974; Wilke, Flenniken, and Ozbun 1994) and in the Fenn (Frison 1991), Richey (Mehringer 1988; Gramly 1993), and Simon (Butler 1963; Woods and Titmus 1985) caches. Refitted flakes from the Sheaman site in Wyoming also demonstrate this technique (Bradley 1982).

Stage 4: Secondary *Shaping and Fluting*

Following the primary thinning step, stage 3 bifaces were trimmed and shaped into fairly regular stage 4 preforms with a distinctive rowboat-shaped outline (Fig. 2i, j). The relatively flat cross-section produced by the deep, transverse percussion thinning during stage 3 was modified by marginal lateral percussion trimming. This was necessary in order to obtain a more lenticular or biconvex cross-section. A convex surface is preferable to a flat surface for successful flute removal. Selectively trimmed and shaped bifaces made from flake blanks often already exhibit the general shape and proportions of stage 4 preforms.

It is at this stage that the reduction sequence indicated by the Ready assemblage diverges from the traditional view of Clovis point manufacture (e.g., Callahan 1979). Rather than leave the relatively risky step of fluting to the final stage of point production, Clovis knappers at the Ready site prepared these still-thick and comparatively large stage 4 preforms directly for the removal of channel flakes. Stage 4 preforms prepared for the removal of the first flute in the Ready assemblage have a distinctive shape and size. The flaking pattern is such that many of the traces of *deep* transverse percussion thinning have been removed by subsequent lateral percussion. The base is generally markedly to moderately convex. Stage 4 preforms are on average 30 percent longer, 40 percent wider, and 25 percent thicker than the finished fluted point. At the timing

of the first flute removal, stage 4 bifaces made of Burlington chert average 103 mm in length, 43 mm in width, and 10.7 mm in thickness (Fig. 5). Those manufactured of other lithic raw material, such as unidentified "icy-blue" chert or Fern Glen chert average somewhat smaller in size, probably reflecting the generally smaller size of pieces of stone available.

Striking platforms prepared for the first flute removal are intact on ten specimens from the Ready site (Fig. 2a). *These platforms are* isolated lobes placed at or near the center of the typically convex basal edge, and they are morphologically similar to the platforms prepared for removal of deep transverse lateral thinning flakes. The *flute scars* exhibit the same deep, narrow initiation characteristic of the transverse thinning flake scars. The initiation points of virtually all flute scars present on the Ready site fluted preforms indicate their removal from well-isolated platforms placed at or near the biface center plane. A Clovis preform base, broken by overshot during the first flute removal, is among the relatively small assemblage of artifacts excavated from the Kimmswick site (23JE354) in east central Missouri (Graham et al. 1981; Hajic et al. 1989). The Kimmswick fluted Clovis preform is virtually identical to dozens that have been collected from the surface of the Ready site.

Fluting was most *likely* accomplished by soft hammer percussion (T. Morrow 1992). Extant fluting platforms on the Ready site preforms are lightly to *moderately* ground. The convexity of the basal edge along with the well-isolated fluting platform would have facilitated the use of direct percussion. Flutes removed from these large preforms are large and bald. Flutes exceeding 50 mm in length and 30 mm in width are not uncommon on the fluted preforms from the Ready site. Flute scars often expand rapidly from their initiation at the isolated platform and in many cases "roll in" and terminate in a step or hinge fracture. These deep flute terminations can create a structural weak spot in the body of the biface. These *weak* spots were often eliminated prior to the fluting of the second face and this was most often accomplished by the removal of one or more lateral thinning flakes. Bradley (1993:254) considers this lateral removal of a step or hinge fracture at the end of a flute scar to be "a diagnostic trait of High Plains Clovis point manufacture."

After the first flute was successfully removed, further basal and lateral flaking was undertaken. Striking platforms prepared for the second flute removal from the opposite face are intact on three specimens from the Ready site. These platforms are similar to those prepared for the first flute removal, but there is a tendency for the basal edge to be straighter or even slightly concave. As a result of the basal and lateral flaking that followed the first flute removal, by the time the stage 4 preforms were prepared for removal of the second flute they *were* slightly smaller (Fig. 6). At this position in the reduction sequence, Burlington chert specimens average about 95 mm in length, 38 mm in width, and 8.9 mm in thickness.

Stage 5: Final Thinning and Shaping

With the second flute successfully removed, the final stage 5 thinning and shaping was conducted. During this stage, the entire periphery of the preform was reflaked by light soft hammer percussion producing a thinner, finely tapered point. This series of flake removals was carefully executed so as to leave the major portions of the flute scars intact while bringing the rest of the body of the point to the approximate thickness of the finished form. In most cases, whole edge, rather than isolated, platforms appear to have been used during Stage 5 thinning and shaping. Some specimens at this stage, however, do exhibit flake scar initiations indicative of well-isolated platforms. Most of the finished fluted points from Ready exhibit simple flutes, but in cases where stage 4 fluting had not sufficiently thinned and tapered the haft element of the biface, one or both of the faces were re fluted. Re fluting or "secondary fluting" may have been accomplished by indirect percussion since the basal edge of the biface, at this stage, is moderately concave. Secondary flute scars are small in comparison to the flutes typically removed during stage 4. The fact that there are no examples in the Ready assemblage of preforms broken during secondary fluting suggests that there is a low risk for breakage during this step.

A substantial portion of the initial flute scar usually remains intact ahead of the secondary flute and typically the two scars blend smoothly together, giving the appearance of a single channel scar. I refer to this fluting variation as "composite fluting" to differentiate it from multiple fluting, in which two or more flutes have been removed side by side (Fig. 7). Multiple flutes are present on a minority of finished fluted points from the Ready site. Similar to "the Barnes finishing technique" described by Roosa (1965:92), composite flutes also occur on a number of Western Clovis bifaces (Frison 1991: fig. 2.34, Haury et al. 1959:17; Mallouf 1989:fig. 11; Titmus and Woods 1993:fig. 3a.; Woods and Titmus 1985 :fig. 6c, d).

Stage 6: Edge Retouch and Haft Grinding

The final steps in manufacturing the fluted biface included pressure retouch along all of the biface edges and the grinding of the haft element. Pressure flaking was employed to straighten both lateral and basal edges. In most cases, pressure flaking was restricted to retouching the edge and reducing the height of crests remaining from former percussion flake removals. Most of the finished Clovis points from the Ready site exhibit moderate to heavy grinding of the basal edges and the lower portions of the lateral blade edges adjacent to the flutes.

Conclusions

In summary, many of the characteristic biface reduction strategies employed by Clovis knappers across the western United States are well represented in the Paleoindian assemblage from the Ready site. *These* strategies include the preparation of well-isolated striking platforms, maximum biface thinning with a minimum number of flake removals, fluting from a well-isolated striking platform (as opposed to a beveled base), and post-fluting lateral trimming and shaping. Significantly, Ready is not the only site east of the Mississippi River that exhibits technological hallmarks of the Clovis complex. On purely technological grounds, the Clovis complex is widely represented in many parts of eastern North America. Sites that have yielded fluted points and fluted preforms analogous to those from the Ready site include Adams (Sanders 1990) and Ledford/Roeder (Tankersley 1989) in Kentucky, Welling (Prufer and Wright 1970; Tankersley 1989) in Ohio, Wells Creek (Dragoo 1973) and Carson-Conn-Short (Booster and Norton 1993) in Tennessee.

In light of this observation, Roosa's (1965) statement that there are few if any true Clovis points east of the Mississippi River was premature. Roosa and others who have followed his lead are correct in identifying other styles of **fluted points** from eastern North America that are indeed distinct from Clovis (e.g., Gainey, games, Holcombe, Cumberland, etc.). However, the widespread distribution of the distinctive hallmarks of Clovis chipped stone technology east of the Mississippi River suggests that the early Paleoindian occupation of much of this region is closely related, culturally and chronologically, with that of western North America.

The sequencing and specific aspects of Clovis point manufacture have been interpreted in a variety of ways (e.g., Callahan 1979; Roosa 1965; Sanders 1990; Howard 1988). The fluted point manufacturing sequence represented at the Ready site provides an alternative model of Clovis point manufacture (Fig. 8). Paleoindian knappers at the Ready site adapted their reduction strategy to cope with the everpresent uncertainties involved in fluted point production. Rather than removing flutes from preforms that were nearly finished, fluting was accomplished at a more intermediate stage in the reduction sequence. This practice effectively reduced the amount of time invested in a preform prior to potential breakage during fluting. As well, since the flutes were being removed from preforms that were substantially wider and thicker than the finished product, breakage resulting from the fluting process was probably also reduced.

The quantity of artifacts representing all stages of biface manufacture recovered from the Ready site indicates that the procurement and processing of chert resources was a major focus of Paleoindian activity on this site. Hundreds of stage 2 and 3 bifaces and biface fragments are present in the surface collections examined for this study. The majority of these bifaces probably relate to the

Paleoindian use of the site based on their size, proportions, and flaking pattern. Through further analysis and by comparison with excavated Early, Middle, and Late Paleoindian assemblages, it may be possible to isolate artifacts related to the Early Paleoindian component from those of later components. Until this more intensive study is completed, any interpretations of the early stages of Paleoindian biface manufacture are tentative.

The fluted point preforms at the Ready site also provide some insights into the organization of Early Paleoindian lithic technology. Although at present we cannot determine the number of early-stage biface blanks that were manufactured by Paleoindians at the Ready site for transport and reduction elsewhere, the abundance of late-stage fluted preforms at the site clearly indicates that fluted projectile points, and probably many of them, were being manufactured directly at this quarry/workshop site. This observation would suggest that one of the major products being transported away from the Ready site was finished fluted points.

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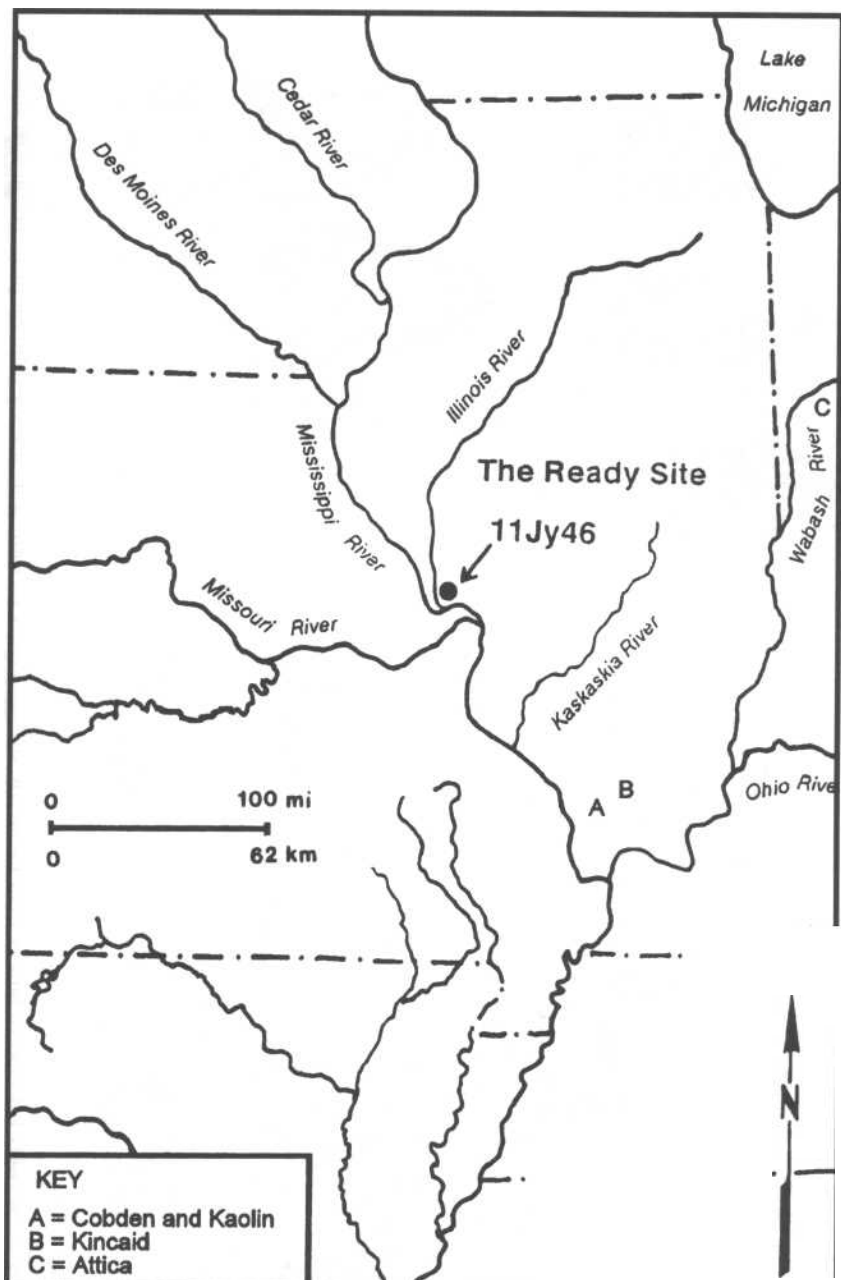


Fig. 1. Map showing the locations of the Ready site and selected exotic raw material sources.

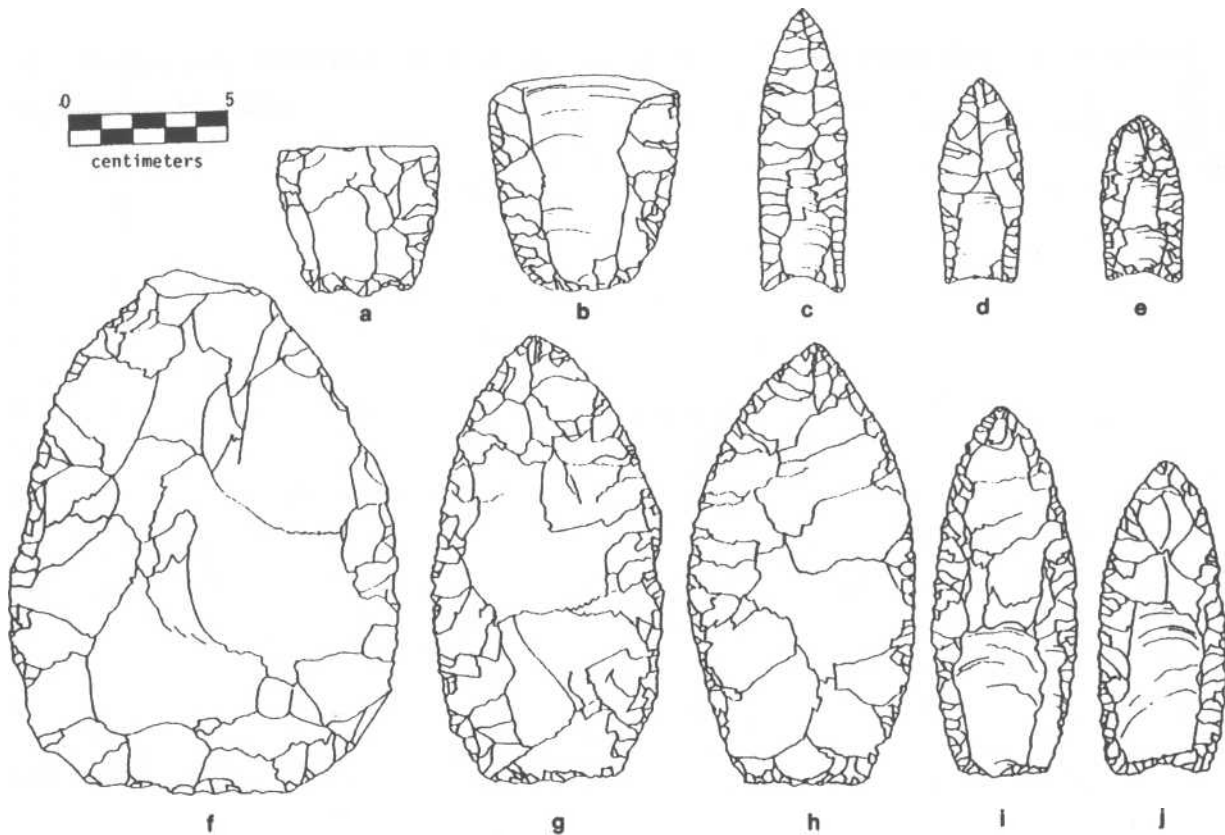


Fig. 2. Selected Paleoindian bifaces from the Ready site: a) stage 4 preform with striking platform prepared for first flute removal, end shocked; b) stage 4 preform overshooting during the first flute removal; c, d, e) stage 5 finished fluted points; f) stage 2 biface; g, h) stage 3 preform, second flute removed.

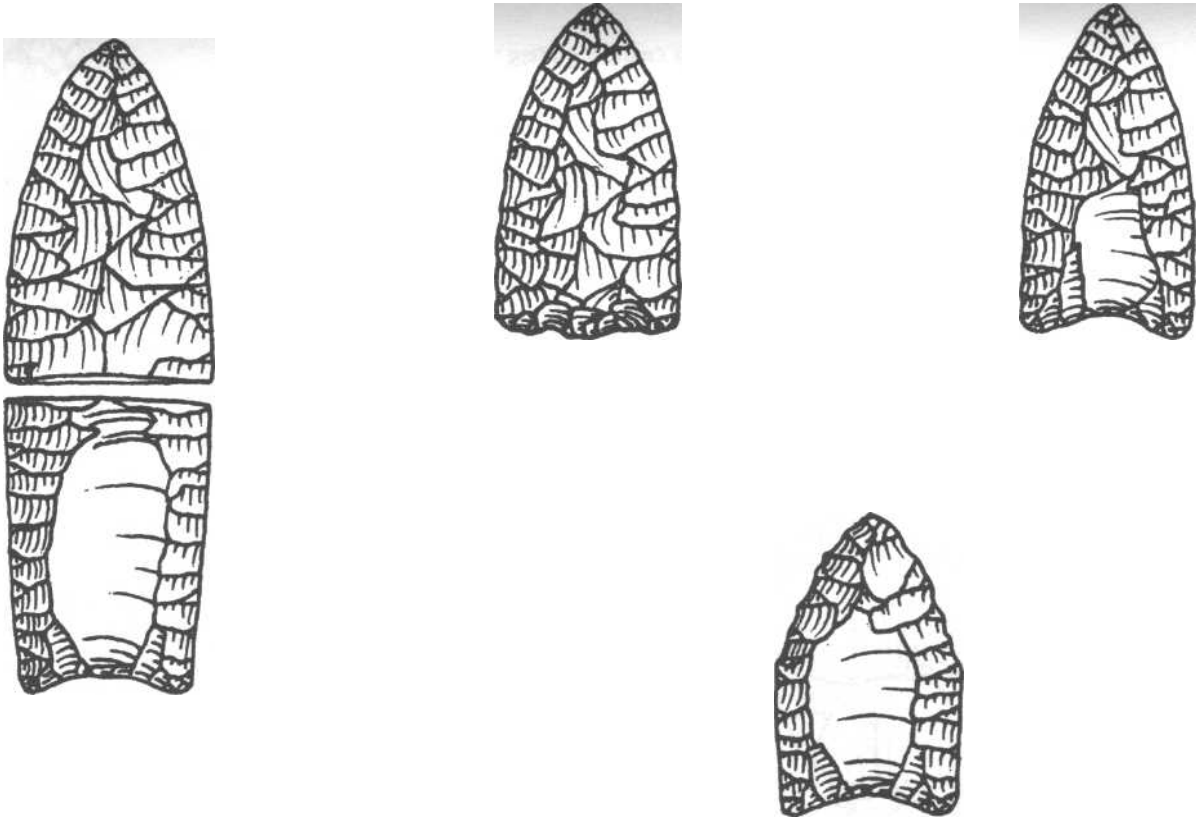


Fig. 3. Recycling and repair of broken Clovis points. Top: Distal end of original point repaired by fluting base. Bottom. Proximal end of original point repaired by removing flakes to form a new point

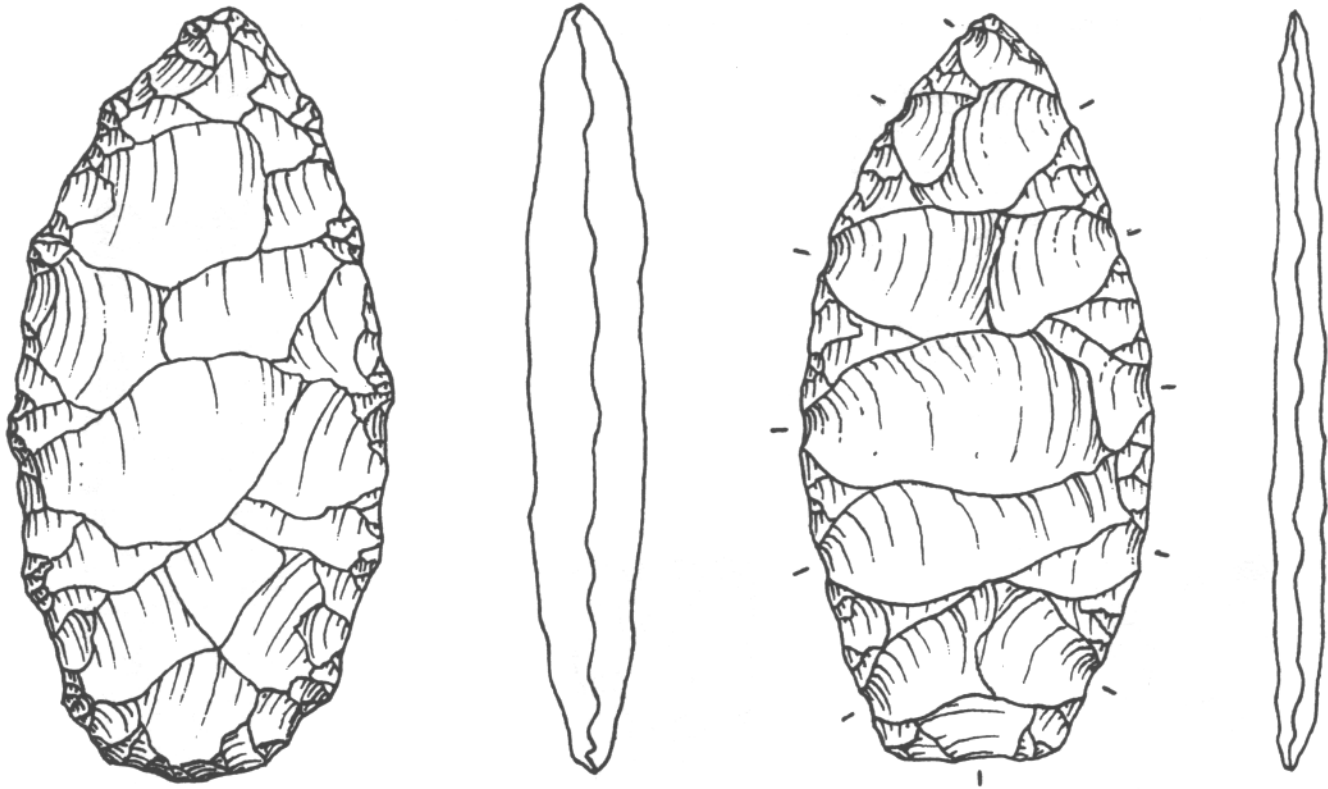


Fig. 4. Stage 3, primary thinning.



Fig. 5. Stage 4, first flute removed.

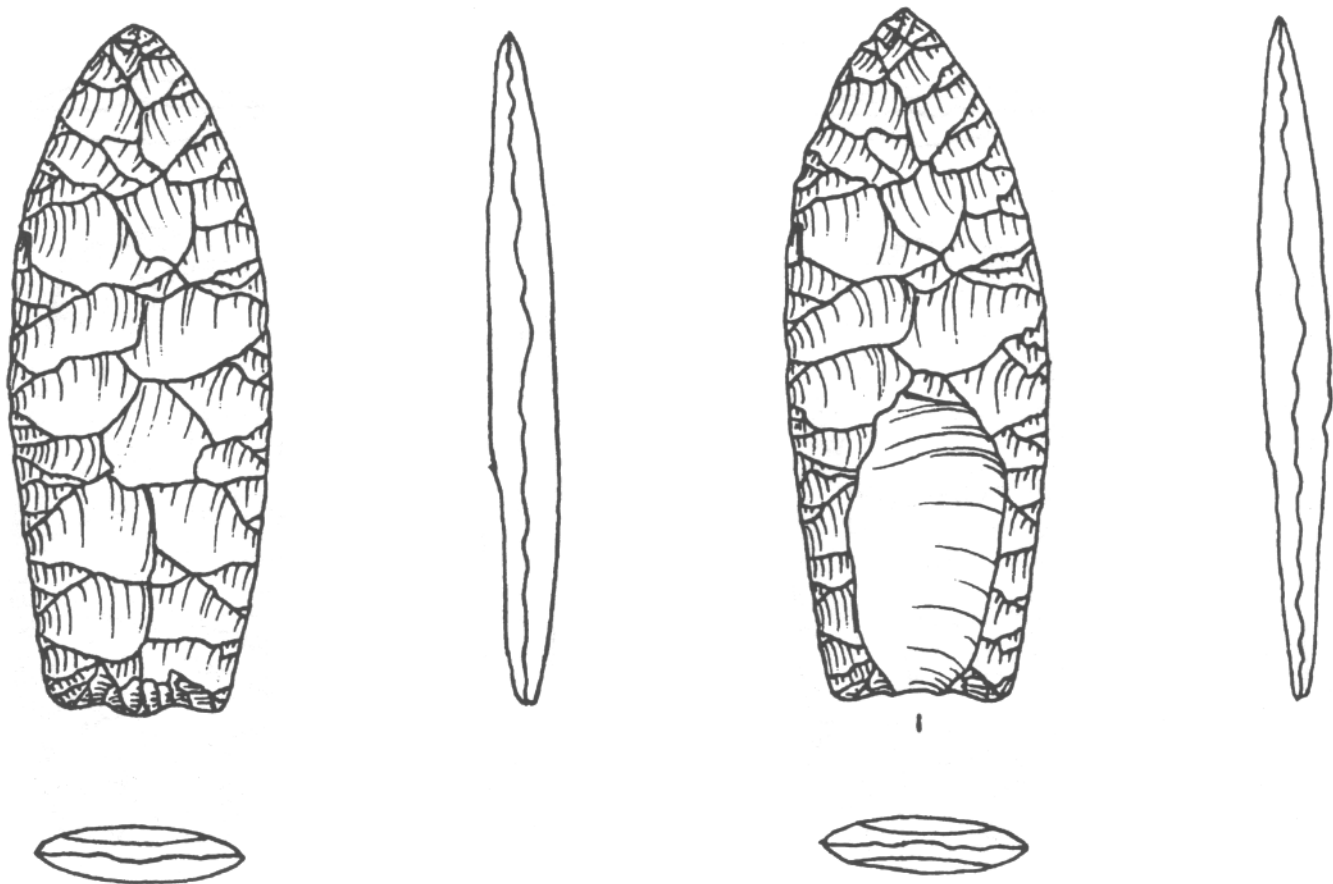
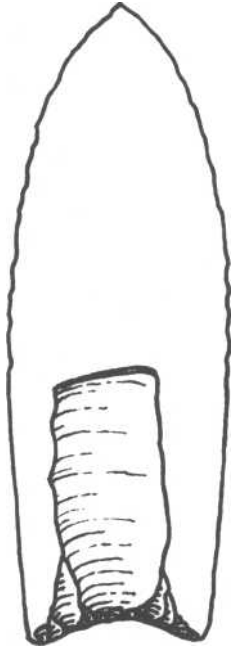


Fig. 6. Stage 4, second flute removed.

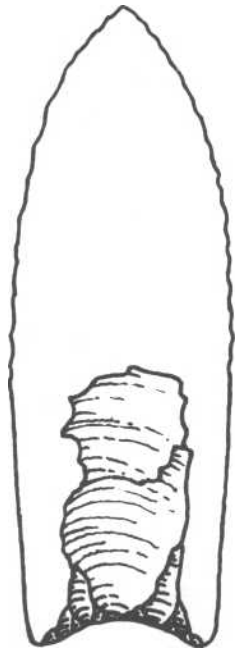
FLUTING VARIATIONS



SIMPLE



MULTIPLE

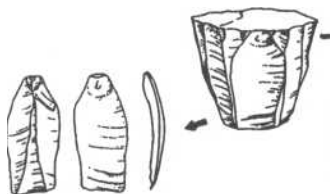


COMPOSITE

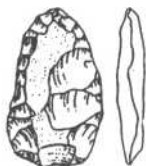
Fig. 7. Fluting variations typical of Clovis and related fluted point forms.

STAGE

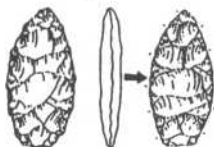
STAGE 1:
S@lactod tabular
Pine. flak* blank



STAGE 2:
4titial edging and
tdnvrng

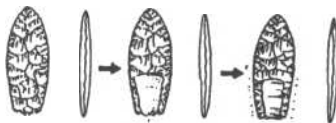


STAGE 3:
prknwy thinning
and @hoping

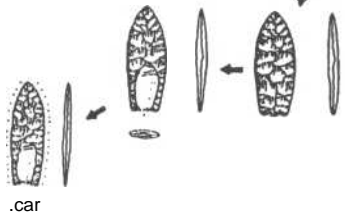


d

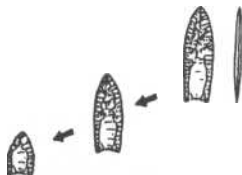
STAGE 4:
a@condary &hoping,
fluting



STAGE 5:
final thinning
and shaping



STAGE 6:
ado* ratcuch,
haft grinding
FINISHED POINT



**REWORKING/
RECYCLING**

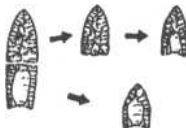


Fig. 8. Fluted point manufacturing sequence model based on the Ready site, II JY4fi.

TABLE 1

Raw Material Frequencies In the Fluted Bitace Assemblage at the Ready Site

Caregny

	Ravi, material*								Total
	BURL	ICBL	FNGN	CHOU	STLS	RINC,	ATCA	INDFT	
First flute removed	57	6	1	—	1	—	—	—	65
Lateral trimming, I	17	—	1	1	—	—	—	1	20
Second flute removal	50	2	—	—	—	—	—	—	52
Lateral trimming, 11	33	1	1	—	2	—	—	1	38
Finished Clovis points	13	3	1	—	—	1	1	1	20
Other fluted points	5	1	—	1	—	1	—	1	8
Reworked point tips	2	1	—	—	—	—	—	—	3
Indeterminate fluted bifaces	17	1	—	—	—	—	—	—	18
<i>Total</i>	<i>194</i>	<i>15</i>	<i>4</i>	<i>2</i>	<i>3</i>	<i>2</i>	<i>1</i>	<i>3</i>	<i>224</i>
<i>Yercenrage</i>	<i>86.9</i>	<i>6.7</i>	<i>1.8</i>	<i>0.9</i>	<i>1.3</i>	<i>0.9</i>	<i>0,4</i>	<i>1.3</i>	

*BURL = Burlington; ICBL = "Icy Blue" (cf. Carbondale Formation); FNGN = Fern Glen; ctou = Chouteau; sTLs = St. Louis; KING = Kincaid; ATCA = Attica; INDET = Indeterminate.

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