## Site Distribution and Physiographic Zones along the Big Blue River Glacial Sluiceway

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### Introduction

Between the summer of 1985 and the spring of 1986 an archaeological reconnaissance was carried out in a 25-mile corridor along the upper portion of the Big Blue River glacial sluiceway, beginning in the southern end of Delaware County, running through Henry County, and ending in the northern end of Rush County (Figure 1). This survey was

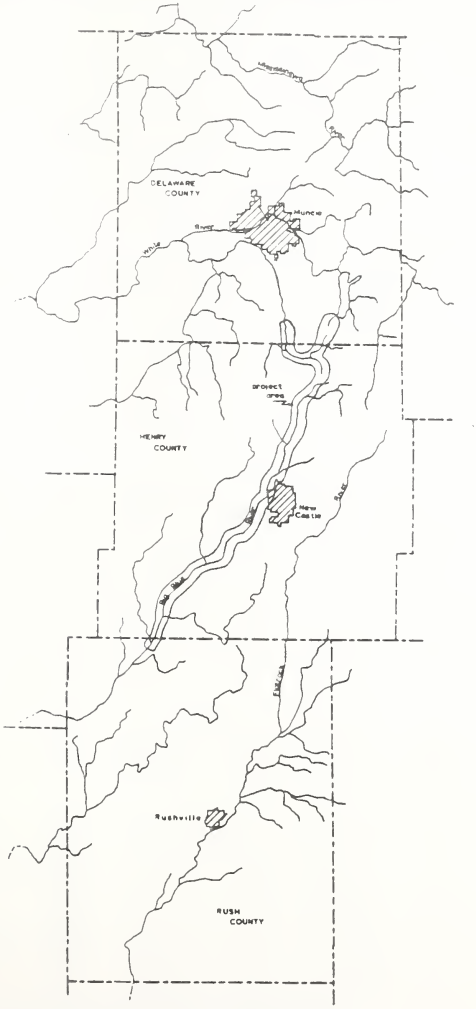


Figure 1. The project area within its regional context.

carried out with the aid of a Historic Preservation Fund Survey and Planning Grant administered by the Indiana Department of Natural Resources Division of Historic Preservation and Archaeology.

The Big Blue River sluiceway is located in the Tipton Till Plain physiographic unit, which has been characterized as a "nearly flat to gently rolling plain" with topographic relief provided by moraines, eskers, esker troughs, and meltwater drainageways (Schneider 1966:41, 49-50). The Knightstown Ridge Moraine transects the project area south of the Delaware/Henry County line and north of New Castle (Burger et al. 1971; Gret et al. 1972). At its highest point, this moraine rises more than seventy feet above the adjacent till plain. The project corridor was defined as encompassing the sluiceway valley plus a strip one-half this width of dissected upland (ranging generally from 50 to 100 feet higher) on either side. All told, nearly 25 square miles were included, of which a sample composed of 1090 acres, or about 7%, was actually surveyed. While the initial intention was to define survey strata using probable prehistoric biotic communities as reconstructed on the basis of soil types and physiographic features, this proved difficult owing to the vagueness of available information and was replaced by a somewhat simpler reliance on topography and types of glacial deposits, as defined by engineering and Soil Conservation Service soil maps. At the simplest level, primary zones were defined as valley and upland. On a secondary level, zones included moraine, till, kame or esker, lacustrine, muck and muck/peat/marl, terrace, and valley other (i.e., general alluvial valley deposits, not terrace, muck/peat/marl, lacustrine, or till). Also considered were transition areas where one of these zones merged into another. These areas, which we have referred to as edge zones, can be presumed to have been minor ecotones owing to differences in the vegetation likely to have developed on each kind of deposit. Edge zones were arbitrarily defined as strips 50m in width straddling a line marking the perceived junction of two secondary zones. This system represented an attempt to refine the strata used in earlier surveys. Table 1 provides a breakdown of acreage sample, by zone, as well as site and artifact densities. Table 2 further breaks this down by tertiary zones.

TABLE 1. Site and Artifact Densities by Primary and Secondary and by Edge Zones

| Zone | Acres | % Total Acreage | Sites | Acres/ Site | Total Artifacts | Acres/ Artifact | Artifacts/ Site |
|---|---|---|---|---|---|---|---|
| Upland | 575 | 52.75 | 150 | 3.83 | 926 | 0.62 | 6.19 |
| Till | 280 | 25.69 | 61 | 4.59 | 267 | 1.05 | 4.36 |
| Moraine | 285 | 26.14 | 84 | 3.39 | 517 | 0.55 | 6.19 |
| Kame | 10 | 0.91 | 5 | 2.00 | 142 | 0.07 | 28.60 |
| Valley | 515 | 47.24 | 79 | 6.69 | 1015 | 0.51 | 12.85 |
| Terrace | 230 | 21.10 | 46 | 5.23 | 854 | 0.27 | 18.75 |
| Lacust. | 100 | 9.17 | 20 | 5.00 | 75 | 1.35 | 3.70 |
| MPM | 105 | 9.63 | 2 | 52.50 | 48 | 2.23 | 23.50 |
| Valley o. | 80 | 7.33 | 11 | 7.27 | 38 | 2.16 | 3.36 |
| Edges | | | | | | | |
| Upland | 36 | 3.31 | 27 | 1.34 | 422 | 0.08 | 15.63 |
| Till | 14 | 1.28 | 13 | 1.08 | 110 | 0.13 | 8.38 |
| Moraine | 17 | 1.57 | 9 | 1.90 | 170 | 0.10 | 18.89 |
| Kame | 5 | 0.56 | 5 | 1.00 | 142 | 0.03 | 28.60 |
| Valley | 36 | 3.33 | 26 | 1.40 | 699 | 0.05 | 26.81 |
| Terrace | 14 | 1.26 | 17 | 0.81 | 604 | 0.02 | 35.47 |
| Lacust. | 3 | 0.27 | 5 | 0.60 | 27 | 0.11 | 5.40 |
| MPM | 11 | 0.96 | 1 | 11.00 | 47 | 0.23 | 46.00 |
| Vo | 4 | 0.36 | 3 | 1.33 | 21 | 0.19 | 7.00 |
| Total | 1090 | | 229 | 4.80 | 1941 | 0.56 | 8.48 |

TABLE 2. Tertiary Zone Site and Artifact Densities

| Zone | Acres | % Total Acreage | Sites | Acres/ Site | Total Artifacts | Acres/ Artifact | Artifacts/ Site |
|---|---|---|---|---|---|---|---|
| Upland | | | | | | | |
| T/M | 10 | 1 | 7 | 1.4 | 54 | 0.19 | 7.7 |
| T/Vo | 4 | >1 | 6 | 0.7 | 56 | 0.07 | 9.3 |
| Tx | 266 | 24 | 48 | 5.5 | 157 | 1.69 | 3.2 |
| M/T | 10 | 1 | 2 | 5.0 | 25 | 0.40 | 12.5 |
| M/Vo | 7 | 1 | 7 | 1.0 | 145 | 0.05 | 20.7 |
| Mx | 268 | 25 | 75 | 3.6 | 349 | 0.77 | 4.7 |
| K/L | 5 | >1 | 5 | 1.0 | 142 | 0.04 | 28.4 |
| Valley | | | | | | | |
| Te/MPM | 8 | 1 | 10 | 0.8 | 534 | 0.01 | 53.4 |
| K/Te/L | 1 | >1 | 1 | 1.2 | 39 | 0.03 | 39.0 |
| Te/M | 2 | >1 | 2 | 1.2 | 19 | 0.11 | 9.5 |
| Te/T | 2 | >1 | 4 | 0.6 | 12 | 0.18 | 3.0 |
| Tex | 216 | 20 | 29 | 7.5 | 250 | 0.86 | 8.6 |
| L/K | 1 | >1 | 3 | 0.3 | 25 | 0.04 | 8.3 |
| L/R | 2 | >1 | 2 | 1.0 | 2 | 1.00 | 1.0 |
| Lx | 97 | 9 | 15 | 6.5 | 48 | 2.06 | 3.1 |
| Vo/T | 4 | >1 | 3 | 1.3 | 1 | 0.19 | 7.0 |
| Vox | 76 | 7 | 8 | 9.5 | 17 | 4.47 | 2.1 |
| MPM/Te | 10 | 1 | 1 | 10.0 | 47 | 0.21 | 47.0 |
| MPMx | 95 | 9 | 1 | 94.5 | 1 | 94.50 | 1.0 |
| Total | 1090 | | 229 | | 1937 | 0.56 | 8.5 |

Key: K = kame or esker, L = lacustrine, M = moraine, MPM = muck or muck/peat/marl, R = river edge, T = till, Te = terrace, Vo = valley other, x = nonedge

### Zones and Site/Artifact Densities

Two hundred twenty-nine sites were identified, with components representing every period from Early Paleo-Indian to Late Woodland. These components included one each of Early and Late Paleo-Indian, 12 Early Archaic, 4 Middle Archaic, 3 Mid/Late Archaic, 14 Late Archaic, 3 Late Archaic/Early Woodland, 1 Early Woodland, 4 Middle Woodland, and 7 Late Woodland. Site density was greater in the uplands, but site size was greater in the valley. Further, site density was 4 times as high in edge zones compared to non-edge, while artifact densities (i.e., artifacts per acre) in the edge zones was over 20 times that in the non-edge—i.e., fewer than one artifact per acre in the non-edge zones vs. over 16 in the edge zones.

In addition, the following conclusions were reached concerning site and artifact densities:

1) Total site and artifact densities were lower than expected based on the results of earlier surveys further to the north in the Tipton Till Plain region, along the Mississinewa and Wabash rivers.

2) Kame had the greatest site and artifact densities among the upland zones while the terraces yielded the greatest densities in the valley.

3) The muck/peat/marl zone showed an exceptionally low density of sites and artifacts, which is not surprising since these soils were formed under boggy conditions.

4) In the upland, all edge zones exhibited high artifact and sites densities compared to their non-edge counterparts except moraine/till. Both till and moraine were higher. The moraine/till transition zone is the most homogenous and also the hardest to identify on the ground, which probably explains this finding.

5) In the valley, the differences between edge and non-edge were even more dramatic.

6) Site densities were highest in the edge zones where lacustrine and kame met, with terrace/till, till/valley other, and terrace/muck, peat, marl also being high. Lacustrine edges, as a group, were highest.

7) Artifact densities were highest also in the terrace/muck, peat, marl edge zone. They were also high in the areas were three zones—kame, terrace, and lacustrine—met as well in the kame/lacustrine zone. As a group, edges with a segment of terrace were highest.

8) Lowest site and artifact densities occurred in the valley non-edge zones, especially muck/peat/marl and valley other though they were also low where lacustrine deposits met the river edge.

9) Upland and valley edge zones exhibited similar site densities, but artifact densities were twice as high in the valley.

## Components

Turning to components (Table 3), Early and Late Archaic points were most com-

TABLE 3. Components Identified by Primary, Secondary, and Tertiary Zones

| Zone | EP | LP | EA | MA | M/LA | LA | LA/EW | EW | MW | LW | Uncl. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Upland | | | 10 | 2 | 1 | 13 | 1 | 1 | 2 | 5 | 1 |
| M | | | 2 | 1 | | 8 | 1 | 1 | 1 | 1 | |
| T | | | 7 | 1 | 1 | 2 | | | 1 | 2 | 1 |
| K | | | 1 | | | 3 | | | | 2 | |
| Valley | 1 | 1 | 5 | 2 | 2 | 2 | 2 | | 2 | 2 | |
| Te | 1 | 1 | 5 | 2 | 2 | 2 | 1 | | 1 | 1 | |
| L | 1 | 1 | | | | | 1 | | | | |
| Vo | | | | | | | | | 1 | | |
| MPM | | | | 1 | | | | | | 1 | |
| Total | 1 | 1 | 15 | 4 | 3 | 15 | 3 | 1 | 4 | 7 | 1 |
| % Total | 2 | 2 | 28 | 7 | 6 | 28 | 6 | 2 | 7 | 13 | 2 |
| Edge Zones | | | | | | | | | | | |
| Upland | | | | | | | | | | | |
| M/V | | | | | | 2 | | | 1 | | |
| M/T | | | | | | 1 | 1 | | | | |
| T/Vo | | | 1 | | | | | | | | |
| T/M | | | | | | 1 | | | | 2 | 1 |
| K/L | | | 1 | | | 3 | | | | 2 | |
| Total | | | 4 | | | 13 | 2 | | 2 | 7 | 2 |
| % Total | | | 4 | | | 13 | 2 | | 2 | 7 | 2 |
| Valley | | | | | | | | | | | |
| Te/M | | | | 1 | | | | | | | |
| Te/MPM | | | 3 | | 1 | 2 | 1 | | | 1 | |
| L/K | | 1 | | | | | | | | | |
| MPM/Te | | | | | | | | | | 1 | |
| Total | | 1 | 3 | 1 | 1 | 2 | 1 | | | 2 | |
| % Total | | 2 | 6 | 2 | 2 | 4 | 2 | | | 4 | |
| Total Edge | | 1 | 5 | 1 | 1 | 9 | 1 | 1 | 1 | 6 | 1 |
| % | | 2 | 9 | 2 | 2 | 16 | 2 | 2 | 2 | 11 | 2 |

Key to column heads: E = Early, M = Middle, L = Late, P = Paleo-Indian, A = Archaic, W = Woodland

mon, both being twice as frequent as the next group, Late Woodland. Late Woodland points were in turn nearly twice as common as the next most frequent group. The high percentages of Early and Late Archaic points resembles the results of a survey conducted along the Upper Wabash in Jay County (James & Cochran 1985). In this survey, both

were most frequent in the uplands (as were Late Woodland points) and were present in the valley only on terraces. Late Archaic points were much more frequently encountered in edge zones, predominantly kame/lacustrine.

Paleo-Indian points occurred only in the valley, in the lacustrine zones.

Distribution of specific point types was also interesting. For example, Kirk Corner-notched points were found most often in the till zone of the uplands. Madison points also were twice as likely to come from the uplands as from the valley.

Other conclusions concerning components include the following:

1) Early and Middle Woodland components occurred much less frequently than expected, especially given the proximity of much of the survey area to the New Castle earthworks.

2) Middle Archaic components were seldom associated with the edge zones and were less frequent than in the surveys carried out further north.

3) Point densities were greatest in the edge zones.

### Artifact Classes and Materials

If we consider artifacts by classes, it can be stated that in general only minor differences were evident in their distribution (Table 4), and no conclusive distinctions could

TABLE 4. Distribution of Artifacts by Primary and Secondary Zones

| Type | Upland | Valley | Till | Moraine | Kame | Terrace | Lacustrine | Muck/ Peat/ Marl | Valley Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Core | 28 | 18 | 11 | 13 | 4 | 15 | 1 | | 2 | 46 |
| Bif. st. 2 | 3 | 9 | 2 | 1 | | 8 | 1 | | | 12 |
| st. 3 | 6 | 1 | 2 | 3 | 1 | 1 | | | | 7 |
| st. 4 | 3 | | 2 | 1 | | | | | | 3 |
| Bif. Frag. | 10 | 14 | 1 | 9 | | 12 | 2 | | | 24 |
| I. R. Fl. | 57 | 84 | 20 | 27 | 10 | 65 | 7 | 9 | 3 | 141 |
| Pr. Fl. | 175 | 183 | 44 | 105 | 26 | 160 | 9 | 6 | 8 | 358 |
| Sec. Fl. | 11 | 17 | 2 | 5 | 4 | 15 | 1 | | 1 | 28 |
| Bro. Fl. | 209 | 224 | 54 | 130 | 25 | 200 | 6 | 15 | 3 | 433 |
| Bl. Fl. | 24 | 22 | 10 | 4 | 10 | 21 | 1 | | | 46 |
| Edge Mod. | 188 | 193 | 54 | 97 | 37 | 155 | 21 | 10 | 7 | 381 |
| Ret. Fl. | 78 | 126 | 27 | 42 | 9 | 98 | 16 | 4 | 8 | 204 |
| Graver | 15 | 16 | 4 | 8 | 3 | 15 | | | 1 | 31 |
| Burin | 1 | | | | | | | | | 1 |
| Blade | 2 | 4 | 1 | 1 | | 4 | | | | 6 |
| Endscpr. | 9 | 15 | 1 | 6 | 2 | 13 | 1 | | 1 | 24 |
| Point | 36 | 19 | 15 | 15 | 6 | 13 | 3 | 2 | 1 | 55 |
| Point Frg. | 21 | 19 | 3 | 17 | 1 | 15 | 1 | 1 | 2 | 40 |
| Perforator | 1 | 1 | | 1 | | 1 | | | | 2 |
| Bipolar | 41 | 38 | 11 | 28 | 2 | 33 | 3 | 1 | 1 | 79 |
| OCS | 5 | 7 | 1 | 3 | 1 | 5 | 2 | | | 12 |
| Ground St. | | 2 | | | | | | | | 2 |
| Blade Core | | 1 | | | | 1 | | | | 1 |
| Denticulate | 2 | 1 | 1 | 1 | | 1 | | | | 3 |
| Bif. w/gvr | 1 | | 1 | | | | | | | 1 |
| Pottery | | 1 | | | | 1 | | | | 1 |
| Total | 926 | 1015 | 267 | 517 | 142 | 854 | 75 | 48 | 38 | 1941 |
| % Total | 48 | 52 | 14 | 27 | 7 | 44 | 4 | 2 | 2 | |

be drawn between edge and non-edge zones. The greatest percentage of initial reduction flakes occurred within the valley, perhaps reflecting the heavy dependence on glacial chert

from the steam bed. The till zone yielded the highest percentage of cores and points, the moraine zone the highest percentage of bipolar artifacts, and the lacustrine zone the highest percentages of biface fragments, edge-modified flakes, and miscellaneous chipped stone. The muck/peat/marl zone contained the highest percentage of initial reduction flakes and broken flakes. And the valley other zone yielded the highest percentages of most other classes. Terraces, interestingly, did not stand out in any category, perhaps indicating their place as a primary occupation area where a fairly even mix of activities was taking place. The main distinction between edge and non-edge zones is that edge modified and retouched flakes occurred much more frequently in non-edge zones.

As already suggested, the primary type of raw material used was chert from the glacial deposits, which appears in ¾ of the artifacts (Table 5). Fall Creek and Laurel

TABLE 5. Comparison of Total Artifacts by Chert Type

| Chert | Total Artifacts | | Points | | Heat-Treated | |
|---|---|---|---|---|---|---|
| | # | % | # | % | # | % of type |
| Attica | 48 | 2 | 3 | 5 | 11 | 23 |
| Brassfield | 1 | >1 | | | | |
| Burlington | 34 | 2 | 1 | 2 | 11 | 32 |
| Delaware | 12 | 1 | 1 | 2 | 2 | 17 |
| Fall Creek | 63 | 3 | 3 | 5 | 22 | 35 |
| Flint Ridge | 9 | >1 | | | | |
| Fossiliferous | 16 | 1 | | | 8 | 50 |
| Glacial | 1435 | 75 | 30 | 55 | 499 | 35 |
| Kenneth | 2 | >1 | | | | |
| Laurel | 117 | 6 | 2 | 4 | 40 | 34 |
| Liston Creek | 9 | >1 | | | 4 | 44 |
| New Holland | 2 | >1 | | | | |
| Quartzite | 4 | >1 | | | | |
| Sugar Creek | 3 | >1 | | | 2 | 67 |
| Unknown | 83 | 4 | 7 | 13 | 27 | 33 |
| Upper Mercer | 14 | 1 | 1 | 2 | 4 | 29 |
| Wyandotte | 71 | 4 | 7 | 13 | 7 | 10 |
| Zaleski | 3 | >1 | | | | |

cherts, available from adjacent drainage systems, accounted for another 9%. The only other cherts occurring with any frequency were Wyandotte (which was in fact slightly more common than Fall Creek), Attica, and Burlington.

Heat treatment of the cherts (Table 5) appeared to be present in slightly over one-third of the examples, most commonly involving Sugar Creek, Fossiliferous, and Liston Creek materials. Wyandotte and Attica, the most common of the exotics, were the least likely to be heat treated, reinforcing the assumption that they were brought in because of their better flaking qualities. Heat treatment occurred most frequently in points of the Paleo-Indian and Late Archaic periods. The percentage of heat-treated points almost exactly matched the percentage for total artifacts.

Local glacial cherts were most commonly used for points of all periods except Early and Middle Woodland (Table 6). Wyandotte was the second most common material for points, especially for the Early Archaic, Late Archaic/Early Woodland, and Middle Woodland periods. Attica, the third most frequent type, was well represented among Early and Middle Archaic points. Fall Creek and Laurel cherts were less frequently used for points than either Attica or Wyandotte. Upper Mercer chert occurred only in a single Early Archaic point while Burlington occurred only in a single Early Woodland point

TABLE 6. Comparison of Points by Component and Chert Type

| Chert | EP | LP | EA | MA | M/LA | LA | LA/EW | EW | MW | LW | Un | To. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Attica | | | 2 | 1 | | | | | | | | 3 |
| Burl. | | | | | | | | 1 | | | | 1 |
| Del. (ht) | | | | | | 1 | | | | | | 1 |
| Fall Cr. | | | 1 | | | 1 | | | | | | 2 |
| F.C. (ht) | | | | | | | | | 1 | | | 1 |
| Glacial | | | 4 | 1 | 2 | 3 | 1 | | | 3 | 1 | 15 |
| Gl. (ht) | | 1 | 1 | 1 | | 7 | 1 | | 1 | 3 | | 15 |
| Laurel | | | 1 | | | | | | | 1 | | 2 |
| Unk. | | | 1 | 1 | 1 | 2 | | | | | | 5 |
| Unk. (ht) | 1 | | | | 1 | | | | | | | 2 |
| Up. Mer. | | | 1 | | | | | | | | | 1 |
| Wyan. | | | 4 | | | | 1 | | 2 | | | 7 |
| # Heat Td | 1 | 1 | 1 | 1 | | 9 | 1 | | 2 | 3 | | 19 |
| % Tot. | 2 | 2 | 27 | 7 | 5 | 27 | 5 | 2 | 7 | 13 | 2 | |
| % Exotic | | 100 | 45 | 25 | | | 33 | 100 | 50 | | | 24 |
| % Gl. (loc.) | | 33 | 50 | 67 | 67 | 67 | 0 | 25 | 86 | 100 | 55 | |
| % Semi-loc. | | 13 | 0 | 0 | 7 | 0 | 0 | 25 | 14 | 0 | 9 | |

and Delaware in one Late Archaic specimen. In general, Early Archaic, Early Woodland and Middle Woodland points were more often manufactured of exotic than local or semi-local cherts.

Pottery was found on only the Van Nuys Site and a second site near it, just north of New Castle.

## Summary

In summary, the survey of the Upper Big Blue River glacial sluiceway demonstrated a preference for edge zones for site location, a variation in the pattern of site distribution from period to period, and a tendency for the largest sites to be on the terraces along the valley edges. Differences could also be observed in the choice of raw materials and in the use of heat treatment from period to period. A more detailed discussion will appear in the full report, to be published in the Ball State Archaeological Resources Management Service Reports of Investigations series.

## Literature Cited

Burger, A., et al. 1971 Geologic map of the 1 x 2 Muncie quadrangle, showing bedrock and unconsolidated deposits. Indianapolis: Department of Natural Resources.

Grey, W., et al. 1972 Geologic map of the 1 x 2 Cincinnati quadrangle, showing bedrock and unconsolidated deposits. Indianapolis: Department of Natural Resources.

James, Mary Lou, & Donald R. Cochran. 1985. An archaeological survey of Jay County, Indiana. Ball State University Archaeological Resources Management Service Reports of Investigations 18.

Schneider, Allan F. 1966 Physiography. *In* Natural Features of Indiana, Alton A. Lindsey, ed., pp. 40-55. Indianapolis: Indiana Academy of Science.