VI. DATA RECOVERY INVESTIGATIONS

Introduction: Methods and Goals

A two-stage mitigation plan was developed for each of the three areas at the Lums Pond site. The two-stage approach was at base a decision-making process that provided flexibility and efficiency in conducting field work. The involvement of regulatory officials at key points in the process was crucial to the success of the approach. The first stage of the mitigation consisted of the excavation of a five percent sample of each of the three areas within the site to determine 1) the appropriate level of effort for intensive data recovery excavations and 2) the precise locations of the most informative parts of the site. Each area was evaluated on the basis of both the quantity of the artifacts present as well as the quality of the depositional contexts from which the artifacts were recovered. Depending on the results of the evaluations, an additional five-percent of each area was excavated using block excavations.

The five percent fractions excavated within each of the survey areas represented samples of the whole site area. Sampling in archaeological survey and testing involves examining artifact distributions within specified portions of the study area and inferring distributions across the larger site area statistically from that sampling. Archaeologists resort to sampling in the interests of time and economy. The best way to discover what is in an archaeological site is, obviously, to excavate it—all of it. In most cases, though, total excavation would be an extremely expensive proposition, and since not all of the site will contain material of interest, it would in fact be a somewhat wasteful procedure. Sampling provides a method for obtaining basic information about the distribution of artifacts without the need to see all of them.

Generally speaking, three types of sample are used in survey and testing operations: judgmental, random, and systematic. Each is best suited to a specific task, depending on the type of site under investigation and what is known about the site before testing begins. Judgmental sampling is most effective when there is prior knowledge about where activity was concentrated within the site—the sample is selected according to the researcher's judgment of the best locations. As an alternative to judgmental sampling, random sampling requires little or no knowledge of the structure of the site. Each test location is chosen individually without regard to site characteristics or the location of the other tests. A random sample is most effective when there is little indication of where activity areas may be, when one point in the site has as much chance of containing artifacts as another. In practice, completely random sampling often results in gaps in the coverage of the area. A systematic sample, in contrast, is excavated on a

regular interval—the nodes of a grid, for example—and covers all areas within the site equally.

Sampling at Lums Pond included aspects of all three techniques. The sample excavations were judgmental in that three areas with relative concentrations of artifacts had been discovered during the initial shovel testing survey, and these areas were chosen for intensive sampling. Since little was known about the artifact distributions within these areas, random sampling was chosen best suited to the data. Yet spatial regularity within the sample was important to ensure that all parts of each area would be tested. Thus the sampling strategies were combined in a procedure referred to as stratified random sampling, in which each area was divided into subsets, or stratified, after which each subset was sampled randomly. The grid coordinates for a single 1-x-1-meter unit were chosen from each subset using a random number table. This method, while in essence random, maintained a relatively uniform coverage of the entire site area, avoiding the clustering of sample locations or the development of wide gaps between them. The additional 5-percent sample excavated in the Stage 2 block excavations represented a shift in the focus of sampling back to a judgmental basis. The initial samples resulting from Stage 1 operations were probabilistic in nature, used to determine the distribution of artifacts across each site area. In contrast, the block excavations comprised a judgmental sample selected because these locations contained the highest proportion of the specifically behavioral data sought in the investigation.

Area 1

Area 1 lay near the northeast corner of the site, on a high terrace overlooking the eastern stream. The modern road that formed the north boundary of the project area lay only a short distance away. In review of earlier site identification and testing in this area, relatively high artifact counts had been recorded in this part of the site during the initial phase of shovel testing. Close interval shovel tests showed what appeared to be two concentrations of artifacts in the area. During evaluation testing, a number of flakes and broken or incomplete tools were recovered from three 1-meter-square test units. The most interesting aspect of the recovered artifacts was the large proportion of a type of jasper that appeared similar to material occurring in the outcrops at Iron Hill, which lies a short distance to the north along the SR896 corridor.

In Stage 1 sampling operations, a metric grid was laid over the area using a theodolite and tape measures. Two blocks of nine 5-by-5-meter squares were flagged for sampling. One 1-meter-square unit was chosen for excavation from each large square using the random stratified sampling method described earlier. A total of 18 units was selected in this way. Artifact counts from these units indicated the locations of the most

intensive activity, and an additional 8 units were excavated in those areas to further define the concentrations. The number of Stage 1 units totaled 26, which represented a 5-percent sample of the estimated area of the site.

Soil stratigraphy consisted of a plow zone overlying a developed soil horizon, which in turn lay atop the Pleistocene age sands of the Columbia formation. All of the artifacts in Area 1 were found in the plow zone, with the exception of a few small fragments which lay in the thin transition layer beneath the plow zone. This transition zone was the result of roots and burrowing animals which had mixed the overlying plow zone material, including artifacts, with the uppermost part of the soil horizon below. No artifacts were recovered from the undisturbed soil. In spite of the fact that all of the artifacts from Area 1 lay in the plowed surface layer, and thus were no longer in their original contexts, the artifact assemblages were considered to be significant and additional investigation of the area was conducted. Stage 2 excavations focused on recovering data from an area that contained high artifact counts and a high proportion of Iron Hill jasper occurring among the tools and flaking debris. The boundaries of the concentration had been well-defined by evidence gathered from the Stage 1 units, and from these data it appeared that the material represented a single episode of stone tool manufacturing, or a lithic workshop. The sampling excavations in this area were expanded into a block of 33 contiguous units (Plate 2).

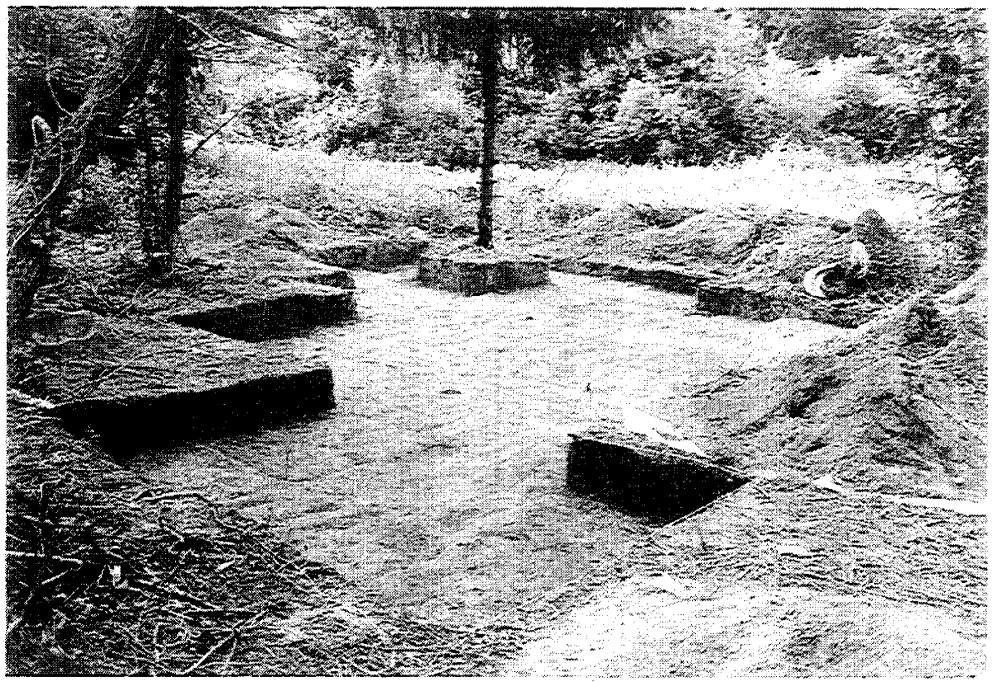

Plate 2. Area 1, Fully Excavated Plow Zone

Area 2

Area 2 lay near the center of the Lums Pond site, on a wide, gently sloping terrace above the eastern stream (Plate 3). Artifact recovery rates from the initial phase of shovel testing indicated a widespread area of prehistoric activity in this part of the site. Additional, close interval shovel tests had revealed two general areas with artifact concentrations, one on either side of a swale. The swale was a long and shallow depression representing a stream channel that once drained the upper reaches of the site but had become filled in through erosion after years of modern agricultural activity. Five 1-meter-square test units were excavated as part of the testing and evaluation of the area, and in one of the units, a portion of a round, deep pit was found. Evidence of the pit was first observed below the plow zone, indicating that it predated historic period cultivation of the field. The pit had been excavated well into the coarse sandy subsoil. Prehistoric artifacts including several flakes and fragments of fire-cracked rock were recovered from the fill within the pit.

Stage 1 sampling in Area 2 began with a metric grid laid over the entire area using a theodolite and tape measures (Plate 4). Two blocks of 36 five-meter-squares, totaling 900 square-meters, were flagged within this grid. A random sample of one-meter-square units was selected for excavation from each square in the blocks, resulting in a total stratified random sample of 72 square-meters. An additional 18 units were excavated following the random sample in order to clarify the distribution data in specific areas, bringing the total number of units to 90. A well-developed soil horizon was found below the plow zone across most of the area, but was thinner toward the south, eventually disappearing so that the plow zone lay directly on top of the sandy subsoil.

Based on the data recovered from the initial sampling, Stage 2 investigations were undertaken in three parts of the area (Plate 5). One of the excavations was a cluster of pit features lying in the eastern half of Area 2. Seventy-six 1-meter-square units were excavated in an irregularly shaped block, designated Block C, to expose the pits and the area around them (Plate 6). A second area was the only locale in Area 2 in which artifacts were recovered from intact, unplowed deposits. Lying along the northern edge of Area 2, this location yielded artifacts in quantity well below the plow zone in a developed soil horizon. A 4-by-4-meter excavation block, designated Block D, was situated in this area to recover a larger sample of the material from the intact deposit. The third area investigated in Stage 2 contained a large pit feature, Feature 10, that was situated in the northwest part of Area 2. Block E was excavated to expose the feature and a portion of the surrounding area. The block consisted of 28 one-meter-square units.

Plate 4. Sampling Excavations in Area 2, View West

Plate 5. Data Recovery Excavations in Block C, Area 2, View North

Plate 6. Pit Features in Block C, Area 2

Area 3

Area 3 lay in the southern part of the site, along the edge of the stream flowing southwestward into Lums Pond. Testing and evaluation had shown that the area contained artifact concentrations along with extensive and seemingly undisturbed deposits below the plow zone. The data suggested that prehistoric groups had used the locale for the gathering and processing plant and animal resources along the stream over the course of several thousand years. In the periods between occupations, flooding had covered the area with layers of silt and sand sealing the debris from each occupation and keeping it relatively unmixed with later material. Significantly, these intact deposits were charcoal stained, raising the possibility of retrieving datable radiocarbon samples.

Stage 1 operations in Area 3 had several goals. One was to define the extent of the floodplain, since it contained the buried layers of occupational debris. Another goal was to enhance the information already in hand as to the number and depth of the occupational layers. Finally, the excavations were aimed at locating the areas of most intensive prehistoric activity to provide the largest and most complete artifact assemblages for analysis. To accomplish these goals, a 4-by-5-meter grid was laid over the area from which a sample of excavation units was chosen. The shape of the grid, 4-by-5m rather than 5-by-5m as was used in Areas 1 and 2, was dictated by the elongated shape of the space between the current stream and the assumed edge of the buried

floodplain. Forty-one units were selected within this grid system using the random stratified sampling method described earlier. These 41 units equaled an initial 5 percent sample of the area. Five additional test units were excavated within the floodplain to further define artifact concentrations along the southern edge of the area.

Two locations were chosen for block excavations in Stage 2 on the basis of artifact distributions and stratigraphy (Plate 7). Block A was situated to recover data from an area in the southern half the grid, where high artifact concentrations and deep sub-plow zone deposition were observed (Plate 8). Block B was placed in a second, non-contiguous area to the northeast that displayed relatively high artifact frequencies as well as several early diagnostic artifacts (Plate 9).

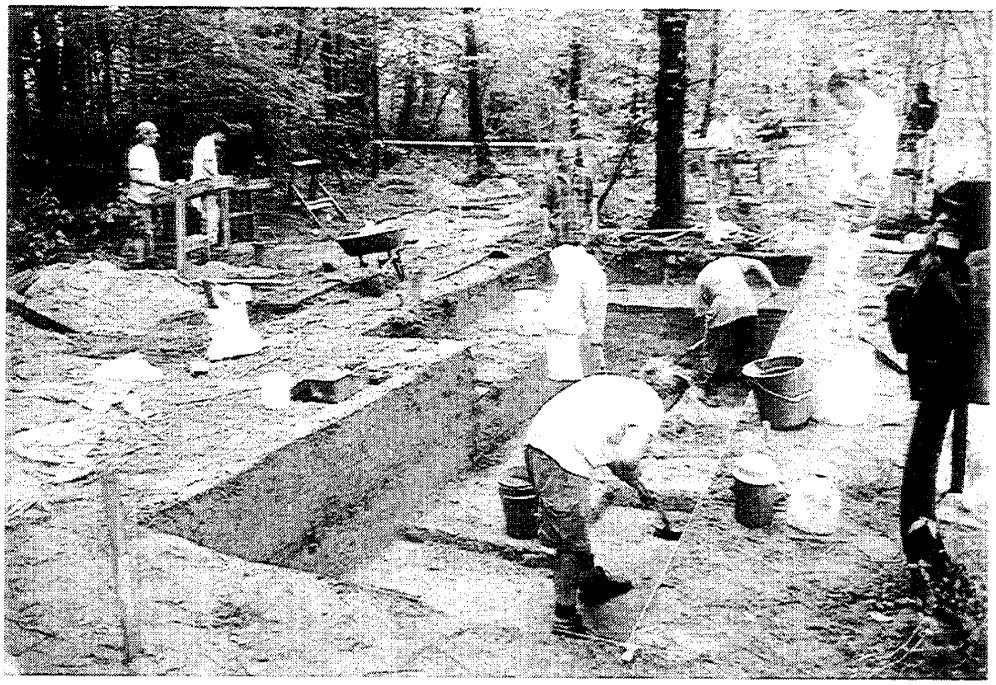

Plate 8. Data Recovery Excavations in Block A, Area 3, View West

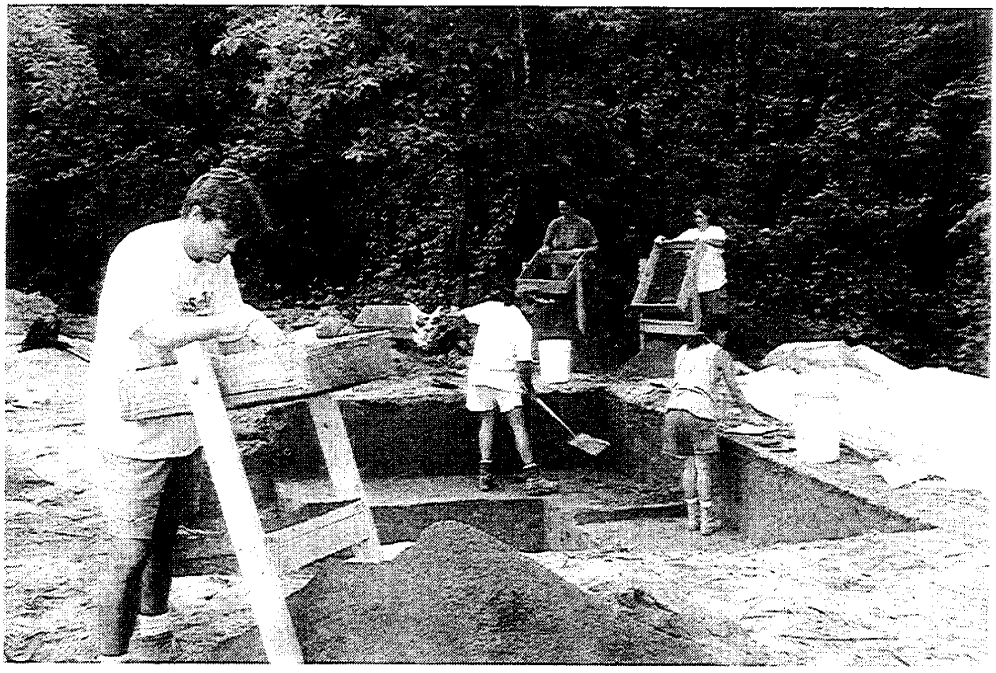

Plate 9. Data Recovery Excavations in Block B, Area 3, View East Showing Screening

Laboratory Procedures

At the conclusion of fieldwork, artifacts were delivered to the Parsons Engineering Science Laboratory for processing and analysis. Artifacts were processed according to the standards of the October 1993 Delaware State Museums Sampling and Curation Policy (Delaware Historic Preservation Office 1993). Artifacts were cleaned in plain water, and bagged by material type in 4-mil polyethylene zip-lock bags. Catalog numbers and provenience information were written in indelible ink on the outside of the bags, and an acid-free tag with the same information was placed within the bags.

A comprehensive inventory was compiled using dBase III+ database management software. In addition to provenience information, coding for database entry included the information listed in Table 4. Figure 5 illustrates some typical flake attributes. Appendix A furnishes points of contact where the artifact inventory may be requested.

- *group*—indicating prehistoric or historic period artifact
- *material*—for prehistoric artifacts, raw material type using general mineralogical terms
- *morphological type*—for prehistoric artifacts, technologically derived terms are generally employed, though some widely accepted functional terms are used
- *typology*—for prehistoric artifacts, generally accepted morphological types associated with known chronological periods; for historic period artifacts, a subdivision based on manufacturing technology
- *segment*—indicating completeness or, if incomplete, the section of the artifact represented (proximal, medial, distal)
- *amount of cortex*—for flakes, expressed as a percentage of the dorsal surface
- *color*—recorded for lithic artifacts and relevant historic period artifacts
- *size grade*—measured on debitage as an indication of geometric dimension, based on Ahler (1989)
- *weight*—expressed in grams, reported as an additional indication of artifact size
- *dorsal surface scar count**—for flakes, approximate number of remnant flake scars on dorsal surface
- *dorsal surface scar orientation**—for flakes, approximate number of remnant flake scar orientations on dorsal surface
- *platform type**—for flakes, description of striking platform as cortical, simple, 2-faceted, bifacial, or crushed
- *platform angle**—for flakes, measure of dorsal platform angle

**recorded for selected block proveniences only*

Table 4. Data Categories Recorded in the Lums Pond Artifact Inventory

Special Laboratory Analyses

A number of special analyses were performed by outside laboratories. The special studies were conducted to address some of the questions posed in the Research Design, Chapter V. These analyses included the following:

- Geochemistry
- Blood Residue Analysis
- Artifact Refitting
- Jasper Experimentation
- Jasper Characterization
- Blood Residue Analysis

The findings of these studies are presented in the Analysis and Conclusions Chapters of this volume, while complete and detailed reports may be found in Volume II.

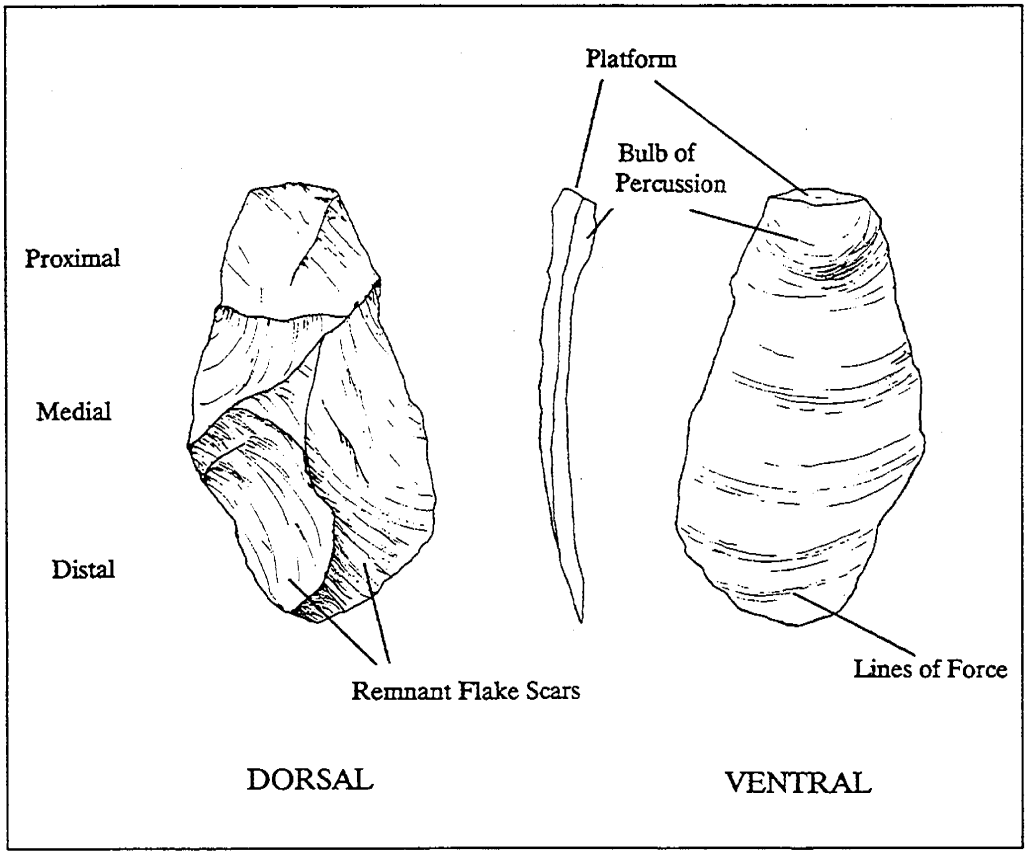

Figure 5. Flake Attributes