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MCDANIEL, ROLAND EDWARD
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THE ARCHEOLOGICAL SURVEY OF LOWES ISLAND, VIRGINIA: TESTING A PREDICTIVE SETTLEMENT MODEL

BY

ROLAND E. MC DANIEL

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PREFACE

The archeological survey of Lowes Island, Virginia was undertaken because a developer was sensitive to the possible destruction of Indian sites that local traditions held to be in his areas of planned construction. The developer, Harvey P. Jones, International, called The American University for assistance in the identification of the supposed sites. Dr. C. W. McNett, Jr. of the Department of Anthropology talked with Jones and agreed to provide some guidance. The developer offered to preserve any sites located by replanning his construction activities around the areas that might be impacted.

At that time, the writer was studying Potomac Piedmont archeology under the guidance of Dr. McNett as a graduate student at the University. Dr. McNett suggested an examination of the property by the writer and an application of the field knowledge gained through four years of site survey work on the other side of the Potomac River in Montgomery County, Maryland. The writer agreed and made arrangements to meet Mr. Robert Mortensen, the project architect, at Lowes Island on March 17, 1977, for a review and tour of the project area. The project, named Gilgarren, involved about seventeen hundred acres. Seven hundred acres are in a floodplain environment that is known as Lowes Island. The remainder of the impacted property is composed of highland meadows and woodland to the south and adjacent to the floodplains.

Lowes Island lies on the right bank of the Potomac River in Loudoun County, Virginia, and adjacent to the western Fairfax County line. This area is about seven miles west of the Great Falls of the Potomac River in the Piedmont zone of that river system (Fig. 1). The topography is defined by eroded Triassic red sandstone through which the river has cut a deep and wide channel. The bluffs of the river are formed by the sandstone heights and are cut by many small drains that feed into the Potomac or into the swamp systems in the floodplains of the river bottoms. The bluffs on the eastern perimeter of Lowes Island are a gabbro-like hard rock that has not been eroded like the softer sandstones and schists to the west. The eastern bluffs form a constriction of the river valley which causes a quite steep and abrupt narrowing of the river system. The floodplains that carry the name Lowes Island are in effect the exposed river bottom from Pleistocene periods when the river was diked by a now penetrated ledge at the narrow gabbro zone. The modern levees and drains that lace the floodplain in an east and west direction are the residuals of a braided or meander river system under much drier weather systems prior to 5,000 B.C. The modern river has cut down into its old bed under wetter conditions during the past several thousand years. The dike was penetrated at some time during that long-ago period, and the waters were released from this impoundment. Water velocity and volume straightened the river and the old meanders were abandoned. During periods of modern flood conditions, the meanders are filled again with silt-ladened waters. As a result, these low areas have slowly become more shallow and very ill-defined. The Potomac River normally flows between eight and twelve feet below its ancient river bed. Figure 2 illustrates the modern river valley, the island, and the bluffs and highlands to the south. Figure 3 is a schematic presentation of the river system under the meander environment discussed above.

The experience of the writer in archeological survey activities exactly north of Lowes Island on the Maryland shores in Montgomery County had led to his construction of a predictive settlement model for the prehistoric Indians that inhabited the area for over 10,000 years. The Maryland predictive settlement model had played a major role in the identification of 70 settlement locations. The topographical elements in the model seemed to be duplicated on the Virginia shores and the adjacent highlands to the south. Other elements of the model, addressing cultural periods, artifacts, lithic preferences, and proximities to water courses, were presumed to be the same for both Maryland and Virginia segments of the Piedmont zone of the Potomac. The model was tested in this survey, and modified where necessary.

On March 17, 1977, Mr. John Lewis, Northern

Virginia Representative of the Virginia Historical Landmarks Commission, joined the writer and Mr. Mortensen on the fields of Lowes Island. The intent was to become familiar with the topography, to make some early estimates of the size of the survey task, and to create a rough schedule for completion that would accommodate the construction schedules of the developer. Attention was focused upon the floodplains where construction was planned for October, 1977. Two golf courses and a boat marina were among the planned land alterations that could be modified by the location of prehistoric Indian settlement remains.

During the ensuing three-hour walk through corn debris of the 1976 harvest the writer made a tentative identification of five prehistoric sites and one early European site. The unexpected density of camping locations caused some consternation for Mr. Mortensen; however, he asked the writer to proceed with the survey. Mortensen and Lewis were very interested in the process of identification and the tentative dating given the artifacts that were found. Pottery sherds, quartz scraper tools, quartzite and quartz projectile points, hammer stones of quartzite cobbles, and tool preforms (or rejects) were found and discussed. Lithic debris scatter marked each locational-set where the tool items were recovered. Large quartzite stemmed projectile points and a small side-notched quartz projectile point bracketed the earlier cultural periods identified that day. The pottery sherds (cord marked, grit tempered) and two small quartz triangular arrow points marked the later cultures of the Woodland periods. Artifacts from both of the above periods were found upon the first (that most near the river) and the second levees. A third, fourth and fifth levee remained to be examined, plus the two and one half miles of the rest of Lowes Island, in addition to the highland areas not traversed that cold March day. The area to be surveyed equaled the area enclosed by the Lincoln Memorial and the Capital (east to west) and K Street and Independence Avenue (north to south) in Washington, D.C.

The writer designed a strategy for a surface search that would produce site identifications that could be accurately translated onto the builder's maps and plan drawings. If the builder was to avoid the prehistoric remains, exact locations had to be maintained. Triangulations were to be made upon prominent landmarks using compass bearings and levee positions relative to the Potomac River. It was not clear at that time just how dense the site locations in the area might be. On the Maryland side of the river, the first levee contains Woodland period village sites that are co-located with earlier Archaic period camp sites (Slattery 1960 , Stearns 1940, Tidwell 1960, MacCord, Slattery, Schmitt 1957). A large Woodland village site is also located upon the first levee of Seldon Island, five miles to the west of Lowes

Island (Slattery 1946). All of these locations are in cultivated fields. Plow activity has brought many materials and artifacts to the surface that very clearly mark the locations of the sites. Lowes Island did not seem to contain materials from the same culture periods of equal density.

Construction schedules dictated that the western two-thirds of the island should be surveyed first. The north-south farm lane that crosses the island to the river from the highlands was a natural and convenient starting place for the survey. This lane can be seen in Fig. 2. The lane became "Lowes Island Road", and is so designated in the site reports filed with the Virginia Center For Archeological Research, and in the survey field logs. The survey was planned to progress in thirty-meter increments in a westerly direction from Lowes Island Road. Each thirty-meter sector would cover only the levee then under survey. While field work was in progress on the first levee, part of the crew would examine the vertical face of the Potomac River bank in the same sector. Field notes would address the findings in both zones. The survey was soon modified to provide for the accurate recovery and recording of the tool artifacts that were encountered in the fields and the banks rather than leave them for the many relic collectors. The strategy of the survey was also altered to include the morphological and positional analysis of these items in an attempt to correlate tools with possible site functions and the degrees of overlap between co-located culture settlements.

A Washington Suburban Sanitary Commission bench mark (No. 3231) had been found near the Lowes Island Road just west of its intersection with the river bank. This marker became the survey zero reference. All artifacts, sites, topological references, and administrative notes and observations are tied to this bench mark. The Lowes Island Road remained roughly the east-west dividing line for field effort and schedule references. Coordinates of east-west and north-south definition were maintained in meters and fractions of meters for all subsequent work. The result has been a complete census of the Lowes Island floodplain, the river banks, drain profiles, and the highland zones to the south. Magnetic bearings of the resulting grid were determined with a gunsight compass throughout the survey. Sites and concentrations, topological references, and levee definitions were recreated upon a scaled map (1:7,200 or 1"=600'). Metric recordings and references were used throughout the survey project.

Because of the census nature of the survey and the revised strategies of artifact recovery and recording, an additional dimension became possible for the survey results. This would be the test application of probability sampling designs to the record. Sampling in archeological survey work has had mixed success in North

America, with most of the more productive area survey designs being applied to work in the Southwest (Judge 1973, Mueller 1974). The Lowes Island survey would be in a position to provide data on sampling efficiencies in survey work in the Piedmont of the Middle Atlantic area. A corollary to this replication would be the combination of a "one best sampling method" with the predictive settlement model in an attempt to design the most efficient strategy for future survey work in the Potomac River Piedmont. Results will be compared with the transect sampling designs of Gardner (1978), Custer (1978), and Leedecker (1977).

Beyond the sampling, transect, and model archeological problems mentioned above, several more specific problems were to be addressed by the survey. Some of the problems came into focus only after the survey had progressed into its terminal stages. The following statements outline these problems, the related hypotheses, and tests of the hypotheses. Answers to the questions that are posed as problems take the form of hypotheses. It is the hope of the survey crew at Lowes Island that when tests of the hypotheses fail to prove or disprove the point in question, this research will have added to the body of information for future activity in attempts to identify chronological sequences of cultural adaptation and the processual definitions that controlled the lives of generations of American Indians living in the Potomac River Piedmont areas.

1. What remains must be identified to qualify a location as an archeological site? This became a problem when the results of the survey were translated into site report forms for recording with the Virginia Center of Archeological Research. It was also a problem in map designations for the benefit of the developer. The developer had to be convinced that some arbitrary concentration or combination of artifacts comprised a site and that he should be sensitive to the location. This became a problem only where surface materials were few. Unfortunately, many of the older site locations (concentrations of debris and tool fragments on the surface) were very small compared to the acre or more of material concentrations in other places. This problem has not yet been resolved. The Lowes Island survey has designated as a site any clustered surface concentration of lithic debris or the presence of two or more tools or fragments. The contingent problem of convincing the developer that these are sites has yet to be tested.

2. What will comprise a "significant" site? This question became important not only because of the concerns of the archeologists and the developer, but because of federal law that became applicable when the Fairfax County Water Authority applied to the Corps of Engineers for a

permit to install a water induction facility, transmission lines, and a pumping station in the survey area of the floodplain of Lowes Island. These activities would impact or destroy certain of the concentrations that had been identified as sites in the survey. The question of significance has been uppermost in many of the contract and environmental impact studies conducted by or for Federal Government agencies. State and county involvements in these questions have also been growing as new laws and regulations are promulgated by a public with a growing awareness of cultural heritage and the fragility of prehistoric resources. Raab and Klinger (1977) addressed these concerns and came to the conclusion that significance could only be established when considered in terms of explicit, problem-oriented research designs. These designs could, and perhaps should, include three of the more traditional criteria for the establishment of significance: National Register criteria, monetary values, and unique characteristics. Wendorf, as the chairman of the Fort Burgwin Conference on National Archaeological Policies (1978) reports the conference consensus in establishing significance: professional judgement under the guidance of a State cultural resource management plan, comparison within a region, and a statement of priorities that address all aspects of the site, its salvage, value, mitigation costs, uniqueness, etc.

The sites identified in the Lowes Island survey have all been judged significant. So little has been accurately recorded in Potomac Piedmont archeology that any new data is considerably more than had been available before. There is no understanding of the Woodland sequences, why the area seemed to be abandoned around 1300 AD, justification or even the technological explanation for the different pottery encountered, relationships between Piedmont cultures and those of the tidal areas to the east, their ties with other cultures to the south and to the north of the Potomac valley, etc. The span of the Archaic years simply fills the 7,000 years between the Paleo-Indian cultures and those of the Woodland periods. Certain gross indicators of change are to be seen in the artifacts recovered, but there are no dates to allow an understanding of the interplay between the changing environment and the several different cultural groups that may have co-existed, or perhaps were separated by thousands of years. The Paleo-Indian cultures are known only by their few and scattered camp sites, the fluted projectile points they seem to have preferred, and the small cryptocrystalline scrapers found with the fluted points. Far more is known about the environment of those times than of the cultures that existed then. Every site that was located in the Lowes Island survey can contribute to some aspect of the unknowns outlined above.

3. Surface survey activities have long been suspect when they have addressed land under cultivation. The

feeling has been that the activities of the plow and the harvest will have displaced the artifacts in the plow zone to such a degree that little can be surmised concerning clusters within a site, or even that a cluster can be defined as a site. Roper (1976) reported findings to the contrary. Her observations were that displacement is a two-way affair. The plow board moved items in one direction in one season, and then put them back the following season. The writer has observed much the same process with non-archeological materials in a cultivated field on Lowes Island. AT&T had buried a cable in 1965 on the Island at its point of crossing the Potomac River. Blue quarry stone had been used in the bottom of the cable trench to cushion the cable. There is no source of this stone anywhere near the Island. The dump depot for the stone was adjacent to the cable trench on the east. Much of the stone was left on the surface of the field at the first levee. The field returned to cultivation as soon as the cable had been buried. Plow activities have moved the stone only a few meters at the most from its primary deposition point. The recorded artifact recoveries from the survey are accurate enough in a real placement to allow computer analysis of their displacements from any combination of hypothetical placements.

4. The geomorphological history of the Potomac River valley in the survey area (both Maryland and Virginia) is of particular interest. The lack of formal information

concerning the history of the formation of the bluffs and the floodplain levees directly impacts the research on the chronology of cultural remains found in these areas. The artifacts found during the survey upon the surface of the plowed fields have given strong hints that the floodplain is far older than had been suspected. The depths of habitation clues at the first levee also have caused second thinking in regard to the age of the floodplains that tradition held to be of recent deposition. Test pits and bank sections that cleanly expose layers of deposition under different conditions of past river activities will go far toward clarifying these questions.

5. Sources of lithics fashioned into tools or found as the debris of artifact manufacture will give clues regarding the past mobility or trading activities of the people who left the materials in the survey area. Those stone materials that were obviously foreign to the Potomac Piedmont valley were treated as artifacts and measured into the grid system. The ability to trace such stones to the quarry source is possible through neutron activation analysis of trace elements. Such analysis is restricted today because of cost. Future analysis can be performed because the materials have been retained with good provenience of recovery. For the most part the retained flakage and chips of exotic stone are of cryptocrystalline nature; jasper, flint, chert, oolitic quartz, agate, plus the very rare porphyries and serpentines from other regions. The more

common stones of quartz and quartzite, siltstone and shale, and even the relatively common volcanic rhyolites are another matter. These stones have been collected only when in the form of some tool artifact or fragment that seems to have been part of a biface or ground stone implement.

6. What are the processual changes that are reflected in the artifacts? Do particular concentrations within a given site of a specific tool artifact imply a changed way of life or do they hint a specific site function? Do combinations of artifacts justify presumptions concerning the functions performed at the site? Can measures of functional efficiency be measured in modified tool forms from prior forms? Can measurable validity be assigned to efficiencies reflected in similar tools from different periods? Can the cultures be placed into sufficiently accurate chronological sequence to allow measurements of paleo-environment differences and impacts upon life styles? This list is endless. The artifacts have been recovered; their relative densities and dispersals, proximities to other tools, have all been recorded and are available for additional study. This data can be placed in juxtaposition, or correlation, with other data from future activities on the same sites, or others in the same Potomac Valley, or with those of any other region.

7. What biases have been introduced into the record by the years of collector activities? Are there measurable differences between the often visited first levee locations

versus the less known and inconvenient second, third, fourth and fifth levee locations? Can the biases be separated and labeled as due to cultural differences versus those due to selective collecting at different rates? Attempts will be made to analyse and come to some conclusions concerning these effects when the settlement model is analysed for fit and efficiency.

8. What elements cause predictive model failures and successes? The elements of the model will be analysed in an attempt to determine why the Maryland environment that structured the model of site placement is different from that of the survey area. Finer sensitivites that will result in a better model for the area should be the product. Each failure must stand alone and be tested against whichever hypothesis can be formulated to provide an answer, not only for the failure in Virginia, but for the successes of that element in Maryland. The following are some of the failures of the model that came to light as the survey progressed.

a. Why are there no Woodland village sites on the first levee?

b. Why is there a relative scarcity of tool-bearing highland sites as compared with a similar area in Maryland?

c. Why such a density of archaic camp locations on the first levee of Lowes Island and not in Maryland?

d. Why is the third levee area of Lowes Island almost completely devoid of any habitation debris or evidence?

e. Why is the McCarty Island area of Lowes Island (the western twenty acres adjacent to Sugarland Run) almost empty of cultural remains?

The value and importance of the Lowes Island project lie in several different regions of archeological, cultural, and methodological interest. The following paragraphs will address and elaborate upon the more meaningful topics.

1. The importance to future Potomac Piedmont archeological surveys of a purified (more efficient) predictive settlement model will allow better utilization of the man hours available for the identification of prehistoric Indian settlements. Growing urbanization of the Maryland and Virginia bluffs and shores of the Potomac River portends the destruction of cultural remains that span habitation periods from the Paleo-Indian to the Woodland people who were in the area when the first white explorers and settlers arrived. Early knowledge of the jeopardized settlement sites will allow alterations in construction plans, structuring a priority system for salvage when preservation cannot be maintained, and a cultural resource management plan that will be based upon good data. Neither Virginia nor Maryland have created the management plans that

will insure optimal preservation, or the introduction of laws and regulations for protection of resources. The availability of an efficient cultural remains inventory process will add to the impetus in creating state plans.

2. The elements of the model will be studied and better defined through the examination of the model prediction failures. These elements can then be used in other area models in a local weighting system that is appropriate. By holding the temporal elements constant in the model for a particular period, a series of models can be structured that cover the full span of habitation in the area. This model array will provide particulars of variation or similarity between temporal sets. In short, the comparison of settlement decision factors can be studied across different times. This process will facilitate the study of processual progressions and the variations within elements for different adaptation demands. An example might be the utilization of prominent topological features for camps across many cultural periods. Hypotheses can be structured and tested that address the reasons for the demonstrated variability between the cultures in the utilization of such prominences. Imputed decision processes can be structured and logic assigned that includes the justification for the decisions reached.

3. The recovered artifacts and their relative densities in particular locations will provide a corpus of data suited for further study and analysis. Lithic

technology can be examined across the many cultural periods represented and the variations addressed through replication activities, hypotheses that can be tested through further Lowes Island work, or through study of other area sites. The artifacts will become part of a larger body of data that covers the entire Middle Atlantic archeological province. The Potomac River, as an ancient and much used pathway from the interior to the tidal zones of the coast and bays has been little studied. The Lowes Island materials will contribute much by enhancing our understanding of the utility of the river and the cultures that were present or absent.

4. The Lowes Island project has elevated the awareness and sensitivities of the public to prehistoric cultures and their remains. This has been achieved through slide presentations to the public, at archeological gatherings, and for school groups in college and high school. Newspaper coverage of the project, its justification and progress, and the value of the cultural data that are being recovered have been widespread. The project has had a direct and successful bearing on the decision of the Fairfax Historical Commission to create and staff the position of Fairfax County Archeologist.

5. The methodologies and techniques of conducting field survey archeology amidst growing corn crops with no damage to the farmer's crops, yet achieving a continuity of accuracy and coverage in the survey process, are of value to

subsequent study and survey efforts. By working in the mature corn fields, a significant addition to the time available in the season was achieved. Traditionally, survey activities have stopped when the crops reached eye level. Because the survey work could only be conducted on weekends, holidays, and vacation days, the addition of the weekends in August, September, and October in 1977 and 1978 was a significant increase in field activity.

6. Over one hundred participating crew members were trained in the many aspects of the survey process, survey need, lithic familiarity and recognition, artifact recognition, ceramic recognition and analysis as to surface treatment and temper, the hypothetical (the writer's views) paleo-structures of the island and the Potomac River in the area, and almost endless minor items of encounter in field survey work. Many of the participating crew members (if only for two or three days) were members of public bodies or private organizations that will influence the course of archeology both in Virginia and Maryland. Briefly, some of these are: the Fairfax County Historical Commission, The Loudoun County Women's University Club, the Head of the Catonsville College Anthropology Department, the Fairfax County Archeologist, the presidents and several officers of both the Virginia and Maryland Archeological Societies, teachers from two campuses of the Northern Virginia Community College, a Loudoun County member of the board of

supervisors, the chief architect of an international developer, members of the Seneca Road Historical Society, and Army Corps of Engineers personnel responsible for cultural impact analysis.

In summary the Lowes Island project has provided extensive information on existing concentrations of cultural materials in the Potomac River Piedmont. It has provided a test of a predictive settlement model developed on nearby Maryland shores and bluffs. The model test has highlighted the observed controlling elements that entered into prehistoric decisions concerning camp or settlement locations. Methodologies of field survey have been developed that will be of value in subsequent survey activities. The survey publicity (planned and made part of the project) has enhanced the awareness and sensitivity to prehistoric cultural remains among the general public and many of the decision-making bodies that serve the public. It has, finally, been a two year training process in survey activity for many people who will continue to provide support and manpower for subsequent field work. These same people now form a corpus of the public that is knowledgeable and willing to take an active support in archeological activities - be they field work, laboratory work, or the all important political support for the legislation and regulations that are starting to come before the public in support of cultural resource preservation and management.

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CHAPTER I

DISCUSSION OF RELATED LITERATURE

The survey of Lowes Island and a test of a predictive settlement model have been conducted in the light of insights provided by the reports, theories, and observations of a wide array of authors and sources. The discussion of this literature will be organized along the lines of the subjects covered by the available references:

(1) Site reports on file with state agencies.

(2) Site excavation reports published by society journals and newsletters.

(3) Regional extrapolations of cultural identities published by symposia and conferences, lecture series, and as summaries in books dealing with the general geographic area.

(4) Reports and publications from other areas that contain appropriate artifact morphological and temporal data that seems to apply to similar artifacts recovered on Lowes Island.

(5) Graduate theses and dissertations that address archeological survey techniques and settlement models.

(6) Articles, books, and critiques that address archeological survey techniques and settlement models, as well as the use of these in cultural resource management.

(7) Books and articles that address sampling tactics and the application of probability sampling to archeological projects.

At the start of the survey, three site reports were on file for Lowes Island. These had been filed by R. Looker (1961) with the Virginia State Library and related field work conducted in the 1930's. The island had in effect been divided into three sections and each was labeled a site. The sites were on the first levee and extended from the river bank of the Potomac fifty meters south. Personal discussions with Slattery and Stabler in 1977 revealed that they had not surveyed south of the fifty meter line because the density of materials on the surface kept them busy collecting along the bank. They maintained no records of artifact position nor of the flake densities or composition.

Two lengthy site excavation reports have been published for sites on the first levee on the Maryland side of the river (Sterns 1940; MacCord, Slattery, and Schmitt 1957). Both reports relate the excavation of Late Woodland village sites. The sites seem to have been constructed on earlier Archaic period camping locations to judge from the projectile points recovered in addition to the expected small quartz triangular points. Three other Woodland period sites in the same Maryland floodplains have been excavated and preliminary reports published: Winslow (Slattery1960), Beshers Site (Tidwell 1960), and the

Shepard Barrack Site (Clyde 1959). A rock shelter (Hargett-King) was excavated several miles north of the Potomac in the Seneca Creek drainage that has bearing upon activity in the Lowes Island survey (Tidwell and Woodward 1965). Steatite tempered pottery was found above sand tempered pottery in the floor of the rock shelter. This was thought to be an anomaly and was discounted as insignificant. The same juxtaposition has been observed in three locations of test pitting in the 1977-78 work on Lowes Island. Carl Manson (1947) reported a bluff settlement near Little Falls on the Potomac just below the Great Falls definition of the Piedmont zone. This site yielded the earliest ceramics yet found in the Middle Atlantic region. These same Marcy Creek ceramics were found in the banks of Lowes Island in 1977 at a depth of fifty centimeters below the modern surface. Slattery (1946) reported his excavations on Selden Island, a floodplain site about seven miles west of Lowes Island. This work produced another early ceramic ware also tempered with steatite, but much thinner, and marked by cord covered malleating tools on the exterior. This is the same type of pottery that has been found on Lowes Island above a very similar ware tempered with sand.

C. G. Holland (1957) reported another bluff site on the Virginia side of the river several hundred meters west of the Marcy Creek site found by Manson. Both Woodland and Archaic materials were recovered in this salvage operation during the construction of the George Washington Parkway. A brief account by W. K. Wimsatt (1958) describes a large cache of rhyolite blades that he and Dr. Madden encountered in a wheat field on the Maryland side of the river about a mile and a half west of Great Falls. The cache report, while impressive, is shadowed by Wimsatt's descriptions of boyhood searches along the islands of the Potomac and the incredible artifact concentrations that were found there after each Potomac flood. These materials were found on the surfaces and eroding from the bank matrix of the islands and the adjacent fields.

More recent site reports have been filed with the Maryland Geological survey for Piedmont Potomac settlements in Montgomery County, Maryland. Franklin (1972), Silsby (1970), and this writer (1973, 1974, 1975, 1976) have examined both the bluffs on the Maryland shore and the floodplain areas just across the river from Lowes Island. The materials found on these sites cover the full range of cultures inhabiting the Potomac Piedmont from 14,000 B.P. until contact times. A report describing a Clovis-like fluted point was published by Russell (1965).

McNett and Gardner (1971), while discussing the early pottery forms and characteristics in the Potomac, provide the stratified sequences at the Monocacy Site, a deep multiple habitation site several miles west of Lowes Island. The artifacts and ceramics there seem to be similar to several of those found on Lowes Island. The work of McNett, Gardner, and McDowell on Ruppert Island (1970) provides additional information on pottery attributes found in the Potomac Piedmont, type variance, and stratified context. Spencer Geasey (1972) described the excavation of the Everhart Rockshelter during the 1951-53 period. This site is above Catoctin Creek in Frederick County, Maryland, about six miles above the Potomac River. The site contained large quantities of artifacts from the Archaic and Woodland periods, but unfortunately, not in stratified context. The site is thought to have been a way-camp on the trails to the rhyolite quarries of South Mountain to the north. The excavation reports and artifact descriptions provided by McDowell (1972) for the Fraser Site (44FX1) and the two close-by sites on General Spaulding's property are of particular interest because this area abuts the Lowes Island environment on the east. Hobbs (1965, 1966) describes a fish weir near the Fraser Site and several others to the west that are thought to be of prehistoric construction.

Discussions addressing settlement patterns, optimal utilizations of ecozones available to the prehistoric Indians, seasonal rounds, and types of encampments are found in Gardner's Flint Run report (1974), McDowell (1972), Broyles (1971), Gardner (1978), Hickey (1967), and Custer (1978). While several of the above references deal with non-Piedmont areas of the Potomac River and its feeder streams, artifact similarities found in those areas lead us to believe that the same cultures occupied those areas. For example, the Zekiah Swamp area of Charles County, Maryland, is topographically very similar to the bluffs and adjacent swales of the Piedmont - in particular when the Piedmont locations are near a swamp. The Zekiah area is now called the upland region of the Potomac tidewater cultural provenience. Certain projectile points from periods of the Early Archaic are found in both zones (Lecroy and St. Albans, Palmer, Kirk, and Dalton). It is likely that the tidewater Potomac was then an extension of the Piedmont area in those days before the resurgence of the oceans following the Wisconsin glacial melt. This caused a drowning of the valleys of the Potomac in the area of Zekiah (Looker and Tidwell 1963). The Ridge and Valley province under study by Gardner and his students along the Shenandoah River contains many of the same types of cultural remains that have been collected in the Potomac Piedmont. These observations are of particular interest because these locations contain Archaic period data that have yet to be clarified in stratified context in the Potomac Piedmont.

Artifact morphological studies are of value because tool or ceramic attributes are often the only clues to cultural continuity between different zones of habitation when radiocarbon dates are available from only one of the zones. While the extensive trait lists from earlier site examinations are of value (Sterns 1940; Tidwell

1967; Manson 1954), excavated and dated materials of similar form and use from other areas give wider perspective and validities to assumptions concerning "look-alikes" in broad cultural context. This same logic applies to settlement patterns from other riverine systems. Reports of investigations in zones similar to the Piedmont Potomac provide contrasts and similarities in the matching of variables that entered into the site placement decision processes of the camp inhabitants. The processual examination of habitat use and the presumed extraction of life support elements from the ecozone are interpreted from the archeological record. Projectile points are still the major diagnostic marker of particular cultural remains. Sources of projectile point data and the dated contexts for many of the unique types that have been located in other places and on Lowes Island are covered by Coe (1964) for the Carolina Piedmont, Broyles (1971) for a West Virginia river environment, Gardner in the Virginia Ridge and Valley environment (1974), Ritchie (1961, 1969) for New York materials similar to many in this area, DeJarnette, Kurjack and Cambron (1962) for a southern view of materials from the highlands of Alabama, Witthoft (1953) for Pennsylvania broad spearpoints, the New England reports of Dincauze (1971), Wahala (1969) for the Michigan views, the Graham Cave excavation report of Klippel (1971), and the recent Meadowcroft Rockshelter report of Adovasio and Gunn (1978). Pottery descriptions are certainly well covered by Manson (1954), Evans (1955), and Stephenson and Ferguson (1963). The later work of Gardner and McNett (1971) amplifies considerably these earlier works and tends to realign many of the seriation-born datings of the earlier research in Potomac River potteries. The tidewater cultures reported by Wright (1974) have pottery similarities with many of the sherds that are to be found in the Potomac Piedmont. Riverine site research that has interest for the Piedmont Potomac researcher because of technique, findings of artifacts, or the ecological development of past periods is: Klinger (1978), a report of an oxbow lake site study in Arkansas; Chapman (1976) and his excavation of an early Archaic complex in Tennessee; Eddy (1974) for locational strategies in resource management; Johnson (1974) for his discussion of settlement patterns and variability in a Missouri river valley; Wood (1978) and his elaboration of optimal location in site placement strategies; Goodyear, Raab, and Klinger (1978) for the status and evaluation of research design in cultural resource management.

Insights into the mysteries of geomorphology and the structure of the land in terms of the resources that may have been present in the distant past are addressed in: Gladfelter (1978), Turnbaugh's discussion of the effects upon archeology of floods (1978), the Geological Map of Washington, D. C. and Vicinity, published by the Department of the Interior (Johnston 1964), an overview of the geological history of the area by Ogburn (1977), the general discussions of Butzer (1971) that address not only the physical mobility of many of the land features that house prehistoric sites but the weather systems that cause the fluctuations in water systems and land mass alterations, and the regional explanations of paleo-weather systems and the flora and fauna that were in this area by Carbone (1976, 1978).

The replication of surface survey work and the value added to the initial information sets is discussed by Ammerman and Feldman (1978). This process was used to equal advantage in the Lowes Island survey. The actual value of such sites is addressed by Raab and Klinger (1978) and Wendorf (1978). The problem of value too often is tied to the dictates of the term "significance" as defined in the criteria for eligibility for nomination of a site to the National Register of Historic Sites. The modern discussions are compared to the round table discussions of "experts" in the field as typified by the Mason, McGee, Wilson, Proudfit, Holmes, Renolds, and Mooney debate reported in 1889. Such experts are still to be contended with as modern archeological techniques attempt to overcome the traditions on the record that were structured in times devoid of the analytical expertise available to the modern researcher.

Survey techniques, objectives, problems of application, and the reliabilities of several approaches are sparsely covered for the eastern Woodlands. Most of the available literature until 1978 addresses the western applications in high and dry areas that are today deserts and dry mountain ranges. One of the most impressive and fruitful of these studies is that of Judge (1973) during which he surveyed a huge area of New Mexico near the Rio Grande River for signs of Paleo-Indian occupations. He verified the survey model of settlement accuracy through probability sampling. Mueller (1974) achieved much the same type of success when he surveyed the high plateau area of the Paria Plateau at the Utah-Arizona border. Mueller then replicated the survey with the aid of a computer in a massive test of sampling techniques and applications. Leedecker correctly questions the validity of these types of surveys in the eastern Woodlands in his Master's thesis (1978) that addresses the archeological survey of the proposed Taylorsville Lake project area in Kentucky. Leedecker found that a series of non-random transects 100 meters by one meter plotted across proven topographical preference locations for sites gave fairly reliable results. In 1978, Mueller came to the Potomac Piedmont area and applied western survey logic to the Lowes Island area under contract to the Fairfax County Water Authority. In essence, the survey was a systematic cluster random sample of particular portions of the zone. Responsible authorities (Kelso 1978) found the resulting analysis (Iroquois Research 1978) to be totally unacceptable. Mueller's western applications have received pointed criticism in recent comments by Plog (1978).

Thomas (1978) has reviewed the whole application of archeological sampling and statistical applications to archeological data and found that there are more abuses than correct applications of these techniques in the literature. Thomas coined the term, "The good, the bad, and the ugly", to identify three aspects of statistical applications that he found in his review and critique. It is disturbing to recognize among his "ugly" the same sort of demonstration versus a census that is planned and executed for this thesis and the Lowes Island study. The major important difference here is that the conclusions from the thesis relate to the purification of a predictive model in conjunction with sampling techniques in the interests of conserving survey manpower rather than just a pure demonstration of sampling versus census.

The philosophies of Binford (1964), Redman (1973), and Redman and Watson (1970) form the basic design intent of the Lowes Island survey. The survey, under the constructs of the settlement model, in reality, is an analysis of past cultural decisions. The adaptive behavior of the people that settled in the various locations are partially reflected in the archeological record. The justification of the survey is to preserve that record until such time as the science has matured sufficiently to extract the optimum amount of data for analysis, or to at least know of the site potential so that salvage operations can be inaugurated should the site be scheduled for destruction. The potential value of any site, and the process of recognizing that potential as it enters into an evaluation of preservation and prioritizing are well covered by Struever (1968), and Talmage and Chesler (1977).

CHAPTER II

METHODOLOGY AND SURVEY RESULTS

Much of the writer's work in Maryland has been conducted to the extent possible under the constraints of the Multistage Fieldwork and Techniques addressed by Redman (1973). Fig. 4 provides a graphic description of this system. The Lowes Island survey has been conducted using the same tactics. Briefly, General Reconnaissance defined the topography of the area and provided a framework that defined those basic areas most desirable for settlement or camping under modern and paleo conditions. Hypotheses were stated that relate to the ages of the geomorphological sets observed and the orientation of settlements that could then be structured into the available environment at any given time in the past. The more obvious settlement areas were placed into a matrix of hypotheses for testing in a later stage of the survey. Intensive Survey was the second process. Elaboration upon early observations caused hypothesis modifications by a feedback process. This was justified by a better understanding of the data that closer examination provided. The Redman plan was modified to accommodate his Controlled Surface Collections in the Intensive Survey portion of the process. Again, feedback into the other segments of the plan ensured a maximum of information applied to clearer hypotheses being stated, or in finer tests being designed in light of the most finite data available from the later stages of the survey. Redman's fourth stage, Excavation, was only applied in non-sensitive areas that would not interfere with the plantings of the tenant farmer. Such areas would be restricted to drains, road cuts at banks, and the banks of the Potomac River on the first levee where farm equipment and crops could not be endangered by pitting activities. The first day of reconnaissance seemed to indicate that a system of landmarks could be triangulated from the field by compass bearings. This was thought to suffice in locating the sites.

Most of the survey area with high probabilities of settlement locations would be in the cultivated zones of the corn fields in the floodplains. Experience in the river bottoms of Montgomery County, Maryland, plus the assurances of such researchers as Roper (1976), and McDowell (1975, personal communication), indicated that artifact displacements due to cultivation had not destroyed the materials in the two dimensional array that would define the sites. The identification of material concentrations that might be analysed for different areas of camp activity was beyond the scope of the survey project. Future analysis and site material recoveries could profitably address this research. The survey was being conducted to identify prior camp sites and to conserve these locations for future study under the commitments of the developer who fully intended to bulldoze most of the other areas under survey.

The survey began on the first levee, or bank, of the modern Potomac River. The bank is a truncated levee that has been cut by the river flowing under more abundant water conditions than had been available when the levee was structured thousands of years ago. By projecting the slope of the modern banks and levee slopes, it is hypothesized that as much as seventy meters of the northern portion of the first levee has been removed by the down-cutting Potomac. Examinations of the truncated levee have exposed living surfaces in profile as deep as two meters below the surface. These are marked by bands of charcoal-flecked earth, fire-cracked rock, flakes, and various tools and fragments. The higher zones near the surface often contain pottery sherds. In most areas of the island, the residual first levee maximum elevation above the river is between three and five meters. Aerial photographs taken by the Soil Conservation Service of the Department of Agriculture (1937) plainly show Lowes Island to have been an area on the outside perimeter of a sweeping arc of the Old Potomac as it narrowed to pass through the hard rock constrictions to the east, an area today known as the "Breaks". The first levee would have been the last formed in the slackening water flow and the first to be eroded under higher hydraulic activity. Fig. 3 diagrams and elaborates upon this depositional sequence that is hypothesized for the Lowes Island geomorphological structure and history.

The weekends of additional and focused reconnaissance with R. Henry provided a much wider understanding of the topography and the densities of the sites that are in the floodplains. The first levee seemed particularly dense, the second levee much less so, and the third levee contained almost no remains of any kind on the surface. The fourth levee (just south of Old Sugarland Run) had site concentrations in some areas equal to those of the first levee. The age of the tool artifacts from the fourth levee seemed to be far older than those of the north levee formations. The fifth levee-terrace formation at the base of the bluffs also contained artifacts of very old definition, plus more recent pottery sherds from Middle Woodland cultures. At this bluff juncture zone, sites occured only where highland water courses cut through the bluffs to the floodplain.

The concentrations of sites revealed by the four day reconnaissance on the first levee, plus the pending cultivation plans of the farmer, convinced the writer and his cohort Henry that survey activities should begin where the returns would be the highest in the event that work should be halted for some reason. It is to be noted that three concentrations of surface debris attributed to early colonial settlers were located upon the first levee. Research by John Lewis and Mrs. John Bazuin in the tax records, deeds, and plot specifics in the old records failed to reveal any history of such early settlement. Several items from these locations have been dated to the 1790 period.

The first formal controlled survey activities addressed the western two-thirds of the Island. This is the natural area to the west of the benchmark and Lowes Island Road (which runs roughly north and south). For the first two hundred meters of surface survey a triangulation process was used to mark the chip and tool artifact concentrations that were to determine site definitions on the first levee. East-to-west progress was marked against the thirty meter tape that was used to control the sector of search in a thirty meter band east-to-west. The north-to-south sector was controlled by the natural drain that marked the termination of the first levee on the south. Artifact densities continued to be higher than had been anticipated. Accuracy of the triangulation process came into grave doubt when editing the field logs from those first few days of survey. The plots of concentrations (flakage and artifacts) could not be reproduced with the accuracy required if the developer should use the resulting maps to redesign his golf course sand traps and water hazards. Tool artifacts were not being recovered in this first effort. The concern was to quickly survey the entire area and not become entangled with the specifics of particular tool concentrations, or even with the whole (and lengthy process of artifact cleaning, labeling, and curation. Three factors caused a change in this philosophy (or survey tactic):

1. The fields were disced and heavy rains quickly washed off the dirt that masked flakage and tool artifacts upon the surface. The returns in information for each passage over the surface were increased many-fold, and two hundred meters of area did not seem much to resurvey in light of what remained to be accomplished.

2. Artifact collectors had come to the fields and were pacing themselves just in front of the survey effort. All encountered were challenged and educated as to what the current survey was trying to accomplish. All daylight and weekend collecting by these people stopped. These people, who had been collecting for many years in these fields, were willing to overtly cooperate and pursue their collecting in other areas. Weekday collecting continued when this writer's crews were not in the fields. Footprints told the story of continued searches by unknown collectors. In the face of such depredations of the materials on the surface it was decided to recover all tool artifacts, pottery, and flakage of materials of cryptocrystalline nature.

3. The concentrations that had been observed in the first two hundred meters of the effort could not be accurately mapped under the triangulation process that was designed for much less dense concentrations of site placements.

The survey began again at the zero marker. Another thirty meter steel tape was purchased and used to measure the north-south position of all artifacts recovered. Flake concentrations were also measured relative to this new grid system that eventually would encompass all of Lowes Island. Bank examinations were also tied to the two dimensional grid matrix and taken at the same thirty meter east-to-west examination set. Artifacts that were observed in the banks were thus tied into the master grid with the added third dimension of distance below the surface of the bank at the point of discovery. An overall island depth below datum was not attempted because of the added time and alignments that would have been required. Fig. 5 depicts the island gridded into one hundred meter squares as an illustration of the process used. Recovered artifacts were bagged by thirty meter search increment sectors. Fragile or unusual items (flint flakes, ceramic sherds) were placed into plastic film canisters and placed in the same bag with the other more robust items. Each recovered item was recorded in the daily log for that search sector. The recording included the east-west and north-south coordinates, a description including the material used in the artifact manufacture, and comments that related the surrounding soil composition, flakage densities, etc. A drawing was included when there was a chance that confusion might result from the description or the presence of similar items in the thirty meter sector bagged together.

The surface search involved walking over each sector. The survey crew placed themselves about one and a half meters apart and normally walked from the road on the edge of the first levee in an east-to-west path. This provided a maximum visual overlap for each pass. Upon reaching the end of a thirty meter sector, the crew would wheel and move south on a pivot and resume the survey. Artifacts were marked with wire flags tipped with red plastic flags. The measuring crew would then start on the eastern perimeter of the sector and move along the steel tape that was lying along the road track in an east-to-west line. One person would move into the field with the end of a second steel tape and align at ninety degrees with the east-to-west tape. A bagger would accompany the tape person who would call out a description of the artifact to the recorder who remained at the reference tape. The recorder and a helper would read the north-sout and the east-west coordinates, record the artifact description, and any other comments that were appropriate for that item at that place in the field. A general comment section in the field log for each thirty meter set defined the overall concentration of materials, both natural and manufactured.

Coincident with the field surface survey of the first levee, one or more crew members would be examining the bank of the modern Potomac River. This process entailed crawling along the vertical face of the bank and moving beneath and through the thorns and brush that most often masked the rise of the bank. When and if flakage or tool artifacts were encountered, the searchers would surface to the top of the bank and obtain an east-to-west reference and then measure the distance below the top of the bank at that point. These coordinates were placed in the field log with artifact descriptions for that thirty meter sector. Early in the process of bank examination it was recognized that the bank concentrations did not coincide with the surface finds in the same survey sector. In short, the crew was discovering that cultural remains existed in a three dimensional milieu and that the surface indicators on the tops of the levee were alone insufficient to fully define the cultural remains on the first levee.

The survey of the second levee required a much more stringent control of the east-to-west reference line because of the distance and angles of the intervening drains. The drains in the western one third of the island had changed their western track for a slow sweep to the northwest, thereby approaching the modern river bank that itself continued basically a westerly track. A gunsight compass was devised using a meter-long board with a compass inlaid in the middle, and several sighting pegs in line with the long dimension of the board. This device worked quite well. As an illustration, after working from the Lowes Island Road on the east to the west for fifteen hundred meters, the error measured at the bank definitions of thirty meter sets was only one meter of error in the east-to-west measures. A transit device was not within the zero funding budget of the survey effort. On one day in July, 1978, a transit was borrowed and used to verify the gunsight compass bearings on current work on the fourth levee. An eight hundred meter survey set was found to be in error by less than one-half meter. Such accuracy provided by the make-shift device was sufficient to pin the discovered locations on the map of the developer. Because of the meander pattern of the drains that defined the difference between the first and second levees, several off-sets to the north had to be made on the second levee as the survey progressed to the west. These were all diagrammed in the day log so that reconstructions could be made of the sites that were to be found on this levee. On one occasion, cultivation activities in the growing corn resulted in 1200 meters of reference stakes being knocked over by the tractor or disc harrowing equipment. Half a day was required to go back and re-establish the line of work that by that time had experienced five off-sets to the north to follow the levee top.

The broad third levee was surveyed in the same manner as the second levee. The southern drain defining this levee is the silted Old Sugarland Run that defines the floodplain area as an island. The second and third levees are cleanly defined only on that part of the island that is cut by the north-south running Lowes Island Road. Minor bifurcations of the drain systems between major levee definitions complicate field recognition of the system. Low altitude aerial photographs enlarged by a factor of five magnitudes proved to be very valuable tools in tracking progress and maintaining full recognition of the levee tops in the major alignments versus the smaller and less important sub-levees formed by bifurcations of the drain systems.

The fourth levee, adjacent on the south to Old Sugarland Run, was examined only in the field portions that were under cultivation. The levee is truncated by a deep swamp adjacent to Lowes Island Road, and a swampy thicket of briars and matted vines on the western end of the slight rise that defines the levee. The constrictions of the floodplain valley on the east by the hard rock outcrops that narrow the river valley terminate the fourth levee perhaps eight hundred meters short of the full bank definition of the island itself. The reference to the area grid for the fourth and fifth levee survey was aligned with a manhole on a sewer line that runs east and west along the base of the fifth levee. The manhole is clearly marked on the larger scale maps provided by the developer and has been scaled into the grid system for the whole area.

The fifth levee is a combination of alluvial and colluvial deposits. Much of the overburden in this area at the base of the bluffs is a product of sheet wash from the higher zones to the south. The composition of the soil is radically different from that of the lower levees to the north. Schist, shale, vein quartz, and sandstone cobbles from the higher ground litter the surface and are bedded in the soil to a depth of at least three meters. All of the artifacts defining site locations on the fifth levee stand out in stark contrast to the rubble stone debris from bluff decomposition. This levee is within the one hundred year flood line and is therefore subject to periodic flooding and surface alteration due to added silts and the effects of current scouring under very high water conditions. This levee, like the fourth levee just to the north, is truncated by modern forest on the west and the projecting bluffs of harder rock on the east. The forest areas are mostly flat with damp zones due to the drains of the highlands that bisect the levee in many places. These drains cut to the swampy edges of the Old Sugarland Run area where they are pooled in low areas covered with heavy undergrowth and scrub trees scattered between locust, maple, oaks, beech, and the large sycamores. Survey activities on the fifth levee were confined to the cultivated areas and the immediate forest edges. The same measuring methods were used here that were used upon the other levees with the change in reference mentioned above for the fourth levee.

The forested highlands were surveyed using a modified plan that placed greater emphasis upon the topographical contour lines of the large scale maps. Only those areas within sixty meters of existing water paths or extinct drains and flat enough for habitation were examined.

Placement of the survey area teams and resultant plotting of activities and finds were positioned upon the maps by means of triangulations between ridges, waterways, and the corner markers of survey stakes used by the Fairfax County Water Authority when they were within reasonable range of activities. Surface observation was impossible because of the heavy leaf cover in the forested areas. A compromise was made by cutting one meter square holes in the forest floor to a depth of about fifteen centimeters. At that depth, the ten centimeter forest duff had been penetrated and five centimeters of the underlying yellow compacted clay. All artifacts were found at the junction of the duff and the clay, or no more than five centimeters into the clay. Site locations became a function of the discovery of artifacts and charcoal beneath the forest duff. The charcoal concentrations were proven not to be of forest fire origin by the process of cutting additional holes in the area until the bounds of charcoal were established by a ring of holes that contained no charcoal. All artifact-bearing test pits did not contain charcoal.

The cultivated highlands were subjected to intensive surface survey and no flake concentrations could be recognized. Surface cover is heavy in much of the area, including several acres covered with lawns, barns, farm yards, and other outbuildings. Many of these standing structures are constructed upon topographical features that were prime site locations in the Maryland survey work.

The growing corn created serious problems after it reached a height of five feet. Artifact flags could not be seen by the measuring crew. It also became very difficult to restrict survey activities to one thirty meter sector because all references and tape measures were hidden by the corn. The problem of sector control was solved by running red survey tape through the corn at the sector boundaries. This red line was aligned with the gunsight compass so that the survey grid system would be retained. The tape was wound up and reused once a sector survey had been completed. In order to overcome the corn (which grew to over ten feet), a six-foot aluminum step ladder was purchased. This, in combination with twelve-foot bamboo poles tipped with red plastic ribbon provided a solution to the problems. The utility of these tools, while unorthodox, allowed the survey to continue during the months of July, August, and September. The ladder was placed in the corn at a grid position established by measuring from a known reference (road, manhole, etc.). One crew member would climb the ladder with the gunsight compass and direct the placement of a bamboo pole thirty meters due west or east. This established the reference line for subsequent survey and artifact position measurements. The "ladder-master" would then guide the measuring crew (carrying bamboo poles) to the corn stalk bearing a survey flag in its top. An artifact would be marked with another flag on the ground.

Figure 6 illustrates the locations of the sites that have been located in the first two years of the survey (through December, 1978). Survey activities will continue in 1979 in the form of highland explorations and additional surface work and pitting on the levees to widen the artifact recoveries needed to better define cultural episodes of site occupation. The following sections of this chapter will address the sites and materials recovered by levee definition.

First Levee

The first levee is the most dense in the remains of prior human occupation. Bank sections, test pits, and a three-meter-deep back hoe trench have established that remains in the matrix of the levee extend on the average to a depth of one meter. In some areas on the western end of the island, flakage is found as deep as two meters below the surface. Three distinct cultural layers are apparent: the first is in the plow zone, the second is thirty centimeters below the plow zone, the third starts about seventy centimeters below the plow zone and is about twenty centimeters thick. A deeper fourth layer is found in places at about two hundred centimeters below the bank surface and is marked by light charcoal scatter with a few quartz and jasper flakes. No tool artifacts have been recovered from this deepest layer.

Site definitions are a function of both

recognizable tool artifacts and the flakes, fire cracked rock, and miscellaneous debris that cannot be defined as to use or production (e.g. shale tabular hunks up to thirty centimeters in length). Table 1 illustrates the artifact array on the first levee defined by the thirty meter sectors east and west of the bench mark. This array addresses only the surface recoveries. Note that the asterisks indicate thirty meter sectors that contain two separate zones of debris and tools that are separated in a north-to-south definition. All of these dual sets are located on the levee top and along the perimeter of the levee drain on the south. Most of these dual sets are in the center one-third of the island where the southern drain forms what has been labled as the "false second levee". This zone is about ninety meters south of the first levee high zone.

To determine the natural depositional history of the first levee and to explore the depth of cultural remains, section pits were cut at several locations. Figures 7 and 8 illustrate profiles in pits one meter by two meters that were dug at 630 meters west and 1350 meters west. These pits were dug within thirty meters of the modern bank of the Potomac River. The pit at 1350 meters west (through the floor of an old mule barn) was dug to over 2.1 meters below the surface. These and other pits and profiles were dug with trowels in two centimeter levels. All artifacts were plotted in three dimensional definition and spoil was screened through quarter inch mesh screen by level. Photographs were taken in color of the floors and profiles when significant materials were exposed. Features were subjected to flotation separation and water screening through 1/16" screen. Figure 9 illustrates three profile pits (one meter square) that were dug in the surface of the first levee at 570 meters west. These pits were designed to test the hypothesized silting sequence in the inter-levee drain zones versus the lack of silting on the levee tops. Survey crew participation in the Selden Island survey in October, 1977, structured the hypothesis that was being tested. Artifact banding on Lowes Island levee tops to the exclusion of inter-levee drain surfaces had been discussed in terms of likely covering of early living floors by siltation episodes in the lower area. At Selden Island an inter-levee zone had been bulldozed away to provide for a farm pond of some fifty acres. The earth was removed to the hardpan zone between the second and the third levees. The south face of the second levee was exposed to a minimum depth of one meter below the surface of the modern fields. An almost continuous living floor of Middle to Late Archaic periods with some Early Woodland components was exposed for one mile along the face of the old levee definition. There had been no surface evidence of these habitations during fifty years of modern cultivation and surface collecting activities (personal communication, Monk brothers, Hugh Stabler, Gates Slattery, James Sipe, Charles Merry, 1977).

The living floors followed a surface that had been differentially covered by slack water silting following flood conditions that inundated the island and flooded the low areas typified by the drains between the levee rises. It was in just such an area (a silted meander bend) and under similar depositional history, that the very productive Coffey Site along the Big Blue River in Kansas came into being and was subsequently excavated (Schmits 1978).

Vertical sections were cut at several locations in the bank of the Potomac and in road cuts in this bank. These were all in zones that had produced bank erosion artifacts. Several other locations yielding materials from the face of the bank have not been tested. Figures 10, 11, and 12 illustrate these sections and the materials and stratifications that were encountered.

The following discussions of the sites on the first levee will progress from the most eastern at the George Washington Canal, east of C&O diversion dam #2, to the McCarty Island end of Lowes Island adjacent to Sugarland Run on the western boundary of the survey area. Metric references are split east and west of the bench mark at the foot of Lowes Island Road. Those references to the east of the bench mark will be suffixed with E, those to the west will bear a W suffix.

44Ld62 is located 823 meters east of the bench mark, and four meters due west of the residual cut rock wall that is a remnant of the George Washington Canal system around the falls and rapids of the Piedmont definition of the Potomac River. The site was exposed when some local campers dug a large trash pit. Quartzite biface fragments, flakes, and stemmed points eroded from the trash pit spoil pile. Rhyolite and quartz flakes were distant minorities behind the quartzite materials. Plans to screen the six cubic meters of the spoil pile were thwarted in November when the campers filled in the trash pit.

44Ld83 is an Archaic camp location underlying a Colonial habitation (1790) at 370 meters E. Two side-notched quartz projectile points and one quartz Woodland triangular point plus eight biface fragments and many flakes were mixed with over two hundred Colonial bits and pieces (gunflints, pipe stems, ceramics, bricks, glass, iron, lead, etc.). The site occupies a barely visible slight rise in the levee at that location. No Indian ceramics have been located here. More work will be done upon this site in 1979 to attempt a more definitive understanding of the Colonial epoch materials.

44Ld80 is a multi-component site located just to the east of the AT&T cable right-of-way at 240 meters E. Two grit tempered sherds were discovered here along with three stemmed projectile points of quartzite, one side-notched point of quartz, two contracting stem points (one siltstone, one quartz), two corner-removed points, and ten biface fragments. Six of the fragments and one of the corner-removed items were of cryptocrystalline material. Fire cracked rock and the expected scatter of quartz flakage were not as dense here as in most of the other first levee locations. Two Woodland period triangular points were recovered: one of gray flint, and one of white quartz. Both examples were of the small variety (L=2.5 cm.).

44Ld3 is located between 30 meters E and 150 meters E. This is the site that will be destroyed in 1979 by the construction of the Fairfax County Water Authority water induction facility. Named The Bazuin Site, it is scheduled for phase IV salvage and mitigation by Commonwealth Associates (Dr. James Fitting) in the spring of 1979. It has been deemed (plus the entire remainder of the first levee from the water edge to one hundred feet south) eligible for the National Register of Historic Places. Material here has been found two meters below the surface by both the writer and Dr. C. Larsen (of Commonwealth Associates). The site has played a major role in the Corps of Engineers permit activity and the ultimate granting of a permit to the Water Authority to alter the banks of the Potomac River. Ten sherds of grit tempered pottery have been recovered from the western portions of the levee surface and the eroded bank. One sherd of crushed quartz has been found. Fifty-seven biface fragments have been recovered from the fields between the bank and a zone about seventy meters south of the bank. Two side-notched points, four stemmed points, one corner-removed point, and two contracting stem points have been found on the surface. Several hammerstones, an obvious pestle made from a green siltstone, and a Confederate minie ball complete the inventory recovered by the writer. Dr. Larsen recovered a Plano-like projectile point from below the layers containing Early Archaic materials. This item resembles very closely the Clovis point without the large fluting flakes. It is of primary interest at this site that 27 of the flakes that have been found are of either heat treated jasper or a gray flint.

44Ld40 is located to the west of the Lowes Island Road to the Potomac River at 50 meters W. The site covers about 50 meters east-west and forty meters south. Six stemmed projectile points of quartzite (Holmes-like) and 23 biface tools or fragments define the surface inventory recovered in 1977-78. Flakage is roughly equivalent in proportions of quartz and quartzite. Fire cracked rock and some siltstone shatter fragments make up the 'trash' artifacts on this location.

44Ld39 is located at 170 meters W. and covers about 120 meters in the east-west direction. Material is to be found as far south as 60 meters from the bank. The site has been named "Swan Flight" to mark the experience of the writer and Robert Mortensen on the site during the first day of project reconnaissance in March, 1977. Eighty-seven biface fragments and tools were found in addition to 11 side-notched projectile points, 19 stemmed points, one corner-removed point, and 4 Woodland triangular points. Two sherds of pottery were recovered, one grit tempered, one crushed quartz.

44Ld94 is located between the above two sites, but at a distance 85 to 120 meters south of the bank. This site is on the southern face of the first levee where it is bifurcated by a drain that starts due south of 44Ld39 and deepens to the east where it joins with a major levee-defining drain about 450 meters E. A single quartz side-notched point and a Guilford-like flaked ax (Coe 1964) were the only whole tools found in this area of light quartz chippage. Twenty tool fragments were recovered, almost all of quartz. The minority stone is quartzite both in flakage and broken tool fragments. No pottery was found on this site.

44Ld37 is located at 250 meters W. This location, dubbed the 3-Stick Site, is much smaller than Swan Flight. It is a thin band between 20 and 40 meters south. Its east-west range is 60 meters. Two side-notched points, 5 stemmed points, 5 corner-removed points, and 2 Woodland triangular points were found with the 33 biface tools and fragments. Fire cracked rock and flaking debris are about 5 per meter. No pottery was seen. A fragment of an atlatl weight was found near the road.

44Ld84 (the Mr. August Site) is situated 370 meters W. This pottery-bearing site yielded four grit tempered sherds, four quartz side-notched points, two stemmed points of quartzite, one corner-removed point, and 24 biface tools or fragments. One jasper flake was seen upon this site; a site that seems to be composed of two bands of material. One band runs close to the bank, the other is twenty meters south. Neither band is more than about 15 meters wide north-south.

44Ld36 (Rainchase Site) is a large pottery-bearing location between 460 meters W and 550 meters W. This site is also comprised of two distinct bands of debris that are separated by about ten meters along the crest of the levee. A heavy concentration of undated 'Colonial' material also marks this location (63 non-Indian artifacts). The heel portion of a Marcy Creek pot was recovered from the adjacent bank of this location with three other sherds of finely ground steatite tempered Selden Island ware. Four side notched points, 7 stemmed points, one corner-removed point and one flint Woodland triangle point were found with the 39 biface tools and fragments. The concentration banding mentioned above is differentiated not only by the empty inter-band area, but by the lithic materials in each band. Rhyolite is the strong minority material behind quartz in the first band, while quartzite is the majority material in the second band with a minority of quartz. Jasper and flint flakes seem to occur more frequently in the southern-most band, as do the few sherds of steatite tempered pottery. Fire cracked rock of quartzite is equally represented in both bands.

44Ld92 (Preston Site) at 470 meters W. is located due south of the Rainchase Site by about 60 meters (90-115 meters S). This location is on the southern face of the levee at the edge of the major drain separating the first from the second levee. A five-holed gorget was found in this area, as was a broken two-holed gorget. Both items are made from a polished slate. Two quartzite stemmed points, a quartz side-notched point, a pitted anvil stone, and several quartz flake scrapers define the tools located. Nine sherds of grit tempered pottery were also located here. Fire cracked rock was not as plentiful on this site as it is in those sites closer to the levee top or the banks of the Potomac River. Chippage is a dominant quartz with quartzite a distant second and only two or three flakes of rhyolite out of the sixty flakes observed.

44Ld38 (Trough Site) is a thirty meter section of the bank area just to the west of the Rainchase Site. Grit and steatite tempered pottery had been encountered eroding out of the turf line where the dip in the bank marks this location at 650 meters W. A test excavation was placed on the western edge of the trough to test the hypothesis that it is an old feature and not a modern ford access or boat landing. The test pit stratification indicated that the cut in the bank was of ancient age. The subtle levels of the pebbles in the pit profile pitched toward the center of the bank depression. The trough formed by the break in the bank and the adjacent fields held no chippage or artifacts on the surface. The test pit produced stemmed projectile points above side-notched and corner-notched items. Of interest also is the occurence in the pit of grit tempered pottery below steatite tempered pottery by fifteen centimeters. This confounds the tradition of significant temporal differences between the two tempered wares, and in a reverse order. More will be said about this situation later in these site reports.

44Ld95 is a 'Colonial' concentration where several hundred artifacts were recovered at the 850 meter W location. No projectile points were found in this area of very light lithic debris (less than one flake per five meters), and only four broken biface items were recovered. The 'Colonial' debris seems to be from the early 1800's based upon the ceramic fragments that have been recovered. This location has been named the Sybil Site.

44Ld2 is a light concentration of material at 940 meters W that covers roughly 90 meters east-to-west and about 40 meters north-to-south. One sherd of unknown temper, one side-notched point of quartz, a fully grooved ax fragment, and eight biface tools or fragments define the materials recovered. The site is near the road, and there seems to be no secondary belting of material to the south as there had been observed more to the east. The chippage is primarily quartz, quartzite next in occurence, and rhyolite and siltstone distant followers in surface visibility. A fragment of a pecked siltstone pestle was ultimately recognized among the artifacts from this site.

44Ld34 is located at 1130 meters W. Twenty-one biface tools or fragments were found there in addition to seven of the Piscataway-like contracting stem projectile points, one quartz triangle point, one quartzite stemmed point, and one quartz side-notched point. One flake of jasper was found in the heavily flaked area (quartz) that lies close to the river bank (no more than 40 meters south). This narrow band of a site covers about 120 meters east-west. Fire cracked quartzite cobbles are common (1 per four meters). Rhyolite and quartzite flakes are rare. No pottery has been found.

44Ld35 (the Stabler Site) covers 90 meters east-west and about sixty meters from the bank edge to the south. The center of the site is located at about 1170 meters W based upon the ten biface tools and fragments that were located in that thirty-meter search zone. Fourteen other biface fragments and tools were found besides the four side-notched quartz points, three stemmed points, one triangular point, and the one contracting stem Piscataway-like point. Flaking density centered around the 1170 meter marker and was primarily quartz. No pottery was seen.

44Ld97, at 1250 meters W, is much like the Stabler site adjacent by sixty meters on the east. Three quartz side-notched points, one contracting stem point, and one triangle point were found. Fourteen biface fragments or tools were located in chippage with a slightly higher quartzite content than upon the Stabler site. Quartz is still the majority flake material. Five grit tempered sherds were found and two steatite tempered sherds.

44Ld96 is the Mule Barn Site located at 1350 meters west of the bench mark. This site was exposed through test pits dug through the floor of the barn and vertical bank sections of the Potomac River bank. Deeply stratified remains were found both in the barn and out on the adjacent bank (twenty meters north). Figures 7 and 10 illustrate the stratigraphy and artifacts that were encountered. This thirty meter sector is fully covered by the barn and the hardened entrance areas to the barn. The fields for an additional thirty meters on either side of the barn are almost devoid of flakage, cracked stone, or tool artifacts.

44Ld33 (Kalins Site) centers at the 1410 meter west position on the first levee. Twenty-one side-notched projectile points, 7 stemmed points, 3 corner-removed points, and 6 triangular points have been recovered. Forty-five biface fragments and tools were also found on this site that covers an area between the river bank and the 60 meter south line. Flakage of quartz and fire cracked rock are very heavy. At times, this material occurs up to five or six items per square meter. No pottery has been recognized at this site.

44Ld41 has been named the Franklin Site to acknowledge the excellent cooperation of Mr. and Mrs. J. B. Franklin, the tenant farmers responsible for the Lowes Island property. This site lies east and adjacent to the bank above Mc Carty Island on the western edge of the Lowes Island definition. It is 1710 meters west of the bench mark. This site has great potential in the study of the Piedmont Potomac because a significant portion of it has never been plowed and remains in the natural stratigraphy provided by cultural occupations and the covering episodes of river siltation on the banks. The site has three current sectors: the vertical (3 meter) banks of the Potomac River, the cultivated portions of the fields to the south, and the road and berm areas between the banks and the fields. Artifacts have been recovered from all three sectors. In the bank, several different layers of occupation debris have been exposed through bank erosion. The deepest is over two meters below the surface; flakes of flint, jasper, and quartz. The fields have produced a heavy concentration of the Piscataway-like contracting stem projectile points (14 by December, 1978). The road and its banks where it drops to Mc Carty Island have yielded stemmed points (5), side-notched points, corner-removed points (2), and over ten grit tempered sherds of pottery. It has also produced ten sherds of steatite pottery, both Selden Island ware and thick Marcy Creek material. Excavation of the bank of this road cut has shown grit tempered pottery below the steatite Selden Island material by as much as 15 centimeters.

The site seems to follow the curvature of an extinct bank of Sugarland Run which once entered the Potomac River in a curve to the east contrary to the westward trending modern entrance.

44Ld87 is a very light exposure of flakage and one grit tempered sherd in the turf line of the eroding river bank at 1800 meters W. The bank was sectioned at that point and nothing was found in the matrix except scattered charcoal flecks. Most of this portion of McCarty Island is covered with a deep grass and surface search is impossible to conduct.

Figure 13 illustrates the typical projectile points that have been recovered from the first levee and those points that are considered unusual in the Potomac Piedmont.

Second Levee

The second levee is significantly shorter in its east-to-west definition than the first levee on the north. On the west of Lowes Island Road, the levee reaches 1410 meters to the west and the north, where it terminates in a low area containing a large stand of trees. The crest of the levee is about 320 meters south of the bench mark at the Lowes Island Road intersect. At its western terminus, the crest is about 50 meters north of the bench mark. At 600 meters west, the levee is penetrated by a swale that is about 30 meters wide. This low area runs southeast from the river bank to the drain on the south side of the second levee. At its maximum depression, the swale is about 1.5

meters below the crest of the levee. In this depressed area the soil is much darker than the surrounding levee. Cobbles have been plowed to the surface on both banks of the levee that border the low area.

Eight concentrations of flakage and artifacts on the second levee have been designated sites. The materials on this levee indicate a greater age for the cultures that camped along the levee top. Bifurcated stemmed projectile points similar to those dated by Broyles (1971) and Chapman (1975) to about 8000 BC were recovered. There was also a significant absence of pottery and the Woodland triangular points.

44Ld43 (the Saddleback Site) is split by Lowes Island Road as it crosses the second levee. The majority of the material is to be found to the west of the road. Two quartz contracting stem Piscataway-like points were found thirty meters west of the road, and then four quartz scrapers and fragments of biface quartz items. No pottery was located on this site. Flakage is a mix in equal proportions of quartz and quartzite and in density less than one flake per five meters . A large brown jasper biface was found on the southern perimeter of the location (340 meters south of the bench mark).

44Ld54 is located on the second levee 550 meters W. The 500 meters between this and the last site contain only a few natural pebbles and cobbles of quartz and quartzite. Named the Johnson Site, this location is a narrow band of material that runs along the levee top in about a ten-meter wide strip. Two sherds of grit tempered pottery were found and two sherds of unknown tempering. Six side-notched points, 9 stemmed points, two bifurcate stemmed points, 1 corner-removed point, and ten contracting stemmed points were recovered. Several of the contracting stem points were of the Morrow Mountain type named by Coe (1964), and three were variations upon the Piscataway type in that the bases were rounded. It is not thought that these rounded base points are from the same cultures making the Guilford points noted by Coe (1964) because the chipping styles are so different and the Lowes Island examples are somewhat smaller than the typical Guilford points. Thirty-eight biface tools and fragments were also found on this site of heavy and varied flake material. Quartz was the majority flakage, but both rhyolite and quartzite were almost as common. Eleven items were made from flint or jasper

44Ld53 (the Monk Site) is located at 750 meters W. Much smaller than the Johnson site to the east, this site contained no pottery. It did yield another of the bifurcated stemmed points of quartz. In addition, it had 2 side-notched points, 4 stemmed points of rhyolite or quartzite, one corner-removed point, one ovoid-base point of quartz, and eight biface tools or fragments. The majority of the tools and the flakes are quartz.

44Ld88 (the Piersall Site) lies 180 meters west of the Monk Site at 900 meters W. This site is also a narrow band of material on the top of the levee; it is 120 meters east-to-west. The lithic materials used by the cultures that used this location are quite varied: quartz, quartzite, rhyolite, argillite, siltstone, jasper, flint, and other silisified slates and sedimentary stones. This site contained the perfect fully grooved ax of greenstone that was the only one of its kind seen in the survey. Ten of the nineteen points are stemmed. The others are: 2 side-notched, 3 corner-removed, 2 contracting stem, and 2 triangular points. Thirty-two biface tools and fragments, plus four quartzite hammerstones of quartzite, and 11 ceramic 'Colonial' fragments were recovered.

44Ld89 centers on 1030 meters W. and is about 150 meters east-to-west. This site is also a narrow band of material on the crest of the levee. The flakage density separates this site from the site to the east which fades to very few flakes on the surface in the 990 meters W sector. This site displays an obvious increase in flakage and artifacts from the near empty western border of the Piersall site. Two side-notched points of quartz, 4 stemmed points (three quartzite and one of rhyolite), 2 rhyolite corner-removed points, a slate gorget, and four quartzite hammerstones, plus eleven biface tools and fragments comprise the inventory of this site. Flake debris is primarily quartz with rhyolite and quartzite close seconds. Few fire cracked rock fragments were to be seen in this area.

There are many natural cobbles of quartzite that do not seem to have been altered by man.

44Ld90 is located at 1200 meters W. This is a small site with only 11 bifaces and fragments and four projectile points. One sherd of unknown temper was found here. One of the points was a flint triangle, 2 were quartzite stemmed, and one was a corner-removed point of quartz. Flakage was light on this site and is comprised of quartz and quartzite.

44Ld91 centers on 1300 meters west on the north edge of the levee. The debris defining this site seems to be in a circular pattern that has a diameter of about 60 meters. One side-notched point, four stemmed points, and one contracting stem point were found. Eighteen biface tools and fragments were recovered and one quartzite hammerstone. The flakes are scattered very uniformly over the entire site and are in company with a few fire cracked rock fragments. Quartz and quartzite are the dual majority lithics with siltstone and rhylite being the distant minority materials.

44Ld32 (the McPike Site) is on the southern and western end of the second levee where it drops into the tree filled low area. A corner-removed point of flint was found here and fourteen biface fragments and tools. The flakage is quartz (90%) and quartzite (8%), and rhyolite. At this point on the second levee, its drift to the north has brought it within 60 meters of the first levee directly behind the Mule Barn on the bank. It is also a site well known by the relic collectors that come to these fields every spring and fall when the cultivation activities turn up a new assemblage of artifacts.

The sector to the east of Lowes Island Road has not shown any site concentrations. This area flattens from the pronounced levee top on the west and becomes a wide zone with no clean drain system except on the north and south perimeters. The surface was surveyed under ideal conditions following heavy rains after disc harrowing in the spring of both 1977 and 1978. Sites are expected on the eastern or southern extremes of this zone according to the Maryland settlement prediction model. Additional work in 1979 and some test pitting will finalize observations that this is an empty zone.

Representative projectile points from the second levee are illustrated in Fig. 14.

Fourth Levee

The fourth levee runs east-to-west and adjacent on the south to Old Sugarland Run. The crest is about 1.5 meters above the surrounding floodplain. The levee is narrow on the eastern end where it terminates in the swamp close to Lowes Island Road. On the south, the low area defining the terminus of the levee contains a wet weather drain that flows to the east to the swamp mentioned above. On the west, the levee terminates in a low area fed by a seasonal drain from the highlands that has created a swamp at the junction with Old Sugarland Run. The levee is about 300 meters in the east-to-west dimension. East of Lowes Island Road the levee does not rise above the floodplain. The levee zone adjacent on the south to Old Sugarland Run on the east is totally devoid of flakes or tools. On the most western site of the fourth levee a fragment of a fluted point was recovered. This artifact is the only certain marker of the Paleo-Indian cultures that has been recovered in the survey. Other less diagnostic tool forms (jasper scrapers, jasper biface items) are suspected to be Paleo-Indian items, but cannot yet be objectively assigned such antiquity.

44Ld52 (the Pettit Site) is located at 440 meters west of the bench mark and 640 meters south. In addition to the fluted point fragment mentioned above, the site has produced four corner-removed points, three stemmed points, and one triangular point. Forty biface tools and fragments were found with over twenty flakes of heat treated jasper and flint. Sixteen of the biface fragments were made from flint or heat treated jasper. Four quartzite hammerstones were also recovered.

44Ld73 is located in the middle of the fourth levee at about 300 meters W and 660 meters south. Six stemmed points, one side-notched point, and three corner-removed points were found in this area with four hammerstones of quartzite and a ground mortar stone. Twenty-three biface fragments and tools were found among the flakes of quartz and quartzite. Rhyolite accounted for only about five of the flakes on this site.

44Ld48 (the Warner Site) is the largest site on the fourth terrace. The center of the site is located at 170 meters W and 670 meters south. This site is surrounded on three sides by swamp and the drains that define the swamp. The ridge top of the fourth terrace fades at this point into the swamp and does not again reach the elevation of this zone. Forty-two biface fragments or tools, a rhyolite 'drill', and three hammerstones were located. Twenty-three projectile points were found. They span a wide Archaic cultural prehistory in the area from the Early Archaic Palmer-like points (Coe 1964) to the small Piscataway quartz points that are thought to be Late Archaic. Eleven stemmed points, one side-notched, six corner-removed, and five contracting stem points define this population. Nine of the flakes, or tool fragments, were made of jasper or another cryptocrystalline material. One Palmer-like point is made from a most unusual banded agate that is totally foreign to the Potomac Piedmont. Microscopic examination of this point reveals wear polish on the edges and along the flake scars of the dorsal ridges. This can be explained by the possible use of the point as a symbol normally worn on a thong or kept in a leather pouch.

44Ld72 is a small site marked by one point, quartz flakes and a few tool fragments. It is on the south face of the levee at 230 meters W and 710 meters south. Five tool fragments and one stemmed point of white quartz marked this location.

The fluted point fragment and the Palmer-like points from these sites would have us believe that the levee is somewhat older than traditional views would have us understand. It is very unlikely that this levee is the result of river flooding in the last eight thousand years. The same implications are present on the other levees, but not as significantly brought home as here where three closely adjacent sites on the same levee bear significant cultural indicators of great age. Figure 15 illustrates typical projectile points from this levee.

Fifth Levee (terrace)

The fifth levee, or terrace, lies south of Old Sugarland Run and abuts the bluffs of the highlands to the south. Unlike the formations on Lowes Island to the north, it does not contain a crest that parallels the levee drains and the Potomac River. It has high points formed by colluvial fans at, or between, the modern and ancient drains that flow north out of the highlands. Only those zones that are under cultivation (the more dry regions of a swampy and stream-cut area) have been found to contain sites. Eight sites were located. Three of them are large concentrations that match those of the first levee.

44Ld44 is named the Henry Site. It is located 170 meters east of the bench mark and 800 meters south. This site contains artifacts from the Early Archaic St. Albans-like bifurcated projectile points to the crushed quartz tempered Albemarle-like pottery and triangular points of the Middle Woodland cultures. Twenty-one points have been found on the Henry site: 58 biface tools or fragments, four hammerstones, a flaked ax, fifty flakes of flint, chalcedony and heat altered jasper. The site lies upon a slight rise that seems to have been an ancient fan to the west of a modern creek that flows from the highlands to the swamps of Old Sugarland Run on the north of the terrace. This slight rise (2.0 meters) in the gentle slopes of the terrace provides a commanding view of almost the entire floodplain to the north.

44Ld93 is sixty meters to the west of the Henry site and upon a second slight rise in the slopes of the fifth terrace. This site is much closer to the tree lines that now form the bounds of the cultivated field. It is 110 meters E and 860 meters south of the bench mark. It is marked by a small scatter of quartz flakes that are isolated from the sites on either side of it by empty surface. One corner-removed point and three biface fragments have been recovered. A Confederate minie ball was recovered from this site.

44Ld45 (the Mortensen Site) is a large scatter of quartz, quartzite and rhyolite flakage in the western edges of the fifth terrace fields adjacent to Lowes Island Road. The center of the site is at 80 meters E and 800 meters S. The site has far less diversity in the tools and projectile points than the Henry site to the east. Nine stemmed points and seven contracting stem Piscataway-like points were the only points found. Thirty-five biface fragments and tools were found on the Mortensen site. In a heavily dominant quartz flake site, eighteen flakes or fragments of jasper and flint were found. Five hammerstones of quartzite round out this inventory. The location of this site is on the gentle western slope toward another small creek that enters the floodplain from the highlands to the south. This creek also enters the swampy zone before it enters Old Sugarland Run through a swale to the east of the fourth terrace ridge formation. This intersect is adjacent on the west of Lowes Island Road at about 700 meters south of the bench mark.

44Ld46 is a small and light scatter of chippage 30 meters south of the Mortensen site and 90 meters to the west. It lies in the field on the west side of Lowes Island Road and adjacent to the creek mentioned above. One side-notched projectile point of an unusual rhyolite was found here with the end fragment of a quartz end-scraper. The flakes, one per four meters, are quartz and flint. The soils of this site are very different from those of the immediately eastern sites; they are a very deep and loose sandy, red clay loam, with very little of the schistic material and vein quartz fragments seen on the eastern sites. The soil is certainly a product of the Triassic sandstone bluffs above it. The field slope and the modern turns of the creek from the highlands suggest that this zone is the result of a radical change in the course of the creek in relatively recent times. At any rate, the site reflects little effect of the Potomac River flooding episodes that mark the lower elevation sites to the north.

44Ld49, 50, and 51 are light scatters of quartz flakes and some few of quartzite. Artifacts of tool nature from these locations are few. The sites range along the 220' contour line just below the bluffs to the west of 44Ld46. These light sites have been named Braden II, III, and IV. A crushed quartz tempered sherd of pottery was found on Ld51. The few and isolated tool artifacts from the other Braden sites are not worthy of discussion with the single exception of a jasper (heat altered), finely serrated, corner-removed point. One other point of this style has been found in the Potomac Piedmont, and this was of jasper (non-heat treated) and from a third levee site in Montgomery County, Maryland, three kilometers west of Lowes Island. The two artifacts look as though they had been cast from the same mould. This point style has not been identified in any of the literature available for the student of the Middle Atlantic.

44Ld47 (Fein Site), located on a small high area that protrudes into the swampy area south of the fourth levee, and between a feeder creek and a seasonal drain from the west, is a unique site in that the projectile points equal in number the flake items that are to be seen on the surface. The projectile points are of only two types, and are of high quality quartz. The site, 130 meters west of the bench mark and 780 meters S, contained eight unusual, corner-removed (at times almost stemmed) quartz points. Three of this style had been found on the first levee in close proximity. Research has failed to reveal any reference to similar points in the Potomac River drainage. Figure 17 illustrates these projectile points. One example of a Piscataway-like contracting stem point was found in the above cluster of eight unique points. Two side-notched points of a familiar form were found on the western perimeter of the site and do not appear to be part of the more eastern materials that define this site. Seventeen biface tools or fragments were located in the center area.

False Second Levee

The four sites that have been located on this formation are all on the south face of the levee overlooking the drain that is as much as 2.0 meters lower than the levee top. This drain has been augmented by modern farmers and is now difficult to perceive in its original path. The sites align with the levee top in an arc that suggests that the drain used to be somewhat more to the north in its natural state.

44Ld77 is a light scatter of quartz flakage adjacent on the east to Lowes Island Road 256 meters south of the bench mark. Two quartz triangle points, one side-notched point, three biface fragments and a hammerstone were found here.

44Ld78 (the Lepkowski Site) is located 147 meters east and 300 meters south. Three quartzite stemmed points, a quartz side-notched point, one rhyolite triangular point, four biface fragments of quartz, a quartzite hammerstone, and two utilized flakes of cryptocrystalline material have been recovered on this site. The chippage is an equal mix of quartz and quartzite scattered in a 60 meter by ten meter band parallel to the drain on the south.

44Ld79 (the Kimbel Site) is the largest site on this portion of the levee. It covers 120 meters east-to-west and a 60 meter north-to-south area that centers 220 meters E by 250 meters S. Thirty-four biface fragments or tools were located in addition to 6 quartzite stemmed points, one rhyolite corner-removed point, three side-notched points (one of which seems to be an Orient fishtail-like point of quartzite), 6 hammerstones, and one large utilized flake of jasper. Early survey planning tours of this area had yielded three grit tempered sherds. None were later found.

44Ld42 (the Lewis Site) centers on the narrow high area between bifurcating drains 200 meters south of the bench mark and 400 meters E. The material is an equal mix of quartz and quartzite. Two quartz stemmed points, a siltstone stemmed point, a quartzite hammerstone, and three biface fragments or tools were found. The surrounding areas are devoid of any flakes or tools. Natural pebbles and cobbles have been plowed to the surface on the edges of the wet weather drains that define the high area of the site.

Bluff areas

Thirteen sites have been located upon the bluffs that overlook Lowes Island from the south. One of these, 44Ld61, is a small rock shelter to the east of the survey property that has been included because the location is part of the environment and topology that defines the full ecological set available to the Lowes Island settlers in times past. The rockshelter contained an Indian female burial that has been removed by a relic collector. Bone fragments and a few flakes of quartz were found in the spoil of the removal excavation. The relic collector was identified and then invited to participate in the survey effort. The offer was refused. The rockshelter is located above the "Breaks", tht narrowing of the Potomac River where it has broken through the hard rock at the east terminus of Lowes Island. The shelter is located on property now part of a Northern Virginia Regional Park, 823 meters west of the bench mark and about 780 south. 44Ld98 is an unusual site in that it has no flake artifacts and no tools in the normal sense of the term; it is a series of mortar holes that have been cut into an exposed ledge of Triassic red sandstone on the bluffs above Lowes Island. These holes vary in size and depth from 16 centimeters in diameter by 13 centimeters deep to 36 centimeters by 28 centimeters. Nearby flat areas are under tangles of wild rose and highland greenbriar and have not yet been explored sufficiently to determine if or not there are other markers of prehistoric occupation. This site has been named the Schwieker Site in honor of the farmer who brought the mortars to the attention of the survey crew.

Four sites were located on the bluffs that face west toward Sugarland Run. These are all flake scatter locations on flat areas between drains in the bluffs. No tool artifacts have been recovered from these locations. In each instance, a site was identified by digging as many as twelve one-meter square test holes in the forest floor. Flakes were encountered about ten centimeters below the modern forest duff at its junction with a clay-hardpan-like matrix. These have been assigned numbers: 44Ld63, 44Ld64, 44Ld65, and 44Ld99. They are located about 1000 meters west of the bench mark and about 1400 meters south.

Six sites were located on the bluff tops that overlook Lowes Island. These sites were located in the same fashion as were those discussed above. The artifact yield of these locations was somewhat more productive. Charcoal flecks and larger fragments were present with flakes of quartz, quartzite, rhyolite, and jasper. A jasper flake knife was recovered from 44Ld71 and was found amid flakes of fire-reddened jasper, white quartz, and gray flint. This site is the most northern on the bluff tops and will be heavily impacted by the construction of the Fairfax County Water Authority pumping station in 1979. 44Ld67 is located adjacent to the deep swale that penetrates the bluffs about 366 meters west of the bench mark and 1153 meters south. It is marked by flakes of quartzite, charcoal, fire cracked rock, and a very few flakes of rhyolite and quartz. 44Ld69 is on the flat top of a finger ridge overlooking the creek that flows next to Lowes Island Road where it drops from the highlands to the floodplains. This site is marked by very heavy quartzite flakage that is found from ten to twenty centimeters below the surface. A quartzite blade and a large fragment of a projectile point were found with charcoal among the flake concentrations. The site is located 220 meters W and 1245 meters S. 44Ld68 and 44Ld70 are similar locations about 100 meters from Ld69. Ld70 contains large numbers of jasper and flint flakes compared to the other sites on the bluffs (5 per meter^2). Fire cracked rock is present, but not in the concentrations seen on the levee sites. 44Ld60 is a highland site located 2000 meters south of the bench mark and 200 meters E. It is located upon a finger ridge facing west toward a creek drain and contains light quartz flakage. One Guilford-like projectile point was found there during preliminary survey work in the fall of 1978.

CHAPTER III

APPLICATION OF A PREDICTIVE SETTLEMENT MODEL TO THE CENSUS DATA

A predictive settlement model is an organized set of elements that strives to replicate prehistoric decision processes. The decisions determined where prehistoric people camped and the elements of the model are those considerations that entered into those decisions. The model gathers the decision elements into a meaningful cluster of factors that can be considered one at a time and evaluated in terms of their importance or priorities. A successful model will allow modern man to replicate decisions made in the past and to then locate settlements within the constraints of the elements. Survey efficiency is thus improved by removing significant portions of the land surface from consideration. The remaining areas that fall within the constraints of the model elements can then be surveyed with high probabilities of settlement location success.

The environmental elements that affect camp position decisions are presumed to be valid and recognizable, to some degree, today. The accuracy of modern observations collectively determine the efficiency of the predictive power of the model. Subjective evaluations of the several element priorities in decision making are unavoidable. The weight given by a modern observer to any one of the decision elements can only be addressed by stating criteria under which an element will have high, medium, low, or zero effect. Such personal elements as tradition, superstition, or cultural role-playing can seldom be included in the model. These elements can have an overriding effect upon logic based only upon environmental considerations. The discovery of settlement locations that seem to abuse all of the environmental elements may reflect cultural or personal overrides. The temptation to attribute model failures to such overrides in the Lowes Island survey has been resisted.

The elements of the model are actually factors that would enter into a camp-no-camp decision for any person, at any period of history, in any environment. Some of the more obvious of these are:

1. slope of the ground
2. proximity to potable water
3. seasonally appropriate topographic features
4. food availability in the ranging zone
5. raw material availability (stone, clay, wood)
6. probability of flood inundation
7. soil fertility
8. rock content on the surface of the ground
9. vantage points
10. seclusion factors

A major problem in considering how much emphasis to place upon any one of the above elements is the stability of the element over the past as compared to what can be seen today. The earliest recognized camps in the Potomac Piedmont were occupied over 10,000 years ago. Since that long ago period radical changes have been wrought upon the environment as we view it today. Not only have the flora and fauna changed, but also whole areas that have been subject to hydraulic alteration. Swamps have come and gone, bluff cuts have deepened and lengthened, drain systems have filled and then become active erosional courses again. The Potomac River itself has passed from a roaring mountain drain to a braided meander in its own ancient bottoms. It is now downcutting even farther into the ancient bottoms under the increased water flows of our modern weather systems.

Application of a particular model element to the evaluation process requires an understanding of the changes that the element has experienced over time. An example would be ground slope considered at the modern river bank. No one would, or could, camp upon the near vertical modern cut of the Potomac banks. At some time in the past, this bank face did not exist and prehistoric people could (and did) camp upon a levee surface that has now been truncated. The temporal sensitivity of some of the model elements due to changing environments allows considerable validity to be assigned to certain element combinations that would indicate camp sites at particular times in the past. An example is the very high probability of finding Woodland period village sites in the river bottoms where rich soils would have supported crops of corn, beans and squash. A counter probability exists for finding Woodland villages located upon the poor soils of the bluff tops and the adjacent uplands. To carry this analogy to an additional set, the areas of rich soil would have been of little interest for the Paleo-Indian who lived along the Potomac soon after the glacial retreat. Not only did he know little of horticulture, but the climate would not have allowed plant cultivation. It is also likely that the rich soils would not have then been formed in the bottoms as we find them today. Thus, the rich soil element of the model has applicability loadings that are functions of neither environment, nor the personal factors mentioned earlier, but simply a matter of the technological ability of the campers to utilize this particular element of the model. The temporal placement of the decision-making culture controls to a great extent many of the element weightings in the model.

The coincidence of the model elements and actual prehistoric Indian settlements were identified, observed, and verified by the writer during four years of field survey and site recordings in Montgomery County, Maryland. This area is directly across the Potomac River from the Lowes Island property. The Potomac Piedmont environment for the Maryland and Virginia zones seemed to be identical. The Maryland element intersects that provide high probabilities of site occurence were presumed to be also valid for the Virginia application in this area.

Predictions of likely site occurence in the Lowes Island survey area were made during the first week of the survey by plotting them on a large scale topological map (one inch equals six hundred feet, five foot contour intervals) provided by the architect of the developer. Areas that were thought to be candidates for site locations (shaded zones) are shown in Figure 18. Figure 6 is the same map as Figure 18 with the addition of the sites located in the survey.

The actual location of sites under the dictates of the model was not as important to the writer as the ability to predict within the model the cultural age of the campers on the sites. This seemed to be the part of the model that needed the most clarification and testing.

The more basic elements of the model used in the initial speculations were restricted to topologically oriented factors. These were: slope of the land, proximity to flowing water, proximity to swamps, alignment or presence on the floodplain high spots (levee tops), and flat bluff areas near water. The highland areas were thought to be similar enough to the Maryland topography to expect similar camp placements. Actual work in the survey area quickly demonstrated the inaccuracies of the map that had been used to predict settlement areas. The USGS 7.5' map of the area was of even less help because of the sensitivity of model elements to minor drain systems not shown on the map. Man-altered aspects of the terrain were not apparent from the maps available. These included such factors as deepened (falsely emphasized) drain definitions in the floodplain, filling of drains to allow road construction in the 1800's, alterations of the bluff cuts for either cultivation or road access to the floodplain, and a possible alteration of the junction of Sugarland Run and the Potomac River. Particular sectors of the river bank also seemed to have been altered to accommodate ford accesses, and required test pitting and soil profile analysis to separate them from natural swales or meander scars that remain in the floodplain. Site placements were later found to be sensitive to the distinctions of this analysis.

The model elements do notaddress the density of sites that may occur in a given location other than to predict a yes-no type of result. There are several reasons for this omission in the model. They are primarily a function of our own lack of finite understanding of the different cultures who chose to settle in a given place. A few items that impact density will be discussed to clarify the complexity of this element.

The current temporal divisions of prehistoric cultures are based roughly upon radio carbon dates from hundreds of sites as derived from cultural debris. These dates range from about 9000BC to 1700AD, a span of 10700 years. Labels have been applied to specific periods in this span: Paleo-Indian for the most early, Archaic for the next periods, and Woodland for the last period through contact with Europeans. Subdivisions of these periods further define segments as early, middle, and late. Major technological change episodes that lead to different labeled eras are named transitional. The Paleo-Indian period seems to have covered a minimum of 2000 years, the Archaic 6000 years, and the Woodland cultures 3200. If there had been equal numbers of campers in any one year, it can be seen that the Archaic would have produced three times the number of Paleo-Indian sites, and about twice as many sites as the Woodland periods. This, of course, presumes all other elements of camping spot choice to have been equal. We know that the elements were not equal, however, and that these inequalities directly impact the densities of sites in a given area.

Population densities during the three major cultural periods defined above varied to a high degree. We feel confident in addressing only the very small populations of the Paleo-Indian cultural sub-units and the much larger populations of the Woodland periods where house remains and fortifications are available with ethnohistoric sources for creating population estimates. The Archaic cultures did not leave sufficient diagnostic remains to allow valid population calculations of any great reliability in the Potomac River Piedmont. It is obvious that population density alone has introduced significant effects in site utilization and frequency in this study area.

Site density in a zone of high choice-element congruence is also affected by locations highly desirable for any culture that may have been in the area. This results in modern perceptions of multi-component sites that contain the markers of thousands of years of rehabitation. The Lowes Island environment has many such locations that were used again and again. The single component (or cultural) camp site seems to be very rare. It goes without saying that a heavily used camp site is very difficult to analyse in terms of incidents of use. In a surface survey, only gross information can be compiled that addresses the more diagnostic cultural period artifacts observed. This is most often restricted to datings based upon projectile point styles.

The locational efficiency of the Maryland predictive settlement model in its Lowes Island survey application has been good. No sites were found that were not predicted in an area focused by the model elements.

Imperfections in the model appear where it has forecast settlements and none were found on the surface. The most notable of these failures is the entire third levee.

This is the east-to-west zone adjacent on the north to Old Sugarland Run. Sites were predicted for this zone because of the proximity to water, higher elevation in the floodplain along the levee maximums, and the nearby swamps. Sites of Early Archaic and Middle Archaic periods were found upon seemingly identical third levee definitions on the Maryland side of the river. Eventually (in the 1979 season), test pits will be excavated in several sectors of the third levee to determine if sites exist, but have been buried by river flood siltation. An empty surface zone, similar to the third levee, was found to have extensive buried site locations on Selden Island. These sites were as much as 1.5 meters below the surface.

A second prediction failure was experienced on McCarty Island, the low zone adjacent on the east to the confluence of Sugarland Run and the Potomac River. Similar floodplain locations adjacent to Seneca Creek, Horsepens Branch, Broadhead Creek, and Goose Creek, contain Middle and Late Woodland sites. The sites are marked with heavy pottery concentrations and quartz flakage. At McCarty Island, one sherd of grit tempered pottery and four flakes of quartz were found together in the root zone of the turf at the eroding Potomac River bank. Not one other flake or artifact has been seen on the surface or in the stream and river banks that define this zone.

A third model failure is that area about three hundred meters to the south of the bluffs in the highlands above Lowes Island. Similar environments on the Maryland highlands contained Archaic camps at almost every vantage point and small stream intersect. In this survey in Virginia, no flake concentrations or tools have been observed in the fields on the low swales and ridges of the highlands. Only one water course cuts the entire area as an all-weather stream. The majority of its course in the highlands is bordered by farm yards and buildings.

The temporal definitions of the sites predicted by the model also had some unexpected results. Based upon the several Late Woodland village sites on the Maryland side of the river, and upon Selden Island, village sites were expected on Lowes Island. The artifacts recovered confound this prediction. Almost no Late Woodland materials were recovered, and when they were, they were scattered widely among materials from much earlier cultures. The first levee was the expected location of the Late Woodland materials. Instead, Early Woodland artifacts were found in small scatters. Late and Transitional Archaic artifacts to the exclusion of Woodland materials were the rule. Early Woodland pottery and projectile points were encountered up to forty centimeters below the surface on the north face of the levee slope. No Late Woodland artifacts were recognized in these stratified tests. No justifications worthy of argument have come to light to explain the difference between the Maryland and Virginia shores of the Potomac River at this part of the Piedmont. One weak observation can be made: the Lowes Island first levee is much more narrow than the Maryland first levee which contains the villages. Perhaps significant portions of the Lowes Island first levee have been eroded away since 1000 AD.

The model was very accurate in its prediction of the cultures that would be found on the second levee: Transitional Archaic, Late Archaic, and a few markers of

Middle and Early Archaic. The model was again accurate in its prediction of Early and Middle Archaic, plus Paleo-Indian on the fourth levee and the fifth terrace. Insufficient diagnostic artifacts have been recovered on the bluffs to test model temporal accuracies there. Heat treated cryptocrystalline flakes from the bluff edge sites imply Paleo-Indian habitation, but certainly not conclusively. More southern bluff locations exhibit the quartzite, rhyolite, and quartz flakage expected on Middle and Late Archaic sites, but insufficient tools are available to verify this.

The less obvious elements within the model are the artifacts that mark a site (this would include features), geomorphology of the survey area, and alterations in the natural environment by man. The temporal placement of a site is dependent upon artifact recovery, identification, and correlation with dated materials of similar morphology. The degree of verification in turn depends upon the diagnostic value of the recognized artifacts, and the degree to which the artifact population has been depleted through natural process or modern activities. An example of limited diagnostic value would be the distal two-thirds of a tan quartzite projectile point. It is very likely that the point is one of the Late Archaic or Transitional period stemmed points, but in the absence of the hafting element, one cannot reliably state that the point represents that group of cultures. Examples of natural effects upon an artifact population are: pottery disintegration, bank erosion (an elimination of artifacts), heavy siltation coverage, sheetwash movements or coverage, and flood damage. Modern alterations of the artifact ensemble include construction activities, farm cultivation, land alterations that fill or excavate certain areas, and the artifact removals by relic collectors.

A final, and very important process in the application of a site location predictive model is the definition by the survey group as to just what will comprise a site. How dense must artifacts be before a site is thought to be present? Must barren ground be identified around a concentration of artifacts before pragmatic bounds of the site can be established? Will some subjective level of artifacts suffice to determine boundaries between closely adjacent concentrations? The small concentration that stands in splendid isolation is never a problem, however its contents are often cause for arguments as to whether or not it should qualify as a site. Parts of Lowes Island's first levee provide good examples of sites that must be identified in terms of higher or lower material densities in what seems to be an almost unbroken strip of flakage and tools for two miles of the river bank. In this survey, isolated single flakes or tool artifacts did not qualify as site locations. In the more dense area, the waxing and waning of material densities sufficed as site boundaries. This was particularly applicable when tool artifact characteristics changed from one area of the levee to another. The mix of flakage between the two different tool sets then became site boundaries if the flakage also changed radically in densities between the two sets. This was the case in three of the larger locations on the first levee.

The use of this predictive settlement model is of value. The elements within the model are valid. Additional elements have not yet been identified that would enhance the efficiency of the model in the Lowes Island survey. The prediction that a given culture will be found on a high probability settlement location cannot be made with the accuracy presumed from the Maryland survey experience. The absence of Late Woodland cultural materials on the Lowes Island first levee is the prime example justifying this negative statement. If the use of the model is more restricted to simply locating settlements and not expected to contribute to an understanding of the people who made the settlement decisions, the above caveat is voided.

The model does not accurately predict the density of sites in a given potential area. The model can, however, strongly suggest the likelihood of multi-component habitation sites. This is achieved by considering those elements that would be common in the decision process of any of the cultures in the past. In short, those elements that address comfort, convenience, and supplies. Such a site would most likely have the following elements dictating its location: close to a major waterway, upland potable water nearby, elevation sufficient to avoid inundation from flooding episodes, ground slope less than 15^{o}, fauna and flora present for food and fuel, lithic resources close at hand.

There are factors of the unknown in many of the model elements; in particular those elements that have changed significantly over time. The applicability of the elements is also a function of ecological and geomorphological stability, or the lack of it. An example would be a camper's lack of concern with a southern slope exposure during periods of the Altithermal climatic optimum (4300-8700 B.P.). A similar and more frequent change in this concern might be simply the difference between a winter or summer camping episode. Geomorphological change would affect streams and banks, flat areas, swamp definitions, and the availability of lithic resources.

Several of the model elements are sensitive to cultural change and pressures. The vantage point preference likely became a minimal factor when hunting shifted from migratory animals to deer, and tree cover masked the view. The vantage point would have reassumed importance when particular groups became hostile and raiding forays became a regular feature of life. Seclusion elements would have been important for small groups in this same period of hostility. At other times, seclusion might have equated to isolation because of cultural traditions (female isolation during menstruation), and the element of seclusion would have been valid, but for a different group of reasons.

The following paragraphs will discuss the cultural periods addressed by the model and the elements that seemed to have entered into site location decisions. Artifact markers are discussed with a view toward tying diagnostic items into the model.

Paleo-Indian settlements

(a) within 100 meters of a bluff edge overlooking the Potomac River, typically within 60 meters of the edge.

(b) upon (or within) colluvial fans at the foot of Potomac River bluffs.

(c) upon ancient levees adjacent to the above fans, at times separated by old swamp formations.

These sites represent small camp locations used by small and transient groups. They may, or may not, be close to small creeks or drain systems that cut the bluffs. The stone artifacts that mark these sites are all that remain of the original cultural debris. All bone, wood, and hide materials have disintegrated over the years. Charcoal from cooking and heating fires may be present below the surface in buried living floors but does not become a factor in surface survey work. The Paleo-Indian seems to have preferred cryptocrystalline stone materials for his lithic tools. In the Potomac Piedmont this is most often reflected in the debris scatter of flint and jasper flakes that were produced during tool manufacture. Several of these tools are very diagnostic of, and unique to, the Paleo-Indian. These are the small, ramped, end scrapers formed on the larger flakes and split pebbles, and the large utilized flakes with partial bifacial chipping that forms scraper and cutting edges. Graver spurs are often worked onto these multi-purpose tools. The most diagnostic tool is the lanceolate projectile point that has been thinned by the removal of large fluting flakes from the face of the implement. These tools are unique not only because of the exotic material that was used, but by extraordinary fine flaking and high quality workmanship. In addition, many of the implements and flakes show the red discolorations caused by heat treatment of the cryptocrystalline materials; a process that often enhances the flaking characteristics of these stones. Flaking debris on these sites is a mixture of high quality quartz, flint, and jasper. Other materials used by later cultures (rhyolite, quartzite, argillite, and siltstone) are normally absent. It should be also noted that fire cracked rock is not as common as upon later period sites.

Early Archaic Indian settlements

(a) close to the river bluff edges and adjacent to water cuts or fault dips in the bluffs.

(b) adjacent to swamp formations in the floodplain, at times some distance from the bluffs.

(c) highland ridge tops that have brooks or creeks (modern or extinct) within 100 meters of the crest.

(d) third or fourth levee tops adjacent to meander intersects or where highland streams erode into the floodplain.

(e) when sites are upon slopes, the slope face tends to the south and southeast.

These sites are much more numerous than the Paleo-Indian settlement locations and utilize a wider topology. The sites themselves are larger with a higher proportion of projectile points in the tool mix.

Recognizable markers of the Early Archaic sites are tool and debitage materials of cryptocrystalline stone, high grade quartz, and quartz crystal. Quartzite and rhyolite are used, but form a small minority of the total. The tools of this period are much like the ones from the Paleo-Indian period with the exception of the projectile points. The lanceolate Clovis-like points are replaced with a series of corner-notched and bifurcated stemmed base items. Flaking and overall workmanship remain at a very high level; perhaps the highest of the prehistoric periods in the Potomac Piedmont. A few new tool forms appear that seem to imply utilization in woodworking. At some point in the Early Archaic period, siltstone, diabase, greenstone, and other less defined sedimentary rocks were introduced as the raw material for chisels, celts, and similar ground bit tools. These, plus flaking from these rocks, are a minority portion among the quartz and cryptocrystalline materials. While not uniquely diagnostic of the period, pecked cobbles and pebbles are found for the first time upon the camping sites. These seem to be either anvil or hammer stones. Some shaped stones (pecking and grinding) are the weights that could be used upon spear thrower sticks to increase the inertial force imparted to a thrown spear. It is thought that this period was the start also of stone drilling. Examples of drilling are to be seen in the spear thrower weights (some models). Concentration of fire cracked rock increase heavily beyond those on Paleo-Indian sites. Camp reutilization episodes can be recognized by the several Early Archaic projectile point styles found on a given site. Site activity specialization is implied through different proportions of tool forms that are found on different locations.

Middle Archaic Indian settlements

(a) levee ridge lines that parallel the Potomac River in the alluvial floodplains; little use of the modern first levee most near the river

(b) third and second order streams away from the river by as much as several miles, most commonly on the intersection terraces that face south and southeast.

(c) almost no utilization of the area within

100 meters of the bluff edges

(d) less swamp-edge utilization than the Early Archaic

(e) far less utilization of vantage points

It was during the Middle Archaic periods that the weather extremes of the Paleo-Indian and Early Archaic stabilized into a warm era and then trended into what we recognize as typical modern weather. The modern definitions of the Potomac River were born and the floodplain assumed much of its current ecological character. The food producing flora of the south moved into the area with a concurrent broadening of exploitation by the Indians. With the new flora came the animals that had been absent in colder periods. Hunting methodologies changed with the demise of the earlier migratory animals and the arrival of the deer and other mast consuming animals. Technologies were altered to meet the new demands. Food resources were more plentiful and provided a wider variety. It is thought that populations increased dramatically during these periods. The numbers and sizes of camp sites certainly increased above those of the earlier cultures, and are to be found in zones unused by the prior inhabitants.

The tool forms found on these settlement sites continue to expand the definitions that began during the Early Archaic. Finer and more varied woodworking tools are visible in longer end scrapers, several forms and sizes of the grooved ax, polished stone chisels, gouges, and multipurpose knives. Projectile point hafting technology began a rapid diversification from the more early corner-notched forms. The side-notched variety became a regular item in the tool kits. There were reversions to some of the early lanceolate forms, but without the fluted thinning. Early manifestations of the stemmed varieties with contracting and rounded bases were used by different cultural groups. Preference for the cryptocrystalline materials became an occasional thing as the full range of available stone materials that could be flaked or ground were sought and used. Flakage of quartzite, rhyolite, various sedimentary rocks, and a growing majority use of quartz, mark these tool-makers. Non-diagnostic tools continued to be part of the remains left upon sites of the Middle Archaic. Many of these items coming into wide usage continued in use through the Woodland periods: hammerstones, winged drill forms, abraders, various forms of the spear thrower weight,drilled, notched, and engraved decorative gorgets, and food grinding mortars and pestles.

<u>Late Archaic and Transitional Archaic settlements</u>

(a) first levee of the Potomac River

(b) highland sites coinciding with Middle Archaic at stream intersections

(c) adjacent on flat stream banks of highland creeks and brooks

(d) low bluffs at swamp or floodplain stream confluences

(e) second and third levees as small, single episode camps

(f) highland finger bluffs that have flat tops and are adjacent to brooks and creeks.

The large scatter of sites that seem to date from these periods indicate that a population expansion had continued the earlier trends. The cultures had as yet to settle into the true village concentrations that were to come during Woodland epochs. Agriculture and several technological triumphs that came to pass in the Woodland periods set those cultures apart from these that were still primarily living in a hunter-gatherer mode.

Large tool production sites are located near quarry sources. Most often the raw material sought is in the form of cobbles and the site will be located within 100 meters of a stream containing large numbers of quartz and quartzite materials in its beds or banks. The density of flakes, spalls, cores, and chips on these large sites is often greater than one hundred per square meter. Broken tools and preforms, that failed during manufacture, made from quartzite are most common. Rhyolite flakes are a distant minority.

Projectile points became quite large during these periods, and a preference for the stemmed hafting technique became obvious in both large and small forms of the points. Some side-notched forms are to be recognized from the early portions of the period, but were soon replaced by the stemmed varieties. The stems were of the contracting variety, or square. Now and again slightly expanding stems are found that resemble corner-removed styles from earlier periods, but do not have the smoothed hafting elements found on the early examples.

New forms of gouges and knives appear at some point near the end of the Late Archaic and at the start of the Transitional periods. These tools were used to fashion a new device: the steatite stone bowl. Woodworking tools continued as part of the tool kit in the form of polished axes, bits with polished and well aligned cutting edges, and celts of presumed woodworking utility. Winged drill forms continued in use (a controversial tool as to usage today), spear thrower weights assumed finer form and finish, and exotic stone materials appear in the Potomac Piedmont fashioned into these items. Gorgets of various sizes, shapes, and decoration continue in use. Camp sites are heavily covered with fire cracked rock at some locations. The density of this material on the surface of cultivated fields often reaches ten or twelve fragments per square meter in the central portions of the sites. Test pits upon these sites have exposed features that seem to have been storage pits cut deeply into the ground. Post molds have also been encountered. The weather, fauna, flora and the topography were then much as we observe them today with the understanding that modern man has removed much of the tree cover that was a common feature of the Potomac Valley. With seeds and nuts plentiful, mortars and pestles continue in use, made from almost any large stone materials that can be found in the area from sandstone to granite.

<u>Woodland Indian settlement sites</u>

(a) first levee locations within 100 meters of the river bank

(b) fans and levee cuts where creeks enter the Potomac River

(c) second and third levee locations that were used by prior cultures, normally very small Woodland concentrations

(d) adjacent to second and third order stream intersects in the highlands within two miles of the river

(e) adjacent to large streams and the Potomac where there are deep alluvial soils

Three technical advances in the Woodland periods radically changed the nature of site debris and the locations of sites: introduction of agriculture, adaptation of pottery, the introduction of the bow and arrow. Hunting and gathering remained a major activity in the lives of the Woodland Indians, but the cultivation of corn, squash, and beans changed the life styles from roaming bands to quasi-settled groups that stayed near their fields. The sites became huge and complex because of the many years spent at one location. Village sites are marked by very dense quartz chippage and pottery sherds. The projectile points are most often triangular in form and vary widely in size and workmanship. Quartz and rhyolite were the preferred materials for these points with some made from flints or quartzite.

Small camp sites are to be recognized through the presence of pottery sherds and other processing tools like scrapers, humped triangular knives, ground stone celts, bits, hoes and axes. These as well as other cultural debris like pipes, shell beads, gorgets, curio fossils, bone punches and chisels, and human bone and teeth are found on the larger village sites. Hammerstones, abraders, mortars, pestles, anvil stones, and tabular hunks of schist and shale are also found.

CHAPTER IV

PROBABILITY SAMPLING SURVEY TECHNIQUES APPLIED TO THE LOWES ISLAND CENSUS SURVEY

Sampling in archeological research is performed every time an artifact is recovered from the surface of the ground or from an excavation. The researcher often does not think of such recoveries as sampling, but that is what has happened. Archeological field research attempts to recover materials from past cultures. The materials available for recovery are those that have been discarded or placed in the zone of research and have not deteriorated beyond recovery. The researcher seldom knows just exactly where the materials he seeks may lie. Often, he is working with only a general idea or focus of where to look, and never knows exactly what has survived for his potential recovery and perusal. What is to be found there is a function of the fortuituous preservation of part of past cultural remains at that location. It almost goes without saying that other constraints on data recovery are the state of the art being applied to the recovery process, and the recognition of all information that may pertain to the culture under study. Using every known process and analytical tool available to him, the archeologist still must lose much of the data that is in the matrix of the site. In short, he attempts to recover as much as he can within the constraints of his talents, technology, and research goals. He is personally biased by his research interests, and to an unmeasured degree by the skills and dedication of his crew, as well as the funding and time that are available for this particular effort. What he does recover is but a sample of all that is really available at the site. As just described, the archeologist has performed a non-scientific sample; one that cannot be measured in terms of how representative the recovered materials might be (validity), nor can he depend upon the same results if the recovery process were to be repeated (reliability). Validity and reliability, and the ability to measure them in relation to a presumed population or total universe of data are the heart and soul of scientific sampling. Most often this type of sampling is called probability sampling. When conducted under very carefully defined constraints and procedures, the researcher can speak with knowledge and understanding about the validity and reliability of his work. Most importantly, he can try to deal with those parts of the information that have not been recovered through probability sampling analysis.

The above remarks refer to a particular site and what may be recovered and imputed from it under scientific sampling processes. We are not here concerned with particular site analysis, but an entire area within which there may be surface indications of past settlement episodes. The assemblage that we study is that grouping of settlement sites that are to be found within the Potomac River Piedmont. This is but one part of the entire universe of settlement sites that are located in North America (located, but not identified). Within the Potomac Piedmont this study addresses an area defined as the Lowes Island sub-population. Lowes Island is itself capable of being further broken down into several sub-sub-populations based upon such criteria as levee position and non-floodplain environments (highlands, bluffs, etc.). As a matter of convention in this study, these smaller breakdowns of geographical placement will be called sub-populations within the population of sites that lie on the Virginia shores of the Potomac Piedmont. The samples of this sub-population attempt to determine those portions of the surface that bear evidence of prior habitation without looking at every inch of the surface as must be done in conducting a census. The sample process must be performed in such a way that both validity and reliability can be calculated for the proportion represented by the sample, and that the sample findings can be expanded to the entire geographical population of site placements (even though all sites have not been identified in the sample). Several recent archeological applications of sampling in surface survey work will be discussed, and then some sampling designs will be presented for the Lowes Island area. The results of these samples and their implications will then be compared with the actual census of the surface that is now a matter of record and a test of efficiency in sample design will be (accuracy of prediction) discussed. Suggestions will be made for improving upon the probability sampling process. Several pragmatic limitations will be reviewed that will suggest limitations on sampling applications in field survey work. The introduction of the predictive model into these analyses will be an attempt to provide a survey strategy for this area of the Potomac River settlement mileu that will be more accurate and more economical than either the model or a sampling design alone.

Binford (1964) was perhaps the earliest of the present day archeologists to plea (demand) that archeology must focus upon the reality of processual change in the larger aspects of chronological placement and artifact identities in order to further the study of anthropology. Sampling within a region and upon a site were two of the field methods that he advocated. He later elaborated (1972:139), "Sampling, as used here, does not mean the mere substitution of a partial coverage for a total coverage. It is the science of controlling and measuring the reliability of information through the theory of probability." Had Binford not taken this stand, and at the same time attacked the traditional methods of survey and site archeology, surely some other archeologist of the broadly educated new school of the science would have. Within a few years of the above publication, sampling was being applied to survey activities all around the world, and in particular, in North America. In the last five years, sampling processes of one kind or the other have been attempted, the results published, and critiqued by those who understand the statistical theories and applications of different designs for different problems. Judge (1973) used sampling to check a field survey based upon a model of Paleo-Indian settlements in the central Rio Grande area of New Mexico. The model used recurring geomorphological features common to the observed settlements as the investigation criteria for 3,000 square miles. His sampling addressed the verification of the accuracies of the presumed model by taking sectors defined under probabilistic random sampling theories and investigating them apart from the model constructs. His results for both the model verification and the proportionate expansion of the sample results to the survey area verified the model and gave huge credence to the sampling process that he had designed. Judge included another demonstration in his study publication that is most unusual: a clear and concise statement of the purpose, objectives, and methodology of his study, "... provide a framework of hypotheses relevent to explanation of cultural processes which will guide more intensive research in the future (Judge 1973:23)."

Ten years after Binford's polemic, Mueller published (1974) a computer replication of a survey done on the Paria Plateau in northwestern Arizona. The replication and analysis involved the generation of 326 surveys of the same area that applied all of the practical sampling strategies that were applicable to this sort of study. Every mode and technique available to the statistically oriented archeologist was applied and measured against the census survey of the Plateau. He even used the data to reconstruct the economics of survey so that a dollar comparison for each could be used in evaluating the loss of data versus the economical gains between one method and another. Mueller's analysis and discussion were so exhaustive that critiques and comments are still being published five years later (Thomas 1978; Plog 1978). These, and other publications, have served to bring good and bad sampling applications in archeological research into the forum of peer analysis and comment. The science cannot help but be the more healthy for the discussion and the revisions to theory and application that are the result. Mueller edited (1975) a publication of the papers presented to the 1973 annual meeting of the Society for American Archaeology, in San Francisco, in a symposium titled, "Sampling in Archaeology." The mood of the authors seems ebullient, yet guarded. They address the problems, they suggest and illustrate field applications, and each seems comfortable with the position taken. Binford (1975:253), in an overview of the papers and making specific comments, places his hand upon the heart of the whole concept of sampling in archeology, "Sampling is concerned with getting as clear a picture as possible, within the limits of stated budget, labor investments, and research goals of the archaeological record as it exists." All of the papers address the same goal and the advantage of properly designed and applied statistical probability sampling: to obtain the optimum amount of information with a minimum of bias. Bias can be more easily recognized and accommodated in a statistical probability sample than under almost any other analytical process. Bias is not a destructive aspect in a survey process if it is understood that its effect upon the data can be measured or at least held within parametric bounds. Leedecker (1978) knowingly created bias in his survey of the Taylorsville Lake area. He labeled the bias skewness, and justified and measured the effect upon the supposed population of the habitation sites within the project area. In his case, the bias was introduced because of time and dollar constraints beyond the control of the researchers. His bias was the elimination of significant portions of the survey as not being appropriate for settlement, and therefore not part of his survey tactics. His modification of the full area sampling process was to define his sample units in terms of transects one meter wide and of variable length that were drawn upon a map marked with the most likely settlement areas as derived from studies of prior field activities in the zone (Leedecker 1978:28-35). This geomorphic association of the preferred settlement sites in the survey zone is similar to the application of the Maryland Model in the Lowes Island study conducted by the writer and his associates in 1977 and 1978.

A caveat that appears again and again in the literature concerning probabilistic sampling in a regional survey is the need to know something about the area and the settlements that are likely to be found within it before the sampling design is formalized. Clarke (1968: 549) addresses this point when he states:

> Archaeological samples differ amongst themselves and indeed should be made to differ for the different purposes of each experiment upon the data - since the archaeologist's conceptual model of his data defines the population of interest, the variables to be measured, and the kinds of variability that need to be considered. This conceptual model is ideally converted into a symbolic mathematical accommodating the variables and structure of the mind model. Then, and only then can a sampling plan be devised to seek out from the infinite range of kinds of samples the best category to test that particular model and situation.

In the case of the Lowes Island survey (and the prior work in Maryland), one of the elements of the "mind model" is that the areas surveyed will be representative of the rest of the Potomac Piedmont settlement patterns. The design of suitable sampling survey tactics is planned to minimize subsequent survey work in the large region of this river drainage, and at the same time identify close to the same number of sites that very expensive census survey would locate.

Presuming, for the moment, that Lowes Island is reasonably representative of the Piedmont Province of the Potomac River, data from the current census impacts the sampling design that might be applied to it. In particular, the census guides our thoughts in regard to site densities (percentage of the surface area that has experienced camping and where cultural remains are now at or near the surface), and geomorphological differences that would encourage the economics discussed by Mueller (1974:66) of sampling within hetrogenous zones to lessen variability and thus, enhance the efficiency of design. Site locations both in Maryland and Lowes Island have been observed to occupy the levee tops, terraces, and bluff tops. The above settlement clusters form bands of occupation when viewed on a map of the area. The plan would be to apply sampling strategies to these different bands as though they were sub-populations within the larger population. Temporal aspects of the choices that caused settlement in these bands under differential past decision processes will be later self-defining after artifact analysis, and are not part of the sample design. The value of particular sites, implied by depth, age, contents, etc., will not be addressed by the sampling designs that follow these introductory paragraphs. After all, the goal of the survey at this level has been to simply locate habitation debris so that later, more intensive, research can be applied prior to placing them in a system of priorities for the preservation and management of cultural resources. All of the implied value judgments and preferences for particular locations based upon cultural age are part of the model of settlement and will be addressed later in this chapter.

The Maryland survey and the Lowes Island census have show that sites are not evenly distributed in any of the several geomorphic zones that define the survey areas. The sites themselves vary widely in size and major axis orientations with the primary east-to-west measuring scheme that has been used in the census. On the highlands and in the Maryland survey work, site boundaries are approximations based upon estimates of artifact dispersal or the lack of artifacts in forest floor test pits. The levees of Lowes Island and the sites they contain have all been carefully measured into the matrix grid system. As might be surmised, this mixture of measures poses a problem in the replication of the survey through probability sampling that depends upon specific and accurate gridding of the population surface that will be sampled. A subtle secondary problem has come to light in the use of the east-to-west axis of basic site reference as used in the floodplains: site configurations have not obliged the surveyors by maintaining a magnetic alignment with the survey base line. A demonstration of this problem is provided in Fig. 19, where two adjacent sites of equal size project different density profiles upon the base reference line because one site is circular, the other is elliptical and not aligned with the base line. In the case of the circular site, the artifacts project to the base line a typical site configuration of thin materials, then a dense area, and then a thin area again on the western edge. The adjacent site seems much wider and the artifacts are evenly spread along the base reference line.

When considering the base line projections of artifacts, these two sites will not seem similar in density, nor in configuration. The phenomenon is to be guarded against in any linear density measure that involves only one dimension.

As mentioned earlier, the census has provided a mass of information that relates to site position, density, and site size. Table 5 summarizes much of this data which emphasizes the unexpected lack of locations adjacent to Old Sugarland Run on its north bank (third levee). The fifth levee figures are incomplete because only the fields in cultivation were measured or surveyed. This levee continues some distance east and west of the cultivated fields in wooded and swampy areas. The remaining levee areas fully complete in the survey data that is the census.

The probability samples that have been drawn from the population of sites summarized in Table 5 are only addressed to the western portions of the first and second levees. The writer feels that twenty-two samples drawn from these two zones (35% of the total levee surface) serve to demonstrate the effects of sample fraction and sample unit size upon the efficiencies of site location using simple random and systematic random sampling. In the random sampling, each element withdrawn from the population was done under random selection (Rand Corporation 1955). In the systematic random sampling process a random number was chosen as the starting point for the subsequent intervals of sampling.

The sampling technique used here has been to address each levee top as a sub-population. A sub-population for sampling purposes is composed of the east-to-west metric measurement of the levee. This composes the frame from which the sample will be drawn. A sample element is defined by its metric serial number. The census used the same serial number system and site definitions are couched in this numbering scheme. The first levee west is 1800 meters long and the second levee west is 1410 meters in length. The two sample elements used will be north-to-south transects of thirty meters width, and then ten meters in width. The north end of a transect meets the Potomac River bank on the first levee and a levee-defining drain on the second levee. The south terminus of the transects will be the southern levee-defining drain on both levees. The transects are not of the same length because of drain deviations from an east-to-west line. Fig. 20 presents a stylized diagram of the sample frames and elements as defined above.

The sampling fraction is that proportion of the frame that will be chosen by random selection. Several sampling fractions will be used to measure the efficiencies of each in the sampling process.

A sampling unit of transects has been chosen because of the non-random placement of sites on the surface of the floodplain. A pure random sample of metric squares would be inefficient because it would address those areas that are known not to contain habitation sites (drains, low areas). A pragmatic argument against pure randomly chosen squares of the surface is the difficulty and time required to locate the sample elements in the field. Such a design would be absolutely impractical after the crops in the same fields reached a height of over five feet. Transects can be easily measured and located in the field as well as upon large scale maps (1:72,000). Beyond the pragmatics of field application, several prior applications and tests of transects versus square quadrats have shown the superiority of transects in population identification (Judge, Elbert, and Hitchcock 1975; Plog 1972; Matson and Lipe 1975). In another application, Mueller (1974:30) cites Plog's determination that sampling precision increases as the size of the sampling unit decreases. The differences between the thirty and the ten meter sample unit efficiencies at the same sampling fraction will address this at Lowes Island.

It is well at this point to take a few words and review just what is being done in this sample process, and why. The writer has had great difficulties in keeping some of these items in mind as he has considered artifacts, depths of materials in the soil, multi-component site characteristics, clusters of similar artifacts, and the settlement debris found in the face of the river bank which did not coincide with any of the visible material clusters on the surface of the adjacent levee top. None of these concerns can be allowed to enter into the design of a probability sampling scheme that is couched in terms of samples of the surface of the ground. The sample will pick certain portions of the surface as representing the rest of the surface in the frame of a given levee. What is then done with the sampled element is another item. The farmer at Lowes Island could use the same sample to measure the yield of his crops on a levee, or perhaps to determine the phosphate content of the plow zone. For what ever use is made of the sample, the design simply states that the surface that has been chosen will be representative of the rest of the sample frame. For purposes of the survey, the sample elements will simply answer a yes or no question: are there cultural remains on the surface that can be recognized?

The several questions that will address the efficiencies of such samples versus the census are quite another set of considerations. Here we must consider the degree of success and the length of time involved for a field crew to accommodate the demands of the sample versus the returns provided by a census. A basic and most tempting contaminant in surface survey work efficiency is to attempt to serve the science of anthropology by recovering more information than the survey sample has been designed to provide. In the census, far more was done than simply mark the sites that were encountered. A much larger corpus of data was recorded and recovered than would be normal in a survey project. These activities increased the time expended in the survey by over 5,000 man hours. In the final measure of survey work, a definition must be part of the survey plan that cleanly sets the limits of investigation. Time and manpower in our economy do not allow wide ranging analysis of every potential site location to recover all of the data that may be present, including that which is below the surface. If this sounds like a mortal compromise, it is. Survey work must be specific in the goals and parametric limits of the effort. This is particularly so in the case of funded work or that done under contract.

A few more comments are in order. The densities of sites on the western first and second levees were absolutely unexpected. The design of a sample that can find sites on a surface that shows material on fifty percent of the surface is no great achievement. By using transects placed at random intervals a means of comparing the several sampling fractions can be demonstrated. Consider a case where .5 hours are required to examine a given transect: how many unsuccessful versus successful transects will the manpower and time constraints allow? For the square meters of coverage required under the higher fractions samples (40-50%), other survey designs of equal precision become very attractive. An example would be a single thirty-meter wide transect running the full east-to-west length of the levee on its crest. An example of this concern can be demonstrated with the data from Table 6: under the thirty-simple random sample, at the 40% fraction, twelve sites were located by examination of 360 meters of linear levee. If the average transect is 80 meters long, 28,000 square meters must be examined. A single twenty meter transect on the crest of the levee running east and west would require 36,000 square meters of effort. The levee top transect, while 12.5% larger than the above example in the area covered, will encounter all of the sites except the two smaller sites that are on the face of the south portion of the levee. The same result could be achieved with a long transect only ten meters wide, fully 16% less than the sample.

A major problem with the sampling process demonstrated here is that it will not define the east-to-west bounds of the sites. On the first levee, site size in this dimension varies from 30 to 150 meters. The larger fraction samples have, of course, drawn several elements from the larger sites, but they have not indicated that these are all from one site. We can only tell this from the census. The levee top transect would define the boundaries of the sites.

The demonstration of the random sample applications to the Lowes Island survey should not be expanded to represent the rest of the Potomac Piedmont until additional research has shown that the site configurations at Lowes Island do, indeed, represent the many miles of varying terrain as far west as Harpers Ferry.

The Maryland survey is of little help here because of the unfortunate impact upon the first levee of the C & O Canal and its construction debris.

Sampling efficiency has been measured against the following two criteria:

1. linear meters of site surface identified when expanded proportionately to the full levee
2. actual recorded sites that the sample transects have encountered

In the instance of the first levee, the expanded samples are compared with the 910 meters identified by the census, on the second levee, its 870 meters of artifact bearing surface. Tables 6 and 7 summarize these measures. Each Table is labeled in terms of the levee, sample scheme, sample fraction, and the working elements that define the above measures of efficiency. It is well to note that comparisons between the first and second levee sites can be misleading because of the vast difference between the north-to-south dimensions of the second levee sites versus those on the first levee. On the second levee, few of the sites are wider than about forty-five meters. In effect, the levee top is more narrow at any given elevation than the residual first levee in the area of this sample demonstration. This caveat warns that a 150 meter wide site on the first levee is far larger than one equally wide on the second levee. Comparisons should be restricted to the different sample fractions, sample units, and simple random sampling versus systematic random sampling for a given levee. The first and second levee are considered to be different sub-populations with the population of the Lowes Island floodplain.

The systematic random samples were only tested for the 10 and 20 percent fractions because larger fractions would result in sampling intervals that were smaller than the smallest site. This would lead to bias simply due to the size of the spacing between the sample units. After a random number start, all subsequent sites would be covered by one or more of the transects.

The number of known sites that the various sampling methods have located is a measure that can only be made with full knowledge of the area. This would require additional field work beyond sampling to determine the site bounds. As might be expected, the higher sampling fractions contained more of the sample elements that encounter sites. This is only another way of saying that the more chances one has of hitting a hidden target, the more often will the target be hit. Note the quick (as compared with simple random sampling) success of the systematic random sampling. On both levees all of the sites had been targeted by the time the 20 percent sample had been run.

The measure, 'transects', shows the total linear meters within sites identified by the sample. This linear measure is then expanded proportionately to represent that part of the total levee that can be expected to contain surface materials. This expansion is labeled, Expan. to Pop., in the Tables. This measure is then compared as a percentage with the full census definition of site coverage, and is labeled,% of Pop. in the Tables. A significant number of the survey elements on the second levee fell into the large empty zone on the eastern third of the levee. The chance of finding such areas like those on the second levee east, or the empty third levee are unknown in the rest of the Potomac Piedmont. Again, the levee top transect would be the more economical method of surveying than the several sample designs here demonstrated.

An overview and summary of the sampling designs used in this study leads this writer to the following conclusions:

1. These sample designs are reasonably accurate (in the higher sampling fractions) as predictors of how much of the survey zone will contain cultural remains on the surface. This has an important presumption that must be emphasized at this point. The survey zone must be in a cultivated state so that the surface of the ground may be seen. If the entire area had been in grass covered meadow, or a forest environment, the designs would not have been applicable. In such cases where the surface cannot be seen, test pits or trenches would have to be cut. Sampling, of course, can be used to determine the location of such test pitting but designs are far more subject to the pragmatics of time and manpower.

2. The ten meter sample element at the thirty to forty percent fraction provides more accurate data concerning the percent of the survey zone containing settlement debris on the surface.

3. The systematic random samples at the twenty percent fraction with ten meter (or smaller) sample units are the most efficient in placing habitation sites on the record for subsequent more intense investigation.

4. The application of sampling to the sub-populations aligned on levee tops is preferable to square quadrat area sampling of the entire floodplain because of the elimination of those areas that are known not to contain habitation locations and the cost of locating the squares to be sampled.

5. A sampling plan that utilizes transects aligned with the observed linearity of site placements is preferable to those perpendicular to the line of settlement. This scheme would define the boundaries of the sites along the settlement line where the test conducted above do not.

6. A close application of the model in conjunction with a transect plan of sampling would be the optimum method of surveying those areas where the surface is not visible.

CHAPTER V

SUMMARY STATEMENTS AND DISCUSSION

The Lowes Island survey began at the request of a developer who offered to preserve Indian sites that might be found in his construction areas. Local tradition held that the Piscataway tribe had used Lowes Island in its trek from the early Colonial settlements near St. Marys, Maryland, to its eventual melding with the Seneca tribes of New York in 1697 (Stephenson, Ferguson, 1963:23). The developer wished to accommodate local concerns that any remains of the Piscataways should be preserved. He contacted The American University and requested assistance in identifying any such remains that might be on his property. The writer, a graduate student in anthropology at the university, was recommended for the task. Four years of surface survey work in Montgomery County, Maryland, adjacent on the north side of the Potomac River to the Lowes Island property qualified the writer for the survey project. Construction on the survey lands was scheduled to begin in October, 1977. Seven months would be available for the Lowes Island survey.

Seven hundred acres of the project area are located in the floodplains of the Potomac River. One thousand acres are in the adjacent highland swales and bluffs to the south of the river bottoms. Trees cover close to 400 acres of the uplands. The rest of the property is under corn cultivation. The river floodplains are comprised of a system of levees and drains that are residual markers of a very different Potomac River system that existed ten thousand years ago. The uplands are heavily eroded fields and drains that have been harvested for almost 200 years.

The methodology used for the survey has been patterned after the multistage fieldwork design of Redman (1973). This, briefly, is a process of specific activities altered by information feedback from later stages of the process. In this manner, each stage continues to benefit from the growing corpus of data extracted from subsequent activities. The mechanics of the survey involved a complete census of the surface of the area as conducted by pedestrian coverage. Test pits were cut into levees, banks, and forest floors to elaborate upon the complex settlement remains that were found on the surface of the property. All tool artifacts and particular lithic debris materials were measured into a matrix system that covers the entire survey zone. Accuracy in the field was maintained to one-tenth of a meter in the matrix definition.

A predictive settlement model that had been developed on the opposite Maryland shores of the Potomac River and the adjacent highlands to the north was tested against the Lowes Island environment before and after the census. Various elements of the model have been elaborated upon in regard to their impact upon the accuracy of its predictive powers. The purification of the Maryland model has been attempted in order to make this tool a more valuable instrument in future Potomac Piedmont survey activities. The model has proven validity not only in its locational placement abilities, but in the designation of the cultural age of located settlements as well.

The census data also provided an opportunity to test the reliability of probability sampling techniques. Twenty-two samples were drawn against the matrix definition of the first and second levees west of the zero reference mark in the survey matrix. The samples differed by proportionate examination of the levees, the sampling unit used, and by the type of probability sampling scheme. Each was evaluated as to efficiency and accuracy in matching the results of the census for the same area. A basic sampling design was found that is the most preferable. It incorporates both the model directives and the proportionate control of a modified sampling design. The pragmatics beyond simple sample design were discussed and evaluated. These address such field problems as the time required to survey an area to locate particular sample choices and the time needed for a field crew to conduct one type of survey versus another.

Archival research was conducted by the writer in the topical areas of the prehistory of the Potomac Piedmont, survey methods, model structures, probability sampling applications in archeology, and various researches on paleo weather systems in the Middle Atlantic, pollen analyses, and recorded site reports in Virginia and Maryland that seemed to apply to the cultural materials at Lowes Island. Mrs. John Bazuin and Mr. John Lewis conducted intensive searches in the records of the county and state land and tax records to elaborate upon the historical aspects of Lowes Island and its use. The collections of twelve past collectors of Lowes Island materials were examined and photographed. Interviews were conducted with not only modern collectors but those who had worked upon the island as avocationalists in the 1930's as well. No known sources of information were ignored.

The findings of the survey, while predicted in kind, were far greater than had been anticipated. Sixty-one sites have been recorded as a result of these activities. It is likely that as many as a dozen more sites will be identified and recorded in continuing survey activities in 1979. Cultural materials, from the scrapers and a fluted point fragment of the Paleo-Indians to an early colonial settlement of 1790, have been identified. Based upon the artifact look-alikes, the Lowes Island environment hosted cultures that had more of the southern focus defined by Coe (1964), Broyles (1971), and Chapman (1975) than those of the north defined by Ritchie (1969), Witthoft (1953), and Kinsey (1972).

Methodology became one of the strong points of the survey. After a false start using bearings and obvious landmarks, the survey settled down to a systematic measuring process using a master grid system that was maintained during the two years of effort. The thirty meter search transects aligned to the north and south against the major survey east-west axis provided a controllable amount of surface for search and subsequent measurement activities. It also divided the field log references into reasonable sectors for later editing and verification of artifacts in the laboratory environment. Field stake markers at thirty meter intervals could be seen from all sectors of search until the corn crop grew to over five feet. The cheap compass that had been embedded in a meter-long board for the primary survey instrument proved sufficient for the survey needs. Tape markers, bamboo poles, and a six-foot step ladder allowed continuing survey activities in the mature corn crop. Artifact bagging by either single artifact or by thirty meter sector with appropriate in-bag labels provided good control of the 2000 artifacts that were recovered. Plastic bags with pressure lock openings allowed perusal of the artifacts and the labels without having to open and remove the materials being considered.

The disciplined approach of Redman's multistage field survey techniques are quite an advance over the types of survey traditionally conducted by avocationalists in the Potomac area. Controlled surface survey, while time consuming, is the only method that will provide the information needed to set priorities and hierarchies of conservation or salvage effort. Early reconnaissance is is crucial to the appropriate design and execution of a controlled survey process. Any digging or testing that must take place should be done only after the surface survey has narrowed down the areas of concern and has provided data for intelligent planning of the labor-intensive digging activities. These dictates were followed to good advantage in the Lowes Island survey. Excavations were only conducted to seek answers to questions raised during the controlled survey: is there variation in the depths of covering silts on the first levee that would explain the banding of artifacts parallel to the levee top; how deep in the levee will artifacts be found; despite the mix of different cultural materials in the surface of the levee, is there stratigraphy still remaining in other parts of the levee; is a given bank depression modern or is it a natural old meander scar; and if it is a scar, will materials be found along its perimeters that run contrary to the levee?

The Maryland predictive settlement model was not a controlling factor in the actual census activities of the survey. It was, however, a constant companion of the crew as they moved from one area to another and looked to the model for a forecast of what could be expected in the new area. They were disappointed only on the third levee, the eastern second levee, and upon Mc Carty Island where the model had predicted sites. The accuracy of the model in all the other areas of the survey created such confidence that the crew is determined to sink test pits on those empty areas to see if the sites are below the surface as they were found to be on Selden Island. 1979 will see this testing activity take place early in the season. Quasi-failures of the model in its prediction in the highland areas are complicated by modern farm buildings and the heavy erosion that has taken place there since the area came under cultivation in the early 1700's. The model was found to be sufficiently accurate (or reliable) to justify its continued use in new Potomac Piedmont survey activities. The major value of the model is the economical elimination of significant areas of the topography from consideration in unfamiliar areas of survey. This is of particular value when all of an area is under fallow cover or forest where test pits must be cut to locate settlement remains.

The findings of the survey were more than the workers, sponsors, or interested on-lookers had anticipated. The Piscataway camping grounds were not recognized among the many camping remains found in the survey area. There are areas of the highlands south of the survey zone that overlook Sugarland Run that could contain camping locations, perhaps those of the transient Piscataway. No tribal identities have been considered or assigned to the remains that have been located on Lowes Island. If grit and steatite tempered pottery sherds are accurate indicators of particular Early

Woodland period cultures, it is doubtful if tribes (in the modern use of the term) had even come into being when that pottery was made (ca. 500 B.C.).

The floodplain sites that were found seem to be centered in the middle two-thirds of the island. The two exceptions were found because of river erosion and because someone had dug a large hole that penetrated a sub-surface site. The first and second levee tops are the areas that have yielded the most data because of the heavy density of materials exposed upon the surface. The fourth and fifth levees are actually a different environment than the levees mentioned above. The fifth is at the foot of the bluffs, and the fourth levee sites are close by, but bordering swampy land and the Old Sugarland Run. The highland locations on the bluffs are a third environment, different in turn from the first two. Sites that have been found in the face of the modern river bank and in nearby pits relate early preferences for the first levee locations. It is very likely that levee top plow activity has cut into a shallow silt covering of the same cultural floors that are to be seen more deeply exposed in the bank. The natural slope of the levee and lighter siltation at its crest would explain this.

Most of the sites seem to be locations used by many groups over very long periods. On the fifth levee (Henry site) bifurcated projectile points were found on the same surfaces with flint arrow points and crushed quartz tempered pottery; an implied span of occupation from the Early Archaic to Middle Woodland times. All first levee sites contain artifacts from many different cultural periods. Because of the use and reuse of these locations it is very difficult at this stage of analysis to attempt the social interpretation and justification espoused by Trigger (1978). An understanding of just why various groups used these levees and their camping needs can only be implied through presuming that the river and swamp environments provided them food resources. As obvious as such an assumption might be, it is not without jeopardy when one also considers the absence of Late Woodland villages that should have been on the same levees to optimize the use of the fertile bottoms for agricultural activities. The Maryland shores and levees contain several such village sites. Lowes Island contains none.

The tool artifacts that have been recovered cover almost all of the known lithic tools that have been found on other sites in the Middle Atlantic area. Recovery through controlled surface survey has placed each item in the matrix of the entire area, and in particular, within given site bounds. Plots of these items have yet to convey sufficient patterning to allow conclusions as to intra-site activity areas or even the recurrence of a given tool-type in relation to other tool types or debris. This writer feels that the tools have been depleted by past collector activities to the point that what remains will be heavily biased toward the more amorphous forms that are not as attractive for the average collector. An example is the recollection of Gates Slatter (1977, personal communication) that on one day in 1934, over twelve fully grooved axes were found on the surface after a Potomac flood had scoured the levees. The axes came from a single acre-sized plot on the first levee in the western third of the island.

Figures 13 through 17 illustrate the diagnostic projectile points that have been recovered. Several of these types are new to the Potomac Piedmont record. The writer, after viewing several thousand projectile points from the area over the past six years has never before seen anything like some of the examples. These forms are not illustrated in the various publications on materials found north and south of the area. What do they represent, who made them when, what were they used for, etc. remain questions that additional work in this area and others may be able to answer. Certainly excavations of stratified sites will add to the knowledge needed to answer questions relating to these one-of-a-kind artifacts. As perplexing as the odd items might be, the more common items are equally perplexing. What of the stone items with the holes carefully drilled through them? What is the significance of the several types of grooved ax that have been found? Where do the flaked forms of axes fit into the cultural mileu that is implied by the changed tool forms. What processual changes can be read into the radical changes in hafting elements of the many types of projectile points that are identified among the survey recoveries? What cultural exchange is implied by the greenston monitor pipe that Hugh Stabler recovered from the banks of the eastern end of the island in 1934? Why is there such a continuity of the expanded stem white quartz point that is implied by its majority presence? Was this a long episode of a given cultural set, or just heavy utility of the area for a short period by one cultural group? As a short and realistic summary statement, the artifact record from Lowes Island has provided more data than the survey had questions. The survey has basically been completed and the justification for the effort has been rewarded by recognition that the entire first levee is eligible for inclusion in the National Register of Historic Places. The data from the artifacts, their provenience, and scatter in the survey area are available for additional studies.

The Maryland predictive settlement model that was used as a guide in the Lowes Island survey had quite a successful life during four years of testing in Montgomery County, Maryland. The sites that were recorded under the dictates of the elements of the model are on file with the Maryland State Archeologist at Johns Hopkins University, Baltimore (Mc Daniel 1973, 1974, 1975, 1976). The model, while not cited, is apparant in the recent reports addressing the cultural resources of Seneca State Park (Mc Namera 1977; Braunberg, et al 1977). The confidence that the model successes generated carried forward to the Lowes Island survey, however it did not fare quite so well in the seemingly identical environment just on the other side of the Potomac River in Loudoun County, Virginia.

Questions that relate to the model performance are of the sort, "why not, where not, when not, etc.". Many of the queries relate not just to the Lowes Island experience, but to the conditions of the model itself as it was structured on the left banks of the Potomac River. Several elements and their predictive weaknesses have become obvious during months of discussion and experience in the field with the crews who were following the dictates of the model in the expected locations of settlements. Other failures of the model have yet to be explained because the time required to excavate surface areas has not been available in the survey schedule.

The model failures will be summarized and some preliminary reasons offered that must stand further field testing before they approach valid justifications for model alterations.

1. Woodland period village sites are not on the first levee of Lowes Island. Two and one half miles of seemingly identical environment that contain at least four village sites on the Maryland shores are devoid of any signs for the same on Lowes Island. Suggestions for this anomaly justification have ranged

from, "The Lowes Island areas was off-limits for the groups on the Maryland shores because of political divisions in the valley", to the observation that the levee continuing such locations has been truncated and washed away by the modern Potomac River. The first 'reason' would be difficult to justify in the absence of ethnohistoric data (none is available for the Potomac Piedmont). The second reason would involve extensive excavations along the bank in an almost blind search for village remains below the modern surface in areas not disturbed by plowing activities. The lack of Woodland period village sites is doubly puzzling because a similar Virginia-side setting at Selden Island, five miles upstream, has two large village sites. A floodplain area two miles east of Lowes Island, just below the Breaks contains a large Woodland village site (Slattery, Stabler, Manson 1977,personal communication).

2. The model strongly predicted a series of sites located along the third levee adjacent on the north to Old Sugarland Run. This is a swampy area with zones of reasonably high levee top. This area is very similar to an equivalent,

but occupied Maryland floodplain levee to the north. The third levee designation may not be accurate because of drain bifurcations between this area and the modern Potomac bank first levee. Much of the third levee is more wet and lower than the others. During the summer months, however, the levee is quite dry, and abuts a line of water that likely was free-flowing before siltation caused by modern farming. If siltation is the problem, excavation will reveal the sites that have not been penetrated by cultivation activities as they have on the other levees.

3. The model predicted more evidence of habitation in the upland areas behind the bluffs than had been located by January, 1979. Two factors may account for this "missing" site complex. On the Maryland side of the river, such sites all face to the south and would have maximized sun warmth during the colder episodes of past weather sets. In Maryland, many of the highland sites seem to have been occupied by groups whose cultural debris indicates Archaic period affiliations; in particular those times when the

altithermal was resolving into the modern cooler and wetter winters of our own experience. The Lowes Island uplands all face to the north and would have been quite colder in the face of prevailing northwest winds and the lack of winter sun exposure. In addition, there is a single all-weather drain that cuts through the property; most of its course and its feeders are now covered by a farm complex of barns, houses, lawns, and roads. These structures could very easily have been built upon the small sites that might have been there.

4. The model failed to predict the heavy density of Archaic settlements on the first levee. This can be attributed to the fact that the Maryland model was structured without a clean first levee experience; that first levee is covered and penetrated by the C & O Canal and its tow path and the digging spoil piles.

The accuracy of the model relates to its record of predicting sites on levee-top locations, swamp-side locations, highland drain locations, and the bluff-top sites. It was also successful in predicting a high degree of cultural positioning on the located sites. The model, if it had been followed to the exclusion of the "no site" areas, would have saved a significant amount of the time required to conduct a census of the Lowes Island project property. Those areas of "yes site" that failed to yield surface materials could have been tested in the hours saved by ignoring many of the sterile zones that were surveyed in growing corn and the debris of harvest in 1977 and 1978.

The sampling plans that were applied to the recorded site definitions provided valuable data on census alternatives. The most promising demonstrations showed the efficiencies available in survey work using probability sampling with transect elements guided by model constraints. The use of quadrats as sample elements is not feasible in the Potomac Piedmont because of the prohibitive labor required to locate the sample quadrats. Transects are desirable as sample units if their linear placement in the grid is controllable. The major difference between the demonstrated transect alignments as lines perpendicular to the river and those that run parallel to the river is the ability to define site boundaries with the parallel designs. These will, at the same time, provide an idea of the total percent of the levee definitions that will likely contain habitation debris. The levee-top transects were shown to be 95% accurate in locating sites (according to a comparison with the census). These accurately located site boundaries in the east-west axis where the other transects could not.

The clear surface sampling just discussed is not as cleanly applicable in those areas of the property where grass or woodlands mask the surface. The sample logic is the same, but requires the additional labor of cutting test pits (shallow) to view what the sample has chosen. The work of both Lovis (1976) and Chartkoff (1978) offer interesting methods that may be applicable in the Potomac Piedmont in areas where forest or fallow lands cover the surface. In this survey, the woodlands were sampled, but not under the control of probability sampling. The sample pits that were cut in the forest floor were placed under the model dictates. Intervals between pits depended upon what was found in the first one or two. Additional pits were cut, for instance, if charcoal was found widely scattered at the junction of the forest duff and the clay hardpan. The additional pits were cut to discover the limits of the charcoal (or artifact) distribution. In most of the areas in the highlands where pits were cut in the forest floor, more than twenty pits were used to determine the limits of the site concentration. Those on the perimeters of the self-defined area eventually resulted in no returns for the effort, but defined the zone where materials were to be found. The Fairfax County Archeologist has adapted a system very similar to that of Chartkoff and the writer (Johnson 1978, personal communication) in his survey work on the upland drains of Fairfax County that transect the Piedmont and Tidal zones. Briefly, this system uses a cleanly defined point near a model-predicted location, and from this point, bearings and distances are run to the artifacts that the avocationalist crews locate with survey flag markers. Johnson's success in the application of this method in cultivated, fallow, and forest zones has been spectacular. His model uses the same elements as those that were developed in the Maryland surveys where he participated as a crew member. His only modification of the model survey process has been in the recording activity. In any event, Johnson's compass bearings and distances are more applicable to small and isolated sets of investigation than the large area benchmark grid system used for the Lowes Island project simply because they are more portable; this means they are relative to one small area and can be easily reproduced upon the maps necessary for recording the survey finds and locating the initial reference mark.

The model and transect applications to archeological research discussed by Gardner (1978) and Custer (1978) take a slightly different approach in that they both are using the term, "transect" in a much wider sense than has the writer on Lowes Island. The control element is the same, however, and their results and conclusions simply cover much broader geographical areas. The model of settlements that both discuss depend upon the elements of the writer's model, plus the functional justification for settlements being in different ecological zones yet still being of the same cultural sets. The Gardner and Custer models apply the excavation-verified functional aspects of site utility as decoded from the artifacts recovered from sealed surfaces.

An example is the definition of base sites, quarry sites, and hunting sites. Each is expected to contain tool materials specific to the activities that were carried out at the site. The hunting camp will not have the large numbers of processing tools that are to be found on the base camp locations. The quarry site, in turn, will not contain the tools of the hunt, nor those items used in processing meat and hides. Gardner's transects are actually taken as particular survey zones in a given physical geological zone (Blue Ridge versus Coastal Plain) that are keyed to different supporting environments based upon elevation and proximity to particular water systems. Those of Custer relate to a tighter definition that are similar to those of the writer, but are scaled upward in the amount of territory that comprises the transects (up to a mile swath). Site placements are specific to the zones and utility of the tools that have been recovered. These observations support the basic logic behind the variables of the Maryland model used at Lowes Island and named 'elements' in the decision processes entering into the camp-no-camp of prehistoric groups.

Schneider and Frantz (1977) have approached the same basic recognition of site placement choice through the application of a modified forest management computer system in Georgia. Working for the U.S. Forest Service, their responsibilities have been to identify the prehistoric settlements that may exist in the federal forests. The system had only to be modified to include flags that would highlight five of the system factors that also seem common to known Indian settlement locations. These factors, in turn were culled from similar work done in the south that had identified specific environmental commonalities, "which set the stage for models predicting site locations" (Schneider and Frantz 1977:1). These sensitive factors were found to be: landform, elevation, vegetation, soils, slope and water source. Of course, there are others, but note that the same basic few are coming into focus all over the land. These models all work to some degree. The defree of fit is a function of the other elements that are included in the model and the degree to which a given model is asked to focus upon a given cultural placement of actual sites in very specific zones.

The Maryland model successfully located areas upon which 61 prehistoric settlements were found and ultimately recorded with the Virginia Center for Archeological Research. The Maryland model for predicting Piedmont Potomac settlement locations was created in a pragmatic vacuum: one that was pure observation and had almost no literature backing. When the model was in the process of assembly and testing, there was almost no discussion of such a thing in the published material that was available. Many different researchers were observing the same commonalities in their observations of the placement of the sites they were finding. It has only been in the late 1970's that his research is becoming available to the interested world.

The census of the survey has provided additional information that will inhance the predictive powers of this and other models. Hypotheses have been stated and tests designed that will further purify the elements (or factors) that comprise the model. Wood (1978:259) has noted

> In archaeological research it is impossible to know what kinds of decision-making process people used in locating their settlements. However, the outcomes of choice are reflected in settlement patterns; so, the reconstruction of settlement space from archaeological data is at least plausible.

He goes on to elaborate upon the very elements addressed in this survey. The Lowes Island work has provided considerable elaboration upon the elements that have temporal sensitivities; in particular, the geomorphological history of this part of the Potomac River, and the temporal placement of many of the cultures that settled there. These two aspects are closely tied together in that each contributed to an understanding of the other.

At the start of the survey, the levees of the Lowes Island floodplain were presumed to be of relatively recent deposition. This was a carry-over from the Maryland survey work and the traditional ages that had been attributed to similar floodplain levee formations there. At Lowes Island, the recovery of Middle and Early Archaic tool artifacts from levee tops quite near the modern river began to create doubts about the newness of these levees. In particular, the projectile point types that have been well dated by Coe (1964), Broyles (1971), and Chapman (1975), were common. The points defined by Ritchie (1961) for New York are rare except for triangular Woodland forms. Most of the survey points closely resemble several types that have become markers of the Archaic periods throughout the Middle Atlantic: Palmer, Lecroy, St. Albans, Morrow Mountain, Guilford, and Halifax. A fragment of a Paleo-Indian fluted Clovis-like point marked the most early of these non-modern materials. The sites containing these markers of very old cultures all appear on the tops of modern levees. They have been close enough to the surface to be exposed through plow cultivation. There are also sufficient numbers of these points, and in clustered sets peculiar to a given site to lessen the small probability that they were brought to the sites as recycled tools found by later groups. The conclusion, as an hypotheses, is that the levee formations are of great antiquity.

Three fortuitous events and a series of tests have given credence to the conclusion that the Lowes Island environment has had a long and complicated past involving all of the known cultures in this part of the Middle Atlantic. The first event was the early survey modification that included plotting and recovery of all tool artifacts. This came about to avoid the loss of diagnostic materials to the collectors who were covering the same fields. The second event was the survey crew participation in the Selden Island survey in late 1977. The third event was the arrival and subsequent Phase II testing of Commonwealth Associates under contract to the Fairfax County Water Authority. The tests were the bank and levee sections performed to establish the depths of cultural materials in the matrix of the levees and the modern bank.

The recovery of artifacts and the maintenance of their positions on the levees has provided an unexpectedly consistant picture of Early Archaic presence on the second and fourth levees. The materials appear in site clusters, and are different between sites. The Selden Island survey educated the entire survey crew in the possible presence and content of the sub-surface living floors (extensive at Selden Island, up to two meters below the surface on the south face of the third levee). Commonwealth Associates dug several three-to-four meter deep backhoe trenches where soil profiles, ancient meander bottoms, swamps, and artifact bearing layers were exposed for study. Discussions with the director of Phase II explorations brought a concurrence as to the composition of the Lowes Island structure, its age, and man's occupation of these levees (Larsen 1978, personal communication). The planned sections of the banks and the first levee top reinforced the surface observations made in 1977 and concurred in by Dr. Larsen: the sediments that comprise the bulk of the Lowes Island mass are of early Pleistocene deposition and were used much later by Paleo-Indians, the Early Archaic, and subsequent groups from other Archaic and Woodland episodes. On the north face of the first and fourth levees, cultural debris exists in the buried matrix (from subsequent siltation events) up to two meters below the modern surface.

The cultural materials found deeply covered on the first and fourth levees imply long use of the levees. When the earliest cultures camped along the Potomac River, it was a braided system during the more dry periods of the summer and fall. The seasonal implications of such use of the levees are significant. The resources available in such environments and man's utilization of them are being reported with increasing frequency in the literature each year (Broyles 1971; Chapman 1975; Gardner 1978; Klinger 1978; Schmits 1978). The Potomac River as a braided system in the Piedmont, with meanders, ox bow lakes, and swamps provides a different picture of potential habitat value than that which has been traditionally presumed. The diagnostic artifacts recovered strongly imply culture-specific exploitation of that environment. The model elements are now more attuned to these priorities in the cultures represented.

As was highlighted in the literature cited, very little modern research has been conducted in the Potomac Piedmont in regard to prehistoric Indian settlements. The work done by this writer in Montgomery County, Maryland and upon Lowes Island has shown a very heavy utilization of the area that likely continues to the west along the river and its feeder streams. The groups that settled in these areas represent 12,000 years of occupation. The sites of these occupations are highly subject to destruction by modern construction activities. The value to modern man of an understanding of these cultures and how they adapted as surviving units to radically differing ecological conditions can hardly be measured. The fossil remains of the tools and processes used in those continuing adaptations form the meager clues that this anthropology needs to answer the never ending questions. Both the states of Maryland and Virginia are in the process of developing programs under which the cultural resources of the prehistoric Indians can be recognized and conserved. The resulting inventories will serve as references in the many priorities that must be assigned to both modern activities and the recovery of data from the sites. Prehistoric Indian sites will have a growing impact upon zoning decisions, construction schedules, park boundaries, maintenance plans for roads and rights-of-way, and taxation details. The general public has demonstrated a growing awareness of, and responsibility for, the cultural resources that prehistoric Indian resources represent. The first problem to be addressed in the light of this awareness and growing appreciation is how to creat a resource inventory so that legislative and governing bodies can measure its impact upon preservation schedules and budgets. The inventory is more than a mere count of sites. It is a corpus of data that contains as much information as possible about each site and its position in the heirarchy of values set by negotiated agreements between scholars, elected officials, and land owners.

The predictive settlement model that has been discussed in this thesis has demonstrated its value in terms of its economic powers in reducing the hours required to locate sites for the inventory. The tests, of non-random and probability sampling partially under the constructs of model elements, have shown the combined value of such a system in terms of determining how much of the landscape will be involved in sites and cultural preservation decisions. The addition of transect analysis under the constraints of the model have made the combination more powerful than any one or two systems alone. Future survey work in the Potomac Piedmont under the control of transects aligned by model constraints can provide efficient and worthwhile inventory data gathering.

It remains to be seen under what management systems and time constraints Virginia and Maryland will address the creation of the cultural inventory. It has taken two years to provide a strong enough site content statement to qualify the first levee of Lowes Island for the National Register of Historic Places and the Virginia Landmark Register. The decision was a forced one, caused by federal law that pertains to the permit activity of the

Army Corps of Engineers. The client for the permit was a public body responsible to the people of Fairfax County. This writer is convinced that the public will demand laws and ordinances to protect these resources when enough of that same public fully understands what is involved. The survey model of site prediction can help with both the education problem and the challange of locating the sites. The public can participate, and will, if they are allowed to do so.

TABLE 1

LINEAR SUMMARY OF ARTIFACTS, FIRST LEVEE

METERS WEST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL	METERS WEST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL
0- 30	0	3	9	0	480- 510	1	4	7	15
30- 60	0	1	12	0	510- 540	4	3	21	24
60- 90	0	3	9	0	540- 570	1	2	7	9
90- 120	0	4	13	0	570- 600	28	5	9	7
120- 150*	1	12	13	3	600- 630*	14	2	10	1
150- 180	1	7	18	1	630- 660	4	2	0	1
180- 210	0	6	28	0	660- 690	0	1	0	0
210- 240	0	7	15	0	690- 720	0	0	0	0
240- 270	0	7	20	0	720- 750	0	2	0	0
270- 300	0	9	13	0	750- 780	1	1	1	0
300- 330	0	1	5	0	780- 810	0	2	1	0
330- 360	1	2	7	0	810- 840	0	1	2	1
360- 390	1	3	10	0	840- 870	0	0	2	60
390- 420	4	2	7	0	870- 900	0	0	2	47
420- 450	4	0	2	0	900- 930	1	1	2	0
450- 480	2	6	4	6	930- 960	0	0	4	1

METERS WEST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL
960- 990	0	1	2	0
990-1020	0	0	0	0
1020-1050	1	0	5	0
1050-1080	0	2	7	0
1080-1110	0	0	5	0
1110-1140	0	8	14	3
1140-1170	0	2	2	1
1170-1200	0	3	10	0
1200-1230	0	3	7	0
1230-1260	0	1	5	3
1260-1290	7	3	10	2
1290-1320	1	2	4	1
1320-1350	15	9	7	80
1350-1380	3	8	6	1
1380-1410	1	20	22	0
1410-1440	5	10	12	0
1440-1470	0	3	5	0

METERS WEST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL
1470-1500	0	2	5	0
1500-1530	0	2	0	0
1530-1560	0	0	1	0
1560-1590	0	0	0	0
1590-1620	0	0	0	0
1620-1650	0	0	0	0
1650-1680	1	1	0	0
1680-1710	25	22	30	0
1710-1740	0	1	2	0
1740-1770	0	0	0	0
1770-1800*	30	4	2	0
1800-1830*	32	4	4	0
1830-1860*	5	2	2	0
METERS EAST				
0- 30	1	2	7	0
30- 60	5	3	17	0
60- 90	3	2	12	2

METERS EAST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL
90- 120	2	0	13	0
120- 150	0	2	11	0
150- 180	0	1	1	0
180- 210	2	2	2	0
210- 240	0	3	1	0
240- 270	0	1	5	0
270- 300	0	3	1	0
300- 330	0	1	0	20
330- 360	0	0	0	54
360- 390	0	1	4	55
390- 420	0	0	1	2
420- 450	0	0	0	2
450- 480	0	0	0	0
480- 510	0	0	0	0
510- 540	0	0	0	0
540- 570	0	1	0	0
570- 600	0	0	0	0
600- 630	0	0	0	0
630- 690	0	0	0	0
690- 720	0	0	0	0
720- 750	0	0	0	0
750- 780	0	0	0	0
780- 810	0	0	0	0
810- 840	0	2	10	0
FIRST LEVEE TOTAL	203	236	500	402

* Artifacts not discussed in text. April 4, 1979 Potomac River flood removed ten centimeters of top soil and exposed the pottery and lithic materials.

TABLE 2

LINEAR SUMMARY OF ARTIFACTS, SECOND LEVEE

METERS WEST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL	METERS WEST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL
0- 30	0	1	0	0	450- 480	0	0	0	0
30- 60	0	1	0	0	480- 510	1	3	4	1
60- 90	0	0	2	0	510- 540	0	3	6	0
90- 120	0	0	1	0	540- 570	0	4	6	1
120- 150	0	0	1	0	570- 600	1	5	7	4
150- 180	0	0	0	0	600- 630	2	12	16	1
180- 210	0	0	0	0	630- 660	0	1	0	0
210- 240	0	0	0	0	660- 690	0	0	0	0
240- 270	0	0	0	0	690- 720	0	1	2	0
270- 300	0	0	0	0	720- 750	0	4	1	0
300- 330	0	0	0	0	750- 780	0	3	3	0
330- 360	0	0	1	0	780- 810	0	0	1	0
360- 390	0	0	0	0	810- 840	0	1	1	0
390- 420	0	0	0	0	840- 870	0	2	2	2
420- 450	0	0	0	0	870- 900	0	7	12	1

METERS WEST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL
900- 930	0	8	12	3
930- 960	0	1	6	7
960- 990	0	3	3	0
990-1020	0	2	3	0
1020-1050	0	2	9	0
1050-1080	0	1	2	0
1080-1110	0	1	2	0
1110-1140	0	3	0	0
1140-1170	1	0	2	0
1170-1200	0	1	4	0
1200-1230	0	1	4	0
1230-1260	0	2	1	0
1260-1290	0	1	9	0
1290-1320	0	1	9	0
1320-1350	0	0	4	0
1350-1380	0	0	0	0
1380-1410	0	1	14	0
1410-1440	0	0	0	0
SECOND LEVEE TOTAL	5	79	121	20

TABLE 3

LINEAR SUMMARY OF ARTIFACTS, FOURTH LEVEE

METERS WEST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL	METERS WEST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL
0- 30	0	0	0	0	240-270	0	6	10	0
30- 60	0	0	0	0	270-300	0	1	9	0
60- 90	0	0	0	0	300-330	0	4	4	0
90-120	0	1	0	0	330-360	0	1	1	0
120-150	0	1	0	0	360-390	0	3	7	0
150-180	0	13	20	0	390-420	0	6	5	0
180-210	0	5	11	0	420-450	0	3	15	0
210-240	0	3	11	0	450-480	0	0	0	0
					TOTALS FOURTH LEVEE	0	46	93	0

TABLE 4

LINEAR SUMMARY OF ARTIFACTS, FIFTH LEVEE

METERS WEST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL	METERS EAST	POTTERY SHERDS	PROJECT. POINTS	BIFACE OBJECTS	COLONIAL MATERIAL
0- 30	0	9	9	0	0- 30	0	7	15	0
30- 60	0	8	9	0	30- 60	0	1	2	0
60- 90	0	0	0	0	60- 90	0	1	3	0
90-120	0	0	0	0	90-120	0	0	0	0
120-150	0	11	15	0	120-150	0	4	6	0
150-180	0	2	3	0	150-180	6	13	39	0
180-210	0	1	0	0	180-210	10	3	13	0
210-240	0	0	0	0					
240-270	0	0	0	0	TOTALS FIFTH LEVEE	16	64	108	0
270-300	0	2	3	0					
300-330	0	0	0	0					
330-360	0	0	0	0					
360-390	0	0	0	0					
390-420	0	2	4	0					
420-450	0	0	0	0					
450-480	1	1	1	0					

TABLE 5

LINEAR DENSITY OF SURFACE SITES ON THE LOWES ISLAND FLOODPLAIN. DEFINED BY LEVEE FORMATION.

LEVEE	# OF SITES	LEVEE LENGTH	SITE COVERAGE
1 WEST*	13	2095 m.	910 m.
1 EAST	4	824 m.	420 m.
2f WEST	1	124 m.	60 m.
2f EAST	5	770 m.	330 m.
2 WEST	11	1420 m.	870 m.
2 EAST	0	585 m.	0
3 WEST	0	1825 m.	0
4 WEST	4	480 m.	270 m.
4 EAST	0	220 m.	0
5 WEST	5	495 m.	210 m.
5 EAST	3	210 m.	180 m.

* Includes two sites in the same north-south transect at two locations.

Table 6. COMPARISON OF SAMPLE SCHEMES AND FRACTIONS, 1st LEVEE WEST. 1800 METERS EAST-TO-WEST, 15 SITES COVERING 910 METERS OF LEVEE.

<u>30 Meter Sample Unit: Simple Random Sample</u>

Sample Fraction	.10	.20	.30	.40	.50
# Transects	6	12	18	24	30
Transects m.	30 m.	270 m.	270 m.	360 m.	480 m.
Expan. to Pop.	300 m.	1350 m.	900 m.	900 m.	960 m.
% of Population	32.9	148.4	98.9	98.9	105.5
Sites	1	10	6	12	12

<u>10 Meter Sample Unit: Simple Random Sample</u>

Sample Fraction	.10	.20	.30	.40
# Transects	18	36	54	72
Transects m.	110 m.	210 m.	260 m.	330 m.
Expan. to Pop.	1100 m.	1050 m.	866 m.	822 m.
% of Population	120.9	115.4	95.2	90.3
Sites	10	11	12	15

<u>10 Meter Sample Unit: Systematic Random Sample</u>

Sample Fraction	.10	.20
# Transects	18	36
Transects m.	100 m.	200 m.
Expan. to Pop.	1000 m.	1000 m.
% of Population	109.9	109.9
Sites	11	15

Table 7. COMPARISON OF SAMPLE SCHEMES AND FRACTIONS, 2nd LEVEE WEST. 1410 METERS EAST-to-WEST, 8 SITES COVERING 870 METERS OF LEVEE.

30 Meter Sample Unit: Simple Random Sample

Sample Fraction	.10	.20	.30	.40	.50
# Transects	5	10	15	20	25
Transects m.	150 m.	180 m.	360 m.	420 m.	540 m.
Expan. to Pop.	1500 m.	900 m.	1200 m.	1050 m.	1080 m.
% of Population	172.4	103.4	137.9	120.6	124.1
Sites	5	5	6	8	8

10 Meter Sample Unit: Simple Random Sample

Sample Fraction	.10	.20	.30	.40
# Transects	14	28	42	56
Transects m.	40 m.	200 m.	280 m.	390 m.
Expand. to Pop.	400 m.	1000 m.	933 m.	975 m.
% of Population	45.9	114.9	107.2	112.1
Sites	3	8	7	8

10 Meter Sample Unit: Systematic Random Sample

Sample Fraction	.10	.20
# Transects	14	28
Transects m.	70 m.	140 m.
Expand. to Pop.	700 m.	700 m.
% of Population	80.5	80.5
Sites	6	8

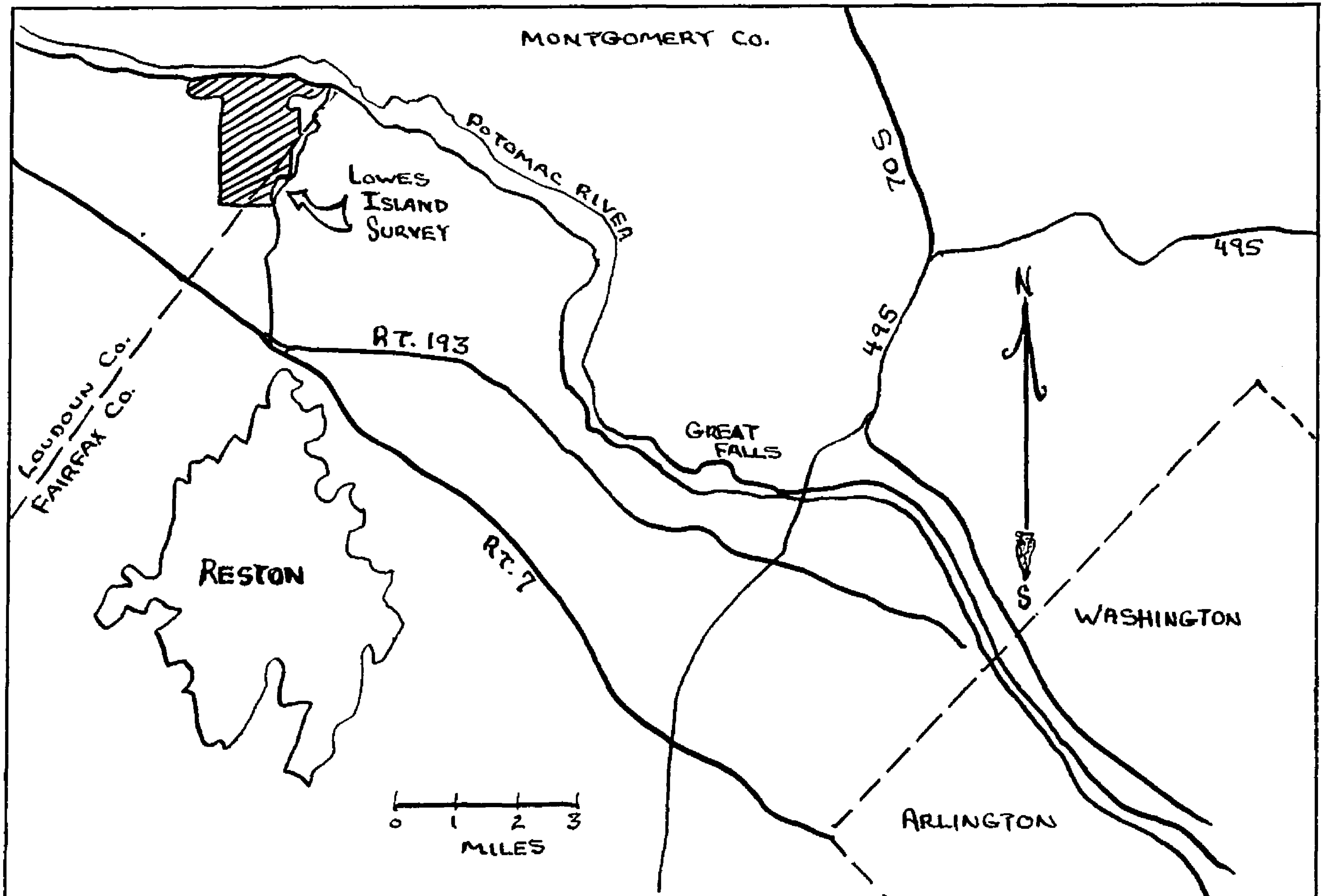


Fig. 1 Lowes Island Survey area in relation to Washington, D. C. metropolitan area.

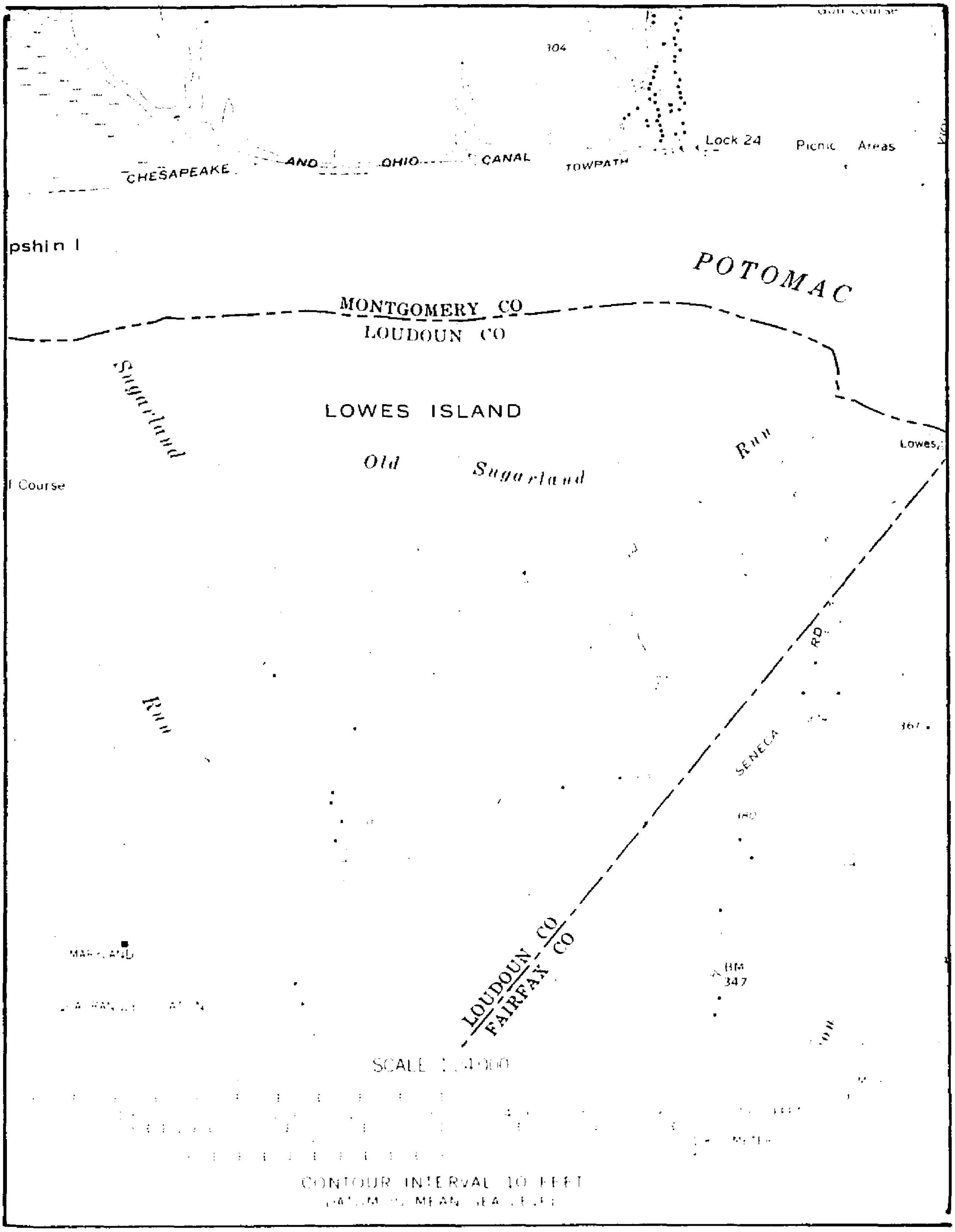
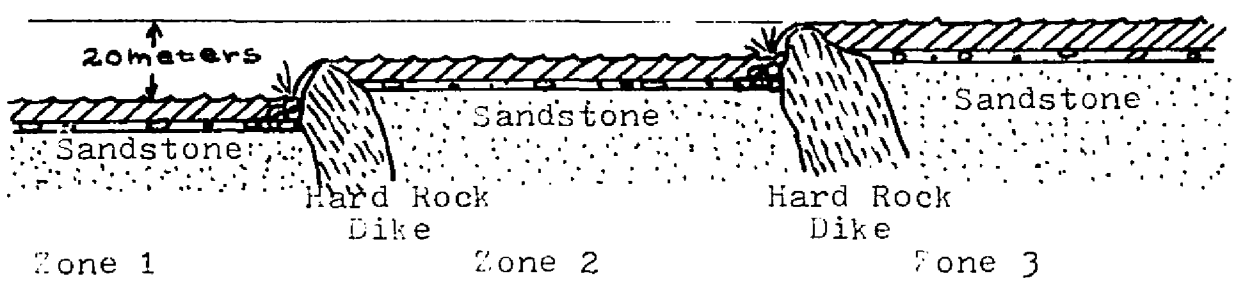
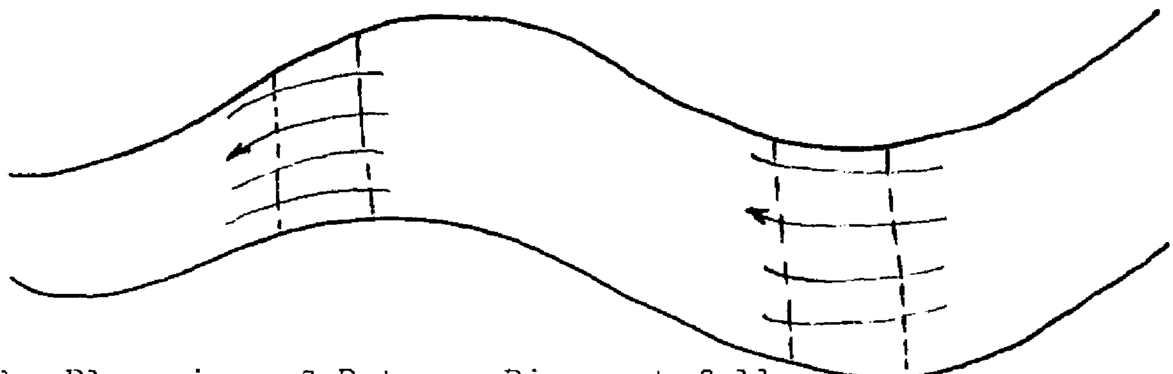


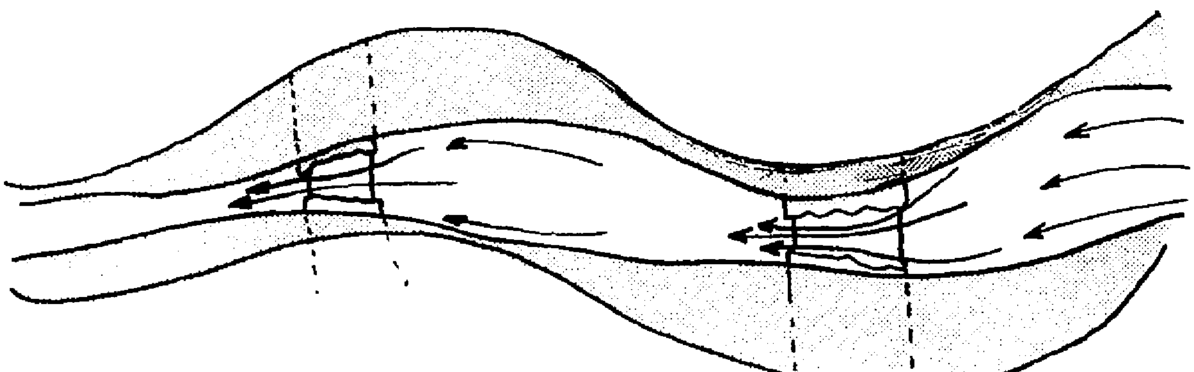
Fig. 2 Topological map of Lowes Island Virginia
(USGS 7.5' Quadrangle, Seneca-Sterling 1968)



a. Section of Potomac River showing hypothetical dikes that would explain the bank vertical differences between Lowes Island and Selden Island.

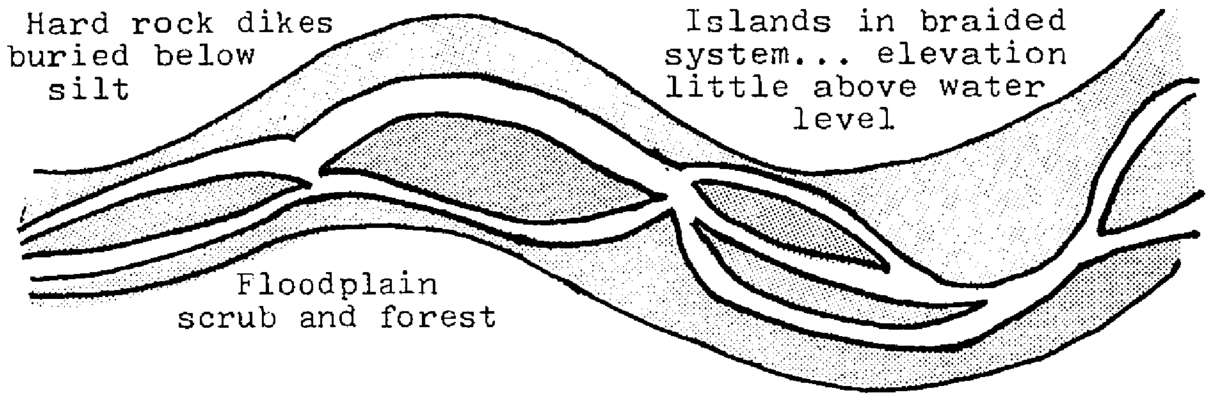


b. Plan view of Potomac River at full glacial melt flood where dikes are below surface.

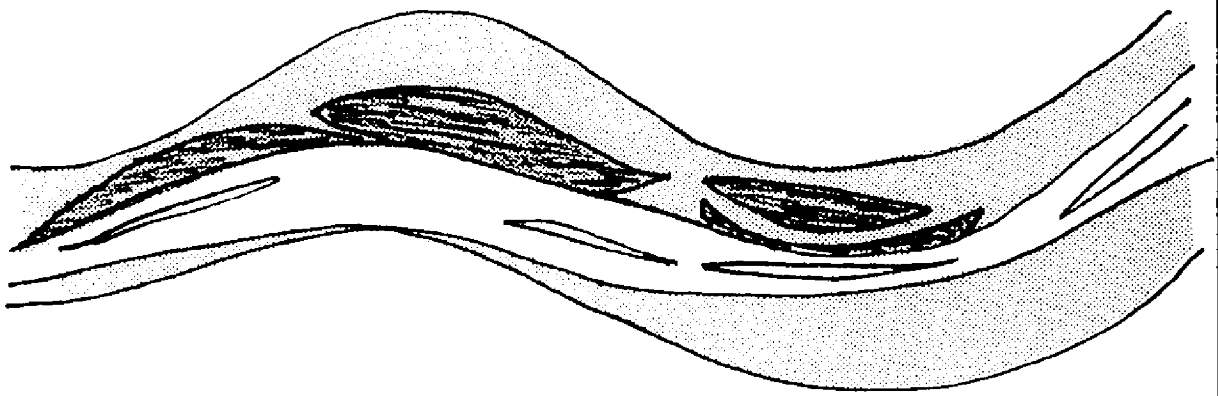


c. Potomac River at early period low water stage showing penetrated dikes and eddy wash fill areas.

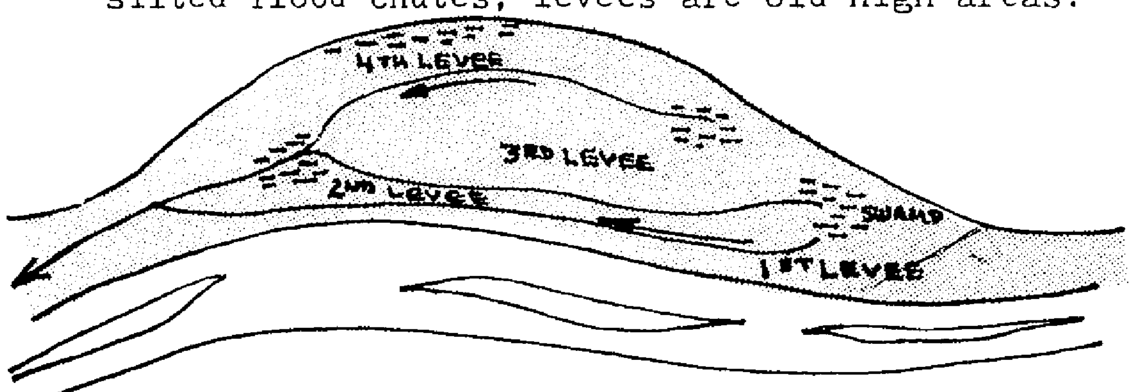
Fig. 3 Diagram of hypothetical construction of Potomac River islands and floodplains.



d. Minimal water flow during altithermal periods, Potomac River is a braided system in its own bed.



e. Modern Potomac River downcutting in its old bed, 'braided islands' truncated, old channels now silted flood chutes, levees are old high areas.



f. Detail of Lowes Island-like floodplain showing residual braided channels as lows between modern levees.

Fig. 3 (continued) Diagram of hypothetical construction of Potomac River Islands and floodplains.

FEEDBACK FUNCTION	FIELD ACTIVITY	PROCESS DESCRIPTION	
	GENERAL RECONNAISSANCE	STAGE 1	
		UNIVERSE:	Region
		SAMPLE:	Entire area
INFER TOTAL SITE INVENTORY		METHOD:	Paleoevnironmental studies and general site survey
	INTENSIVE SURVEY	STAGE 2	
		UNIVERSE:	Region stratified by zones
REFINE CHRONOLOGY AND FUNCTION OF EACH SITE		SAMPLE:	Proportion of area of each zone
		METHOD:	Complete survey
	CONTROLLED SURFACE COLLECTIONS	STAGE 3	
		UNIVERSE:	Sites located
MEANING OF SURFACE PATTERNS		SAMPLE:	Some of each type of site
		METHOD:	Intensive, systematic surface collection
	EXCAVATIONS	STAGE 4	
		UNIVERSE:	All sites from which intensive surface collections have been made
		Sample;	Block exposures and test squares within newly defined areas of each of the selected sites
		METHOD:	Deep, broad, and test excava-tions

Fig. 4 Redman's Organizational Framework for Regional Multistage Field Research Design.

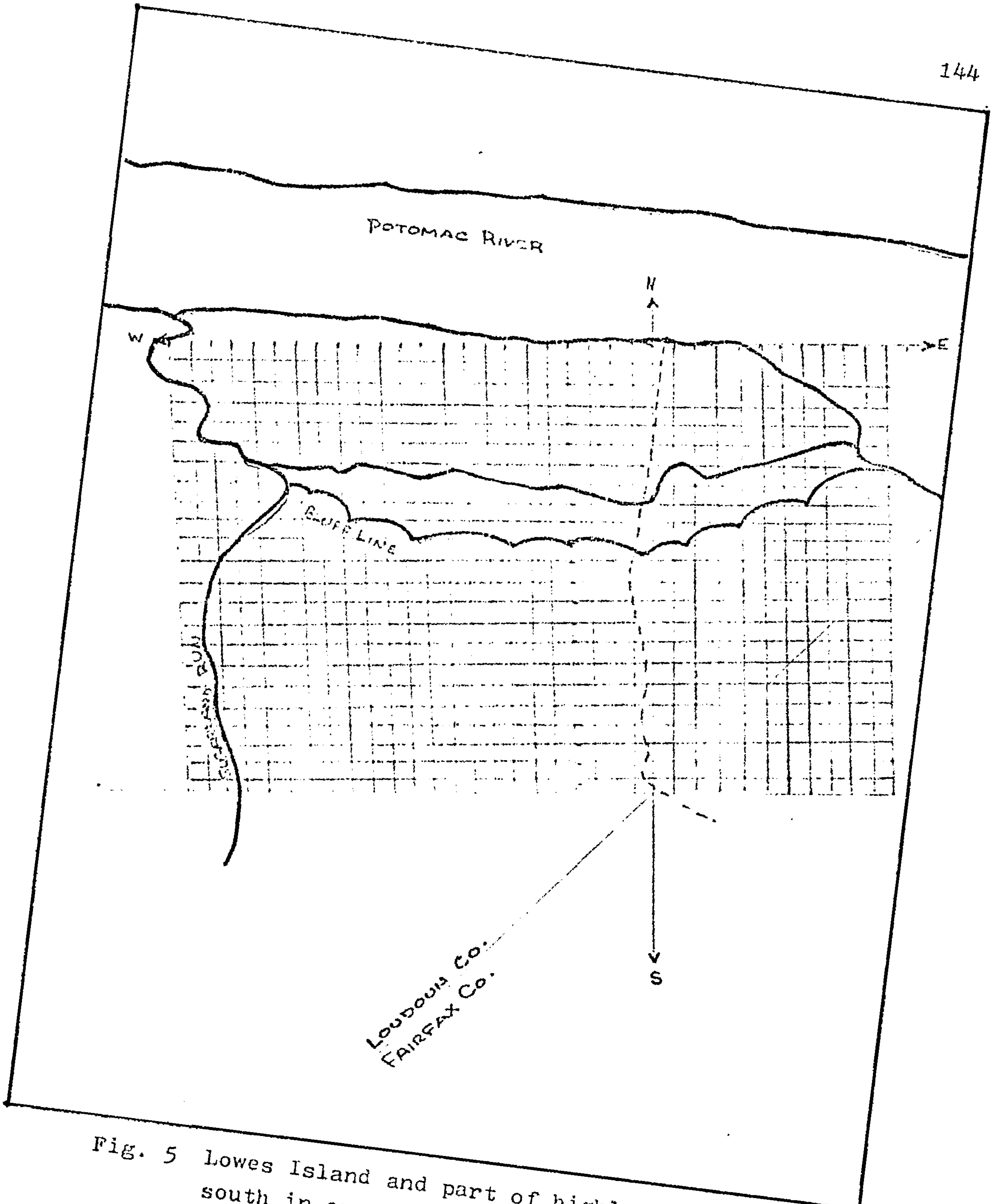


Fig. 5 Lowes Island and part of highlands to the south in one hundred meter gridding.

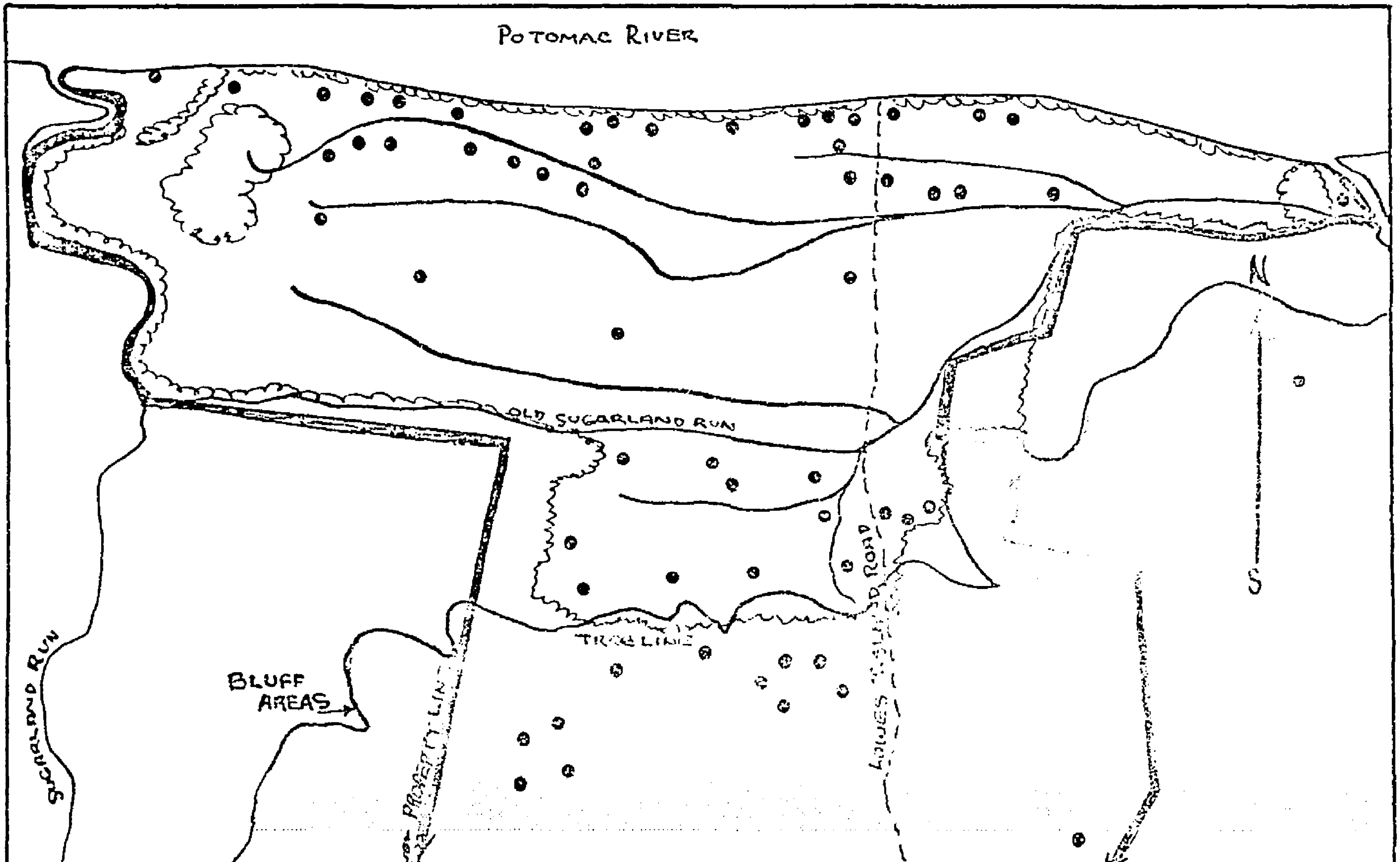


Fig. 6 Lowes Island, Virginia, prehistoric Indian settlement sites located in survey, 1977-1978.

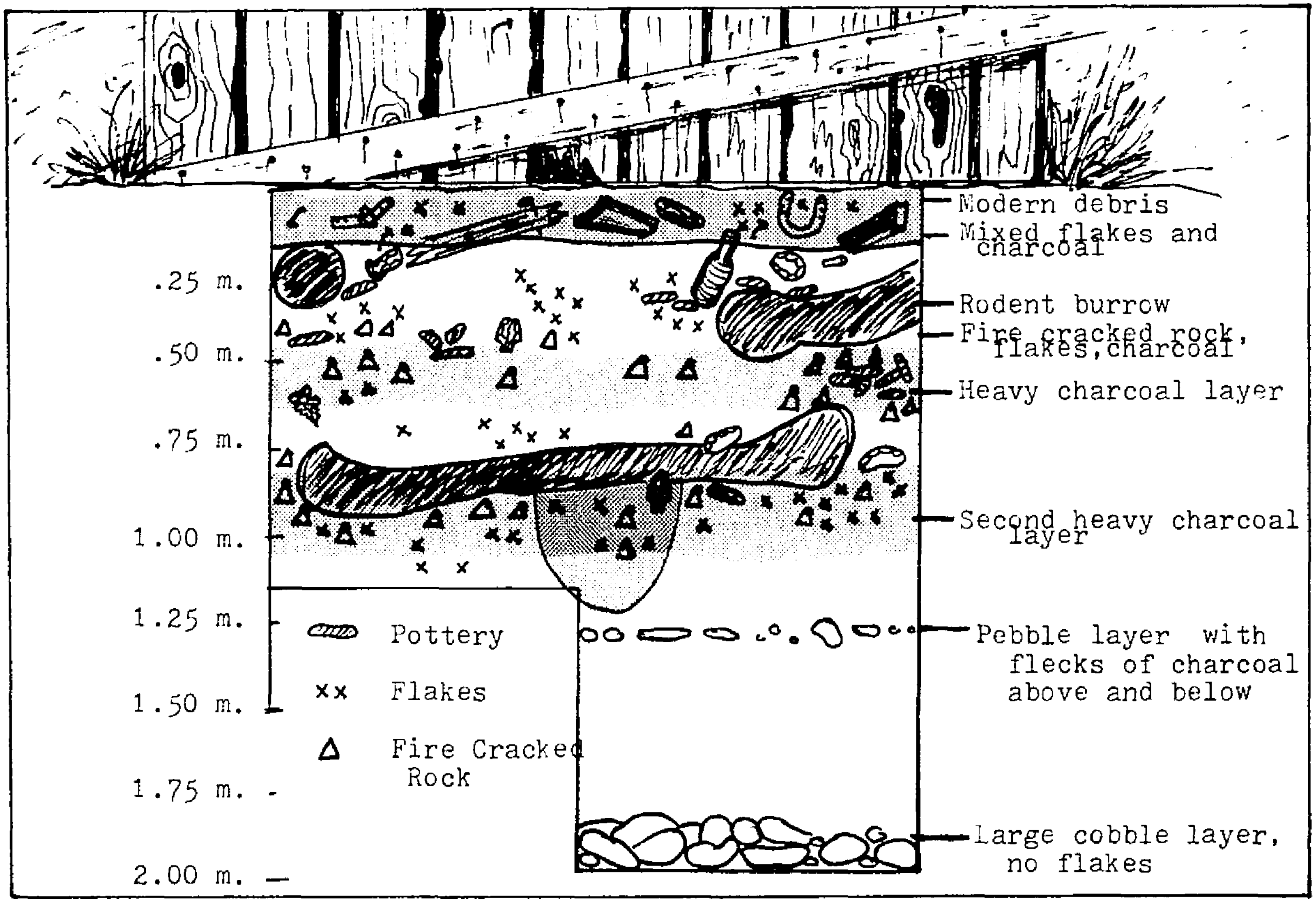


Fig. 7 Mule Barn test pit, Lowes Island, Virginia, first levee 1350 meters west of bench mark reference by 20 meters south.

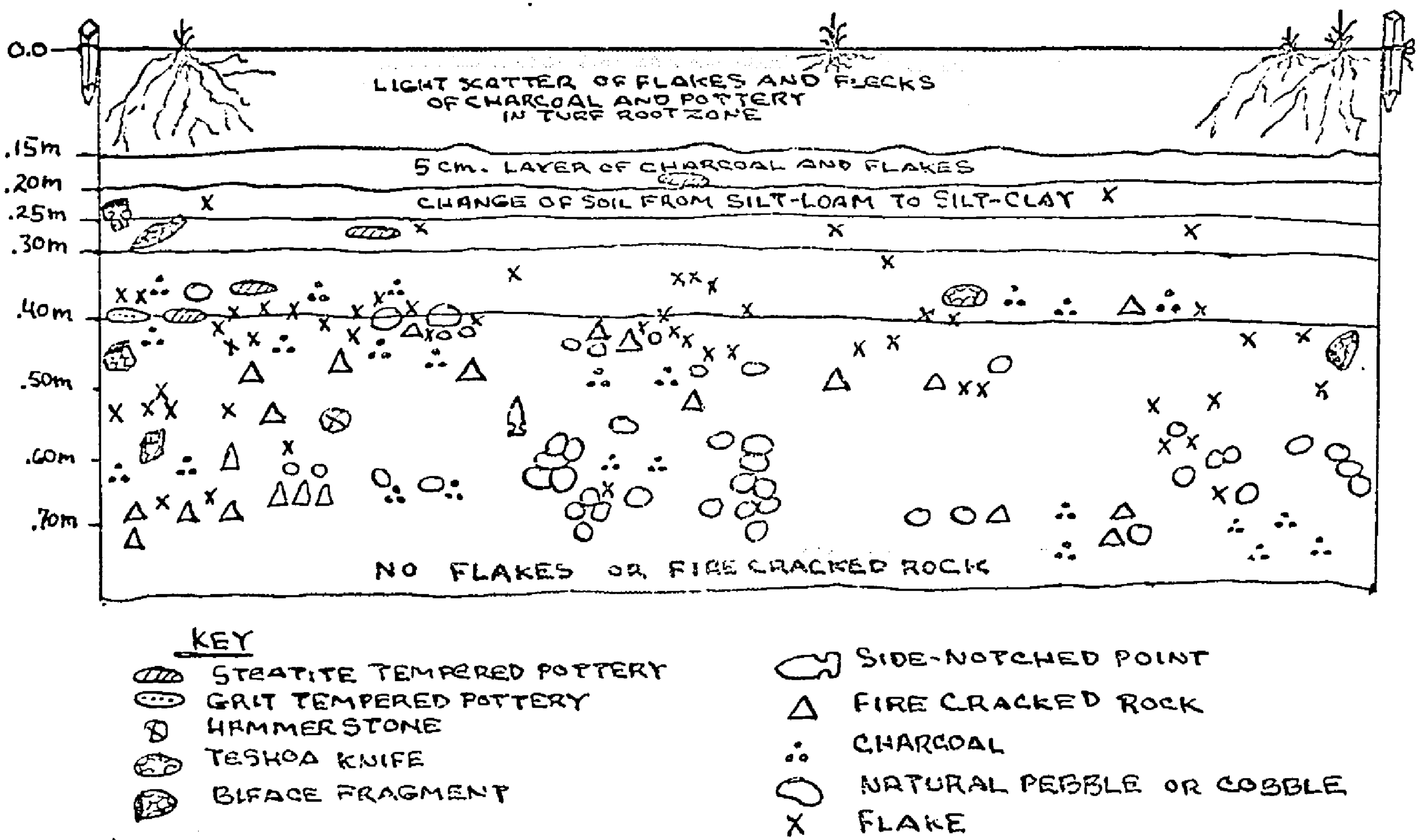


Fig.8 Potomac River bank test pit, 650 meters west of bench mark reference.

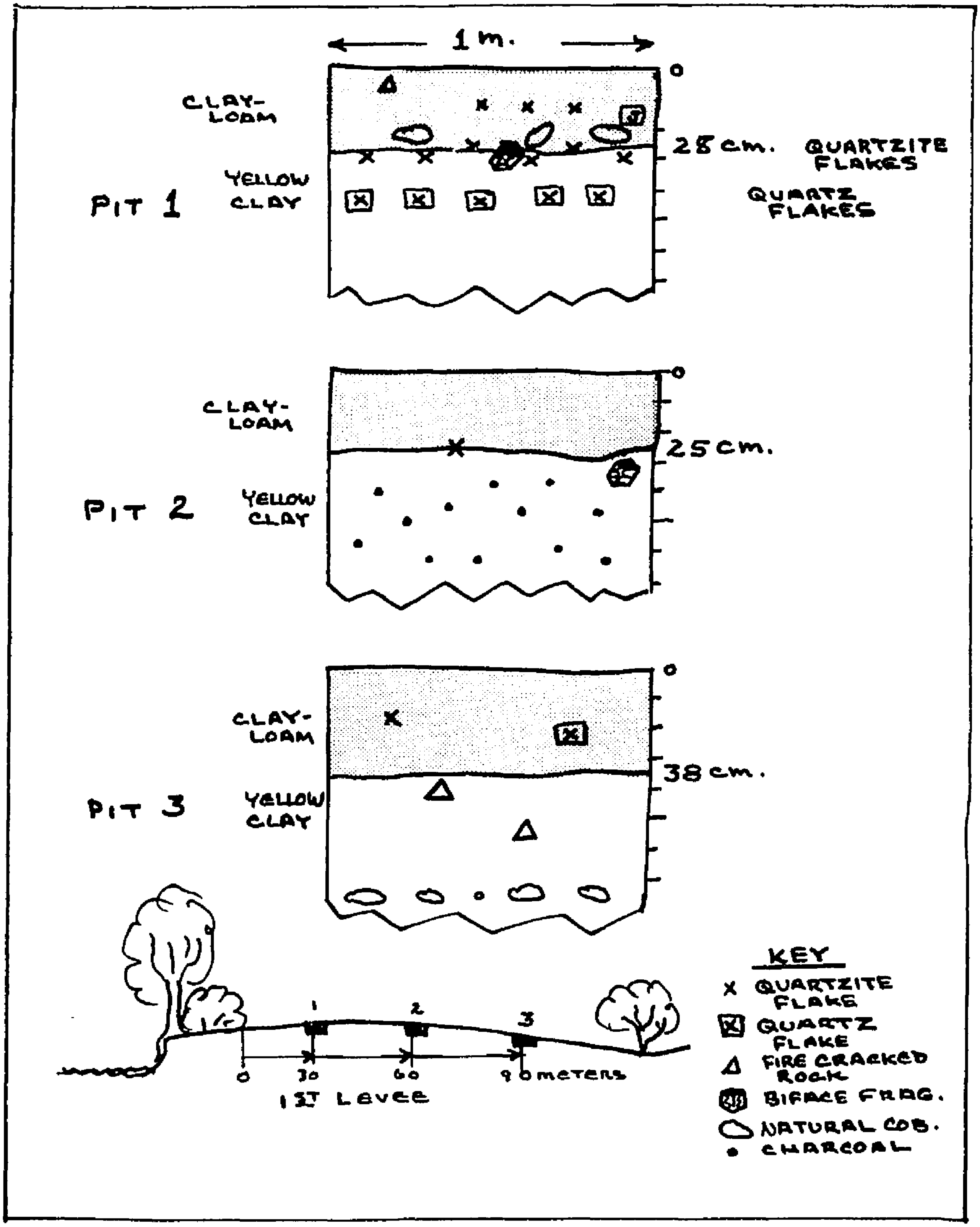


Fig. 9 Soil profile pits at 570 meters west.

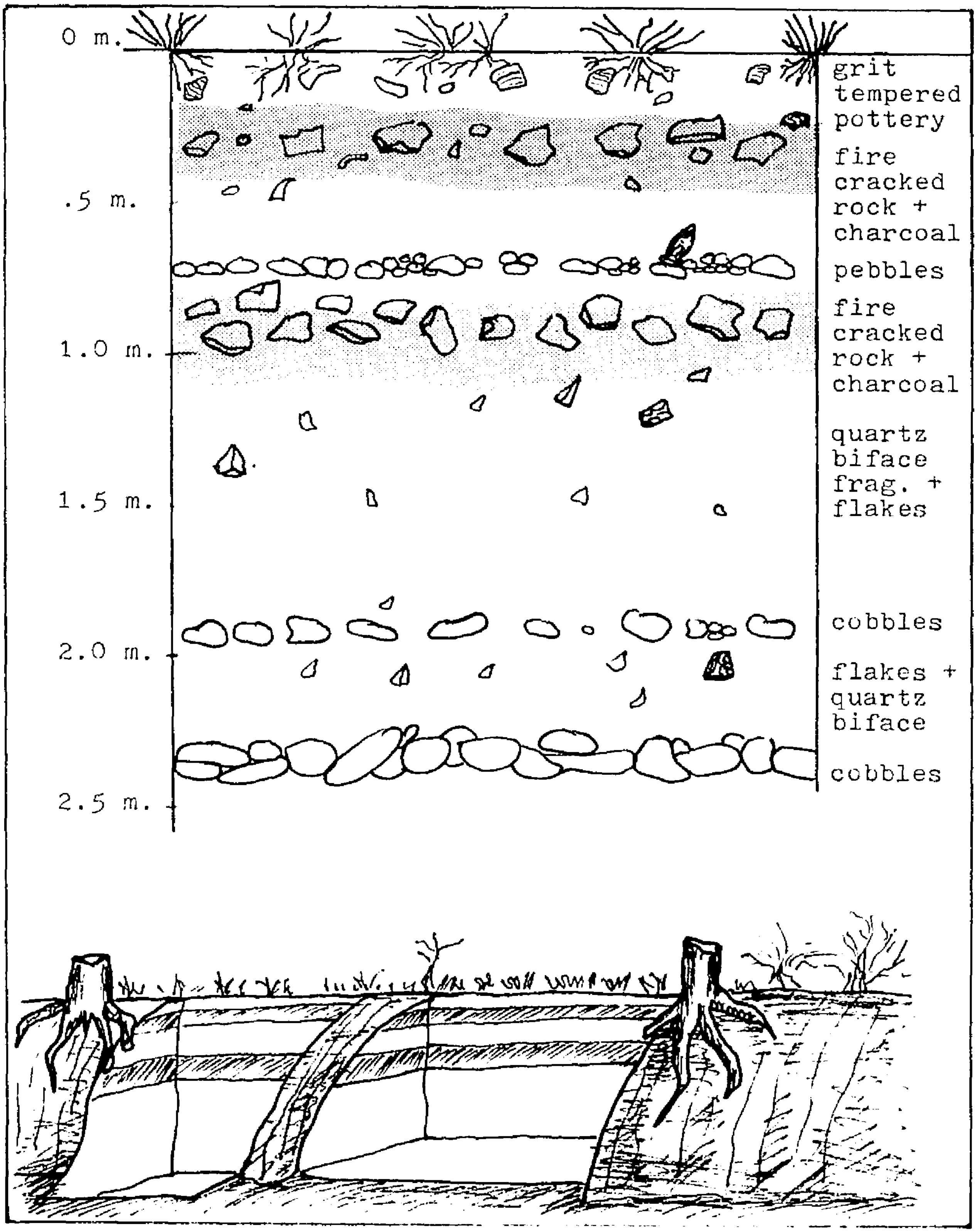


Fig. 10 Potomac River Bank Section; 1350 meters west of bench mark reference

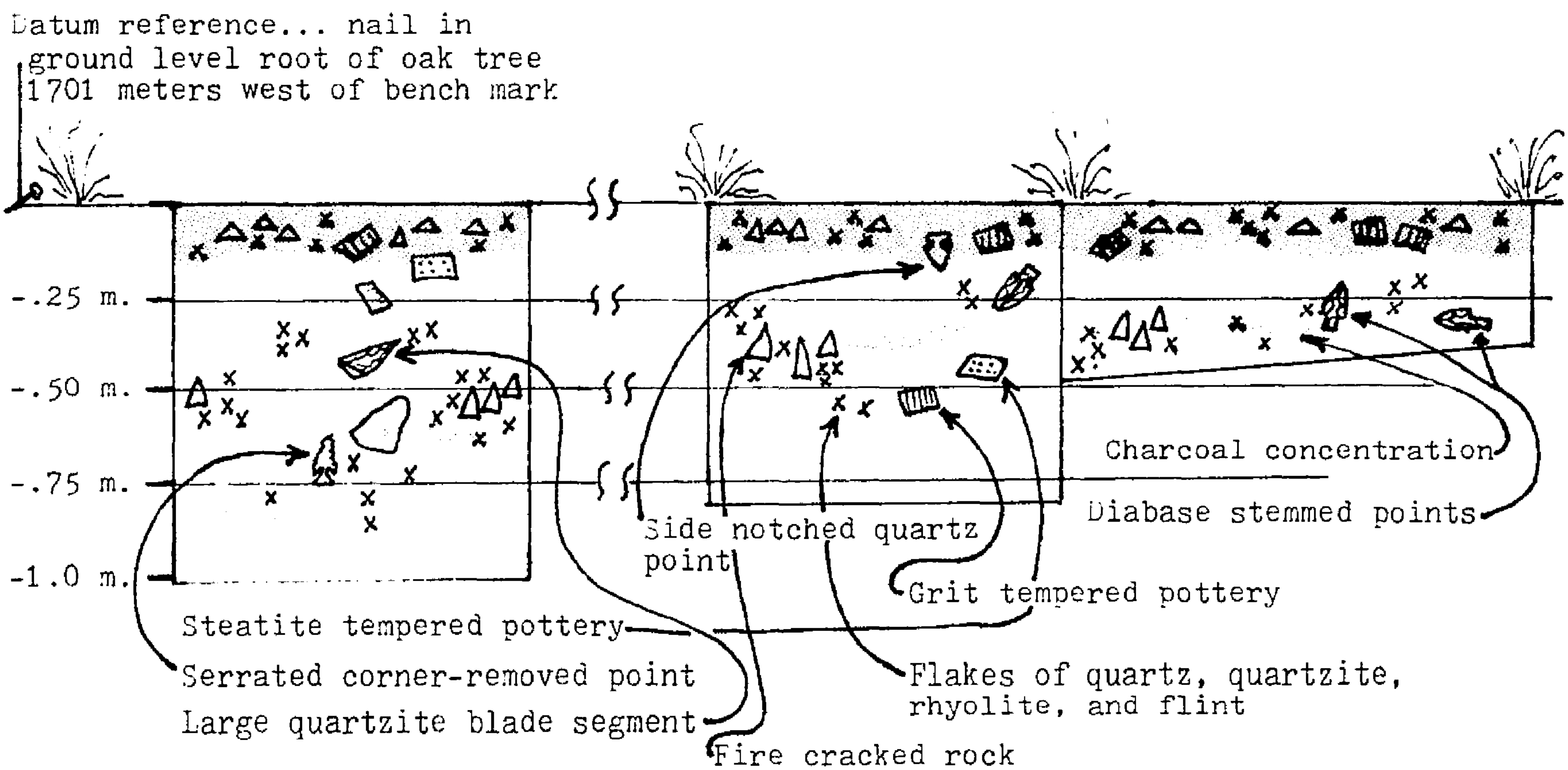


Fig. 11 Bank sections at the road cut adjacent to the Franklin site 1701 meters west of the bench mark on Lowes Island, Virginia.

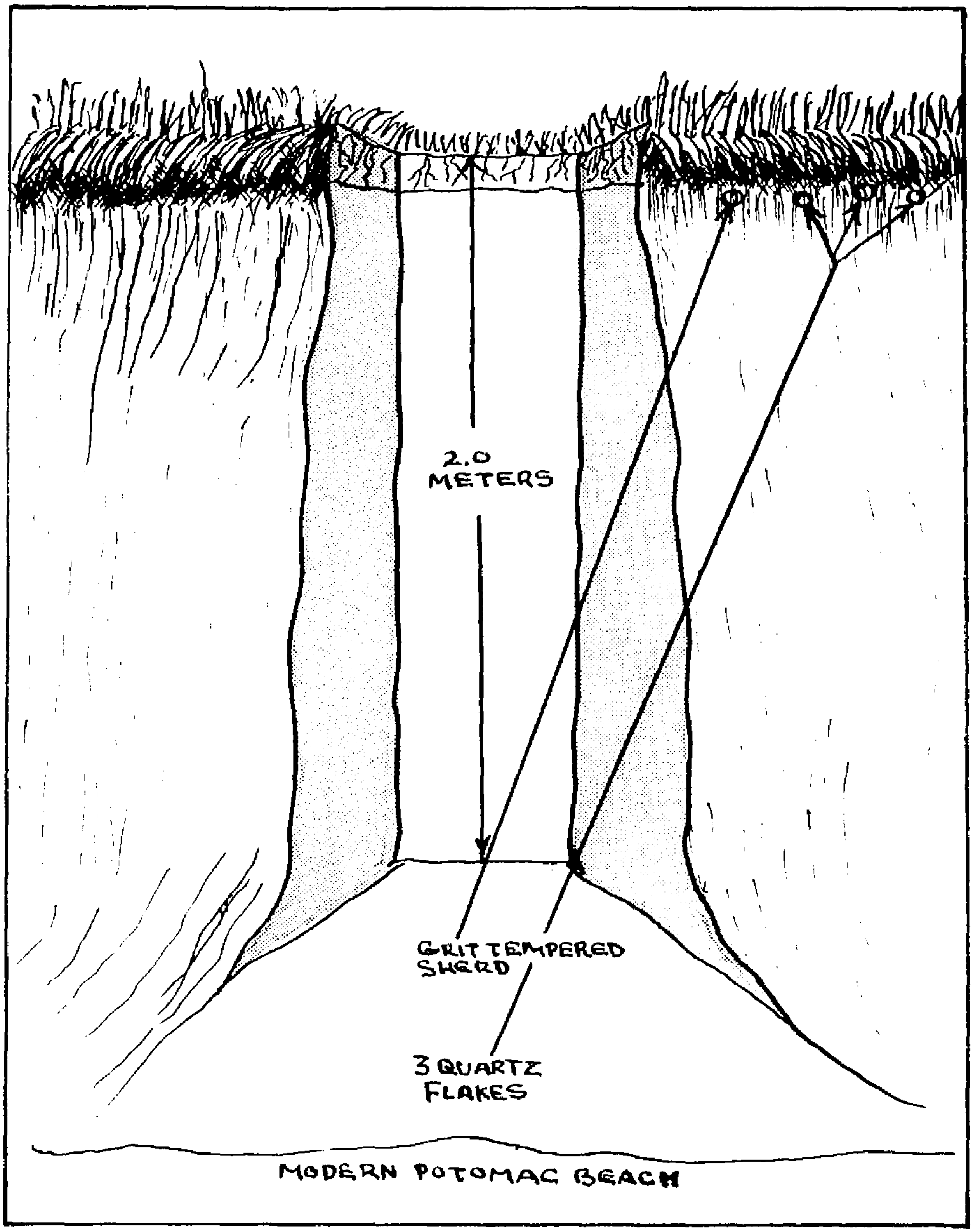


Fig. 12 Potomac River Bank Section, Mc Carty Isl.

Fig. 13a.	Item a.	Quartz stemmed point
	Item b.	Quartz stemmed point
	Item c.	White flint stemmed point
	Item d.	Tan quartzite stemmed point or knife
	Item e.	Tan quartzite stemmed point or knife
	Item f.	Rhyolite stemmed point
	Item g.	Tan quartzite stemmed point or knife

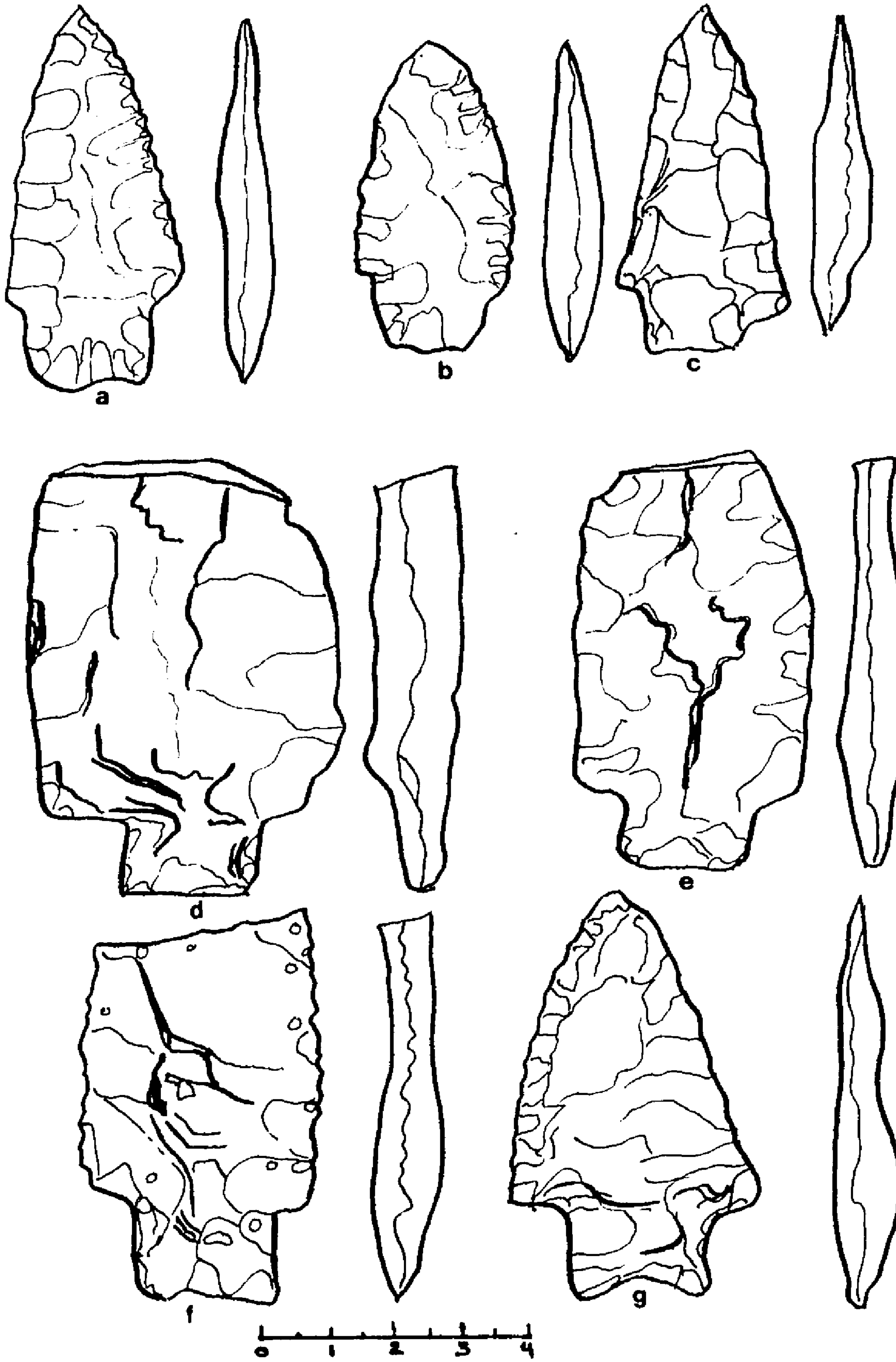


Fig. 13a. Representative Projectile Points From the First Levee of Lowes Island, Virginia.

Fig. 13b.

Item h. Quartzite stemmed point
Item i. Quartzite stemmed point
Item j. Rhyolite stemmed point
Item k. Quartz contracting stem point
Item l. Quartz contracting stem point
Item m. Quartz contracting stem point
Item n. Quartz contracting stem point
Item o. Quartz contracting stem point
Item p. Quartz lobate stemmed point
Item q. Quartz corner removed point
Item r. Quartz corner removed point

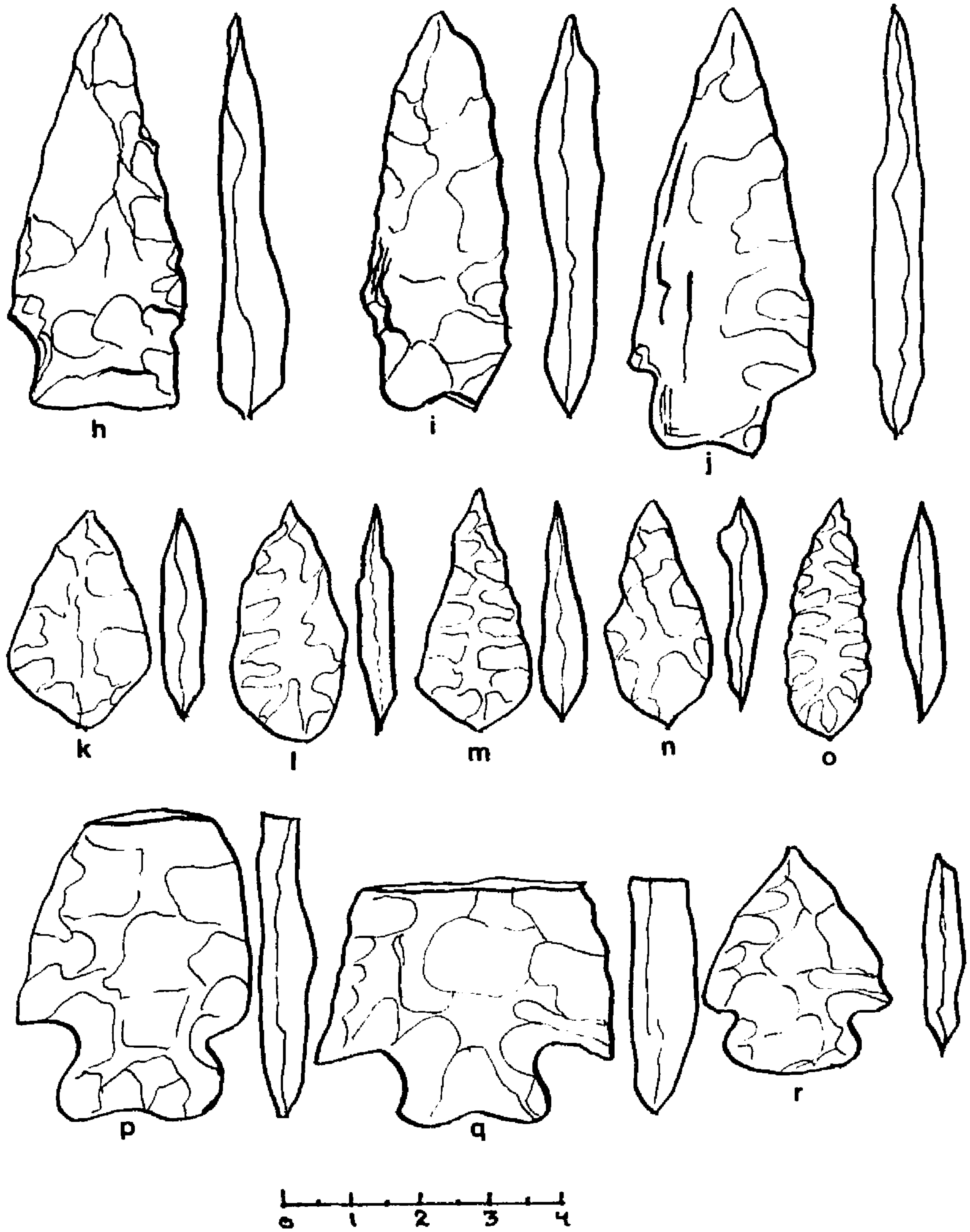


Fig. 13b. Representative Projectile Points From the First Levee of Lowes Island, Virginia.

Fig. 13c.
Item s. Quartz corner removed point
Item t. Rhyolite stemmed point
Item u. Jasper corner removed point
Item v. Black flint corner removed point
Item w. Quartz corner removed point
Item x. Quartz corner removed point
Item y. Quartz corner removed point
Item z. Quartz corner removed point
Item aa. Quartz corner removed point
Item bb. Quartz corner removed point
Item cc. Quartz corner removed point
Item dd. Quartz stemmed point
Item ee. Quartz stemmed point
Item ff. Quartz stemmed point
Item gg. Quartz side notched point
Item hh. Quartz side nothced point
Item ii. Rhyolite side nothced point
Item jj. Silicified slate side notched point

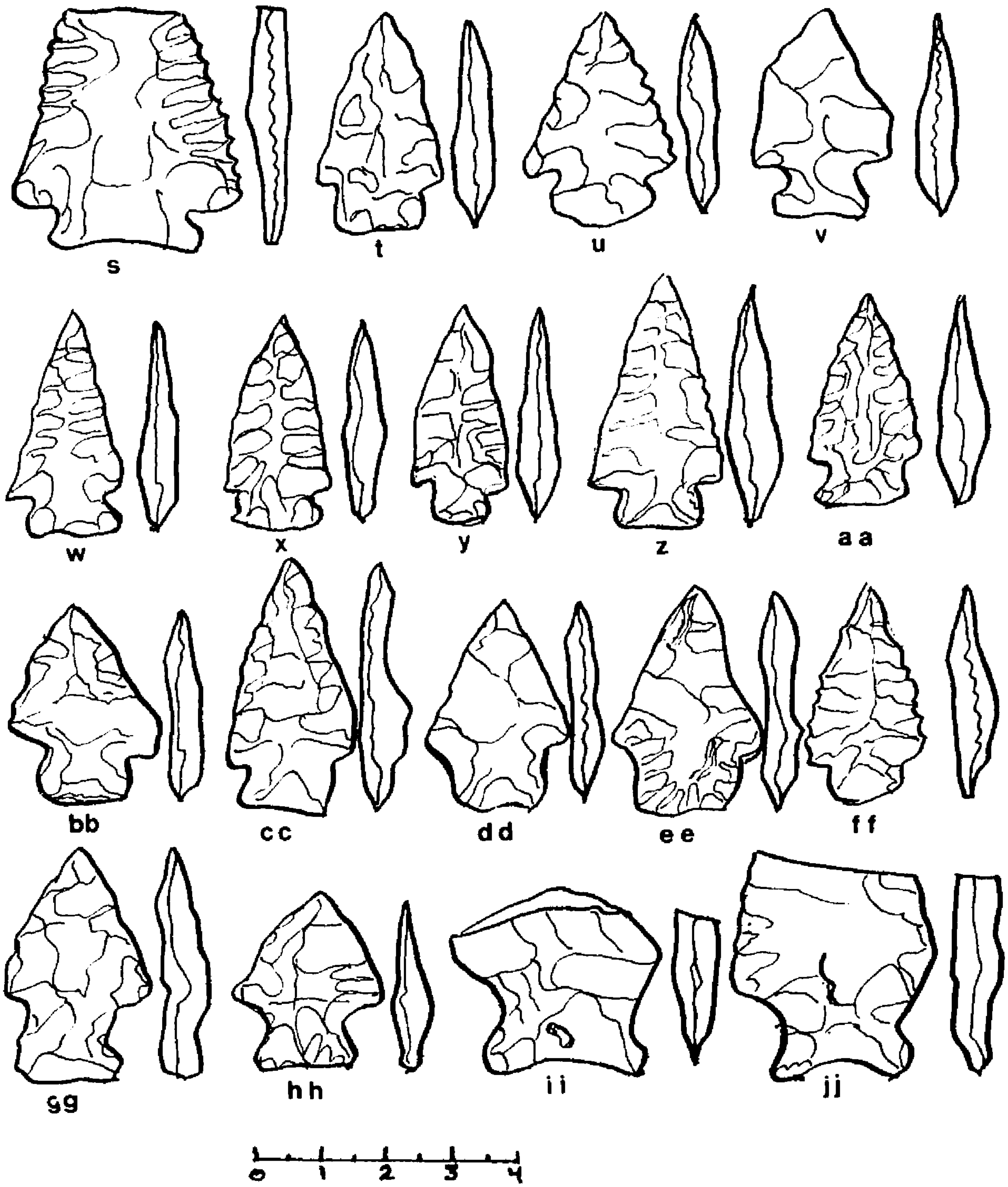


Fig. 13c. Representative Projectile Points From the First Levee of Lowes Island, Virginia.

Fig. 13d. Item kk. Quartz side notched point
Item ll. Rhyolite side notched point
Item mm. Rhyolite side nothced point
Item nn. Pink flint side notched point
Item oo. Quartz side notched point
Item pp. Quartz side notched point
Item qq. Quartz side notched point
Item rr. Rhyolite side notched point
Item ss. Quartz corner removed point
Item tt. Quartz bifurcated base point
Item uu. Rhyolite triangular point
Item vv. Black flint triangular point
Item ww. Quartz triangular point
Item xx. Quartz triangular point

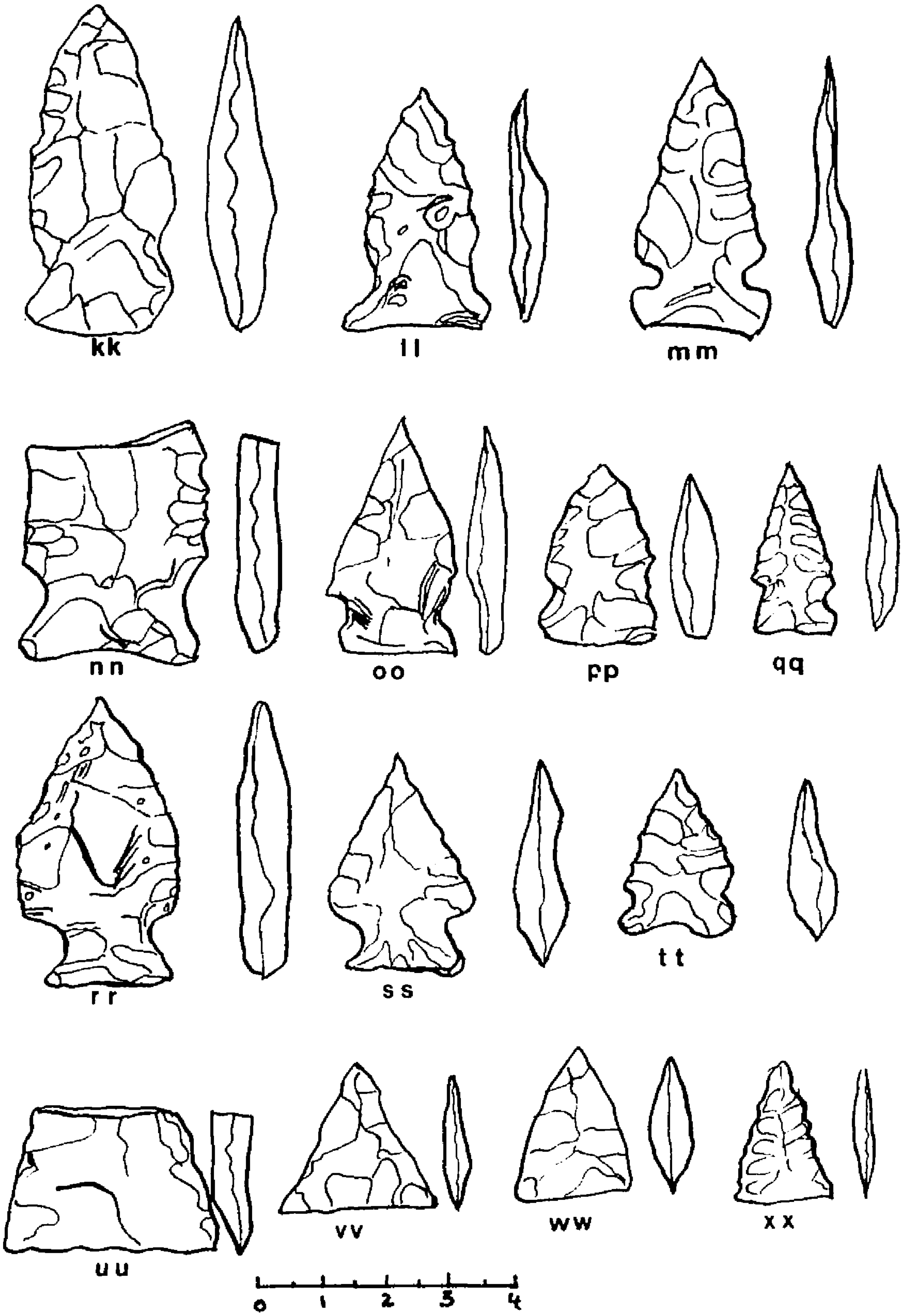


Fig. 13d. Representative Projectile Points From the First Levee of Lowes Island, Virginia.

Fig. 14a. Item a. Rhyolite ovate base point
Item b. Rhyolite ovate base point
Item c. Quartz ovate base point
Item d. Black flint ovate base point
Item e. Quartz corner removed point
Item f. Quartz stemmed point
Item g. Quartz ovate base point
Item h. Black flint bifurcated base point
Item i. Quartz bifurcated base point
Item j. Quartz corner removed point
Item k. Quartz stemmed point

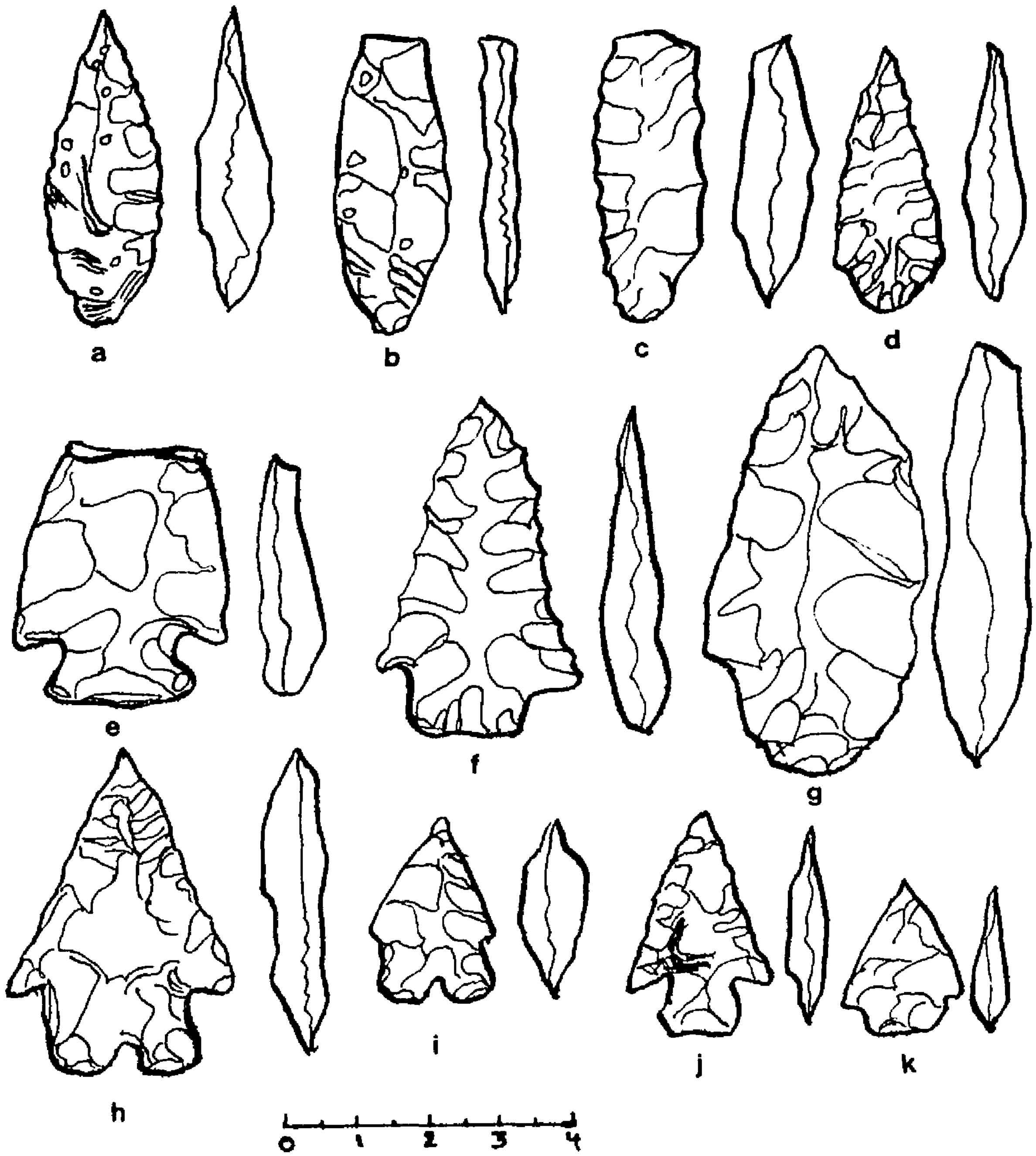


Fig. 14a. Representative Projectile Points From the Second Levee of Lowes Island, Virginia.

Fig. 14b. Item l. Quartz triangular point
Item m. Quartz triangular point
Item n. Quartz triangular point
Item o. Quartz triangular point
Item p. Quartz triangular point
Item q. Quartz triangular point
Item r. Quartz triangular point
Item s. Rhyolite "drill"
Item t. Quartzite stemmed point
Item u. Quartzite stemmed point

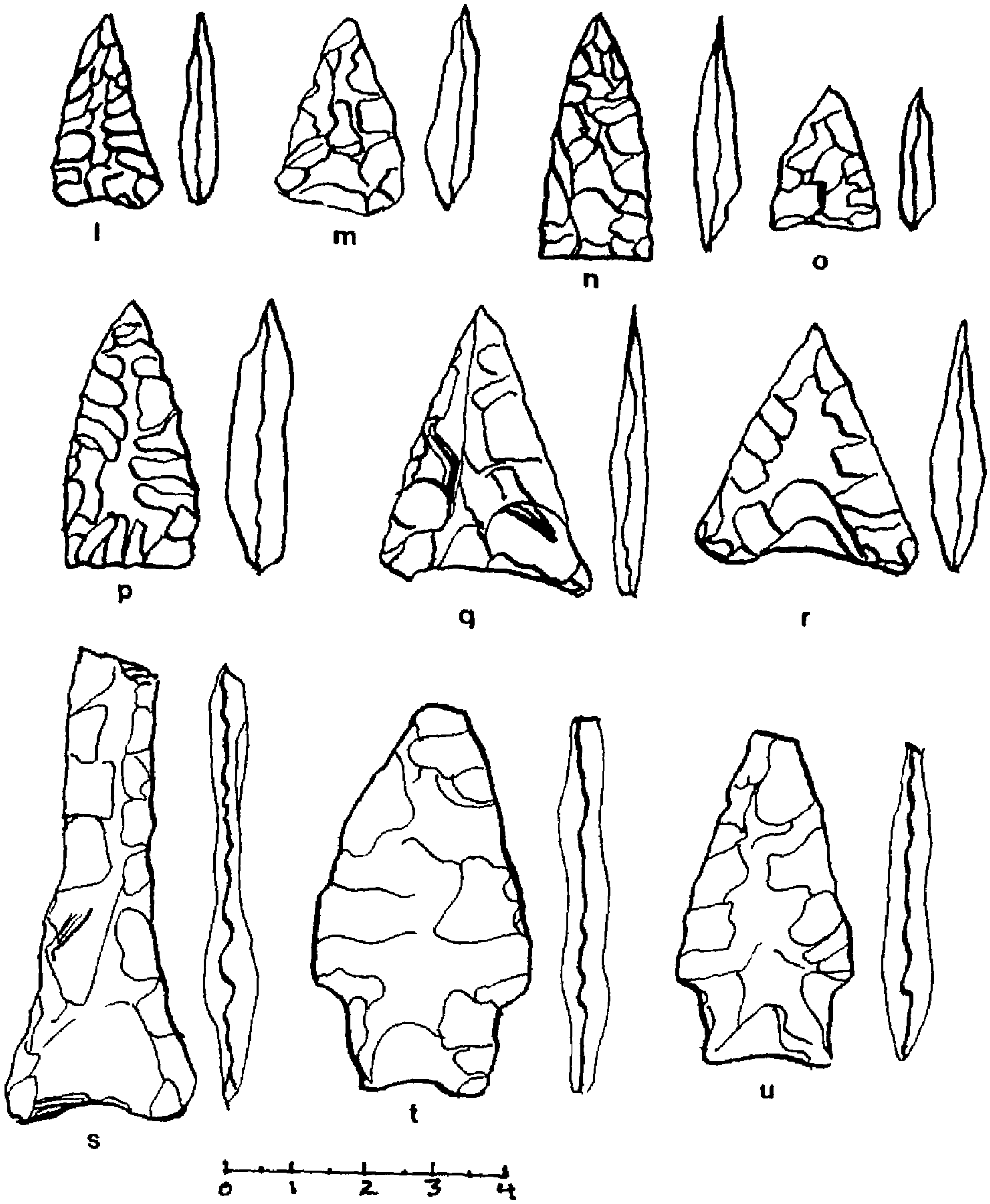


Fig.14b. Representative Projectile Points From the Second Levee of Lowes Island, Virginia.

Fig. 15a. Item a. Quartz side notched point
Item b. Quartzite stemmed point
Item c. Rhyolite "drill"
Item d. Quartz ovate base point
Item e. Quartz corner removed point
Item f. Banded agate corner removed point
Item g. Unknown material corner removed point
Item h. Red jasper fragment of fluted point
Item i. Quartz ovate base point
Item j. Quartzite stemmed point or knife
Item k. Quartz contracting stem point

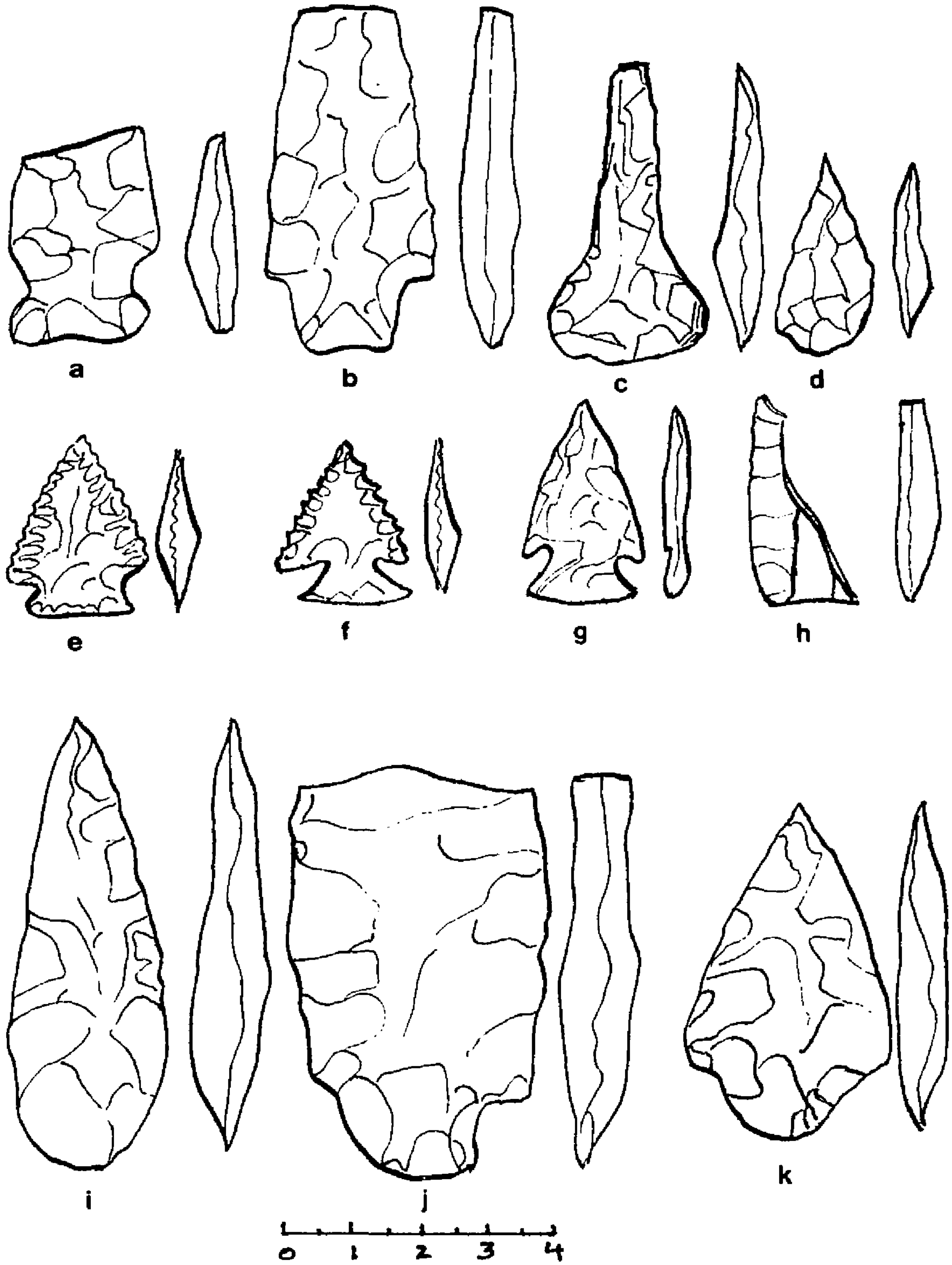


Fig. 15a. Representative Projectile Points From the Fourth Levee of Lowes Island, Virginia.

Fig. 15b. Item l. Quartzite stemmed point
Item m. Quartz triangular point
Item n. Rhyolite corner removed point
Item o. Quartz stemmed point
Item p. Silicified slate stemmed point
Item q. Quartz stemmmed point
Item r. Quartz corner removed point
Item s. Quartz corner removed point
Item t. Quartz corner removed point
Item u. Quartz corner removed point

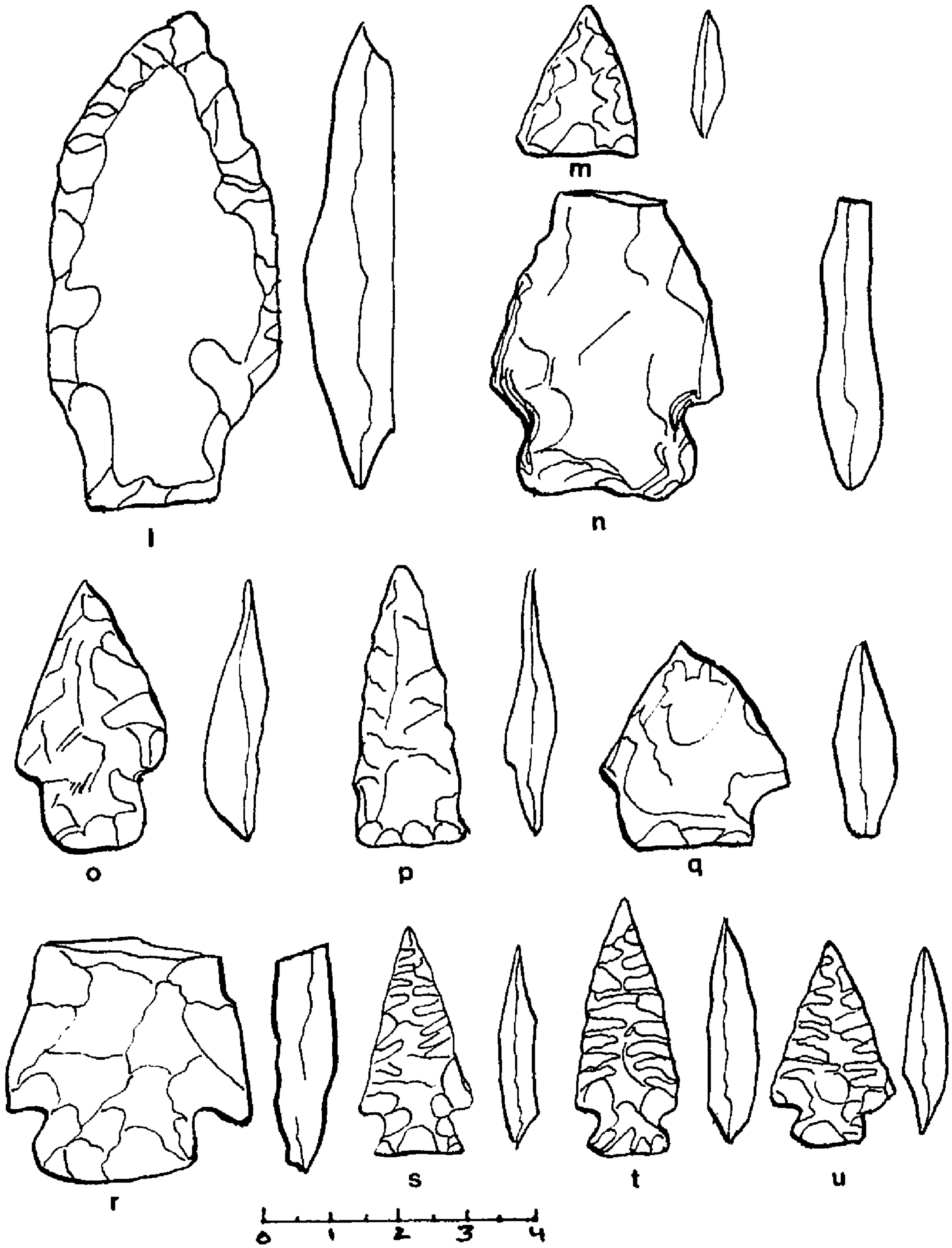


Fig.15b. Representative Projectile Points From the Fourth Levee of Lowes Island, Virginia.

Fig 16a.	Item a.	Quartzite stemmed point
	Item b.	Quartzite stemmed point
	Item c.	Quartz triangular point
	Item d.	Quartz side notched point
	Item e.	Contracting stem point (chert ?)
	Item f.	Quartz stemmed point
	Item g.	Quartz bifurcated base point
	Item h.	Chert blade or point
	Item i.	Rhyolite side notched point
	Item j.	Rhyolite bifurcated base point

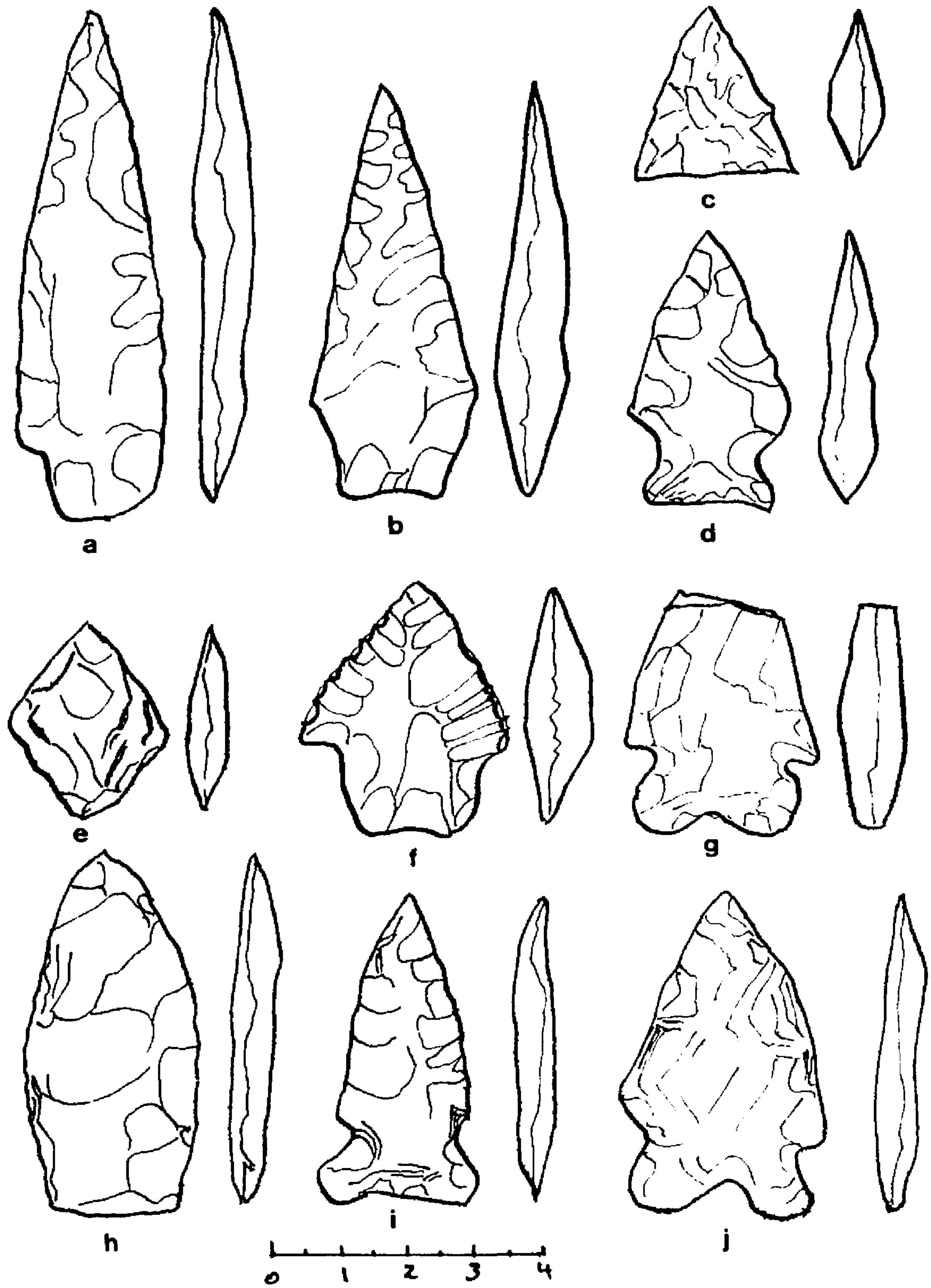


Fig. 16a. Representative Projectile Points From the Fifth Levee of Lowes Island, Virginia.

Fig. 16b.	Item k.	Argillite contracting stem point
	Item l.	Rhyolite contracting stem point
	Item m.	Argillite contracting stem point
	Item n.	Quartz side notched point
	Item o.	Quartz ovate base stemmed point
	Item p.	Quartz stemmed point
	Item q.	Quartz stemmed point
	Item r.	Quartz stemmed point
	Item s.	Rhyolite side notched (?) point
	Item t.	Quartz contracting stem point
	Item u.	Quartz contracting stem point
	Item v.	Quartz contracting stem point
	Item w.	Quartz contracting stem point
	Item x.	Quartz bifurcated base point
	Item y.	Red jasper corner removed point

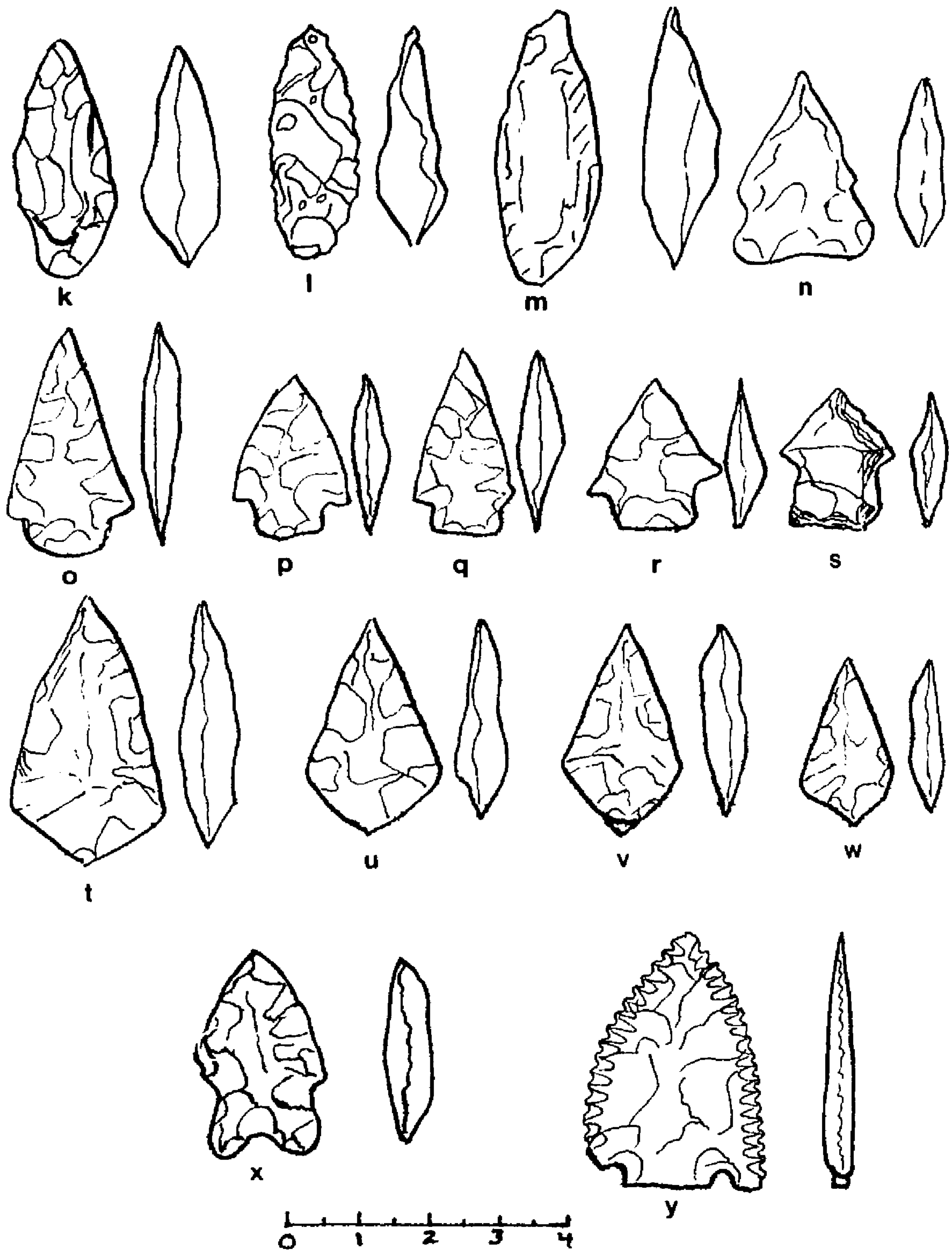


Fig. 16b. Representative Projectile Points From the Fifth Levee, Lowes Island, Virginia.

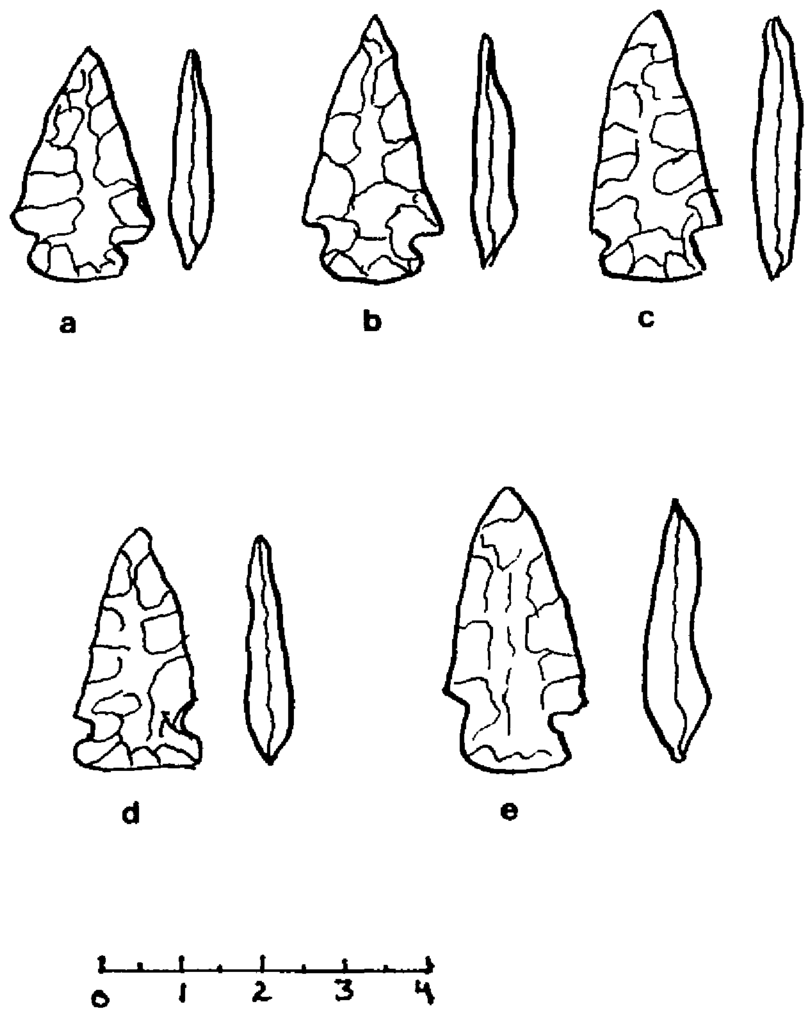


Fig. 17 Quartz Corner Removed Projectile Points
From Lowes Island, Virginia.

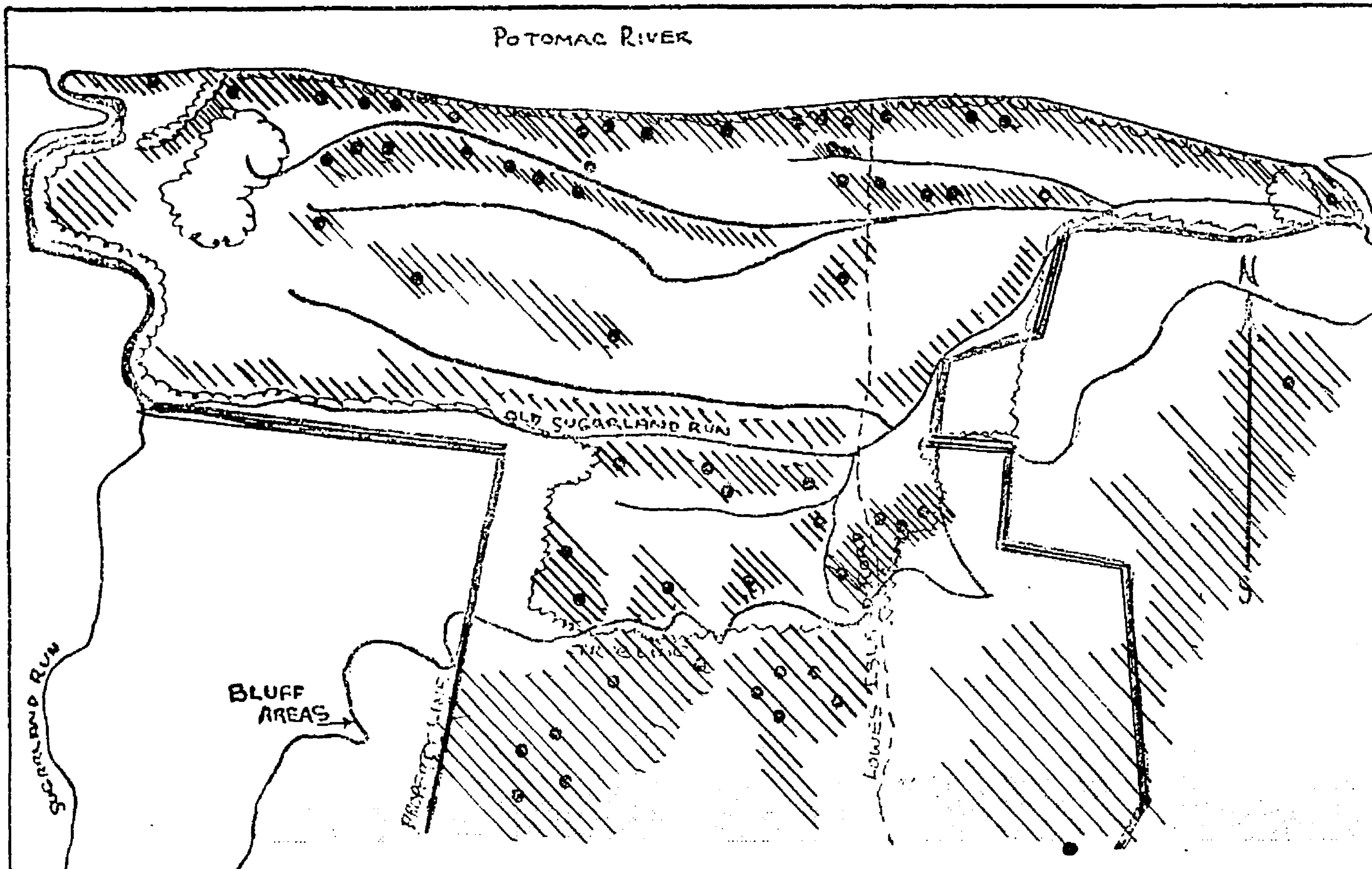


Fig. 18 Lowes Island, Virginia with Predictive Model of Settlement Zones Marked with Cross Hatching.

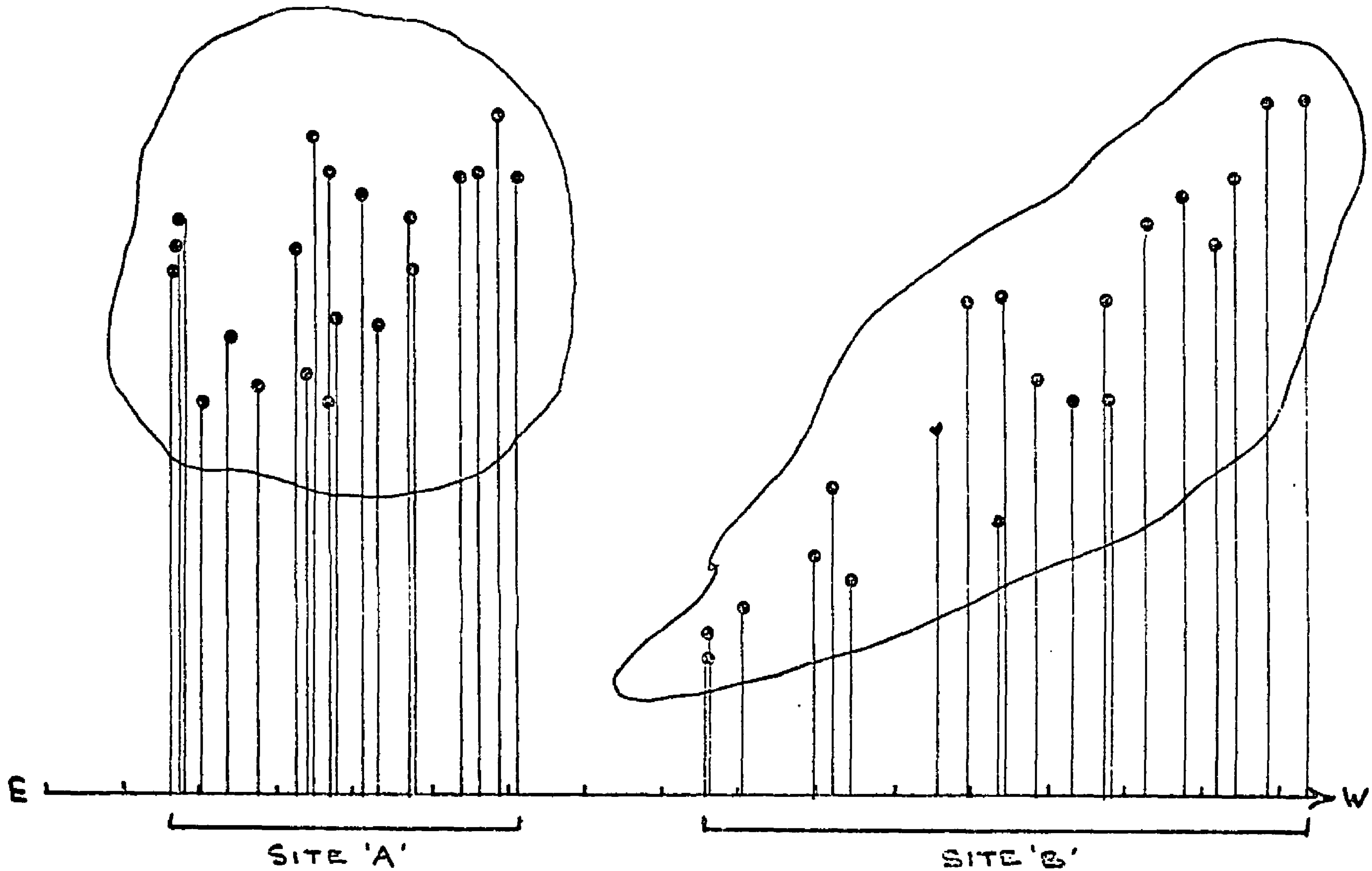


Fig. 19 Site size and alignment bias demonstration when major axis of measurement is aligned with natural features or with an arbitrary map alignment.

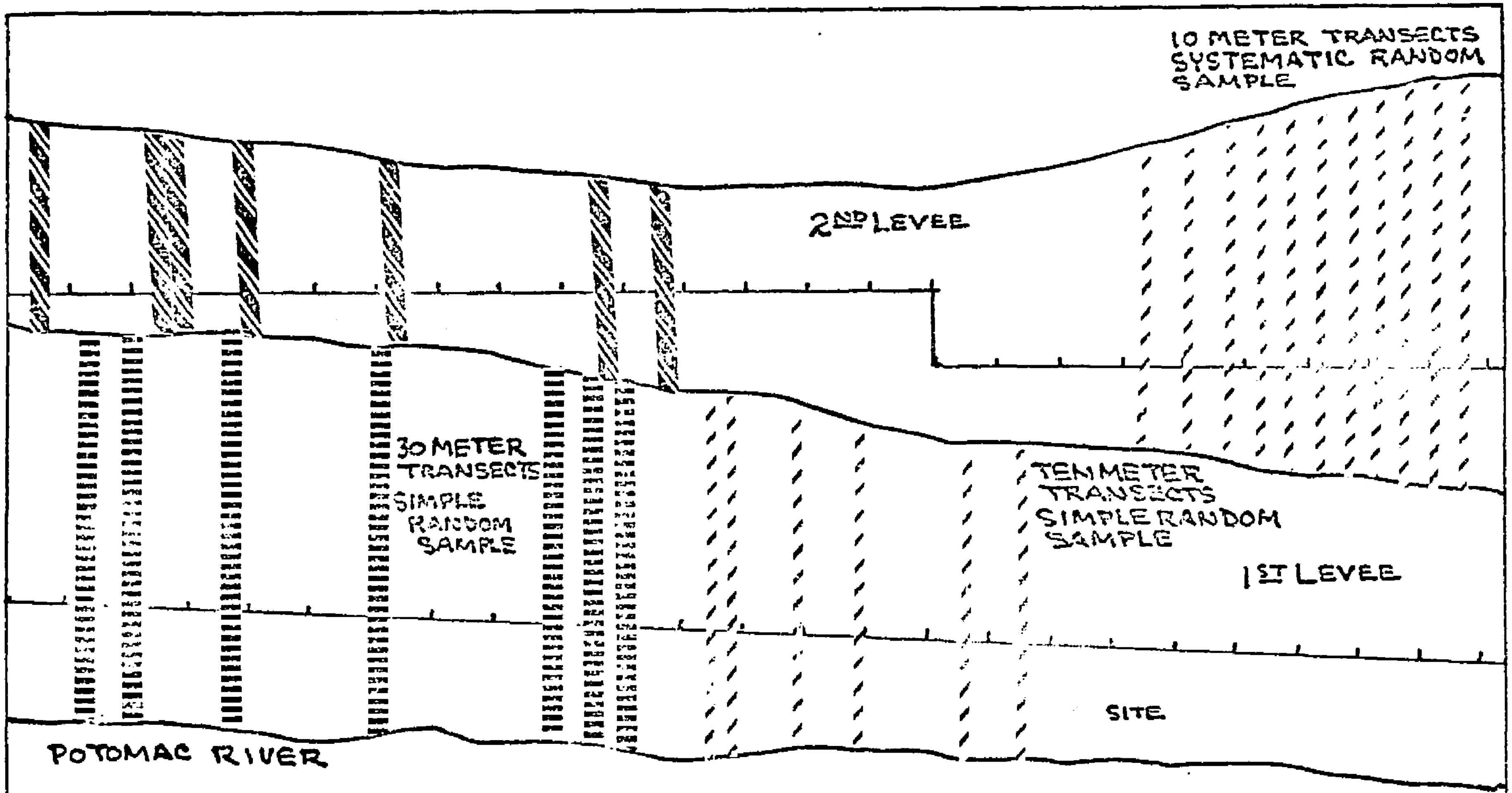


Fig. 20 Schematic diagram of probability sampling process

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