APPENDIX A

PEDO-ARCHAEOLOGY OF THE PUNCHEON RUN SITE

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ABSTRACT

This report discusses the pedology, geomorphology, and chemistry of soils, landscapes, and archaeological features at Puncheon Run. The report is divided into two sections: the first section deals principally with physical attributes of the site, and the second deals with chemical attributes. All investigations were designed to address two primary objectives: 1) to develop a general model of site formation processes; and 2) to facilitate interpretations of subsurface cultural features through applications of pedological characterization methodologies. Field studies were conducted over the course of the 1997 and 1998 seasons, and although both primary objectives were operative during the entire study, efforts were prioritized differently for each of the years. Whereas the elucidation of soil genesis and site formation received the greater emphasis during the first year of work, examinations of specific archaeological features were the chief focus for the second year. To a substantial extent this division of emphasis is duplicated through the partitioning of the report. Archaeological features receive some attention in the first section with respect to physical compositions and morphologies, but since soil chemical investigations were undertaken almost exclusively for the benefit of feature explication, the great majority of the second section concentrates on features. As a lesser component of the second section, chemical properties are also discussed within the broader context of cultural influences registering across an entire landscape.

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PART 1: SOILS, GEOMORPHOLOGY, AND SITE FORMATION

I. INTRODUCTION

Addressed in this section are the origins and compositions of soils and landscapes distributed across the widely ranging area of the Puncheon Run Site. Concentrating primarily on the natural variables that define the site's soil and landscape relationships, this section also examines cultural influences ranging in scale from such landscape-wide effects as historical tillage to the point-specific disturbances of prehistoric pits. Recognizing that the existing association of soils, landscapes, and environment represents only the latest stage of a long-evolving site history, investigations were chiefly focused on assessing the available evidence of the site's paleogeographic record. To this end, efforts were directed toward examinations and analyses of soil and geomorphic features for indications of landscape stability, buried surface levels, deposit types, deposit ages, and environmental conditions. Subsurface pit features were also studied for indications of possible origin and function.

As soil profiles represent an integration of the variables of land, climate, and time, interpretations of soil profile development are fundamental to paleogeographic analyses. Derived from the progressive climate-dependent weathering of geologic parent materials over time, soil profile characteristics provide tangible records of the past. Because soil profiles owe many of their properties to weathering processes acting during extended intervals of relative landscape stability, the degree of soil profile development may be related to duration of deposit stability, and where sufficient subsoil development has occurred, can suggest approximate ages for deposits. Where most of the main factors of soil genesis are at least roughly definable, the tendency for soil formation to follow pathways normally culminating in predictable horizonation sequences provides a means of establishing chronostratigraphic markers, even in situations where only truncated remnants of soil profiles remain in the stratigraphic column. Hence, within the context of soil-landscape relationships, soil profiles may be interpreted as indicators of depositional histories, erosional intervals, land surface ages, and environmental conditions.

II. METHODS

Several methods of investigation were employed in the study, including on-site field examinations supported by reviews of available maps, as well as laboratory analyses of soil particle size distributions. Field efforts were of primary importance and entailed pedestrian surveys of the project landscapes, together with detailed observations of soil profiles exposed either by archaeological excavations, backhoe trenches and blocks, or hand auger borings. The site was visited a number of times during the course of the 1997 and 1998 field seasons. This allowed for mutually supportive pedological and archaeological interpretations throughout the phased investigations of the three site loci. Those soil profiles selected for detailed characterization were described in accordance with standard (NCSS, NRCS) techniques and nomenclature for the field description of soils. The compiled descriptions are given in Attachment A.

Particle size analyses were determined for soil samples collected from natural profiles as well as from subsurface features of potential cultural origin. The sampled soil profiles were selected either because they were considered representative of main soil types or because they occurred in close proximity to subsurface features also chosen for sampling. Particle size analyses entailed determination of silt and clay by the hydrometer method (Gee and Bauder 1986) and measurements of sand by sieve fractionation. Soil particle size data are provided in Attachment B.

III. GEOLOGIC SETTING

The Puncheon Run Site is located in central Delaware within the Coastal Plain physiographic province that composes all but the northernmost portion of the state. Geographically, the site lies within the mid-drainage zone of the lower Coastal Plain region, in which landscapes generally lie at elevations of less than about 12 meters and occupy the middle stretches of eastward-flowing stream systems draining toward Delaware Bay. Geologic materials in the region consist of variously textured unconsolidated sediments derived from both marine and fluvial sedimentation. In the study area, marine deposits are restricted to fairly deep depths, and the surficial deposits in which the soils and landscapes are formed are considered to be of fluvial and terrestrial origin. These surficial deposits are identified mainly as the Columbia Formation of Pleistocene age, which is extensive throughout much of the Delaware Coastal Plain and consists largely of stratified sand and gravel.

Columbia deposits were laid down by an ancient system of rivers whose flow and discharge patterns were influenced by the climatic variations of the Pleistocene glacial cycles. Based on the coarseness of the Columbia deposits, which indicate strong flow velocities with high sediment transport competence, Jordan (1964) has speculated that most Columbia materials were amassed during and near the ends of glacial advances, with little or no deposition occurring during the more stable interstadial periods. Some of the sands and gravels in northern Delaware may even have been directly transported by glacial meltwaters, but such an intimate glacial linkage is not likely for Columbia deposits in the central and southern portions of the state. Most Columbia sediments probably date well into the Pleistocene, and even though early Holocene deposits, particularly those of fluvial origin, are not normally distinguished from the much more prevalent Columbia sediments, ages for most of the Columbia materials are well in excess of 30,000 years. Varying greatly in thickness across the state, Columbia sediments in the South Dover area extend to depths corresponding to elevations on the order of about 8 to 10 meters below sea level (Johnston 1973). With a base at this elevation, the thickness of the Columbia Formation at the Puncheon Run Site would accordingly range from about 10 to 15 meters.

Although the bulk of the Columbia sediments are likely to be of mid-Pleistocene age, few if any of the existing land surfaces formed in these deposits would be of similar antiquity. Rather, most of the region's landscapes and surfaces should be viewed as considerably younger, with origins largely attributable to processes acting well after the emplacement of the Columbia sediments. Erosional actions, directed by such forces as climate, vegetational changes, alterations in stream base levels in response to varying sea levels, and perhaps even tectonic movements of land masses, have acted on the Columbia sediments through subsequent multiple periods of the Pleistocene as well as the Holocene. Gross erosional processes have combined with stream valley alluviation and near-surface soil reworking by a host of pedoturbational agents to generally limit the ages for most of the region's landscapes to a late Pleistocene through Holocene time frame.

Among the most important considerations for landform genesis in coastal areas of the Middle Atlantic region are the effects of the Pleistocene cycles of falling and rising sea levels accompanying glacial advances and retreats. Coastal Plain sediments of the regional uplands are for the most part distributed across a series of elevationally stepped terrace surfaces generally associated with former Pleistocene sea level stands. These surfaces were formed either as cut terraces or as terrace levels abandoned by rivers shifting and down-cutting in response to the changing base level of the sea. Even though they have often been partially reshaped by local tectonic, erosional, or alluvial processes during subsequent periods of the Pleistocene or Holocene, the major geomorphic surfaces associated with the sea level cycles are recognizable over great lengths of the Atlantic Coastal Plain. They occur not only in the vicinity of the study area, but also in neighboring states to the north and south of Delaware. The entire sequence of these terraces is seldom present across any single landform continuum, but their several levels are so distinctively bracketed within specific ranges in elevation that four major geologic terraces can be consistently recognized from region to region.

Based on their elevational ranges, the four major terrace levels of the Atlantic Coastal Plain have been assigned designations that commonly carry from state to state. The lowest and youngest of these landforms is normally identified as the Pamlico. Restricted to elevations of less than about 7 meters, the Pamlico surface is considered mainly of late Pleistocene age, but may also include deposits of Holocene origin. Rising above the Pamlico to achieve a height range between 7 and 14 meters is the Talbot terrace level, which is believed to date well into the Pleistocene. Much more ancient Pleistocene terrace levels include the Wicomico, which ranges between the elevations of about 18 and 28 meters, and the oldest Sunderland terrace which, at elevations typically ranging between 30 and 60 meters above modern sea level, does not occur in Delaware. Based on the above scheme, the Puncheon Run landscape is contained mainly on the mid-Pleistocene Talbot surface, but at its easternmost end falls to a level more compatible with the late Pleistocene Pamlico surface.

IV. PEDOLOGICAL CONSIDERATIONS

Instability of upper soil horizons during the Holocene is of particular interest for the large expanses of the Delaware Coastal Plain, where sandy soil textures predominate. Sandy soils are among the most susceptible to pedoturbational disturbance, and relative to more loamy-textured soils are subject to greater frequencies of reworking by such landscape-wide agents as eolian mobilization of sand, or more localized mixing related to pedoturbation. Eolian sand deposits are extensive in Delaware and are principally derived from the winnowing of previously water-lain Columbia or later sediments. Windblown sand is, of course, found along modern coastlines, but it is also abundant over inland positions of the central Delmarva Peninsula, where the deposits may exhibit dunal forms marking relic dune fields or former Pleistocene beachlines (Denny and Owens 1979). Much more commonly, inland eolian sands occur as widespread sheet deposits that may thinly mantle land areas kilometers in extent. Indeed, the leveling effect of the eolian sand deposits is among the factors contributing to the vast areas of nearly level terrain typical of southern Delaware.

Soils formed wholly or partly in eolian sand are common in central and particularly southern Delaware. Such sandy soils as the Evesboro and Klej series are major soils in both Sussex and Kent counties, where these eolian-influenced soils together account for nearly 200,000 acres covering roughly 35 percent of Sussex County and two percent of Kent County (Ireland and Matthews 1974; Matthews and Ireland 1971). Other soils, such as Rumford and Kenansville, are also likely to have at least a minor eolian sand component, so that as much as 50 percent of Sussex County and perhaps about six percent of Kent County have been significantly affected by wind-driven movements of sand.

Major periods of eolian sand mobilization in humid temperate regions typically correspond to drier climatic intervals when fluctuating stream flows and diminishing vegetative cover promote the availability of eolian sand from such potential sources as exposed river bars or bare soil areas on the land. Several comparatively dry periods are known to have occurred during the Holocene, and some, like the altithermal or xerothermic sub-boreal period about 2,000 to 4,500 years ago (Dent 1979), were probably significant enough to have left a patchy eolian imprint distributed over a nearly continental scale. In addition to the abundance of eolian sand on the Delmarva Peninsula, non-coastal deposits of Holocene-age eolian sand have been recognized at a number of locations throughout the southeastern Coastal Plain (Markewich and Markewich 1994). Many of these were linked to an available source of sand such as an adjacent river, and more locally Blume (1995) was able to identify several significant periods of eolian sand mobilization during the Holocene at archaeological sites within the James Branch watershed in Sussex County, Delaware. Undoubtedly, a number of widespread droughty periods, as well as more localized intervals of instability perhaps exacerbated by other contributing agents, such as fire or plant disease, have given rise to eolian activity at many locations during the Holocene. Thus, where sandy soils are present, the possibility of multiple eolian impacts on landscapes and environmental settings should be considered in assessing not only prehistoric settlement patterns but also the postdepositional disposition of artifacts.

Eolian-induced landscape instability would obviously be limited to locations where sandy soils or other sources of sand are available for wind mobilization, and as discussed above such locations are abundant in central and southern Delaware. Where deposits of eolian sand are present, they can be recognized based on stratigraphic or pedogenic discontinuities within soil profiles, as well as by a very distinct particle size tendency skewed toward the finer sand fractions. Pebbles and coarser sand fractions too large to be transported by wind would not normally be present in deposits that have undergone significant eolian sorting.

Sandy soils are highly susceptible to an assortment of pedoturbational disturbances, even where eolian action has not been a significant factor in site formation processes. In a discussion of regressive pedogenesis, Johnson and Watson-Stegner (1987) summarized 10 major categories of pedoturbational processes, ranging from simple climate-driven mechanisms to more exotic actions, such as meteor impact. Two of the 10 categories from this spectrum, floral and faunal, are by far the most significant non-eolian agents active in very sandy soils. Principal among the floral agents is tree-fall. Long known to be a major factor in forest soil disturbance, tree-falls have been studied by numerous investigators. Depending on site conditions, studies have found that this single mechanism of soil churning is capable of reworking upper soil layers across an entire landscape at frequencies ranging from every several thousand years (Brewer and Merritt 1978; Mueller and Kline 1959) to, in extreme cases, as often as every few hundred years (Denny and Goodlett 1956).

Soil is also disturbed by the actions of animals. Such disturbances can vary from the dramatic mixing produced by large burrowing animals to the much more subtle, but, in the long-term, often more significant modifications caused by insects. For instance, studies in the Upper Midwest found that ants were capable of producing landscape-wide surface changes by bringing soil to the surface at rates ranging from roughly 1 centimeter per century (Hole and Nielson 1970) to a high of 15 centimeters per century (Salem and Hole 1968). Within prehistoric time frames, either of these amounts could obviously have an appreciable effect on the postdepositional context of artifacts by accomplishing substantial soil mixing as well as site burial.

The degree of soil development exhibited by a very sandy soil is usually no more than weak to moderate, even given a prolonged weathering age. The reason for this is two-fold. First, very sandy soils are normally highly siliceous, and with a scant weatherable minerals content, many soil genetic pathways are retarded within a fabric heavily dominated by relatively inert quartz mineralogy. Second, the higher rates of pedoturbational destructive actions in very sandy soils are more able to overwhelm or neutralize the progressive development of horizons that in finer-textured, more stable soils would otherwise proceed to more advanced stages. Recognizing reworked surficial zones as a trait variably characteristic of all soils, Johnson (1993) has applied the concept of biomantle to the upper zone of a soil profile in which regressive pedoturbational processes tend toward profile simplification. In many medium- to fine-textured soils this zone might be only a few centimeters thick, but in sandy soils biomantle zones tens of centimeters in thickness would usually be more typical. Thus, with comparatively resistant mineralogies and thick biomantles, sandy soils seldom exhibit advanced soil development, even when parent materials were originally derived as long ago as the Pleistocene.

V. SOILS, GEOMORPHOLOGY, AND FEATURES OF LOCUS 3

A. SITE SETTING

The Locus 3 portion of the Puncheon Run Site is distributed across two landforms that together compose a peninsula bounded by the St. Jones River to the east and north and Puncheon Run to the south. As previously discussed, the two landforms occur in a stepped topographic sequence typical of many landforms along the Atlantic Coastal Plain. Most of the site area is distributed across a Coastal Plain upland composed of Columbia deposits and falling within the elevational range usually assigned to the mid-Pleistocene Talbot surface. A lower-lying terrace more closely associated with the St. Jones River valley forms the easternmost portion of the peninsula and can probably be correlated with the Pamlico terrace of late Pleistocene or perhaps very early Holocene age. Most of this lower terrace's nearly level to gently sloping surface is situated between the elevations of about 3 to 5.5 meters. Along the St. Jones River and Puncheon Run shorelines, as much as 3 to 4 meters of this elevation is gained via scarps produced by past undercutting actions of the two streams. Landward, the terrace surface rises gently to the west, where it then joins with the Coastal Plain upland across a moderate (five to six percent) slope, which climbs to the upland surface elevation of somewhat more than 8 meters. This slope spanning the transition between the two forms covers a lateral range of about 70 meters, and within this broad transition zone materials of mixed origin but generally dominated by Columbia sediments are present. Where the upland borders the waters of the St. Jones River to the north or more extensively along the Puncheon Run valley to the south, its edges are defined by slopes that steeply fall to the near-sea level elevations of the adjacent waters and wetlands. Westward, the upland encompasses both Loci 1 and 2, and then continues to range beyond the site limits, where it becomes the principal regional landform.

The eastern and northern edges of the lower terrace are defined by a meander of the tidal floodplain of the St. Jones River. This floodplain has changed greatly over time due to the natural effects of a rising sea level as well as to historical modifications. Supporting a melange of marshland and mud flats, and coursed by a channel artificially straightened by the U.S. Army Corps of Engineers, the valley floor adjacent to the Puncheon Run Site now bears little resemblance to its predominant form during the Holocene. Through most of the Holocene the stretch of the St. Jones River valley adjacent to the site supported a strictly freshwater fluvial system. Envisioned within a generalized reconstruction for this freshwater Holocene river system would be an actively migrating channel, ranging across a low-lying, variably swampy floor contained within a broad (300 to 500 meters), steep-walled valley that had been largely shaped during the last marine transgression of the Sangamonian interstadial period. Before the latest encroachment of tidal conditions, much of the river's action during the ensuing Wisconsinan glaciation and the Holocene probably involved erosion and removal of tidal sediments emplaced by the previous marine intrusion.

Even before the drastic meander cut-off by the U.S. Army Corps of Engineers channelization project early in the twentieth century, shifts in flow and sedimentation had already brought changes to the St. Jones River. Greatly increased rates of sedimentation resulting from historical land clearing, agricultural erosion, and development are so common to Coastal Plain rivers that, except for the artificial dredging, the river's channel can assumed to have been much reduced from its original depth. Silting in of the channel and burial of the former valley floor had, however, already begun by the late Holocene. As a consequence of the rise in sea level, sluggish flows retarded by the higher regional base level, together with the eventual introduction of tidal sediments, would have so increased riverine and pallustrine sedimentation that it would have substantially change the environment around Puncheon Run. Kellogg and Custer (1994) have reported roughly 4 meters of such sediments dating to about 2,000 years before present (BP) from core samples collected in and adjacent to the St. Jones River, approximately 1 kilometer downstream from Puncheon Run. Other than the formation of increased areas of marsh and swamp habitat produced by the accumulation of these sediments, as well as the introduction of slightly brackish water, it is also apparent that the river previously coursed at a level well below the modern one. Thus, where shoreline scarps 3 to 4 meters in height now define the eastern rim of the site, prior to the very late Holocene the site landscape would have loomed twice as high (7 to 8 meters) above the river.

B. SOILS OF THE LOWER TERRACE

Most of the archaeological efforts in Locus 3 were focused on the lower terrace, and the bulk of the Locus 3 pedological examinations were also concentrated on this landform. In addition to walk-by examinations of a number of excavation units (EU) and the shallow excavations of six blocks, a total of 13 soil profiles were described in detail as exposed in excavation units, backhoe trenches, hand auger borings, or along a borrow pit wall. Seven soil profiles were sampled for laboratory determination of soil particle size distributions. Also, five subsurface pit features (25, 30, 32, 37, and 38) were examined and sampled.

The detailed examinations revealed similar well-drained soils developed in coarse-textured deposits consisting of 1 to 2 meters of sandy material atop underlying gravels. As would be expected for soils formed in a sandy parent material, subsoil development is mostly weak to moderate. Upper subsoil horizons (E- and BE-horizons) are typically dark yellowish brown (10YR 4/4-4/6) loamy sand grading into weakly developed, slightly clay-enriched argillic (Bt-) subsoil horizons of strong brown (7.5YR 4/6) light sandy loam or sandy loam at depths ranging from about 40 to 60 centimeters. Below the argillic horizons, textures again coarsen to become yellowish brown (10YR 5/6) to brownish yellow (10YR 6/6) sand normally within a depth of about 1 meter, which is underlain by similarly colored gravelly sand at variable depths.

Soils of the lower terrace are distributed between two closely similar types of subsoil argillic horizons differing mainly in texture. Representative profiles of these two types are shown in Figure A-1. As stated above, argillic horizon textures range mainly from sandy loam to light sandy loam, and most of the soils examined on the terrace contained the heavier of these two similar textures as shown in the profile for EU 127 in Figure A-1. One soil profile (Profile 5 in Attachment A) even had an argillic horizon texture of light sandy clay loam. Otherwise, the argillic horizon texture for a subordinate group of soils is only light sandy loam (EU 58 of Figure A-1). There may be some tendency for the lighter-textured argillic horizons to occur slightly deeper in the solum, but regardless of subsoil texture in only one instance (Profile 1 in Attachment A) was the top of an argillic horizon observed to be below the 40- to 50-centimeter depth range typical throughout the terrace.

Laboratory analyses of soil particle size distributions closely support the field observations. As shown in Figure A-2, the cumulative particle size distribution graphs for the six control profiles demonstrate that soils across the terrace are coarse and fall predominantly within the loamy sand and sandy loam textural classes. These data also substantiate the weak to moderate degrees of soil development in the terrace soils. Each profile contains clay-enriched Bt- subsoil horizons, although the more weakly developed Bt-horizons in some (Feature 25 Control) do not contain sufficient clay increases relative to adjacent horizons to taxonomically qualify as argillic. Nevertheless, the exhibited degrees of subsoil formation, particularly that of the more prevalent type, demonstrate a prolonged period of relative subsoil stability.

Although soil development on the lower terrace is only weak to moderate, it is sufficiently advanced to evince a landform age approaching or reaching into the Pleistocene. As discussed previously in this report, strong development is seldom characteristic of weathering-resistant and frequently disturbed sandy soils, and the observed degree of both clay and iron enrichment in the subsoil can actually be considered fairly substantial given the sandy parent material. In addition, there are no known geomorphic events of the Holocene that could have produced such a pronounced terrace landform in the central Delaware region. Thus, the

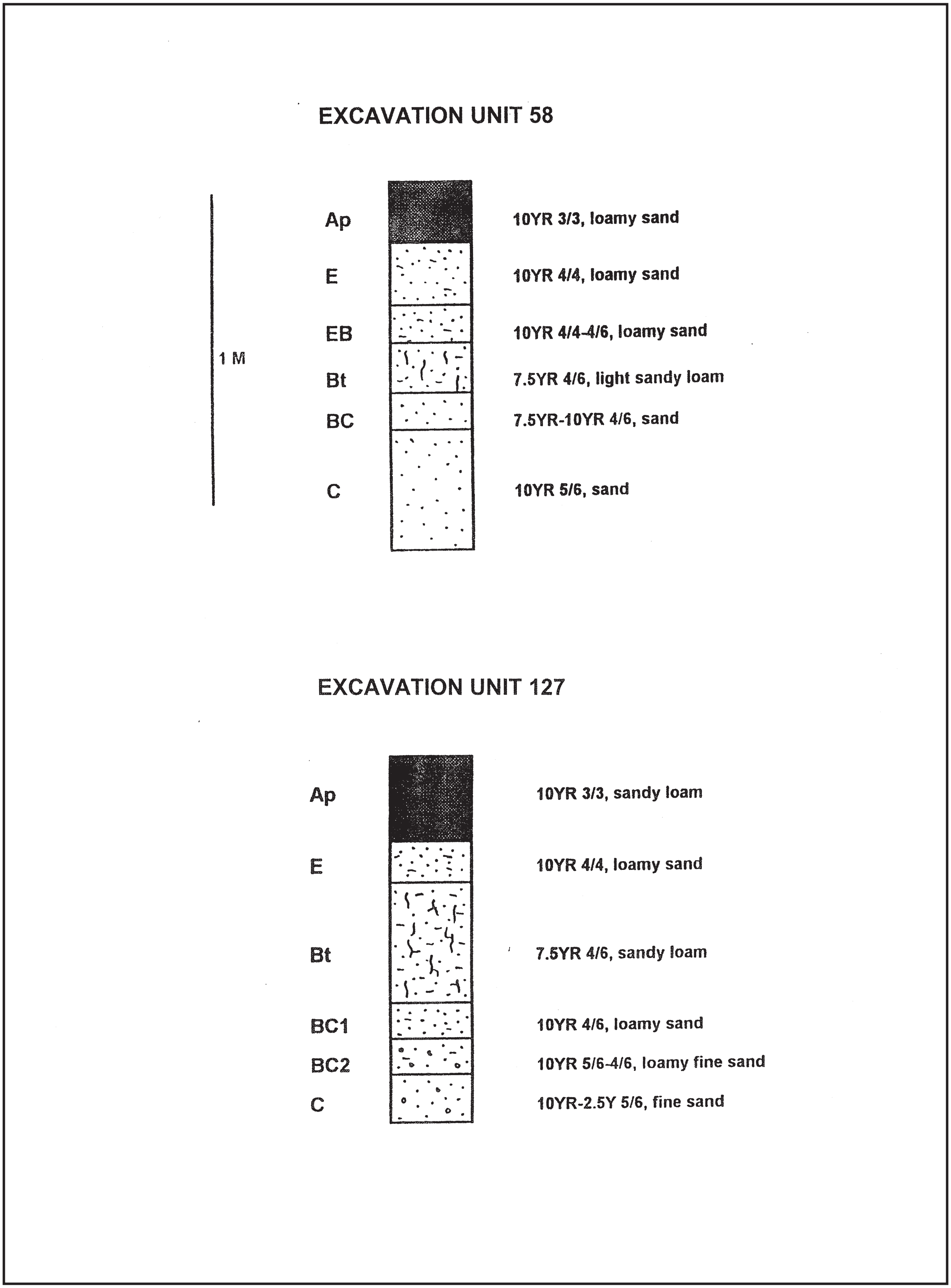


FIGURE A-1: Soil Profiles Representative of the Two Similar Soil Types on the Lower Terrace of Locus 3

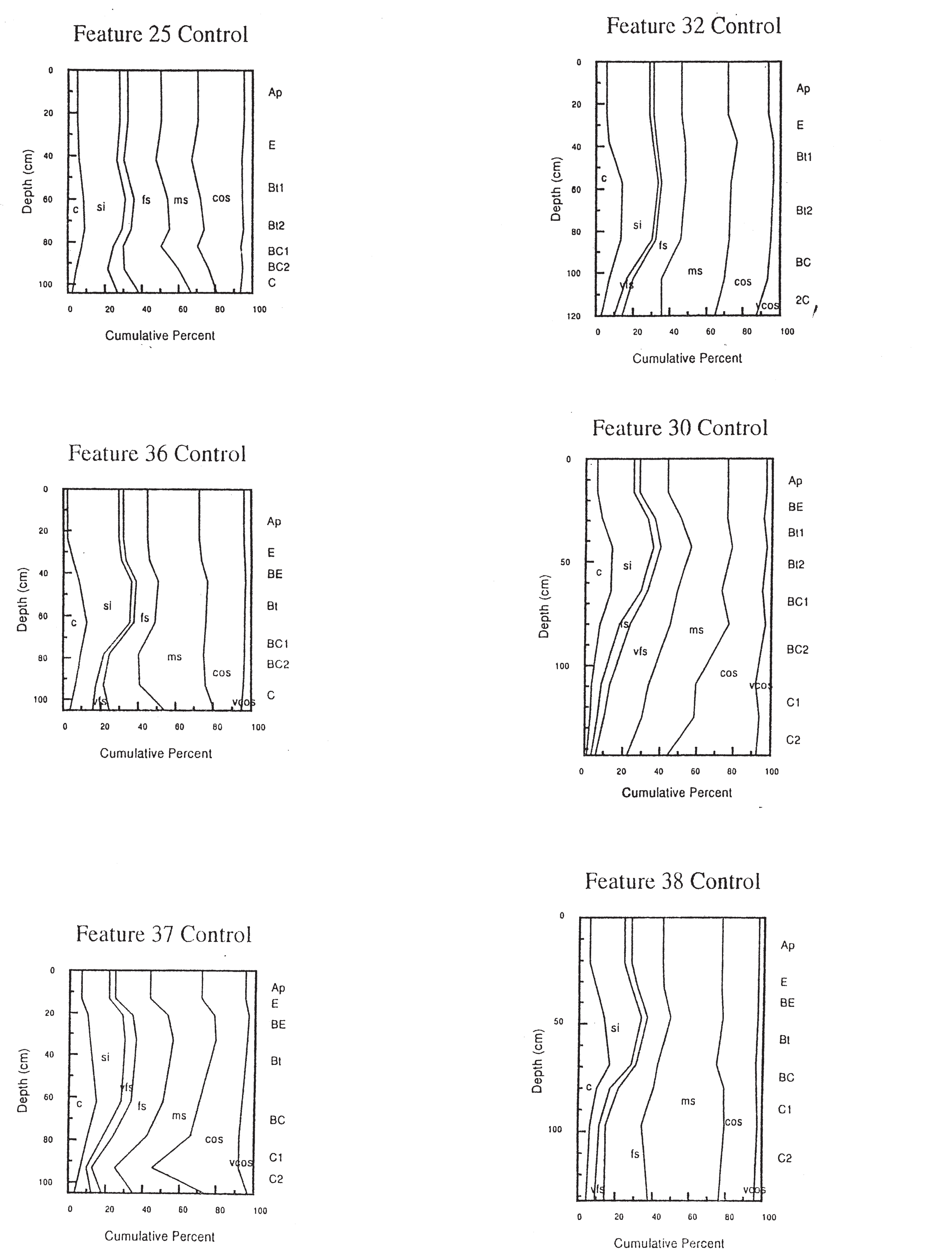


FIGURE A-2: Distributions with Depth of Soil Particle Size Fractions in the Six Control Profiles of Locus 3

terrace is likely to have been formed at some time during the Pleistocene, possibly when flow volumes were greater or perhaps under conditions of higher sea level that would have raised the base flow of the St. Jones River. Subsequent to the eventual exposure of the landform as a terrestrial surface, processes of erosion, soil weathering, and mixing worked on the terrace deposits. The combination of time-driven progressive soil development, moderated by genetically regressive pedoturbational disturbances account for both the limited degree of soil formation, as well as the relatively narrow range of soil conditions now present across the terrace.

Based on field estimates of soil textures, as well as the more definitive laboratory data for particle size distribution, eolian activity has probably only minimally affected the soils of the lower terrace. Separate sand fractions within the upper horizons do not exhibit the trend toward finer sizes that would be expected for soil materials subject to appreciable sorting by wind. In field determinations of soil texture, medium-size sands were estimated to be dominant, with as much coarse sand present as fine sand. Laboratory data depicted in Figure A-2 actually demonstrate an even coarser material, in which coarse sand particles (cos) are more predominant than fine particles (fs). Additionally, small pebbles and occasionally gravels up to several centimeters in diameter were scattered throughout most levels of nearly every examined soil profile. Pedoturbational mixing could account for this to some degree, but the predominance of particles too large to be readily transported by wind is strong evidence against a major eolian influence on the site. Nor, as should be recognizable with eolian burial, did field examinations or laboratory particle size analyses identify any discontinuities either in lithologic composition or genetic horizonation within the artifact-bearing zones of any of the profiles. Some minor, highly localized eolian reworking cannot be ruled out, and, given the sandy nature of the soil parent material, almost surely occurred at some points, particularly once the land was cleared for historical agriculture. However, soil profile characteristics suggest that any eolian sorting that might have occurred prehistorically would very likely have been a much less significant site formation process than either floral or faunal pedoturbation.

Estimating deposit ages and artifact distribution potentials solely on the basis of soil development in such sandy soils as those of the lower terrace is problematic. The fact that all of the examined profiles, except for those associated with obvious recent disturbances or subsurface features, contained argillic subsoil horizons suggests that most of the terrace deposits below an average depth of about 50 centimeters have been largely stable for a considerable length of time. Given the probable low weatherability of the parent mineralogy, the time since materials at argillic horizon levels were last destabilized by some major event is probably as distant as the early Holocene or more likely the late Pleistocene, when periglacial climatic conditions would have been conducive to landscape instability. Levels above the average depth of 50 centimeters would thus constitute the active biomantle in the terrace soils, and these layers are likely to have been reworked multiple times since the early Holocene.

The degree of contextual integrity for any artifacts in the upper biomantle zone above argillic horizons could be highly variable. In some instances, subsurface artifacts could be reasonably intact and even vertically distributed in a chronostratigraphic sequence, whereas only a short distance away artifacts from more than one occupation could be thoroughly intermingled in the same level. Unless associated with a particularly deep disturbance, few artifacts should be found at argillic horizon levels. Where argillic horizons are intact, the suggested late Pleistocene or early Holocene age would limit any artifacts in these horizons to those of Early Archaic or previous occupations. The stronger probability, however, is that intact argillic horizon levels have been stable since before the earliest humans arrived in the area and would accordingly be culturally sterile.

C. SOILS OF THE COASTAL PLAIN UPLAND

Soils over the upland portion of Locus 3 were described in detail at five points by means of four hand-auger borings (Profiles 6, 9, 12, and 13) and a single archaeological excavation unit (Profile 10, EU 109). These examinations revealed soils that were more strongly developed as well as more variably textured than those of the lower terrace. The degrees of subsoil development in the upland Coastal Plain soils can be considered typical for soils of the central Delaware region and range from moderate to strong. Each of the examined profiles contained well-developed argillic horizons of strong brown (7.5YR 4/6 or 5/6) color and textures typically in the range of heavy sandy loam to sandy clay loam. Argillic horizon textures of sandy loam and loam were also encountered. Upper horizons (Ap-, E-, and BE-horizons) overlying the argillic horizons were mainly of sandy loam or loam texture, and the average combined thickness of these biomantle horizons was more on the order of 40 centimeters, rather than the 50-centimeter thickness of the lower terrace soils. Lower subsoil horizons and substrata beneath the argillic horizons are considerably more variable than the those of the river terrace soils and were found to range from sand and gravelly sand to finer textures of loam and, in one unusual case, clay. Where the southern edge of this landform plunges sharply toward Puncheon Run, gravels are widely scattered over a surface that because of its steep slope should be considered geomorphologically unstable.

As with most well-drained upland settings occupied by moderately to strongly developed soils, archaeological interpretations are relatively straightforward. Although the degree of soil development varies somewhat across the landscape, this is primarily a reflection of variability in the Columbia sediments that serve as the soil parent material. Where not limited by an excessively coarse parent material, the typical degree of subsoil development across the upland is advanced enough to indicate that the surface has been largely stable since the Pleistocene. As will be discussed in subsequent portions of this report, this is also the case for Loci 1 and 2, which are entirely contained on the upland.

Natural soil disturbance is less of a factor in the potential distribution of artifacts in the Coastal Plain upland soils than in the lower terrace soils. Generally more loamy in texture than the terrace soils and lacking a fine sandy surface mantle to even suggest an appreciable eolian component, soils of the upland exhibit even less evidence of eolian activity than the meager indications in the terrace soils. Thus, any surface disturbances in the upland soils would be limited to the usual amounts related to natural pedoturbation and erosion or historical plowing. Since the more loamy soils of the upland would not be as susceptible to these processes as the sandy soils of the lower terrace, prehistoric artifacts should be contained within a thinner biomantle. Most artifacts should therefore be concentrated in the plowed surface (Ap-) horizons, but could also extend into underlying eluvial (E-) horizons where these layers are present. Minor artifact concentrations may tail off through upper transitional (BE-) horizons but should generally not continue into argillic horizons, which are typically encountered at the average depth of about 40 centimeters.

VI. CHARACTERISTICS OF ARCHAEOLOGICAL FEATURES IN LOCUS 3

A. BLOCK 4, FEATURE 25

In appearance, this feature was discernible as a large (about 3 meters long, 0.5 meters wide), arcuate stain in planar view, and with a depth variably extended into and below the argillic horizon level to as much as 1 meter below the natural surface. In contrast to adjacent undisturbed subsoil horizons, the homogeneous soil material of the feature had properties more similar to those of upper soil horizons. Unlike the strong brown (7.5YR 4/6) and yellowish brown (10YR 5/6) colors of adjacent argillic and lower transitional (BC-) horizons, the dark yellowish brown (10YR 4/4-4/6) color of the feature material was like that of the upper E- and BE-horizons in nearby intact Profile 7. Similarly, the light sandy loam texture of the feature is more compatible with E- and BE-horizons than with the heavy sandy loam of the adjacent argillic horizon. Hence, the feature material is not only distinctly different from intact adjacent subsoil horizons, but seems to have also derived largely from near-surface materials that entered presumably by wash-in filling.

Characteristics of the feature are consistent with some type of disturbance origin. Although some natural undulations in the thickness of the combined A-E-BE- upper horizons is normal, a penetration of these horizons to a depth as great as that of the feature base would be far beyond the 30- to 60-centimeter thickness range typical for the terrace soils. Stronger evidence of disturbance is offered in cross-sectional views of the feature, which along both excavated trenches revealed disruptions of lower subsoil horizons that on opposing sides of the feature were well matched. These characteristics leave little room to doubt that the feature is some form of disruption imposed upon subsoils that had otherwise been previously stable for some thousands of years.

Morphological properties of the feature are not, however, sufficient to positively identify the specific type of disturbance agent responsible. Homogeneity of the feature matrix would tend to argue against tree-fall as the cause, since discrete materials mixed from several horizon types are usually identifiable in tree-fall disturbances. It is possible that in a very old tree-fall pit different materials could eventually become well blended, but the roughly 1-meter depth of the feature in comparison with the 0.5-meter average biomantle thickness for the terrace would place the feature well beyond the norm for such a disturbance. Thus, the leading contenders for producing the feature would seem to be either human or large animal agency.

Soil morphology alone as a basis for distinguishing between these two agents would not normally be very reliable, however, in this case some evidence leans to at least a partial contribution by a large burrowing animal. As exposed on the east wall of the southern bisectional trench, an intact argillic horizon extended nearly 0.5 meters laterally over the feature. This would be much more consistent with animal burrowing than human pit excavation and demonstrates that at least part if not all of the feature was derived from animal rather than human activity. A more mixed origin in which the animal burrowing was simply opportunistic reuse of an abandoned human excavation cannot be discounted, nor, conversely, can human modification of a former animal burrow be ruled out.

B. FEATURE 30 BLOCK, FEATURES 30, 37, AND 38

Three features and three control profiles, all located within a few meters of each other, were examined and sampled in this block area. As with all other locations, sampling of control profiles was by genetic horizon increments. Features were sampled based on fill morphology and feature size. For instance for Feature 30, one of the two large features, the core feature fill was morphologically homogenous and was sampled in 20-centimeter depth increments. The morphology of Feature 38, however, was somewhat more mixed, and sampling was in accordance with archaeological stratigraphic bodies. Sampling of the more shallow Feature 37 entailed two depth samples from the feature fill, as well as additional samples from underlying natural horizons.

Of all of the subsurface pit features investigated in the Locus 3 portion of Puncheon Run, only Features 30 and 38 were never in doubt as to their anthropogenic origins. Up to 3 meters in diameter and as much as 1.65 meters deep, these nearly adjoining pits were considered too large and symmetrical in shape to be compatible with any potential natural mechanism capable of creating subsurface pit features. In addition to being clearly manmade, other properties were suggestive of prehistoric age. These included near uniformity of the deep fill in Feature 30, as well as colors of 10YR 4/4 and 10YR 3/4 dark yellowish brown (that were only subtly different from control profile E- and BE-horizon colors of 10YR 4/4-4/6). Subsequently determined radiocarbon dates ranging from 1,300±80 to 4,480±60 BP confirmed the suspicion of prehistoric origin.

A characteristic also noteworthy for Features 30 and 38 is that segregations are possible between the main feature fills and peripheral deposits lining the features' edges. In both of these large features, discrete packets of upper subsoil horizon material consisting of strong brown (7.5YR 4/6) sandy loam occurred along the features' sides and bases, adjacent to extant substrata horizons of yellowish brown (10YR 5/6) sand or loamy sand. The amounts of vertical displacement were as much as 40 to 50 centimeters below the horizon levels from which the subsoil masses originated. This could have resulted from simple slumping, but the unmixed character of the subsoil bodies tends to argue against this, particularly in comparison to such thorough blending of the main feature fills beside them. Intentional placement, possibly for structural reasons, is equally plausible and perhaps more likely. The loose sandy substrata intercepted at the lower levels of each of the large pits would have been susceptible to almost immediate caving, and intentional packing of finer-textured soil materials against the sand would have been a means of preventing or slowing wall collapse. Furthermore, sufficient masses of displaced subsoil occur at the middle level of Feature 30, suggesting intentional benching, possibly for shelf support.

Demonstrations of the degrees of blending of the main fills in Features 30 and 37 are given in Figures A-3 and A-4. Whereas the distributions of soil particle size fractions show the normal depth trends in the control profiles, the fill materials are of highly uniform composition. This degree of textural uniformity (also exhibited by most chemical constituents) is particularly striking for the larger Feature 30 and has implications for the means by which the pit was refilled. Quite clearly, intentional refilling, unless repeated over numerous episodes of reuse, can be ruled out. It would not be reasonable to expect that such thorough blending could have been accomplished with immediate purposeful refilling after one or two uses of the pit. Rather, the data are more suggestive of pit abandonment followed by gradual filling in at a slow enough rate to allow complete bioturbational blending as new soil entered by wash-in or perhaps minor slumping.

Neither is slumping likely to have been a major contributor to the material that eventually composed the main fill masses of the features. Not only would appreciable slumping tend to operate against thorough blending, but it should also bias the mean textures of feature fills toward those of layers most susceptible to undermining and collapse. The data in Table A-1 argue contrarily that the great bulk of soil originally excavated from a pit's space in the end found its way back. This table comparing the textures of feature fills to the volume-averaged textures of those horizons originally occupying the spaces of the pits demonstrates essentially identical particle size distributions. Simply stated, it is apparent that, except for a minor replacement of silt for sand, the material that came out of the pits went back in, and, as discussed, was fully homogenized during the course of its reintroduction.

C. BLOCK 3, FEATURE 32

With respect to dimensions, Feature 32 is similar to Feature 37. Both are between 3 and 4 meters in diameter but are limited to depths of 50 and 45 centimeters, respectively. Unlike the deep features, a cultural origin for these shallow features is far from certain. As with the deep features, the fill material is well homogenized and has a color similar to the 10YR 4/4 dark yellowish brown to 10YR 5/4 yellowish brown coloration of the control profile E-horizon. This uniformity may again be suggestive of slow natural refilling more compatible with a prehistoric age than a historical age, but otherwise offers no clues as to the feature's origin. Textural data in Table A-1 indicate that the fill material of Feature 32 is again well representative of the average for horizons originally occupying the feature's space, although a greater difference in clay content is notable. Shallower features may have a tendency to be more sensitive to natural variations in soil composition both because of their smaller bulks and the fact that they are contained entirely within levels where pedogenetically altered textures are undergoing significant changes over relatively short vertical distances.

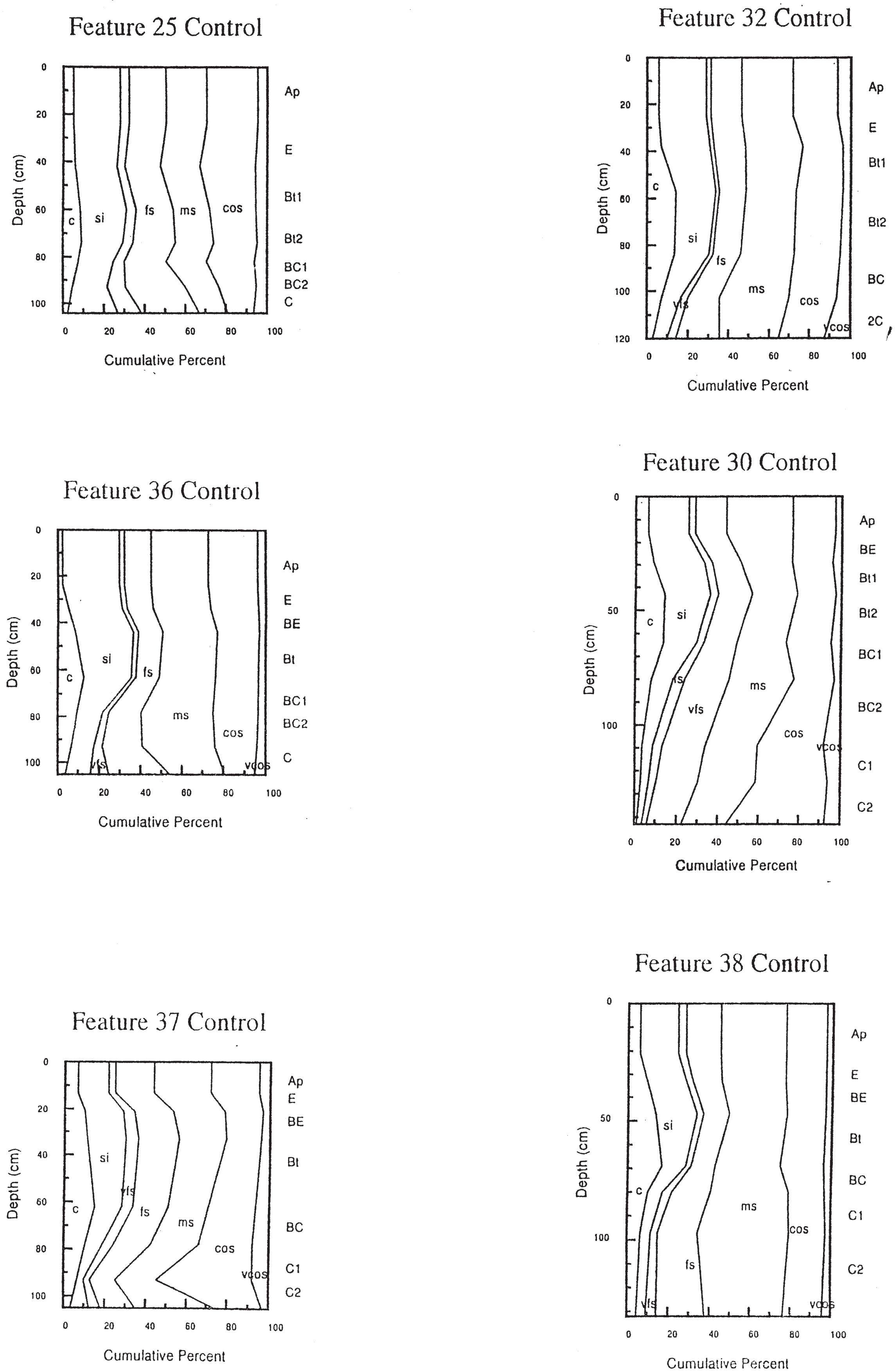
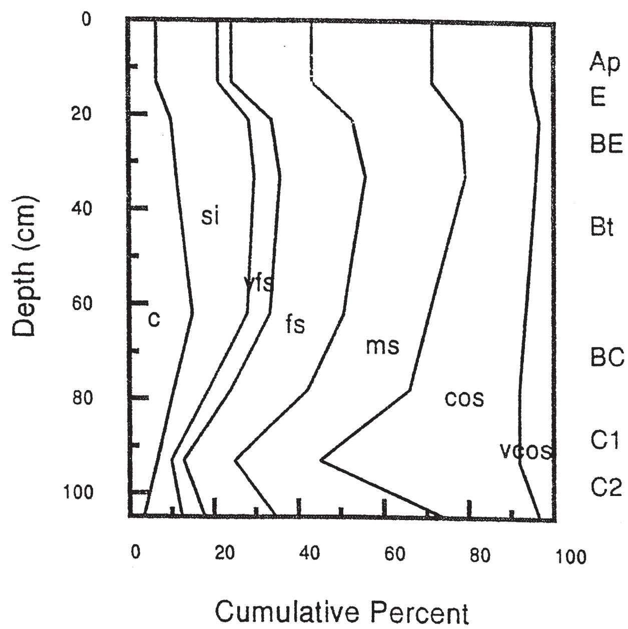


FIGURE A-3: Comparison of Particle Size Distributions Between Feature 30 Fill and the Nearby Control Profile

Feature 37 Control



Feature 37 Fill

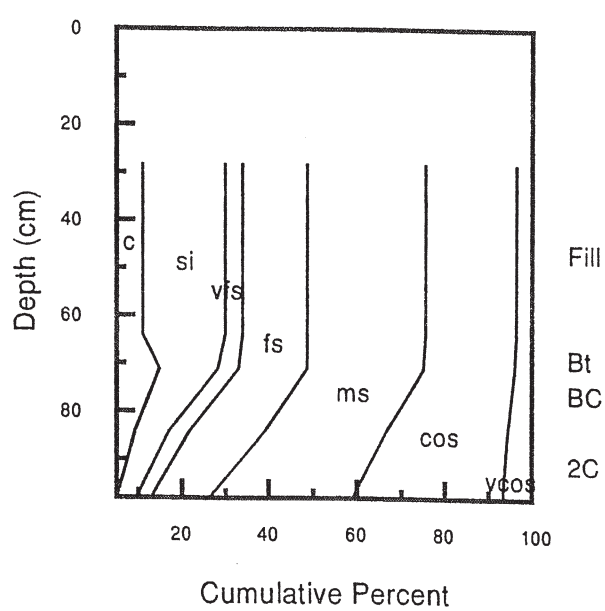


FIGURE A-4: Comparison of Particle Size Distributions Between Feature 37 Fill and the Nearby Control Profile

VII. SOILS AND GEOMORPHOLOGY OF LOCUS 2

A. SITE SETTING

The same Coastal Plain upland over which the western portion of Locus 3 is distributed also encompasses all of Locus 2. This much smaller locus is contained on a nearly level to gently sloping surface situated on the highest elevational reach (8 to 9 meters) of the Puncheon Run Site. The locus is bounded to the west by the small valley of an intermittent drainageway, and to the south by the steeply declining upland sideslope that leads to the wetlands of the Puncheon Run valley. As with the upland portion of the adjoining Locus 3, the landform occupied by Locus 2 is composed of loamy and coarse-textured strata of the Pleistocene-age Columbia Formation. The geologic sediments within the locus consist of loamy material overlying gravelly and sandy substrata. South of the locus on the steep sideslope, the gravels are widely exposed at the surface.

The valley of the intermittent drainageway west of the locus would have been a favorable topographic attribute for prehistoric occupation, but it is also likely to have undergone substantial changes in historical times. In view of the difficulties involved with the traversal of a slope as steep as that south of the locus, the less arduous egress to Puncheon Run afforded by the draingeway's incision of the slope was probably a major consideration for site location by prehistoric inhabitants. A similar regard may also have played a role in early historical activity near the drainageway, but later agricultural practices are likely to have profoundly affected the drainageway itself. As the recipient of intermittent surface runoff from several hectares of cultivated fields, this local valley would have acted as a trap for quantities of historically eroded soil vastly greater than any amounts carried to it from less-erodible, naturally vegetated landscapes. The volume of historical sediment in the drainageway bottom was not determined in this investigation, but deposits of 1 meter or more in thickness would not be uncommon for a location with such a long history of agriculture.

Table A-1: Mean Textures of Locus 3 Feature Fills Compared with Volume-Averaged Textures of Soil Horizons Originally Occupying Feature Spaces

Soil	% Sand	% Silt	% Clay
Feature 30			
Weighted control	76.2	15.5	8.3
Feature fill	72.6	18.7	8.7
Feature 38			
Weighted control	77.2	12.4	10.3
Feature fill	73.2	16.2	10.6
Feature 37			
Weighted control	72.9	15.2	11.9
Feature fill	70.0	19.0	11.0
Feature 32			
Weighted control	68.9	21.5	9.6
Feature fill	66.4	26.0	7.6

Indeed, significant sedimentation is evidenced by a pronounced alluvial fan formed where the mouth of the drainageway intercepts the Puncheon Run floodplain. This depositional feature is readily apparent on the site topographic map, and even though much of its structure may date to the Holocene, potentially deep historical deposits could also be present.

The fan deposits represent only one type of historical sedimentation in the Puncheon Run valley, and not even all of the sediments exiting the small intermittent drainageway would have been laid down in the fan. Some would have been carried beyond the fan to join with other historical sediments entering the valley from more inland stretches of the watershed. Together, the combined sediments from multiple sources would be expected to form a variably thick mantle of historical alluvium over the entire floodplain. The distribution of this alluvium along the valley was also no doubt influenced by the millpond (Nixon Mill) formerly impounded behind the earthen dam crossing the valley near the eastern end of Locus 1. Now breached to allow free flow of Puncheon Run, this dam would previously have captured some of the sediments that otherwise would have found their way to points farther down the valley.

Modifications attributable to historical sedimentation would have affected both the Puncheon Run valley and the St. Jones River. With the influx of historical alluvium, the original prehistoric surface of the Puncheon Run floodplain is now presumably buried and variably preserved at some formerly lower level of the valley floor. Lying at a higher level, the modern floodplain surface is probably somewhat more favorably drained than its Holocene precursor. Whereas much of the floodplain in the vicinity of Loci 1 and 2 is now readily traversable and its land surface coursed by a single channel, during the Holocene the floodplain is likely to have been more swampy, with braided channels and more strands of shallow open water.

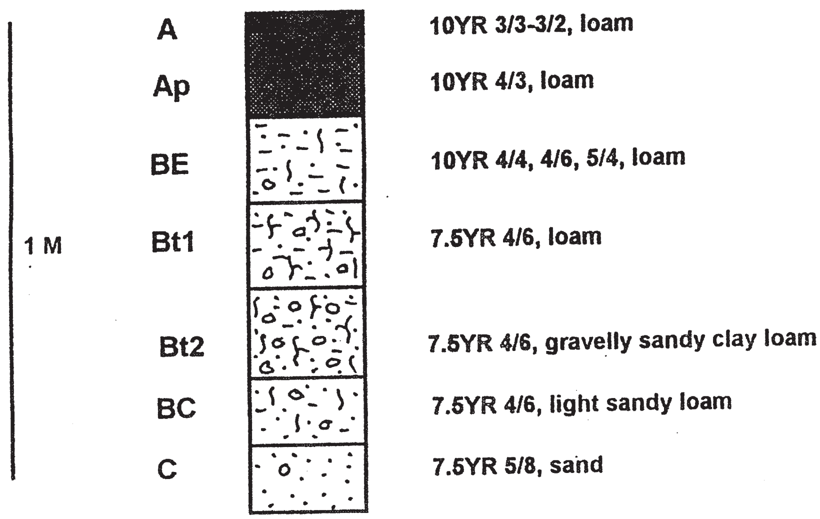
B. SOILS OF LOCUS 2

At the time of the pedological examination, the soils of Locus 2 were exposed in three stripped blocks and two deeper excavation units. One of these excavation units (EU 214) situated near the field edge was described in detail, and, along with another profile (EU 109) from Locus 3, is depicted in Figure A-5 as representative of soils occupying the higher reaches of the Coastal Plain upland. Another profile (EU 218) near EU 214 was examined but was not fully described because of its general similarity. One feature, however, distinguishes the two otherwise similar profiles. Unlike the described profile of EU 214, which was considered more representative of the almost entirely cultivated landscape of the locus, the profile of EU 218 was located within the woodland margin. The EU 218 profile still retained the original surface (A-) and underlying eluvial (E-) horizons that would be typical for a loamy, forested soil, and thus has apparently never been plowed. Since these two near-surface horizons are normally blended together by plowing, such intact horizonation indicates that, not surprisingly, the steep slope leading to Puncheon Run has very probably remained wooded throughout the historic period. As at the location of EU 214, this mostly steeply sloping woodland also supports small isolated areas with more level surfaces in the vicinity of the field edge.

The EU 214 profile was also situated within the present woodland boundary, but the surface horizons demonstrated that the location was previously part of the cultivated field. A plowzone (Ap-horizon) was readily identifiable in the upper 24 centimeters of the profile, even though a new forest-type A-horizon was also present at the surface. Such surface horizon morphology is common in reforested areas and indicates that sufficient time has elapsed since encroachment of the tree line for natural processes to begin to reestablish the normal horizonation of a forest soil.

As indicated by field observations and supported by laboratory particle size analyses, subsoil formation in the profile of EU 214 is advanced. Strongly expressed argillic horizons were described in the field with moderate structural development, nearly continuous clay films on ped surfaces, and strong brown (7.5YR 4/6) color. Formed across a mixed lithology, including both loamy and gravelly materials, the clay enrichment of the well-expressed argillic horizon is also clearly apparent in the particle size data in Figure A-6. These properties, together with a combined argillic horizons thickness of nearly a half meter, testify to a prolonged interval of soil weathering extending into the Pleistocene. The surface of this Coastal Plain upland landscape has thus been relatively stable throughout the Holocene, and most prehistoric artifacts should therefore be

EXCAVATION UNIT 214



EXCAVATION UNIT 109

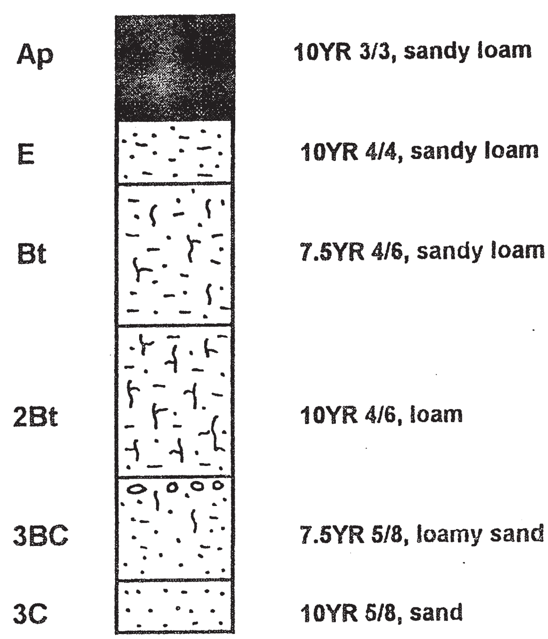


FIGURE A-5: Soil Profiles Representative of Locus 2 Soils

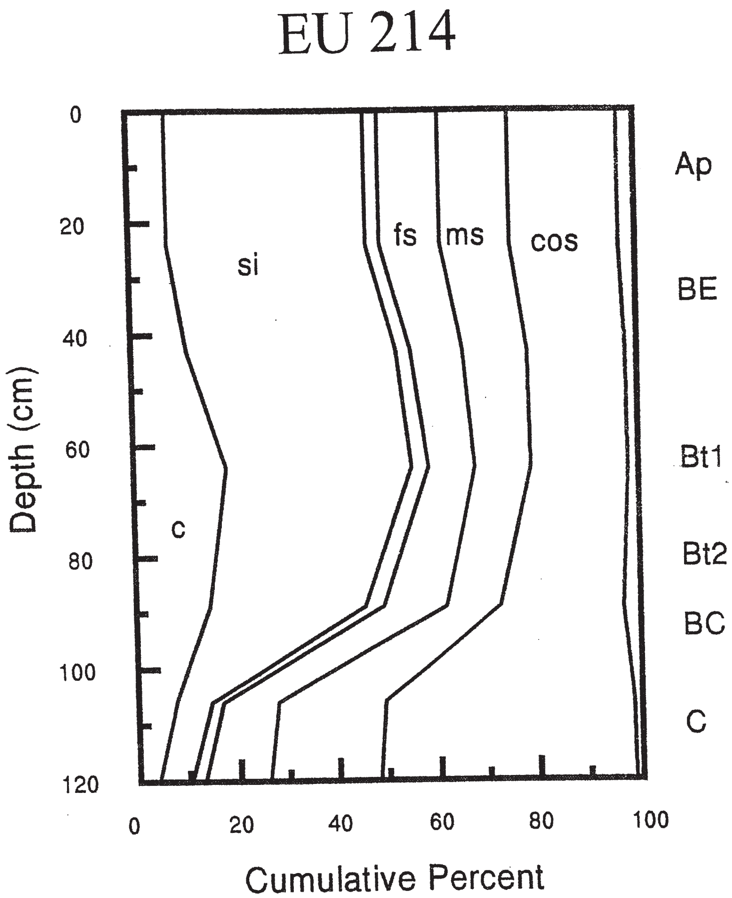


FIGURE A-6: Distribution with Depth of Soil Particle Size Fractions in a Soil Profile (EU 214) Typical of Locus 2 Soils

concentrated near the present surface. As previously mentioned in the discussion of Locus 3, artifact concentrations in soils of Pleistocene age typically tail off through the transitional BE-horizon underlying the plowzone and should not be expected within the long-stable argillic horizons. In the described profile (EU 214) of Locus 2, the top of the argillic horizon occurs at the depth of 43 centimeters.

VIII. SOILS, GEOMORPHOLOGY, AND FEATURES OF LOCUS 1

A. SITE SETTING

Locus 1 is also contained entirely on the Coastal Plain upland, but the landscapes of this locus span a much greater elevational range than those of Locus 2. The portion of Locus 1 in the vicinity of Block 19 occupies a similar high position as that of Locus 2, but most of Locus 1 is spread along the descending northern flank of the Puncheon Run valley, where slopes fall to elevational levels that are below those of both Locus 2 as well as the upland part of Locus 3. Most of Locus 1 is concentrated between the elevations of about 4 to 5.5 meters, and as such actually lies within the upper end of the height range for the lower terrace of Locus 3. This elevationally similar but more sloping terrain than the terrace should not, however, be structurally correlated with the lower terrace. The location is not only well removed up the Puncheon Run valley from the St. Jones River, but the observed compositional variability of the soils within the locus is consistent with the mixing and erosional reworking often encountered along the sideslopes of Delaware's Coastal Plain uplands.

B. SOILS OF LOCUS 1

Soils within this locus were observed in a number of shallow stripped blocks and multiple excavation unit and subsurface feature exposures. Of the available excavation unit exposures, seven were described in detail, and five were sampled as control profiles against which to compare feature properties. Investigations were concentrated in two areas referred to as the main feature cluster area and the slope wash area. Of the control profiles, four were located in the larger area of the main feature cluster, and a single profile was located in the slope wash area at the western end of the locus.

Soil variability in Locus 1 is greater than in Locus 2 and reflects ranges in elevation and landscape position as well as varying parent material composition and soil drainage class. At the highest landscape position in the area of Block 19, strongly developed and well-drained loamy soils are similar to those of Locus 2 and readily indicate that mostly stable landscape conditions have existed in this area since well into the Pleistocene. On lower slope positions, where the majority of the locus is concentrated, soils are well to moderately well drained and are formed in more mixed soil parent materials, often exhibiting dramatic textural changes across relatively short distances. This trait together with varying expressions of soil development suggests that this lower sloping portion of the Coastal Plain upland has been less geologically stable than the nearly level summit positions.

Much of the instability probably occurred prior to the Holocene, however, and may be related to periglacial climatic conditions during the Pleistocene. The freeze-thaw cycles of such a climate are conducive to surface instability, particularly for sloping terrain. Solifluction deposits, which are derived through gravity-induced movements of thawed, gel-like soil masses, characteristically exhibit seemingly bizarre melds of sharply contrasting soil types. Surface instability induced by a periglacial climate is only a speculation, but the notion that the last major period of instability is likely to have occurred prior to the Holocene is also supported by degrees of soil development. Subsoil formation in the locus soils is moderate to strong, even along the lower elevational positions, and thus demonstrates that most of the landscape has been relatively stable through the

Holocene. Although not linked in form with the lower terrace of Locus 3, it may well be that the advent of relative landscape stasis occurred at about the same time for both positions.

With respect to parent material composition, two soil types dominate along the lower slope positions. As represented by the profile diagrams in Figure A-7, the two types are loamy and gravelly soils that are prevalent over the majority of the locus, and silty to loamy soils that are confined to the comparatively small slope wash area at the western end of the locus. Subsoil development in the predominant loamy and gravelly soils is variable, largely as a function of parent material lithology, but based on field descriptions argillic subsoil horizons were present in all of the examined profiles. In the more gravelly soils such as that of EU 192, development is noticeably weaker, with less clay accumulation and no clay films. As shown by the distribution of soil particle sizes in Figure A-8, even with the more advanced subsoil development that was described in the field for the Feature 1 control profile, increases in clay content for the Bt-horizons are just barely adequate to taxonomically identify an argillic horizon. Other profiles, such as the controls for Features 41, 53, and 64, are clearly argillic. Similarly the Feature 14 control typifying the generally more silty soils of the slope wash area has advanced argillic horizon development. For such soils, a developmental history extending to the Pleistocene is evident, but even for the more weakly developed soils, considering the coarse nature of the parent material, the exhibited degrees of soil development might still have required weathering intervals encompassing most if not all of the Holocene. Therefore, although the lower-lying and gently sloping landscape of these gravelly soils has probably not been generally stable for as long as the higher, nearly level summit position, major episodes of instability during the Holocene are not evinced by the profiles.

Owing to the apparent age of the locus soils, most prehistoric artifacts should be confined to near-surface levels. As with nearly all soils of the Coastal Plain upland, the highest concentrations should be in plowed surface horizons. Pedoturbational mixing or anthropogenic disturbance could introduce artifacts to lower levels, but in the absence of human or large animal activity, sterile levels should correspond to argillic horizon depths. In deeper profiles, such as that of EU 192, depths to argillic horizons could be as much as 40 to 50 centimeters, but for the majority of the locus, agricultural erosion has sufficiently deflated the surface to bring the plowzone into direct contact with the underlying argillic horizon. The subsoil over most of the locus is well drained, but for the lowest positions nearer the Puncheon Run floodplain subsoil drainage restrictions would further reduce any prospects of artifacts below near-surface levels.

Unlike most of the locus, where soil losses have occurred due to agricultural erosion, the slope wash area actually constitutes a depositional position. This area has also been subject to considerable historical modifications, which are demonstrated by several lines of evidence, including a large rubble pile just north of the area, an irregular surface microtopography, and unnatural soil profile horizonations. Soils exposed northwest of the area revealed obvious signs of severe disturbance, such as truncated subsoils and greatly over-thickened, perhaps filled, surface horizons. At least some grading and filling has occurred in the area, but even in the relatively intact profiles exposed along most of the Block 19 walls, historical changes to the profiles are apparent in a surficial veneer of agricultural slope wash.

Occupying a nearly level, depositional footslope position, the soils of the slope wash area have been historically altered, but in a manner conducive for better preservation of prehistoric artifacts. The covering mantle of historically accumulated wash derived from the tilled fields lying upslope to the north of the locus has afforded partial protection of the original prehistoric surface. The wash deposits and underlying original surface occur in a stacked sequence of two or three Ap-horizons. Even though all of the surface horizons observed in a number of units displayed indications of former plowing, the original surface marked by the lowest Ap-horizon was probably only subject to a relatively brief period of plowing before being effectively

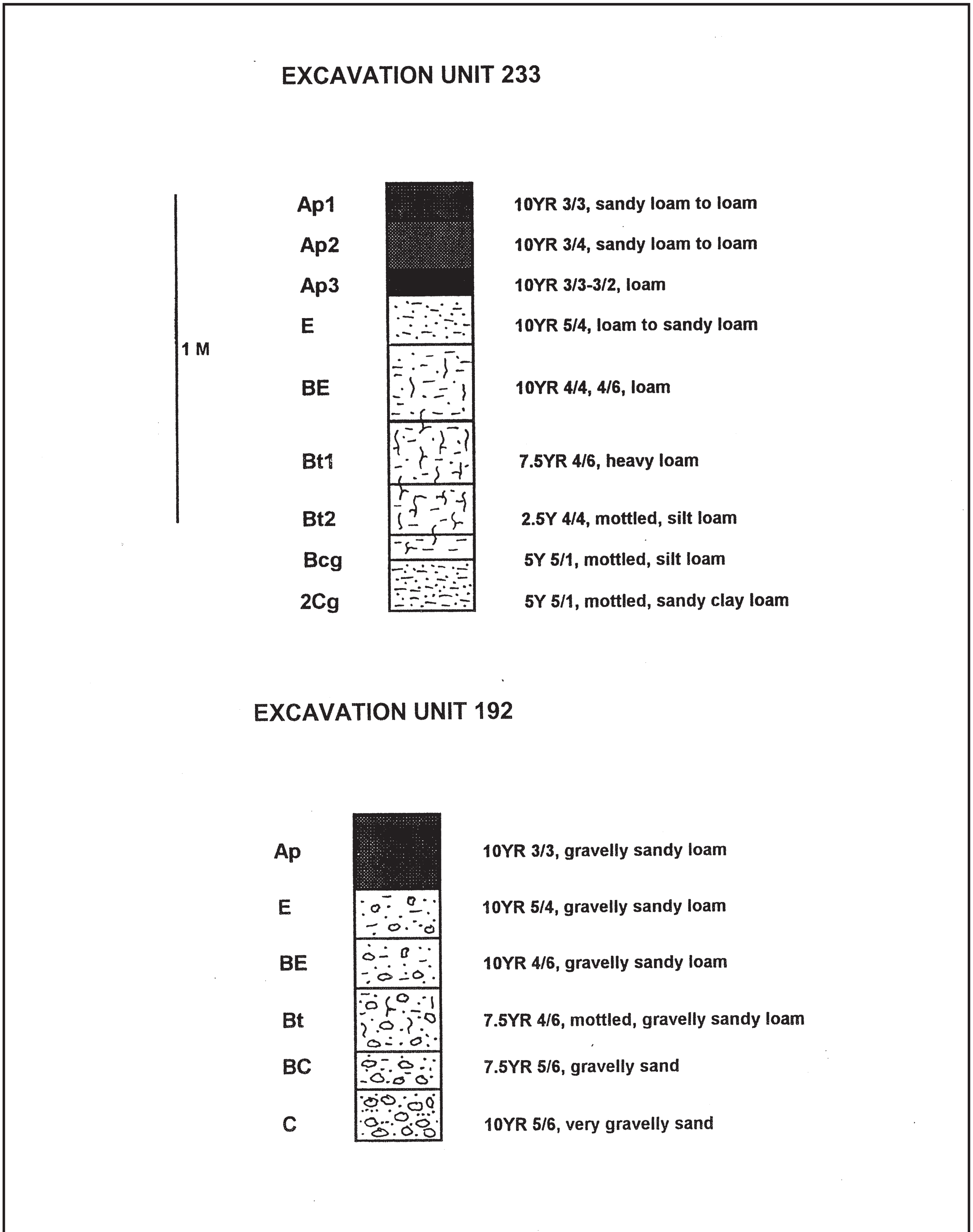


FIGURE A-7: Soil Profiles Representative of Locus 1 Soils

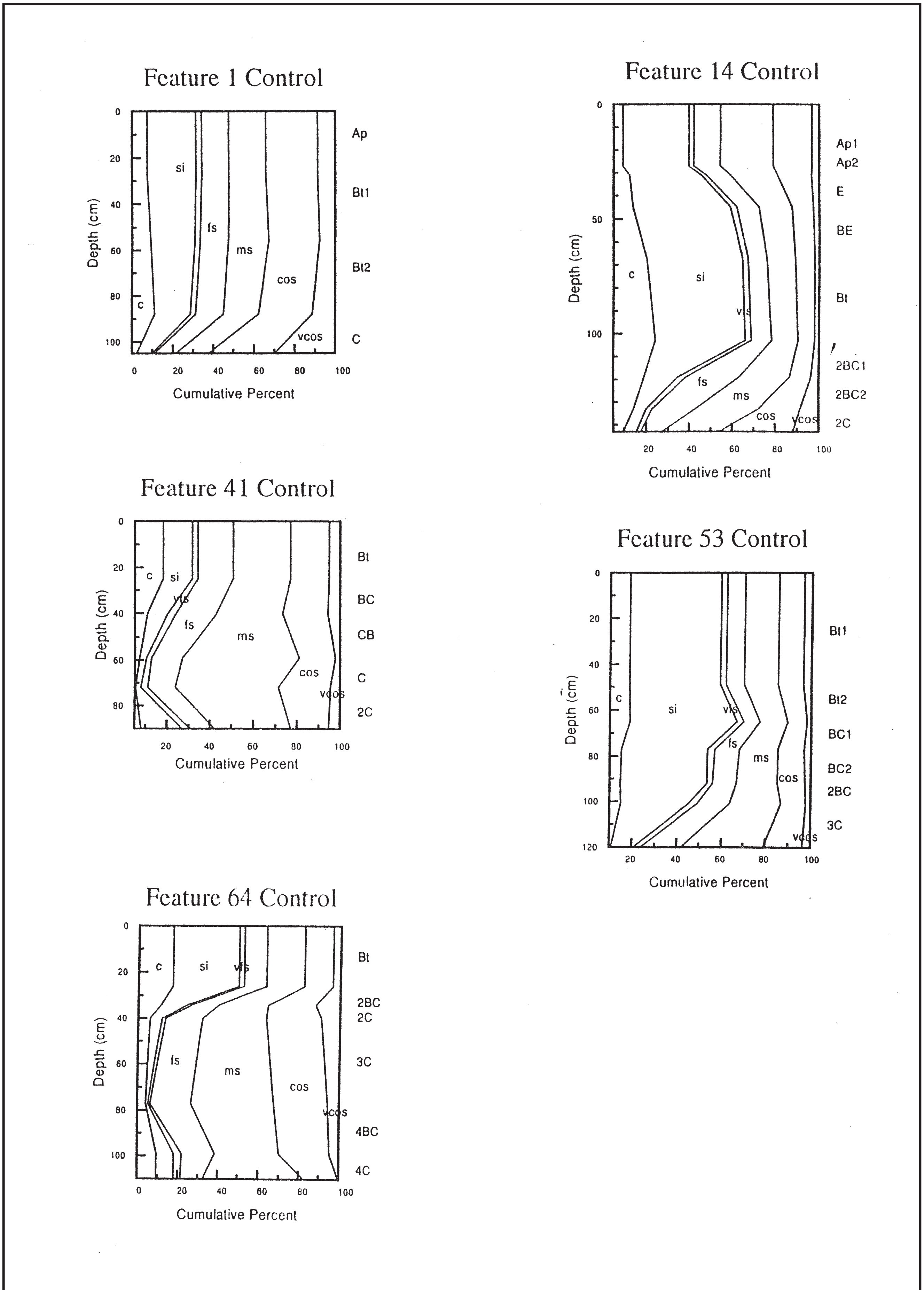


FIGURE A-8: Distributions with Depth of Soil Particle Size Fractions in the Five Control Profiles of Locus 1

isolated by the accumulating slope wash. This is suggested both by a darker color (10YR 3/2 very dark grayish brown to 10YR 3/3 dark brown) relative to those (10YR 3/3 dark brown and 10YR 3/4 dark yellowish brown) of the overlying horizons, as well as by fully intact E-horizons beneath. A darker color indicates higher organic matter content, which implies both less oxidative carbon loss due to tillage and possible residuals of the much higher organic matter concentrations typical of forested A-horizons. The intact underlying horizonation also demonstrates minimum plowing, since prolonged plowing tends to eventually destroy E-horizons through incorporation with the surface horizon. When accompanied by tillage-induced soil erosion, upper transitional (BE-) horizons and even deeper argillic horizons may also in time be intercepted by a downwardly migrating plowzone. This has occurred over most of the locus, particularly in the main feature cluster

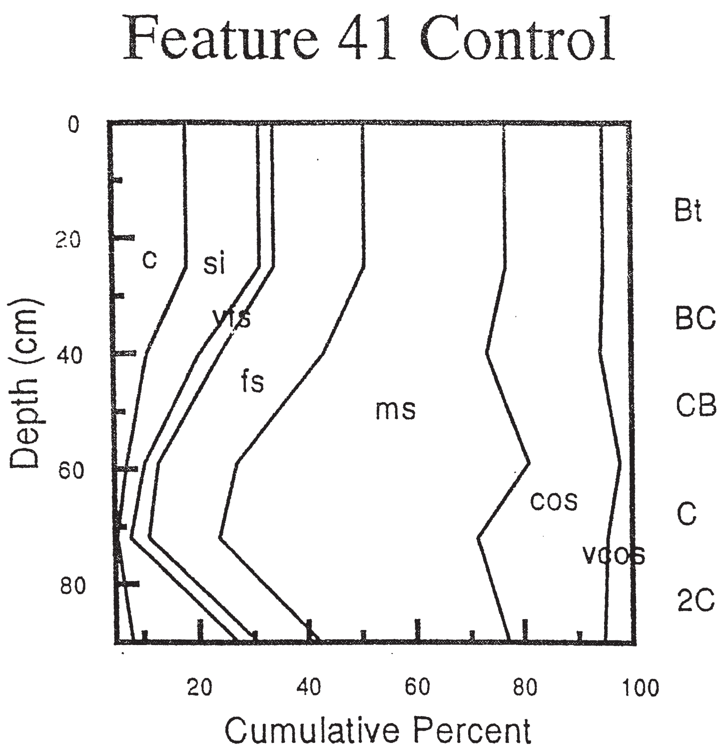
The implications of the surficial cover of slope wash for the distribution of prehistoric artifacts are significant. The apparent protective burial of the original surface within relatively short order subsequent to the introduction of historical agriculture allows for the prospect of greater *in situ* context. Most prehistoric artifacts should therefore be recovered very near their original points of deposition, and they should as well be concentrated in the lowest plowzone. Some mixing as the slope wash was being laid down has probably caused minor upward dilution of artifacts into the overlying historical deposits, and some may also tail off into upper subsoil horizons as would be normal in soils on an old landscape. As with other strongly developed Coastal Plain soils, artifacts should not be present below the top of the argillic horizon, which because of the surface wash deposition may be as much as 75 centimeters deep.

IX. CHARACTERISTICS OF ARCHAEOLOGICAL FEATURES IN LOCUS 1

A. MAIN FEATURE CLUSTER

Most of the subsurface features examined in the main feature cluster stand out in greater contrast to adjacent intact subsoil horizons than do those of either the Locus 3 terrace or in the slope wash area of Locus 1. For example, whereas the 10YR 3/3 dark brown and 10YR 4/3 brown main fill colors for Feature are several units in value and a page in hue different from the strong brown (7.5YR 4/6) color of the adjacent subsoil, for Locus 3 features, colors are often no more than one unit in value different from intact subsoil. Reasons for this include more advanced subsoil development for many of the Locus 1 soils, as well as the absence of E- and BE-horizons in the agriculturally deflated soils. Where these upper subsoil horizons are still present, as in the slope wash area or on the lower terrace of Locus 3, colors similar to feature fills often complicate precise definition of feature boundaries. Probably a greater obstacle to defining Locus 1 feature boundaries was the high natural variability of subsoil and substrata composition, wherein some contrasts were so abrupt as to seem artificial.

Some physical similarities, however, link the major clusters of subsurface features at Puncheon Run. Specifically, as with the fills of the lower terrace, the core fill materials for a number of the Locus 1 features are well blended. Figures A-9 and A-10 demonstrate this for Features 41 and 53. Although neither feature was positively identified as cultural and both exhibited peripheral irregularities, the recognizable central fills for each feature are thoroughly blended. Therefore, despite the effects of possible slumping or other cataclysms around the features' extremities, much of the eventual filling process must have entailed a slow enough rate of addition to allow for bioturbational blending. As previously discussed, the time frames required to accomplish this blending are more likely to be compatible with a prehistoric age rather than a historical age.



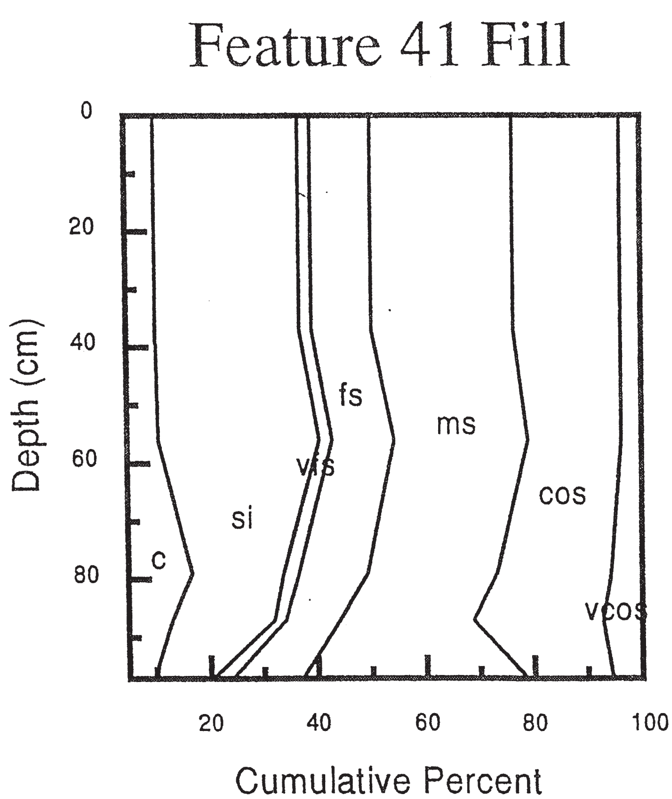
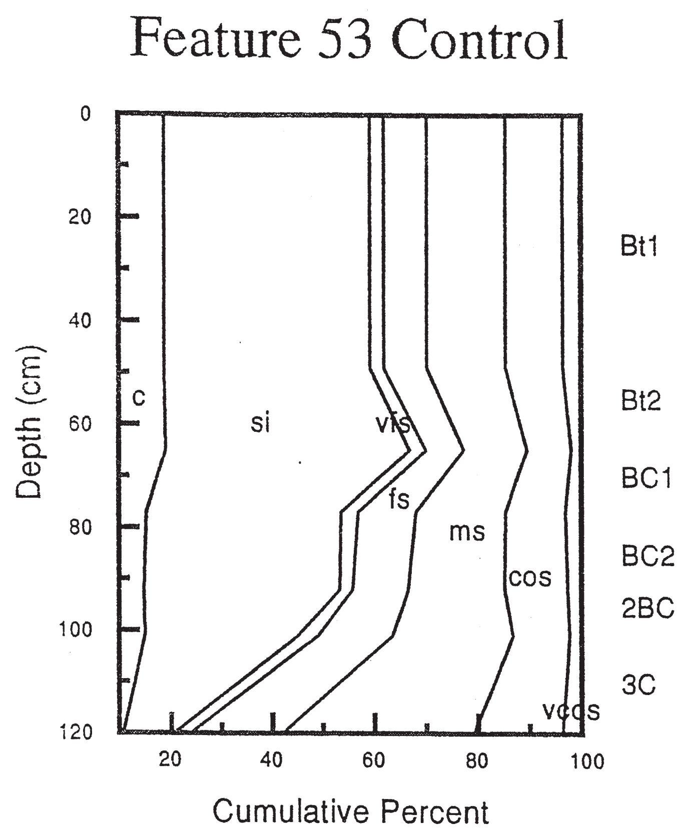


FIGURE A-9: Comparison of Particle Size Distributions Between Feature 41 Fill and the Nearby Control Profile



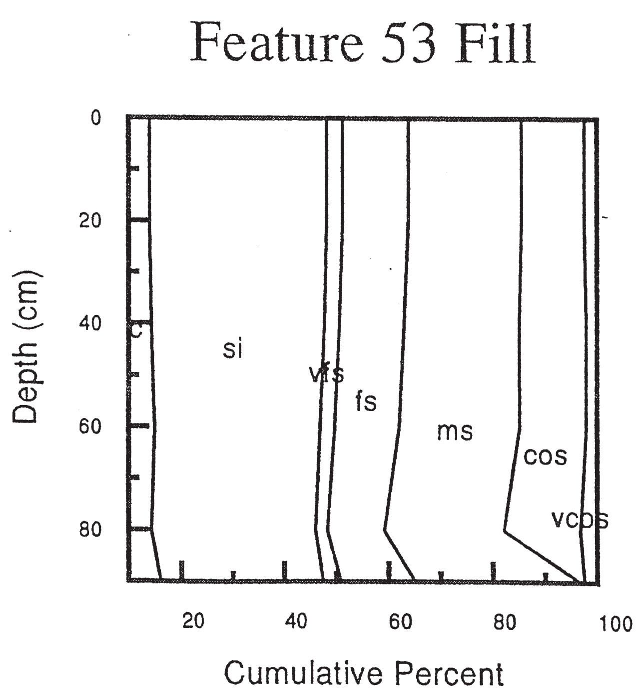


FIGURE A-10: Comparison of Particle Size Distributions Between Feature 53 Fill and the Nearby Control Profile

B. SLOPE WASH AREA

A single feature (Feature 14) and an adjacent control profile were examined and sampled in this portion of Locus 1. The feature was shallow, extending to no more than about 60 centimeters below the original surface level. The data in Table A-2 indicate that like the analyzed fills of Locus 3, the Feature 14 fill is well representative of the soil that originally occupied the space. The main difference is a minor replacement of sand for silt, which is the reverse of the trend for Locus 3 features.

Table A-2: Texture of Feature 14 Fill Compared to the Volume-Averaged Texture of Soil Horizons Originally Occupying the Same Space

Soil	% Sand	% Silt	% Clay
Weighted control	44.0	38.8	17.2
Feature fill	37.8	45.0	17.2

X. SUMMARY

A. LOCUS 3

The Locus 3 portion of the Puncheon Run Site is distributed across two landforms: a Coastal Plain upland and a lower terrace adjacent to the St. Jones River. The upland is by far the most extensive landform of the Puncheon Run Site and also ranges well beyond the site to become the predominant landform throughout the Dover area. Most investigation efforts were concentrated on the more limited area of the lower terrace, which lies between the elevations of about 3 and 5.5 meters. This eastern end is a peninsula defined by Puncheon Run to the south and a meander of the St. Jones River to the north and east.

Although the present river system is tidally influenced and mildly brackish, prior to about 2,000 years ago the St. Jones was a strictly freshwater, riverine system. Since the encroachment of the sluggish tidal flows and with greater regional land erosion in historical times, increased sedimentation has filled the original channel and buried the valley floor by as much as 4 meters. Although the terrace currently rises above the river by steep banks 3 to 4 meters high, through most of the Holocene the difference in height between the terrace surface and the river level was as much as 7 to 8 meters.

The sandy soils of the lower terrace exhibit sufficient subsoil development to indicate an early Holocene or more probably a late Pleistocene age for the terrace. Although upper levels of these very sandy soils would have been subject to reworking by a host of pedoturbational agents during the Holocene, no evidence exists to indicate appreciable additions of new sediment to the terrace surface as a means of accomplishing artifact burial. Neither field observations nor laboratory particle size analyses found any indications of lithologic or genetic discontinuities within artifact-bearing zones. Rather, horizonation, soil composition, and artifact distribution patterns were all consistent with biomantle mixing of the upper 40 to 50 centimeters of the terrace soils. As would be typical with essentially random biomantle mixing of A-, E-, and to a lesser extent BE-horizons, pebbles and artifacts of varying cultural periods are scattered throughout the zone. In some instances, stratigraphic separation of cultural diagnostics has occurred, but intermingling is more often the case.

Surfaces over most of the Coastal Plain upland portion of Locus 3 lie above the elevation of about 8 meters. This landform is composed of Columbia sediments of mid-Pleistocene age, and the degree of soil development in the upland soils suggests that the present land surface has been largely stable since the late Pleistocene. Of a more variable, loamy composition than the sandy terrace soils, soils of the upland exhibit even less evidence of eolian activity than the terrace soils. Surficially mixed zones in the old, relatively stable soils of the upland are comparatively thin, and thus restrict the potential distribution of artifacts to shallow depths, leaving only limited prospects for artifacts below the levels of the plowzone or upper eluvial horizons.

The main fill materials of subsurface features in Locus 3 are generally well blended. This is particularly true for the larger, clearly cultural disturbances, such as Feature 30. In addition to being thoroughly homogenized, textures of the main fill materials closely match the bulk-averaged textures of the natural soil horizons that originally occupied feature spaces. Thus, materials excavated from the pits ultimately were returned and in the process were so well blended as to suggest prolonged periods of gradual reintroduction

B. LOCUS 2

This locus lies just to the west of Locus 3 and occupies the same Coastal Plain upland as the higher positions of Locus 3. Strongly developed, loamy soils formed in Columbia sediments indicate that the high summit positions of the Coastal Plain upland have been mostly stable since the Pleistocene. Pedoturbational processes that would be active on any old landscape occupied by loamy soils could account for artifacts in upper subsoil levels, but none should be present below the tops of the long-forming argillic horizons. An intact forest soil profile in the wooded area south of the field is evidence that the steeply sloping woodland leading to Puncheon Run has remained forested throughout the historic period.

The location of the locus was likely influenced by its proximity to a small intermittent drainageway that provided a lower-gradient access route to Puncheon Run than that of the very steep sideslope. This drainageway, as well as the Puncheon Run floodplain, would be expected to be mantled by deep deposits of historical slope wash and alluvium. Similar deposits together with late Holocene alluvium are also likely in the larger valley of the St. Jones River.

C. LOCUS 1

This locus is also situated on the Coastal Plain upland, but being more sprawling than Locus 2, it is distributed across a wider range of elevations and landscape positions. Higher elevational positions of the locus contain soils similar to those of Locus 2 and the upland part of Locus 3. These strongly developed soils of the upland summit date to the Pleistocene, and artifacts should be mainly limited to near-surface levels.

Lower-lying landscapes, such as that of the main feature cluster, are occupied by more variable soils that range between gravelly and loamy textures and also exhibit varying degrees of soil development. Elevationally, this portion of Locus 1 lies at the same level as the lower terrace of Locus 3, and although they are two different landforms, some similarities in the degree of soil development suggest that conditions of relative landscape stability may have been established for both positions at about the same time in the early Holocene or late Pleistocene. The lower landscapes and soils are thus probably somewhat younger than those of the higher, more level summit.

Gravelly soils are more prevalent than loamy soils along the lower slope positions of Locus 1. Limited by coarse textures, subsoil development in these gravelly soils has achieved only moderate to weak argillic horizon formation. However, these rather weakly formed argillic horizons are still likely to date to at least the early Holocene, and, unless introduced by deep soil disturbance, artifacts should not be present in argillic horizon levels. The gently sloping landscape has suffered sufficient soil loss from historical plowing that in most locations argillic horizons occur immediately beneath the surface horizon.

Loamy to silty soils occur at the western end of Locus 1. Some soils in this area have been severely disturbed by historical grading and filling, but where intact profiles are still present, the soils exhibit more strongly developed argillic subsoil horizons than the gravelly soils. Prior to being historically plowed, these soils had been relatively stable since the Pleistocene. With the introduction of historical agriculture, however, the location became the recipient of slope wash from upslope portions of the cultivated field. Although the original surface was also plowed, it was soon buried and partially preserved beneath the slope wash. Artifacts should be concentrated in this original surface now buried beneath one or two overlying plowzones. Some artifacts would have been mixed upward into the wash and should also extend downward into upper subsoil horizons. As with other soils of the Coastal Plain upland, argillic horizon levels should correspond to archaeologically sterile depths.

As in the subsurface features of Locus 3, the main fill materials of several investigated Locus 1 features also tend to exhibit a high degree of uniformity. Although peripheral portions of the pits may be more irregular, the degree of homogeneity of the core materials is again suggestive of a prolonged process of gradual filling concurrent with bioturbational blending. Probably more compatible with a prehistoric time frame, thorough blending of feature fill material may serve as a relative indicator of age.

PART 2: CHEMISTRY OF PUNCHEON RUN SOILS AND FEATURES

I. INTRODUCTION

To further characterize the many subsurface features distributed across the landscapes of Loci 1 and 3, soil chemical analyses were conducted for the fill materials of selected features. Additionally, several control profiles in each locus were sampled to provide natural base levels against which feature chemistries could be compared. Variations in soil chemistry across a landscape can be related to both natural and human-influenced factors. Natural variations arise from such factors as shifts in parent material composition, varying pedogenic histories for different portions of a site, and depth-function trends normal within all soil profiles. Cultural influences normally stand out as enhancements of chemical constituents above what would be expected as normal for a given soil. Among the most obvious and important examples of this are historical fertilizer amendments, which in cultivated or formerly cultivated settings can greatly skew the chemical signatures not only of surface horizons but also of subsoil layers. This historical overprint may mask the often more subtle contributions of prehistoric people, particularly on a landscape-wide basis. With specific features, however, where elemental compositions are often distinctively elevated within spatially defined units, the prospects of isolating prehistoric inputs are more favorable.

Analyses of soil chemical properties have long been used as broad markers of human presence as well as more specific indicators of concentrated activity areas and possible functional aspects of individual features. The utility of soil chemical analyses arises from the general rule that a significant human presence on a landscape normally results in elevated concentrations of one or more major elements associated with living organisms. Originating from such sources as human excreta, residues from the decomposition of refuse, or the ash remains of burned materials, the major elements most commonly derived from anthropogenic sources and retained in soil include carbon (C), phosphorus (P), calcium (Ca), potassium (K), and magnesium (Mg). Trace elements, such as barium (Ba) and strontium (Sr), or heavy metals, such as lead (Pb), have also been recognized as indicators of human influence (Lewis et al. 1992; Lutz 1951).

Of all the major elements, phosphorus has received the greatest attention in soil chemical examinations of archaeological sites. The reasons for this are twofold. Not only does phosphorus often occur in elevated concentrations that can be clearly associated with human occupation, but its tendency to remain largely stationary in most soils also makes it a better stratigraphic marker than other more mobile elements, such as calcium and potassium. Scrutinized as early as the mid-1900s (Hrdlicka 1937), soil phosphorus has been the focus of numerous studies dealing with amounts as well as chemical forms present. Even in disciplines not directly concerned with archaeology, the association of high phosphorus levels with human activity is recognized. In the field of pedology, surface horizons with phosphorus concentrations in excess of 1,500 milligrams per kilogram (mg/kg) are considered to have been strongly influenced by human occupation and are uniquely identified as anthropic epipedons (Soil Survey Staff 1999).

Phosphorus occurs in soil in a number of forms, ranging from organic types to variously soluble phosphate species. Usually first added in organic form, over time most phosphorus eventually converts to various inorganic forms determined by the nature of the soil environment. For instance, in the mostly acidic soils of the East, phosphorus tends to become fixed with iron and aluminum, and in the more alkaline soils of the West, it tends to become fixed with calcium. Recognizing this natural transformation process, some studies have attempted to develop chronologies or identifications of feature types based on ratios of different phosphorus species (Eidt 1977; Kerr 1995). Unfortunately, most of these efforts have been less than convincing. Kerr (1995), in a thorough treatment of the phosphorus-fractionation concept, conducted detailed examinations of a Caddoan (AD 1250-1400) mound complex in northwest Arkansas. Although he was unable to reliably discriminate between 12 feature types based on phosphorus species fractionation, the results strongly supported the association of high phosphorus levels with human occupation and were at least able to identify activity areas by location if not by function.

II. METHODS

Soil samples obtained for chemical analyses were collected from the fill materials of selected subsurface features, as well as from control soil profiles considered representative of the local soil type. Control samples were collected from undisturbed soil profiles typically located no more than 1 or 2 meters from sampled features. These vertical profiles were sampled in increments corresponding to genetic soil horizons. Sampling techniques for feature fills varied in accordance with feature size and homogeneity of fill material. Samples were submitted to the University of Delaware Soil Test Laboratory for measurements of a suite of soil chemical parameters. Soil chemical data are given in Attachment C.

Weighted average values were determined for the Locus 3 control profiles to better enable comparative analyses between control profiles or between feature fills and nearby controls. Weighted values were not determined for Locus 1 since intact soil profiles were not consistently available. Not only had the plowzone been stripped in the major feature cluster portion of the locus, but even before this investigation tillage-induced soil mobilization across the gently sloping landscape would previously have resulted in alterations to original soil compositions. As evinced by the absence of E- or BE-horizons, deflationary losses have been the main effects of tillage, but it should also be recognized that soil transfers across the landscape would also have resulted in unknown amounts of blending in surface horizons.

For the purpose of comparing Locus 3 control profiles, averages were weighted to proportionately reflect the extent of each major horizon within the upper meter. As an example, a horizon 10 centimeters in thickness would contribute 10 percent to the final calculated value. For comparing controls to features, the values for control horizons were weighted to reflect their original spatial extent within the volume now occupied by a feature. This entailed three-dimensional weighting based on feature profiles. For instance, within a bowl-shaped feature that tapers with depth, a 10-centimeter-thick horizon near the surface could originally have contained two or more times the volume of another horizon also 10-centimeters thick but formerly occupying the narrowing space near the feature's base. Following this approach allows the chemical composition of the space's original material to be compared with the characteristics of the material now present, thus helping to isolate any potential cultural contributions.

Unless otherwise stated, all data for weighted control profiles of Locus 3 have been treated to better portray original pre-agricultural conditions. Figure A-11 illustrates the concept of horizon weighting as well as modifications to reconstruct pre-agricultural horizonation. Specifically, the data for A- and underlying E- or BE-horizons have been manipulated to more closely approximate pre-agricultural conditions. This manipulation entailed adjustments both in the thicknesses of the horizons as well as in the chemical properties of the Ap-horizon. Existing Ap-horizons are 10 to 15 centimeters thicker than would be expected for A-horizons of the original forest soils. To correct for this, A-horizons were assigned a fixed thickness of 10 centimeters, and the removed depth increment was then restored to the underlying E- or BE-horizon, thus decreasing the contributions of A-horizons and increasing those of the underlying horizons.

Whereas the present E- and BE-horizon chemistries are likely to be reasonably representative of their pre-agricultural status, those of Ap-horizons have obviously been historically modified. To generate a better portrayal of pre-farming conditions, chemical properties of Ap-horizons were variably altered to more closely resemble those of a forested A-horizon. Relative to plowzones, forest A-horizons are thinner but much higher in organic matter (OM). Thus, to achieve increased values more closely resembling those likely for

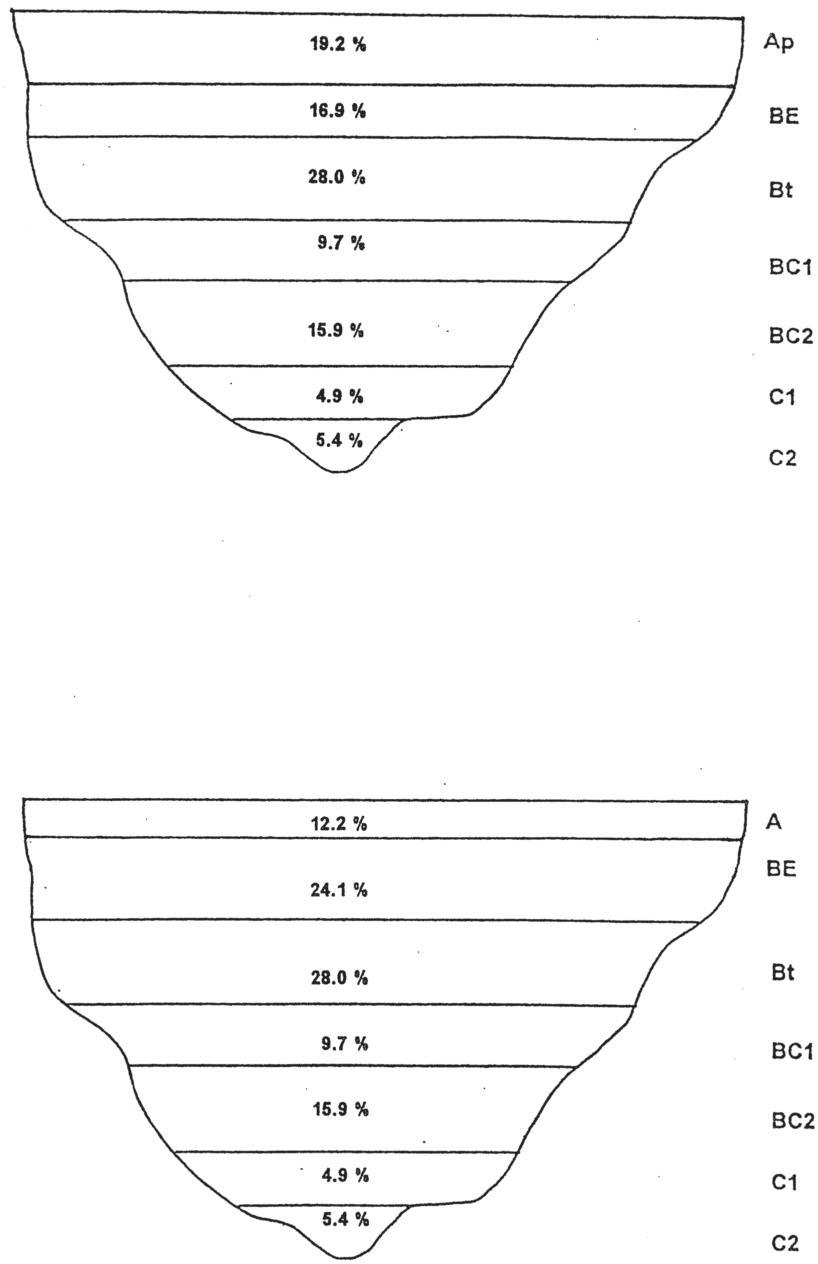


FIGURE A-11: Example Drawn from Feature 30 of Locus 3 Illustrating Horizon Weighting and Pre-agricultural Reconstruction (Bottom Diagram)

the original surface horizons, organic matter contents of Ap-horizons were simply doubled. For all other measurements except pH, values were calculated as the average of Ap-horizons and the underlying E- or BE-horizon, which normally have lower elemental concentrations. This averaging was considered to greatly reduce the effects of agricultural amendments and yet still maintain relatively higher surface concentrations typically produced by natural biocycling. Since strongly acid pH values together with low calcium contents suggested only modest impacts from liming, pH values of surface horizons were left unchanged. While it is readily acknowledged that the above procedure results in a suite of ersatz chemical properties, it is nevertheless still strongly believed that for the purpose of identifying prehistoric chemical signatures, the altered figures provide a more practical basis for comparison than values so patently skewed by historical agriculture.

III. LOCUS 3 RESULTS

Locus 3 samples collected for determinations of soil chemical analyses represent a total of nine features and six control soil profiles. The analyzed features and associated control profiles were distributed between four blocks in different portions of the locus. These were Block 3 (Feature 32), Block 4 (Feature 25), the Metate block (Features 36, 94, 96, and 97), and the Feature 30 block (Features 30, 37, and 38).

As a group, the six control profiles demonstrate that the chemical characteristics of the Locus 3 soils are typical for coarse-textured soils of the Delaware Coastal Plain. Table A-3 summarizes major chemical properties of control profiles volume-averaged for the upper 1 meter of horizons. These data reveal an overall fertility profile for Locus 3 soils that is deficient in all of the major elements. Low native fertility levels are consistent with the very siliceous and strongly weathered nature of the soil parent materials, but the low values also evince a low-intensity regime for any previous agricultural amendments. Unaltered plowzone data given in Table A-4 show higher spikes for some values, most notably for phosphorus and calcium in EU 127, but for the most part fertilizer and lime additions have only modestly affected surface horizon chemistries. The impact on subsoil horizon chemistries should therefore be even less.

Table A-3: Chemistries of Locus 3 Control Profiles Averaged to the Depth of 1 Meter

Feature	% Sr	pH	OM mg/kg	K mg/kg	Ca mg/kg	Mg mg/kg	P mg/kg	T-P mg/kg	Ba mg/kg
Feature 25 (EU 127)	5.8	0.5	48.0	193.2	52.0	21.1	261.2	34.1	7.5
Feature 30 (EU 336)	4.9	0.6	44.7	142.4	45.8	16.0	313.1	44.7	8.0
Feature 32 (EU 332)	4.7	0.6	17.4	146.7	20.4	8.9	324.1	52.1	9.4
Feature 37 (EU 380)	5.1	0.6	49.5	140.8	44.9	17.7	347.2	40.7	8.3
Feature 38 (EU 314)	4.9	1.0	65.5	192.6	35.4	17.1	336.4	NA	7.5
Metate (EU 415)	5.2	NA	10.7	170.6	11.3	3.8	171.3	43.9	6.5

Table A-4: Chemistries of Locus 3 Ap-Horizons

Feature	% Sr	pH	OM mg/kg	K mg/kg	Ca mg/kg	Mg mg/kg	P mg/kg	T-P mg/kg	Ba mg/kg
Feature 25 (EU 127)	5.5	1.1	48.8	362.1	55.1	158.1	716.3	48.9	6.8
Feature 30 (EU 336)	4.4	1.2	34.4	116.8	17.8	67.7	550.6	40.1	10.2
Feature 32 (EU 332)	4.3	1.4	17.7	48.4	8.4	4.6	305.5	45.5	7.1
Feature 37 (EU 380)	4.6	1.5	36.1	109.6	14.7	74.5	619.5	45.3	7.1
Feature 38 (EU 314)	4.4	2.3	41.5	155.7	15.1	60.5	706.0	52.1	6.2
Metate (EU 415)	5.0	1.6	15.4	149.0	18.1	6.3	265.2	51.9	5.7

Elemental distributions with depth are similar for all of the control profiles and are consistent with mature soil profiles undisrupted by lithologic discontinuities but influenced by historical farming. As an example representative for Locus 3, the major chemical properties of the control profile (EU 127) near Feature 25 are summarized in Figure A-12, which shows the distributions of selected elements. The graphs reveal elemental distributions reflecting both natural pedogenic trends as well as anthropogenic influences. Among the chief pedogenic trends are concentrations of elements in the surface horizon by biocycling, and illuvial enhancements in lower subsoil levels by downward translocations. Distributions of extractable-calcium, extractable-potassium, and total-barium provide good examples of both of these natural trends, and increased subsoil levels of total-strontium are strongly suggestive of an illuvial concentration of this element as well.

Anthropogenic influences are best illustrated by distributions of extractable- and total-phosphorus (T-P), as well as extractable-calcium and probably extractable-potassium. Phosphorus and calcium are both heavily concentrated near the surface, where historical fertilizer and lime amendments have no doubt increased their presence beyond that which can be credited to biocycling alone. Phosphorus concentrations in particular are very high and may be indicative of animal pasturing or confinement at this location, in addition to probable applications of fertilizer.

The relationship between extractable- and total-phosphorus is also worth noting. Unlike many other common elements, phosphorus does not as readily move in the soil due to adsorption with insoluble iron oxides or organic compounds. This element is accordingly considered relatively immobile in the soil, a concept amply demonstrated by the limitation of extractable-phosphorus to levels near the surface. Adsorbed phosphorus is, however, not recovered by standard weak-acid extraction, and is best detected by means of strong acid digestion for total elemental analysis. Thus, whereas extractable forms are virtually nonexistent in more iron oxide-rich subsoil levels, total-phosphorus is not only comparatively higher throughout the profile, but its concentration in the subsoil of the EU 127 profile actually exceeds the highest level of extractable-phosphorus occurring at the surface.

Although the distribution of total-phosphorus in the EU 127 control profile is likely evidence of some translocation, the origin of the subsoil phosphorus is open to speculation. Typically, the longer phosphorus resides in the soil, the more likely it is to convert to an adsorbed form, such that older phosphorus tends to be both less mobile and more difficult to extract. But given the high concentration of presumed historical

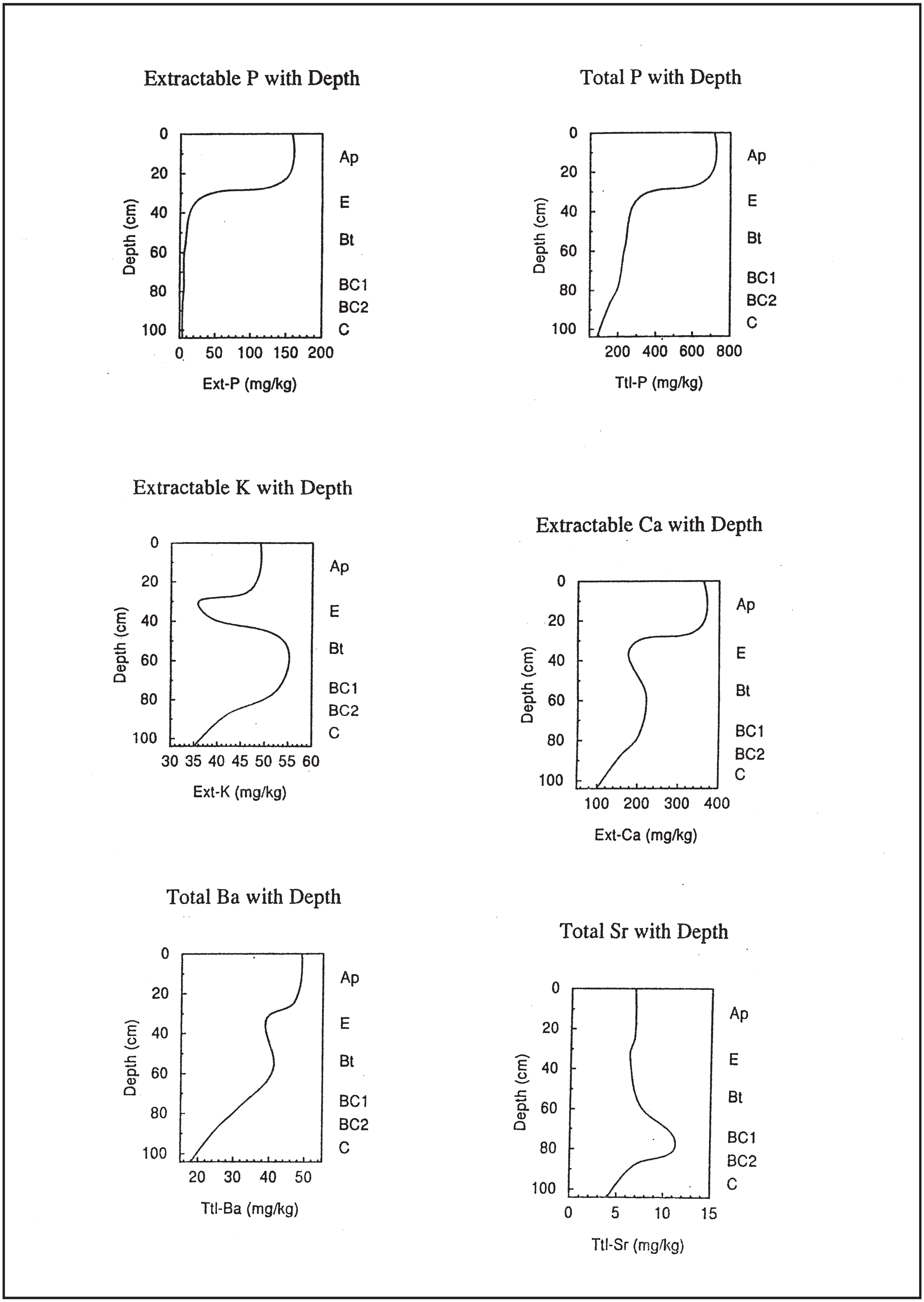


FIGURE A-12: Distribution of Selected Elements in the Control Profile of Excavation Unit 27

phosphorus in the surface horizon of this location, as well as the high permeability of the sandy site soil, at least some of the subsoil phosphorus is also likely to be of historical origin. At all but one other location (EU 314) Locus 3, surface concentrations of extractable-phosphorus are not nearly as high (Table A-4), but it is of special interest that weighted values for total-phosphorus (Table A-4) are appreciably higher for almost all other feature locations. Lower extractable-phosphorus but higher total-phosphorus is a strong indication that relative to the Feature 25 location, the proportion of older, potentially prehistoric phosphorus is much greater for both the Feature 32 location as well as that of the Feature 30 block.

A. FEATURE CHEMISTRIES

1. Block 4, Feature 25

Feature 25 was the first of the Locus 3 features to be chemically analyzed. This feature and its nearby control profile (EU 127) were sampled during the 1997 field season. A somewhat unique sampling technique entailing collection of samples along a horizontal column was employed for Feature 25. Samples were collected in 5-centimeter increments along a line near the base of the feature, commencing within the feature interior and extending laterally beyond the feature edge into adjacent undisturbed subsoil. This method was employed in consideration of the dynamics of soil chemistry with time. With a speculative feature age of as much as 2,000 years or more (subsequently determined radiocarbon date of 3,400±110 BP) together with the sandy, chemically non-retentive nature of the site soil, it was presumed that original elemental concentrations within the feature would have been modified over time by translocations out of the feature. Although some movement of elements would probably have resulted in complete loss from the system, especially since the feature base was sufficiently deep to penetrate underlying substrata of sand texture, it was believed possible that lateral migrations into more chemically retentive subsoil B-horizons might still be detectable.

In comparing the overall chemistry of the control profile with the chemistry within Feature 25 (data in Attachment C) several general observations arise. Relative to the control profile, the feature is lower in total-phosphorus; higher in extractable-potassium, total-strontium, and total-barium; and lower or similar in concentrations of organic matter, extractable-calcium, and extractable-magnesium. It is particularly interesting to recognize that the feature chemistry is different from the chemistries of near-surface horizons in the control profile. Although the feature fill bore a morphological resemblance to E-horizon material and a presumed near-surface origin for the feature fill reasonably suggests there may be further similarities in chemical composition as well, several differences are notable. Substantially lower in total-phosphorus (198 versus 312 mg/kg), and much higher in total-strontium (10.9 versus 6.3 mg/kg) and extractable-potassium (75 versus 36 mg/kg), the feature fill is so chemically different from the modern E-horizon and even more so from the Ap-horizon that a contemporary genetic linkage cannot be made between the materials. These discriminating chemical characteristics indicate that the feature fill, presumably at least partially derived from wash-in of near-surface soil, is registering a prehistoric (3,400±110 BP) surface that had chemical characteristics much different from those of the modern one.

As demonstrated by the bar graphs in Figure A-13, it is also apparent that the chemistry of Feature 25 has changed over time. These analyses of the horizontal column sampled near the base of the feature reveal translocations of elements out of the feature interior and into adjacent extant soil. The trend is most pronounced in the distributions of extractable-calcium, extractable-magnesium, and total-phosphorus, where within the feature fill (shaded bars [see Figure A-13]) elemental concentrations increase toward the feature edge, continue at their highest levels into the adjacent soil, and then tail off with increasing distance (greater than 15 centimeters) from the feature. Trends for extractable-potassium, total-barium, and total-strontium show a similar pattern outside of the feature but do not undergo as much increase within the feature as the

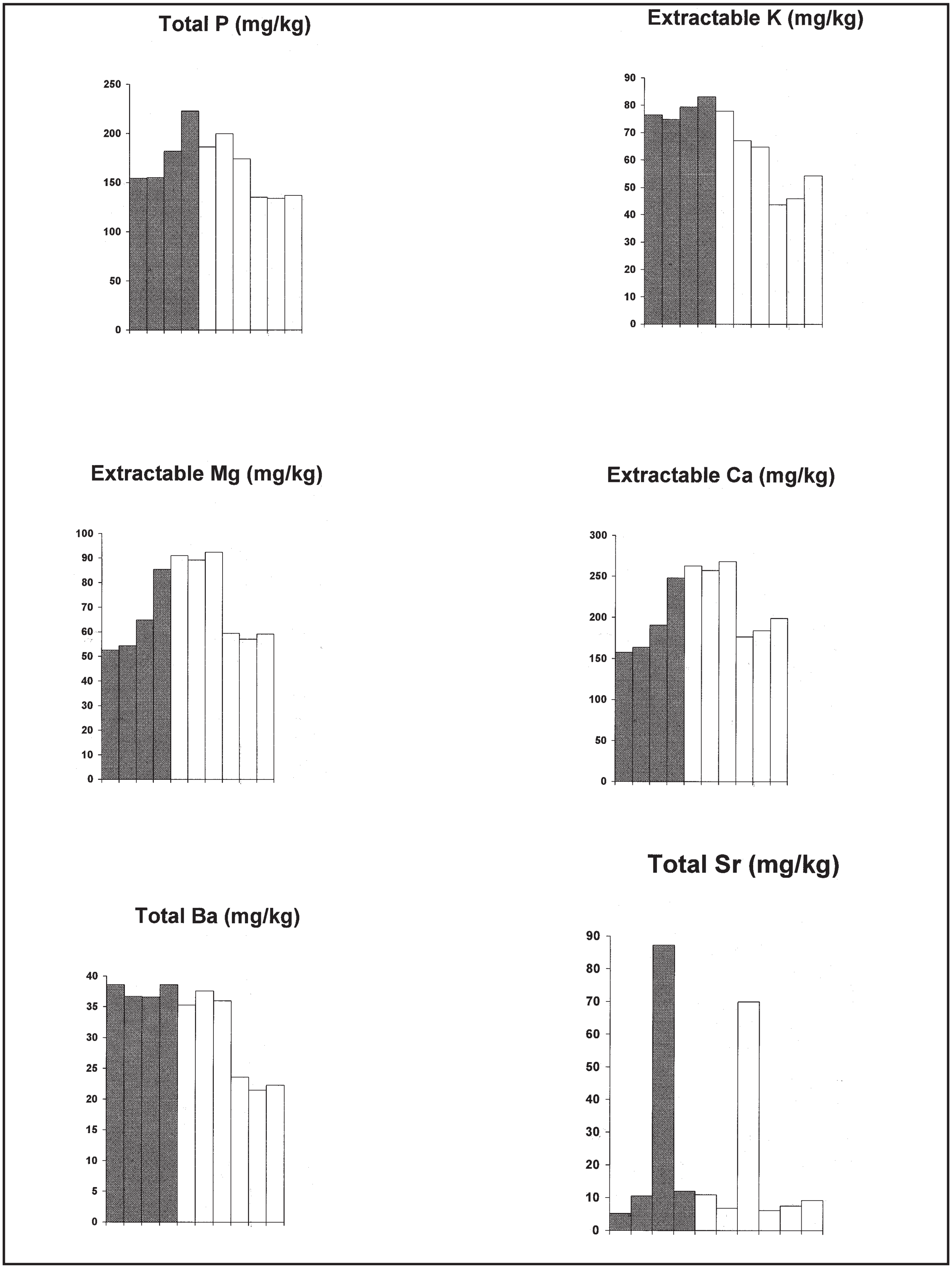


FIGURE A-13: Horizontal Distribution of Elements Across Feature 25 Showing Chemical Changes as Feature Margin Is Approached

edge is approached. The degrees of apparent elemental migration support the concern that older features in coarse-textured soils can not be expected to exhibit chemical profiles wholly consistent with conditions of origin or functional purpose.

Like the previously discussed morphological and physical properties, chemical characteristics of Feature 25 do not definitively identify its origin. Although several strong trends are supportive of the prehistoric age, anthropogenic origin is not proved by the data. Relatively low phosphorus contents that may even be at least partially enhanced by historical contamination would tend to weigh against an intensive human influence. However, distribution patterns for other elements, such as strontium, may lean toward human activity. Not only are the fill materials of both Feature 25 as well as other nearby features consistently higher in strontium than either the modern surface or most undisturbed subsoils, but two anomolously high concentrations associated with Feature 25 also stand out beyond natural variation. As is clear in the bar graphs in Figure A-13, these two values (87.3 and 69.9 mg/kg) near the feature edge are roughly eight times higher than typical feature amounts and as much as 12 times higher than levels in the modern surface and most subsoils. Outliers of such extremes can not readily be relegated to a category of isolated natural oddities, and these values from early in the study fostered some speculation that high strontium levels could possibly be correlated not only with human presence, but also perhaps with some specific activity, such as fishing. Unfortunately, this speculation was not supported by subsequent investigations, which failed to find similarly high strontium values in any of the numerous other feature or control samples.

2. Feature 30 Block, Features 30, 37, and 38

Three features and three control profiles, all located within a few meters of each other, were sampled in Feature 30 block. As with all other locations, sampling of control profiles was by genetic horizon increments. Features were sampled based on fill morphology and feature size. For instance, of the two deepest features, Feature 30 was composed of morphologically homogenous fill that was sampled in 20-centimeter depth increments. The morphology of Feature 38, however, was somewhat more mixed, and sampling was in accordance with archaeological stratigraphic bodies. Two samples were considered adequate to characterize the most shallow (Feature 37) of the three features.

Of all of the subsurface pit features investigated in the Locus 3 portion of Puncheon Run, only Features 30 and 38 were never in doubt as to cultural origin. Up to 3 meters in diameter and as much as 1.65 meters deep, these nearly adjoining pits were considered too large and too symmetrical in shape to be compatible with any potential natural mechanism capable of creating subsurface pit features. Additionally, the subtlety of the fills' appearances and particularly the thorough blending apparent in Feature 30 were suggestive of prehistoric ages. Radiocarbon dates ranging from 1,300±80 to 4,480±60 BP subsequently confirmed the presumption of prehistoric origin.

Tables A-5, A-6, and A-7 show the comparative chemistries of the fill materials and control profiles for this cluster of subsurface features. In support of the morphological indicators of cultural agency, fill chemistries for Features 30 and 38 are also indicative of human influences. Fill concentrations of phosphorus, barium, and strontium are all sufficiently elevated above control levels to demonstrate inputs above natural background levels. In comparison, the fill of Feature 37 actually contains less phosphorus than the control. Moderately higher levels of barium and strontium are notable, but unsupported by a higher phosphorus content are not convincing evidence of a cultural influence. The lower level of phosphorus in Feature 37 leaves the question of cultural origin in doubt, and, as discussed below with respect to echoing the chemistry of a former landscape, may be indicating a different, probably more recent age than Features 30 and 38.

The elemental enhancements of Features 30 and 38 might be related to the original purposes for the two features, or they may simply offer some insight into the degree of human activity around the features. If derived from the residues of such materials as food stores, bone fragments, human waste, or discarded refuse, the elements could be related to original or secondary feature uses. Otherwise, the higher concentrations can also be attributable to less-specific soil chemical alterations related to human occupation of a landscape. Since the uppermost soil horizons are those that receive occupational inputs, the presumption of this scenario is that soil materials eventually refilling the features either through gradual wash-in or intentional refilling were formerly in near-surface contexts long enough to acquire the chemical markers of human presence.

Such a landscape imprint further suggests that activity in the area of the Feature 30 block was not restricted to a scattering of brief visits by a few individuals, but must have at least occasionally entailed more extended stays by groups of people. Logically then, in causing essentially landscape-wide alterations to soil chemistry, it might also be expected that such occupations would be chemically recorded in more than just feature fills. As previously shown in Table A-3, control profile concentrations of phosphorus are conspicuously high, particularly given the relatively coarse sandy loam texture of the subsoil. As sinks for slowly migrating ions, even the subsoil B-horizons well below artifact-bearing levels could provide a record of the former presence of prehistoric humans.

Table A-5: Chemistries of Feature 30 Fill and Weighted Control Profile

Profile	% Sr	pH	OM mg/kg	K mg/kg	Ca mg/kg	Mg mg/kg	P mg/kg	T-P mg/kg	Ba mg/kg
Control (EU 336)	5.2	0.6	40.8	130.8	39.7	18.0	313.1	37.3	7.7
Fill	5.9	0.4	47.9	128.3	44.3	25.0	402.6	51.9	8.6

Table A-6: Chemistries of Feature 38 Fill and Weighted Control Profile

Profile	% Sr	pH	OM mg/kg	K mg/kg	Ca mg/kg	Mg mg/kg	P mg/kg	T-P mg/kg	Ba mg/kg
Control (EU 314)	5.2	0.7	61.7	176.7	33.1	14.3	298.7	NA	7.1
Fill	5.1	0.5	47.7	225.7	38.2	24.2	450.4	60.8	8.0

Table A-7: Chemistries of Feature 37 Fill and Weighted Control Profile

Profile	% Sr	pH	OM mg/kg	K mg/kg	Ca mg/kg	Mg mg/kg	P mg/kg	T-P mg/kg	Ba mg/kg
Control (EU 380)	5.1	0.8	60.7	175.5	55.1	24.5	413.7	49.6	9.5
Fill	5.4	0.4	49.2	172.9	60.9	6.5	353.2	65.0	11.0

3. Block 3, Feature 32

Feature 32 is similar in form to Feature 37 in that it has a large diameter (3 meters) but a shallow depth (0.5 meters), but as shown in Table A-8 the chemical characteristics of Feature 32 are even less suggestive of cultural influences. In fact, except for a very slight increase in extractable-phosphorus, elemental concentrations in the feature fill are actually lower than in the control profile. In light of the preceding discussion of control profile chemistries, it should be noted, however, that phosphorus concentrations in the Feature 32 control (Table A-3) are similar to those of the controls in the Feature 30 block. This arises largely from elevated phosphorus levels in the control subsoil. Thus, whereas the feature fill offers no chemical evidence of former human presence, the control may serve as a landscape marker of human activity comparable to that of the Feature 30 block.

Table A-8: Chemistries of Feature 32 Fill and Weighted Control Profile

Profile	% Sr	pH	OM mg/kg	K mg/kg	Ca mg/kg	Mg mg/kg	P mg/kg	T-P mg/kg	Ba mg/kg
Control (EU 380)	5.0	0.8	20.0	135.8	20.5	7.2	281.8	54.4	9.1
Fill	5.4	0.4	18.6	88.6	14.6	10.0	230.4	50.3	7.9

4. Metate Block, Features 36, 94, 96, and 97

Unlike the other features investigated in Locus 3, the Metate block features were not subsurface pits. Rather, they consisted of the single metate stone and hearth scatters concentrated at depths ranging from 35 to 50 centimeters below the surface. Soil chemical properties of these features are consistent with those of sandy soils influenced by prehistoric people several thousand years ago (radiocarbon dates: 2,960±50, 3,330±60, and 3,820±70 BP). Although it may well be that most of the original elemental deposits left by prehistoric people have been lost from the highly permeable soil of the block, concentrations of phosphorus, barium, and to a lesser extent potassium are consistently higher in features relative to the nearby control profile.

Concentrations of total-phosphorus listed in Table A-9 provide a good example of feature chemical enhancement. In all feature samples, concentrations of total-phosphorus are greater than in the corresponding level for the control profile. Also, where three depth levels were sampled (Feature 96), the increase of total-phosphorus with depth not only exceeds that of the control profile, but is also suggestive of vertical phosphorus movement through the loamy sand matrix.

B. SUMMARY OF LOCUS 3 FEATURE CHEMISTRIES

A summary of features' properties relative to background soil chemistries is given in Table A-10. Also shown are archaeological interpretations of feature type based on field morphology and artifact assemblages. The data are reported not as absolute quantities but rather as relative degrees of enhancement above control soils. This approach was taken for two reasons: 1) it provides a means of compensating for natural variation; and 2) unlike what may exist at some archaeological sites, none of the measured elemental concentrations at Puncheon Run are so high as to stand as lone indicators. The shown percentage ranges are approximate only.

The data in Table A-10 demonstrate that feature fills exhibit chemical profiles that while probably not sufficiently reliable to be diagnostic are still nonetheless serviceable as general indicators of feature type. Among the clearest discriminations apparent is simply the difference between what appear to be natural features and manmade features. In none of the features considered either of unknown or of likely natural origin (25, 32, and 37) were there any trends appreciably distinguishing the feature fills from control soils. Whereas in all other features with strong morphological and artifactual evidence of human agency, distinguishing chemical markers are clearly present. In the two large pit features (30 and 38) thought to have been used either for storage or mortuary function, fill materials register with well-enhanced concentrations of phosphorus, barium, and strontium. Calcium was also slightly elevated in Feature 38. These data are not adequate to specify the exact purpose of the feature; if human burial is a consideration, then interment must have been temporary, with the detectable residues only representative of fragmentary remains. Permanent burial and the decomposition of all bodily or even just skeletal remains would register with much higher elemental concentrations. Those features associated with evidence of burning, such as fire-cracked rock (FCR) clusters and charcoal (36, 94, 96, and 97), exhibit enhanced concentrations of phosphorus, barium, and potassium. Elevated potassium levels are particularly prominent, since the Locus 3 soils are naturally quite deficient in potassium.

Table A-9: Total-Phosphorus Concentrations in Soil Samples From the Metate Block

Feature/ Excavation Unit	Phosphorus (Mg/kg)		
	Level 3	Level 4	Level 5
Control/415	177.9	-	241.0
F36/356	247.8	-	-
F36/370	190.8	-	-
F36/409	211.7	-	-
F94/410	202.2	-	-
F96/397	259.2	260.7	316.5
F97/436	194.0	-	-

Note: Levels are in 10-centimeter increments below the Ap-horizon.

Table A-10: Chemistries of Locus 3 Feature Fills Relative to Control Soils

Feature	Extractable						Total			Archaeological Interpretation
	Ph	Om	K	Ca	Mg	P	P	Ba	Sr	
25	+	0	+	0	0	0	0	0	+	animal den
30	+	0	0	0	0	++	++	++	+	storage or burial pit
32	0	0	0	0	0	+	0	0	0	probably natural
36	NA	+	+	0	0	+	+	+	0	metate
37	0	0	0	0	0	0	0	+	+	uncertain
38	0	0	0	+	0	++	++	+	+	storage or burial pit
94	NA	+	0	0	0	+	+	+	0	FCR cluster, Metate block
96	NA	+	+	0	0	++	++	+	0	FCR cluster, Metate block
97	NA	+	++	0	0	0	+	+	0	FCR cluster, Metate block

Enhancement above control: 0 none (less than 10%)
\+ slight (10-25%)
++ moderate (25-50%)

IV. LOCUS 1 RESULTS

Control profiles and features sampled for chemical investigations of Locus 1 were distributed between two portions of the locus. Most were in the main cluster of features where the surface horizon had been mechanically stripped and was no longer available for sampling. Samples collected from this area for chemical analyses represent a total of three control profiles and 14 subsurface pit features. At a separate location near the western end of the locus, where deposits of slope wash were present, samples were also collected from one feature and one control profile.

Despite a large amount of textural variability in the soils of Locus 1, the chemical compositions of the control profiles are relatively similar. Centrally located in the main feature cluster, the control profile for Feature 53 provides a good representative example of major chemical traits for Locus 1 soils. As shown in Table A-11, elemental concentrations and distributions with depth exhibit patterns typical for a soil of the Delaware Coastal Plain that has been marginally influenced by agricultural amendments. Generally poor in fertility throughout, the only suggestions of previous amendments are higher concentrations of calcium and potassium in upper subsoil levels. Even these amounts are so modest as to demonstrate only meager influences on subsoil chemistry by fertilizer or lime amendments. Similar trends hold for the other control profiles, with the only notable exceptions being somewhat higher phosphorus contents in the upper levels of other profiles.

Table A-11: Major Chemical Properties of the Feature 53 Control Profiles

Horizon, Depth (cm)	% Sr	pH	OM mg/kg	K mg/kg	Ca mg/kg	Mg mg/kg	P mg/kg	T-P mg/kg	Ba mg/kg
Bt1, 0-49	5.8	0.2	61.1	312.4	76.4	1.2	117.3	47.1	12.1
Bt2, 49-65	5.4	0.2	23.8	268.3	53.7	1.4	128.9	43.4	11.2
BCl, 65-77	5.4	0.2	19.8	220.4	40.0	2.2	132.6	37.2	9.0
BC2, 77-92	5.2	0.3	15.6	205.7	35.9	2.2	114.8	36.5	9.2
2BC, 92-101	5.4	0.3	14.2	167.4	38.2	1.8	81.0	30.6	8.5
3C, 101-120	5.4	0.2	13.2	130.1	21.7	1.7	70.2	22.8	6.4

One of the exceptions that bears separate discussion occurs in the slope wash area of Feature 14. From the chemical data found in Attachment C, it can be seen that for this portion of the locus (Control Profile EU 377) high phosphorus concentrations are a conspicuous attribute of the surface horizon. This profile, containing two stacked plowzones, was actually the only one from which surface horizon samples were collected, so it is unknown how representative the profile's surface chemistry is of the entire locus. Apparently significantly altered by historical fertilizer applications or possibly animal confinement, the concentrations of extractable and total-phosphorus in the Ap1-horizon are 53.9 and 485.1 mg/kg, respectively. Dropping off substantially to values of 12.8 and 278.6 mg/kg, respectively, in the underlying Ap2-horizon, further phosphorus depth trends are then similar to other control profiles, such as that in Table A-11. Although high phosphorus concentrations in the Ap1-horizon are two to three times greater than subsoil levels in any of the control profiles, the fact that this profile's subsoil phosphorus concentrations eventually taper off to levels similar to those of other control profiles is supporting evidence that historical chemical influences on subsurface horizons have been both modest and probably reasonably uniform throughout the locus. Thus, any comparative differences between the chemical constituencies of subsurface pit features and control subsoils can be considered nearly pristine to potential agricultural contamination.

As previously discussed, the absence of intact profiles throughout most of the investigated portions of Locus 1 prevented the weighting of control profiles for comparison with feature fills. Only in the slope wash area of Feature 14 was this possible. Otherwise, feature fills were compared with similar levels of the closest control profile, typically no more than a few meters distant.

SUMMARY OF LOCUS 1 FEATURE CHEMISTRIES

Table A-12 summarizes the chemical properties of feature fills relative to background soil chemistries. As in the summary table (see Table A-10) for Locus 3, the data are reported not as absolute quantities but rather as relative degrees of enhancement above control soils. The data allow for varying degrees of discrimination between feature types as determined by archaeological field classifications. As in Locus 3, features of apparent natural origin do not generally exhibit chemical profiles appreciably different from control soils. However, two exceptions are present in Locus 1.

Features 1 and 53 are identified as natural disturbances, and yet their chemistries are elevated in phosphorus, barium, organic matter, and potassium, calcium, or strontium. At least two possible explanations could account for the elevated concentrations. Historical contamination is always a possibility on any landscape utilized by Europeans for as long as three centuries, but such relatively young disturbances normally have recognizable morphologies entailing mixtures of poorly blended and discretely different soil bodies. Animal influences are another possibility, particularly if involving recent occupation. Older animal disturbances in which secondary modification imposed a burrow configuration upon what was originally a manmade feature could also greatly complicate field identification of feature type.

Pit features with the sharpest chemical evidence of cultural influence are those where burning occurred. In each of the two features (Features 50 and 51) where burned materials were present, concentrations of phosphorus, calcium, potassium, barium, and organic matter were all elevated over control levels. Similarly, the chemistry of one of the designated storage pits (Feature 7) has probably also been influenced by burning, but not to the extent of Features 50 and 51. Slightly elevated levels of potassium, calcium, and barium in the ringed pit feature (Feature 64) are possibly suggestive of burning, but without an accompanying increase in phosphorus the data are insufficient to support an anthropogenic origin for this feature.

The several features designated as silo pits (Features 3, 4, 42, and 98) and one of the storage pits (Feature 48) generally do not register with any chemical differences from control soils other than slightly elevated concentrations of organic matter. Based on regularity of shape, there is little doubt that these pit features were manmade, so it is particularly interesting that they contain no chemical evidence of human presence. Whatever may have been contained in them was apparently completely removed, and they were obviously not used for the discard of refuse or other substances. Also, considering that wash-in of soil from a near-surface context is likely to account for some portion, probably even the bulk of a feature's fill, this material should provide some chemical impression of the prehistoric land surface. With no increases in elemental concentrations to evince large groups of people or extended periods of occupation, the chemical barrenness implies only a low level of human activity in association with the silo pits.

V. COMPARISON OF LOCUS 3 AND LOCUS 1 CHEMISTRIES

Several general observations can be made about the soil chemistries of the two occupation loci at Puncheon Run. First, large chemical contributions from prehistoric occupations are not an attribute of either of the loci. In contrast to heavily utilized sites where increases in soil elemental concentrations can often be expressed in orders of magnitude, at the Puncheon Run Site even the largest of increases is no more than about 50 percent above background. This probably implies relatively low occupation intensities, but given the sandy nature of many of the soils, together with the 2,000- to 3,000-year passage of time since most site occupations occurred, long-term retention of elements could be poor. Those still detectable may represent no more than greatly reduced residuals from initially much higher concentrations.

Although soil chemical properties are not inordinately enhanced in either locus, higher elemental concentrations in Locus 3 suggest that more human activity occurred in this locus than in Locus 1. As presented in previous tables, the chemistries of a substantial number of cultural features in Locus 1 are not even significantly different from background soil concentrations. In comparison, all of the identified manmade features sampled in Locus 3 register chemistries readily distinguishable from control levels. Bt-

Table A-12: Chemistries of Locus 1 Feature Fills Relative to Control Soils

Feature	Extractable						Total			Archaeological Interpretation
	pH	OM	K	Ca	Mg	P	P	Ba	Sr	
1	+	+	0	+	0	+	+	++	+	natural disturbance
2	0	0	0	0	0	0	0	+	0	rodent burrow
3	+	0	0	0	0	0	0	0	0	silo pit
4	0	+	0	0	0	0	0	0	0	silo pit
5	0	0	0	0	0	0	0	0	0	natural disturbance
6	0	0	0	0	0	0	0	0	0	silo pit
7	NA	+	+	0	0	0	+	+	0	prehistoric storage pit
14	0	+	0	0	0	0	0	0	0	natural anomaly
41	+	++	0	0	0	0	0	0	0	silo pit
48	NA	+	0	0	0	0	0	+	0	prehistoric storage pit
50	NA	++	++	+	0	0	+	++	0	cultural pit, burned nut
51	NA	+	+	++	0	+	++	+	0	cultural pit, burned soil
53	+	++	+	0	0	+	+	++	0	natural disturbance
64	NA	0	+	+	0	0	0	+	0	ringed pit
98	NA	+	0	0	0	0	0	0	0	silo pit

Enhancement above control: 0 none (less than 10%)
\+ slight (10-25%)
++ moderate (25-50%)

horizon chemistries of control profiles from the two loci provide a further indication of different occupation densities. As shown in Table A-13, mean subsoil chemistries are noticeably different in the two loci. Despite the fact that the finer textured subsoil horizons of some of the Locus 1 control profiles would have higher elemental retention capacities than the generally sandier subsoils of the Locus 3 controls, concentrations of elements in the Locus 1 soils are not markedly higher. Slightly higher Locus 1 concentrations (all still quite low) of calcium, potassium, and strontium can probably be attributed to greater chemical exchange capacities, but the much lower concentrations of phosphorus are far less likely to represent natural soil variation. Instead they are suggestive of different levels of input. As eventual depositories for chemical additives, subsoil horizons provide a long-term, landscape-wide window into soil history. These data reveal that considerably more phosphorus has been added to Locus 3 soils than to Locus 1 soils. Some of the additional phosphorus may be a result of historical farming, but phosphorus movement through soil is so slow that most phosphorus recovered from argillic horizon levels is more likely to have originated from a prehistoric source. With this presumption, the greater contributions of prehistoric phosphorus demonstrate more intensive levels of human activity in Locus 3 than in Locus 1.

Table A-13: Chemistries of Bt-Horizons in Control Profiles of Locus 3 and Locus 1

Feature (Profile)	% Sr	pH	OM mg/kg	K mg/kg	Ca mg/kg	Mg mg/kg	P mg/kg	T-P mg/kg	Ba mg/kg
Locus 3									
Feature 25 (EU 127)	5.7	0.4	53.6	220.1	68.8	6.8	236.9	42.3	7.4
Feature 30 (EU 336)	5.6	0.4	70.0	241.2	89.4	7.4	347.0	61.7	10.2
Feature 32 (EU 332)	5.2	0.3	16.8	211.9	25.9	15.8	472.3	60.4	11.6
Feature 37 (EU 380)	5.3	0.4	84.5	248.0	93.8	7.4	420.1	51.0	10.9
Feature 38 (EU 314)	5.2	0.7	104.6	350.6	65.5	22.9	449.3	84.1	9.9
Metate (EU 415)	5.1	0.7	11.2	241.8	17.9	4.6	241.0	50.3	9.1
Locus 3 $\bar{X}$	5.4	0.4	56.8	252.2	60.2	10.8	**361.1**	58.1	9.8
Locus 1									
Feature 14 (EU 377)	5.0	0.3	116.1	223.7	42.5	1.5	234.9	88.7	13.0
Feature 41	5.7	0.2	116.4	377.4	58.9	2.2	201.5	60.7	10.2
Feature 53	5.6	0.2	42.4	290.3	65.0	1.3	123.1	45.2	11.6
Feature 64	5.6	0.1	84.5	308.8	71.4	2.8	247.0	58.6	10.9
Locus 1 $\bar{X}$	5.5	0.2	89.8	300.0	59.4	2.0	**201.6**	63.5	11.4

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ATTACHMENT A

SOIL PROFILE DESCRIPTIONS

SOIL PROFILE DESCRIPTIONS

HORIZON	DEPTH (cm)	BDRY	TEXTURE	STRUCTURE	COLOR	MOTTLING	CONSIS-TENCE	OTHER FEATURES
Profile 1 (borrow pit) - lower terrace of Locus 3								
A	0-14	CW	FSL	1FGR	10YR 2/2	none	VFR	
E	14-26	GS	LS	1FSBK	10YR 4/4-4/5	none	VFR	
BE	26-61	GS	LS	1COSBK	10YR 4/4	none	VFR	
Bt	61-98	CS	SL	1MSBK	10YR 4/4-4/6	none	FR	
BC	98-120	CS	LT. SL	1MSBK	10YR 4/4-4/6	none	VFR	
C1	120-130	CW	S	OSG	10YR 5/6, 4/6	none	LO	
C2	130-163	CW	S	OSG	10YR 6/4	none	LO	2 10YR 5/4 ls lamellae 1 cm+ thick
2C	163-170+		GS	OSG	10YR 6/6	none	LO	
Profile 2 (NW corner Block 5) - lower terrace of Locus 3								
Ap	0-10	CS	LS	1MGR	10YR 3/3	none	VFR	
E	10-22	CS	LS	1MPL	10YR 4/4	none	VFR	
BE	22-36	CS	LT. SL	1COSBK	10YR 4/6	none	FR	
Bt	36-57	CS	SL	1COSBK	10YR 4/6	none	FR	
BC	57-76	CS	LT. LS	1COSBK	10YR 5/6	none	VFR	
C1	76-119	CS	S	OSG	10YR 5/8, 6/6	none	LO	small pebbles
C2	119-236+		S	OSG	10YR 6/6	none	LO	minor gravel and FSL lenses
Profile 3 (Excavation Unit 57) - lower terrace of Locus 3								
Ap	0-15	AS	LS	1MGR	10YR 3/3	none	VFR	
E	15-30	CS	LS	1MSBK-OSG	10YR 4/4	none	VFR	
BE	30-41	CS	LT. SL	1MSBK	10YR 4/6	none	VFR	
Bt	41-59	CS	SL	1COSBK	7.5YR 4/6	none	FR	
BC	59-77	CS	LT. SL	1MSBK	7.5YR 4/6	none	VFR	
C	77-100+		S	OSG	10YR 5/6	none	LO	

HORIZON	DEPTH (cm)	BDRY	TEXTURE	STRUCTURE	COLOR	MOTTLING	CONSIS-TENCE	OTHER FEATURES
Profile 4 (Excavation Unit 58) - lower terrace of Locus 3								
Ap	0-21	AS	LS	1MGR	10YR 3/3	none	VFR	
E	21-41	CS	LS	1MPL-OM	10YR 4/4	none	VFR	
EB	41-50	CS	LS	1MSBK-OM	10YR 4/4-4/6	none	VFR	this horizon not distinguishable from E on some walls
Bt	50-65	CS	LT. SL	1COSBK	7.5YR 4/6	none	VFR	minor clay bridging
BC	65-88	GS	S	OSG	7.5-10YR 4/6	none	LO	
C	88-115+		S	OSG	10YR 5/6	none	LO	
Profile 5 (near Excavation Unit 155) - lower terrace of Locus 3								
Ap	0-25	AS	LT. SL	1MGR	10YR 3/3	none	VFR	
E	25-42	CS	LS	0M	10YR 4/4	none	VFR	
BE	42-52	CS	SL	1MSBK	10YR 4/6-4/4	none	FR-VFR	
Bt	52-75	CS	LT.SCL	1-2MSBK	7.5YR 4/6	none	FR	discontinuous clay films
BC1	75-91	CS	LT. SL	1MSBK	7.5YR 4/6	none	FR	
BC2	91-105	CS	LS	1COSBK	7.5YR 5/6	none	VFR	
BC2	105-116+		S	OSG	7.5YR 5/6	none	LO	
Profile 6 (near Shovel Test A-1) - lower terrace of Locus 3								
Ap	0-31		LS		10YR 3/3	none	VFR	
E	31-46		LS		10YR 4/4	none	VFR	
Bt	46-69		SL		10YR 4/6	none	FR-VFR	
BC	69-87		LT. SL		10YR 4/6	none	VFR	
C	87-125		FS		10YR 5/6	none	LO	
Profile 7 (Excavation Unit 27, near Feature 25) - lower terrace of Locus 3								
Ap	0-24	AS	SL	1MGR	10YR 3/3	none	VFR	
E	24-42	CS	LS	1MPL	10YR 4/4	none	FR-VFR	

HORIZON	DEPTH (cm)	BDRY	TEXTURE	STRUCTURE	COLOR	MOTTLING	CONSIS-TENCE	OTHER FEATURES
Bt	42-74	CS	SL	1MSBK	7.5YR 4/6	none	FR	patchy clay films
BC1	74-82	CS	LS	1MSBK	10YR 4/6	none	VFR	
BC2	82-93		LFS	1MSBK	10YR 5/6-4/6	none	VFR	few pebbles
C	93-105+		FS	OSG	10YR-2.5Y 5/6	none	LO	few pebbles
Profile 8 (Excavation Unit 74) - lower terrace of Locus 3								
Ap	0-22	AS	LT. SL	1MGR	10YR 3/3	none	VFR	
E	22-42	CS	LT. SL	1MPL	10YR 4/4	none	VFR	
Bt1	42-52	CS	SL	1MSBK	10YR 4/6	none	VFR	
Bt2	52-71	CS	SL	1MSBK	7.5YR4/6	none	FR-VFR	patchy clay films
BC	71-97	GW	LT. SL	1-2COSBK	10YR 4/6 7.5YR 4/6	none	FR-VFR	discontinuous clay films on 7.5YR 4/6 ped faces; gravels
C	97-120+		S	OSG	10YR 4/6	none	LO	
Profile 9 (near SW corner Block 9) - Coastal Plain upland of Locus 3								
Ap	0-32		LT. SL		2.5Y 3/2	none	VFR	
Bt	32-60		LT. SCL		7.5YR 4/6	none	FR	
BC	60-85		SL		7.5YR 4/6	none	VFR	
C	85-110		LS		10YR 4/6-5/6	none	LO	
2C	110-138		L-SL		10YR 4/6	none	FR	
3C	138-150		GSL		10YR 5/8	none	VFR	
Profile 10 (Excavation Unit 109) - Coastal Plain upland of Locus 3								
Ap	0-27	AS	SL	1MGR	10YR 3/3	none	VFR	
E	27-42	CS	SL	1MSBK	10YR 4/4	none	VFR	
Bt	42-74	CS	SL	1COSBK	7.5YR 4/6	none	FR	
2Bt	74-112	AW	L	2-1M+CO SBK	10YR 4/6	none	FR	continuous clay films of 10YR 3/4
3BC	112-130	CS	LS	1COSBK	7.5YR 5/8	none	VFR	stone line at top

HORIZON	DEPTH (cm)	BDRY	TEXTURE	STRUCTURE	COLOR	MOTTLING	CONSIS-TENCE	OTHER FEATURES
3C	130-145+		S	OSG	10YR 5/8	none	LO	
Profile 11 (near Shovel Test I-1) - Coastal Plain upland of Locus 3								
Ap	0-33		LT. SL		10YR 3/3	none	VFR	
BE	33-50		SL		10YR 4/6	none	FR	
Bt	50-82		LT. SCL		7.5YR 4/6	none	FR	
2Bt1	82-96		VGSL		7.5YR 5/6	none	VFR	
2Bt2	96-110+		VGSCL		7.5YR 5/6	none	FR	
Profile 12 (near Shovel Test D-1) - Coastal Plain upland of Locus 3								
Ap	0-32		SL-L		10YR 3/3	none	FR	
E	32-50		SL		10YR 4/4	none	FR	
Bt	50-79		H. SL		7.5YR 4/6, 10YR 4/6	none	FR	slightly more silty with depth
BC	79-91		SL		10YR 4/6	none	FR	
2C1	91-125		S		10YR 5/6, 6/4	none	LO	
2C2	125-146		SL		10YR 5/8	none	VFR	
3C1	146-163		CL		7.5YR 4/8	none	FI	
3C2	163-193		C		2.5YR 5/6	C2D 5Y 6/2 M3P 7.5YR 4/8	FI	
Profile 13 (near west edge of Block 10) - Coastal Plain upland of Locus 3								
A	0-9		L		10YR 3/3	none	FR	
E	9-18		L		10YR 5/3, 5/4	none	FR	
BE	18-28		L		10YR 5/6, 5/4	none	FR	
Bt	28-57		L-SCL		7.5YR 5/6	none	FR	
BC1	57-74		SL		7.5-10YR 5/6	none	FR	
BC2	74-89		LS-SL		10YR 5/6	none	FR	
C	89-111		S		10YR 5/6, 6/6	none	LO	
2C	111-159		COS		10YR 6/6, 5/6	none	LO	few gravels
Feature 30 Control of Locus 3 (Excavation Unit 336)								
Ap	0-16	AS	SL	1MGR	10YR 3/3	none	VFR	

HORIZON	DEPTH (cm)	BDRY	TEXTURE	STRUCTURE	COLOR	MOTTLING	CONSIS-TENCE	OTHER FEATURES
BE	16-29	CS	SL	1MSBK	10YR 4/4, 4/6	none	VFR	> %c
Bt1	29-43	CS	SL	1MSBK	7.5YR 4/4-4/6	none	VFR	~12%c, patchy clay films and bridging
Bt2	43-64	CS	SL	1M+CO SBK	7.5YR 4/6	none	FR	~14%c, patchy clay films and bridging
BC1	64-80	CS	LT. SL	1COSBK	7.5YR 5/6	none	VFR	
BC2	80-109	CS	S	OSG	7.5YR 5/6	none	LO	few pebbles
C1	109-125	CS	S	OSG	7.5YR 5/8, 10YR 5/6	none	LO	few pebbles
C2	125-143	GW	S	OSG	10YR 5/6	none	LO	~10% gravel
2C	143-155+		GS	OSG	10YR 5/6, 5/4	none	LO	
Feature 38 Control of Locus 3 (Excavation Unit 314)								
Ap	0-21	AS	SL	1MGR	10YR 3/3	none	VFR	
E	21-33	CS	SL	1MPLÕ 1MSBK	10YR 4/4	none	VFR	
BE	33-47	CS	SL	1MSBK	10YR 4/6	none	FR	
Bt	47-69	CS	SL	1COSBK	7.5YR 4/6	none	FR	
BC	69-80	CS	LT. LS	1VCOSBK	7.5YR 5/6	none	VFR	
C1	80-97	GS	S	OSG	10YR 4/6	none	LO	
C2	97-132	CS	S	OSG	10YR 5/6	none	LO	
C3	132-149+		S	OSG	10YR 4/4	None	LO	gravel line at top
Feature 37 Control of Locus 3 (Excavation Unit 380)								
Ap	0-13	AS	LS-SL	1MGR	10YR 3/3	none	VFR	
E	13-21	CS	LS	OM	10YR 4/4	none	VFR	Varies to lt. Sl in other test units
BE	21-33	CS	SL	1MSBK	10YR 4/6	none	FR	
Bt	33-62	CS	SL	1-2MSBK	7.5YR 4/6	none	FR	
BC	62-78	CS	Ls	1COSBK	7.5YR 4/6	none	VFR	
C1	78-93	CS	S	OSG	10-7.5YR 4/6	none	LO	

HORIZON	DEPTH (cm)	BDRY	TEXTURE	STRUCTURE	COLOR	MOTTLING	CONSIS-TENCE	OTHER FEATURES
C2	93-105+		S	OSG	10YR 5/6	none	LO	
Metate Control of Locus 3 (Excavation Unit 415)								
Ap	0-24	AS	SL	1MPL	10YR 3/3	none	VFR	
E	24-34	CS	SL	1MPL	10YR 4/4	none	VFR	
BE	34-44	CS	SL	1MSBK	10YR 4/4-4/6	none	FR	
Bt	44-63	CS	H. SL	1COSBK	7.5YR 4/4	none	FR	
BC1	63-78	CS	LT. SL	1VCOSBK	7.5YR 4/6-4/4	none	VFR	
BC2	78-93	CS	LS	OM	10YR 4/6	none	VFR	few pebbles
C	93-105+		S	OSG	10YR 5/6, 4/6	none	LO	~10% gravel
Feature 32 Control of Locus 3 (Excavation Unit 332)								
Ap	0-25	AS	SL	1MGR	10YR 3/3	none	VFR	
E	25-38	CS	LT. SL	1MPL	10YR 4/4, 5/4	none	VFR	
Bt1	38-57	CS	SL	1MSBK	10YR 4/6	none	FR-VFR	minor 10YR4/4 patchy clay films
Bt2	57-84	CS	SL	1-2MSBK	7.5YR 4/6	none	VFR-FR	patchy clay films
BC	84-103	CS	LT. SL	1COSBK	7.5YR 5/6-4/6	none	VFR	few gravels
2C	103-120+		S	OSG	10YR 5/6, 6/6	None	LO	nearly gravelly
Excavation Unit 214 - Coastal Plain upland of Locus 2								
A	0-5	AS	L	1MGR	10YR 3/3-3/2	none	FR	
Ap	5-24	AS	L	1FSBK	10YR 4/3	none	FR	
BE	24-43	CS	L	1MSBK	10YR 5/4, 4/4, 4/6	none	FR	
Bt1	43-64	CS	L	2-1MSBK	7.5YR 4/6	none	FR	nearly continuous clay films; few gravels
Bt2	64-89	CS	GSCL	2MSBK	7.5YR 4/6	none	FR	nearly continuous clay films
BC	89-106	GS	LS-SL	1COSBK	7.5YR 4/6	none	VFR	discontinuous clay films

HORIZON	DEPTH (cm)	BDRY	TEXTURE	STRUCTURE	COLOR	MOTTLING	CONSIS-TENCE	OTHER FEATURES
C	106-120+		S	OSG	7.5YR 5/8	none	LO	
Excavation Unit 185 - Coastal Plain upland of Locus 1								
Ap	0-28	AS	SL	1MGR	10YR 4/3	none	VFR	<10% gravel
Bt1	28-56	GS	SL	1COSBK 1MPL	10YR 4/6 7.5YR 4/6	none	FR	discontinuous clay films <10% gravel
Bt2	56-88	CW	SL	1MSBK	7.5YR 4/6 10YR 4/6	none	FR	<10% gravel
C	88-105+		GS	OSG	10YR 4/6 7.5YR 4/6	none	LO	20% gravel
Excavation Unit 192 - Coastal Plain upland of Locus 1								
Ap	0-26	AS	GSL	1MGR	10YR 3/3	none	VFR	
E	26-47	CS	GSL	1MPL	10YR 5/4	none	VFR	
BE	47-61	CS	GSL	1MSBK	10YR 4/6	none	VFR	
Bt	61-81	CS	GSL	1COSBK	7.5YR 4/6	C2D 10YR 5/3	VFR	
BC	81-92	CS	GS	OSG	7.5YR 5/6	none	LO	
C	92-100+		VGS	OSG	10YR 5/6 7.5YR 5/6	none	LO	
Excavation Unit 233 - Coastal Plain upland of Locus 1								
Ap1	0-19	CS	SL-L	1MGR	10YR 3/3	none	FR	historic slope wash
Ap2	19-30	CS	SL-L	OM	10YR 3/4	none	FR	historic slope wash
Ap3	30-36	AS	L	1MPL	10YR 3/3-3/2	none	FR	
E	36-55	CS	L-SL	1MPL- 1MSBK	10YR 5/4	none	FR	
BE	55-76	CS	L	1MSBK	10YR4/4 10YR 4/6	none	FR	
Bt1	76-97	CS	H. L	2MSBK	7.5YR 4/6	none	FR	nearly continuous clay films

HORIZON	DEPTH (cm)	BDRY	TEXTURE	STRUCTURE	COLOR	MOTTLING	CONSIS-TENCE	OTHER FEATURES
Bt2	97-112	CS	SIL	2MSBK	2.5Y 4/4	C2D 5Y5/1 C2D 10YR 4/6	FR	patchy clay films
Bcg	112-122	CS	SIL	2MPL	5Y 5/1	C3D 5Y 5/3, C2P 7.5YR 4/6	FR-FI	
2Cg	122-130+		SCL	OM	5Y 5/1	C3P 10YR 5/6	FR	
Feature 64 Control of Locus 1								
Bt	0-26	CW	H. L	2-1MSBK	7.5YR 4/6	none	FR	continuous clay films
2bc	26-34	CW	SL	1MSBK	10YR 4/6	none	FR	few gravels
2C	34-40	AW	GS	OSG	10YR 4/6, 5/6	none	LO	
3C	40-77	AS	S	OSG	10YR 5/6	none	LO	several lamellae 2-5 mm thick, 7.5YR 4/6 LS
4BCb	77-99	CS	SL	1COSBK	10YR 4/6, 7.5 YR 4/6, 5/8	none	FR	gravel line at top
4C	99-110 +		LT. LS	OM	7.5YR 4/6	none	VFR	
Feature 41 Control of Locus 1								
Bt	0-25	CS	H. SL	1MSBK	7.5YR 4/6	none	FR	discontinuous clay films, few gravels
BC	25-40	CW	GSL	1COSBK	7.5YR 4/6	none	VFR	
CB	40-59	CS	S	OSG	7.5YR 5/6, 4/6	none	LO	partially cemented several lamellae 1 cm thick
C	59-72	CS	S	OSG	10YR 5/6	none	LO	
2C	72-90+		SL	OM	10YR 5/8, 4/6	none	FR	
Feature 53 Control of Locus 1								
Bt1	0-49	CS	H. L	2-1MSBK	7.5YR 4/6	none	FR	nearly continuous clay films

HORIZON	DEPTH (cm)	BDRY	TEXTURE	STRUCTURE	COLOR	MOTTLING	CONSIS-TENCE	OTHER FEATURES
Bt2	49-65	CW	L-SIL	1-2MSBK	10YR 4/6	C3D 10YR 5/3	FR	discontinuous clay films, mottling more abundant elsewhere
BC1	65-77	CW	L-SL	1MSBK	10YR 4/6	none	FR	
BC2	77-92	CS	L	1M+CO SBK	10YR 4/6	none	FR	
2BC	92-101	CS	GSL	1MSBK	10YR 5/4	M2D 10YR 6/2	VFR-FR	
3C	101-120+		SL-LS	OM	10YR 5/6, 2.5Y 6/3	none	VFR	
Feature 14 Control of Locus 1 (Excavation Unit 377)								
Ap1	0-27	CS	L	1MGR	10YR 3/3	none	FR	
Ap2	27-31	AS	L-SIL	1MGR	10YR 3/2	none	FR	this horizon more strongly expressed in adjacent test units
E	31-45	CS	L-SIL	<1MPL	10YR 5/4	none	FR	nearly massive structure, vesicular
BE	45-67	CW	L-SIL	1-2MSBK	10YR 4/4, 4/6	none	FR	
Bt	67-103	CW	H. L	2MSBK	10YR 4/6	none	FR	discontinuous clay films
2BC1	103-119	CW	H. SL	2-1MSBK	10YR 4/6	none	FR	
2BC2	119-133	CW	LS	1MSBK	7.5YR 4/4	None	VFR	few gravels
2C	133-143+		S	OSG	10YR 5/6	C2+3D 2.5Y 5/3	LO	~10% gravel

ATTACHMENT B

PARTICLE SIZE DATA

PARTICLE SIZE DATA

HORIZON	DEPTH (cm)	% SAND	% SILT	% CLAY	SAND FRACTIONS				
					% VCOS	% COS	% MS	% FS	% VFS
Locus 3 Metate Control, Excavation Unit 415									
Ap	0-24	70.3	27.5	2.2	3.8	23.3	27.9	12.8	2.5
E	24-34	69.0	25.8	5.2	3.5	22.5	28.1	12.4	2.5
BE	34-44	63.5	28.0	8.5	3.0	19.8	26.4	11.9	2.4
Bt	44-63	64.2	23.1	12.7	3.4	20.1	27.3	11.3	2.1
BC1	63-78	78.2	12.3	9.5	3.5	21.2	34.9	15.6	3.0
BC2	78-93	82.6	10.7	6.7	4.1	19.8	35.3	19.3	4.1
C	93-105+	84.1	12.2	3.7	5.3	14.0	26.6	29.4	8.8
Locus 3 Feature 38 Control									
Ap	0-21	75.8	18.4	5.8	2.9	20.0	32.4	16.8	3.7
E	21-33	71.9	18.6	9.5	3.0	20.1	31.6	14.0	3.2
BE	33-47	66.7	19.8	13.5	3.0	19.1	28.7	12.7	3.2
Bt	47-69	72.0	11.3	16.7	3.7	21.7	32.4	11.6	2.6
BC	69-80	82.9	7.1	10.0	2.4	18.6	38.8	18.7	4.4
C1	80-97	88.5	5.0	6.5	2.6	18.0	45.3	19.2	3.4
C2	97-132+	91.0	4.5	4.5	3.2	19.6	39.5	23.4	5.3
Locus 3 Feature 38 Fill									
Str. B		89.9	3.3	6.8	5.9	34.1	36.3	11.7	1.9
Str. C		89.0	5.2	5.8	11.1	33.7	30.1	11.1	3.0
Str. E		73.6	15.2	11.2	3.8	22.2	31.4	13.2	3.0
Str. F		72.8	17.2	10.0	4.6	22.1	29.4	13.3	3.4
Str. G		71.7	12.3	16.0	4.6	25.7	29.5	9.4	2.5
Str. H		76.8	12.2	11.0	4.9	23.9	33.5	11.6	2.9
Str. L		84.7	5.9	9.4	2.0	20.8	41.3	17.5	3.1
Locus 3 Feature 30 Control									
Ap	0-16	74.5	19.3	6.2	3.0	20.6	32.6	15.2	3.1

HORIZON	DEPTH (cm)	% SAND	% SILT	% CLAY	SAND FRACTIONS				
					% VCOS	% COS	% MS	% FS	% VFS
BE	16-29	66.8	24.4	8.8	4.3	19.5	25.2	14.1	3.7
Bt1	27-43	63.9	21.9	14.2	2.6	18.5	22.2	16.6	4.0
Bt2	43-64	70.4	15.8	13.8	4.7	21.7	24.3	16.0	3.7
BC1	64-80	81.6	10.4	8.0	3.0	19.5	32.0	21.5	5.6
BC2	80-109	91.2	5.3	3.5	8.2	32.1	25.6	20.7	4.6
C1	109-125	93.2	4.0	2.8	6.1	35.2	28.4	19.9	3.6
C2	125-143+	96.6	2.4	1.0	7.6	48.4	21.6	16.6	2.4
Locus 3 Feature 30 Fill									
	20-40	70.6	20.6	8.8	4.0	20.7	27.8	14.7	3.4
	40-60	74.9	16.3	9.2	5.7	24.3	28.7	13.4	2.8
	60-80	71.8	19.4	8.8	4.2	24.4	27.4	12.9	2.9
	80-100	73.1	18.7	8.2	3.9	25.7	28.9	12.1	2.5
	100-120	72.5	19.0	8.5	4.0	25.4	28.2	12.4	2.5
	120-140	72.9	18.3	8.8	3.4	23.5	33.1	10.6	2.3
	Mean	72.9	18.7	8.7	4.2	24.0	29.0	12.7	2.7
Locus 3 Feature 32 Control, Excavation Unit 332									
Ap	0-25	71.2	23.0	5.8	6.5	21.6	25.4	15.4	2.3
E	25-38	69.4	23.6	7.0	3.9	19.3	28.4	15.7	2.1
Bt1	38-57	66.7	19.5	14.2	4.2	22.6	24.8	13.3	1.8
Bt2	57-84	69.8	16.7	13.5	5.0	22.3	26.6	13.8	2.1
BC	84-103	82.5	9.2	7.3	6.6	23.3	34.4	15.8	3.4
2C	103-120+	90.2	7.0	2.8	12.7	22.6	29.1	21.4	4.4
Locus 3 Feature 32 Fill, Excavation Unit 324									
Ap	0-22	71.5	21.3	7.2	4.3	23.3	26.1	15.4	2.4
Fill	22-37	65.3	26.9	7.8	2.7	17.6	26.2	16.1	2.7
Fill	37-64	67.3	25.2	7.5	4.5	21.2	25.8	13.8	2.0
Bt/BC	64-95	84.3	9.2	6.5	6.4	22.3	32.3	20.4	2.9
2C	95-110+	91.2	5.8	3.0	8.2	20.5	31.4	26.7	4.4

HORIZON	DEPTH (cm)	% SAND	% SILT	% CLAY	SAND FRACTIONS				
					% VCOS	% COS	% MS	% FS	% VFS
Locus 3 Feature 37 Control, Excavation Unit 380									
Ap	0-13	78.7	14.8	6.5	5.3	23.2	28.1	18.8	3.3
E	13-21	71.4	18.6	10.0	2.5	18.2	25.5	18.8	5.5
BE	21-33	70.1	18.7	11.2	4.2	16.6	23.2	20.0	6.1
Bt	33-62	71.9	13.1	15.0	6.7	22.7	19.9	17.1	5.5
BC	62-78	81.1	8.4	10.5	8.0	26.0	23.8	18.0	5.3
C1	78-93	90.2	3.3	6.5	8.0	46.9	20.0	12.3	3.0
C2	93-105+	87.4	9.3	3.3	3.2	22.6	39.2	17.2	5.2
Locus 3 Feature 37 Fill, Excavation Unit 380									
Fill	28-64	70.0	19.0	11.0	3.6	20.8	26.9	14.6	4.1
Bt	64-71	71.6	13.6	14.8	4.0	20.9	26.4	15.6	4.7
BC	71-84	82.9	7.9	9.2	5.6	27.7	27.5	17.4	4.7
C	84-98+	90.5	4.5	5.0	6.7	34.4	32.7	13.3	3.4
Locus 3, Excavation Unit 127									
Ap	0-24	72.2	22.8	4.9	4.5	24.9	20.3	18.0	4.4
E	24-42	73.8	20.3	5.8	5.7	27.1	19.7	17.4	3.8
Bt1	42-60	69.0	22.5	8.5	5.5	22.4	18.2	18.2	4.6
Bt2	60-74	70.7	20.1	9.2	4.8	21.0	19.2	20.7	4.9
BC1	74-82	75.3	17.1	7.6	6.2	23.3	20.0	20.4	5.3
BC2	82-93	78.4	17.0	4.6	5.4	18.1	16.5	29.5	9.0
C	93-104+	73.1	24.6	2.3	6.6	12.4	13.9	28.6	11.6
Locus 3, Excavation Unit 58									
Ap	0-21	82.0	12.8	5.2	7.7	37.1	23.9	11.4	1.8
E	21-41	81.5	13.5	5.1	7.2	36.2	24.7	11.8	1.7
EB	41-50	80.5	13.2	6.0	7.3	34.5	25.6	11.9	1.6
Bt	50-65	83.3	10.0	6.8	8.2	34.9	26.5	12.4	1.2
BC	65-88	89.4	6.2	4.4	7.0	37.9	29.4	13.6	1.6
C	88-115+	95.7	3.6	0.7	5.8	40.9	32.5	14.8	1.7

HORIZON	DEPTH (cm)	% SAND	% SILT	% CLAY	SAND FRACTIONS				
					% VCOS	% COS	% MS	% FS	% VFS
Locus 1 Feature 53 Control									
Bt1	0-49	40.9	40.4	18.7	3.5	11.1	15.3	8.3	2.7
Bt2	49-65	33.3	47.7	19.0	1.9	8.6	12.2	7.4	3.2
BC1	65-77	46.5	38.3	15.2	3.1	11.5	17.5	11.1	3.3
BC2	77-92	46.7	38.5	14.8	2.6	12.2	18.8	10.6	2.5
2BC	92-101	54.9	30.1	15.0	2.3	10.9	23.4	14.4	3.9
3C	101-120+	79.5	9.7	10.8	3.7	17.2	37.0	18.4	3.2
Locus 1 Feature 53 Fill									
	0-20	51.8	34.2	14.0	2.4	12.0	21.8	12.6	3.0
	20-40	52.2	33.5	14.3	2.3	12.8	22.1	12.2	2.8
	40-60	63.0	32.0	15.0	2.1	12.7	23.1	12.4	2.7
	60-80	53.9	31.8	14.3	3.2	14.6	23.0	10.9	2.2
	80-90	52.5	31.5	16.0	2.4	10.7	21.8	14.2	3.4
Locus 1 Feature 14 Control, Excavation Unit 377									
Ap1	0-27	60.2	30.5	9.3	3.3	17.7	24.6	12.3	2.3
Ap2	27-31	64.5	33.2	12.3	3.5	15.6	21.9	11.1	2.4
E	31-45	40.7	45.3	14.0	2.7	9.5	15.2	10.3	3.0
BE	45-67	35.0	44.7	20.3	2.1	8.7	13.0	8.7	2.5
Bt	67-103	33.6	42.1	24.3	2.0	7.5	11.9	9.5	2.7
2BC1	103-119	65.3	15.7	19.0	3.7	9.7	23.3	24.8	3.8
2BC2	119-133	80.0	5.8	14.2	8.5	19.2	29.4	20.2	2.7
2C	133-143+	84.6	5.9	9.5	11.9	34.2	26.9	9.4	2.2
Locus 1 Feature 14 Fill									
	50-70	45.0	38.7	16.3	3.2	11.2	17.0	11.0	2.6
	70-90	43.1	38.9	18.0	2.2	10.5	16.4	11.2	2.8
Locus 1 Feature 41 Control									
Bt	0-25	68.4	13.3	18.3	5.1	18.0	26.0	16.6	2.7
BC	25-40	79.5	9.5	11.0	5.7	21.1	30.0	19.0	3.7

HORIZON	DEPTH (cm)	% SAND	% SILT	% CLAY	SAND FRACTIONS				
					% VCOS	% COS	% MS	% FS	% VFS
CB	40-59	89.6	3.2	7.2	2.2	16.8	53.9	14.2	2.5
C	59-72	92.2	2.4	5.4	4.5	24.2	47.5	12.7	3.3
2C	72-90	72.9	19.1	8.0	5.2	17.7	34.9	11.5	3.6
Locus 1 Feature 41 Fill									
	0-37	62.9	26.8	10.3	3.7	19.8	26.2	11.0	2.2
	37-56	59.5	29.8	10.7	3.7	17.3	24.7	11.4	2.4
	56-79	66.2	17.1	16.7	5.7	21.1	23.9	12.7	2.8
	79-87	68.0	19.0	13.0	7.2	24.0	24.7	10.0	2.1
	87-97+	79.6	10.9	9.5	5.4	15.9	41.5	13.1	3.7
Locus 1 Feature 64 Control									
Bt	0-26	49.9	33.1	17.0	3.7	13.9	18.9	10.9	2.5
2BC	26-34	75.7	13.0	11.3	12.0	23.5	24.2	13.4	2.6
2C	34-40	88.3	5.9	5.8	9.1	27.3	31.7	18.3	1.9
3C	40-77	94.9	1.1	4.0	5.7	26.8	41.1	20.2	1.1
4BC	77-99	81.9	8.6	9.5	4.7	25.1	31.6	16.6	3.9
4C	99-110+	82.0	8.7	9.3	0.4	17.0	50.1	11.2	3.3
Locus 1, Excavation Unit 185									
Ap	0-28	68.6	23.9	7.5	8.7	25.3	18.0	13.5	3.0
Bt1	28-56	69.2	21.6	9.2	7.7	24.8	19.7	14.2	2.7
Bt2	56-88	71.5	17.3	11.3	11.5	26.3	17.2	13.8	2.6
C	88-105+	90.2	7.4	2.4	29.9	32.5	16.1	10.4	1.3
Locus 2, Excavation Unit 214									
Ap	0-24	52.9	39.5	7.6	3.0	21.2	14.1	11.7	2.8
BE	24-43	47.4	41.6	11.0	2.2	19.1	12.9	10.4	2.8
Bt1	43-64	44.7	36.9	18.4	2.0	18.9	11.2	9.3	3.3
Bt2	64-89	54.4	31.1	14.6	3.4	24.1	10.9	12.3	3.7
BC	89-106	85.4	7.0	7.6	1.4	49.1	21.5	11.0	2.3
C	106-120+	89.9	6.6	3.8	1.3	50.5	22.2	13.0	2.6

ATTACHMENT C

SOIL CHEMISTRY TEST RESULTS

Puncheon Run Site (7K-C-51) -- Soil Chemistry Test Results

CAT#	LOCUS	BLOCK	UNIT	STR.	LVL.	FEAT.	FSTR.	FLVL.	COL	pH	BpH	OM/LOI	OM/WB
149	1	14				1		2		6.3	7.72	0.6	0.29
150	1	14				1		3		6.1	7.74	0.7	0.48
151	1	14				1		4		6.3	7.75	0.6	0.37
152	1	14	235	B	3					5.8	7.90	0.1	0.07
153	1	14	235	B	4					5.8	7.85	0.2	0.07
154	1	14	235	B	5					6.0	7.89	0.1	0.01
155	1	14				2	A	2		5.6	7.78	0.5	0.25
156	1	14				2	A	3		5.8	7.78	0.4	0.14
157	1	14				2	A	4		5.9	7.80	0.4	0.14
158	1	14	237	B	2					5.8	7.69	0.6	0.24
159	1	14	237	B	3					5.8	7.64	0.6	0.18
160	1	14	237	B	4					5.8	7.72	0.3	0.11
163	1	14				3	A	3		6.0	7.73	0.5	0.27
164	1	14				3	A	5		5.9	7.80	0.2	0.21
165	1	14				3	A	7		6.1	7.73	0.2	0.13
166	1	14				3	B	9		6.2	7.79	0.2	0.14
167	1	14				3	C	10		6.3	7.72	0.3	0.10
168	1	14				3	D	11		6.2	7.76	0.1	0.14
172	1	14	239	C						6.4	7.85	0.2	0.03
173	1	14	240	B						6.0	7.72	0.8	0.27
174	1	14	240	B						5.9	7.65	0.7	0.25
175	1	14				4	B	3		5.9	7.72	0.6	0.29
176	1	14				4	B	5		6.0	7.71	0.5	0.28
177	1	14				4	B	7		6.0	7.76	0.4	0.20
178	1	14				4	B/C	9		6.1	7.79	0.3	0.17
179	1	14				4	C	11		6.2	7.86	0.2	0.18
180	1	14	241	F	12					6.3	7.68	0.5	0.10
181	1	14	241	B	3					6.0	7.71	0.5	0.25
188	1	14	241	B	5					6.1	7.65	0.5	0.13
189	1	14				5	A	3		6.0	7.74	0.5	0.24
190	1	14				5	A	5		6.1	7.62	0.4	0.23
191	1	14				5	A	6		6.0	7.81	0.2	0.17
192	1	14	241	C						6.1	7.73	0.2	0.16
193	1	14	242	B	3					5.9	7.69	0.5	0.25
194	1	14	242	C	5					6.2	7.71	0.2	0.25
195	1	14				6	B	2		6.1	7.84	0.2	0.59
196	1	14				6	B	3		6.2	7.80	0.2	0.16
197	1	14				6	B	5		6.3	7.86	0.2	0.17
198	1	14	244	C						6.4	7.80	0.1	0.11
199	1	14	243	B						6.0	7.56	0.6	0.27
200	1	14	243	B						5.4	7.67	0.0	0.11
738	1					48	A	2		5.4		0.9	0.45
745	1					51	A	4		6.0		1.1	0.73
850	1					51	A	2		5.8		0.6	0.00
856	1					51	B	3		5.9		1.0	0.02
868	1					66	A	2		5.5		0.9	0.18
869	1					66	B	2		5.6		0.8	0.26
873	1					48	A	7		5.9		0.6	0.27
893	1					48	B	9		6.0		0.4	0.29
1056	1					64	A	2		5.6		0.5	0.00
1062	1					50	A	2		5.8		1.1	0.92
1092	1					50	B	5		5.9		0.7	1.28
1138	1					64	B	6		5.6		0.7	0.00
1301	1					7A	A	2		5.4		0.9	0.56
1308	1					7A	A	7		5.6		0.6	0.37

Puncheon Run Site (7K-C-51) -- Soil Chemistry Test Results

CAT#	Ttl. P	M1-P	M1-K	M1-Ca	M1-Mg	M1-Mn	M1-Zn	M1-Cu	M1-Fe	M1-Ba	M1-Sr
149	160.55	7.6	34.7	152.0	20.8	64.6	0.6	0.3	152.32	74.58	4.56
150	208.19	9.4	32.6	158.5	18.5	16.8	0.7	0.2	40.48	82.05	4.70
151	189.98	11.6	32.2	176.7	19.3	55.9	1.5	0.3	85.88	78.52	4.75
152	135.05	5.8	21.4	101.9	16.0	14.0	0.2	0.2	54.90	16.87	3.33
153	199.54	6.9	31.9	136.1	21.7	6.3	0.2	0.2	57.98	29.42	3.82
154	136.72	5.4	30.8	123.5	23.2	4.4	0.2	0.2	35.94	21.84	3.32
155	181.18	4.4	59.7	187.4	23.8	15.7	0.3	0.2	29.85	78.52	5.69
156	162.97	3.7	55.2	170.5	22.0	18.3	0.3	0.2	37.81	73.59	5.29
157	171.78	3.7	64.3	241.2	38.5	22.1	0.3	0.2	46.20	59.92	5.86
158	230.96	3.9	84.6	292.1	54.7	8.5	0.3	0.2	23.98	66.34	6.59
159	189.53	3.7	74.7	292.5	68.2	11.0	0.3	1.1	35.54	47.30	5.44
160	137.48	3.8	60.6	220.6	56.3	15.2	0.2	0.2	52.39	28.79	4.17
163	112.44	5.0	35.8	166.3	20.0	17.4	0.3	0.1	43.87	38.54	4.34
164	85.25	3.3	33.8	148.4	19.2	8.6	0.3	0.2	25.62	32.70	4.28
165	102.90	2.3	39.4	143.1	19.7	6.6	0.2	0.1	22.86	36.53	5.53
166	120.55	2.2	62.9	216.7	32.4	7.2	0.2	0.1	27.38	42.62	5.27
167	121.81	2.3	73.1	265.3	41.6	6.9	0.2	0.1	33.79	39.50	5.05
168	126.38	2.8	66.0	233.6	37.6	8.1	0.2	0.1	32.88	43.08	5.40
172	165.30	6.1	41.8	124.3	23.3	1.8	0.1	0.2	7.29	23.00	3.94
173	178.54	3.8	78.6	350.3	67.2	2.5	0.3	0.1	22.65	36.93	8.01
174	164.51	4.3	82.2	287.3	57.0	3.4	0.2	0.2	21.46	42.92	5.93
175	137.41	3.6	40.5	238.8	27.6	14.7	0.3	0.2	26.28	59.95	5.20
176	115.51	4.1	36.1	193.4	23.2	17.3	0.3	0.2	37.38	45.83	4.49
177	107.31	3.8	37.4	206.8	27.2	15.8	0.3	0.2	32.75	41.78	4.34
178	82.26	2.5	35.6	174.3	24.6	13.5	0.2	0.1	34.15	35.30	4.45
179	70.60	2.4	41.3	174.2	25.5	10.3	0.2	0.1	49.96	28.07	4.07
180	114.56	3.8	103.9	340.1	61.2	1.1	0.2	0.2	41.22	48.85	6.66
181	164.20	3.3	63.4	279.5	58.5	8.1	0.3	0.2	50.37	47.10	6.04
188	129.22	2.8	58.3	330.4	62.3	1.1	0.3	0.2	54.47	30.79	8.98
189	185.94	5.4	46.7	176.2	25.1	23.4	0.3	0.2	49.38	52.54	5.87
190	146.71	3.3	41.5	153.1	23.7	10.6	0.2	0.1	29.76	45.29	5.11
191	115.06	3.2	53.6	181.4	31.4	7.8	0.2	0.1	30.73	39.16	4.64
192	106.28	2.3	71.9	275.6	54.4	1.6	0.2	0.1	40.19	30.00	4.98
193	229.05	4.0	65.6	372.4	87.9	3.0	0.3	0.2	23.56	43.11	8.29
194	117.84	3.8	54.3	279.1	63.2	3.1	0.3	0.2	52.68	25.44	8.29
195	102.13	3.6	46.9	160.9	27.8	12.6	0.2	0.2	36.14	36.02	4.10
196	77.33	3.5	31.3	126.6	14.8	22.2	0.2	0.2	48.47	39.61	3.23
197	105.36	2.6	38.4	192.9	25.6	11.9	0.2	0.2	53.08	55.27	5.31
198	75.02	2.3	47.1	242.2	53.7	1.3	0.2	0.1	30.43	52.34	4.60
199	232.90	5.1	91.2	329.5	71.8	3.7	0.3	0.2	84.33	39.97	5.31
200	149.57	3.9	50.8	351.2	37.6	2.7	0.2	0.1	75.36	22.08	5.66
738	171.3	3.4	42.0	162.1	18.5	2.9	0.2	0.2	14.7	74.7	7.0
745	148.4	5.3	48.5	398.1	27.6	9.0	0.3	0.5	5.4	42.3	5.7
850	195.2	1.9	70.5	228.7	31.4	7.2	0.1	0.1	21.2	69.2	8.7
856	306.7	17.2	81.9	345.7	44.8	16.8	0.3	0.5	16.1	74.2	8.1
868	151.2	3.5	35.6	202.3	30.4	7.9	0.1	0.2	18.6	58.5	6.4
869	202.2	2.4	52.0	300.3	70.7	4.5	0.1	0.1	28.2	52.5	8.6
873	123.9	1.0	55.5	201.4	35.1	2.7	0.1	0.1	13.4	70.6	7.9
893	117.4	1.7	42.5	185.3	38.2	2.1	0.1	0.1	15.2	55.4	7.2
1056	129.9	3.4	50.6	125.7	16.9	5.4	0.1	0.1	9.5	46.0	4.8
1062	244.7	2.6	116.9	338.3	53.5	9.5	0.1	0.2	19.6	73.4	9.2
1092	200.7	1.3	111.9	225.2	44.8	15.2	0.1	0.1	33.2	60.8	8.3
1138	166.4	1.6	84.5	191.2	44.6	0.7	0.1	0.1	18.4	57.1	7.4
1301	218.0	3.8	65.5	261.9	38.8	3.9	0.2	0.2	17.2	62.0	7.9
1308	158.1	2.3	77.9	242.7	48.6	3.6	0.1	0.1	23.2	75.0	9.0

CAT#	LOCUS	BLOCK	UNIT	STR.	LVL.	FEAT.	FSTR.	FLVL.	COL	pH	BpH	OM/LOI	OM/WB
1322	1					7A	B	6		5.5		0.6	0.33
1338	1					98	A	2		5.6		0.6	0.18
1341	1					98	B	8		6.0		0.4	0.18
1342	1					98	D	10		6.0		0.3	0.46
1408	1		377	Ap1		14				5.1		1.3	0.97
1409	1		377	AP2		14				5.2		2.0	1.57
1410	1		377	E		14				5.4		0.9	0.47
1411	1		377	BE		14				5.3		0.8	0.17
1412	1		377	2BC1		14				5.0		0.5	0.05
1413	1		377	2BC2		14				5.2		0.5	0.02
1414	1		377	2C		14				5.0		0.3	0.05
1415	1		361			14	A	50-70		5.1		0.5	0.07
1416	1		361			14	A	70-90		5.4		0.8	0.10
1417	1		277			14	A	50-70		5.5		0.7	0.20
1418	1		277			14	A	70-90		5.1		0.5	0.03
1419	1		W	BT1		41				5.8		0.9	0.23
1420	1		W	BT2		41				5.5		0.5	0.27
1421	1		E	BT	0-25	41				5.8		0.7	0.23
1422	1		E	BC	25-40	41				5.8		0.3	0.02
1423	1		E	CB	40-59	41				5.9		0.1	0.10
1424	1		E	C	59-72	41				6.0		0.0	0.03
1425	1		E	2C	72-90+	41				5.8		0.2	0.41
1426	1					41	A	0-37		5.8		0.7	0.61
1427	1					41		37-56		6.0		0.4	0.76
1428	1					41		56-79		6.1		0.5	0.84
1429	1					41		79-87		6.1		0.3	0.69
1430	1					41		87-97		6.3		0.2	0.84
1431	1			Bt1		53				5.8	7.55	0.4	0.24
1432	1			Bt2		53				5.4	5.60	0.4	0.24
1433	1			BC1		53				5.4	7.58	0.3	0.24
1434	1			BC2		53				5.2	7.59	0.3	0.28
1435	1			2BC		53				5.4	7.66	0.2	0.26
1436	1			3C		53				5.4	7.74	0.0	0.18
1437	1					53	A	0-20		5.8		0.6	0.91
1438	1					53	A	20-40		6.0		0.4	0.83
1439	1					53	A	40-60		6.0		0.4	0.89
1440	1					53	A	60-80		6.0		0.3	0.64
1441	1					53	A	80-90		6.1		0.3	0.89
1442	1			Bt		64				5.6	7.54	0.5	0.14
1443	1			2BC		64				5.3	7.64	0.2	0.07
1444	1			2C		64				5.6	7.75	0.0	0.22
1445	1			3C		64				5.7	7.88	0.0	0.12
1446	1			4BCb		64				5.4	7.74	0.1	0.20
1447	1			4C		64				5.4	7.71	0.2	0.18
1411B	1		377	BT		14				5.0		0.7	0.03
47	2	20				1	A	2		6.4	7.71	1.0	0.57
48	2	20				1	A	4		6.5	7.70	0.9	0.01
49	2	20				1	A	6		6.5	7.79	0.6	0.26
50	2	20	247	B						6.0	7.57	1.1	0.42
51	2	20	247	C						6.4	7.70	0.6	0.27
200	3	4	125	C	4				6-2	6.0	7.60	0.5	0.18
201	3	4	125	D	5				6-3	6.0	7.70	0.5	0.28
202	3	4	125	E	6				6-4	6.0	7.65	0.4	0.16
203	3	4	125	E	7				6-5	6.0	7.76	0.2	0.14
204	3	4	125	E	8				6-6	5.7	7.78	0.1	0.07

CAT#	Ttl. P	M1-P	M1-K	M1-Ca	M1-Mg	M1-Mn	M1-Zn	M1-Cu	M1-Fe	M1-Ba	M1-Sr
1322	128.6	1.8	68.7	187.4	36.3	0.8	0.1	0.1	17.5	44.3	7.5
1338	149.7	2.1	47.8	157.8	25.3	7.1	0.2	0.1	20.1	46.8	6.0
1341	130.8	1.3	52.4	198.2	51.2	3.2	0.1	0.1	18.6	50.0	7.0
1342	118.2	1.6	44.1	163.8	39.9	15.1	0.1	0.1	43.7	46.5	9.3
1408	485.10	53.9	65.7	279.3	23.8	14.0	1.8	1.4	17.10	69.2	6.0
1409	278.60	12.8	79.6	185.7	15.3	9.7	1.1	0.7	17.90	95.3	7.8
1410	205.10	5.6	94.2	193.8	20.4	6.0	0.3	0.3	24.10	93.7	10.1
1411	185.50	1.7	132.7	274.6	51.6	4.8	0.2	0.2	27.20	81.9	11.8
1412	195.10	1.7	72.2	271.1	58.5	1.6	0.2	0.2	31.40	56.7	9.8
1413	170.20	2.2	53.1	255.4	63.4	2.9	0.1	0.2	35.70	47.4	6.9
1414	146.20	1.9	45.6	227.9	59.4	0.5	0.2	0.2	19.00	41.6	5.7
1415	168.10	2.2	98.4	150.6	32.2	3.4	0.2	0.2	27.40	91.7	9.9
1416	182.30	2.5	98.0	219.2	44.2	6.3	0.2	0.3	23.50	79.3	10.2
1417	145.50	2.9	88.6	139.0	23.5	5.9	0.2	0.2	27.8	84.7	8.9
1418	128.30	2.1	74.0	96.0	20.4	4.7	0.7	0.2	25.20	89.3	8.6
1419	197.60	1.7	145.6	485.4	76.1	7.1	0.2	0.2	31.00	69.2	12.1
1420	160.10	2.4	88.4	309.8	50.3	6.7	0.2	0.2	39.20	49.7	10.8
1421	224.20	2.3	115.8	357.2	54.6	2.9	0.2	0.2	18.90	62.0	9.1
1422	182.70	2.4	87.2	246.7	45.3	2.1	0.1	0.1	15.20	47.5	6.2
1423	159.20	3.3	54.8	110.2	20.7	0.6	0.1	0.1	8.10	36.8	4.5
1424	107.80	3.4	47.0	79.6	16.1	0.4	0.1	0.1	5.50	35.7	3.7
1425	100.5	3.8	104.9	152.8	27.0	0.2	0.1	0.4	5.40	25.4	4.2
1426	127.80	3.8	60.8	229.3	17.9	8.3	0.2	0.3	16.40	54.3	6.0
1427	94.00	1.7	74.3	234.6	20.6	9.8	0.1	0.1	22.40	51.4	7.2
1428	211.50	1.9	92.4	363.6	44.0	5.5	0.1	0.2	21.50	73.2	11.5
1429	109.20	2.0	56.9	196.5	27.5	4.6	0.1	0.1	12.90	48.8	6.3
1430	122.00	4.4	72.7	154.8	23.6	2.3	0.1	0.3	10.20	28.6	3.1
1431	117.31	1.2	61.1	312.4	76.4	11.1	0.1	0.2	118.48	47.10	12.078
1432	128.87	1.4	23.8	268.3	53.7	2.7	0.1	0.2	95.15	43.35	11.203
1433	132.59	2.2	19.8	220.4	40.0	4.2	0.1	0.2	113.08	37.22	8.952
1434	114.83	2.2	15.6	205.7	35.9	1.5	0.1	0.2	84.64	36.49	9.167
1435	80.96	1.8	14.2	167.4	28.2	2.4	0.1	0.1	205.43	30.55	8.507
1436	70.22	1.7	13.2	130.1	21.7	2.1	0.1	0.1	185.87	22.77	6.427
1437	163.80	6.8	72.5	184.0	24.8	8.6	0.2	0.4	15.30	60.8	6.9
1438	123.10	3.2	67.4	167.1	27.1	7.9	0.1	0.2	15.60	58.8	7.1
1439	190.00	4.6	64.1	158.1	28.7	6.5	0.2	0.2	17.30	58.4	7.1
1440	132.70	3.4	67.2	156.2	32.6	4.9	0.1	0.2	16.80	97.4	7.8
1441	108.30	2.8	60.8	225.5	52.8	2.3	0.1	0.1	19.20	41.8	7.8
1442	247.01	2.8	84.5	308.8	71.4	5.0	0.1	0.2	85.32	58.62	10.916
1443	165.64	3.1	48.5	132.4	32.8	3.5	0.1	0.1	183.75	30.27	5.941
1444	108.22	2.4	24.3	78.7	17.2	10.8	0.1	0.1	175.41	15.55	5.650
1445	89.63	3.3	23.3	73.4	15.7	7.4	0.0	0.1	79.58	13.90	4.230
1446	148.29	3.2	43.1	94.6	24.5	4.7	0.1	0.2	187.68	28.44	5.341
1447	223.05	4.7	54.0	100.8	24.6	5.4	0.1	0.2	40.23	30.91	5.221
1411B	234.90	1.5	116.1	223.7	42.5	1.9	0.3	0.2	31.70	88.7	13.0
47	185.13	5.7	51.5	296.2	60.5	13.8	0.4	1.1	34.31	63.97	5.64
48	186.65	4.9	54.9	312.0	66.1	20.8	0.5	0.9	46.52	70.41	5.92
49	141.43	3.2	57.3	223.1	63.7	13.0	0.3	0.3	53.22	52.00	6.05
50	274.51	29.0	84.0	452.8	110.8	9.6	0.4	2.3	24.35	70.19	7.35
51	234.60	3.9	83.1	394.4	98.0	7.6	0.3	0.6	54.18	45.92	7.86
200	348.70	8.3	92.0	298.6	102.2	4.0	0.3	0.3	52.19	38.00	10.11
201	335.50	10.7	76.2	297.2	93.9	1.5	0.3	0.3	35.00	34.65	16.17
202	299.50	11.2	70.5	261.0	76.9	1.0	0.2	0.2	25.62	31.57	9.72
203	190.90	8.7	60.3	178.3	50.0	0.9	0.2	0.2	34.87	22.94	11.68
204	142.60	7.1	44.9	106.8	30.7	0.7	0.1	0.2	34.83	23.22	9.52

Puncheon Run Site (7K-C-51) -- Soil Chemistry Test Results

CAT#	LOCUS	BLOCK	UNIT	STR.	LVL.	FEAT.	FSTR.	FLVL.	COL	pH	BpH	OM/LOI	OM/WB
205	3	4	125	E	9				6-7	5.5	7.84	0.0	0.09
206	3	4	126			25	A	1	7-1	6.2	7.72	0.5	0.20
207	3	4	126			25	A	2	7-2	6.3	7.80	0.4	0.26
208	3	4	126			25	B	3	7-3	6.3	7.74	0.3	0.20
209	3	4	126			25	B	4	7-4	6.3	7.79	0.3	0.20
210	3	4	126			25	B	5	7-5	6.1	7.72	0.3	0.20
211	3	4	126			25	B	6	7-6	6.2	7.80	0.4	0.14
212	3	4	126	E	9				7-7	5.5	7.69	0.1	0.14
222	3	4	129			26	A	1	10-1	6.1	7.63	0.8	0.58
223	3	4	129			26	A	2	10-2	5.7	7.48	1.1	0.74
226	3	4	131			24	A	1	12-1	5.7	7.75	0.7	0.44
227	3	4	131			24	A	2	12-2	6.1	7.67	0.7	0.39
228	3	4	132	C	3				13-1	6.1	7.75	0.7	0.33
229	3	4	132	C	4				13-2	5.8	7.64	0.8	0.37
231	3	4	129			26	A	3	10-3	5.4	7.56	1.0	0.54
233	3	4	131			24	A	3	12-3	6.1	7.66	0.5	0.39
234	3	4	132	C	5				13-3	6.0	7.69	0.5	0.31
246	3	4	126			25	B	5	14-12	6.1	7.74	0.4	0.20
247	3	4	126			25	B	5	14-13	6.3	7.84	0.2	0.29
248	3	4	126			25	B	5	14-14	6.3	7.73	0.3	0.16
249	3	4	125			25	B	5	14-15	6.2	7.74	0.4	0.13
250	3	4	125	E	7				14-16	6.2	7.66	0.4	0.31
251	3	4	125	E	7				14-17	6.3	7.76	0.4	0.28
252	3	4	125	E	7				14-18	6.2	7.65	0.4	0.18
254	3	4	125	E	7				14-20	6.5	7.83	0.2	0.14
256	3	4	125	E	7				14-22	6.4	7.77	0.2	0.11
258	3	4	125	E	7				14-24	6.6	7.88	0.2	0.16
276	3	4	129	D/C	6				10-4	5.6	7.56	0.5	0.48
283	3	4	131			24	A	4	12-4	6.2	7.73	0.4	0.43
288	3	4	132	C	6				13-4	5.8	7.64	0.3	0.26
293	3	4	129	D	7				10-5	5.4	7.71	0.2	0.14
295	3	4	131			24	A	5	12-5	5.9	7.78	0.3	0.18
296	3	4	132	D	7				13-5	5.4	7.88	0.1	0.08
298	3	4	129	D	8				10-6	5.3	7.73	0.2	0.10
300	3	4	131			24	A	6	12-6	5.4	7.80	0.2	0.08
301	3	4	132	D	8				13-6	5.9	7.77	0.0	0.02
303	3	4	129	D	9				10-7	5.3	7.87	0.0	0.00
305	3	4	131	C	9	24	A	7	12-7	5.3	7.69	0.4	0.02
306	3	4	132	D	9				13-7	5.2	7.77	0.0	0.04
415	3		156			30	A	1		5.3	7.58	0.8	0.56
421	3		156			30	A	7		6.4	7.72	0.4	0.27
422	3		156			30	A	8		6.0	7.75	0.8	0.52
428	3		156	D	10	30				6.7	7.90	0.1	0.18
429	3		156	D	11					6.7	7.90	0.0	0.00
548	3	4	27	C						6.6	7.91	0.1	0.02
549	3	4	27	Ap						5.5	7.79	1.3	1.07
550	3	4	27	E						5.9	7.69	0.5	0.54
551	3	4	27	Bt						5.7	7.61	0.4	0.39
552	3	4	27	BC1						6.0	7.77	0.3	0.13
553	3	4	27	BC2						6.5	7.74	0.1	0.18
685	3		409	B	3					5.6		0.7	0.64
812	3		397	B	3	96				4.8		0.7	0.73
816	3		397	B	4					5.2		0.6	0.46
817	3		397	B	5					5.3		0.6	0.73
840	3		410	B	3	94				5.3		0.8	0.73

CAT#	Ttl. P	M1-P	M1-K	M1-Ca	M1-Mg	M1-Mn	M1-Zn	M1-Cu	M1-Fe	M1-Ba	M1-Sr
205	109.50	5.4	27.9	63.2	16.6	1.0	0.1	0.2	35.49	15.51	4.88
206	227.20	8.1	69.7	162.4	46.3	10.9	0.2	0.3	25.52	40.60	9.38
207	212.80	8.9	74.4	154.6	48.1	12.2	0.2	0.3	30.04	37.58	10.13
208	171.90	5.4	77.3	151.3	50.0	12.3	0.2	0.3	31.31	39.20	11.49
209	189.30	6.4	76.7	168.7	56.3	10.0	0.2	0.3	32.31	38.22	11.40
210	202.40	5.8	75.8	195.5	66.5	5.6	0.3	0.3	37.65	39.91	15.25
211	186.40	4.4	75.9	197.7	64.8	2.5	0.3	0.3	35.38	34.83	7.51
212	117.70	3.5	44.3	109.7	31.2	1.3	0.2	0.2	56.94	20.15	9.99
222	286.00	8.9	60.0	272.5	84.4	4.0	0.3	0.3	32.12	47.55	8.42
223	342.80	15.7	72.0	303.5	88.2	12.4	0.4	0.4	42.59	51.69	14.29
226	295.90	20.6	93.3	234.2	68.7	32.6	0.4	0.6	78.99	44.05	12.75
227	305.10	17.4	100.8	207.6	63.0	25.5	0.4	0.4	50.42	48.24	8.04
228	245.80	6.1	83.7	212.4	80.1	10.9	0.3	0.3	41.18	36.12	7.45
229	225.20	4.9	79.7	255.3	84.3	2.7	0.3	0.3	30.87	36.89	13.01
231	343.30	16.8	65.6	264.4	71.5	8.6	0.3	0.4	32.27	45.83	10.89
233	334.70	19.7	108.3	192.5	62.1	11.8	0.3	0.3	29.36	45.73	11.16
234	189.40	5.1	82.6	257.4	77.9	2.6	0.2	0.2	51.94	31.51	6.42
246	154.40	5.1	76.4	157.6	52.6	14.1	0.3	0.3	59.76	38.55	5.18
247	155.10	4.4	74.8	163.7	54.3	8.4	0.2	0.3	42.03	36.70	10.50
248	182.00	5.3	79.4	190.6	64.4	7.0	0.2	0.3	62.10	36.57	87.30
249	222.80	5.6	83.2	248.0	85.4	3.1	0.2	0.3	40.62	38.60	11.90
250	186.40	4.8	77.9	262.7	91.0	2.2	0.3	0.3	58.78	35.34	10.87
251	199.80	4.6	67.1	257.2	89.2	1.4	0.2	0.2	39.35	37.61	6.75
252	174.40	4.6	64.7	268.1	92.4	2.4	0.2	0.2	76.70	35.96	69.90
254	135.00	4.2	43.7	176.5	59.4	1.0	0.2	0.2	54.19	23.55	6.09
256	133.90	5.0	46.0	184.0	57.0	1.7	0.2	0.2	70.44	21.52	7.46
258	136.90	4.8	54.4	198.9	59.1	0.8	0.2	0.2	37.26	22.27	9.17
276	211.10	8.9	59.2	249.0	64.6	0.7	0.3	0.3	44.04	37.18	10.20
283	263.80	15.8	98.7	161.4	51.9	14.7	0.3	0.3	35.02	38.00	6.44
288	156.30	4.8	74.1	198.1	57.3	2.8	0.3	0.3	49.81	26.18	8.84
293	138.00	7.8	38.4	135.9	33.3	0.8	0.2	0.3	31.86	23.13	4.65
295	212.40	13.7	83.5	134.7	39.8	18.8	0.3	0.3	45.28	35.56	10.85
296	113.20	3.7	48.1	82.1	22.9	2.7	0.2	0.3	46.64	19.38	7.39
298	145.70	11.2	31.2	83.3	20.2	1.1	0.2	0.2	34.51	18.12	4.87
300	200.20	8.3	85.6	150.0	44.6	14.0	0.2	0.2	38.97	32.27	5.62
301	80.96	3.0	48.9	59.9	14.4	1.4	0.2	0.2	56.79	20.41	7.71
303	65.80	3.5	24.0	58.0	12.6	0.7	0.1	0.2	51.28	14.34	5.58
305	281.90	6.9	110.6	290.3	86.3	9.5	0.3	0.2	60.33	41.17	10.19
306	99.26	2.9	41.6	59.0	13.3	1.0	0.1	0.2	54.30	15.53	5.40
415	234.20	13.3	46.2	168.6	30.9	94.6	0.7	0.4	201.86	44.37	5.88
421	266.40	14.2	48.0	124.4	40.9	37.4	0.4	0.3	79.61	41.02	10.45
422	462.40	39.8	58.5	138.0	39.8	23.6	0.6	0.3	50.23	50.46	6.70
428	249.20	17.8	42.9	101.5	44.8	33.0	0.3	0.2	132.37	25.87	8.58
429	99.93	6.4	21.6	54.7	22.8	10.4	0.1	0.2	100.31	10.34	7.05
548	90.52	3.7	35.1	98.7	31.0	4.0	0.1	0.2	67.12	17.65	4.05
549	716.30	158.1	48.8	362.1	55.1	17.3	2.0	2.4	23.26	48.90	6.77
550	312.40	26.9	36.3	181.6	39.7	9.5	0.3	0.7	24.06	39.29	6.32
551	236.90	6.8	53.6	220.1	68.8	7.4	0.2	0.4	25.49	41.29	7.37
552	200.90	5.6	53.1	201.0	65.6	2.8	0.2	0.2	24.10	30.65	11.27
553	151.39	4.5	42.1	156.3	50.5	2.5	0.2	0.2	19.22	25.40	6.94
685	211.7	3.7	14.1	145.9	13.1	4.1	0.2	0.2	15.5	64.5	7.1
812	259.2	12.5	14.0	76.8	11.7	2.6	0.2	0.2	15.4	50.8	6.0
816	260.7	10.8	13.3	124.8	11.2	1.7	0.1	0.1	13.4	59.1	7.1
817	316.6	14.7	14.9	157.9	12.7	1.8	0.1	0.1	13.7	53.4	7.7
840	202.0	5.0	10.2	106.9	6.2	4.4	0.1	0.2	12.9	55.4	6.0

CAT#	LOCUS	BLOCK	UNIT	STR.	LVL.	FEAT.	FSTR.	FLVL.	COL	pH	BpH	OM/LOI	OM/WB
849	3		356	B	3	36				4.4		0.9	0.86
940	3		370	B	3	96				4.8		0.6	0.69
979	3		436	B	3	97				5.0		0.8	0.66
1168	3		455	B	3					4.7		0.8	0.88
1448	3		336	Ap		30				4.4	7.45	1.4	1.20
1449	3		336	BE		30				5.1	7.65	0.6	0.46
1450	3		336	Bt1		30				5.5	7.54	0.6	0.43
1451	3		336	Bt2		30				5.6	7.61	0.4	0.39
1452	3		336	BC1		30				5.3	7.71	0.0	0.20
1453	3		336	BC2		30				5.4	7.82	0.0	0.22
1454	3		336	C1		30				5.2	7.92	0.0	0.14
1455	3		336	C2		30				5.4	8.00	0.0	0.12
1457	3					30	D1			5.8	7.84	0.4	0.46
1458	3					30	D2			5.8	7.87	0.3	0.35
1459	3					30	D3			6.0	7.89	0.2	0.33
1460	3					30	D4			5.8	7.88	0.4	0.28
1461	3					30	D5			5.9	7.77	0.2	0.19
1462	3					30	D6			5.9	7.87	0.2	0.27
1463	3		332	Ap		32				4.3	7.51	1.6	1.36
1464	3		332	E		32				5.0	7.82	0.6	0.52
1465	3		332	Bt1		32				5.2	7.61	0.6	0.29
1466	3		332	Bt2		32				5.1	7.68	0.5	0.33
1467	3		332	BC		32				5.0	7.69	0.0	0.12
1468	3		332	2C		32				4.8	7.95	0.0	0.00
1469	3		324	Ap		32				4.3	7.45	1.4	1.45
1470	3		324			32				5.1	7.83	0.5	0.57
1471	3		324			32				5.6	7.84	0.2	0.25
1472	3		324	Bt/BC		32				5.5	7.94	0.1	0.19
1473	3		324	2C		32				5.3	8.00	0.0	0.06
1474	3		415	Ap	0-24					5.0		1.3	1.60
1475	3		415	E	24-34					5.6		0.7	1.24
1476	3		415	BE	34-44					5.7		0.7	0.99
1477	3		415	Bt	44-63					5.1		0.7	1.20
1478	3		415	BC1	63-78					5.0		0.5	0.99
1479	3		415	BC2	78-93					5.0		0.2	0.81
1480	3		415	C	93-105+					5.0		0.0	1.14
1481	3		380	Ap		37				4.6	7.44	1.2	1.49
1482	3		380	E		37				4.8	7.77	0.5	0.56
1483	3		380	BE		37				5.5	7.77	0.3	0.34
1484	3		380	Bt		37				5.3	7.72	0.6	0.42
1485	3		380	BC		37				5.3	7.77	0.2	0.25
1486	3		380	C1		37				5.1	7.92	0.0	0.25
1487	3		380	C2		37				5.4	7.91	0.0	0.17
1488	3		380			37				5.4	7.91	0.4	0.38
1489	3		380	Bt		37				5.7	7.74	0.4	0.34
1490	3		380	BC		37				5.6	7.91	0.2	0.29
1491	3		380	C		37				5.5	7.90	0.0	0.23
1492	3		314	Ap	0-21	38				4.4		2.2	2.30
1493	3		314	E	21-33	38				5.0		0.8	0.85
1494	3		314	BE	33-47	38				5.3		0.6	0.33
1495	3		314	Bt	47-69	38				5.2		0.8	0.69
1496	3		314	BC	69-80	38				5.4		0.2	0.51
1497	3		314	C1	80-97	38				5.4		0.0	0.33
1498	3		314	C2	97-132+	38				5.1		0.0	0.15
1499	3		420			38	B			5.5		0.2	0.23

CAT#	Ttl. P	M1-P	M1-K	M1-Ca	M1-Mg	M1-Mn	M1-Zn	M1-Cu	M1-Fe	M1-Ba	M1-Sr
849	247.8	11.9	15.9	34.4	7.3	3.4	0.3	0.3	14.9	57.2	7.7
940	190.8	5.7	9.9	71.6	8.9	1.9	0.1	0.2	12.6	53.1	6.0
979	194.0	3.8	24.0	130.6	12.2	1.3	0.1	0.3	12.1	58.6	6.5
1168	197.5	4.1	14.5	59.0	7.4	1.6	1.0	0.3	12.8	57.1	5.4
1448	550.61	67.7	34.4	116.8	17.8	44.3	1.3	1.0	86.54	40.06	10.244
1449	459.32	35.7	38.8	117.4	23.4	13.6	0.5	0.6	27.18	58.99	8.608
1450	303.60	9.0	63.5	230.7	70.5	9.5	0.1	0.3	39.63	61.73	10.114
1451	390.34	5.9	76.4	251.7	108.3	5.1	0.1	0.2	67.86	61.73	10.263
1452	185.88	5.8	32.0	86.4	26.8	1.3	0.1	0.1	54.01	23.32	5.865
1453	105.74	2.9	18.0	46.8	11.8	2.0	0.1	0.1	55.32	16.10	4.482
1454	82.62	2.0	13.0	47.2	11.3	0.5	0.1	0.1	14.54	10.38	3.877
1455	61.97	1.6	9.7	40.7	8.8	1.4	0.0	0.1	8.43	8.40	3.511
1457	350.34	16.0	43.1	145.7	30.1	3.4	0.1	0.2	14.56	56.08	8.234
1458	372.58	25.3	46.6	136.1	43.4	2.8	0.1	0.1	14.16	48.83	7.935
1459	444.48	32.4	45.2	116.1	44.1	2.6	0.1	0.1	13.05	54.35	9.092
1460	429.39	27.0	50.6	119.5	54.5	2.3	0.1	0.2	11.91	49.57	9.000
1461	432.56	26.9	55.8	113.6	53.1	27.3	0.1	0.1	61.73	51.47	9.455
1462	446.47	27.6	54.7	119.5	57.7	3.8	0.0	0.1	18.22	45.37	9.040
1463	305.46	4.6	17.7	48.4	8.4	3.1	1.0	0.5	15.80	45.54	7.109
1464	165.64	2.4	21.7	98.3	18.7	2.1	0.2	0.4	14.23	52.04	8.064
1465	370.20	11.8	20.0	187.0	24.0	1.7	0.1	0.2	17.30	57.39	9.827
1466	574.37	19.1	13.7	236.8	27.8	0.8	0.1	0.1	19.00	68.35	13.388
1467	172.39	3.1	11.4	76.8	11.0	0.4	0.1	0.1	12.81	28.74	5.705
1468	76.26	1.9	7.0	45.9	7.0	0.7	0.0	0.1	8.12	17.62	5.873
1469	327.70	5.2	17.2	62.4	9.2	3.3	0.9	0.7	17.00	48.01	7.591
1470	234.35	10.7	18.6	86.1	13.7	2.9	0.2	0.3	13.58	48.09	7.319
1471	226.41	9.4	18.6	91.6	15.6	1.9	0.1	0.1	12.30	52.54	8.549
1472	143.79	2.7	12.1	125.0	16.1	0.5	0.0	0.1	8.89	24.37	6.331
1473	90.77	1.7	5.4	59.1	8.5	0.4	0.0	0.1	6.31	13.96	4.725
1474	265.20	6.3	15.4	149.0	10.1	6.6	0.2	0.8	18.00	51.9	5.7
1475	150.00	4.1	8.2	190.5	8.3	5.6	0.2	0.3	22.10	48.9	6.3
1476	177.90	3.3	7.5	276.1	14.6	5.8	0.1	0.2	22.60	49.4	8.0
1477	241.00	4.6	11.2	241.8	17.9	1.0	0.2	0.2	14.70	50.3	9.1
1478	166.10	3.3	18.8	123.0	11.2	0.4	0.1	0.2	13.90	37.1	6.0
1479	139.40	2.9	9.8	84.5	7.8	0.4	0.2	0.3	10.80	35.2	4.9
1480	72.70	1.7	5.8	46.6	4.4	0.4	0.2	0.2	6.10	24.9	3.2
1481	619.51	74.5	36.1	109.6	14.7	10.0	0.9	0.7	18.09	45.32	7.059
1482	455.02	50.2	36.0	87.5	15.4	6.8	0.6	0.6	16.11	50.92	8.756
1483	273.49	13.9	49.7	156.3	33.4	2.8	0.1	0.3	10.34	49.33	8.335
1484	420.14	7.4	84.5	248.0	93.8	2.8	0.1	0.2	17.95	51.00	10.877
1485	319.86	7.0	41.4	108.3	44.1	0.4	0.0	0.1	9.56	32.44	7.714
1486	196.99	5.0	22.8	57.6	16.4	0.3	0.0	0.1	7.19	19.23	5.441
1487	114.94	3.3	20.9	66.5	14.0	0.3	0.0	0.1	7.54	22.07	4.685
1488	353.16	6.5	49.2	172.9	60.9	2.5	0.1	0.1	10.35	65.05	10.696
1489	319.86	6.1	53.3	240.2	101.8	1.0	0.1	0.1	13.08	38.80	9.112
1490	226.32	3.0	38.6	165.5	58.4	0.4	0.0	0.1	10.56	28.01	7.280
1491	137.54	3.1	16.8	72.8	21.6	0.3	0.0	0.1	8.26	14.30	5.278
1492	706.00	60.5	41.5	155.7	16.1	36.8	1.2	0.5	22.30	52.1	6.2
1493	386.40	19.9	54.2	145.2	24.7	8.2	0.5	0.3	13.50	141.1	8.7
1494	321.20	11.6	73.1	223.8	32.8	7.9	0.3	0.3	13.30	95.0	9.0
1495	449.30	22.9	104.6	350.6	65.5	4.4	0.6	0.2	15.90	84.1	9.9
1496	195.80	9.4	62.5	171.0	39.3	0.6	0.2	0.2	9.50	28.4	4.9
1497	147.90	4.1	43.5	92.4	24.1	0.2	0.2	0.1	6.70	1544.9	4.3
1498	80.80	2.5	25.2	39.6	11.2	0.2	0.1	0.1	5.40	32.0	3.0
1499	169.00	7.3	30.9	139.2	38.6	0.8	0.1	0.1	7.50	25.9	6.3

Puncheon Run Site (7K-C-51) -- Soil Chemistry Test Results

CAT#	LOCUS	BLOCK	UNIT	STR.	LVL.	FEAT.	FSTR.	FLVL.	COL	pH	BpH	OM/LOI	OM/WB
1500	3		420			38	C			4.9		0.0	0.31
1501	3		420			38	E			5.2		0.6	0.43
1502	3		420			38	F			5.0		0.3	0.51
1503	3		420			38	G			5.0		0.4	0.43
1504	3		420			38	H			4.9		0.2	0.55
1505	3		420			38	L			5.7		0.3	0.35
566.1		MAR			1					5.3		2.2	2.10
566.2		MAR			1					5.1		1.2	1.58
566.3		MAR			1					6.0		1.1	1.34
567.1		MAR			2					5.8		0.7	0.95
567.2		MAR			2					5.7		1.1	1.05
567.3		MAR			2					4.3		1.1	0.78
568.1		MAR			3					4.9		2.1	2.03
568.2		MAR			3					4.1		2.1	1.48
568.3		MAR			3					5.5		1.1	0.79
568.4		MAR			3					5.8		0.6	0.78
568.5		MAR			3					4.6		1.5	1.11
Mean										5.7	7.7	0.5	0.4
Min.										4.1	5.6	0.0	0.0
Max.										6.7	8.0	2.2	2.3
St. Dev.										0.5	0.2	0.4	0.4

Puncheon Run Site (7K-C-51) -- Soil Chemistry Test Results

CAT#	Ttl. P	M1-P	M1-K	M1-Ca	M1-Mg	M1-Mn	M1-Zn	M1-Cu	M1-Fe	M1-Ba	M1-Sr
1500	218.10	15.3	32.9	44.5	11.0	0.6	0.1	0.1	11.00	25.9	3.8
1501	461.60	27.7	49.6	162.0	52.8	4.8	0.2	0.2	15.60	57.3	7.3
1502	439.30	20.8	45.8	63.7	23.7	4.6	0.2	0.1	13.90	64.3	8.6
1503	530.60	24.3	75.9	128.8	38.1	1.0	0.2	0.2	16.60	62.2	9.8
1504	435.50	23.5	62.4	97.4	26.3	1.0	0.1	0.2	16.00	49.5	8.6
1505	332.90	13.5	40.3	141.0	48.6	0.7	0.1	0.3	9.50	33.5	5.1
566.1	642.8	44.5	105.9	410.1	43.0	14.3	6.6	50.6	14.7	135.9	9.8
566.2	359.4	40.8	119.5	203.7	35.1	20.9	0.8	3.8	14.1	51.1	5.3
566.3	244.0	5.9	107.2	216.8	36.2	11.1	0.3	2.2	22.8	98.0	7.9
567.1	269.4	6.9	91.2	308.6	86.8	2.1	0.2	0.4	25.1	55.6	8.1
567.2	204.0	3.5	78.9	321.1	80.7	10.1	0.9	1.1	21.4	160.1	8.3
567.3	455.3	48.7	130.5	177.8	34.3	10.9	0.9	3.8	27.0	69.4	7.4
568.1	833.6	131.4	148.3	214.2	40.4	36.0	1.8	3.3	24.6	76.6	7.8
568.2	876.8	197.8	692.6	607.7	146.9	33.6	3.5	2.0	23.4	66.3	8.4
568.3	356.8	8.7	141.7	338.7	97.7	6.8	0.3	0.8	22.7	65.4	9.1
568.4	286.3	5.1	95.5	297.0	63.7	2.1	0.1	0.3	21.4	59.9	9.0
568.5	1013.6	239.4	308.9	223.5	43.2	11.0	1.7	2.2	34.1	63.0	7.1
Mean	223.7	11.5	59.4	189.4	40.9	7.8	0.3	0.5	36.3	53.5	8.0
Min.	62.0	1.0	5.4	34.4	4.4	0.2	0.0	0.1	5.4	8.4	3.0
Max.	1013.6	239.4	692.6	607.7	146.9	94.6	6.6	50.6	205.4	1544.9	87.3
St. Dev.	142.3	25.5	53.3	91.6	25.2	10.7	0.6	3.3	34.0	99.7	7.0

Abbreviations:

- BpH (buffered pH)
- OM/LOI (organic matter by loss-on-ignition method)
- OM/WB (organic matter by Walkley-Black method)
- M1-Ca (milligrams per kilogram of calcium)
- M1-Mg (milligrams per kilogram of magnesum)
- M1-Mn (milligrams per kilogram of manganese)
- M1-P (milligrams per kilogram of phosphorous)
- M1-K (milligrams per kilogram of potassium)
- M1-Ca (milligrams per kilogram of calcium)
- M1-Mg (milligrams per kilogram of magnesum)
- M1-Mn (milligrams per kilogram of manganese)
- M1-Zn (milligrams per kilogram of zinc)
- M1-Cu (milligrams per kilogram of copper)
- M1-Fe (milligrams per kilogram of iron)
- M1-Ba (milligrams per kilogram of barium)
- M1-Sr (milligrams per kilograms of strontium)