Archeological Investigations of Minute Man National Historical Park

Volume II: An Estimation Approach to Prehistoric Sites

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Management Summary

In 1989 and 1990 an intensive archeological investigation was conducted within Minute Man National Historical Park (MIMA) in the towns of Concord, Lincoln, and Lexington, Massachusetts. This survey was conducted by The Public Archaeology Laboratory, Inc. under contract with the National Park Service and involved a project area of about 745 acres within MIMA.

The purpose of this investigation was to carry out a systematic survey for prehistoric cultural resources to address current gaps in the available data base. This survey was generally intended to locate, identify, an evaluate the prehistoric and any identified historical-period cultural resources. It was also designed to provide an estimate of the frequencies and types of prehistoric sites within MIMA.

The research design developed for the reconnaissance survey describes the general approach used to reach the objective of evaluating archeological sensitivity. Two primary tasks, background research to review data on known cultural resources and formulation of a sensitivity ranking (predictive model) for the project area are outlined. Background research also included the collection of information on the physical environment. Environmental data such as geomorphology, soils and hydrology/drainage patterns were used to develop the predictive model for the location of prehistoric cultural resources. Known patterns of prehistoric and historical settlement and land use near MIMA and the relationship of these patterns to local and regional developments were used to develop interpretive contexts for assessing the potential significance of identified sites.

An important aspect of the survey was field testing the predictive model for prehistoric resources through the application of a combination of probabilistic and judgmental sampling. The results of the probabilistic sampling were evaluated using summary statistics. Historical-period cultural collected during subsurface testing was analyzed with a series of formats that examine the temporal association of this material, its density, spatial distribution, and connection to historical-period agriculture and refuse disposal patterns.

A total of 14 prehistoric sites were identified within areas marked as having high or moderate archeological sensitivity and the mean frequencies of sites in particular areas were determined. The prehistoric sites fall into three general categories based on their estimated size/structural characteristics and probable function. Ten sites consisted of very small (ca. 50 sq m) "find spots" of a few pieces of prehistoric cultural material representing locations where specific tasks (resource collection and processing, stone tool repair/maintenance) were carried out. These very small sites were widely distributed through those sections of MIMA investigated during the survey, occurring near the margins of wetlands and streams as well as more isolated, upland settings away from water sources. Three other sites with estimated horizontal areas of about 250 to 500 sq m appear to be the remains of small, temporary camps briefly occupied by prehistoric hunter/gatherers during hunting or other resource collection activities. The largest prehistoric site identified during the survey was a moderate sized (ca. 1500 sq m) temporary camp similar to some other previously known sites in the vicinity of MIMA (Elm Brook, Shawsheen River headwaters). The small assemblages of cultural material (chipping debris, burnt rock fragments, bifacial tool blade, etc.) recovered from the 14 sites did not include any diagnostic items and periods of occupation are not known. One small, temporary camp contained a lithic workshop that may be associated with a Middle Archaic Period (ca. 7700 - 6000 years ago) component at this site. Estimates of site frequency based on the results of probabilistic sampling were made for designated areas (Hardy Hill, Folly Pond, Nelson Road, Massachusetts Avenue/Marrett Road) of high and moderate archeological sensitivity within MIMA. These areas were considered to be representative of high and moderate sensitivity zones within the park. The estimates were intended to provide a basis for predicting site frequency and type in other high and moderate sensitivity areas within MIMA that could not be sampled during this investigation. The final estimates of site frequency ranged from .14 sites per sample unit (30 m x 30 m block) in the Hardy Hill area to .20 sites per sample unit in the Nelson Road and Massachusetts Avenue/Mannett Road areas and .69 sites per sample unit in the Folly Pond area. These results indicated that site frequencies in both high and moderate sensitivity areas within some non-riverine, upland sections of MIMA may be quite low. Based on these results, it appeared that most of the population of prehistoric cultural resources within MIMA would consist of many small (50 - 500 sq m) and a few moderate (1000 - 1500 sq m) sized sites distributed in relatively low density, widely dispersed patterns.

The primary focus of the survey was the collection of information on the prehistoric cultural resources within MIMA, however, six historical-period sites were also identified within MIMA during the survey. These were mostly the remains of domestic sites. The two exceptions to this were a small stone bridge and a probable barn or outbuilding. The three residential sites were foundations and a cellar hole marking the former locations of houses. The stone bridge appears to have been built before 1775; construction/occupation dates for the domestic sites and probable barn/outbuilding range from the early or mid-19th to the 20th century. The Ox Pasture Site, Cartpath and Stone Bridge was located in the Hardy Hill section of the park. The Thomas Brooks Farm Site, Barn/Outbuilding and one domestic site (Ephraim Hartwell Farm Site, Foundation) were in the Old Bedford Road area. Other domestic sites were in the Bedford Lane (William Smith Farm Site, Foundation) and Folly Pond (Samuel Hartwell Farm Site, Cellarhole; Ephraim Hartwell Farm Site, 20th c. Filled Foundation) areas. These six sites have some potential to contribute to the resolution of research problems involving transportation networks (Ox Pasture Site, Cartpath and Stone Bridge) and settlement/land use patterns in rural/peripheral areas (Thomas Brooks Farm Site, Barn/Outbuilding; William Smith Farm Site, Foundation; Ephraim Hartwell Farm Site, Foundation; and Samuel Hartwell Farm Site, Cellarhole). The stone bridge relates to the 18th century interpretive period of MIMA, while the other sites may be of value for interpreting rural land use in the park since the Revolutionary War. In addition to the six sites containing structural features, the survey within MIMA recovered a substantial sample of non-site related cultural material, or "field trash." Analysis of this material indicated that it may have some potential to contribute information on a variety of research questions such as changes in refuse disposal behavior, changes in agricultural land use practices, and the growth of market gardening or extensive agriculture in the Concord area during the 19th century.

Prior to this survey there were no documented prehistoric sites in the central and eastern portions of the park, and available information on the kinds of sites outside this section of MIMA was limited. The survey has provided new information to fill this gap. The identified prehistoric sites are important potential sources of information about land use within MIMA prior to European settlement of the Concord area. These sites form a basic inventory illustrating some of the range of prehistoric cultural resources that could be expected to occur within MIMA. While this current inventory consists of small sites without much information on periods of occupation or function they are potentially important as a group. They represent the upland aspect of prehistoric settlement/land use systems which are not well known and deserve both protection and further study. Since these and other unknown sites in MIMA are likely to be small and not easily detected, it is important that future planning for the park include archeological surveys that can locate sites of this type. The sensitivity stratification of MIMA completed during the survey should assist in planning future development within MIMA by defining those areas most likely to contain other prehistoric sites. In summary, the prehistoric cultural resources identified during the survey are important additions to the extant data base for the region surrounding Minute Man National Historical Park. While this inventory of sites is fairly small and includes many "low visibility" sites or loci when viewed within larger contexts (southern Merrimac basin) it should contribute to a more complete reconstruction of prehistoric settlement/land use systems. The six historical-period sites identified during the survey had not been previously documented and are an addition to the inventory of cultural resources within MIMA. Most of these sites are a potential source of information about 19th century settlement/land use and should be afforded the same protection given to other historical-period archeological sites within the park.

Other recommendations for future management of the identified cultural resources include preservation, additional documentary research for historic sites, and investigation to answer specific research problems about prehistoric site distributions.

Chapter 1

Introduction

Minute Man National Historical Park (MIMA) is located about 12 miles (19.2 km) west of Boston in the towns of Concord, Lincoln, and Lexington, Massachusetts (Figures 1-1, 1-2). The park consists of about 750 acres and is divided into three separate parcels. The North Bridge parcel is located just north of the center of Concord along the Concord River, the Wayside parcel is a small area along Lexington Road east of Concord center and the remainder of the park extends for four miles from Meriam's Corner in Concord to Fiske Hill in Lexington (Figure 1-3). The park was established in 1959 by an Act of Congress on the recommendation of the Boston National Historic Sites Commission to preserve sections of the Lexington-Concord Battle Ground and associated structures, properties and sites to increase public understanding and appreciation of the start of the American Revolution (National Park Service 1963:1).

Archeology has always been an integral part of the purpose of the park since the initial assessment of historical-period resources and planning was conducted in the early 1960s. There is a 27 year history of archeological investigations (1963-1990) within MIMA. During this period, 23 sites or areas including historical roadways have been studied. These investigations were done to provide additional information to supplement documentary or architectural evidence or to assess the impact of proposed construction on any archeological sites present in specific areas of the park. With the exception of recent study of the North Bridge prehistoric site, most of these previous investigations have focussed on historical sites closely related to the events of April 19, 1775 (Towle 1984; Synenki 1987).

Limited amounts of prehistoric cultural material (projectile points, bifacial tool blades) marking sites or small activity loci were in collections from several historical-period sites in different sections of the park (McMahon 1987:154) but no systematic survey for prehistoric cultural resources had been conducted. In 1984, an Identification and Evaluation study was initiated under the auspices of the MIMA Archeological Project to address gaps in the available data base. The primary goal of this study as part of the project was to locate, identify, and evaluate selected prehistoric (and historical-period) cultural resources through the systematic survey of portions of MIMA for the purpose of estimating the frequency of different kinds of prehistoric sites within the sampled areas. The inventory of previously known prehistoric cultural resources within or in close proximity to MIMA was limited to 12 sites, located mostly along the Concord River (Baker 1980:89). Other non-riverine, upland sections of the park had the potential to contain many more prehistoric sites based on the similarity of environmental settings there to the locations of known sites in the combined Sudbury/Assabet/Concord River drainage.

This investigation has been able to add another dimension to the body of information on patterns of past settlement and land use patterns in MIMA by collecting data on the distribution and characteristics of prehistoric sites in different environmental settings. This information will allow the park to more effectively plan for future development and

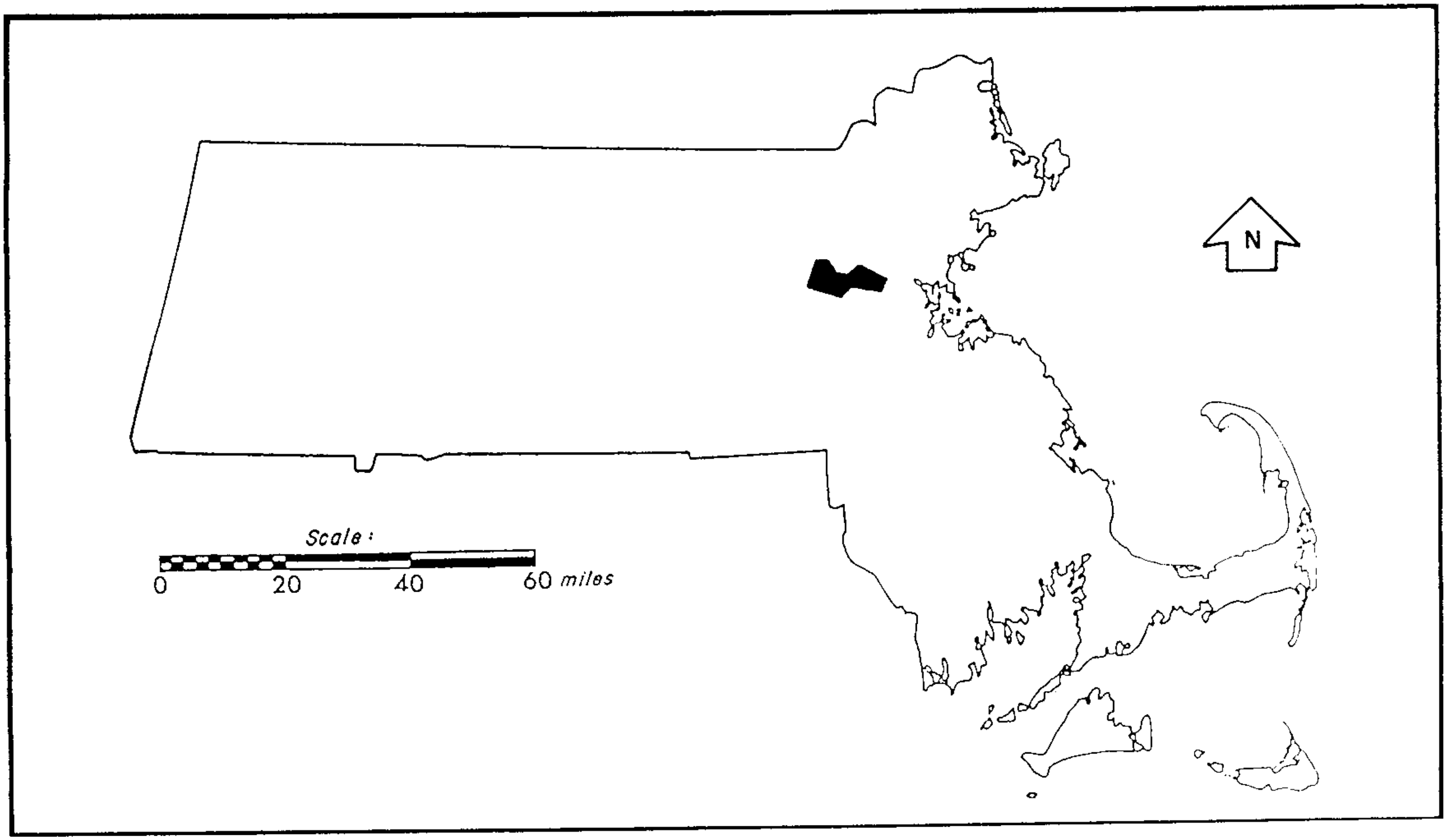


Figure 1-1. Map of the state of Massachusetts showing location of Minute Man National Historical Park.

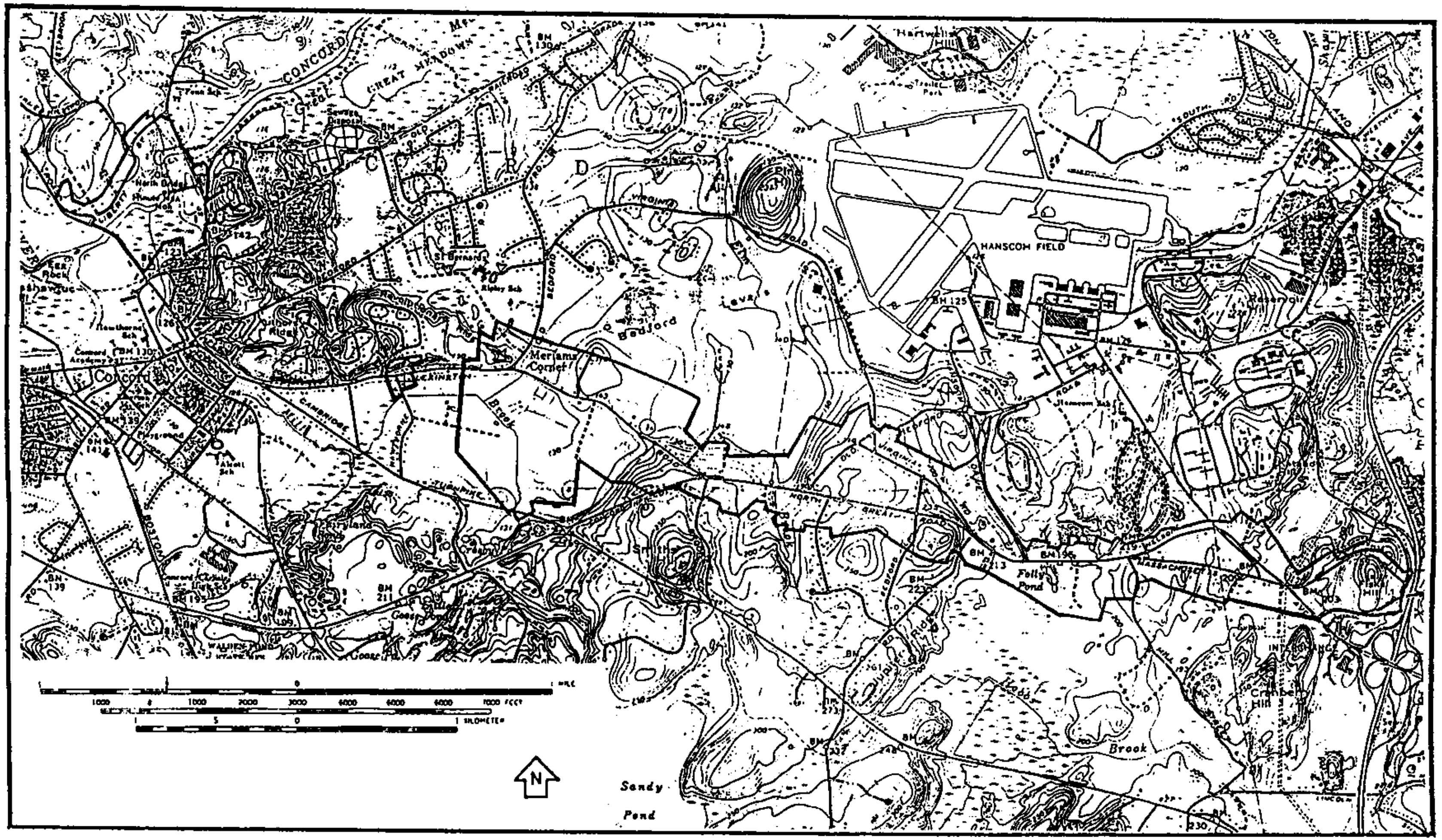


Figure 1-2. Location of Minute Man National Historical Park on USGS Concord quadrangle map.

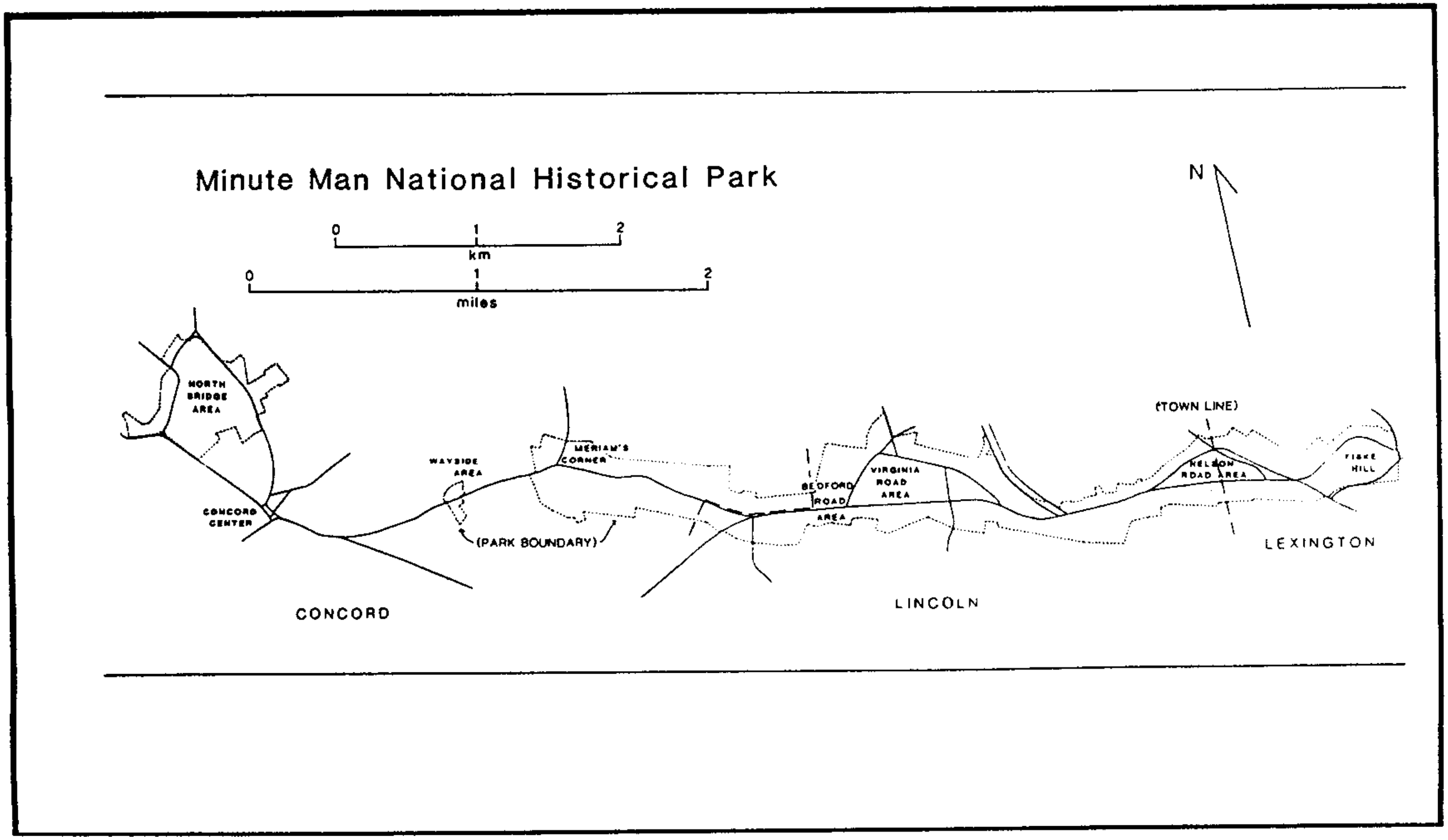


Figure 1-3. ACMP base map of Minute Man National Historical Park showing major subdivisions.

manage its non-renewable prehistoric cultural resources in areas where our knowledge of them prior to this survey was limited.

The archeological investigations of MIMA were conducted by The Public Archaeology Laboratory, Inc. (PAL, Inc.) under contract (Contract No. CX1600-9-0021) with the National Park Service, North Atlantic Regional Office. The various tasks required to carry out this investigation were completed between July 1989 and the end of June 1990. Preparation of a draft research design to guide the survey took place in July and August 1989 and the final research design was completed in September 1989. Other tasks carried out in September were the review and synthesis of background information, preparation of base maps showing the archeological sensitivity stratification, and training of PAL, Inc., staff members involved in the project (use of field recording forms, cataloging procedures). Two pre-field conferences held to finalize the archeological sensitivity stratification and subsurface testing strategies were completed in October 1989. The fieldwork stage of the survey began in early November and continued until a period of unusually cold, winter weather terminated fieldwork in mid-December 1989. The fieldwork for the survey and cleaning and cataloging of cultural material recovered during subsurface testing was completed in April 1990. Analysis and preparation of the final report was done in March, April, and May 1990.

PAL, Inc. staff involved in the archeological investigations of MIMA were Duncan Ritchie and Marsha King (Principal Investigators). PAL, Inc. administrative staff were Deborah Cox (Project Administrator), Lisa Smolski (Office Manager), and Jennifer Cox (Administrative Assistant). Christy Vogt was the Supervisory Archaeologist for the project. Edna Feighner also assisted for a few days as Supervisory Archaeologist. Cleaning and cataloging of cultural materials recovered during the survey and preparation of the artifact collection for final storage was done by Patricia Fragola (Senior Cataloger) under the supervision of Donna Raymond (Laboratory Supervisor). PAL, Inc. Archaeological Technicians involved in the project were: Stuart Dalton, Dianna Doucette, Shoki Goodarzy-Tabrizi, Steven Liberace, Valerie McCormack, Steve Willan, and Mark Rees.

Overview: Problem Orientation

The primary purpose of the investigation was to locate and identify the frequency and kinds of prehistoric sites within portions of MIMA so that a statistical estimate could be projected for them within the sampled area. To determine this, a reconnaissance-level survey was conducted using a multi-stage approach. The research conducted during this investigation was divided into five basic stages; background research, archeological sensitivity stratification, subsurface sampling, analysis and interpretation of the results of the subsurface sampling, and preparation of this final report.

Background research provided the basic information for constructing the stratification scheme used to guide the location and intensity of subsurface testing. To effectively carry out the subsurface testing stage, it was necessary to design a sampling strategy that would be capable of collecting data for use in estimating the frequency and kinds of prehistoric sites in park areas that display high or moderate archeological sensitivity. This sampling strategy had to be capable of locating the kinds of prehistoric sites likely to occur in the environmental settings within MIMA.

The general interpretive framework for the survey was oriented towards deriving as much information as possible about various aspects (structural characteristics, temporal period) of the prehistoric sites from the small samples of cultural material likely to be recovered. Knowledge of the range of variation in site frequency and structural characteristics across various environmental settings, patterns of lithic resource use and other aspects of prehistoric activity in the Sudbury/Assabet/Concord River drainages was essential for this task.

It was expected that historical-period sites might be identified and that varying amounts of historical cultural material deposited primarily as "field trash" would be recovered during subsurface sampling for prehistoric sites. Therefore, it was necessary to develop a set of research problems and an analytical format relevant to these kinds of expected structural remains (small domestic sites/farmsteads, outbuildings, etc.) and archeological deposits typically associated with intensive agricultural/pastoral land use.

Upon completion of the tasks briefly described above, preparation of a final report on the archeological investigations in MIMA provided a synthesis of the information collected during the survey. Methods used during the survey and categories of information (background data, stratification scheme, prehistoric and historical cultural resources, the estimation approach to sampling, etc.) were evaluated in terms of their effectiveness and potential significance. The results of the survey (estimates of prehistoric site frequency and characteristics) were the basis for recommendations for managing cultural resources and planning future land use in the park.

Environmental Settings

Geomorphology and Geology

MIMA is located within the Seaboard Lowland physiographic province of eastern Massachusetts (Figure 1-4). The vicinity of MIMA is within a general area where the landform is a reflection of a strong southwest to northeast trending fault complex between the Clinton-Newbury and Bloody Bluff fault zones. The Clinton-Newbury fault zone is located just west of the present alignment of Route I-495 and extends from southern Worcester County to the Merrimack River estuary in northeastern Massachusetts. The Bloody Bluff fault extends from the Blackstone Valley area south of Worcester, northeast along the west edge of the Boston Basin near the alignment of Route 128. This fault passes through the eastern end of MIMA and is named after the rocky knoll located at the intersection of Massachusetts Avenue, Marrett Road, and Nelson Road (Barosh 1976:311-313). The bedrock formations in the area extend in bands oriented southwest to northeast following the alignment of the fault zones (Clinton-Newbury, Assabet River, Bloody Bluff) crossing central and eastern Massachusetts. The northeast trend of the Bloody Bluff fault can be seen in the orientation of the series of small ridge-like hills between Sandy Pond and Katahdin Hill. The bedrock units underlying the vicinity of MIMA are igneous and metamorphic rocks primarily diorites, granite, gneiss, and amphibolite. The North Bridge and Concord center areas contain sections of the Shawsheen Gneiss, Straw Hollow Diorite, and Assabet Quartz Diorite. The Shawsheen Gneiss is a medium-grained, locally sillimanitic muscovite, biotite, oligoclase quartz gneiss with some lenticular bodies of bedded and massive amphibolite. The Straw Hollow and Assabet Quartz Diorites are gray, medium-grained, slightly foliated, biotite hornblende diorite, and quartz diorite. In the central portion of MIMA from Concord center to the vicinity of Elm Brook the primary bedrock unit is Andover Granite, a light or medium gray medium- to coarse-grained muscovite-biotite granite with pegmatite masses. In the area northeast of Sandy Pond near Nelson Road are thin lenses of the Marlboro formation (Sandy Pond member) and Sharpners Pond Diorite, a medium-grained equigranular biotite-hornblende tonalite and diorite. The Sandy Pond member of the Marlboro formation is a thinly layered, very fine grained amphibolite, biotite schist and gneiss with minor calc-silicate

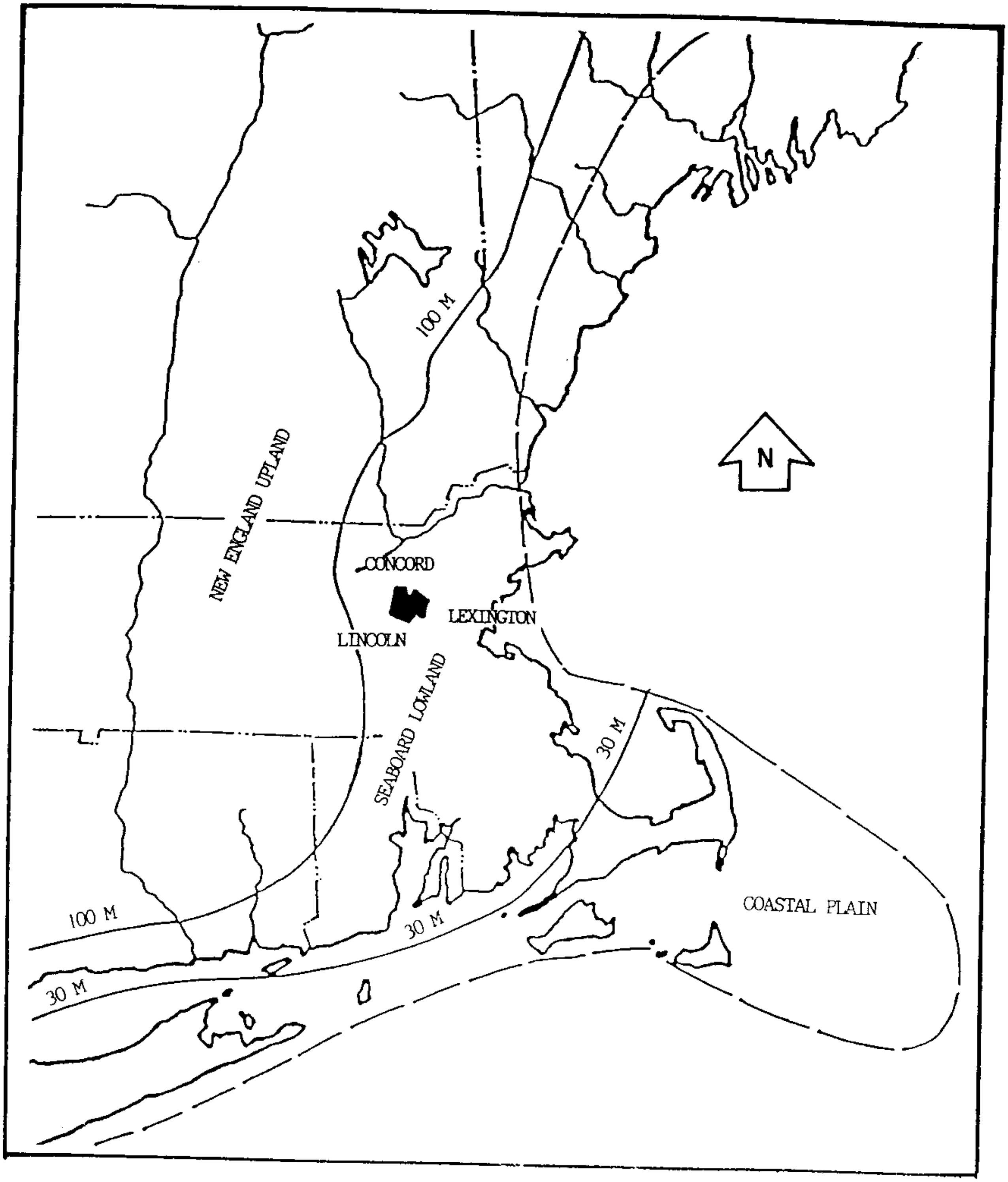


Figure 1-4. Location of Minute Man National Historical Park in relation to major physiographic provinces in southern New England (Fenneman 1938).

granofels and felsic granofels. Bedrock formations in the Bloody Bluff/Fiske Hill area of MIMA are Andover Granite and Dedham Bedrock outcrops in or near MIMA are few in number and Granodiorite (Zen et al. 1983).

Bedrock outcrops in or near MIMA are few in number and concentrated mostly at the end of the park near Fiske Hill. In the the North Bridge section of MIMA a few small outcrops are present on the hill between Lowell Road and Barnes Hill Road north of the confluence of the Assabet and Sudbury Rivers. Several other very small exposures of bedrock appear to be located near the North Bridge. In the Nelson Road area a large bedrock exposure extends south from Massachusetts Avenue along the eastern slope of a rocky knoll. Another nearby knoll in front of Minuteman Vocational Technical School has a bedrock core which is exposed in an outcrop on its southern slope. At the intersection of Massachusetts Avenue and Marrett Road the large outcrop on the southern end of Bloody Bluff is a contact between the Dedham Granodiorite and Andover Granite. The eastern half of Fiske Hill is an area of numerous bedrock outcrops and thin deposits of glacial outwash.

The formations of coarse-textured granitic and gneissic rocks within or near MIMA were not likely to have been sources of lithic raw material used by prehistoric hunter/gatherer groups for chipped or ground stone tools. Other volcanic and metamorphic rocks suitable for the manufacture of stone tools outcrop in the northern Boston Basin and middle/upper Sudbury and Assabet River drainages and were important sources of lithic raw material. Sections of the Lynn Volcanic Complex located to the northeast of MIMA in Wakefield and the Salem/Marblehead area were the closest sources of felsite. Several varieties of gray and black felsite from the Lynn Volcanic were used throughout the prehistoric period for the manufacture of chipped stone tools (MHC 1981:16-24). Another important source of raw material was the Cambridge Argillite outcropping in the northern half of the Boston Basin (Belmont, Waltham, Arlington, etc.). This gray-green to blue-gray argillite was used primarily in the Middle Archaic period by groups occupying the Sudbury-Assabet/Concord and Shawsheen River drainages. A distinctive translucent, light green to gray material tentatively identified by several geologists as a mylonite or lithic tuff was available from outcrops along several sections of the Bloody Bluff fault zone (Ritchie 1983a). The primary source area appears to be in the Lexington/Woburn area. In the Sudbury/Assabet/Concord drainage this material was almost exclusively used during the Middle Archaic period and to a limited degree in the Late Archaic period (Small Stem Point tradition) (Ritchie 1979). Other local lithic materials include the Westborough Quartzite and amphibolite associated with the Marlboro formation. Source areas for these two rock types are located in the middle and upper sections of the Sudbury and Assabet River drainages (Nelson 1975).

The surficial deposits within MIMA consist primarily of material associated with several stages or levels of Glacial Lake Concord and till. Glacial Lake Concord was formed when large delta deposits of sand/gravel at the northern end of another post-glacial lake (Lake Sudbury) blocked the flow of meltwater to the south. The total extent of Glacial Lake Concord is not clear since the north edge of the lake was marked by a retreating ice-front. Along the Concord River in the North Bridge section of the park a set of low terraces ranging from about 120 to 150 feet in elevation consist of deposits of sand, gravel, silt, and clay associated with the low stage of Glacial Lake Concord. A more elevated set of terraces including the large kame delta known as Authors Ridge and Revolutionary Ridge are deposits associated with an earlier, high water stage of this glacial lake. Lake bottom deposits of fine sand, silt, and clay cover a large area of low terraces ranging from 120 to about 140 feet in elevation extending east from the center of Concord along the drainages of Mill and Elm Brooks to Meriam's Corner and the Bedford Levels (Koteff 1964).

In the Hardy Hill, Old Bedford/Virginia Road, and Nelson Road sections of MIMA, elevated hilly areas consist of deposits of till, a light gray to greenish-gray poorly sorted mixture of sand, gravel, and boulders with some clay and silt. These areas containing till are generally uplands with elevations ranging from 150 to 270 feet above sea level. Along the west side of upper Elm Brook are high terrace-like deposits of gravel, sand, and silt. Similar deposits form a flat plain marked with kettle hole features between Virginia and Nelson Roads in the Folly Pond area and extending from there to Fiske Hill. These outwash deposits extend from about 150 to 200 feet in elevation (Koteff 1964).

The distribution of various soil types within MIMA is related to the type of surficial deposits present in and the physical characteristics (texture, drainage, slope) of these deposits. The areas of outwash deposits of sand and gravel associated with the high and low stages of Glacial Lake Concord contain soils classified as the Windsor loamy sand (3-8%, 8-15% slope), Hinckley loamy sand (3-8%, 8-15%, 15-25% slope), Paxton fine sandy loam (8-15%, 15-25% slope), Deerfield loamy sand (0-3%, 3-8% slope), and Wareham loamy sand (0-5% slope). The terrace-like deposits of undifferentiated sand/gravel such as those near Elm Brook and from Folly Pond to Fiske Hill also contain these soils series. The Hinckley and Windsor series soils are excessively drained, sandy and gravelly soils that form on glacial outwash plains, terraces, kames, and eskers. Paxton series soils are well-drained sandy loam soils that form in compact glacial till on drumlins. These soils also contain numerous stones at and below the surface. The Deerfield and Wareham soil series are moderately and poorly-drained sandy loam soils formed on glacial outwash plains, terraces, and deltas. Deerfield soils are better drained with only seasonally high water table while Wareham soils tend to have a high water table for most of the year (USDA 1986).

The low terraces and plains of glacial lake bottom deposits contain soils of the Boxford silt loam (3-6%) in addition to Deerfield and Wareham loamy sands. The Boxford series consists of silty loam or clay loam soils that form on deep silt and clay lacustrine sediments. Boxford soils tend to have a seasonal high water table and are moderately well drained. Sections of MIMA with glacial till deposits contain soils of the Canton fine sandy loam (3-8%, 8-15% slope), Montauk fine sandy loam (3-8% slope), and Woodbridge fine sandy loam (3-8% slope) series. All three of these soil series are moderately well drained or well drained sand loam and loamy coarse sand that form on glacial till, ground moraine, or ice-contact stratified drift in uplands or on hills. These soil series typically have very stony surfaces and subsoil horizons. Canton series soils have moderate to rapid drainage or permeability while Montauk and Woodbridge soils display poor drainage characteristics (USDA 1986).

Other soil series present in the MIMA project area include the Charlton-Hollis-Rock outcrop complex on hills and other areas with thin deposits of soil covering bedrock. Wetlands along the Concord River, stream drainages (Elm, Mill Brook, etc.), and in more upland locations contain poorly drained soils such as the Scarboro loamy sand, Saco mucky silt loam, and Freetown muck series (USDA 1986).

Drainage Patterns

Extending in a linear, corridor-like configuration oriented roughly east/west, MIMA lies within sections of several major river drainage basins. An important feature of the drainage patterns in and around MIMA is the position of the park along the boundaries of the Concord, Shawsheen, and Charles River basins (Figure 1-5). The western portion of the park lies within the southern end of the Merrimack River basin which is formed by the combined drainages of the Sudbury, Assabet, Concord, and Shawsheen Rivers in east/central Massachusetts. The general southwest to northeast orientation of these drainages conforms to a broad regional fault system (Clinton-Newbury) which extends across this part of eastern Massachusetts (Alvord, Pease, and Fahey 1976).

The Sudbury River has a total length of 36 miles and drains an area covering 165 square miles. From its source in Cedar Swamp Pond in Westborough, it flows east and north through upland terrain with large hills. Along most of the upper Sudbury drainage, wetlands and marsh are restricted to a narrow zone along the main river channel. Broad marshes/river meadow up to two miles in width occur along the lower section of this drainage in the towns of Sudbury and Wayland. The Sudbury/Concord River system has a very low gradient dropping only two feet in a distance of 23 miles from the small fall-line in Saxonville to North Billerica. The headwaters of the Assabet River are at the base of an elevated hill zone near the Grafton/Westborough town line. The Assabet River extends for 31 miles draining an area of 176 square miles. Flowing through slightly more elevated terrain than the Sudbury River, the Assabet has a steeper gradient of 7 feet per mile and is flanked by narrow marsh/wetland zones and hilly uplands (League of Women Voters 1963:4). The Sudbury and Assabet Rivers join at Nashawtuc Hill in Concord to form the Concord River which then flows north to enter the Merrimack in Lowell. From just north of the Sudbury/Assabet River confluence, the Concord River is bordered by a wide marsh or river meadow for a distance of about 3 miles. This section of the river has been known historically as the Great Meadows. Within MIMA, drainage into the Concord River is primarily through Mill Brook, an important tributary stream. Mill Brook originates from several small feeder streams in wooded wetlands in the Meriam's Corner area and two streams draining from Fairyland and Crosby Ponds just north of Route 2. From a fairly large area of marsh and wooded wetlands south of Meriam's Corner and east of Concord center, Mill Brook runs in a northwest direction across low terraces of glacial lake bottom sediment toward the Concord River. Another unnamed tributary stream enters the Concord River about 750 feet (225 m) northeast of the park headquarters flowing from wetlands at the base of Punkatasset Hill and crossing under Liberty Street. This stream is one of several small tributaries that drain wetlands in the more elevated upland terrain bordering the Concord River on the northwest.

In the central and eastern portions of MIMA from the intersection of Lexington Road and the Concord Turnpike cut-off (Hardy Hill area) to Fiske Hill, wetlands and streams flow into both the Shawsheen and Charles River drainages. The Shawsheen River drainage has a total length of about 20 miles and forms the southeastern edge of the Merrimack basin running roughly parallel to the Concord River. The headwaters of the Shawsheen are located just north of Massachusetts Avenue (Route 2A) and northeast of Virginia Road and Hanscom Drive. In its original configuration, the upper Shawsheen River began in a small pond and drained to the north through the Great Swamp a large wetland located in what is now Hanscom Field. From the northern boundary of MIMA near Hanscom Drive, the Shawsheen River flows northeast and is joined by two other tributary streams, Kiln Brook and Elm Brook in the town of Bedford. From its origin in a wetland north of Route 2 and west of Bedford Road in the town of Lincoln, Elm Brook flows north through MIMA near the intersection of Massachusetts Avenue (Route 2A) and Old Bedford Road. The upper section of Elm Brook in the vicinity of MIMA is bordered by wooded wetlands and sloping hillsides of rocky ground moraine or till. North of the park boundary in the Bedford Levels area, Elm Brook crosses low terraces of glacial lake bottom deposits west of Pine and Hartwell Hills. The alignment of Massachusetts Avenue in the area between Bedford Road and Nelson Road follows a narrow divide between the upper Shawsheen and Charles River drainages.

The Charles River drainage includes an area of 300 square miles extending from the elevated uplands of the southern Worcester Plateau to Boston Harbor (Clapp 1902:218). The northern boundary of the Charles River basin is defined by the Hobbs Brook drainage in Lincoln. Hobbs Brook begins in the extensive wetlands south of Folly Pond and east of Juniper Ridge and flows southeast into Cambridge Reservoir before joining Stony Brook in the town of Weston. The small unnamed stream that drains wetlands south of Nelson Road and the Battle Road Visitors Center flows into Hobbs Brook.

During the historical-period there have been a number of modifications to the original drainage patterns in and around MIMA. A series of dams was built for mills on the Concord River at North Billerica beginning in the early/mid 18th-century (MHC 1980a).

In 1798, a dam was constructed at North Billerica to supply water for the Middlesex Canal. This dam was increased in height several times until a stone dam was built at this location in 1828. Sections of river meadow as far upstream as Wayland and Sudbury were inundated by period flooding that destroyed valuable cranberry and hay crops. Construction of another dam (Talbot Dam) at North Billerica for a woolen mill in the 1850's also led to the flooding of river meadows in the upstream towns and changes in the configuration of wetlands and their vegetation (League of Women Voters 1963:7-8). Areas that were formerly accessible became subject to periodic flooding and various types of meadow grasses were replaced by wetland shrubs and sedge. In 1859, farmers in the upstream towns of Concord, Carlisle, Bedford, Wayland, and Sudbury petitioned the State Legislature claiming that the Billerica dam was responsible for a decline in the condition of hay meadows along the Concord and Sudbury Rivers. Investigations by legislative committees in 1859-60 concluded that the Billerica dam was responsible for flooding upstream meadow areas. Several years later, other studies indicated that lowering the dam by 16 1/2 inches would lower the river a few inches in Concord but have little or no effect further upstream in Sudbury and the Billerica dam remained in place.

The rapid rate of deforestation and land clearing in the Concord area during the early/mid 19th-century has also been cited as a factor contributing to the severe periodic flooding that damaged river meadows. Clearing of upland areas adjacent to the Concord River for agricultural land use appears to have increased runoff into the river meadow particularly during episodes of heavy precipitation (Donahue 1984:46-53). Portions of the North Billerica dam remain and the present limits of wetlands along the Sudbury and Concord Rivers may be slightly larger than during the prehistoric period. During intensive agricultural land use particularly during the 19th-century, the drainages of the three primary tributary streams (Elm, Mill, Hobbs Brooks) within MIMA were altered. Sections of these streams were modified by converting their original channels into linear ditches. Other ditches were also excavated through wetlands along these streams to drain areas converted to pasture or cultivated fields. The clearing and ditching of wooded wetlands to provide new pasture and plowland was related to the larger process of extensive farming in Concord (Donahue 1984:39). More recently, the headwaters of the Shawsheen River were filled and modified during the construction of Hanscom Field in the 1940's and subsequent

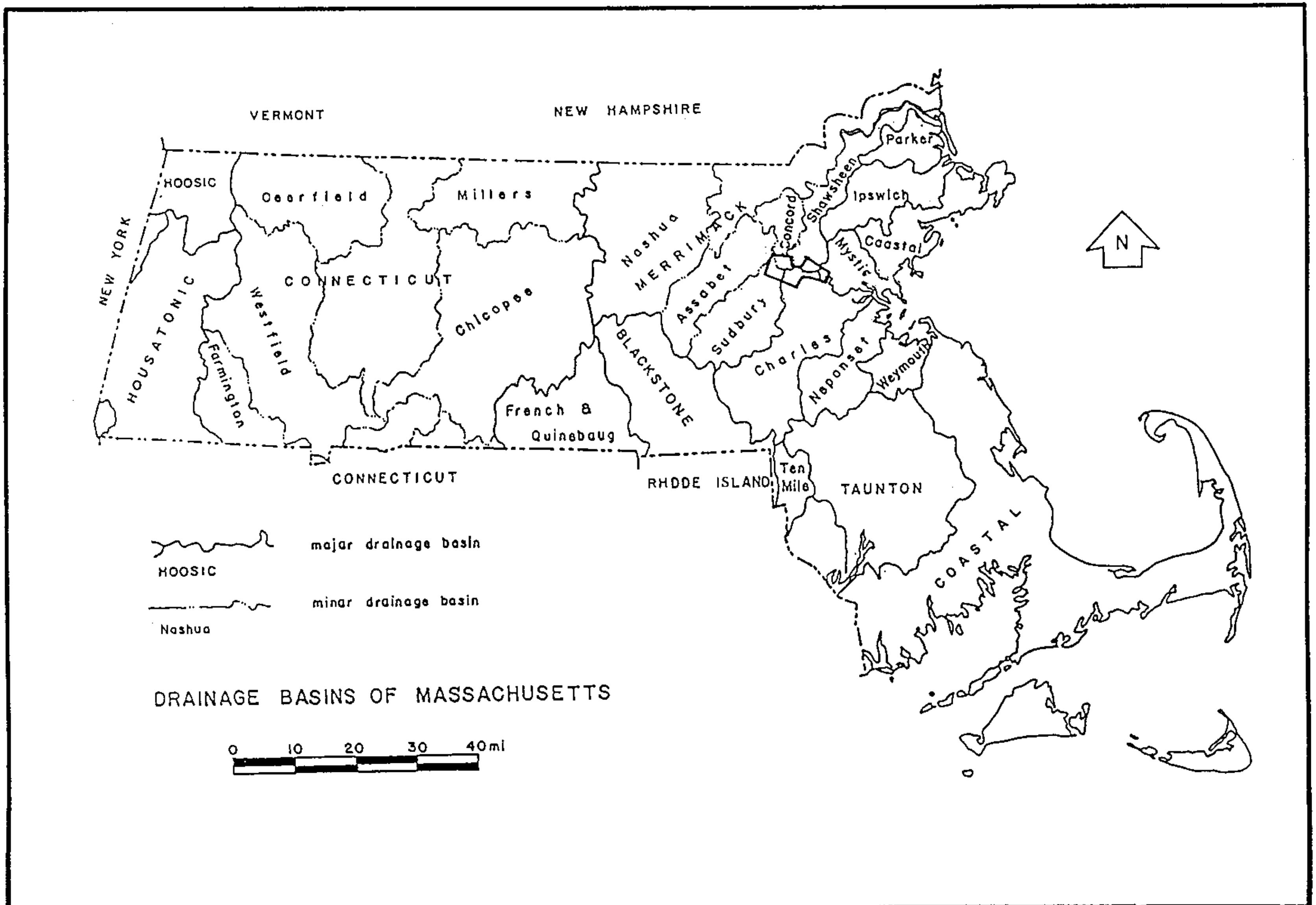


Figure 1-5. Location of Minute Man National Historical Park in relation to major river drainages in eastern Massachusetts.

expansion. The large wetland known historically as the Great Swamp was filled and various types of land use (i.e., gravel pits, residential development, roadways) have altered the topography near the source of this river.

Past Environmental Settings

Over the last 12,000 years, vegetation patterns in the area of eastern Massachusetts surrounding MIMA have changed in response to larger climatic trends and the gradual spread of various species into this region during the post-glacial period. This long sequence of changes in the regional forest cover provide a broad environmental context or background for the different settlement and resource use strategies developed by prehistoric hunter/gatherer populations. The brief paleoenvironmental reconstruction presented in this section is a synthesis of data obtained from palynological analysis of sediment cores collected at several locations in central, eastern, and southeastern Massachusetts. These locations include Cedar Swamp Pond, Westborough (Sneddon and Kaplan 1987), Houghton's Pond, Canton (Newby, Webb, and Webb 1986), Winneconnet Pond, Norton (Suter 1985), and Nipmuck Pond in Mendon (Newby, Tzedakis, and Webb 1985) (Table 1-1). The Cedar Swamp core is the most complete and current source of information on prehistoric period vegetation patterns for the area within the combined Sudbury/Assabet/Concord River drainages. The chronology of forest types reconstructed from these cores is generally similar, reflecting broad regional trends. Important regional trends in the forest vegetation of southern New England described by Gaudreau and Webb (1985) have also been included. The general chronology of vegetation patterns and contemporary prehistoric settlement/land use discussed here is considered to be applicable to the southern Merrimack basin and useful as part of a larger interpretive context for cultural resources identified within MIMA.

The lower portion (Zone A, spruce) of the Cedar Swamp core contained evidence of an open spruce woodland with jack or red pine, larch, fir, alder, and hornbeam in the area around 12,000 to 11,000 years ago. Small amounts of oak, ash, elm, and chestnut pollen in the lower zone suggest the presence of these deciduous species at very low densities in the sub-regional forest cover. At Winneconnet Pond in the Taunton basin, pollen from jack or red pine made up about 70% of the total assemblage indicating the dominance of jack/red pine in forests after 12,000 years ago (Sneddon and Kaplan 1987; Suter 1985).

Between about 11,000 and 10,000 years ago during the PaleoIndian period, a pine dominant forest developed in the eastern Massachusetts region as the earlier, boreal forest of spruce, fir, and larch declined. White pine was the major species in the pine dominant forest with lesser amounts of birch and oak. By this time oak had increased and other temperate deciduous trees such as maple, elm, and ash were established as a consequence of climatic warming.

After 10,000 years ago pine decreased in abundance within regional forests and a transition from a primarily coniferous to a mixed coniferous/deciduous forest occurred. Hemlock replaced pine as the major coniferous tree. By about 8000 to 7500 years ago, the warm, dry climate of the Hypsithermal episode is marked by the expansion of temperate deciduous species such as oak, maple, ash, elm, and birch. Beech first appeared during this general episode and made up a significant portion of the deciduous element of forests in east/central Massachusetts. This temperate forest expansion corresponds well with the spread of the Early Archaic bifurcate base point tradition in southern New England (Dincauze and Mulholland 1977).

Between about 8000 and 6000 years before present oak forests established in an ecotone or

Table 1-1. General chronology of vegetation patterns in southern New England ca. 14,000 to 1000 years B.P.

Years B.P.	*Forest Types and Major Trends*
13,500	Spruce parkland forest with shrub birch,alder and herbaceous plant species (sedge).
12,000 - 11,500	Pine dominant boreal forest with jack pine, red pine, spruce and alder.
10,000	More mesophytic pine dominant forest with white pine, hemlock and white birch.
8000	Oak forest established along major east/west ecotone crossing central Massachusetts. Mixed conifer/hard wood forest north of this boundary.
6000 - 4000	Hemlock and beech increase north of central Massachusetts ecotone. Oak dominant mixed deciduous forest to south of ecotone.
4000 - 3000	Oak dominant forest type with hickory,beech, yellow birch and white pine. Period of maximum diversity in regional deciduous forests.
3500 - 2000	Regional cooling trend with in crease in spruce. Oak and hemlock decline, hickory and chestnut become important species.
1000 to historical period	Oak/hickory forest type with some birch and beech.

boundary zone crossing the southern New England region in a southwest to northeast direction. This boundary extended from the southern coast of Maine across north central Massachusetts and the Worcester Plateau forming the southern boundary of a mixed conifer/hardwood forest. This ecotone also marked the northern boundary of the oak dominant forest covering southern New England (Gaudreau and Webb 1985). This important event took place during the general span of the Middle Archaic period when prehistoric populations appear to have settled into group territories within major river drainage basins in eastern/southeastern Massachusetts (Dincauze and Mulholland 1977). This more sedentary pattern of settlement and resource use may have developed in response to stabilizing forest ecosystems.

To the north of the ecotone crossing central Massachusetts, hemlock and beech increased as elements of the mixed hardwood deciduous forest after about 6000 years ago. In southeastern Massachusetts, beech may have been present in significant amounts by 6700 years before present. By around 5000 years before present, hickory became established as part of the deciduous forest and pollen cores from throughout the southern New England region show that hemlock rapidly declined ca. 4700 B.P. possibly as a result of disease (Gaudreau and Webb 1985; Suter 1985). Around 4500 to 3000 years ago the upland interior of central Massachusetts was covered by an oak dominant forest with hickory, beech, yellow birch, white pine, and some other species (maple, elm, basswood, walnut, sycamore, ironwood, chestnut) (Newby, Tzedakis, and Webb 1985). The hemlock decline reached its maximum about 3000 years ago. At about this same time, evidence of eutrophication in ponds and changes in wetland structure (bog formation) and vegetation has been noted in several pollen cores taken from different locations in southeastern New England (Nelson 1984).

The Cedar Swamp Pond core in the upper Sudbury River drainage contained evidence of eutrophication (algae bloom) that has been attributed to the decline in hemlock and an increase in nutrient rich run-off from the deciduous forest. The occupation of upland areas adjacent to wetlands and ponds by prehistoric hunter/gatherer groups has also been suggested as a possible source of nutrients responsible for eutrophication (Sneddon and Kaplan 1987). At the regional scale there was a shift to cooler, moist climatic conditions across the entire Northeast after about 4000 years ago. At higher altitudes spruce increased in frequency in both northern and southern New England forests and this species moved further south. Chestnut entered southern New England during this period of cool, moist climate and remained as a minor component of the oak-chestnut forest even at peak abundance. Syntheses of palynological and archeological data from southeastern Massachusetts and Rhode Island have suggested that changes in wetlands (size, structure, vegetation types) due to eutrophication and the climatic cooling trend were factors influencing prehistoric settlement and resource use (Bradshaw, Nelson, and McGown 1981; Thorbahn et al. 1982; Cox, Thorbahn, and Leveillee 1983). From about 3500 to 2000 years ago, there was a slight decline in the percentage of oak in the forests of central Massachusetts and birch, beech, ash, elm, and maple were also present. There were small amounts of spruce and white pine. Hemlock was still present in low numbers even 1000 years after its decline in the region. Changes in forest composition were probably not noticeable to prehistoric populations. The regional hemlock decline took place over a span of 600 years and this event may have been more obvious in northern New England. It is not clear what effect the hemlock decline would have had on prehistoric hunter/gatherer groups (Newby, Tzedakis, and Webb 1985). The interior uplands were still part of settlement patterns as shown by the numerous Late/Terminal Archaic period sites located in this general physiographic zone.

The exact nature of changes in prehistoric settlement and resource use are not clear; however, upland forest environments may have been used differently in the Terminal Archaic/Early Woodland period (ca. 3500-2500 B.P.) when there was apparently an intensified use of riverine and coastal zones. Evidence of a local dry phase possibly affecting the size of ponds and wetlands and the vegetation communities associated with them was observed in a pollen core taken from Titicut Swamp in the Taunton basin of southeastern Massachusetts. This local environmental event took place between 4200 and 3150 years ago and may have affected prehistoric settlement and resource use (Nelson 1984). The pollen records of wetlands in eastern/southeastern Massachusetts indicate that cedar first became established in this area by around 2500 years ago (Sneddon and Kaplan 1987).

Some indications of forest clearance or alteration about 1000 years ago have been observed in pollen diagrams from wetlands in southern Rhode Island and southeastern Massachusetts. A significant increase in herbaceous plant pollen (*Ambrosia, Tubuliflorae* etc.) at that time suggests that there were openings in the forest vegetation cover which provided suitable habitat for these weedy plants (Bernabo 1978:87-88). During the late prehistoric period, forests in eastern/southeastern Massachusetts consisted of an oak-chestnut type with hemlock, hickory, beech, birch, pine, and maple.

At the regional level, the effects of early historical-period forest clearance within the last 300 years are clearly evident in pollen cores taken from wetlands and ponds in southeastern New England. Decreases in tree pollen are matched by strong increases in pollen from weedy plants such as sheep sorrel (*Rumex*), plantain (*Plantago*), ragweed (*Ambrosia*), and grass (*Graminae*) (Newby, Webb, and Webb 1986; Nelson 1984).

At the local level, historical-period documentary sources provide a record of fairly rapid changes in the forest vegetation in the vicinity of MIMA. The earliest descriptions of the site of initial English settlement in Concord ca. 1635, indicate that it was an open plain covered with shrubs and sweet fern. This early succession stage vegetation probably marked land cleared earlier and then abandoned by Native American occupants of the area. Other contemporary accounts suggest the presence of extensive areas of pine forest. Pitch pine was apparently the dominant species covering the "pine plains" described in 17th-century deeds. A large, 400 acre stand of mature, second growth forest studied by Henry David Thoreau in 1860 consisted mostly of white oak with lesser amounts of black, red, and scarlet oak, white pine, and chestnut. This mixed oak, chestnut, pine woods was probably similar to the original forest type covering the area in the 17th-century (Whitney and Davis 1986:71,73-74).

The amount of area in the town of Concord covered by woodland declined rapidly in the 18th and early 19th-centuries. Woodlots were important sources of fuel and timber with oak, chestnut, and white pine being most frequently exploited. It has been estimated based on a variety of documentary sources that by the mid 19th-century only about 10% of the town of Concord supported woodlands. The species composition of local forests had been modified by sequential cutting and clearing. Farmland in sandy soils allowed to become fallow for a few years was taken over by pitch pine and then white pine. Other abandoned fields that had been recently plowed were covered by red maple and gray birch saplings. With the abandonment of more upland pasture land in the late 19th-century, second growth forests dominated by white pine and red maple developed (Whitney and Davis 1986:75-76,81).

Present Conditions in the Project Area

Existing topographic conditions and vegetation patterns in the MIMA project area reflect the sequence of changing land use patterns within this area over the last 300 years. The range of past land uses has altered the original topography to varying degrees and led to the creation of a mosaic of vegetation patterns. The section of Middlesex County including MIMA is near the original boundary of the hemlock-white pine northern hardwoods forest type and an oak-chestnut forest extending along the edge of the Boston Basin. The oak-chestnut forest type was prevalent in southeastern Massachusetts. In the area covered by the hemlock-white pine northern hardwoods forest, a typical "old field" succession consists of gray birch and white pine with some red cedar. On lands that were cleared of all stumps from earlier hardwood trees and then plowed, white pine and gray birch or red cedar are the early stage succession species. These old field trees are rapidly invaded by hardwoods like oak that eventually dominate and crowd out the birch and pine saplings creating mixed stands. Common species in the hardwood forest include red or white oak, red maple, ash, and occasional black birch and hemlock on north facing slopes or cooler, moist microenvironments (Braun 1950). The general patterns of past land use, modifications to the landscape, and current vegetation in the six sections (North Bridge, Meriam's Corner, Old Bedford Road, Virginia Road, Nelson Road, Fiske Hill) of MIMA are described below.

The North Bridge section of MIMA contains a mix of open fields, riverine marsh/wetlands, and wooded uplands. The current vegetation pattern includes areas of shrub swamp and wooded wetlands bordering the Concord River and the mouth of Mill Brook. The wooded wetlands are dominated by red maple with some swamp white oak and white pine. Typical wetland shrub species include buttonbush, buckthorn, blueberry, and red osier willow. Wooded uplands (Poplar Hill) are covered with a second growth forest dominated by oak. Past land use was predominantly agricultural and moderate density residential development. More recent alterations include landscaping of lawns and construction of parking areas, footpaths, and other facilities around the North Bridge Visitor Center and the David Brown historic site along the Concord River. Previous investigations indicate that prehistoric archeological sites near the North Bridge have survived in good condition and that historical-period agricultural land use included filling of areas with muck soils taken from wetlands (Towle 1984; Dwyer and Synenki 1990a, 1990b).

In the Meriam's Corner section of MIMA, the landscape has retained an essentially rural appearance. A large percentage of the property within the park boundary is open land space; past land use consisted mostly of farming activities and limited residential development along Lexington and Bedford Roads and the Concord Turnpike Cut-off. Several parcels of land in this section of MIMA are in active agricultural land use. Other areas of former pasture are in the early stages of old field succession (birch, white pine) or are wooded with second growth forest (oak, pine, red maple). Poorly drained wooded sections support solid stands of red maple with some white pine and ash. South of Lexington Road along Mill Brook is a large area of shrub swamp and wooded wetlands.

Sources of previous disturbance in the Meriam's Corner areas include the demolition of modern period houses and other structures located mostly on the north side of Lexington Road or near the intersection of this road and the Concord Turnpike Cutoff. A system of drainage ditches excavated in the low-lying fields bordering Mill Brook south of Lexington Road is likely to have caused some disturbance to that area.

In the vicinity of Elm Brook and Old Bedford Road, past land use was primarily agricultural and pastoral in nature, with the exception of the Brooks

In general, large sections of MIMA have been minimally disturbed by previous historical-period landscape alterations and modern development. Past agricultural land use did result in the alteration of soil profiles over most of the park through the creation of homogeneous plowzone horizons, however, this is considered to have been the least damaging form of past land use. In most areas where demolition of modern period structures has taken place, the horizontal extent of subsurface disturbance appears to be restricted to the immediate vicinity of the structure. General categories of previous disturbance noted during the survey included the construction and demolition of residential and commercial structures, construction of roadways, sand/gravel extraction, agricultural land use, and a utility easement. More recent construction of facilities within the park such as the Battle Road Visitors Center, various parking areas, landscaping, and other improvements have also been sources of disturbance. This information on current conditions within MIMA was one category of data used to develop the stratification scheme identifying zones of archeological sensitivity.

Prehistoric Land Use and Settlement: General Overview

As an initial step in this overview, the currently available information about prehistoric cultural resources within or adjacent to MIMA was reviewed. In an earlier assessment of archeological resources within MIMA, Baker (1980) stated that many unrecorded prehistoric sites could be located within the park based on the relatively high frequencies of known sites identified by avocational archeologists in the Concord area. Ample evidence of prehistoric-period activity in the vicinity of MIMA was also represented by the thousands of artifacts in collections now curated by museums in Concord and elsewhere. The number and location of prehistoric sites within MIMA could not be determined from the information available in existing reports. The scarcity of information about prehistoric-period cultural resources within MIMA was attributed to the limited scope of previous archeological investigations rather than an absence of prehistoric sites in the park (Baker 1980:89,94).

A search of the site inventory maintained by the Massachusetts Historical Commission identified 12 prehistoric sites within MIMA or adjacent to park boundaries. Seven of these sites (19-MD-88, 89, 90, 91, 102, 111, 112) appear to actually be within the park boundaries (see Figure 1-6). The five other sites (19-MD-103, 104, 105, 135, 119) discussed by Baker (1980) were located outside the boundaries of MIMA. Most of these sites had been identified by two of the more active avocational archeologists (Smith, Tolman) and described in very general terms probably reflecting the estimated size of the area where artifacts were collected and the relative density of cultural material. With only two exceptions, all 12 of the sites in or near MIMA were originally described as "camps." One site was referred to as a "large village" and the other exception was the location of a historically documented fishweir on Mill Brook. A few descriptions of cultural material collected from these sites were given; however, very little information on their temporal/cultural affiliation was included in Baker's assessment study.

The association between prehistoric site locations and permanent water sources noted in previous predictive studies by Smith (1944) and Casjens (1978) was used to designate areas within MIMA considered to have a high probability to contain prehistoric cultural resources. These high probability or sensitivity areas were divided into three categories; rivers and streams, ponds, and marshes. The river and stream category included areas along the Concord River, Mill Brook, and Elm Brook. Folly Pond and two other small, unnamed ponds (northeast of Fiske Hill, south of Nelson Road) formed another category. One wetland located

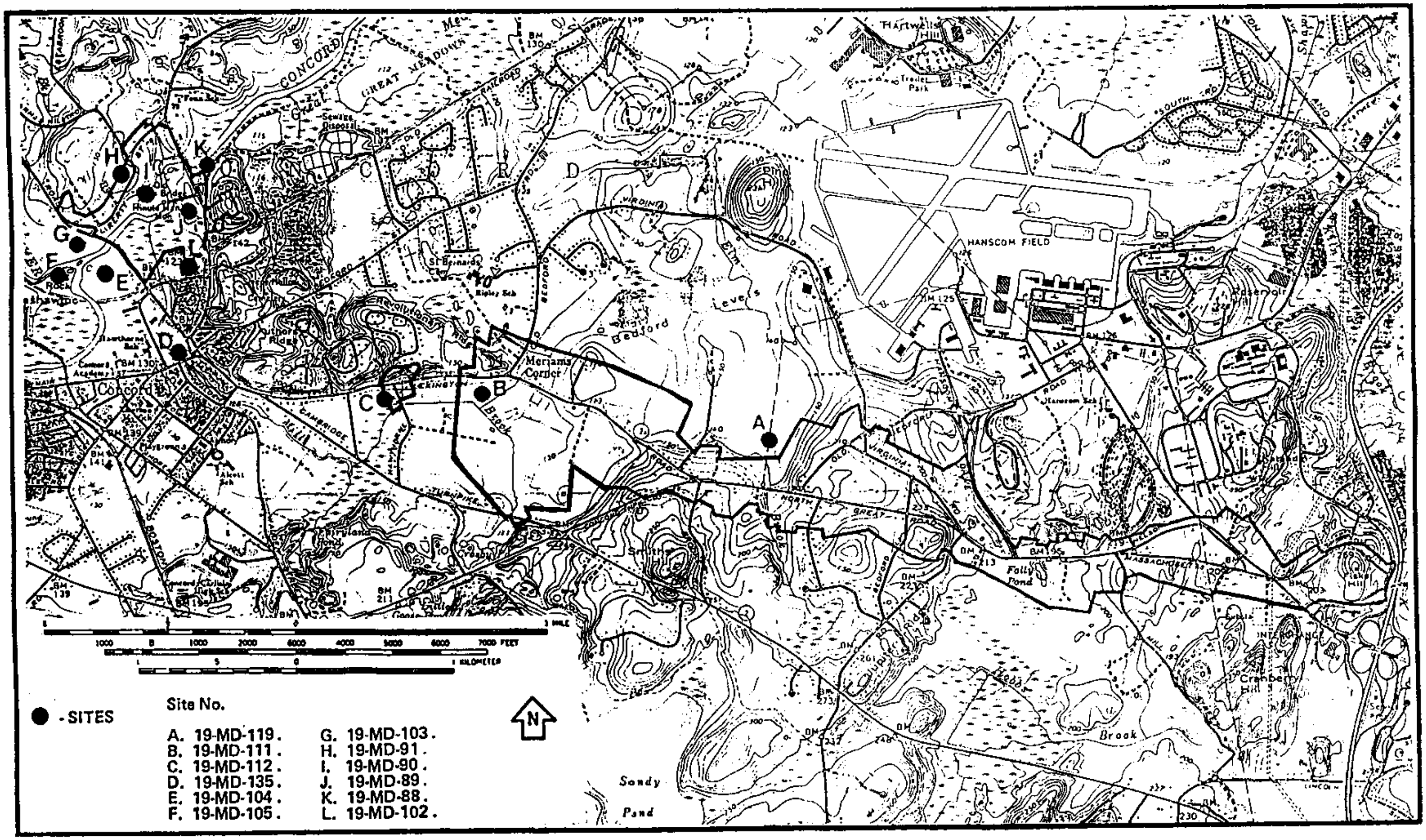


Figure 1-6. Locations of 12 previously known prehistoric sites within or in close proximity to Minute Man National Historical Park (Baker 1980).

south of Massachusetts Avenue near the Lexington/Lincoln town line formed the marsh category of areas with high probability to contain prehistoric sites (Baker 1980:94,96).

There is some additional information on prehistoric cultural resources within or in close proximity to MIMA which was not included in the previous assessment. The North Bridge section of the park contained a concentration of previously known sites similar to other clusters of known sites located upstream along the sudbury River. Another smaller group of previously known prehistoric sites was along the upper section of Mill Brook in the Meriam's Corner area. The six known sites in the North Bridge area (19-MD-88, 89, 90, 91, 92, 102) were typical of many other riverine zone sites in the vicinity with evidence of numerous occupational episodes from the Middle and Late Archaic through the Middle to Late Woodland periods. Available data on the size and internal structure (densities of cultural materials, features) was limited; sites appeared to cover areas ranging from less than 400 sq m (rockshelter, small temporary camp) up to about 7500 sq m (large area of multiple depositions). Site 19-MD-92, a rockshelter site apparently located in or just outside the park on a hillside north of Liberty Street was estimated to cover about 320 sq m. Another small site, 19-MD-102, was reported to have a total area of about 400 sq m. Several other sites, 19-MD-89, 19-MD-90, and 19-MD-91, appeared to be fairly large, covering estimated areas of 2000 to 8000 sq m Site 19-MD-88 could be a large multiple component site, however its estimated horizontal extent was unknown. The North Bridge site, 19-MD-487 appeared to cover an area of at least 1000 sq m based on the results of a recent investigation (Towle 1984).

Information on general periods of occupation was available for most of the sites in the North Bridge section of MIMA. The presence of Middle Archaic period components on all but one of the riverine zone sites was consistent with a larger pattern within the Sudbury/Concord River drainage. A high percentage of known sites along the margins of riverine marsh/wetland environments in this drainage contain some evidence of use during the Middle Archaic period. The reported presence of Late Archaic components on all the sites for which there was temporal information was also typical of larger patterns. Middle and Late Woodland components were reported from five of the six known sites in the North Birdge section of the park and this appeared to be a somewhat unusual concentration of Woodland period activity. The four burials excavated from the Poplar Hill site (19-MD-88) in the 1940's represent a rare category of site in the combined Sudbury/Assabet/Concord River drainage. There are very few recorded discoveries of prehistoric burials in this area and they are not well documented. The Poplar Hill burials are of unknown age; it is possible they could date to the Late Woodland or Contact period. The well-documented North Bridge site (19-MD-487) provided an example of the internal structure of a multicomponent riverine zone site with small overlapping deposits of cultural material and features belonging to many occupational episodes and evidence of periodic use from the Middle Archaic to Late Woodland period.

A smaller cluster of four known prehistoric sites exists within the Meriam's Corner section of MIMA. Rough estimates of horizontal extent or size were available for two of these sites. The Revolutionary Ridge site (19-MD-180) was a small locus estimated to cover an area about 25 m in diameter and site 19-MD-111 may be of moderate size, possibly including an area of several thousand sq m. General periods of occupation were known from three of the four sites. Sites 19-MD-111 and 19-MD-112 are multicomponent loci with evidence of use during the Middle and Late Archaic and Woodland periods. A Late Archaic component was reported to be present on site 19-MD-397. The

Meriam's Corner section was clearly an area of recurrent prehistoric settlement containing indications of periodic use of the area between the margin of Mill Brook and the base of Revolutionary Ridge in the Middle and Late Archaic and Woodland periods (McMahon 1987:243).

Only one other possible prehistoric site was known from previous investigations within MIMA. An isolated recovery of a projectile point somewhat ambiguously described as a small stemmed, Atlantic point (?) of quartzite was reported from the Thomas Nelson site (Baker 1980:41). This was of particular interest due to its proximity to an upland, wetland environment in the Nelson Road section of MIMA and indicated that other small sites could be located there.

A few other known prehistoric sites were located just outside the boundaries of MIMA in the area between Meriam's Corner and Fiske Hill. In the Old Bedford Road area, the Hartwell Farm (19-MD-119) and Barthel's Farm (19-MD-120) sites were located along the upper part of Elm Brook. These sites were recorded by an avocational archeologist (Ben Smith) and their approximate size is unknown. The Hartwell Farm site contained Late Archaic and Late Woodland period components and the Barthel's Farm site was used during the Middle and Late Archaic and Late Woodland periods (Johnson and Mahlstedt 1982).

A recent cultural resource management survey just outside the northern boundary of MIMA near the intersection of Old Bedford Road and Hanscom Drive identified a cluster of three prehistoric sites. The Black Rabbit (19-MD-587), Black Walnut (19-MD-588), and Perk (19-MD-589) sites were small to moderate sized temporary camps. The Perk (ca. 100 sq m) and Black Walnut (ca. 500 sq m) sites covered fairly small areas while the Black Rabbit site had a total horizontal extent of about 1100 sq m. The temporal affiliation of the Perk site was unknown. The Black Walnut site probably contained a single Middle Archaic component and the Black Rabbit site contained evidence of use during the Late Archaic (Susquehanna tradition) period (Mowchan, Schneiderman, and Ritchie 1987). These sites were good examples of the kinds of prehistoric cultural resources that could exist within the central and eastern portions of MIMA.

The following comprehensive review of known information on prehistoric settlement and land-use patterns in the area surrounding MIMA was intended to serve as a larger context.

The combined Sudbury/Concord River drainage and the lower end of the Assabet River has been and still remains as one of the most intensely investigated Massachusetts river basins in terms of known prehistoric site locations and general land use patterns. A lengthy history of over 100 years of antiquarian, avocational and professional archeological interest has left behind a substantial amount of data, mostly in the form of large artifact collections, and a small body of published material. Sources of information on prehistoric-period land use and settlement can be divided into three general categories. These are extant artifact collections assembled by avocational archeologists since about 1880, previous surveys and information on site locations/settlement patterns published before about 1965 and more recent site-specific excavations and surveys conducted by both avocational and professional archeologists. While the quantity of available data is large, the quality of this data is variable. There are many known sites but not much detail on the actual size, content, or depositional/occupational histories of these sites.

Artifact collecting from sites in the Concord area may have started by the mid-19th-century. Henry David Thoreau, whose collection is housed at the Peabody Museum, Harvard University, described a large freshwater, shell midden site (the Clam Shell Bluff site, 19-MD-388) in Concord, as well as other sites in the 1840s. Thoreau's accounts attracted the interest of other antiquarians, and amateur collecting activity increased through the late 19th-century. This increase in collecting may have been related to the intensive agricultural land use (market gardening) that began in the 19th-century.

Artifact collections contain mostly items collected from the surface of larger, multi-component Archaic and Woodland period sites bordering the open marsh/wooded wetland floodplain zone of the Sudbury, Assabet, and Concord Rivers. Surface collecting of artifacts from sites exposed by agricultural land use (plowing, cultivation) has been the major activity for avocational archeologists in the area since at least the third quarter of the 19th-century. Some of the most avid collectors were able to assemble collections of several thousand artifacts by concentrating on the larger, riverine zone sites which were under active plowing and cultivation. The oldest extant collections dating from about 1860 to 1920, were put together by a group of avocational prehistorians from the town of Concord. Two of these early collectors, Alfred Hosmer (ca. 1892-1903) and Adams Tolman (ca. 1890-1920) visited sites located within MIMA near the North Bridge.

The earliest attempt to survey prehistoric sites in the Sudbury/Assabet/ Concord drainage was the Merrimack Archelogical Survey of 1930-1931 directed by Warren Moorehead, then of the R. S. Peabody Foundation in Andover. The leading avocational archeologist in Concord, Ben Smith, shared his knowledge of sites in the area with Moorehead and wrote a brief overview of the prehistory of this watershed for the survey report. Following some surface collecting and subsurface testing of sites located primarily in Concord, the general conclusion was that most of the sites had little research potential. Previous, intensive collecting on the larger, multi-component riverine sites was cited as one of the reasons for the low densities of artifacts found in subsurface testing (Moorehead 1931). It was reported that over 25,000 artifacts were in private collections from the Concord area (Smith 1931).

From 1940 to 1941, Smith conducted a survey for the Massachusetts Archaeological Society and recorded a majority of the known site locations now in the combined Massachusetts Archaeological Society/Massachusetts Historical Commission inventories of prehistorical cultural resources. This preliminary survey identified 135 sites in just the Concord USGS quadrangle, making the lower Sudbury drainage and Assabet/Concord confluence area one of the most intensively surveyed sections of eastern Massachusetts. Some of this survey data was used by Ben Smith to describe site location criteria and general settlement patterns around the town of Concord (Smith 1944). At about the same time, the local chapter of the Massachusetts Archaeological Society began excavations at the Davis Farm, a large multi-component site on the Sudbury River. Information recorded from this site included a possible house floor outlined by post molds (Movius 1941; Bullen 1949). The survey conducted by Bullen (1949) in the Shawsheen River was restricted to the middle and lower sections of that drainage and did not include the headwaters near MIMA. A large artifact collection created by Smith during this general period contained several thousand items from over 100 sites in Concord and surrounding towns (Johnson and Mahlstedt 1982).

During the rapid expansion of suburban development in the 1950s and 1960s, avocational activity was at a low point and many sites were probably destroyed and not recorded. In the past few decades there has been an increase in professional and avocational research in the area. Excavations by the Ekblaw Chapter of the MAS in the upper Assabet, and by the Wayland Archeology Group in the lower Sudbury (Hoffman 1979; Robinson 1980), as well as a recent synthesis of data from the combined Sudbury/Assabet drainage (Ritchie 1980, 1984), have increased knowledge about this area.

The middle and lower sections of the Sudbury and upper Concord River drainage have been recognized as important exploitation territories used by Early and Middle Archaic period hunter/gatherer groups (Dincauze and Mulholland 1977); diagnostic artifacts collected previously by avocational archeologists were an important source of data for this study. Other recent research on lithic resource use has pointed out that Middle Archaic lithic technologies were based primarily on a variety of distinctly local raw materials, providing evidence that resource utilization strategies were concentrated within river drainage territories by about 7000 to 6000 years ago (Ritchie 1979, 1983a).

A cachment analysis of prehistoric settlement patterns in the town of Concord evaluated the relationship between various environmental environmental/locational characteristics and site locations (Casjens 1978). This study used sites which had been located in the MAS survey of 1940-1941 and reached the same conclusions about site selection criteria outlined by Smith (1944). Other recent evaluations have attempted to identify the range of historical/recent land use patterns that have destroyed or impacted many prehistoric sites, assess the research potential of the remaining prehistoric sites and point out sources of data to counteract the bias in the currently available information (Ritchie 1980, 1983a).

More specific, town-oriented inventories of sites in Wayland (Wayland Archeology Group 1981; Kerber 1985) and Concord (Blancke 1982) have been funded with survey and planning grants from the Massachusetts Historical Commission. Cultural resource management surveys completed in the last ten years have contributed important new information about the density and structural characteristics of prehistoric sites in both riverine (Bolian, Dillon, and Winter 1982; Ritchie 1983b, 1985a; Towle 1984) and upland settings (Mowchan, Schneiderman, and Ritchie 1987; Mowchan 1988; Mowchan, Goodby, and Ritchie 1989).

A large body of data of variable quality from known sites and artifact collections can be used to document about 10,000 years of prehistoric cultural activity in the lower Sudbury/Assabet and upper Concord River drainages (Table 1-2). Isolated, diagnostic PaleoIndian projectile points have been reported from several artifact collections in the Sudbury and Concord drainages, but no definite components or sites dating to this time period (ca. 9500 years ago) have been identified. One possible basal fragment of a fluted PaleoIndian point is known from the Heard Pond site in Wayland, and several other fluted points have been identified from sites in Concord (Wayland Archaeology Group 1981; Blancke 1982). It seems likely that sites of this earliest prehistoric time period are present, but have not been identified.

Early Archaic bifurcate base projectile points showing a range of stylistic (and temporal?) differences have been found at several of the largest, multi-component Archaic/ Woodland period sites in the riverine environmental zone. In particular, artifact collections from the Heard Pond site in Wayland and the Davis Farm site in Sudbury each contain several bifurcate base points chipped from both local quartzite and rhyolite or felsite from source areas in eastern Massachusetts. At least 16 bifurcate base or Kirk-like points are known from ten find spots or sites located in the middle and lower section of the Sudbury drainage and the upper Concord River just below the confluence of the Sudbury/Assabet River. Most of these Early Archaic points were found by avocational archeologists; the Benjamin Smith collection contained half of the known bifurcate base projectile points (Ritchie 1984). It is still unclear whether the bifurcate base points surface collected from large sites near the Sudbury River represent Early Archaic depositions on those sites or isolated, discarded items.

Morse's Farm, a small site in Wayland that reportedly yielded a bifurcate base point is located

Table 1-2. Identified prehistoric sites within the Assabet, Concord, and Sudbury drainages in Massachusetts.*

General Period	Site Name	Town	Drainage	Eco-Zone	Site Size	Site Type	Cultural Material/Diagnostics
PaleoIndian 12,500-10,000 BP (10,500-8000 BC)	Dakin Farm (19-MD-94)	Concord	Assabet	riverine	large	base camp?	Clovis
	Heard Pond	Wayland	Sudbury	riverine/ wetland	large	multi-comp	fluted basal frag.
	.... (19-MD-77)	Bedford	Concord	river/ meadow	?	find spot	Clovis-type fluted
	find spot	Northboro	Assabet	upland/ wetland	?	find spot	large flint knife (Paleo?)
Early Archaic 10,000-7500 BP (8000-5500 BC)	Heard Pond	Wayland	Sudbury	riverine/ wetland	large	multi-comp	bifurcate
	Davis Farm	Sudbury	Sudbury	riverine	large	multi-comp base camp	bifurcate
	Morse Farm	Wayland	Sudbury	upland	small	temp camp	bifurcate
	Hosmer's Rocks	Concord	confl. A,C & S	riverine	small?	multi-comp	bifurcate
Middle Archaic 7500-5000 BP (5500-3000 BC)	Charlestown Meadows	Westboro	Assabet	upland/ stream	large	multi-comp base camp	Neville, Stark
	Hocomonco Pond #3	Westboro	Assabet	upland/ pond	small	multi-comp	Neville, Stark

* MHC Site Files; Ritchie, personal communication 1990; Dincauze 1968; Hoffman, Huntington et al. 1982; Blanche 1978
B.P. refers to years before present (i.e., before 1950).

Table 1-2 (cont.). Identified prehistoric sites within the Assabet, Concord, and Sudbury drainages in Massachusetts.

General Period	Site Name	Town	Drainage	Eco-Zone	Site Size	Site Type	Cultural Material/Diagnostics
	Clam Shell Bluff (19-MD-388)	Concord	Sudbury	riverine	large	multi-comp base camp	shell midden
	Castle Hill	Wayland	Sudbury	riverine	large	multi-comp base camp	Neville, Stark
	Cedar Swamp #3	Westboro	Sudbury	upland/ wetland	large	multi-comp base camp	
	Hosmer's Rock (19-MD-103)	Concord	confl. A,C & S	riverine	small?	multi-comp temp camp	
	Egg Rock (19-MD-104)	Concord	Concord	riverine	medium	temp camp	
Late Archaic 5000-3000 BP (3000-1000 BC)	Vincent	Sudbury	Sudbury	upland	small	burial	Susquehanna C_{14} 3470+135 BP
	Mansion Inn	Wayland	Sudbury	upland/ pond	large	cemetery	Susquehanna
	Robin Hill	Marlboro	Assabet	riverine	small	multi-comp temp camp	Brewerton, Susquehanna
	Charlestown Meadows	Westboro	Assabet	upland/ stream	large	multi-comp base camp	Brewerton, Vosburg C_{14} 4365+105 & 4290+280 BP
	Hocomonco Pond	Westboro	Assabet	upland/ pond	small	multi-comp	Susquehanna, Atlantic
	Flagg Swamp Rock-shelter	Marlboro	Assabet	upland	small	multi-comp rockshelter	Vosbury, Brewerton-eared C_{14} 4220+80 & 4070+60 BP

Table 1-2 (cont.). Identified prehistoric sites within the Assabet, Concord, and Sudbury drainages in Massachusetts.

General Period	Site Name	Town	Drainage	Eco-Zone	Site Size	Site Type	Cultural Material/Diagnostics
	Heard Pond	Wayland	Sudbury	riverine/ wetland	large	multi-comp	Brewerton
	Cedar Swamp #3	Westboro	Sudbury	upland/ wetland	large	multi-comp	Small Stem
	Davis Farm	Sudbury	Sudbury	riverine	large	multi-comp base camp	Small Stem
	Cold Brook	Sudbury	Sudbury	upland/ wetland	small	temp camp	Small Stem
Terminal Archaic/ Transitional 3600-2500 BP (1600-500 BC)	Weir Hill #3	Sudbury	Sudbury	riverine	small	temp camp	Orient
	Hocomonco Pond	Westboro	Assabet	upland/ pond	small	multi-comp fish camp	steatite frags
	Cedar Swamp #3	Westboro	Sudbury	upland/ wetland	large	multi-comp	Orient
Early Woodland 3000-1600 BP (1000 BC-300 AD)	Clam Shell Bluff	Concord	Sudbury	riverine	large	shell mid	Meadowwood
	Lobelia Beach	Wayland	Sudbury	riverine	medium	temp camp	Meadowwood
	Hocomonco Pond #1	Westboro	Assabet	upland/ pond	small	multi-comp fish camp	
Middle Woodland 1650-1000 BP (300-950 AD)	Staiano	Wayland	Sudbury	riverine	medium	fish camp	Fox Creek, dentate ceramics burnt rock features
	Hocomonco Pond #1	Westboro	Assabet	upland/ pond	small	multi-comp	ceramics, burnt rock features fish camp

Table 1-2 (cont.). Identified prehistoric sites within the Assabet, Concord, and Sudbury drainages in Massachusetts.

General Period	Site Name	Town	Drainage	Eco-Zone	Site Size	Site Type	Cultural Material/Diagnostics
	Mantatucket Rock (19-MD-105)	Concord	confl. A,C & S	riverine	medium	temp camp	ceramics
Late Woodland 1000-450 BP (950-1500 AD)	Flagg Swamp Rock-shelter	Marlboro	Assabet	upland	small	multi-comp rockshelter	C_{14} 1270+100 BP
	Bartell's Farm (19-MD-120)	Concord	Concord	upland/ stream	small	temp camp	Levanna
	Heard Pond	Wayland	Sudbury	riverine/ wetland	large	multi-comp	Levanna
	Weir Hill #2	Sudbury	Sudbury	riverine	medium	temp camp	Levanna
ProtoHistoric/ Contact 450-300 BP (1500-1650 AD)	Flagg Swamp Rock-shelter	Marlboro	Assabet	upland	small	multi-comp rockshelter	C_{14} 230+70 BP
	Okommakamesit Praying Ind. Village	Marlboro	Assabet	upland	?	village	
	Dorchester Burial Ground	Marlboro	Assabet	upland	small	cemetery	human skeletal remains
	Mill Brook Weir	Concord	Concord	upland/ stream	small	fish weir	
	burial (19-MD-106)	Concord	confl. A,C & S	riverine	small	burial	human skeletal remains, pestle
	Hocomonco Pond #3	Westboro	Assabet	upland/	small	multi-comp	cut copper point

outside the riverine environmental zone on an elevated kame delta. Some variation in the location of Early Archaic activities/ potential site areas is suggested by this find spot and with additional information it should be possible to outline a basic settlement pattern for this time period.

The much larger number of known Middle Archaic sites relative to those of earlier time periods provides graphic evidence of extensive use of the Sudbury/Concord drainage basin by 7000 years ago and this area was a major focus of Middle Archaic activity in eastern Massachusetts. This area has been identified as one of several concentrations of regional importance within the southeastern New England region (Dincauze and Mulholland 1977:440-441). The high frequency of Middle Archaic components on riverine zone sites suggests that subsistence/settlement activities were focussed on river meadow and adjacent wooded wetland environments.

Indications of a fairly intricate settlement pattern are emerging from the distribution of Middle Archaic components in a variety of riverine and upland environmental settings and they range in site size and internal complexity. Several small, possibly single component sites found recently in upland settings contrast sharply with the previously known larger riverine zone sites (Ritchie 1982). The functional diversity evident in probable Middle Archaic tool assemblages from both large and small sites in various settings may be evidence of the development of seasonal rounds within river drainage territories which has been described from other drainage systems in eastern Massachusetts (Dincauze 1976:136-137; McManamon 1978:30-31). In addition to Neville, Stark and Neville variant projectile points, chipped and ground stone tools such as gouges, semi-lunar knives, whetstones, biface preforms, choppers and plummets have been recorded from avocational excavations at several sites in the Sudbury drainage (Fowler 1950; Carlson 1964).

Local Westborough formation quartzite or mylonite and rhyolite or felsite from sources in the Blue Hills and Charles-Neponset River drainage area were used for Neville points. Stark points were primarily chipped from distinctly local lithic materials such as quartzite, crystal tuff and amphibolite schist or argillite from source areas in the Charles River drainage. The local quartzite, mylonite, crystal tuff and amphibolite schist were quarried from bedrock outcrops located in upland sections of the Sudbury/Assabet drainage and demonstrate that Middle Archaic populations were making extensive use of local resources (Ritchie 1979). The Asparagus Experimental Station (19-MD-86), North Bridge (19-MD-487), and Hos- mer's Rock (19-MD-103) sites are good examples of riverine zone Middle Archaic components and the Barthel's Farm (19-MD-20) site along upper Elm Brook near MIMA is one of the few upland zone components from this temporal period. The group of 21 Neville and Stark points from the Asparagus Experimental Station site in the Ben Smith collection is one of the largest known assemblages of Middle Archaic material.

Prehistoric sites which can be affiliated with various Late Archaic cultural complexes show the greatest frequency and widest distribution in different environmental zones than sites of any other time period. Surface collections from the larger, multi-component sites along the Sudbury River drainage invariably contain projectile points considered to be diagnostic of the three major cultural traditions (Laurentian/Brewerton-Vosburg, Small Stem Point, Susquehanna) within the Late Archaic period. The Ben Smith collection contained Late Archaic projectile points of various types from 73 sites in the Sudbury/ Assabet/Concord River drainage. Over 80% of the sites investigated by Smith that could be placed in any temporal period contained Late Archaic components (Johnson and Mahlstedt 1982:11).

Radiocarbon dates recently obtained for Late

Archaic components in this drainage cover a range between 4500 and 2900 years B.P. and it is apparent that many site locations in the area were being used at that time.

Settlement and resource use patterns of the local cultural complexes representing the Laurentian tradition are poorly known. Characteristic Otter Creek, Vosburg, and Brewerton series projectile points tend to appear mostly on sites also used by earlier Middle Archaic hunter/gatherer groups for exploiting the riverine wetland environmental zone. More substantial depositions of Laurentian affiliated cultural material have been found on sites in the headwaters area of the Sudbury and Assabet River drainages. At the Charlestown Meadows site in Westborough, radiocarbon dates ranging from 5225 ± 195 to 4305 ± 165 years B.P. have been obtained from depositions containing both Middle Archaic (Neville and Laurentian tradition (Vosburg, Brewerton series) projectile points (Hoffman 1984).

The most diversified patterns of settlement and resource use are illustrated by the frequency and spatial distribution of Late Archaic Small Stem Point tradition sites and components. Some large, riverine zone locations also used by earlier groups (Neville/Stark, Brewerton) such as the Heard Pond site in Wayland, and the Davis Farm site in Sudbury were probably base camps judging from the large numbers of diagnostic projectile points (Squibnocket Triangle, Small Stemmed) picked up there by collectors. The Ben Smith collection contained over 60 small stemmed points from the Davis Farm site (Johnson and Mahlstedt 1982:11). Riverine wetland zone resources were also exploited from many other smaller site locations oriented to tributary streams and wooded wetlands.

Some potential single component sites recently identified in the area between the Sudbury and Assabet River drainages also show that small groups of these people were exploiting upland zone resources. Utilization of many different plant/animal species is suggested by the distribution of small, resource extraction type sites along the edges of streams, bogs, and kettle hole swamps (Ritchie 1983a:89). Upland zone resource exploitation by Small Stem Point hunters about 4200 to 3500 years ago was clearly documented at the Flagg Swamp Rockshelter in the nearby Assabet River drainage (Huntington et al. 1982).

A similar settlement pattern probably existed in the network formed by the Shawsheen and Ipswich River drainages. Bullen (1949) recorded Small Stem Point material from sites in a variety of settings including some at distances of 2 to 6.5 km from the Shawsheen and Ipswich Rivers on minor tributaries or ponds. In general, the distribution of Small Stem Point components seems to correspond well with some models of Late Archaic settlement systems that suggest hunter/gatherer groups occupying relatively small territories developed subsistence strategies based on exploitation of a broad spectrum of resources. Microenvironments within these territories not used by earlier and later cultural groups appear to have been important to Small Stemmed point tradition hunter/gatherers for the resources they contained. An extended period of gradual environmental change affecting the size, structure, and vegetation pattern in wetlands in the southern New England region from about 4000 to 3000 years ago may have affected Late Archaic settlement/subsistence systems (Dincauze 1980; Ritchie 1983a:89-91; Thorbahn 1982:6-17,6-20,6-21).

Three sites in the Sudbury/Concord River drainage containing Late Archaic cremation burials, the Mansion Inn cemetery (Wayland), the Vincent site (Sudbury), and the Call site (Billerica) were used to define the Susquehanna tradition in southern New England. The Vincent site was a single, isolated example of the cremation burial pits which composed the much larger Mansion Inn cemetery; a radiocarbon date of 3470 ± 125 years B.P. was obtained for the Vincent cremation burial feature. The Call site contained a group of cremation burial features belonging to an early Susquehanna tradition phase (Atlantic phase). Burned artifacts recovered from cremation burials on these sites show that Susquehanna tradition hunter and gatherers were using a diversified tool kit of hunting (projectile points, bifacial knives), woodworking (full grooved axes, adzes, gouges, whetstones), and processing (pestles, scrapers, hammerstones, soapstone cooking vessels) equipment. Participation in regional scale trade/exchange networks by these people was demonstrated by tools made of lithic materials from source areas throughout eastern Massachusetts, Maine, and eastern New York (Dincauze 1968). From a review of various artifact collections, it is obvious that Susquehanna tradition groups concentrated their resource exploitation activities in the riverine wetland environmental zones. Recent surveys in upland areas near tributary streams and wetlands draining into the Sudbury, Assabet, and Concord Rivers have identified several small, probably single component sites with Susquehanna tradition materials. Several sites containing bifacial preforms and Wayland Notched points like those from the Mansion Inn cemetery have been found in upland areas between the Sudbury and Assabet Rivers (Gallagher, Ritchie, and Davin 1985). The Black Rabbit (19-MD-587) site is a moderate sized (ca. 1100 sq m) Susquehanna tradition camp probably created during a single seasonal hunting/collecting episode in the headwaters of the Shawsheen River. This site is located north of the Virginia Road section of MIMA (Mowchan, Schneiderman, and Ritchie 1987). The Hartwell Farm (19-MD-119) site located a short distance north of MIMA on Elm Brook contained a Susque-hanna tradition component marked by Atlantic and Susquehanna Broad-like projectile points.

Many of the same riverine site locations with Susquehanna tradition components were also used by Terminal Archaic/Early Woodland period hunter/gatherers for the next six or seven hundred years, ca. 3200 to 2500 years ago. Diagnostic Orient Fishtail and some Meadowood projectile points have been recorded in collections from some of the large riverine zone multicomponent sites in the Sudbury/Concord River drainage. While most of the known Terminal Archaic components are in the riverine zone, a few find spots of Coburn-like or Orient Fishtail projectile points along the upper sections of various tributary streams suggest that there is an upland aspect of Terminal Archaic settlement/resource use which has not been recognized.

The apparent low frequency of Terminal Archaic/Early Woodland period sites in interior areas like the Sudbury/Assabet/Concord drainage is probably due to the traditional reliance on certain projectile point types (Orient Fishtail, Rossville, Meadowood) as indicators of components dating to ca. 3000 to 2500 years ago. The small sample of four Meadowood and four Rossville points within the collection assembled by Ben Smith from numerous sites is a good example of the relative scarcity of these artifact types. Assemblages containing a variety of small stemmed projectile points with associated radiocarbon dates ranging from ca. 3200 to 2000 years before present have been reported from a growing number of sites in the southeastern New England region.

Early Woodland depositions containing Orient Fishtail, small stemmed points and small amounts of Vinette-like ceramic sherds on the Cedar Swamp #3 site in Westborough (Hoffman 1985, 1986:10) have been dated to between 2650 and 2170 years ago. The earliest ceramic vessels consisting of thick bodied wares with cord marked exterior surfaces and burnt rock temper (Vinette I type) apparently were in use during the Terminal Archaic to Early Woodland transition. A radiocarbon date of 3315 $\pm$ 90 B.P. associated with Vinette sherds from the Eddy site (Manchester, N.H.) provided good evidence for early ceramic manufacture in the Merrimack River basin (Kenyon 1986).

Throughout the Merrimack River basin an expansion of settlement patterns relative to the preceding Early Woodland is evident from the number and distribution of Middle Woodland components. Consistent with patterns recognized throughout New England, this was a period of apparently increasing population and intensive long-distance interaction. A recent study of Merrimack Valley Middle Woodland ceramics, indicated that the drainage became a single, homogeneous interaction unit towards the end of the Middle Woodland period (Kenyon 1983). Recent studies have shown that late Middle Woodland components are marked by a high percentage of exotic lithics, and that the distribution of these lithics (particularly Pennsylvania Jasper) is directly associated with Jack's Reef components dated between 500 and 800 A.D. (Mahlstedt 1985; Luedtke 1987; Goodby 1988).

In the middle and lower Sudbury River drainage, most of the site locations used during the Terminal Archaic/Early Woodland period continued to be staging points for Middle Woodland resource exploitation, however, there was also a significant reuse of other sites that had been occupied during the Middle and Late Archaic. The Watertown Dairy site in Wayland seems to be an example of this pattern; evidence for Terminal Archaic/Early Woodland occupation is minimal, but a definite Middle Woodland activity area containing ceramic sherds, turtle bone, and chipping debris has been identified (Largy 1983:104). At the Staiano site in Wayland, evidence of intensive resource processing activity by Middle Woodland groups has been documented. Three large circular burnt rock features about 2 to 3 m in diameter appear to have been used for smoking and/or drying fish. The site is situated in a section of the Sudbury River known historically as the location of fishing weirs (Weir Hill, Weir Meadows) (Hudson 1887:45-49). Diagnostic Middle Woodland or early Late Woodland material associated with these features included dentate-stamped ceramic sherds, a Fox Creek-like biface/knife, and a Levanna point. Four radiocarbon dates ranging from 1610 to 640 B.P. were obtained on charcoal from these features (Blancke 1978:176-177). At the Hocomonco Pond #1 site in Westboro, several large (ca. 2 m), circular burnt rock features containing ceramic sherds and some non-local lithic material (chert) appear to have been used by Middle Woodland groups for intensive resource processing (smoking or drying fish?). Similar large, burnt rock features have been reported in Middle and Late Woodland contexts at the Wheeler's Shattuck Farm, and Garvin's Falls sites on the Merrimack River (Barber 1983; Luedtke 1985; Starbuck 1985). The location of all of these sites suggests that these features were directly related to the harvesting and processing of anadramous fish.

Middle Woodland components on several sites in the Cedar Swamp Archaeological District (Westborough) are radiocarbon dated to between 1230 and 970 B.P. (Hoffman 1987). These components provide evidence of activity in elevated, upland terrain as well as the riverine floodplain environmental zone along the lower Sudbury River drainage. A few small Middle Woodland sites have been found near tributary streams in upland settings between the Sudbury and Assabet Rivers and settlement patterns were probably more diversified than generally indicated by the available site inventory (Gallagher, Ritchie, and Davin 1985). Known Middle Woodland components in the upper Concord River drainage are mostly restricted to the riverine zone and include the Punkatasset Field (19-MD-81), Poplar Hill (19-MD-88), and Old Manse (19-MD-89) sites which are in or near the North Bridge section of MIMA.

Middle and Late Woodland settlement patterns in the Sudbury drainage appear to be fundamentally similar, with a possible reduction in resource exploitation territories during the Late Woodland period. Some of the same riverine zone site locations along the Sudbury drainage such as Baldwin Pond (Wayland Golf Course, loci 1 and 2), Weir Hill #3 (Sudbury), and several areas around Heard Pond (Wayland) were probably fishing stations. The confluence of the Sudbury and Assabet Rivers seems to have been a focal point of Late Woodland activity; possibly for fishing at shallow rifts or narrows suitable for the construction of weirs or other fish traps. Just downstream from the confluence, near the North Bridge section of MIMA (Poplar Hill, Old Manse, Battle Lawn/Buttrick Estate, North Bridge sites), there is such a location. Woodland period activity appears to have Archaic use of this site, however Middle/Late exotic lithic materials in the Middle Woodland period were no longer active. Diagnostic projectile (Levanna) points in several collections were made of local quartzite and quartz with lesser amounts of Boston Basin derived felsite, rhyolite and hornfels. A similar sbift to more use of local lithic material from the Middle to Late Woodland bas also been recognized as a sub-regional pattern and was interpreted as evidence of increasing empbasis on local resources during tbe Late Woodland (Dincauze 1974:51; Goodby 1988).

In spite of reasonably good evidence for Late Woodland activity in most of the Sudbury River drainage, Contact period components or sites bave not been identified. Several traditional land holdings, including one on tbe fall-line on tbe Sudbury River at Saxonville described in a mid-17th-century deed, were being used for spring fisbing and for planting fields (Temple 1887). Several locations including Nashawtuc Hill (Assabet/Sudbury River confluence) and a fisbing weir on Mill Brook (Concord center) bave been cited as locations of Contact period settlements. Burials discovered by avocational arcbeologists in the Nashawtuc Hill area and on Poplar Hill (North Bridge area) may be late prehistoric period interments.

Descriptions of early to mid-17th century activity from secondary sources and the use of native place names suggest that the area was inhabited. It is unclear if the early to mid-17th century settlements in the Sudbury/Assabet/Concord drainage area near Marlborough (Ockoocangansett), Acton (Nagog Pond/Nashobah), and Tewksbury (Wamesit) were located near former Late Woodland or Proto-historic period villages. The apparent absence of identified 15th/16th century Proto-historic to Contact period sites may be the result of several factors; including decreased population size due to early 17th century epidemics, the re-use and destruction of these sites during early English settlement, and a shift in settlement patterns in which populations aggregated in large coastal zone villages.

Historical-Period Land Use: General Overview

Concord

The area now known as Concord, Massachusetts was originally a six mile square tract of land known as Musketaquid (Table 1-3). Purchased by a group of Englisb proprietors in 1635, the original settlement consisted of only 10 to 12 families. This early 17th-century plantation became a frontier town, the first of its kind which was not located along the coast (Barber 1839). Colonists initially occupied the area along Mill brook nortb of tbe Commons and along the Concord River. It was a clustered settlement with outlying fields and common lands (MHC 1980a). Early farmsteads were located on level to slightly sloping ground composed of soils deposited during glacial retreat, specifically by glacial Lake Concord (Koteff 1963).

Economic activities during tbe 17th and 18th centuries focused on agricultural and small-scale industries. A large portion of Concord's land next to rivers was meadowland suitable for conversion to farmland (Gross 1982). Agricultural pursuits

Table 1-3. Historical cultural chronology for Concord, Lincoln, and Lexington, Massachusetts.

General Period*	Cultural Aspects/Diagnostic Cultural Material
Contact & Plantation	
1500 - 1675	Initial European exploration and contact with Native American population. Native core areas established along major river drainages (e.g., Concord, Assabet, Sudbury, and Shawsheen) connected by extensive overland trail system. Major native trail network intersected at confluences of Concord and Sudbury (Concord) and Charles and Sudbury (Lincoln) rivers, with branches extending in many directions. Local rivers provided seasonal fishing, diverse terrain offered hunting, gathering, and agricultural opportunities for the dense aboriginal settlements in this area. Extensive immigration of Puritan settlers to newly established permanent settlements beginning with coastal towns (e.g., Plymouth 1620 and Boston 1630) then moving inland to establish plantations (e.g., Mustketequid, including Concord and Lincoln, in 1635). Increasing interaction introduced European diseases and material culture, altered native culture and society, and lead to encroachment on native lands. Agriculture, seasonal fishing, and small local industry formed basis of colonial economy. Waterways and native trails provided major transportation routes. Colonial settlement pattern expanded from concentrated at meeting houses to include scattered farms and mills.
	Majolica, early tin-glaze earthenware, Rhennish and Bellarmine stonewares predominate ceramic assemblage. Pipestems with mean bore diameter of 7-9/64ths inch. Handwrought nails only. Freeblown glass bottles, pontil scar, no mold mark.
Colonial	
1675 - 1775	European settlement and expansion in area virtually unaffected by King Philip's War (1675-76), continued. Agriculture and raw material collection remains principal economic activity in the towns. Industrial pursuits, including grist, saw, and fulling mills, and briefly an iron works, processed and produced goods for local consumption. Concord developed from a frontier town into a regional center. Lexington, once part of the north precinct of Cambridge, was established as a separate town in 1713. Lincoln split off from Concord as new town in 1754. The Census of 1765 listed 1,664 residents of Concord, 646 in Lincoln, and approximately 900 in Lexington. Massachusetts colonists, angered by British economic restrictions (e.g., Stamp Act 1770, Townshend Acts 1767), rebelled in Boston Massacre (1770), Boston Tea Party (1773), and finally started fighting at Lexington and Concord (April 19, 1775).
	Imported tin-glaze earthenware, white salt-glaze, English brown, Westerwald and scratch-blue stonewares. Imported and domestic redwares. Mean pipestem bore diameter of 4-6/64 inch. Handwrought nails only. Freeblown and molded glass bottles.

* Source: MHC 1980a, 1980b, 1980c

Table 1-3 (cont.). Historical cultural chronology for Concord, Lincoln, and Lexington, Massachusetts.

General Period	Cultural Aspects/Diagnostic Cultural Material
Federal	
1775 - 1830	Following the Peace of Paris (1783) ending Revolutionary War, population in Concord and Lexington grew slowly, while that of Lincoln declined slightly. The economic base of all three towns remained primarily agricultural, with an emphasis on corn, flax, hay, and livestock. Industries included: lumbering and saw mills, quarrying, and a small glass factory in in Lincoln, a cotton and a lead pipe factory in Concord, and manufacture of fur garments and footwear in Lexington. Colonial highways remain, with improvements in form of Cambridge (Route 2A) and Concord (Route 2) turnpikes. Creamware and pearlware predominate ceramic assemblage. Handpainted and transfer print decorated. Small bore diameter (4/64 in.) pipestems. Both handwrought and machine cut nails. Post 1810 3-piece molded bottles introduced. First tin cans (post 1819).
Early Industrial	
1830 - 1870	Introduction of railroads (1844, the Fitchburg railroad from Boston in Concord and Lincoln; 1846, a commuter railroad in Lexington) revolutionized regional transportation network. With the arrival of the railroad came a change from production of agricultural products solely for local markets to exportation of these products to Boston and other markets. Milk and fruit (in Concord Bull developed the Concord grape) were the major agricultural products exported. Unlike many Massachusetts communities, these three towns did not experience the full impact of changes brought by the Industrial Revolution. Concord and Lexington both experienced an increase in population, primarily due to Irish immigrants, while Lincoln's population remained relatively stable through the period. A prominent group of writers and transcendentalists (Emerson, Thoreau, Hawthorne, Alcott, etc.) were attracted to Concord beginning in the 1830s. Pearlware, hard white earthenware, yellowware, and domestic stoneware most common. Transfer print design technique predominates. Machine cut nails predominate. 2-piece mold bottles replace 3-piece mold bottles (post 1840). Snap-case bottle bottom finish, no pontil scar (post 1857). Mason jar patented 1858. 1867 lettered panel bottles introduced. Pressed or sandwich-type glass (post 1827). Condensed milk can patented 1856. Vulcanization process patented by Goodyear (1839) resulted in increased production of rubber products.

Table 1-3 (cont.). Historical cultural chronology for Concord, Lincoln, and Lexington, Massachusetts.

General Period	Cultural Aspects/Diagnostic Cultural Material
Late Industrial	
1870 - 1915	Technological developments resulted in major changes (e.g., steam power, electrification, gas lighting, etc.). Development of urban and interurban mass transportation, street railways (i.e., streetcar routes in Concord and Lexington by early 1900s). Country estates and some suburban development began in all three towns by the end of this period. Arrival of large numbers of immigrants, especially from Ireland, Italy, Norway, and Nova Scotia. There was a gradually increase in population in all three towns with minor fluctuations. By 1915 the population of Lexington exceeded 5,000. Market gardening and greenhouses were present in all three towns, forming an important part of Lincoln's economy. West Concord developed as an industrial village around the freight depot and pail factory. A paint factory, leather factory, and gas works were located in Lexington. Hard white earthenware predominates ceramic assemblage with yellowware and domestic stoneware. Machine-made bottles most common. Semi-automatic bottling machine (post 1881); replaced by fully automatic machine made bottles (post 1903). Hutchinson stopper (post 1872/9); canning jar closure (post 1875); crown bottle cap (post 1892). 1904 double-seamed tin can introduced.
Modern	
1915 - present	Introduction of automobile and major improvements in automobile transportation network (e.g., Routes 2, 2A, 117, 126, and 128). Agriculture remains important in town economies with market gardens and dairies shipping produce to urban areas. Bedford Airport (Hanscom Air Force Base) created in 1940s with growth of associated industrial zone. Development, both commercial and resid transportation corridors. New industries located in West Concord, including a foundry, garnett mills, manufacturer of elastic webbing, and Allen Chair Company. Hard white earthenware, stoneware, porcelains, and melamine (post WWII). All bottles fully automatic machine-made. Purple manganese glass. Beer can introduced 1935. Pull-tab can opening introduced 1962. Plastic products (post 1900).

consisted of farming, cattleraising, the production of dairy products, as well as the establishment of orchards.

A few major roads were established in the 17th and early 18th centuries, providing connections with the developing urban core of Boston. A radial system of roadways extending to the north (Carlisle, Lowell), east (Bedford, Lincoln), south and west (Acton, Sudbury) originated in the center of Concord. A distinct nucleus of settlement formed at the town center. A mix of residential and commercial structures, including taverns, banks, and merchant or artisan/craftsmen's shops were located here. Saw and grist mills were established to provide lumber and process grain for local use. Brick, tar, and iron were also produced in Concord. As a result of this steady economic growth, the population grew through the 18th century (Table 1-4; Figure 1-7). Concord became an important town in the north/central part of Middlesex County. A court house was established in the town by 1721 (MHC 1980a).

The town of Concord was a center of activity during the Revolutionary War. It was the site of one of the first battles between British regulars and minute men and militia from Concord and adjoining towns. While the British met with defeat at the North Bridge, they still succeeded in burning several houses and shops. One of the reasons the town was attacked was because of the collection of military equipment stored there for militia use. Concord was also the site of a meeting of the provincial congress in 1774 (Barber 1839).

Throughout the Revolutionary War, Concord had an integral part in many aspects of defense. It first experienced a major population boom when townspeople evacuated from Boston and fire-ravaged Charlestown sought refuge in Concord. The town also received the students and faculty of Harvard College in 1775-76, while soldiers used their school as barracks. By mid-March 1776, the population of Concord had increased by more than 25 percent in just over a year. All of this put a severe strain on Concord's supplies and economy. When the war was over, the population of the town of Concord had been reduced by 25 percent.

From the mid-18th century through the first half of the 19th century Concord retained a stable, primarily agriculturally-based economy, with relative prosperity (Gross 1984). Crop yields, which had declined gradually during the later 18th century began a slow but steady increase after 1790 (Donahue 1984: 31).

Concord's major settlement concentrated around Monument Square, Lexington Street, and Main Street (MHC 1980a). During the 19th century Concord was characterized by the expansion of the village at Damon's Mill (West Concord) and the establishment of a new village along Commonwealth Avenue. Industrial development from this point on in the town was minimal due to the lack of significant sources of water power. In the mid-19th century (ca. 1839), there was only one textile manufacturer (cotton factory), a lead sheet/pipe factory, and one company producing lead pencils (Barber 1839). Improvements in the transportation network, primarily improved roads and railroad connections, led to closer ties between Concord and the urban core of Boston. Concord center continued as the focus of commercial activity while country estates were built in the northern and eastern sections of the town (MHC 1980a).

The pattern of predominantly agricultural and pastoral land use established early in Concord continued into the late 19th and early 20th century. Dairying, which had become an important economic activity with the arrival of the railroad, continued. Commercial production of fruits (including the Concord grape developed in the town by Ephraim Bull) and vegetables (especially asparagus) for the Boston markets became an important part of the local economy (Gross 1982:42). Intensive market gardening and truck farming probably reached a peak in the early 20th century in Concord and

Table 1-4. Population of the towns of Concord, Lexington, and Lincoln in Middlesex County, Massachusetts, 1765 to 1980.*

Year	*Massachusetts*	*Middlesex Co.*	*Concord*	*Lexington*	*Lincoln*
1765			1,664	649	
1776			1,900	775	
1790	378,787	42,737	1,590	941	740
1800	422,845	46,928	1,679	1,006	756
1810	472,040	52,789	1,633	1,052	713
1820	523,287	61,472	1,788	1,200	706
1830	610,408	77,970	2,017	1,541	709
1840	737,699	104,451	1,800	1,559	711
1850	994,514	161,383	2,249	1,893	719
1860	1,231,066	220,558	2,246	2,329	718
1870	1,457,351	274,353	2,412	2,277	791
1880	1,783,085	317,830	3,922	2,460	907
1890	2,238,947	431,167	4,427	3,197	987
1900	2,805,346	565,696	5,652	3,831	1,127
1910	3,366,416	669,915	6,421	4,918	1,175
1920	3,852,356	778,352	6,461	6,350	
1930	4,249,614	934,924	7,477	9,467	1,493
1940	4,316,721	971,390	7,972	13,187	1,783
1950	4,690,514	1,064,569	8,623	17,335	2,427
1960	5,148,578	1,238,742	12,517	27,691	5,613
1970	5,689,170	1,398,397	16,148	31,886	7,567
1980	5,737,037	1,367,034	16,293	29,479	7,098

* U.S. Bureau of the Census 1808, 1852, 1864, 1883, 1913, 1922, 1952, 1982.

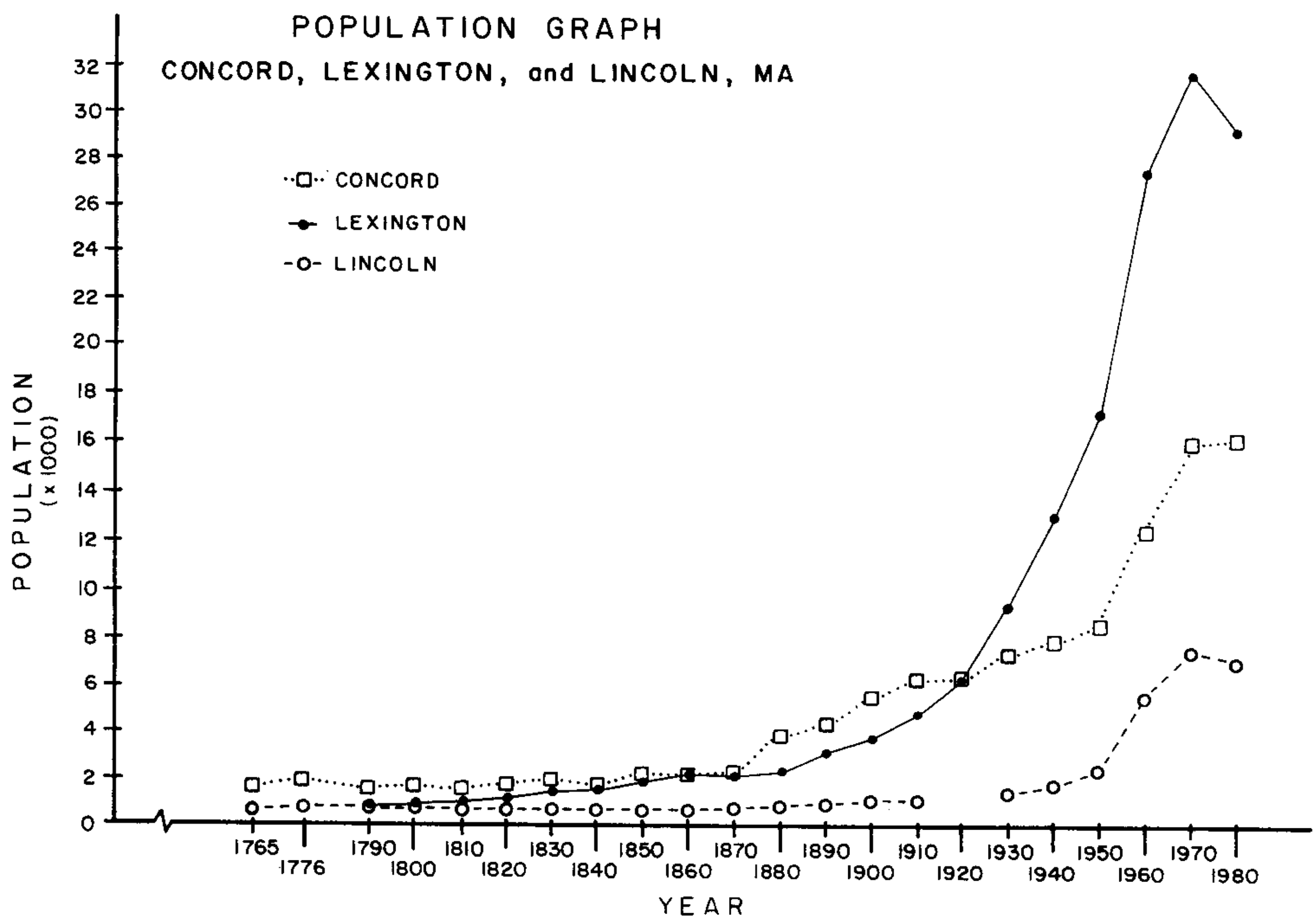


Figure 1-7. Graph of populations for towns of Concord, Lexington, and Lincoln, Massachusetts, 1765-1980.

surrounding towns such as Bedford and Carlisle. In the post-World War II years, both population and residential development have expanded in Concord as part of a larger pattern of suburban growth around Boston, especially in the area between Routes 128 and I-495 (Mowchan, Goodby, and Ritchie 1989).

Lincoln

The Town of Lincoln, formerly a precinct of Concord, was incorporated as a separate town in 1854 (see Table 1-3). However, settlement of this area dates back to the 17th century when towns like Sudbury and Concord, English frontier towns, were at the perimeter of the colonial settlement.

The town, located on intermediate highland between the Charles and Concord Rivers, has had a primarily agriculturally-based economy throughout its history. Much of Lincoln has been continuously plowed historically, and some areas were reportedly mined for clay used in brick-making activities (Mowchan, Schneiderman, and Ritchie 1987). A number of sawmills were erected after 1690 to support growing demands for lumber. By the late 18th century, a number of saw and grist mills were located on area brooks.

In 1721, the Town of Concord officially laid out the road which is now named "Old Bedford Road" (Malcolm 1985). It was designed to be an "open driftway" for driving cattle and was two rods wide, beginning at the main highway in the area known as Concord or Bay Road. It extended to the land owned by John Fassett located near the northeast corner of the town, then known as the Shawshine Corner. The road enabled Bedford residents to reach the Concord Road, and opened the way for farmers to their back fields in the Rocky Meadow area. Old Bedford Road was part of a network of radial highways originating at the Lincoln meetinghouse.

In 1728, Virginia Road was laid out to facilitate travel to the new road, around the wetlands. It is speculated that at the time of European Contact, Old Virginia Road was part of a network of trails Native Americans utilized to link the Charles and Sudbury River valleys (MHC 1980c). Paths along the upland area known as Virginia, were connected to Concord's main roads. The highland was so surrounded by water that in colonial times it was referred to as "The Great Island". Joseph Wheat's farm was the closest to the Old Bedford Road. A new road was laid out connecting the Bedford Road, 20 to 30 rods north of the intersection with the Concord Road. The original road was only one and a half rods wide and was widened to two rods in 1732 (Malcolm 1985).

By the end of the Colonial Period, there were five new saw/grist mills located along Elm Brook, Stony Brook, and Hobb's Brook. Taverns were scattered in unspecified locations along North Great Road, a road which had been improved upon during this time period (MHC 1980c). Although the town of Lincoln has primarily had an agriculturally-based economy, some quarrying of marble and lime production took place in the area south of Sandy Pond (Gross 1982). The early 19th century saw the introduction of a small industry in boots and shoes. Two tanneries were present, and the mills continued to operate.

The population grew gradually through the early and mid-19th century (see Table 1-4). Improvements in the transportation network linking the town to Boston and surrounding towns, most notably the arrival of the railroad in 1844, resulted in increased markets for Lincoln's agricultural products. Agriculture heavily supported the economy (MHC 1980c). Thus the land in the project area has a long history of use as agricultural land and as woodlots (Mowchan, Schneiderman, and Ritchie 1987).

In the late 19th century, wealthy Bostonians increased the population of Lincoln as they left Boston for suburban homes and country estates

(MHC 1980c) (see Table 1-4). During this period the economy remained primarily agricultural.

The 20th century saw an expansion of the transportation network with improved roads for automobile traffic, including the upgrading of Routes 2, 117, and 126. Hanscom Airfield was built in the 1940's in Elm Brook meadow. Lincoln experienced little expansion of its industrial base, and only a slow and steady population increase during the later 20th century. It remains today a relatively affluent Boston suburb.

Lexington

Lexington was once part of the northern precinct of the town of Cambridge. It was established as a separate town in 1713, with a section later annexed to Lincoln in 1754, and another to Bedford in 1768 (see Table 1-3). Its economic and land-use history closely resembles that of Concord and Lincoln. An agricultural town, it became famous as the site of the attack by British Regulars on Colonial militia men on the morning of April 19, 1775. On the Town Green, in a half-hour engagement, eight Americans were killed by royal troops before the British column proceeded on to Concord. During this confrontation Lexington suffered 1,700 pounds worth in damage to the town while Concord lost only 275 pounds in damage (Gross 1984).

The portion of Lexington which lies within the Minuteman Park project area was primarily dedicated to agriculture in the Colonial period. Both Ebenezer Fiske and Ainos Marrett who lived in the Fiske Hill area used their land for both farming and growing apple orchards to produce cider (Malcolm 1985). It is unclear where this cider was used, but presumably it went to Ebenezer Fiske himself (who was licensed as an innkeeper in 1772) or to the nearby Bull Tavern (Malcolm 1985). Concord Road (now known as Massachusetts Avenue), which goes through the Fiske Hill project area, was an important roadway connecting Concord to Lexington and eventually to the waterfront. Perhaps this is why both an inn and a tavern were located in such close proximity along this road.

During the late 18th and early 19th century, the town's population remained well under 2,000 inhabitants (see Table 1-4). Aside from agriculture, which was the primary economic base of the town, a few work shops and factories produced footwear, garments, and printed calico (Barber 1839:397).

While some reorientation of the settlement pattern occurred in the town with the introduction of the Middlesex Central Railroad in the 1840s, most land-use continued to be consistent with that of a peripheral area supplying agricultural produce to Boston and suburban markets throughout the 19th century (MHC 1982:76). Neither major population growth nor industrial development was a factor in Lexington's late 19th century development.

The town was more closely linked to the Boston core by the early 20th century with the expansion of electrified trolley lines. Improvements in automobile roads provided better access to towns such as Lexington, which gradually became suburban rather than rural communities. This trend continued through the 20th century, with the town now occupied primarily by affluent suburban developments and a few remaining open spaces. Some commercial and light industrial development has taken place along the major highways crossing the town, especially Route 128.

Summary of Historical Agricultural Land Use

Due to the large body of data available in secondary, as well as primary sources, for Concord, this section will focus on the agricultural history of this town. Agricultural practices in Lexington and Lincoln would have been similar during most periods. Some geographic and environmental differences, most notably the presence/absence of the

Concord and Sudbury rivers and their adjacent meadowlands, certainly resulted in some differences in agricultural land use and production within the three towns.

Among the factors which attracted colonial settlers to the Concord area during the first half of the 17th century were the broad expanses of river meadows adjacent to the Concord and Sudbury Rivers and considerable cleared acreage. Both of these attractions are probably attributable, at least in part to the previous Native American inhabitants of the area. A common pasture/open field land use system was initially adopted by the settlers. Under this system each proprietor received a parcel of each land type (i.e., cleared Indian planting fields, fresh meadow, etc.) and a house lot in the village. The remainder of the lands (open forest, dense forest, and some pasture) was held in common.

This "commons" pattern of land use, developed by European peasants, served to conserve and equitably share limited or, in the case of colonial America, undeveloped resources (Donahue 1984: 24). Agricultural practices of the common field system in England varied considerably, but generally included: regular rotation of crops, fallow periods, and pasturing of animals to transfer nutrients from common pasture or woodlands to tillage lands. These improved farming methods formed the basis of the "agricultural revolution" in 17th century England. Colonial farmers tended to be more conservative, following pre-"revolution" practices handed down from generation to generation. Corn and rye were the major grain crops, with lesser quantities of oats, barley, wheat, and malt also being raised. Flax and hemp, which provided the raw materials for linen, were the only non-edible crops raised on tillage land during the Colonial period. American farms during this period were cultivated ineffectively, using rough implements to produce shallow plow zones. Fields were planted with little preparation, weeds were neglected, and seldom manured. Crop rotation was not standardly practiced, and land was left fallow only after it had been worn out by several seasons of planting (Kimenker 1984:145-150). In combination these practices resulted in the rapid exhaustion of the land.

The Colonial solution to the problem of exhausted land was to clear more land. Virtually simultaneously with the allotment of additional lands was the beginning of a movement away from the common pasture/open field system surrounding a nucleated village, and toward dispersed farms on privately owned lands. The division of the common land began in Concord in 1653 and was accomplished over the next decade. At the end of this process each of the 60 Concord proprietors owned a tract averaging 250 acres. The subsequent century saw the the division and consolidation of land holdings into nucleated farms (Donahue 1984: 26-27). According to Gross (1982), by 1750 the number of farms had stabilized at approximately 200. The size of the land holdings varied, with the average size of farms being about 60 acres. Both the number and average acreage remained relatively constant until the middle of the 19th century. Gross (1982:44) explains this farm pattern as "a rational adaptation to the conditions of farming and family life in the preindustrial, household economy."

By the middle of the 18th century there was too much land under cultivation with too little meadow and pasture remaining to maintain stock and supply the grasses which livestock transformed into natural fertilizer. This extensive, as opposed to intensive, pattern of agricultural land use gradually eroded the ecology of the lands. Colonial grain yields began to decline and pastures became badly over stressed. The decrease in the number of cattle and sheep raised indicates that the land was gradually losing the capacity to support livestock (Gross 1982:47). A solution to this situation began to appear by the 1770s, but was not firmly implemented until the post-Revolution period (Donahue

1984:31). The initial implementation of crop rotation, improved farm equipment and usage, and increased use of manure were among the advancements in agricultural practices which appeared during the late 18th century. Greater diversification of crops also occurred during this period. The most significant addition was the potato, which rapidly became an important staple of the farm economy (Kimenker 1984:146-147).

The period following the post-Revolutionary War depression through the mid-19th century was one of reasonable prosperity in Concord, although there was a slow but steady decline in crop yields. Improved transportation provided access to growing urban markets for the farmers' grain and produce. This was aided by the destruction of the town's forests, resulting in an increase in "unimproved" (e.g., overcut woodlands, abandoned pastures), an apparent fluctuation in river levels with an associated drop in fresh meadow acreage, and poor yields from upland pastures and hayfields (Donahue 1984:32). The percentage of Concord's woodlands to the total agreage decreased steadily from 28 percent in 1801 to approximately 11 percent in 1850 (Donahue 1984; Kimenker 1984) (Table 1-5). During the latter half of the 19th century these remaining woods continued to be carelessly managed and heavily exploited for timber, fuel, and pasturage (Whitney and Davis 1986: 75).

The tilled acreage within Concord declined during the initial post-Revolutionary period, dropping from 20 percent of improved lands in 1771 to only 13 percent in 1791. This percentage remained fairly stable during the first half of the 19th century, fluctuating only a few percentage points between census years (Table 1-5). Another easily discernible trend in Concord's land use patterns during this period was toward increasing acreage in English mowing (i.e., a strain of hay which was sown, as opposed to the native grasses termed fresh meadow). In the mid-19th century Concord farmers converted pastures, woodland, and unimproved lands to "English and upland meadows" for the cultivativation of English hay as an important cash crop (Gross 1982:48-49).

Agricultural production levels, as represented by total production of grain (in bushels) and hay (in tons), improved slightly during the late 18th to mid-19th century (Table 1-6). Donahue (1984:33-34) and Kimenker (1984:153) suggest that when tilled acreage planted in non-grain crops (especially potatoes, which are not reported in valuations) is taken into account, grain yields actually experienced a more significant increase. They argue that the agricultural production statistics indicate a shift toward "stronger soil for tillage". Several variables, including crop rotation and better plowing, probably combined to produce the improvement, however a major factor was manure (Donahue 1984:33-34; Kimenker 1984:153).

The usefulness of manure for agriculture was recognized in Europe before the birth of Christ. There are references to carting manure to fields in classical literature and in the Bible. A common method of adding manure to fields, which avoided hauling it from animal pens, was to fold or pasture the animals in the field when it was fallow. The introduction of mixed farming, which integrated crop production and livestock husbandry, during the agricultural revolution increased manure production and conserved soil fertility (Mather and Hart 1967:334-336).

Manure, usually a mixture of feces and urine-soaked litter, provided a means of increasing agricultural production through revitalizing the soils. It provides a medium through which nutrients removed from a pasture or hay field (by the cow's ingestion of grasses) can be returned, or transfered, to another field via spreading of the manure (Donahue 1984:35).

An average cow, weighing approximately 800 pounds, produces approximately 72 pounds of solid and liquid manure per day (Mather and Hart 1967:

Table 1-5. Land use in Concord, Massachusetts, 1749 - 1850.*

Land Use	1749	1771	1781	1791	1801	1811	1821	1831	1840	1850
Total Acreage					12905	12379	13001	13428	14203	13871
Total Improved	6351	7475	7129	8011	7989	7261	8347	8547	8953	8593
Acres Tillage	1471	1487	1188	1064	1112	1156	1137	1098	1229	1068
% of Improved	23	20	17	13	14	16	14	13	14	12
% of Total					9	9	9	8	9	8
Acres English Mowing	459	908	753	722	841	992	1205	1279	1644	2206
% of Improved	7	12	11	9	11	14	14	15	18	26
% of Total					7	8	9	10	12	16
Acres Fresh Meadow	2567	1086	2089	1827	2236	2131	2153	2111	2088	1495
% of Improved	40	28	29	23	28	29	26	25	23	17
% of Total					17	17	17	16	15	11
Acres Pasture	1854	2994	3099	4398	3800	2982	3852	4059	3992	3824
% of Improved	29	40	43	55	48	41	46	47	46	45
% of Total					29	24	30	30	28	28
Acres Woodland			3878	4436	3635	3386	3262	2048	1994	1534
% of Total					28	27	25	15	14	11
Acres Unimproved					1282	1732	1392	2833	3256	3744
% of Total					10	14	11	21	23	27

* Donahue 1984; Gross 1982; Kimenker 1984

Table 1-6. Agricultural production statistics for Concord, Massachusetts, 1749 - 1850.*

Agricultural Production	1749	1771	1781	1791	1801	1811	1821	1831	1840	1850
Total Grain (bushels)	19799	18672	---	---	16791	14457	16930	18080	20604	17762
Bushels/Acre	13.2	12.2	---	---	15.1	12.5	14.9	16.4	17.4	16.7
Total Hay (tons)	2467	2134	---	---	2165	2301	2150	2206	2667	2296
Tons/Acre	0.81	0.71	---	---	0.7	0.74	0.64	0.66	0.72	0.89
Horses	217	205	137	146	182	---	---	---	---	---
Oxen	430	395	324	288	374	326	337	418	---	---
Cows	865	910	916	775	934	831	743	725	810	656
Swine	287	389	137	308	290	---	---	---	---	---
Sheep	1342	690	---	---	---	---	---	---	---	---

* Donahue 1984; Gross 1982; Kimenker 1984

338). Spread on a field, this 72 pounds of manure provides nutrients (1.3% nitrogen, 0.2% phosphorus, and 1.2% potassium) which can be used by plants. Comparatively, poultry manure contains a greater percentage of useable nutrients, and human waste a lower percentage of these nutrients.

Contemporary and secondary documentary sources and analogies drawn from previous archeological research document the use of manure by New England yeomen and farmers. Eighteenth through 20th century agricultural journals, handbooks, and manuals (e.g., *The New England Farmer*, *Papers of the Massachusetts Society for the Promoting of Agriculture*, Copeland 1859; Mitchell 1867; Greeley 1881; Bailey 1916) provide a wealth of information concerning composting, use of barnyard manure, fertilizing, and cultivation practices. The first book on agricultural practices written in the colonies (first published serially in 1747-1759, and as a single volume in 1760), Jared Eliot's *Essays Upon Field-Husbandry in New England*, blamed the region's agricultural woes on the failure of the colonists to use new farming methods. He proposed the use of crop rotation, fertilizers such as manure and lime, and methods of land reclamation to improve farming in New England (McManis 1977:101; Russell 1982:118).

Copeland (1859:745) suggested that privies should be constructed to collect all human waste which could then be applied to the soil. He argued that "the solid and liquid feces of each person are capable of producing, if applied to the soil and covered, food enough to support the individual a year". Copeland (1859:415) also suggested that manure should be mixed with "meadow mud, sand, loam, or any similar material; this absorbs the liquid portions of the manure, and the gases, and preserves them for the use of plants". One of Mitchell's hints for country places suggests locating the compost heap "in a position convenient to the manure deposits of the cattle-yard" (Mitchell 1867: 279).

Horace Greeley (1881:93) was a proponent of "Deep Plowing," by which he meant

> pulverizing the sub-soil to a depth of not less than six inches, but leaving it in position exactly where it was. The surface-plow turns the next furrow upon this loosened sub-soil, and so on till the whole field is thus pulverized to a depth of not less than twelve inches [30 cm], or, better still, fifteen [38 cm]. Now, please remember that you have twice as much soil per acre to fertilize as there was before; hence, that it consequently requires twice as much manure, and you will have laid a good foundation for increased crops.

Greeley (1881:115) argued that not only poor lands, but also better farm lands, should be fertilized, with the better lands getting the lion's share as they would be most productive. He recommended that weeds, freshly fallen leaves, pond muck, turf, clay, and a variety of other materials could be converted into useful fertilizer if spread in the barnyard where the animals could trample and mix manure into it for several months (Greeley 1881:116).

Improvements in agricultural practice and in land management, begun in the late 18th century, continued and increased pace during the 19th century. Secondary sources providing a synthesis of agricultural information (e.g., Stilgoe 1982; Russell 1982; Benes 1988; Mather and Hart 1967) indicate that by the late 18th to 19th century standard historical agricultural practices in New England included the heavy reliance on barnyard manure and composted household organic refuse as a source of fertilizer for fields. If contemporary diaries and farm journals are to be believed, yeomen and farmers spent much of their time collecting, hauling, and spreading barnyard manure. This was a significant change from the Colonial period when few farmers made an attempt to use barnyard manure and "some farmers moved their barns rather than move the manure to the fields for fertilizer" (Kimenker 1984:146). In coastal and some riverine areas, fish (herring and whitefish are most often mentioned), shell, rock-weed, kelp, eelgrass, peat, and king crab was deposited on the fields.

Near urban areas nightsoil was collected in tightly covered wagons and brought to the farms. It was deposited in open basins or troughs and mixed with "mould" or humus before being spread on the fields (Russell 1982:173-175). An archeological study in Philadelphia and Baltimore suggested that the sale of the contents of residential privies as fertilizer was widespread during the 19th century (Roberts and Barrett 1984:109). This practice of selling composted nightsoil to farmers has been historically documented during the period prior to the introduction of public sewage in the urban northeastern United States (Melosi 1981 cited in Roberts and Barrett 1984:109). These supplemental fertilizers were often dumped on the land to decompose, or put in with the hogs to be worked into manure, before being applied to the fields (Russell 1982: 173).

Nineteenth century Concord was a leading center of agricultural innovation and improvement. During this period another agricultural revolution was taking place, the "great transition to modern agricultural capitalism" (Gross 1982:43). This revolution saw the transformation of the agricultural economy from one based primarily upon family and local subsistence to production of surpluses for sale resulting in full involvement in the market system. By the middle of the century farmers were devoting more and more land and time to production for market. They focused on three crops: oats (sold to city markets as feed for horses), hay, and wood (sold as timber and fuel). Farmers also sought new crops and markets for their production. The arrival of the railroad made profitable the large-scale production of milk, butter, eggs, fruits, and garden vegetables for sale to urban markets (Gross 1982:48-50).

In *Walden*, Henry David Thoreau attempted to warn his Concord neighbors against this new system of agricultural capitalism which had arrived in town with the railroad. The small farmer's survival under the new economic conditions required change; from subsistence agriculture with production of a small surplus for market, farmers needed to focus on production for market and purchase subsistence items at a store. Many farmers could not make this transition. Some moved west to newly opened territories with cheap lands, while others supplied their labor to the developing urban industrial population (Gross 1982:53-55).

For those farmers who continued farming in Concord into the 20th century, agricultural practices changed as technological innovations produced improved farming machinery (e.g., threshing machines, tractors, hay bailers, combines, etc.), new crops or hybrid strains of old crops, and ever changing market conditions. Increasing land prices and expanding suburbanization through the 20th century, combined with competition from other markets, has resulted in the reduction of tilled acreage in the town. Instead of the expansive agriculture practiced during the Colonial period, the remaining farms in the town practice intensive methods (fewer acres carefully managed) and specialize on a few lucrative crops.

Chapter 2

Research Design and Strategies

The purpose of this research design was to provide a general framework for the study to be undertaken. This research design established the theoretical orientation and relevant research issues or questions, and outlined the methodology to be employed in obtaining the project goals (U.S. Department of the Interior 1983, 1985). Regional and park-specific research questions proposed for this investigation included: the correlation of the functional types, structural characteristics, and locations of prehistoric sites with characteristics of the environment; the impact of historical and modern land use on prehistoric and historical site integrity; and the use of space on rural historical-period farmsteads. The survey methodology was designed to gather and review background information from in and around MIMA to develop and implement an estimation approach including predictive statements regarding the location, functional types, and environmental settings of prehistoric sites within MIMA. Predictions of the archeological sensitivity of particular areas were tested during the intensive survey phase of the project with subsurface sampling. Historical-period sites located during the course of the survey have also been briefly addressed. The expected results of the archeological investigations of MIMA included: additions to the existing data base of known sites, both prehistoric and historical, within the park; production of a probability estimate and predictive statements concerning the number and kinds of other potential prehistoric and historical sites within MIMA; and analysis and discussion of the regional and local research issues in light of the new data. Information collected and analyzed during the survey was expected to be useful for park administration decisions relating to management of its cultural resources and the implementation of the master plan.

Theoretical Orientation and Research Questions

Several research problems were selected to serve as part of the framework for the survey. The research design developed for this survey within MIMA was built in part on the results of previous investigations in the local area and larger southern Merrimack River basin sub-region. The importance of developing research designs that are connected in some way with regional problem sets extending beyond the requirements of a single project has been pointed out by Goodyear (1977) and others (Dincauze 1980). Hopefully the results of this study can meet two goals; the management needs of MIMA and a contribution to the development or refinement of regional and sub-regional problems.

Most of MIMA is located in a nonriverine upland area for which there was minimal information on the frequency or characteristics of sites. Issues or problems relevant to prehistoric period activity in this type of terrain were the focus of the investigation and were included in the research design. A primary research problem for the survey was the organization of prehistoric settlement/land use systems within the southern Merrimack River basin and evidence for adaptation to small-scale environmental heterogeneity or diversity particularly in upland, non-riverine areas.

The importance of understanding the sources of observed variations in settlement patterns and technologies across relatively small geographic spaces in prehistoric southern New England has been pointed out by other researchers. A possible explanation for this observed variation has been offered in a model of Archaic period adaptation which predicts that hunter/gatherer populations developed adaptive strategies closely linked to the resources available within relatively small group territories (Dincauze 1980). This model assumes that the development of a relatively stable temperate forest environment with high species density and heterogeneity allowed prehistoric populations to settle into well defined group territories by around 4000 years ago.

A smaller scale model suggests that prehistoric settlement/land use systems in the southern end of the Merrimack River basin (Sudbury/Assabet/Concord drainages) between 9000 and 400 B.P. were closely related to the spatial distribution of environmental zones with high natural resource potential. Sites in the riverine environ range from multicomponent sites to small activity-specific loci. Upland environmental zones appear to contain sites which span the widest range of sizes and internal structures. They range from large internally complex to smaller ones with less complex internal configurations. Exceptions to this are a few upland base camps on large wetlands or ponds with evidence of numerous depositional episodes (Ritchie 1983a; Gallagher, Ritchie, and Davin 1985). This model proposes that prehistoric sites have a tendency to display zonation or clustering in environmental settings with high natural resource potential. This zonation is expected to be more evident in upland areas and may reflect the lower frequency and smaller size of areas with high natural resource potential in upland versus riverine environments. An example of a smaller scale setting with high natural resource potential would be the narrow corridor-like zones of wetlands found along upland stream networks and ponds. The actual spatial distribution of sites and the range of variation in their structural characteristics, temporal/cultural affiliation, and content (assemblages) in these upland areas is not well known. Differences in site size, function, and temporal/cultural associations between upland areas and other environmental zones are expected. While sites of almost every temporal period have been identified in upland areas, it is expected, based on recent surveys, that a majority of the sites in upland, non-riverine areas were occupied during the Late/Terminal Archaic or Early Woodland periods (ca. 3500-2000 B.P.) (Gallagher, Ritchie, and Davin 1985).

Some other models have viewed the interior upland zone as an area that was marginal to prehistoric populations during episodes of fairly rapid environmental change or stress, such as the Terminal Archaic/Early Woodland period, with a shift to more intensive use of coastal zone environments (Dincauze 1974; Filios 1983). While there are indications of significant changes in the size, structure, and vegetation communities of wetlands (dry period) in the paleoenvironmental record ca. 3500 to 2000 B.P., it is not clear how these changes affected prehistoric settlement/land use in the region (Bradshaw, Nelson, and McGown 1981; Thorbahn 1982). Rather than abandoning upland areas, prehistoric populations in eastern/southeastern New England may have developed new strategies for exploiting the resources of this type of environment. These strategies apparently included the intensive exploitation of a broad spectrum of plant and animal resources from many sites and a focus on the small-scale environmental features (microenvironments) typical of upland zone topography.

A secondary research issue for prehistoric cultural resources was understanding the effects of various kinds of historical and modern land use (agriculture, residential and commercial development, resource extraction such as sand/gravel pits, etc.) on these sites. This was considered to be an important step in gaining some understanding of the present condition of the surviving prehistoric sites through estimating rates of site destruction in the past or other post-depositional changes (i.e., plowzone, etc.) that have occurred (Schiffer 1987; Ritchie 1983b).

While the major focus of the PAL, Inc. survey was on the prehistoric resources present within MIMA, it was likely that evidence of historical occupation and land use would be recovered as well. An important research problem for historical-period cultural resources was the study of changes in the use of domestic and agricultural space. This research question is a major focus of current investigations of the MIMA Archeological Project (Synenki 1986), of which this study is a part. It includes consideration of the placement of structures/outbuildings, the waste stream (Schiffer 1987: 64-66), activity areas, farming practices, and other activities which affected the rural landscape from the 17th through 19th centuries.

One important source of information relating to historical-period rural land use which is frequently recovered archeologically is "field trash". This term refers to small fragments of domestic and building-related debris (i.e., ceramics, bottle fragments, brick, nails, window glass, bone, shell) recovered from a non-site context (i.e., at a distance from any known historical structure). Analysis of recovered field trash focused on the temporal associations of the historical cultural materials recovered; distribution patterns of this material across the historical landscape; documentation of agricultural land use and practices which may have initiated and/or perpetuated the distribution of refuse; and evidence for changing refuse disposal practices through time.

Primary documentary sources (i.e., tax records, agricultural censuses, and contemporary agricultural journals, handbooks, and manuals) offer a wealth of information concerning historical-period land use and agricultural activities. These sources contain such details as acreages devoted to different crops and land uses, lists of cultivated crops and production statistics, livestock counts, and recommended farming methods, including composting, use of barnyard manure, and fertilizing and cultivation practices.

Secondary sources (e.g., Stilgoe 1982; Russell 1982; Benes 1988; Mather and Hart 1967; Donahue 1984; Kimenker 1984; Gross 1982; Whitney and Davis 1986) offer regional and local syntheses of this type of information. In general, these sources indicate that New England agricultural practices and standards changed through time to include crop rotation, the heavy reliance on barnyard manure and composted household organic refuse (supplemented in some areas with shell and fish) as a source of fertilizer for fields, and emphasis on different combinations of crops and/or livestock.

Several research approaches were used to examine and interpret the field trash recovered from MIMA. Date ranges, *terminus post quem* dates, and calculated mean dates for certain artifact types (e.g., ceramics, pipe stems, and nails) were considered but, due to insufficient sample size, could not provide reliable temporal associations for this material. Measurement of the distance of sampling blocks containing historical cultural material from certain historical and modern features (e.g. known domestic/agrarian sites and roads/cart paths) provided a context in which to discuss the observed distribution of field trash. Since this historical cultural material most likely originated from either barnyard or household refuse sources, identifiable objects within the field trash assemblage were examined in order to ascertain whether they came from a barn context, a house context, a mixture of both, or other unspecified source. Determination of original context was considered as a possible indicator of how this material was introduced into its archeological context (e.g., thorugh manuring, household dumping, or filling). In addition, average observed plow zone depths were calculated for each testing block and this information was compared with the 1775 land uses determined from documentary sources (Malcolm 1986).

Background Research, Archeological Sensitivity Stratification, and the Estimation Approach

Cultural resource management studies in the southern New England region have generated numerous schemes for evaluating the archeological sensitivity of a project area for prehistoric sites. These stratification schemes have generally been based on broad categories of environmental attributes that could be applied to project areas throughout the region (Barber 1979; Root 1978; Thorbahn et al. 1980). The stratification approach employed for the survey of MIMA used these general environmental attributes but also relied on knowledge of localized, small-scale factors affecting prehistoric settlement/land use gained through prior surveys in the combined Sudbury/Assabet/Concord River drainages. The use of the latter was intended to increase the effectiveness of the stratification particularly in the upland, nonriverine sections of the park.

Background Research

Background research provided an important source of information for stratifying the physical environment of MIMA into archeologically sensitive areas. Categories of data which were gathered included: local and regional geomorphology, geology, soils, paleoenvironments, prehistory, and historical-period settlement/land use patterns; cartographic sources; known sites and artifact collections; and previous investigations by avocational and professional archeologists. The inventory of known prehistoric sites and previous investigations were analyzed to determine the strengths and weaknesses/inadequacies in the existing data base and any biases which may have been caused by past data collection strategies. There were two initial products of the background research and analysis. These products were a determination of the portions of MIMA which will be investigated during the survey, and the stratification of MIMA into archeologically sensitive areas.

A disturbance assessment of MIMA was conducted to determine what portions of the park would be considered during the archeological investigation. Areas that had been significantly disturbed by modern development (i.e., highways, parking lots, buildings, etc.) or the focus of previous archeological investigations (e.g., frequently collected by amateurs, NPS surveys, etc.) were subtracted from the total area of MIMA. An example of an activity that causes minimal disturbance to the landscape is agricultural plowing. It does modify the landscape but does not necessarily destroy the potential to recover important archeological information (Talmage and Chesler 1977; McManamon 1976). A moderate disturbance rating was given to areas if grading had taken place but not removed all of the postglacial soil horizons. Severe disturbance would be the absence of these subsoils, construction activity or artificial reconstruction of the landscape.

Other areas not considered include portions of MIMA which contain demolished structures, private property designated "No Access" by NPS or possibly other areas that are currently under agricultural or other lease agreements. It was expected that elimination of these areas would considerably reduce the size of the project area to be examined during the survey.

The collection, evaluation, and analysis of background data followed a geophysical hierarchy of contexts. At the upper end of this hierarchy were the *physiographic zones*. These zones were defined primarily on the basis of differences in the geomorphology area in and around MIMA. For example, the Sudbury/ Assabet/Concord riverine zone is flanked by a broad area of low terraces of glacial lake bottom and other outwash deposits (kame terraces, kame deltas) cross-cut by tributary streams and extensive wetlands. These zones are recognizable and considered to have relevance for reconstructing prehistoric settlement and land use. The next lower level of the hierarchy were *environmental settings*. These are localized conditions found within the broader physiographic zones. An example is a wooded wetland, the margin of a tributary stream, or an upland hillside. At the base of this hierarchy were *locational attributes*. These were considered to be variables found within various environmental settings. Examples of locational attributes include soil texture, drainage characteristics, degree of slope (e.g., 0-3%, 3-8%, 8-15%), aspect, and in some cases vegetation (i.e., wetlands, wooded, etc.). Different combinations or types of locational attributes define environmental settings. For example, the presence of steep slopes (15-25%) and rocky surface soils help to define an upland hillside setting. A complete list of these locational attributes is given in Table 2-1.

Stratification Scheme

The stratification of MIMA into zones of expected archeological sensitivity was a product of the analysis of the background information. The underlying assumption of the stratification is that there is a strong correlation between certain environmental settings and the location of prehistoric sites. The stratification scheme considered known site locations, the distribution of certain environmental settings, and known or suspected patterns of prehistoric settlement and resource use based on previous research.

Another assumption was that prehistoric settlement and land use/resource use were organized in different ways in various environmental settings. Three physiographic zones were recognized within the park: the riverine zone, adjacent to the Concord River; the upland tributary stream/wetland zone, to the east near Elm and Mill Brooks; and the elevated upland hill zone, including the eastern portion of MIMA near Fiske Hill. These three physiographic zones provided the larger geophysical context within which the results of the archeological survey of MIMA were discussed and which allow generalization and extrapolation of the MIMA data to a larger universe (e.g., Sudbury/Concord drainage, the southern Merrimack River basin, east/central Massachusetts).

Archeological sensitivity was based on the results of the critical analysis of the existing database of prehistoric sites both within MIMA and adjacent to the park. Even with the limitations of the database, it was evident that prehistoric sites of various functional categories are not evenly distributed across different physiographic zones. Instead, they show a tendency to be clustered in certain environmental settings (e.g., large base camps resulting from seasonal aggregation of peoples tend to be located in riverine zones, while sites in upland zones tend to be smaller, less complex sites representing specific resource procurement activities). Different resource procurement activities or segments of the prehistoric settlement system were presumed to have been located within the three zones. Therefore, different sensitivity criteria were expected to be necessary to effectively locate the kinds of sites occurring in these zones. For example, distance from water or stream/wetland margins as an indicator of high sensitivity areas (a commonly used criteria) (e.g. Casjens 1978) would be expected to be greater near a major river or wetland (120 m), and less in upland areas (60 m) in the tributary stream/wetland zone, and 30 m in the elevated, upland hill zone. Slope categories and soil characteristics used to mark high sensitivity areas would also be expected to vary according

Table 2-1. Locational attributes used to define environmental settings.

Locational Attribute	*Categories*
Slope	(0-3%, 3-8%, 3-15%, 15-25%)
Distance to water/wetlands	(0-30 m, 30-60 m, 60-90 m, 90 m+)
Boulders on surface	(frequent, scattered, rare)
Bedrock outcrops	(frequent, scattered, rare)
Current vegetation pattern	(upland forest, wooded wetland/shrub swamp, other second growth types)
Surficial deposit/Soil texture	(stony till or ground moraine, sand/gravel outwash, glacial lake bottom)
Soil drainage characteristics	(well drained, moderately well drained, poorly drained)

to the physiographic zone. The relative scale or size of sensitivity zones was also expected to vary with the physiographic zone. In upland zones smaller, isolated pockets of high sensitivity (for example, a small bench or terrace with well-drained sandy soils near a small stream, or a ridge overlooking an animal trail) occur, and attention must be paid to these small scale features. Areas of high archeological sensitivity within the riverine zone tend to be larger in scale, often encompassing much of the flood plain. Sections of MIMA with locational attributes identical or similar to known prehistoric sites in upland sections of the surrounding area (Sudbury/Assabet/Concord, upper Shawsheen, and Charles River drainages) were considered to have high archeological sensitivity.

The MIMA project area was stratified into areas of high, moderate, and low archeological sensitivity. Zones of archeological sensitivity were identified from combinations of three basic factors: (1) the similarity to areas containing known prehistoric sites, (2) the degree of previous disturbance, and (3) the presence of favorable or unfavorable environmental/locational attributes. The values assigned to each set of attributes are shown in Table 2-2.

Different combinations of these environmental/locational attributes observed within

Table 2-2. Environmental/locational attribute sets and values.

Attribute set	*Sensitivity value*
1. Correlation with known site locations	
A. *Positive*	2
B. *Negative*	1
2. Degree of previous disturbance	
A. *minimal* (shallow plowzone, dirt trail/road)	2
B. *moderate* (deep plowzone, minor erosion or removal of topsoil horizon)	1
C. *severe* (gravel/borrow pits, topography modified by machine excavation or grading)	0
3. Environmental characteristics	
A. *favorable* (sandy, fine textured subsoil, good drainage, proximity to wetland or stream, minimal slope)	2
B. *moderate* (gravelly subsoil, fair drainage, wetland margin vegetation, moderate slope)	1
C. *unfavorable* (coarse textured, gravelly subsoil, poor drainage, boulders frequent on surface, wetland vegetation, steep slope)	0

MIMA were then scored using the values listed above. The maximum possible score would be six, indicating an area of high sensitivity and the lowest score would be one, for an area of low archeological sensitivity. Actual scores of five and six were considered to mark zones of high archeological sensitivity, scores of three and four indicated zones of moderate sensitivity, and scores of two or less, zones of low expected sensitivity. High sensitivity areas (Stratum I) and moderate sensitivity areas (Stratum II) were subsurface tested using a stratified random sample. Low sensitivity areas, primarily steep slopes, boulder fields, and bedrock out crops, were not sampled due to time constraints.

The end product of the background research and sensitivity stratification stage of the survey were a series of maps showing the distribution of various zones of archeological sensitivity (high, moderate, low) within the MIMA project area. These maps are shown in Chapter 3 as Figures 3-1 through 3-6. These archeological sensitivity maps were then used to develop a specific plan for conducting subsurface testing within selected parts of the project area.

Estimation Approach

An important component of the research design for the archeological investigations within MIMA was the use of an estimation approach for predicting the likely occurrence, density, and characteristics of prehistoric sites in portions of the park. The advantage of this approach is that the precision of estimates derived from the sample data can be quantified. With this approach, it is possible to use sample data to generalize to a larger target population and state the statistical precision of these generalizations or estimates (Mueller 1978). Statistical sampling can be used to select a segment of a population according to specific procedures and make observations about the population based on properties of the sample. Inferences about the population can then be made based on the observed properties of the sample (Nance 1981:153). In the case of MIMA, the target population consisted of the prehistoric sites located within a number of designated areas considered to be representative of zones of high and moderate archeological sensitivity. These designated areas were all in the upland non-riverine section of MIMA since the riverine section of the park was not sampled during the survey. The frequencies of prehistoric sites discovered by random sampling in these designated upland zone areas were observed, and inferences made, about the population of sites in those areas. These inferences could then be extended to other upland, non-riverine sections of the park not included in the survey but having characteristics (high or moderate sensitivity) similar to the areas sampled. In the case of MIMA, the target population included those sections of the park that could not be sampled due to time and other constraints. The use of the estimation approach including the application of summary statistics (sample mean, standard error of sample mean) for the survey within MIMA was consistent with the objectives of a prior survey for prehistoric sites within the Cape Cod National Seashore (McManamon 1981).

General procedures for determining an adequate sample size in surveys of large populations where it is necessary to provide statements of precision have been described by Cochran (1963).

In order to establish what an adequate sample size is, it is necessary to first establish an acceptable standard error or error factor and confidence limit for the estimates of prehistoric site frequency. These data had initially been proposed for the survey within MIMA based on an application of this estimation technique within the Cape Cod National Seashore (McManamon 1981). The selection of the desired error factor or tolerance is important since varying this factor effects the required sample size. To achieve low error factorsthe collection of larger sample sizes is required because a smaller sample may yield results with a confidence level that is very wide and of little interpretive value (Shennan 1988:309).

Conducting preliminary pilot studies on the population being studied provides a way to obtain a sample mean and standard deviation for estimation of a required sample size (McManamon 1981:206; Shennan 1988:307). This first step is necessary unless some information about the target population is available from previous work. The sample-based estimate of the population mean and standard deviation can then be used with the specified error factor and confidence limit to determine the required sample size. If the sample size is too large to be completed during estimations, some other strategy for sampling may be necessary. A standard formula for estimating the required sample size using these variables is available (Cochran 1963:76; Shennan 1988:306-307). A pilot study using data from two sections of MIMA containing previously known prehistoric sites was an important first step in developing a sampling strategy for the survey. The results of the pilot study based on known site distributions in the riverine (North Bridge area) and transitional upland/tributary stream (Meriam's Corner) zones were the basis for determining the location and relative intensity of subsurface testing within the park. In the case of MIMA, the target population was initially considered to be the prehistoric sites located in the high and moderate sensitivity strata in both the riverine and non-riverine upland areas of the park. The riverine section of MIMA contained a high density cluster of known prehistoric sites. It was included in a pilot study to determine if the riverine zone needed to be surveyed in the same way as other sections of the park where there were fewer known sites. A simulated random sampling of the riverine zone suggested that this type of approach would not yield much more new data on the distribution of sites there and the emphasis of the survey was shifted to the upland, non-riverine sections of MIMA.

In a staged approach to fieldwork like that used for the survey of MIMA, the estimation formula can be applied to the results of subsurface testing at several stages to assess the amount of sampling required to achieve the desired confidence interval. This provides a means of evaluating the results of subsurface sampling while the survey fieldwork is in progress and any necessary adjustments can be made. Finally, good estimates of site frequency and characteristics within particular types of environmental settings within MIMA were important for interpreting the results of the survey and forming recommendations for managing the known and expected sites within the park.

Expected Results of the Archeological Survey

The archeological survey of MIMA using the general approach described above was expected to provide data needed to estimate the frequency and characteristics of prehistoric sites within selected areas of the park that were sampled. The survey was also expected to identify some previously unknown historical-period sites and result in the collection of a relatively large sample of historical cultural material from non-site specific contexts (field trash). The previously unknown prehistoric and historical-period sites as well as the assemblage of historical cultural material had the potential to contribute to the resolution or modification of a number of research questions, methodological problems, and cultural resource management issues.

The identification of prehistoric sites in the upland, central, and eastern portions of MIMA could offset the bias toward the riverine zone evident in the existing data base. At a larger, subregional scale, it would also expand the available information on prehistoric settlement/land use patterns in the southern Merrimack River basin. Analysis of correlations between site locations and certain environmental/locational attributes such as soil types and wetlands was expected to point out some interesting detail on the organization of prehistoric activities with respect to small-scale landscape features.

From the comprehensive background research, several categories of expected prehistoric sites were developed for the general physiographic zones and sensitivity strata within MIMA. Some anticipated results in terms of the numbers and kinds of sites in the sensitivity strata were also developed. Overall, the numbers of sites in both high and moderate sensitivity stratum were expected to vary between the riverine and upland zones. High and moderate likely to contain fewer sites than the same strata in the riverine zone. In addition, it was expected that small, less complex sites would form a large percentage of the population of prehistoric cultural resources in the upland, non-riverine sections of MIMA.

The riverine zone within MIMA was known to contain sites displaying a wide range of variation. Large (ca. 5000-10,000 sq m) sites containing cultural material from numerous occupational episodes (Early Archaic to Late Woodland periods) were expected only in the high sensitivity sections of the riverine zone. These sites may have been used as base camps during intensive, seasonal resource collection and processing. Sites of this general type are frequent along the margin of the wooded wetlands and marshes on the Sudbury, lower Assabet, and Concord Rivers. Other categories of prehistoric sites expected in the riverine zone were moderate sized (ca. 1000-5000 sq m) sites with several cultural components and small (ca. 500 sq m or less) sites with varying densities of cultural material. The moderate-sized sites would be located primarily in the high sensitivity stratum. The results of previous cultural resource management surveys adjacent to MIMA have shown that the riverine zone contains large numbers of small (500 sq m or less) sites filling "spaces" between larger multi-component sites. Many of these sites may mark locations where specific resource collection tasks were carried out by groups of hunter/gatherers using nearby base camps. These small sites could occur in areas of both high and moderate sensitivity within the riverine zone.

Upland environmental zones outside the riverine "core" areas in the combined Sudbury/ Assabet/Concord River drainage were known to contain sites from virtually every temporal period (Middle Archaic to Late Woodland) post-dating the PaleoIndian and Early Archaic periods. Any small, upland zone sites located during the survey of MIMA that could be assigned to a temporal period or cultural tradition were expected to have high research value because of their high probability to contain material from a single occupational episode. Four general categories of prehistoric sites were expected to occur in the upland sections of MIMA and along the tributary stream and wetland network. The largest, most internally complex site likely to occur in upland settings would be moderately sized (ca. 1000-2500 sq m) loci found in the most favorable locations (high sensitivity stratum only) near large wetlands, ponds, tributary streams, or springs. This category of site may contain several components or depositions of cultural materials and features. It was likely that only a few sites of this type would be present within MIMA. Previous surveys in the area have identified examples of a category of moderate sized (ca. 750 to 2500 sq m or more) sites apparently consisting of many small depositions of cultural material closely spaced along the edge of a wooded wetland or tributary stream. These sites display a type of "edge effect" apparently created by recurrent use of an environmental boundary or edge by small groups of hunter/gatherers for specific tasks (i.e., hunting, trapping, foraging plant food, etc.). A few sites of this type were expected to occur in narrow zones of high or moderate sensitivity along streams like Elm Brook or wetlands at the headwaters of Hobbs Brook.

Two other expected categories of upland zone sites were small (ca. 500 sq m or less) loci with either high or low densities of cultural material. The small, low density sites were created by activities that result in the discard of very limited amounts of cultural material. This category also includes single item (chipped stone tool, chipping debris) "find spots" or locations where isolated pieces of cultural material are found. These loci represent the most minimal definition of what constitutes a prehistoric site and are at the low end of the scale of archeological visibility. As a general category, these sites were expected to be present in both high and moderate sensitivity strata with small, low density loci being the most frequent. Based on the results of other cultural resource management surveys in the vicinity of MIMA, these small, low density loci are often the only evidence of prehistoric activity found in areas ranked as having moderate sensitivity.

The small, high density sites were created by activities that result in the deposition or discard of fairly large amounts of cultural material within a short period of time, such as a single occupation. Examples of this include loci where the manufacture of one or a few chipped stone tools created numerous pieces of chipping debris, or intensive processing of resources produced a large amount of burnt rock fragments. Examples of these kinds of small sites with varying densities of cultural material have been found during cultural resource management surveys in the vicinity of MIMA.

Previously unknown historical-period sites identified during the survey (especially 19th century sites not relating to the events of April 19, 1775) should have the potential to assist in answering such research problems as the effect of increased use of land for commercial purposes (market gardening, etc.) in the mid-19th century and changing patterns of domestic refuse disposal from the 17th through the 19th centuries in this rural setting (Synenki 1986). The range of impacts to prehistoric sites caused by these historical land use practices and others was also expected to be a potentially informative category of new survey data.

In terms of methodological problems, the survey should provide an opportunity to evaluate the use of probability sampling and the estimation approach as a means of providing more accurate data for reconstructing prehistoric settlement/land use patterns beyond what would have been possible with the existing, biased data base. This investigation was also viewed as an opportunity to develop a format to analyze historical "field trash" in terms of its temporal associations and distribution relative to known domestic sites. The analysis of this kind of historical-period archeological deposit within a geographic context should be useful for relating "field trash" to larger settlement/land use patterns and the ways in which they may have changed from the 17th to mid-20th century.

Finally, it is expected that the intensive archeological survey of MIMA will generate a more complete and accurate inventory of prehistoric (and historical) cultural resources that can be used for the development of a comprehensive management plan.

Field Methodology and Sampling Strategy

The methodology developed for the fieldwork aspect of the survey for prehistoric cultural resources within MIMA was specifically designed to collect the information necessary to achieve the primary objective of the survey. That goal was to provide a reasonably accurate estimate of the frequencies and distribution of different types of prehistoric sites within the archeologically sensitive strata defined for MIMA. This approach was taken because of the large size of the project area (745 acres) and limitations on available funding and time, which prohibited survey of the entire park. It was necessary to develop a sampling methodology that was both cost-effective and capable of collecting the basic data required to estimate the frequencies of sites in these strata.

The basic methodology selected for subsurface testing within MIMA was stratified random sampling carried out in several stages. The advantage of a staged approach is that it can be used to address the problems of rarity and spatial clustering of archeological sites. MIMA was expected to be an area in which prehistoric sites might be relatively rare in some environmental settings (hilly uplands) and clustered in others (margins of tributary streams or wetlands). In this type of situation (rare or clustered sites) probability sampling for estimation purposes can be made more effective through the use of careful stratification (Schiffer et al. 1978:2; McManamon 1981:195-197). Subsurface sampling within specific sections of MIMA was carried out in two basic stages. During the first stage, sampling units (30 x 30 m blocks) were randomly placed within specific sections of the park to provide a basic set of data from several areas of high and moderate archeological sensitivity. Statistics were then applied to measure the reliability of this data for estimating the characteristics of larger populations of sites in these strata. The second stage consisted of limited judgmental testing to refine the stratification scheme and collect additional data from areas of particular interest.

The sampling units selected for use in the subsurface testing were 30 x 30 m hlocks, each containing 13 test pits in an offset grid pattern (see Figure 2-1). Offset grid patterns of test pits are a more efficient means of sampling an area because they can locate sites of the same size as a square, systematic grid with fewer test pits (Krakker et al. 1983:472). Recent statistical evaluation of the use of 30 x 30 m sampling blocks for surveys has indicated that these blocks are more likely to locate small sites with diameters of at least 56 sq m. The computer program EVALSTP was used in this evaluation (McNiff and Cox in prep.; Kintigh 1987). The choice of 30 x 30 m sampling blocks with a 7.5 m offset test pit pattern was also intended to insure that all sites greater than 7.5 m (56 sq m) within a sampling unit would be found and that bias would not be introduced by sub-sampling of any sites present in the area covered by the sampling unit. The use of 30 x 30 m blocks as sampling units increased the probability that some small, less "archeologically visihle" sites would be discovered. This general category of prehistoric sites is under-represented in the existing data base and identification of a representative sample of such sites could contribute to a more accurate and objective estimate of the range of prehistoric land use activities in the park.

In order to actually carry out probabilistic or random sampling within MIMA, it was necessary to develop a system for dividing the park into units of equal size. The base maps of MIMA used to guide the survey were a set of 13 topographic maps with a two foot contour interval and scale of one inch equals 100 ft. These maps were produced from photogrammetric data and included a Universal Transverse Mercator (UTM) coordinate grid. Each UTM grid unit on the maps was a 500 x 500 ft square containing the equivalent area of 25, 30 x 30 m blocks.

To organize the random sampling procedure, all of the UTM grid units containing sections of the park were numbered consecutively beginning in the North Bridge area and continuing east to Fiske Hill. This produced a total of 209 grid units. To assist in subdividing the UTM grid units into 30 x 30 m blocks, a mylar template was made. This template consisted of a UTM grid unit divided into 25, 30 x 30 m blocks. Each block was numbered consecutively in rows beginning with one in the southwest corner and ending with 25 in the northeast corner of the UTM grid unit (Figure 2-2). By placing this template over the base maps showing the sensitivity stratification of MIMA, it was possible to determine the total number of 30 x 30 m sampling blocks that were in zones of high and moderate archeological sensitivity. This information was recorded in a table that included the UTM coordinates of the southwest corner of each grid unit, its numbered position within the grid system, and the number of 30 x 30 m sampling blocks of high or moderate sensitivity it contained. Upon completion of this step, it was found that the high sensitivity stratum in MIMA contained a total of 618, 30 x 30 m sampling blocks. The moderate sensitivity stratum contained a total of 981, 30 x 30 m sampling blocks.

To assist in the development of an adequate

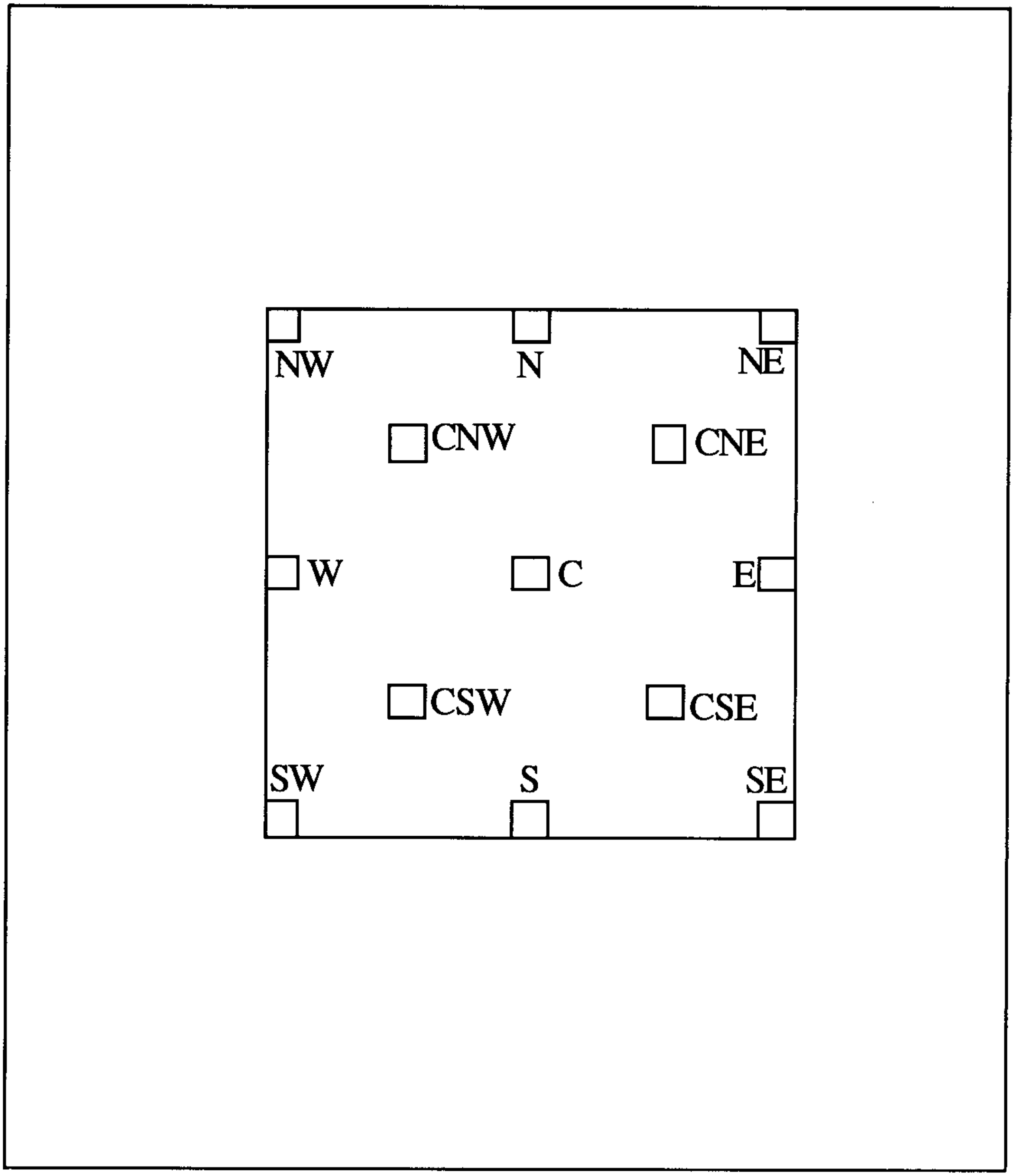


Figure 2-1. Typical 30 x 30 meter block with staggered grid test pattern used as sampling unit.

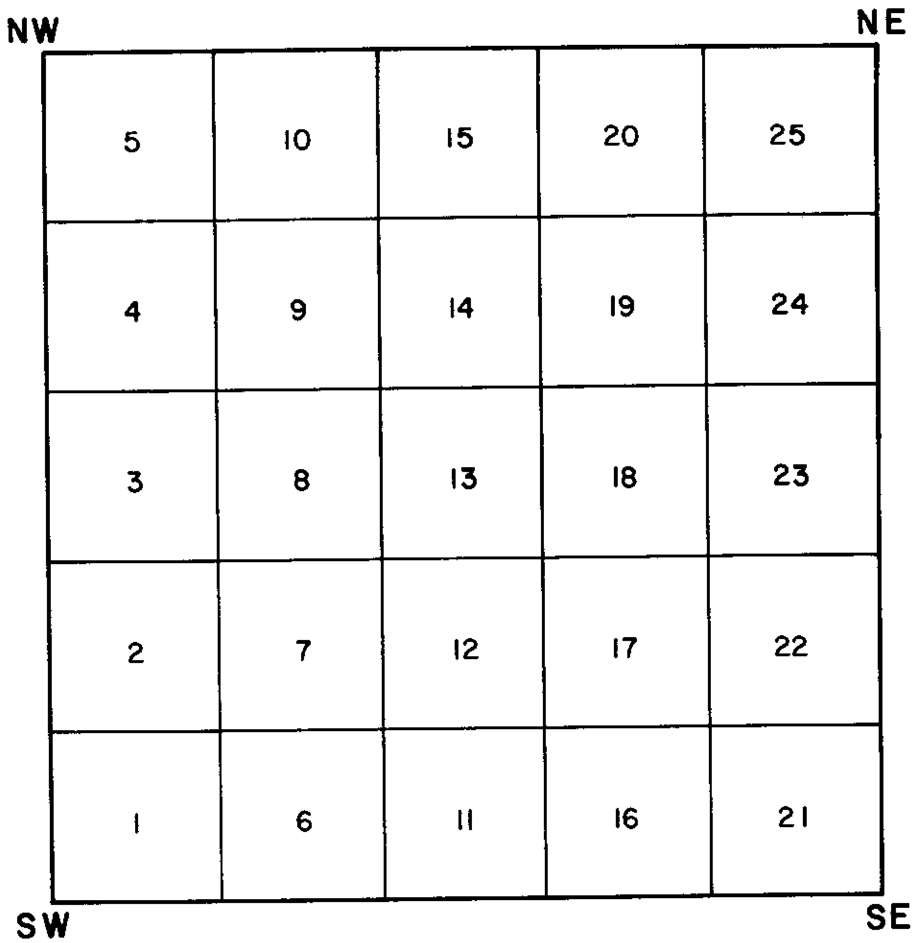


Figure 2-2. Template used to divide UTM grid into 25, 30 x 30 meter sampling units.

sampling design for the survey, pilot studies were done using data from two sections of the MIMA project area (North Bridge, Meriam's Corner) representing high and moderate sensitivity strata within both riverine and upland zone environmental settings. Both of these sections of the park contained clusters of previously known prehistoric sites. There were six known sites in the North Bridge area and four known sites in the Meriam's Corner section of the park. With the exception of a single projectile point find spot in the Nelson Road area described by Baker (1980) there were no other sections of MIMA that contained known prehistoric sites. Since the North Bridge and Meriam's Corner areas were within MIMA, the known sites located there could be placed on base maps of the park. This made it possible for the pilot study to use the same random sampling procedure based on UTM grid units that was employed during the subsequent survey of MIMA. In the pilot study, a small (4%) random sample of 30 x 30 m sampling blocks was drawn from the high and moderate sensitivity strata within the North Bridge and Meriam's Corner areas. These block locations were overlaid on maps of these two sections of the park showing the locations of known prehistoric sites. The number of sampling blocks that fell within known sites was noted. In the riverine North Bridge area, half of the pilot study sample fell within known prehistoric sites. In the tributary stream/upland transition zone of Meriam's Corner, only a third of the blocks (high sensitivity stratum) fell within known prehistoric sites. Application of the statistical formula for estimating sample size to these results indicated that archeological investigations were not likely to provide much new information about the frequency, characteristics, or distribution of prehistoric sites in the riverine zone. Based on these results, the North Bridge area of MIMA was excluded from the subsurface testing conducted in the fieldwork stage of the survey. The pilot study also indicated that the high and moderate sensitivity strata in the upland zone would have to be sampled much more intensively than riverine zone strata to provide adequate site locational data in order to formulate an estimate of the population of sites in that zone.

To organize the random selection of 30 x 30 m sampling blocks or units, information on these units was recorded on a standard form. Information placed on this random sample record form included: the number of the block within a high or moderate sensitivity stratum; the UTM grid unit and base map sheet number; and the general location of the block within one of the six major subdivisions of MIMA.

Subsurface testing within MIMA during the fieldwork aspect of the survey was conducted in several stages. The first stage of fieldwork consisted of placing 15, 30 x 30 m sampling blocks within the high and moderate sensitivity strata to collect a 1% sample. Nine blocks were randomly placed in the moderate sensitivity stratum and six blocks in the high sensitivity stratum in this initial pilot study sample.

In the second stage of fieldwork, the approach to subsurface testing was modified since it was not possible to sample all of the high and moderate sensitivity strata within the park at the level required to reach a relatively high confidence level and low error factor. Five areas were selected within MIMA. Three of these were considered to have high sensitivity (Fiske Hill, Nelson Road, Elm Brook) and two areas were ranked as having moderate sensitivity (Bedford Road/Folly Pond, Nelson Road/Visitors Center Parking). Subsurface testing in these areas consisted of nine 30 x 30 m sampling blocks which resulted in a 10% sample of these areas. In some areas (Nelson Road, Elm Brook), the 10% sample included blocks that were part of the original 1% pilot sample.

In the third stage of subsurface testing, larger random samples were taken from three areas (Fiske Hill, Nelson Road, Folly Pond) to improve the statistical confidence level and error factor obtained from previous testing. Twelve (12)30 x 30 m sampling blocks were placed in these areas. One sampling block was placed in the Fiske Hill area, three blocks were added to the Nelson Road sample, and five blocks were excavated in the Folly Pond area. Since the Folly Pond area appeared to have the best potential (three sites identified) for providing an estimate of prehistoric site frequency with a relatively high statistical confidence level, three additional sampling blocks were excavated in that section of the park.

Two other high and moderate sensitivity areas were designated in the final stage of random sampling. The Hardy Hill (moderate sensitivity) and Massachusetts Avenue/Marrett Road (high sensitivity) areas were sampled at a level (20%) comparable to that done in the other study areas. Ten randomly placed 30 x 30 m sampling blocks were excavated in these two areas. A limited amount of judgmental sampling within two high sensitivity areas (Nelson Road, Folly Pond) was done in an attempt to increase the number of prehistoric sites in those sections of MIMA and improve the statistical confidence level for estimation purposes.

Five other locations with high and moderate sensitivity were also examined with judgmentally placed 30 x 30 m sampling blocks to refine the stratification scheme and possibly expand the inventory of known prehistoric sites within MIMA. The results of judgmental testing were also of potential value for addressing research problems guiding the survey within MIMA (the range of site locations in upland settings, variation in site size, contents, etc.).

All of the test pits within the 55, 30 x 30 m sampling blocks placed within MIMA were excavated by shovel following the soil stratigraphy in 10 cm arbitrary levels. The soil excavated from test pits was screened through 1/4 in mesh hardware cloth to recover any cultural material. Cultural materials were placed in plastic bags with labels containing provenience information and bags were numbered consecutively within each sampling block. Soil profiles exposed in each test pit were recorded on standard forms. Soil colors were recorded with a Munsell Soil Color chart and a soil sample collected from the center test pit of each sampling block. The provenience information for soil samples was recorded on an analytical sample form. A bag log recording the provenience and number of bags from each sampling block was also completed during fieldwork. Black/white and color photographs taken during fieldwork were recorded on a photo log form.

Laboratory and Analytical Methods

The laboratory procedures for this investigation followed those developed by the MIMA Archeological Project and the Archeological Collections Management Project of the Eastern Archeological Field Laboratory (currently referred to as the Archeology Branch of the Cultural Resources Center) of the National Park Service. When the artifacts were first received in the laboratory, they were cleaned with soft brushes. The artifacts were cleaned by block. As each block was done, the bags were checked off on the field bag list.

Once dry, artifacts were rebagged and put into Hollinger boxes to await cataloging. The bags of artifacts were arranged in numerical order by block number (where possible) and cataloged within each block in a consistent order (starting with the north unit and going to the south, east, west, northeast, southeast, northwest, southwest, center, center northeast, center southeast, center northwest and center southwest).

All of the artifacts were cataloged according to the National Park Service ANCS system. The Archeological Collections Management Project (ACMP) flow chart was used to classify and establish a hierarchy (i.e., ceramic, glass, metal, stone, etc.) for the objects. The artifacts which fell into a common typology within the same stratigraphic level were considered a "lot" and were assigned a "lot" number. A lot number is the same as the catalog number. The lot numbers began with number 34,310 and ran consecutively throughout the project area with the last number being 36,528. Lot numbers 34,961 to 34,972 were not used as MIMA had already used them for another project.

Next, an accession number was assigned to the project area. The same number was given to the entire project area. At first this was number 437 but was later changed at the request of the Park curator to number 439.

As the artifacts were cataloged, sets of four proof sheets were periodically sent to NPS for review and approval. Corrections were made where necessary. When cataloging was complete, the artifacts were placed in plastic bags according to artifact type. An acid-free tag was placed in each bag which indicated the project name (MIMA), provenience, catalog number, and accession number. Where applicable, site names were also put on the tags. These bags were separated into organic and inorganic groupings and placed in Hollinger boxes with acid-free labels attached indicating the project name (MIMA), site name (where applicable), accession number, and catalog numbers. The field tags for the artifacts bags were placed in plastic bags marked "tags" and placed with the artifacts in Hollinger boxes.

After the entire project was completed, archival records were created using the classifications found in ACMP. Field notes and photographs were placed in three-ring binders; other materials were placed in folders.

During excavation, soil samples were taken from each block (one per block). They were cataloged, tagged, and stored in the same manner as the artifacts. Before storing, however, soil samples were removed from their field bags and spread out on labeled trays to dry. Once dried, samples were rebagged and labeled with acid-free tags. Tags were placed in small plastic bags before being placed in with the soil samples.

After all the materials were cataloged (artifacts, archival records, soil samples, etc.) and all proof sheets sent to NPS for approval, computer catalog cards were printed. Cards used were of the two-part, one-part style. These cards were placed, unseparated, in a Hollinger box to await delivery to MIMA.

Prehistoric Cultural Material

The archeological investigations within MIMA provided a relatively small sample of prehistoric cultural material for analysis. The probability and judgmental subsurface testing carried out in MIMA identified a number of locations containing evidence of prehistoric activity. This evidence consisted mostly of very small "find spots" of cultural material or small sites. The amount and diversity of cultural material recovered from these find spots and sites was very limited, consisting almost entirely of chipping debris (less than 20) with the exception of one bifacial tool blade and a single piece of modified debitage (retouched flake). Analysis of this material consisted mostly of identifying the chipping debris in terms of lithic raw material and recording its general size range. Pieces of chipping debris were also examined for evidence of modification (retouched edges) or use wear. Lithic materials were identified by comparison with samples in a lithic type collection maintained at PAL, Inc. This type collection includes materials from the major lithic source areas in eastern/ southeastern Massachusetts (Blue Hills, Lynn, Mattapan Volcanic Complexes) as well as sources outside the southern New England region (New York, Maine, New Hampshire, etc.). It also contains samples of lithic materials frequently used by prehistoric groups in the Sudbury/Assabet/Concord River drainages such as Westboro Quartzite, lithic tuff or mylonite, and Cambridge Argillite.

Although the chipping debris was not diagnostic of any particular temporal period or cultural group, it was possible in at least one case to suggest a temporal affiliation for debitage based on known patterns of lithic resource use in the Sudbury/ Assabet/Concord River drainage.

Other information derived from the samples of chipping debris collected during the survey were rough estimates of densities and the horizontal and vertical extent of cultural material within sites. It was also possible in some cases to suggest which stage of a lithic reduction sequence (on-site activity) might be represented by the chipping debris based on a few general attributes (size, thickness, platform shape, etc.).

Historical-Period Cultural Material

The subsurface testing conducted by PAL, Inc. during the archeological survey of MIMA was designed to locate and identify prehistoric cultural resources using an estimation approach. Few of the random sampling units, (30 x 30 sq m blocks), which have been examined were located in close proximity to known or identified historical structures, sites, or roadways. The majority of these testing units were located away from areas of concentrated historical settlement or activity, being situated instead in or near old fields, pastures, and/or woodlots.

A low density of historical cultural material was recovered from the testing units examined within MIMA. In surveys conducted in similar areas, this low density scatter of historical material located in agricultural fields has been referred to as "field trash". This term refers to small fragments of ceramics, glass, nails, coal, and other pieces of discarded historical materials commonly found archeologically in low density scatters in historical New England fields. This material, consisting of household trash and refuse from farmyards, became mixed with soil and was distributed across the landscape as a result of the plowing, composting, filling, and/or landscaping of fields, pastures, and yards (Gallagher 1987). The low density presence of such small fragments of cultural material in a suspected old field is one indicator that the area was once cultivated.

The analysis of this material from MIMA focussed on several problems. These research problems were the temporal association of the historical cultural material found as field trash, its density and spatial distribution, and the relationship between the observed distribution, historical-period agriculture, and refuse disposal practices.

It was anticipated that certain diagnostic artifacts (e.g., ceramics, pipe stems, and nails) would be analyzed, where quantities permitted, to determine the temporal affiliation of the material. A mean ceramic date formula (South 1978), the Binford-Harrington pipestem dating formula (Binford 1978; Harrington 1978), and manufacturing indicators on nails (Nelson 1968:3,7; Towle and MacMahon 1986:65) are among the methods which can be utilized to determine the approximate age of recovered historical cultural material assemblages (Figure 2-3, Tables 2-3, 2-4). For a reliable date to be calculated using these methods it is necessary to have "an *adequate sample*, that is, a large enough sample to be representative of the population being dated" (Binford 1978:67). "A large, tightly controlled sample is desirable" (South 1978:75); reliability of the calculated mean date is much lower for a small sample. The size of the assemblages (by testing block) of ceramics, pipestems, and nails recovered during the prehistoric survey of MIMA were too small to yield reliable occupation/deposition dates. Due to the small sample sizes recovered from the testing blocks, mean dates were not utilized in the final analysis of the recovered historical cultural material. Likewise, *terminus post quem* dates, referred to by Noel Hume (1985:11) as "the cornerstone of all archeological reasoning," were not utilized due to the small sample sizes. It was

$$Y = \frac{\sum_{+=1}^{n} x_i - f_i}{\sum_{+=1}^{n} f_i}$$

where y = Mean Ceramic Date

x = the median date for the manufacture of each ceramic type (type median).

f_i = the frequency of each ceramic type (sherd count).

n_i = the number of ceramic types in the sample

Figure 2-3. Formula for calculating mean ceramic date.

Table 2-3. Dating ranges based on stem diameters of clay tobacco pipes and formula for calculating mean pipesteam date*.

STEM DIAMETER (inches)	*DATE RANGE*
8/64	1620 - 1650
7/64	1650 - 1680
6/64	1680 - 1710
5/64	1710 - 1750
4/64	1750 - 1800
3/64	1800 -

FORMULA: $Y = 1931.85 - 38.26 X$

Where - Y is the mean date of group

X is the mean hole diameter of group

eg.	*Diameter*	*Number of Stems*	*Product*
	-- x	--	= --
	-- x	--	= --
	---------	---------	
	A	B	

$X = B/A$

* Binford 1978; Harrington 1978

Table 2-4. Dating ranges based on the method of manufacture of nails*.

Type of Nails	*Date Range*	*Mean Date*
Hand Wrought Nails	17th c. - early 19th c.	c. 1725
Early Machine Cut Nails with Handmade Heads	c. 1790 - c. 1810	c. 1800
Machine Cut Nails, Indeterm.	c. 1790 - present	c. 1845
Late Machine Cut Nails	c. 1840 - 1885	c. 1862
Wire Nails	post 1850 - present	c. 1920

* Nelson 1968:3,7; Towle and MacMahon 1986:65

considered unreasonable to attempt to assign a date to the historical cultural material recovered without known site associations on the basis of the date(s) of manufacture of an inadequate sample of artifacts.

Three general categories of historical-period cultural material were included in the analysis of the density and/or distribution of field trash relative to known landscape features. The three categories selected were: building-related material (nails, window glass, and brick), domestic items (ceramic sherds), and organic refuse (bone, shell).

The distribution of "field trash" within MIMA was examined through analyzing the relative mass of the given category of historical cultural material located within each testing unit within a geographic context. The formula used to calculate relative mass involved multiplying the volume of the excavated soil from each test pit in the block (test pit length x width x depth) by the number of items of cultural material in the category. The resulting number may be expressed as the number of items per cubic m of excavated soil. Using relative mass or density, rather than simple weights or counts, makes comparisons between artifact categories or between units more significant. The location of each testing unit relative to known historical-period (17th to 20th century) sites (i.e., domestic and agrarian sites--houses, barns) and transportation corridors (i.e., roads/cartpaths) was identified and measured. This information was then used to analyze and interpret distributional patterning of the recovered historical cultural material. Two general relationships between the recovered field trash distribution were examined. First, the relationship between the location of historical domestic/agrarian sites and the distribution of refuse was examined. It is generally assumed that the density of historical cultural material (often referred to as "sheet refuse" when associated with a house yard) decreases with increased distance from the structure and/or activity areas. Density of historical cultural material was compared for each testing unit, controlling for the distance to the nearest known contemporary historical structure present. Second, the relationship between the historical road network and the distribution of historical cultural material was also examined. The distance between each testing unit and the nearest contemporary roadway(s) was measured. Differences in the density of cultural material were then compared to the distance from historical-period roads.

Historical agricultural practices, which may have spread historical cultural material from houseyards and barnlots into fields, were examined through documentary sources and analogies drawn from previous archeological research. A brief examination of changing patterns of refuse disposal through time also considered a number of issues based on project-specific and regional data, and archeological analogies.

Four expected patterns of refuse disposal were considered. These patterns were: disposal of trash in plowed versus unplowed lands; composting of fields under active cultivation; discrete dumping or filling episodes; and dumping along roadsides/highways.

It was expected that historically cultivated fields (i.e., lands that had been tilled at least once by EuroAmericans) would be more likely to contain historical cultural material than uncultivated lands (e.g., woodland, swamps, non-cultivated pastures or meadows, etc.). Cultural material would be expected, at least in small amounts, in tilled fields, and much less would be expected in uncultivated lands.

Cultivated fields which had been fertilized using barnyard manure and/or compost were expected to contain field trash, while non-fertilized cultivated fields would be less likely to contain historical cultural material. The distribution of refuse predicted by this pattern would consist of a low density, reasonably even, distribution of field trash within cultivated fertilized fields, while little or no historical cultural material would be expected within non-fertilized fields.

Discrete dumping involves two related practices: a) disposal of trash through intentional dumping, usually out of sight; and b) the use of domestic and agrarian refuse and building debris mixed with soil to fill old cellarholes or erosional gulleys. The expected distribution representative of this pattern would consist of high density concentrations of historical cultural material within restricted areas (e.g., specific dump areas, filled cellarholes, etc.).

With respect to roadside dumping, it is expected that the density of historical cultural material would decrease with increasing distance, and therefore decreasing accessibility, from the road. Temporal changes in any or all of the above patterns of refuse disposal would be expected to occur through time.

The results of the analysis of temporal association, density, and spatial distribution and documented historical methods of agricultural land use and refuse disposal provided a set of actual or observed patterns based on the MIMA survey data. These observed patterns were then compared to the expected patterns of refuse disposal to determine which modes of refuse disposal were represented in the survey data.

Chapter 3

Results

Background Research: Archeological Sensitivity Stratification

The synthesis of information collected and analyzed during the background research stage of the survey indicated that MIMA includes a diversified mosaic of areas expected to have high or moderate potential to contain prehistoric cultural resources. Many sections of MIMA have general locational attributes similar to other areas in the Sudbury/Assabet/Concord River drainage known to contain such sites.

Existing Data Base

An analysis of the information currently available on known sites inside MIMA and within a roughly one mile (1.6 km) radius of the park was used to develop criteria for stratifying the park into zones of expected sensitivity for prehistoric cultural resources. This group of known prehistoric cultural resources included 68 sites and was considered to be a representative sample of the existing data base for the section of the Sudbury/Assabet/Concord River drainage surrounding MIMA. One of the problems with the available inventory of known sites, however, is that it includes a limited number of sites in upland locations more than 1/2 mile (.8 km) from the Concord River. The limited representation of upland zone sites is a product of previous surveying and artifact collecting that focused on areas under agricultural land use in the riverine zone or along the lower sections of tributary streams. This bias is a recognized problem of site inventories, and its effect on reconstructions of prehistoric settlement and resource use in the Sudbury and Assabet River drainages has been noted (Ritchie 1983a). For example, within the sample of 68 sites analyzed for this study, 37 sites (54.4%) were in the riverine zone, and 18 (26.5%) sites were in a general transition area between the riverine and upland zone along tributary streams or wetlands. Only 13 sites (19.1%) were in upland zone settings, usually more than one mile from the Concord River.

An analysis of other locational attributes of the 68 sites showed that they occur on 16 different soil series. The frequency of occurrence of these soil types on the sites is shown in Table 3-1. Many site areas contained more than one soil series; as the table shows the Deerfield, Windsor, Hinckley, Merrimac, and Wareham series were the most frequently occupied soils. Soil series were grouped according to the type of surficial deposit from which they were derived in order to determine if there was any overall pattern. This analysis clearly showed that a majority of the currently known prehistoric sites were located on soils derived from sand/gravel glacial outwash such as outwash plains and kame deltas or terraces. For example, a total of 58 sites (86.5%) were situated on soil series (Deerfield, Windsor, Hinckley, Merrimac, Agawam, Carver, Wareham, Sudbury, Paxton, Limerick) belonging to the glacial outwash group. Only nine sites (13.4%) were located on soil series (Canton, Charlton-Hollis-Rock outcrop, Scituate, Montauk, Woodbridge) belonging to the glacial till/ground moraine group.

Table 3-1. Frequencies of occurrence of soil types on a sample of known prehistoric sites near MIMA.

Soil series	*Frequency of occurrence on known prehistoric sites*	
Deerfield	26	(38%)
Windsor	21	(31%)
Hinckley	8	(11%)
Merrimac	8	(11%)
Wareham	8	(11%)
Paxton	5	(7.4%)
Walpole	2	(3%)
Limerick	2	(3%)
Agawam	1	(1.4%)
Carver	1	(1.4%)
Sudbury	1	(1.4%)
Scituate	5	(7.4%)
Montauk	4	(5%)
Canton	2	(3%)
Charlton-Hollis-Rock outcrop	1	(1.4%)
Woodbridge	1	(1.4%)

Among the inventory of sites considered, a further distinction can be made to include three general settings for sites in the glacial outwash deposits. They include those in low lying riverine and stream settings; transitional areas; and upland zones. They primary difference in the location of sites relative to soil type was the presence of more sites on till/ground moraine derived soils in the upland zone. However, this is biased by the higher frequencies of known sites in the riverine zone and the lack of comparable survey data for the upland environmental zone. This bias was considered when constructing the sensitivity stratification scheme for the MIMA survey. Areas with glacial till or ground moraine deposits were not considered to have low sensitivity based on soil type alone since the available data indicated that prehistoric sites can occur on till or ground moraine in upland settings. One previous survey conducted adjacent to the Virginia Road section of MIMA located a small, high density cluster of prehistoric sites on ground moraine derived soils (Montauk, Scituate series) (Mowchan, Schneiderman, and Ritchie 1987). It was expected that other sites like these could exist within the park.

The approximate distance of known sites to the nearest water source (river, stream, wetland) was also examined. The data was considered to be less reliable than other locational information because it was often missing from the site records examined and had to be estimated from USGS topographic maps. Distance was divided into five categories (less than 50 m, 50-100 m, 100-150 m, 150-200 m, more than 200 m). Most of the known sites appeared to be located less than 50 m (32 sites, 47.7%) and between 50 to 100 m (24 sites, 35.8%) from a water source. Beyond distances of 100 to 150 m (8 sites, 11.9%) there were only a few previously known sites. Two sites appeared to be about 200 m from water and three sites were located more than 200 m from the nearest water source.

Information on periods of occupation was available for 39 (58%) of the 68 sites in or near MIMA. Evidence of PaleoIndian (3 sites) or Early Archaic (3 sites) period use was restricted to sites located in the riverine zone. Over half of the 22 Middle Archaic components in this sample of sites were also in the riverine zone, however they did occur on sites in transitional tributary stream/wetland and upland settings. This distribution was similar to that observed in the Sudbury and Assabet drainages where small Middle Archaic sites appear in upland areas outside a riverine zone of concentrated settlement. Late Archaic components were the most widely distributed in all three general environmental settings, corresponding to a general pattern observed of the local and subregional scale (Dincauze 1974).

In contrast to the Late Archaic pattern, Woodland period components as a group were concentrated on riverine zone sites. Only one component (Late Woodland) was reported from an upland zone site location. The apparent absence of sites with Woodland period components in upland areas may be partially due to a bias in the site inventory since recent surveys in the middle Sudbury and Assabet drainages have located a number of Middle Woodland sites near upland zone streams, ponds, and wetlands (Gallagher, Ritchie, and Davin 1985; Ritchie 1980). The distribution of the various temporal components in the three general environmental settings is shown in Table 3-2.

As noted earlier, the combined body of data from background research and a disturbance assessment of MIMA divided the park into strata of expected sensitivity for prehistoric cultural resources. This research and assessment indicated that in general, the prehistoric sites within a large percentage of MIMA were expected to be in relatively intact condition. A primary reason for this was the persistence of agricultural land use in this area into the mid-20th century. Recent residential or commercial development is concentrated in a linear zone along Massachusetts Avenue and various connecting side roads.

Expectations

MIMA contains numerous locations with general attributes (surficial deposit/soil type, proximity to water, minimal slope, etc.) similar to those of prehistoric sites recently discovered in upland environmental settings. These areas were considered to have high archeological sensitivity. In particular, the previously known sites adjacent to MIMA along the upper sections of Elm Brook (Hartwell Farm, Barthel sites) and the headwaters of the Shawsheen River (Black Rabbit, Black Walnut, Perk sites) provided good examples of high sensitivity zones. Based on the synthesis of background information, the "stereotypical" prehistoric site expected within the high sensitivity zones in MIMA was a small (ca. 500 sq m), temporary camp. We would expect these sites to be located on Hinckley, Windsor, Deerfield or Scituate soils within 50 m of a water source. They would likely containing cultural material from a single occupation, most likely during the Late Archaic period.

Within MIMA, high sensitivity zones or strata were identified mostly along the margins of wetlands along the upper section of Mill, Elm, and Hobbs Brooks on areas of glacial outwash derived soils. Other, smaller areas of expected high sensitivity were designated further from water sources. These areas were primarily on the crests of elevated knolls or in protected hollows containing soils derived from glacial till or ground moraine.

Moderate sensitivity areas were mostly larger areas with glacial outwash soil types further away from water sources (more than 150 m) and formed peripheral zones around high sensitivity strata. Most of the upland areas containing soils derived from glacial till or ground moraine were designated as moderate sensitivity zones.

Moderate sensitivity areas were expected to contain mostly small (less than 100 sq m) prehistoric sites resulting from single episodes of activity (resource collection/foraging, processing). These sites would typically contain low density (less than 10 pieces of material per sq m) and diverse (chipping debris of one lithic material) assemblages of cultural material. Many of these sites could be "find spots" of isolated pieces of chipping debris or chipped stone tools like projectile points and bifaces. It was also possible that moderate sensitivity areas within MIMA could contain a few larger sites (500 to 1000 sq m) consisting of deposits of cultural material from one or two brief occupations. Moderate sensitivity areas were expected to contain fewer sites and they were likely to be more widely dispersed than those in high sensitivity areas.

Low sensitivity zones were generally wetlands and low-lying, poorly drained areas or upland hillsides with rocky, steeply sloping (15-25%) surfaces. Sections of the park showing evidence of previous disturbance (building demolition, sand/gravel extraction, grading or filling, etc.) from types of land use other than agricultural activity (plowing) were also considered to have low sensitivity. Any evidence of prehistoric sites in low sensitivity areas was expected to consist of cultural material found in disturbed contexts, where sites had been damaged or destroyed by the kinds of land use mentioned above. The sensitivity strata within MIMA are depicted in Figures 3-1 through 3-6.

Subsurface Investigations: Prehistoric Period Cultural Resources

Following the stratification of the MIMA project area into zones of expected sensitivity for prehistoric cultural resources, subsurface testing was conducted to locate sites and provide some verification of the sensitivity scheme. Subsurface testing was carried out in several stages only within the high and moderate sensitivity zones of the non-riverine upland areas. The North Bridge area was excluded from subsurface testing since, as noted,

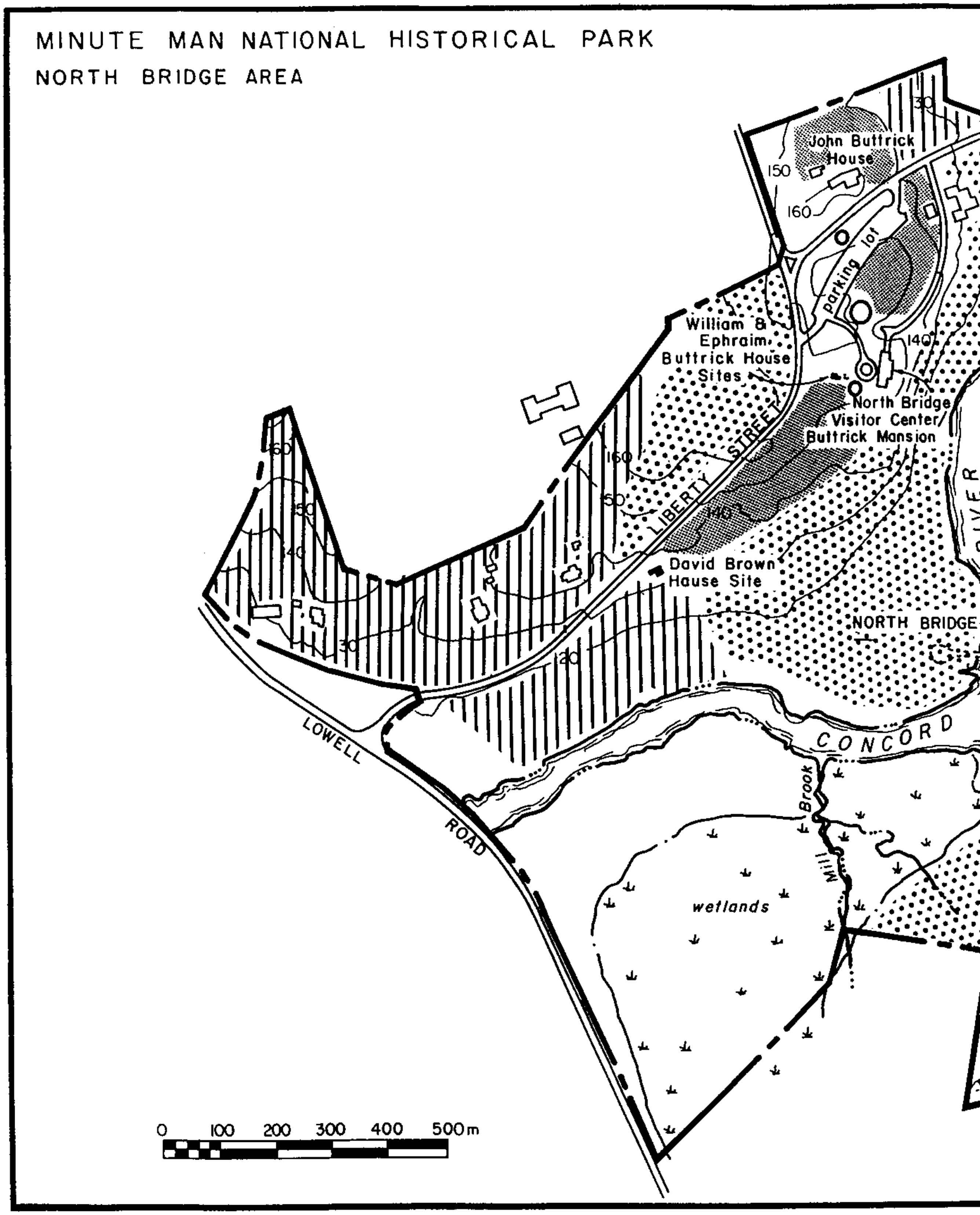
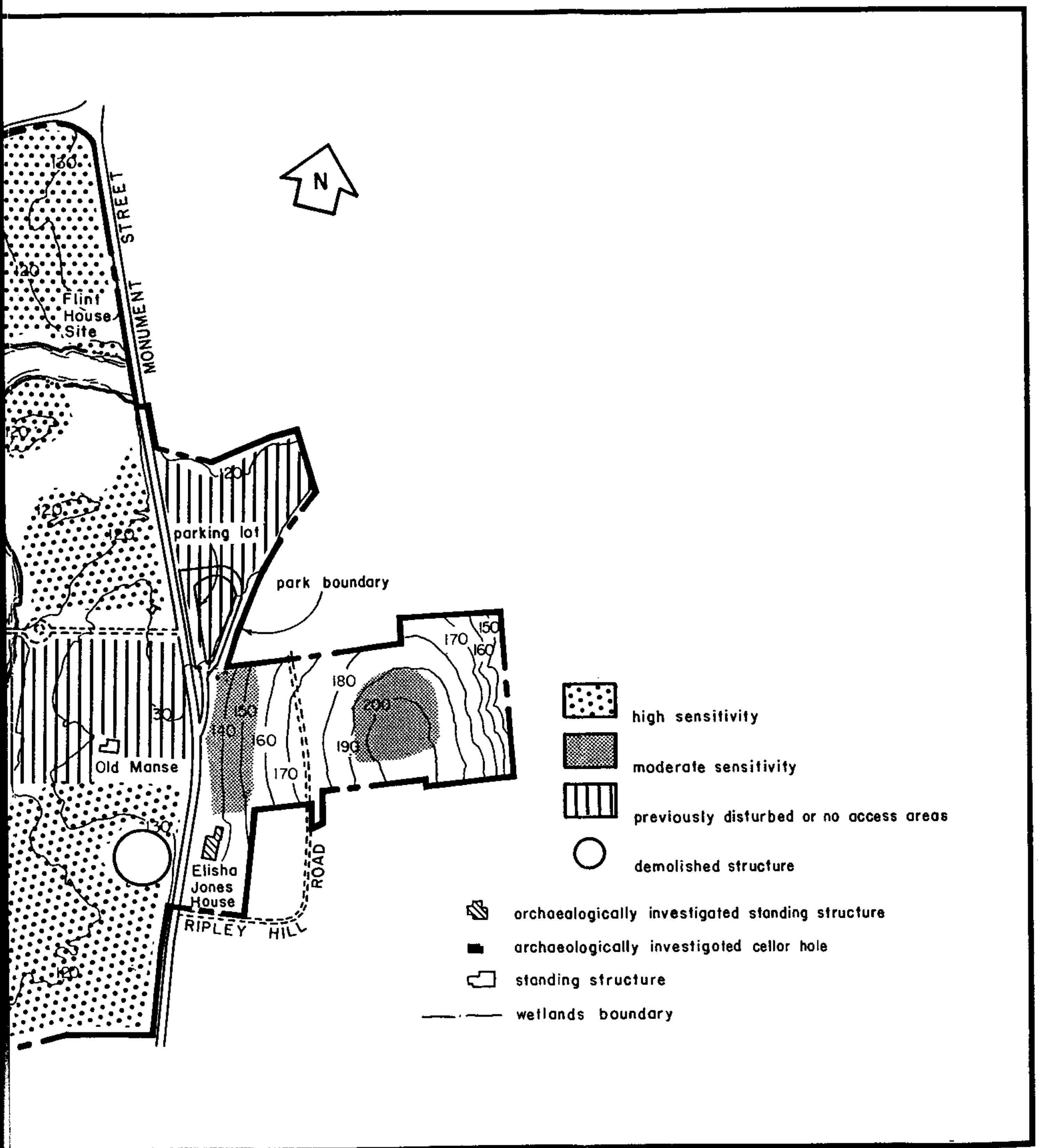


Figure 3-1. Stratification of North Bridge section of MIMA into zones of expected archeological sensitivity.


N
MONUMENT STREET
Flint House Site
parking lot
park boundary
Old Manse
Elisha Jones House
RIPLEY HILL ROAD
high sensitivity
moderate sensitivity
previously disturbed or no access areas
demolished structure
archaeologically investigated standing structure
archaeologically investigated cellar hole
standing structure
wetlands boundary

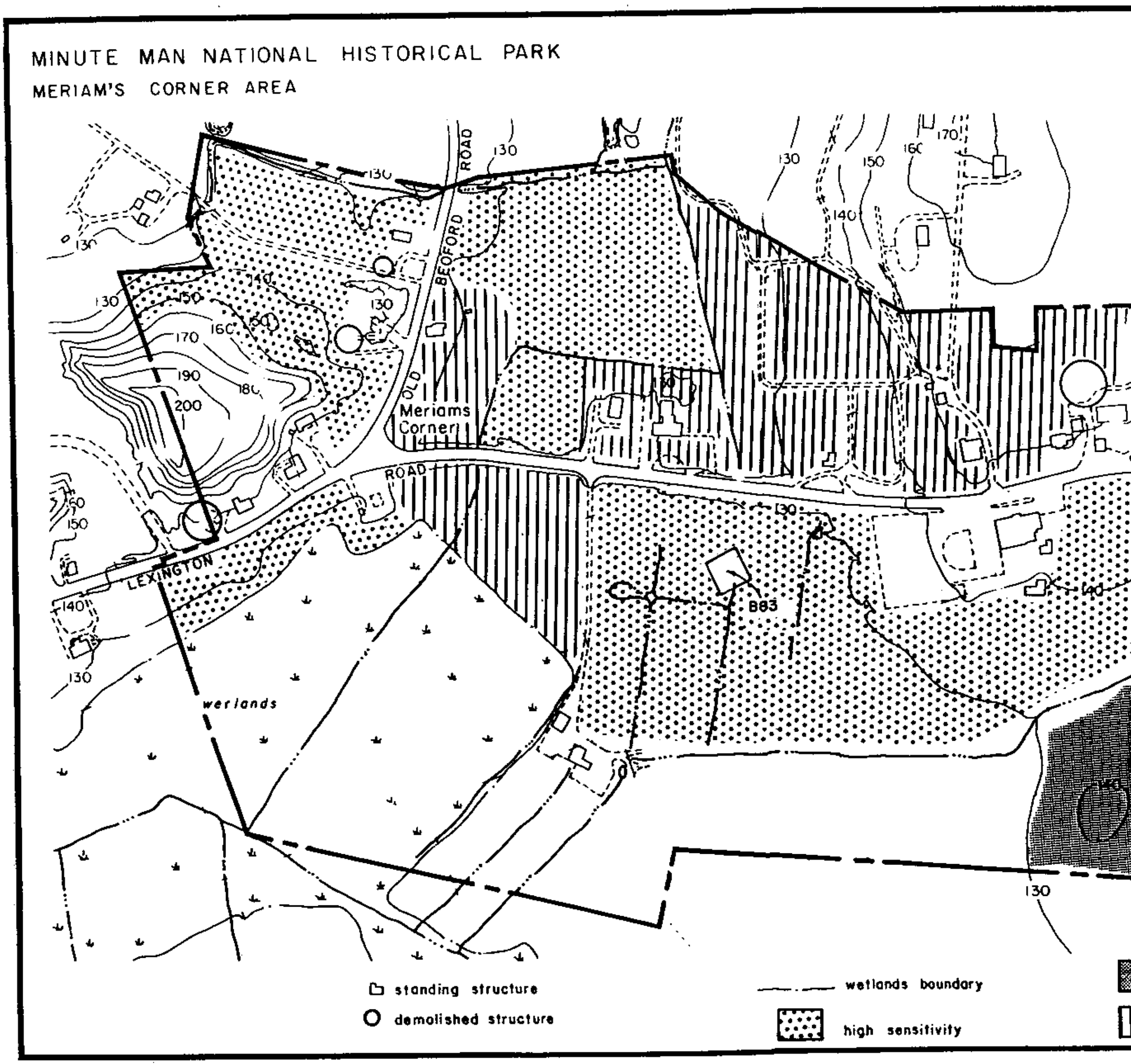
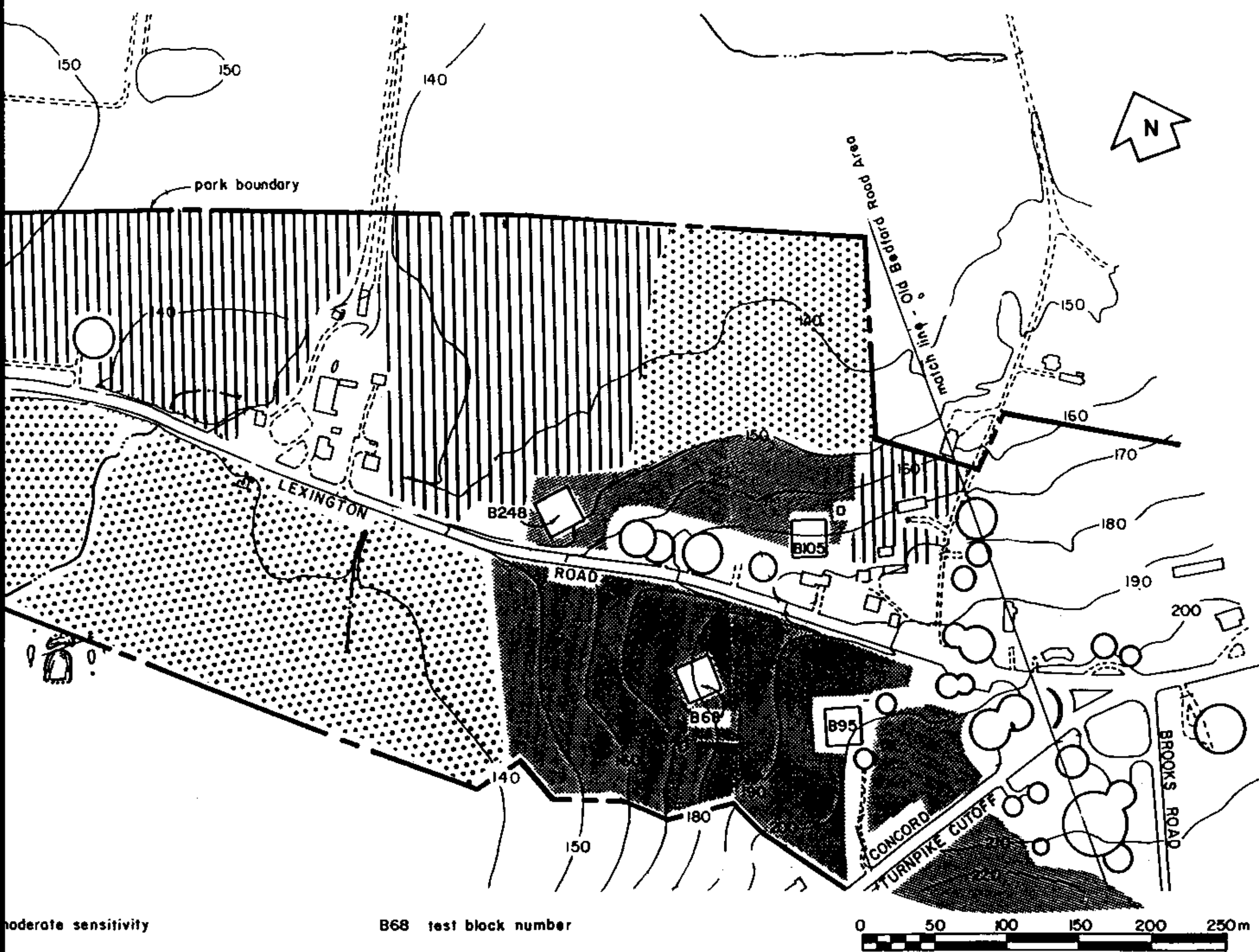


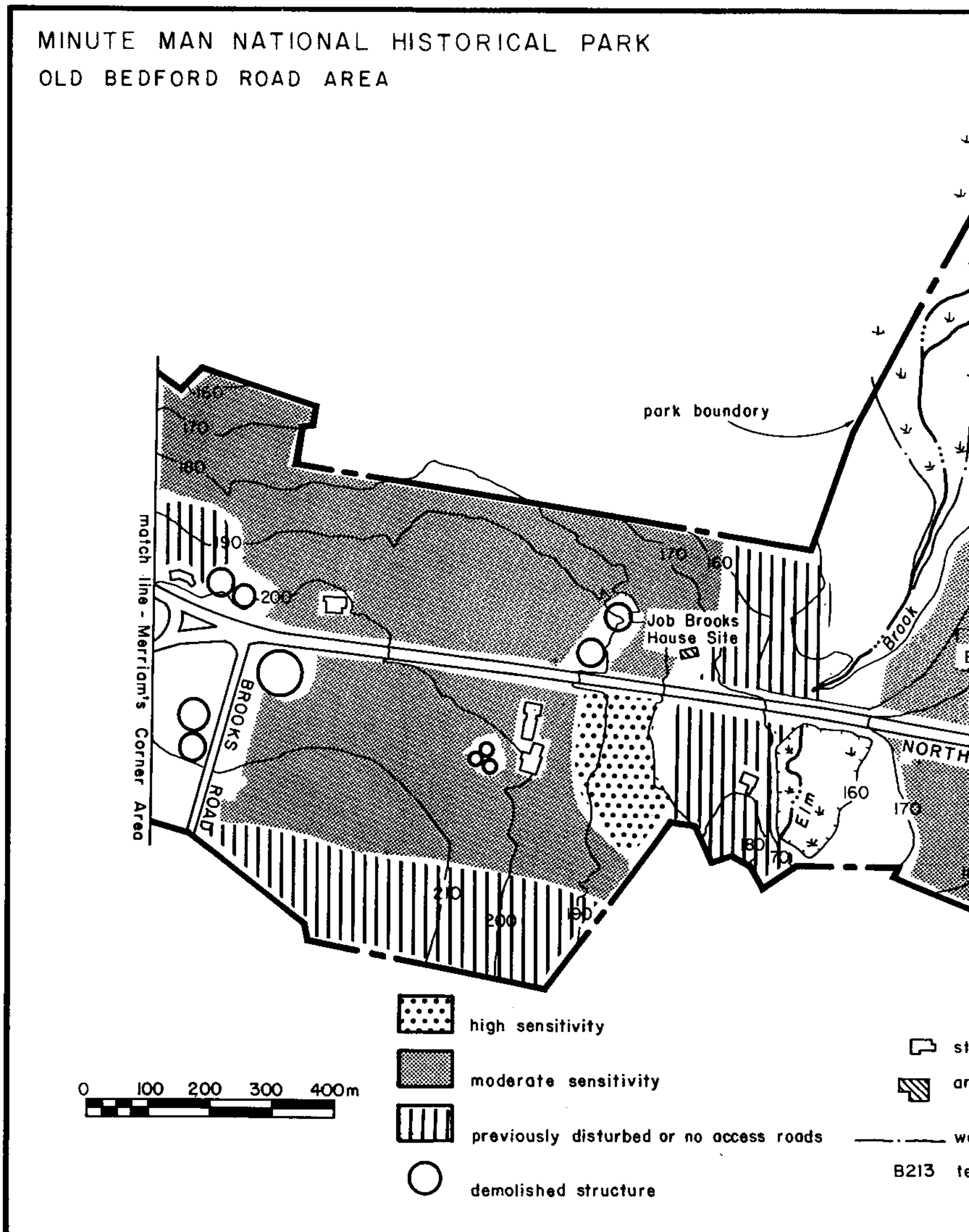
Figure 3-2. Stratification of Meriam's Corner/Hardy Hill section of MIMA into zones of expected archeological sensitivity.



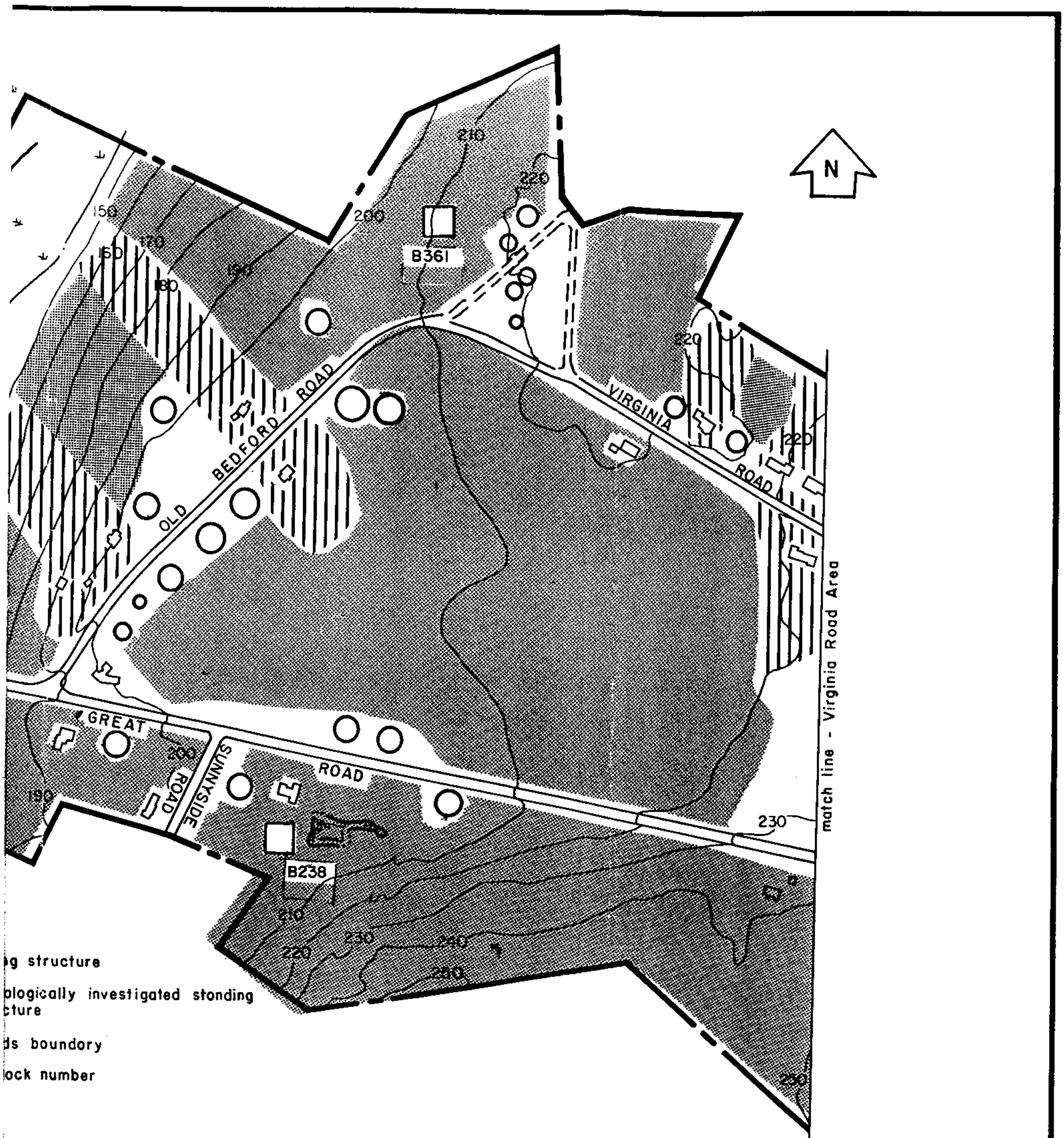
noderate sensitivity

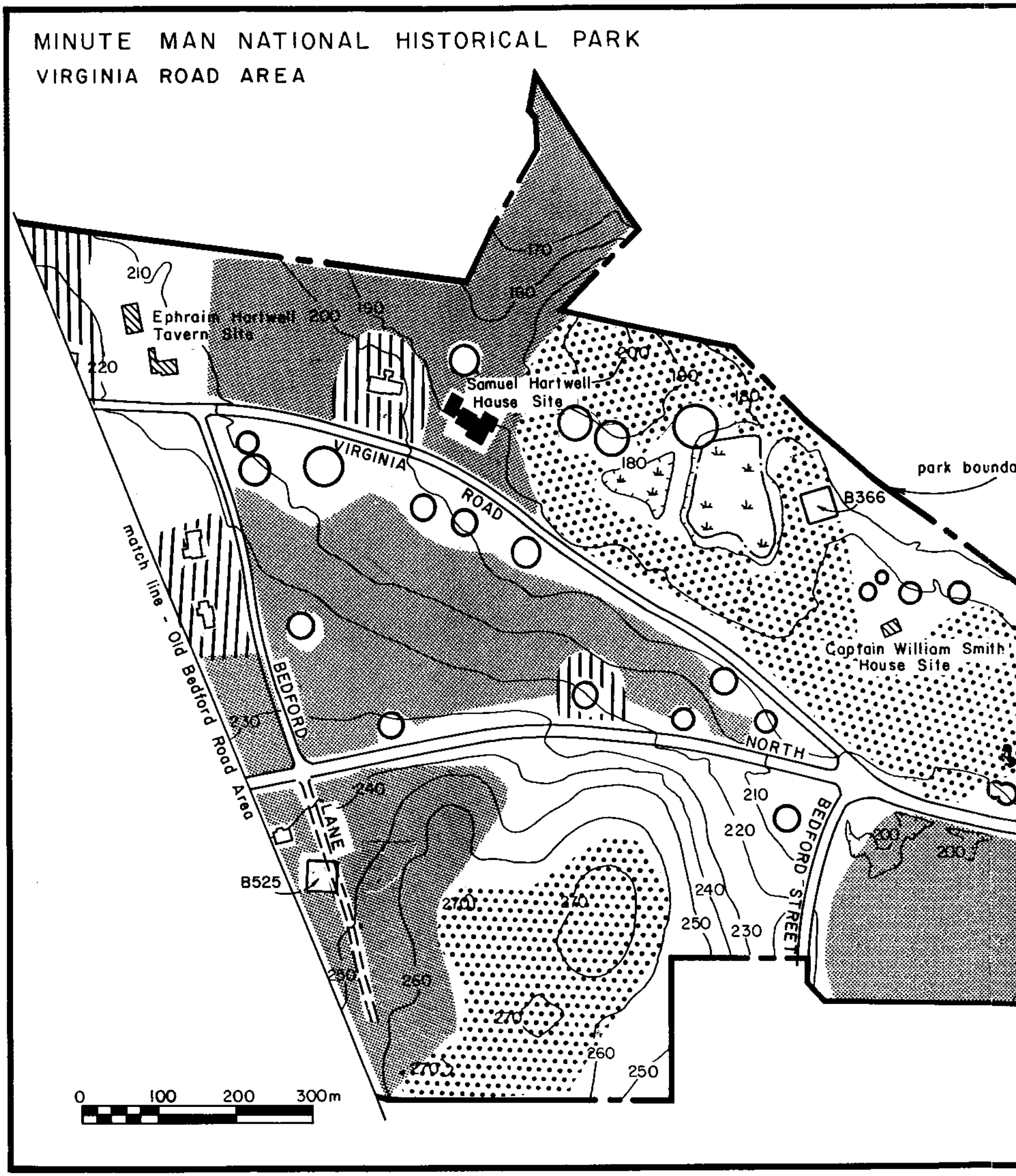
B68 test block number

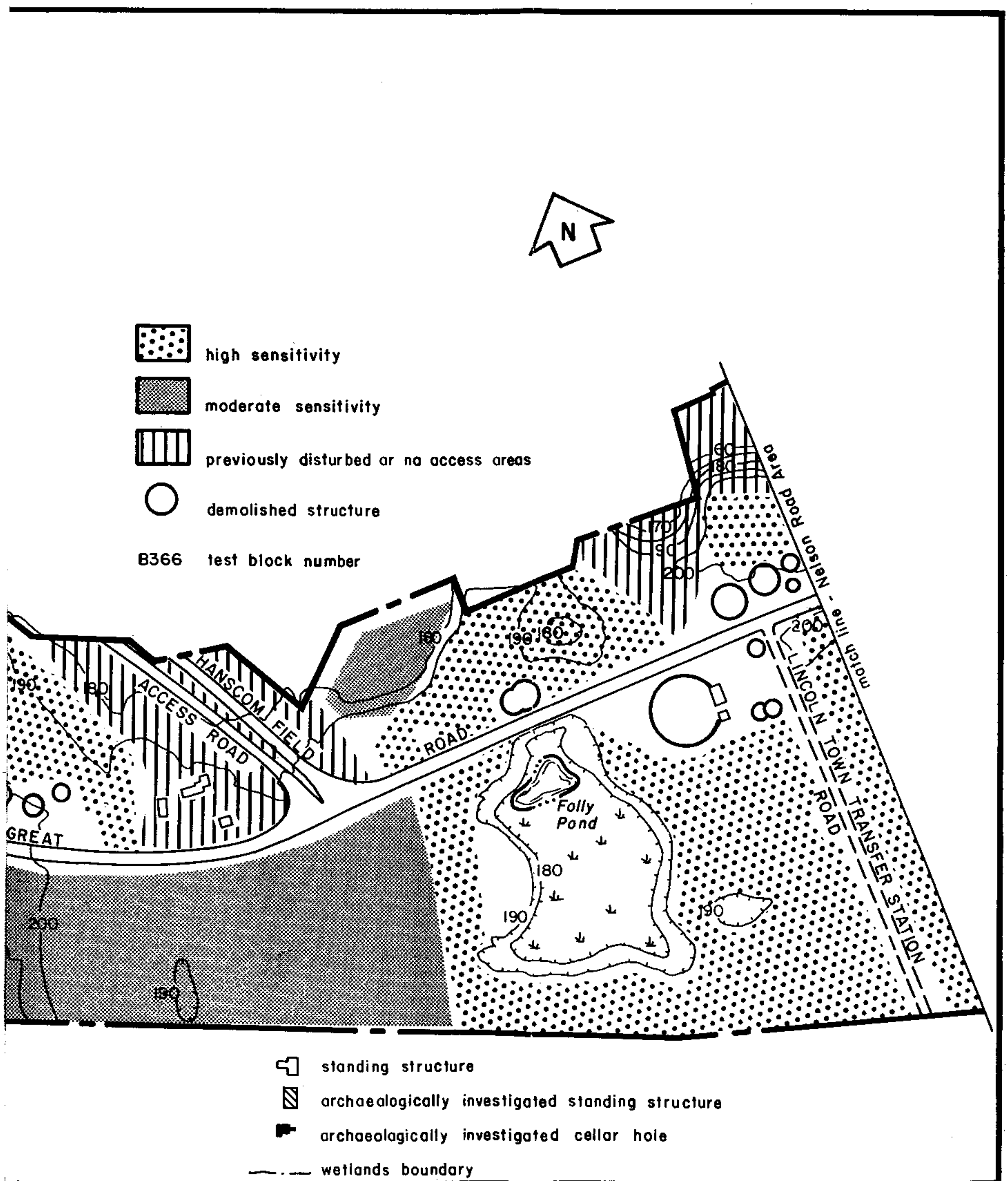
reviously disturbed or no access areas



MINUTE MAN NATIONAL HISTORICAL PARK
OLD BEDFORD ROAD AREA
park boundary
match line - Merriam's Corner Area
BROOKS ROAD
Job Brooks House Site
Brook
Elm
NORTH
160
170
180
190
200
210
high sensitivity
moderate sensitivity
previously disturbed or no access roads
demolished structure
0 100 200 300 400m
B213


N
B361
B238
OLD BEDFORD ROAD
VIRGINIA ROAD
GREAT ROAD
SUNNYSIDE ROAD
ROAD
150
160
170
180
190
200
210
220
230
240
250
190
200
210
220
230
250
match line - Virginia Road Area
ng structure
ologically investigated standing
cture
ds boundary
ock number


MINUTE MAN NATIONAL HISTORICAL PARK
VIRGINIA ROAD AREA
Ephraim Hartwell Tavern Site
Samuel Hartwell House Site
Captain William Smith House Site
park bounda
B366
B525
VIRGINIA ROAD
NORTH
BEDFORD
LANE
BEDFORD STREET
match line - Old Bedford Road Area
0 100 200 300m


N
high sensitivity
moderate sensitivity
previously disturbed or no access areas
demolished structure
B366 test block number
HANSCOM FIELD
ACCESS ROAD
ROAD
GREAT
Folly Pond
LINCOLN TOWN TRANSFER STATION ROAD
match line - Nelson Road Area
standing structure
archaeologically investigated standing structure
archaeologically investigated cellar hole
wetlands boundary

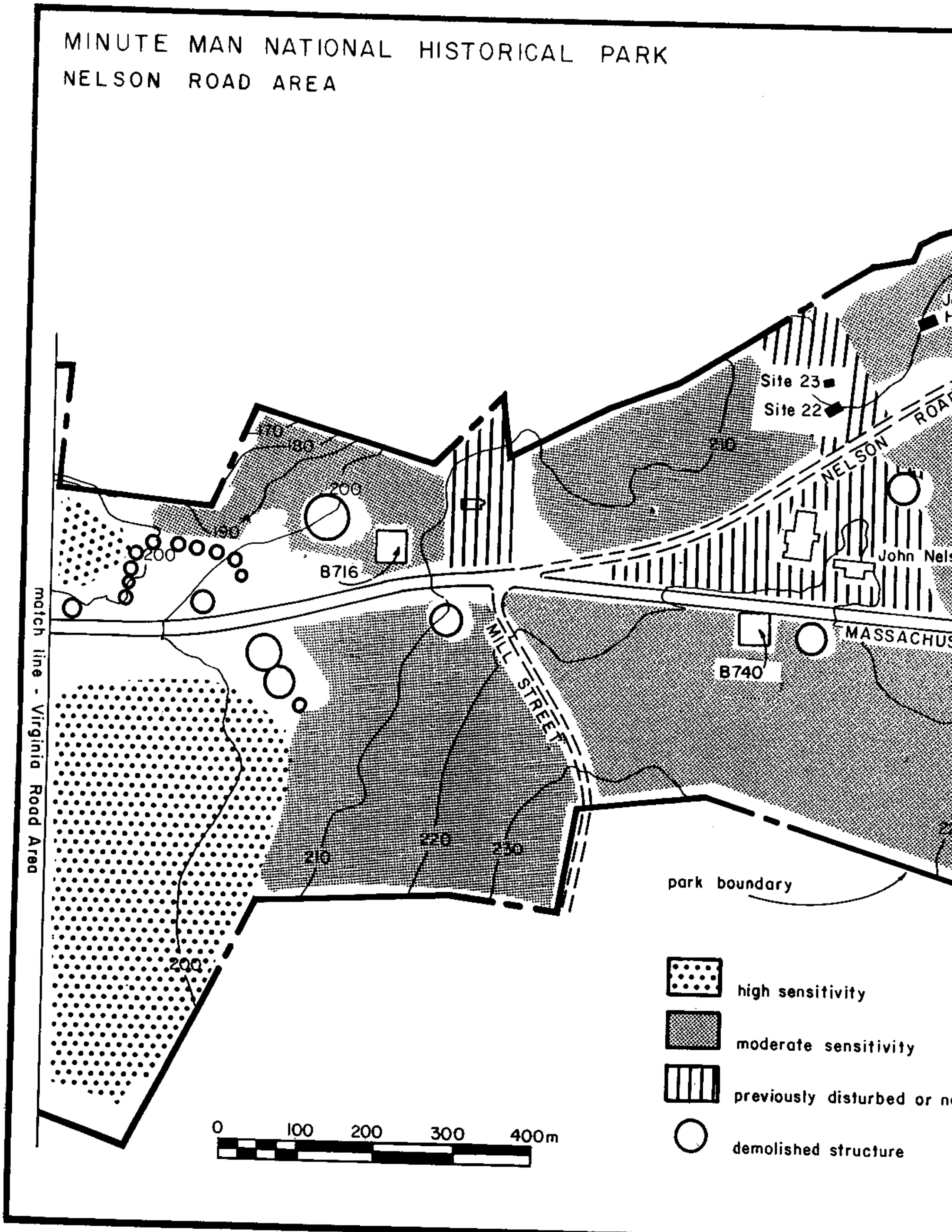
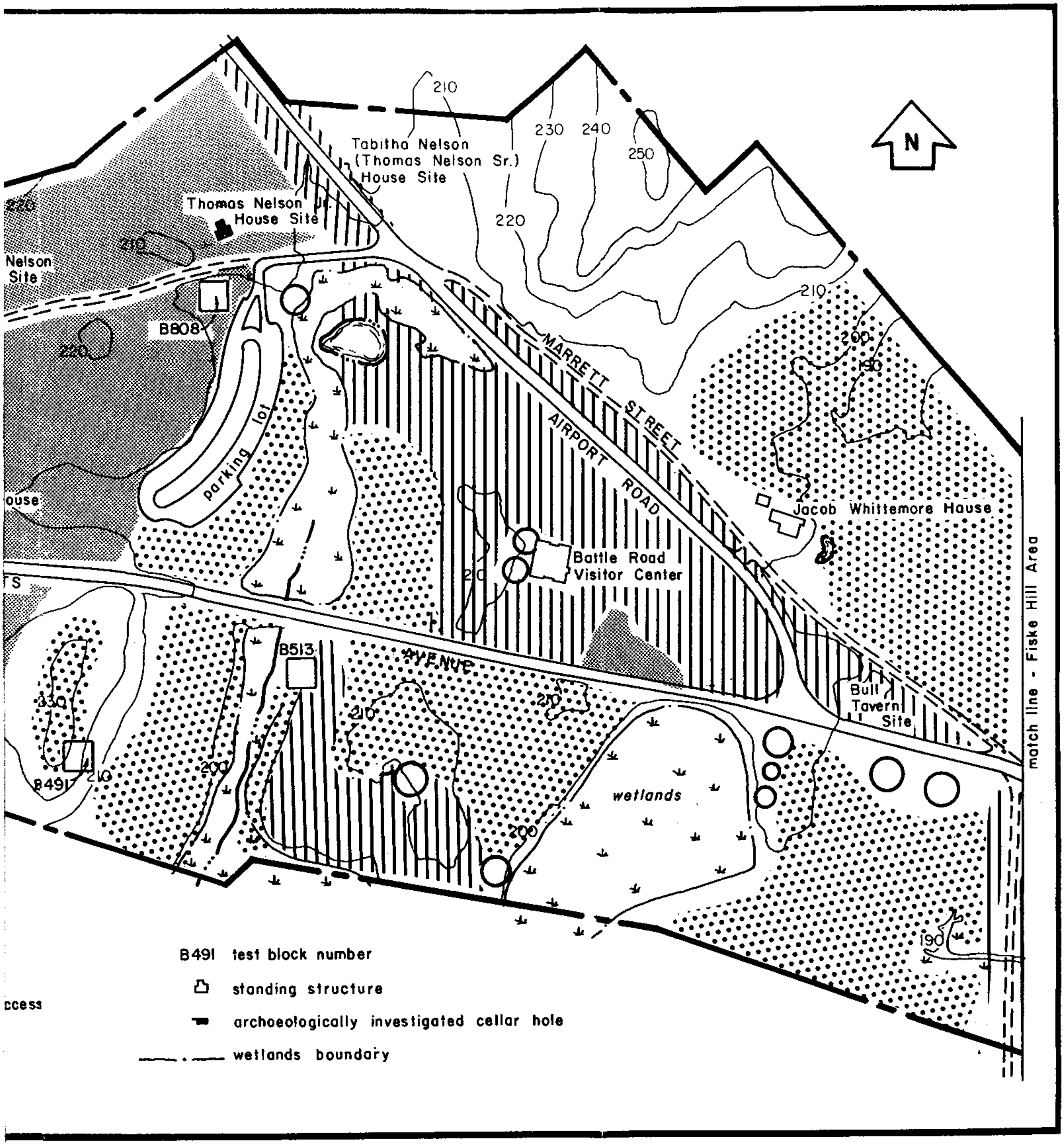


Figure 3-5. Stratification of Nelson Road section of MIMA into zones of expected archeological sensitivity.



N
Tabitha Nelson (Thomas Nelson Sr.) House Site
Thomas Nelson Jr. House Site
Nelson Site
B808
parking lot
ouse
MARRETT STREET
AIRPORT ROAD
Jacob Whittemore House
Battle Road Visitor Center
AVENUE
B513
Bull Tavern Site
B491
wetlands
match line - Fiske Hill Area
210
220
230
240
250
200
190
330
TS
B491 test block number
standing structure
archoeologically investigated cellar hole
wetlands boundary
ccess

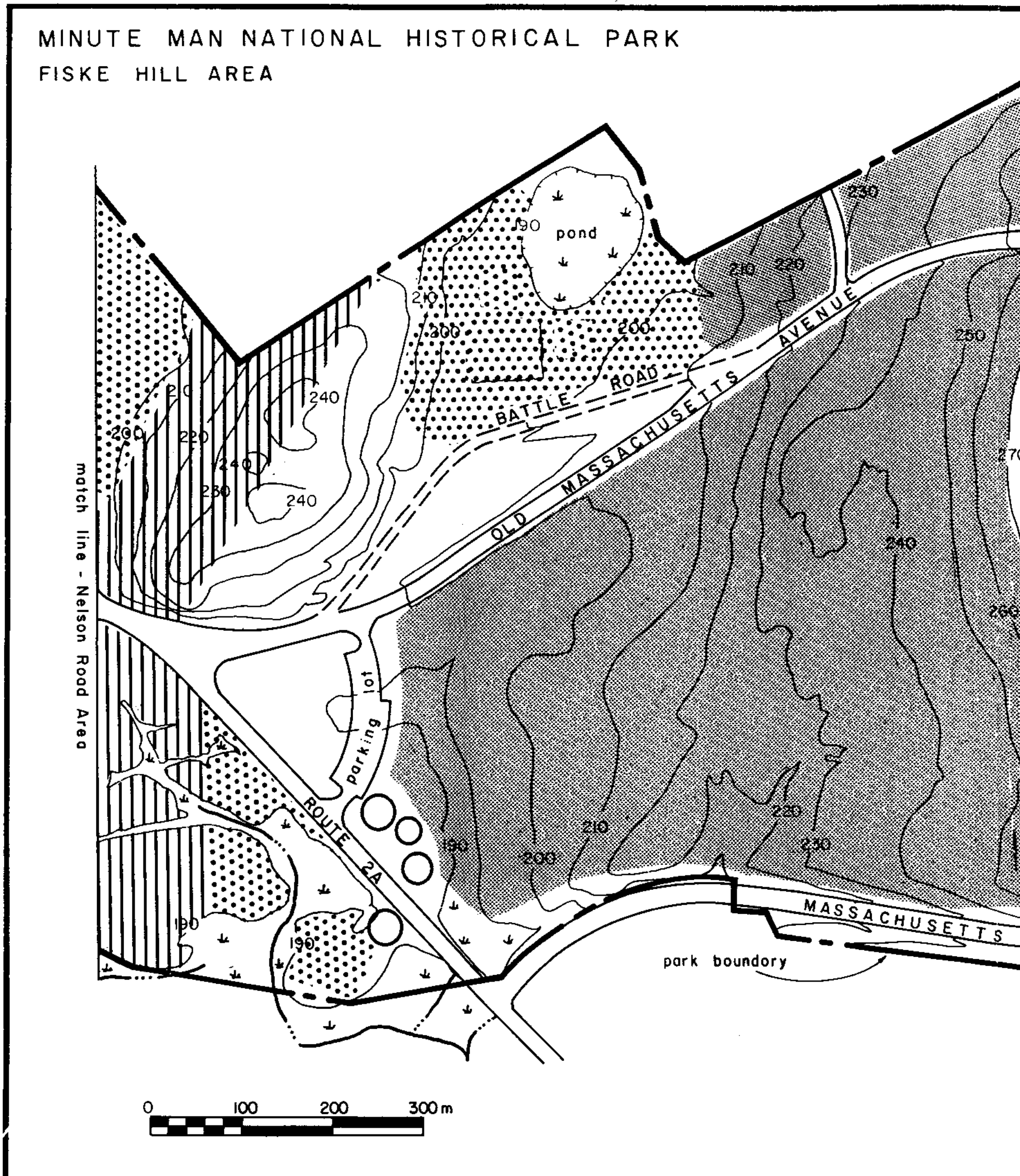
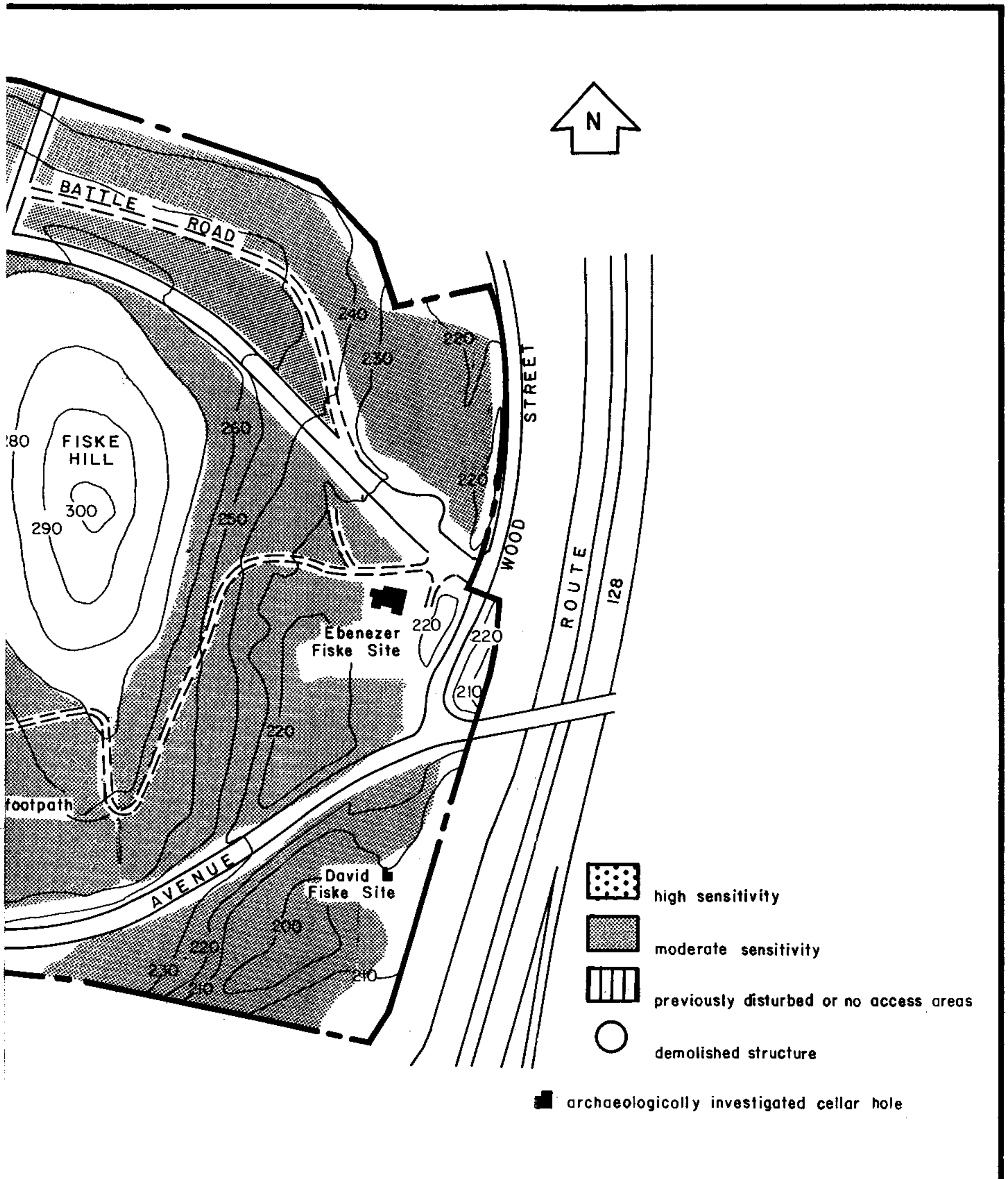


Figure 3-6. Stratification of Fiske Hill section of MIMA into zones of expected archeological sensitivity.



N
BATTLE ROAD
FISKE HILL
280
290
300
260
250
240
230
220
210
200
WOOD STREET
ROUTE 128
Ebenezer Fiske Site
David Fiske Site
footpath
AVENUE
high sensitivity
moderate sensitivity
previously disturbed or no access areas
demolished structure
archaeologically investigated cellar hole

Table 3-2. Distribution of temporal components in a sample of known prehistoric sites near MIMA.

Temporal period	*General environmental setting*			
	Riverine	*Tributary Stream/Wetland*	*Upland*	*Total*
PaleoIndian	3			3
Early Archaic	3			3
Middle Archaic	13	6	3	22
Late Archaic	18	12	7	37
Early Woodland	3			3
Middle Woodland	5	1		6
Late Woodland	12	4	1	17

there was enough available information to estimate the frequency and characteristics of prehistoric sites in the riverine zone.

A total of 55, 30 x 30 m sampling blocks were investigated within MIMA during the subsurface testing phase of the survey. Of this total, 48 sampling blocks were randomly placed and seven were judgmentally located. The 55 sampling blocks contained a total of 715, 50 x 50 cm shovel test pits.

Subsurface testing within MIMA led to the identification of 14 prehistoric sites. These sites were found in all five of the major areas (Meriam's Corner, Old Bedford Road, Virginia Road, Nelson Road, Fiske Hill) of the park in a variety of locations (wetland margins, upland knolls, glacial outwash plain, etc.). With two exceptions, all of the sites appear to be small loci of prehistoric activity (resource processing stations) marked by "find spots" (less than 56 sq m) of a few pieces of cultural material. The exceptions to this are two small to moderate sized (500 1500 sq m) sites that may have been temporary camps. More detailed information on the environmental setting, estimated extent, contents, and potential importance of these prehistoric cultural resources is presented in Appendix A.

Initial subsurface testing within both the high and moderate sensitivity strata resulted in the identification of four small prehistoric sites. The locations of the 15 sampling blocks placed within MIMA during this first stage of subsurface testing are shown on the sensitivity stratification maps (see

Figures 3-1 through 3-6). All four of the sites were small "find spots" consisting of one or two pieces of prehistoric cultural material found in a single test pit. The cultural material recovered was limited to chipping debris. Densities of cultural material on these sites appear to be very low, and are estimated at probably less than 10 pieces per sq m. The Ox Pasture P1 (Block 68), Jacob Foster Farm P1 (Block 716), and Holt Pasture (Block 238) sites were found in sections of the moderate sensitivity stratum. The Thomas Nelson Jr. Farm P2 Site (Block 491) was found in an area considered to have high archeological sensitivity (Figures 3-7 through 3-14). Application of the statistical formula for estimating sample size to the results of this 1% pilot study indicated that very large numbers of sampling units would have to be excavated within both strata to achieve reasonably high confidence levels (80% certainty, 20% error).

In a secondary stage of subsurface testing a limited number of sampling blocks were randomly placed within five areas. These areas included three ranked as having high sensitivity (Fiske Hill, Nelson Road, Elm Brook) and two areas ranked as moderate sensitivity (Nelson Road, Folly Pond) zones. In this stage of sampling a roughly 10% sample of each of the five areas was obtained through the random placement of additional 30 x 30 m test pit blocks. This required a total of nine sampling blocks and resulted in the identification of three small "find spot" sites. No prehistoric sites were found in the Fiske Hill or Elm Brook areas.

The Thomas Nelson Jr. Farm P2 (Block 505) and Ephraim Hartwell Farm P1 and P2 (Blocks 655, 667) sites were found in high (Nelson Road area) and moderate (Folly Pond areas) sensitivity zones (see Figures 3-10, 3-12). Statistical analysis of the results indicated that larger samples would be required from these areas to achieve reasonably high confidence levels. Based on this analysis an additional 12, 30 x 30 m test pit blocks were randomly placed within three of the designated areas (Fiske Hill, Nelson Road, Folly Pond). This step increased the sample size from these areas to 20% and resulted in the identification of one other prehistoric site in the Folly Pond area. The Aaron Brooks Farm Site (Blocks 612, 615, 637) was found in this moderate sensitivity zone (see Figure 3-10).

To complete the probabilistic sampling within MIMA, subsurface testing was conducted in two additional areas with high (Massachusetts Avenue/Marrett Road) and moderate (Hardy Hill) sensitivity. The excavation of a total of 10, randomly placed, 30 x 30 m test pit blocks provided a sample (ca. 20%) equivalent to that obtained from the other areas. As a result of this subsurface testing, one prehistoric site (Jacob Whittemore Farm P1) was identified in the Massachusetts Avenue/Marrett Road area (Figure 3-13). The total number of randomly placed test pit blocks and identified prehistoric sites within the designated areas is shown in Table 3-3.

In the final stage of the survey, limited judgmental testing of specific areas within MIMA was conducted. Seven, 30 x 30 m sampling blocks were judgmentally placed within two areas (Nelson Road, Folly Pond) and four other areas of high (Fiske Hill, Bedford Lane, Virginia Road) and moderate (Elm Brook/Old Bedford Road) sensitivity. A total of five small, "find spot" prehistoric sites were found. The Ephraim Hartwell Farm P3 and P4 sites (Blocks 403, 412) were found near Folly Pond (see Figure 3-10). The William Smith Farm P1 and P2 sites were found near Bedford Lane (Block 327) and Virginia Road (Block 374) (see Figure 3-9). The Joshua Brooks Farm P1 Site was located near Massachusetts Avenue and Old Bedford Road (Block 215) (see Figure 3-8). At the completion of subsurface testing within MIMA, the Fiske Hill area was the only section of the park where no prehistoric sites had been found (Figure 3-13).

Various aspects of the sample of 14 prehistoric sites identified during the survey were analyzed in

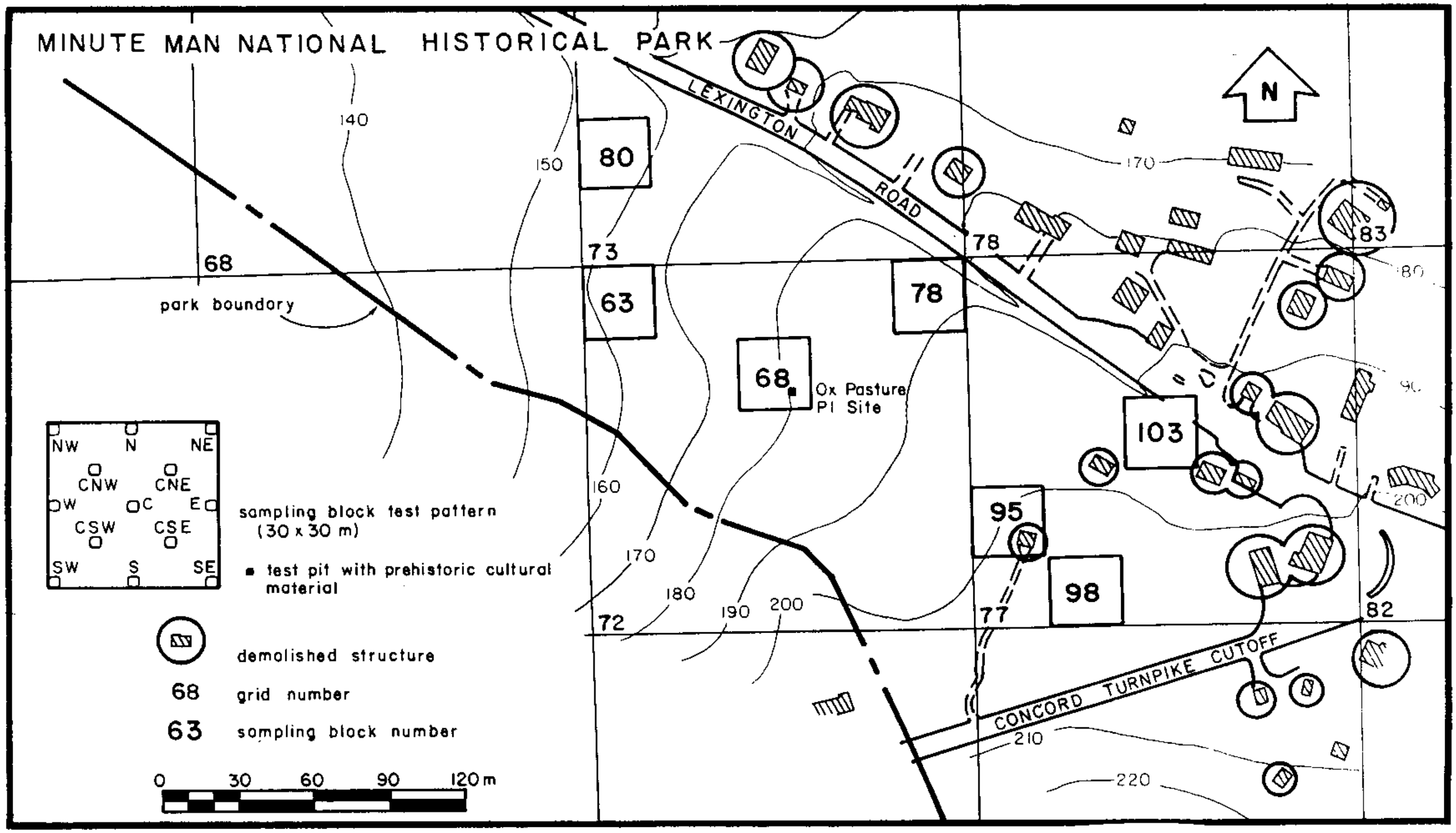


Figure 3-7. Location of subsurface testing within the Hardy Hill area (Ox Pasture Site).

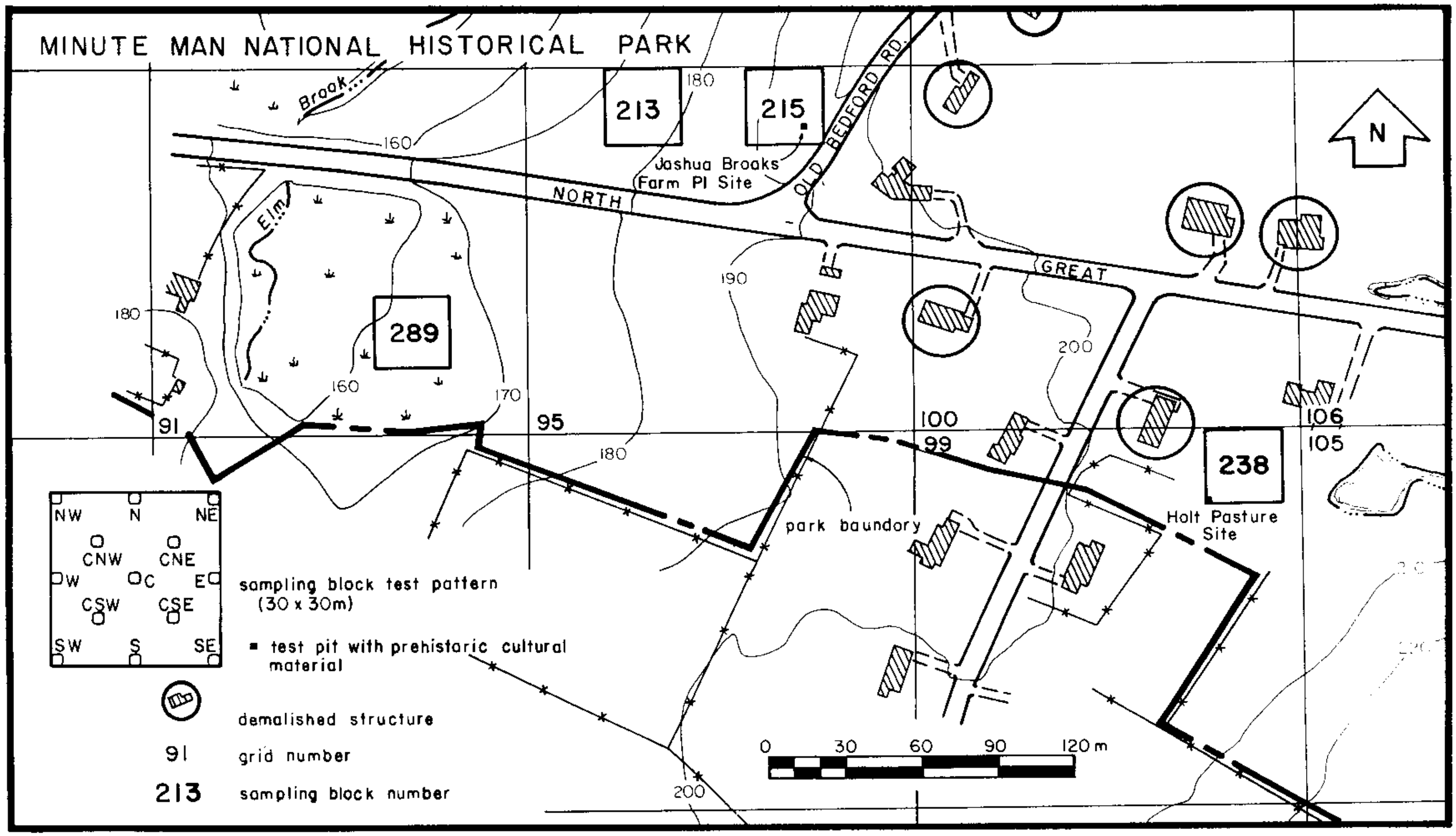


Figure 3-8. Location of subsurface testing within the Elm Brook/Old Bedford Road area (Holt Pasture, Joshua Brooks Farm P1 Sites).

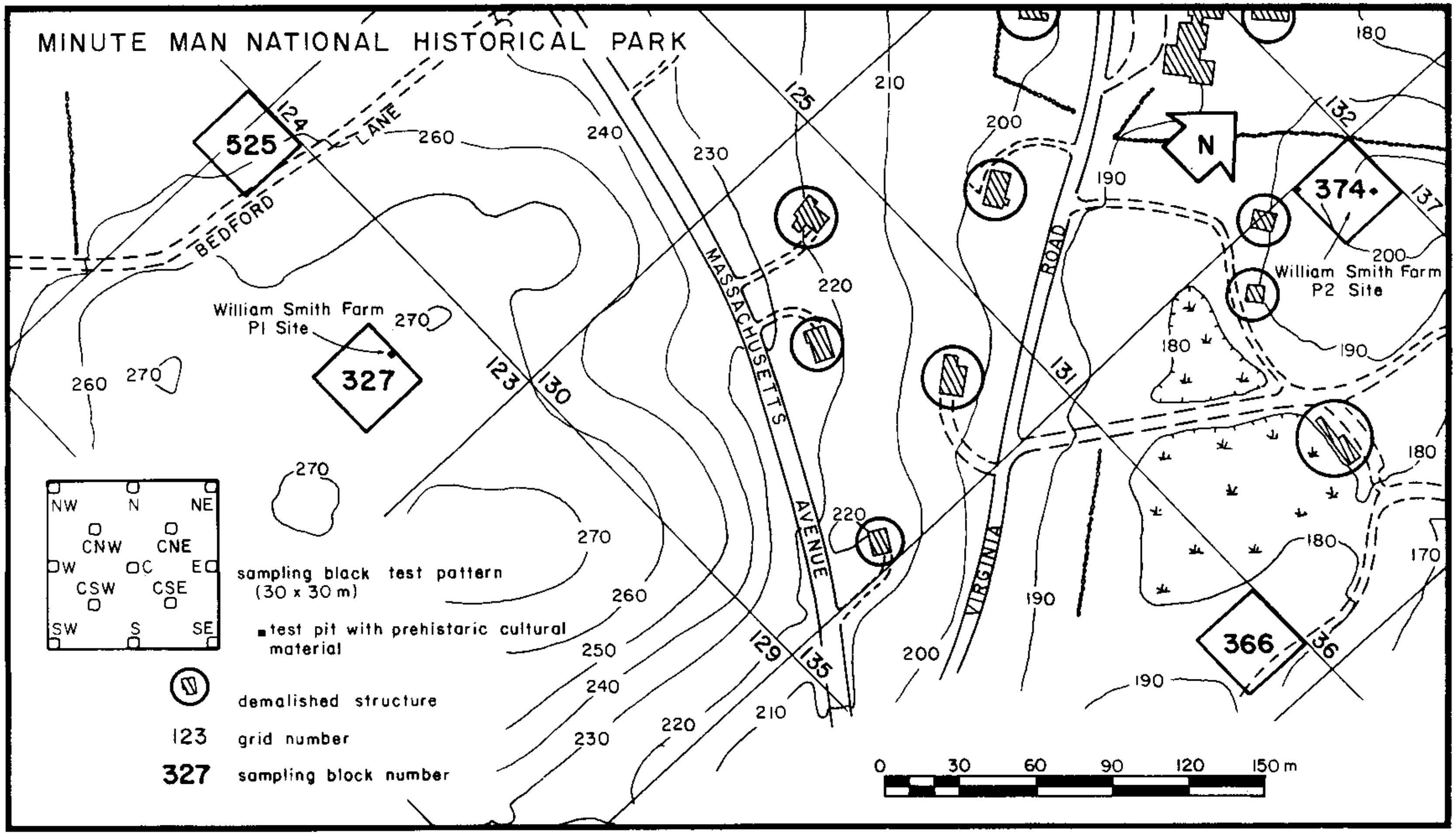


Figure 3-9. Location of subsurface testing within the Virginia Road/Bedford Lane area (William Smith Farm P1, P2 site).

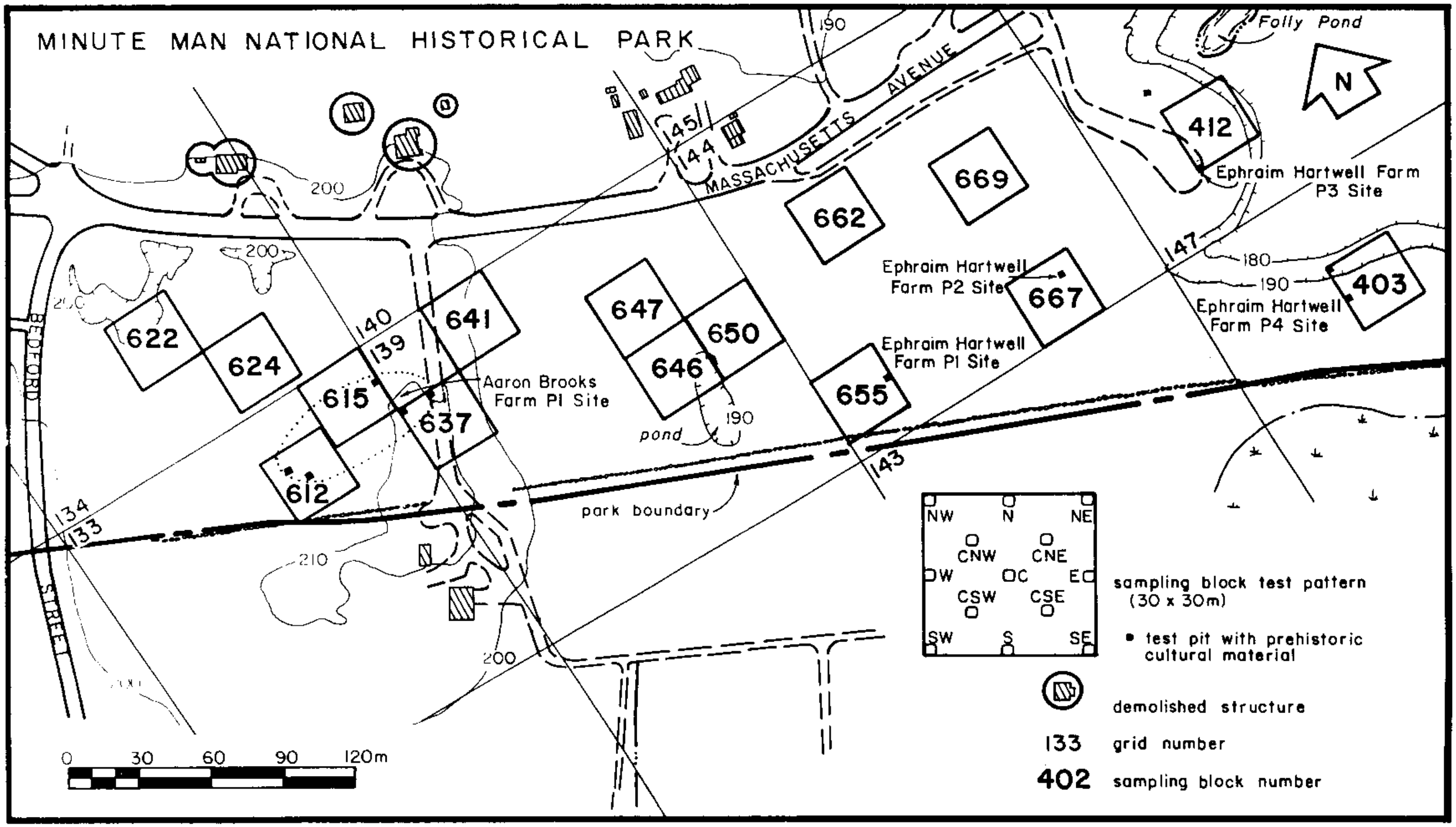


Figure 3-10. Location of subsurface testing within the Folly Pond area (Aaron Brooks Farm P1, Ephraim Hartwell Farm P1, P2, P3, P4 sites).

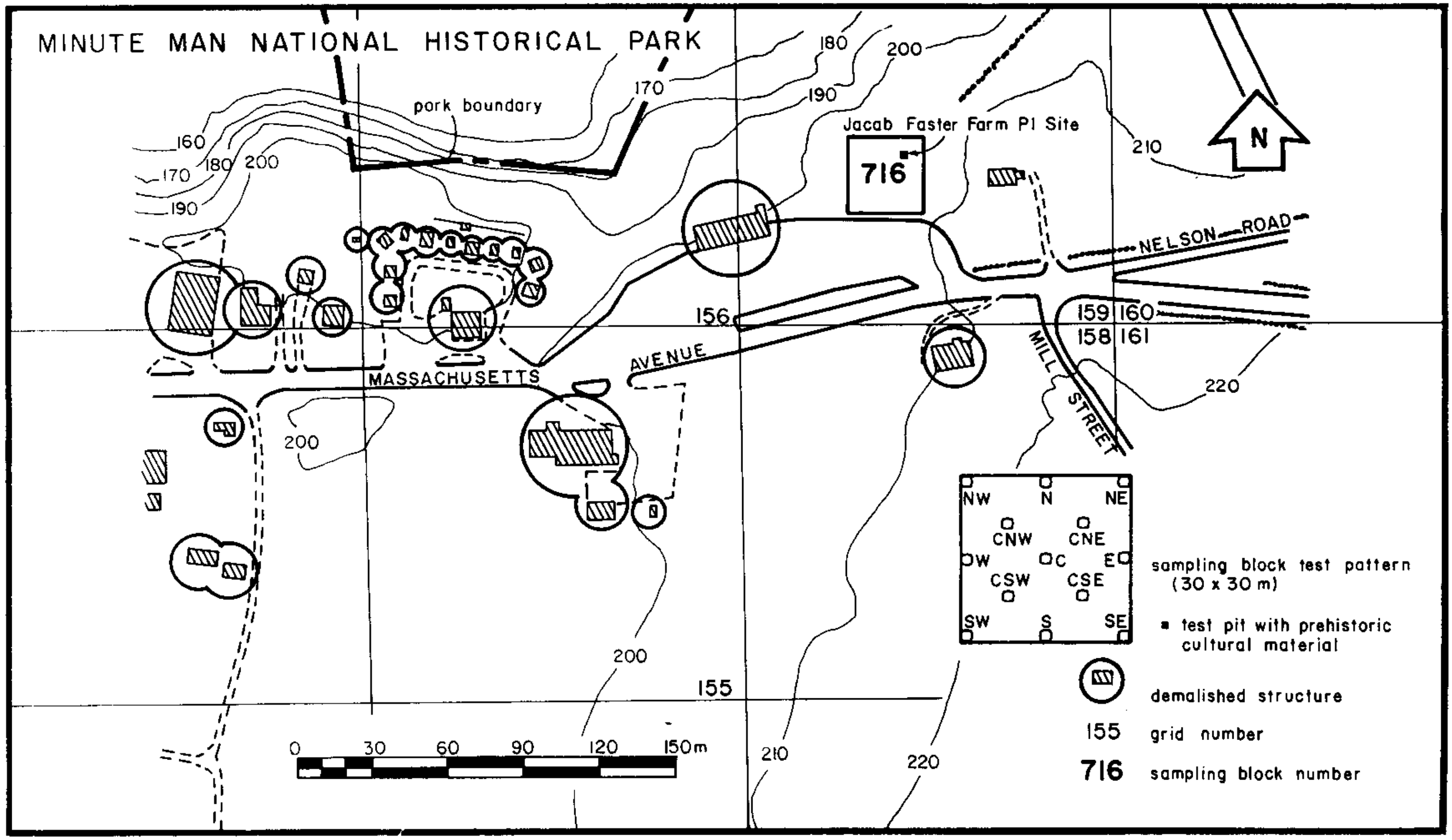


Figure 3-11. Location of subsurface testing within the Paul Revere Capture site area (Jacob Foster Farm P1 site).

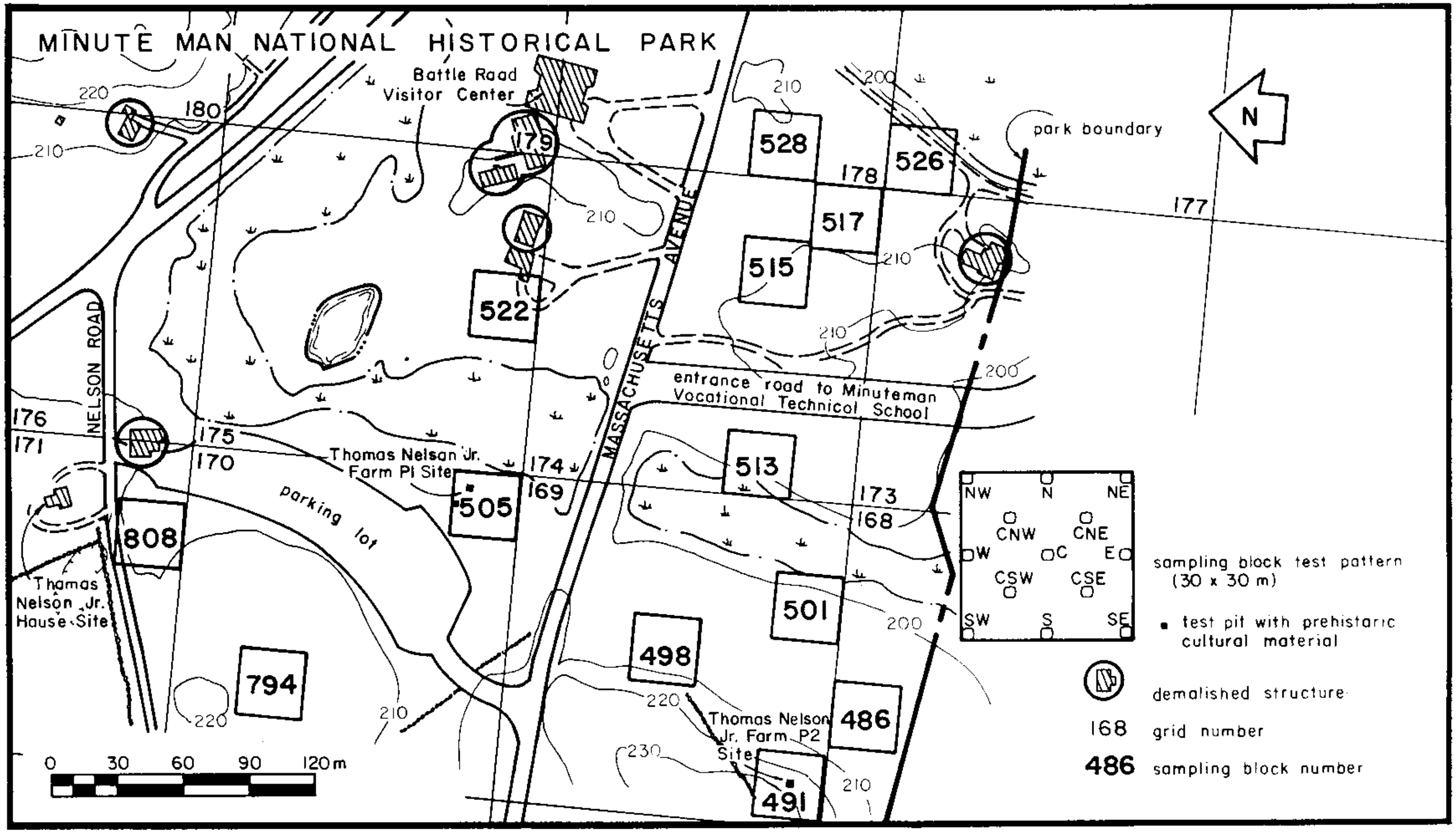


Figure 3-12. Location of subsurface testing within the Nelson Road Area (Thomas Nelson Jr. Farm P1, P2 sites).

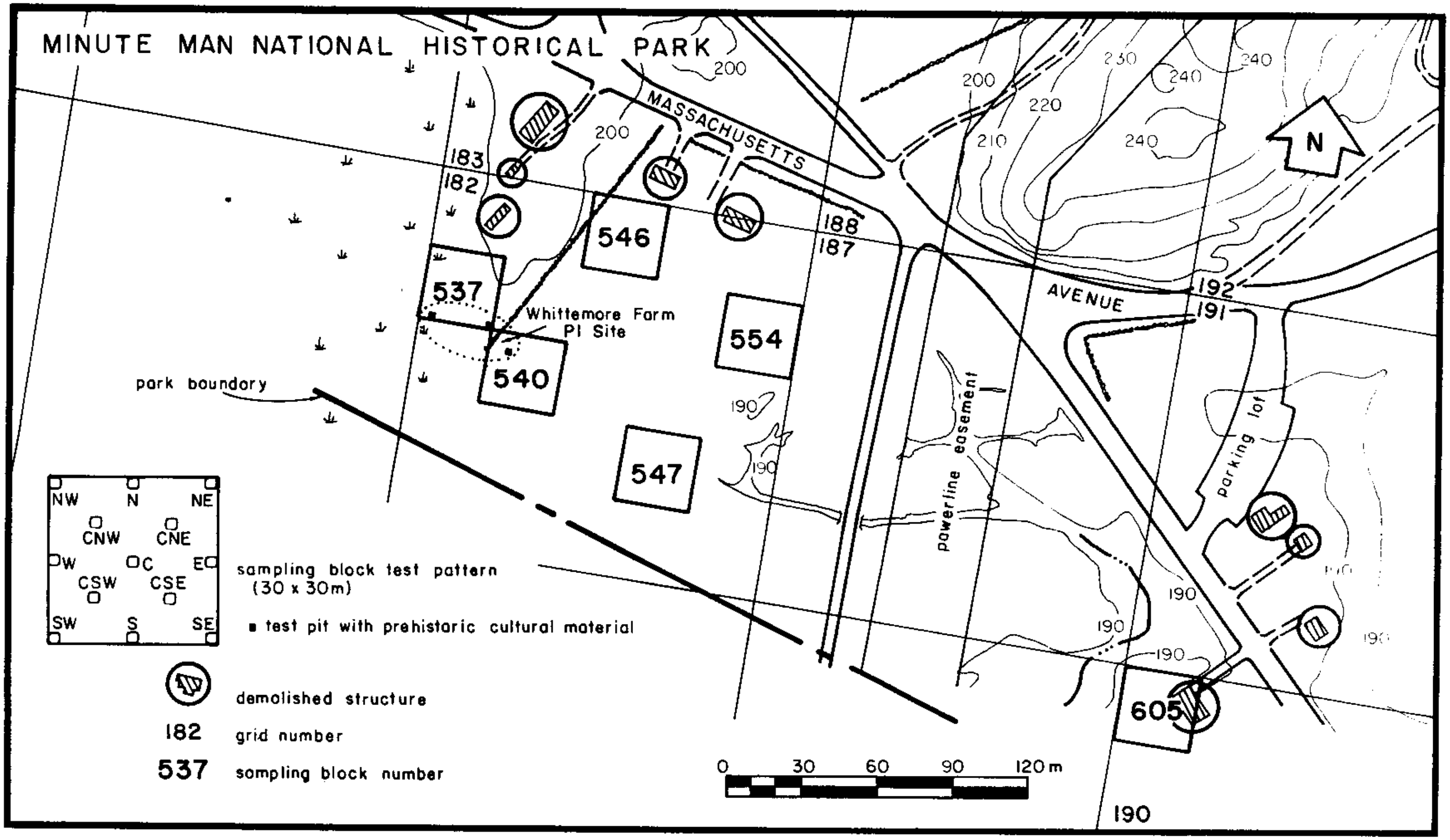


Figure 3-13. Location of subsurface testing within the Massachusetts Avenue/Marrett Road area (Whittemore Farm P1 site).

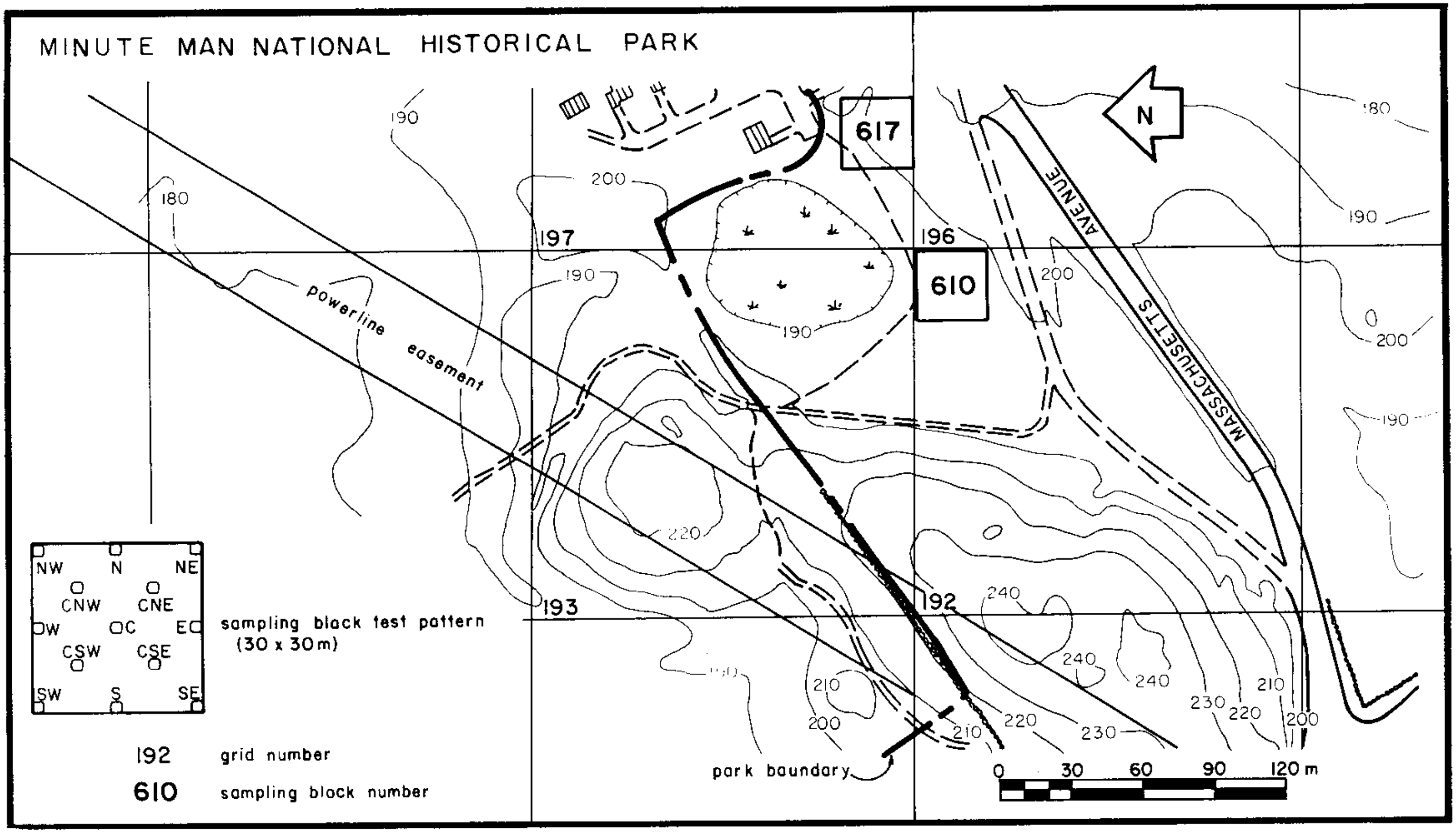


Figure 3-14. Location of subsurface testing within the Fiske Hill area.

Table 3-3. Sampling units and prehistoric sites within designated areas.

Designated area	*Total sampling units in area*	*Random sampling units excavated*	*Prehistoric sites identified in random sample units*
Hardy Hill (moderate)	34	7	Ox Pasture
Elm Brook (high)	8	1	none
Folly Pond (moderate)	53	13	Aaron Brooks Farm P1 Ephraim Hartwell Farm P1, P2
Nelson Road	45	10	Thomas Nelson Jr. Farm (high) P1, P2
Nelson Road (moderate)	10	2	none
Mass. Avenue/ Marrett Road (high)	20	5	Whittemore Farm P1
Fiske Hill (high)	8	2	none

order to address research questions or problems outlined in the research design for this study. An analysis of the locational attributes of the sites found within MIMA was done to look for correlations between the functional types and structural characteristics of sites, and characteristics of the environment. An attempt was also made to outline the evidence for any variation in the frequency and structural characteristics of sites in different environmental settings. This brief analysis was based on a few of the locational attributes (soil series/surficial deposit, distance to water) used to summarize available information from known sites within and near MIMA, and develop criteria for the sensitivity stratification of the park. To evaluate the possible impact of historical land use practices on the sites identified, the distribution of prehistoric cultural material within various soil horizons (plowzone, subsoil) was also examined.

The analysis of locational attributes showed that the 14 sites identified within MIMA were situated on five different soil series. A total of nine sites were located on soils derived from sand/gravel glacial outwash deposits including the Windsor, Deerfield, and Paxton series. The five other sites were located on soils derived from glacial till or ground moraine deposits: either Montauk or Canton series (Table 3-4). The distribution of the identified sites relative to soil type reflects an overall pattern seen in the larger sample of sites analyzed during the background research. A majority of prehistoric sites appear to be located on outwash derived soils, with the Windsor and Deerfield series being the most frequently occupied. More than half of the 14 sites identified within MIMA were in locations with Windsor or Deerfield series soils. A potentially informative result of the survey was the identification of five prehistoric sites on glacial till or ground moraine derived soils. One type of soil (Montauk series) in this category had four sites located on it. Within the larger sample of 68 sites analyzed in the background research, Montauk and Scituate series soils were the most frequently occupied in the till or ground moraine derived category. Based on the results of both background research and actual survey within MIMA it is likely that additional investigations in upland, non-riverine areas would probably reveal more sites located on ground moraine derived soils, particularly the Montauk and Scituate series. Within the sample of prehistoric sites identified during the survey there did not appear to be any correlation between site size, structural characteristics or function, and soil type.

There was no evidence of any distinct pattern or correlation of site size, structural characteristics or function with distance to a water source. The 14 sites were located as close as 30 m and as distant as 250 m from potential water sources. While all four of the largest sites with estimated horizontal areas ranging from 250 to 1500 sq m were within 150 m of a water source it is not clear if this reflects any larger pattern. In general, there is probably no single environmental attribute or variable that has a strong correlation with sites of a particular size range or structural type. The results of the survey do indicate that there are many small sites (less than 150 sq m) like the "find spots" identified within MIMA which are located at distances in the range of 100-200 m from a water source or wetland. If these "find spots" of a few pieces of cultural material mark locations used only long enough to carry out a specific brief task (resource collecting or processing, stone tool repair/maintenance, etc.), being near a water source may not have been important. Two sites (Jacob Foster Farm P1, William Smith Farm P1) in this category provide a good illustration of this pattern and are located 200 m or more from a potential water source.

In terms of structural characteristics and probable function, the sample of 14 sites did not show as much variation as initially expected prior to the survey. A majority (10) of the sites found within MIMA were small "find spots" of isolated pieces of prehistoric cultural material. Three sites appeared to be small temporary camps with horizontal areas ranging from about 250 to 500 sq m and there was one example of a moderate sized (ca. 1500 sq m) temporary camp. All of these sites could have been the result of single occupational episodes.

No larger sites (more than 1500 sq m) likely to contain evidence of more than one occupation or component were found. This makes it difficult to speculate which site locations within the upland, non-riverine sections of MIMA would have been recurrently used by prehistoric hunter-gatherers. Based on the limited available information on soils from sites just outside the park boundaries, it is likely that any larger, multi-component, upland zone sites are located in close proximity to tributary

Table 3-4. Locational attributes and structural characteristics of prehistoric sites identified within MIMA.

Site Name	Soil Series	Distance to Water Source	Functional Type	Soil Horizon with Cultural Material
Ox Pasture	Windsor	150 m	Find spot	Subsoil
Joshua Brooks Farm P1	Montauk	150 m	Find spot	Subsoil
Holt Pasture	Montauk	50 m	Find spot	Altered subsoil
William Smith Farm P1	Montauk	250 m+	Find spot	Subsoil
William Smith Farm P2	Paxton	100 m	small temporary camp	Subsoil
Aaron Brooks Farm P1	Montauk	120 m	Moderate size temporary camp (1500 sq m)	Plowzone, subsoil
Ephraim Hartwell Farm P1	Windsor	180 m	Find spot	Subsoil
Ephraim Hartwell Farm P2	Windsor	80 m	Find spot	Plowzone
Ephraim Hartwell Farm P3	Windsor	80 m	Find spot	Subsoil
Ephraim Hartwell Farm P4	Windsor	50 m	sm. temporary camp (ca. 250 sq m)	Plowzone
Jacob Foster Farm P1	Canton	ca. 200 m	Find spot	Plowzone
Thomas Nelson Farm P1	Deerfield	30 m	Find spot	Plowzone
	Deerfield	75 m		Subsoil
Thomas Nelson Farm P2	Deerfield	75 m	Find spot	Plowzone
Whittemore Farm P1	Deerfield	30 m	small temporary camp (ca. 500 sq m)	Plowzone Subsoil

streams like Elm and Mill Brooks.

A rough measure of the possible impacts of historical period land use on the prehistoric sites within MIMA was obtained from the distribution of prehistoric cultural material in soil horizons. On three sites (Ephraim Hartwell Farm P2, P3, Jacob Foster Farm P1) prehistoric cultural material was found only in the loam plowzone horizon. These sites may represent locations where past and present agricultural land use has completely altered the horizontal distribution of cultural material, while some horizontal integrity may remain. Prehistoric cultural material was found in both the plowzone and underlying subsoil horizon on five sites (Aaron Brooks Farm P1, Ephraim Hartwell Farm P4, Thomas Nelson Farm P1, P2, Whittemore Farm). On these sites, past agricultural land use may have been less damaging and prehistoric cultural material could have retained some vertical integrity. On five other sites (Ox Pasture, Joshua Brooks Farm, William Smith Farm P1, P2, Ephraim Hartwell Farm P1) prehistoric cultural material was found only in the subsoil horizon. These sites may have been affected the least by historical period agricultural land use.

Two sites (Holt Pasture, Ephraim Hartwell Farm P3) showed evidence of disturbance from modern period development in the form of altered loam topsoil and subsoil horizons. The construction and demolition of residential structures on or near these sites created intermixed or compacted soils and fill deposits. This type of previous disturbance resulted in a partial loss of integrity on these sites and some intact sections may remain. Prehistoric cultural material on the Holt Pasture Site was found in an altered, disturbed soil horizon, possibly a deposit of modern period fill. On the Ephraim Hartwell Farm P3 Site, demolition of a modern period (20th century) structure created an area of disturbed subsoil horizons and fill deposits. Despite this disturbance, prehistoric cultural material was found in an intact plowzone horizon outside the direct area of impact from demolition and filling.

Evaluation of Stratification Scheme and the Estimation Approach at MIMA

As part of the interpretation of the results of the survey for prehistoric sites in MIMA, statistical analysis was carried out at the completion of each of the above mentioned stages of subsurface sampling. This analysis was the primary source of information for evaluating the effectiveness of the archeological sensitivity stratification scheme. The results of the probabilistic sampling done in various sections of MIMA provided most of the information about the distribution and frequency of prehistoric sites needed to verify the sensitivity scheme. The limited amount of judgmental sampling done in selected locations in MIMA also provided useful information for further testing some of the assumptions behind the sensitivity scheme.

Upon completion of the stratification scheme prior to conducting fieldwork, the MIMA project area, excluding the North Bridge section, contained a total of over 600 sampling blocks within the high sensitivity stratum and over 900 sampling blocks in the moderate sensitivity stratum. During the first stage of subsurface testing, an initial 1% sample of both the high and moderate sensitivity strata was examined. One prehistoric site was identified within the high sensitivity stratum and three sites were found in the moderate sensitivity stratum. It was not expected that this very small sample would locate more than one site in the moderate sensitivity stratum.

Two slightly different sample size estimation formulas were applied to these results. A formula discussed by Cochran (1977: 77-78) and used in a previous survey within Cape Cod National Seashore is as follows (McManamon 1981:210):

Formula 1:

$$n_0 = \frac{t^2 s^2}{r^2 \bar{x}^2}$$

where:

n_0	=	the estimated necessary sample size
t	=	the Z score correspond ing to the desired confi dence limits (for 80% = 1.28)
s	=	the standard deviation of the 1% sample (an esti mate of the population standard deviation)
r	=	the relative error desired (10%)
$\bar{x}$	=	the 1% sample mean (an estimate of the population mean)

In cases where the sample size estimate is large, the sample size can be reduced using the following formula (finite population correction):

$$n = \frac{n_0}{1 + (n_0/N)}$$

Another generally similar formula for estimating a required sample size based on the results of a pilot study is also available (Cochran 1963:76; Shennan 1988:307-308; Joliffe 1986:91):

Formula 2:

$$n = \left(\frac{Z_a s}{d}\right)^2$$

where:

n	=	the estimated necessary sample size
Z_a	=	the Z score corresponding to the desired confidence limits
s	=	the sample standard deviation
d	=	the tolerance or error factor (a percentage of the sample mean)

Using standard deviations and means based on the results of the 1% initial sample of the high and moderate sensitivity stratum, necessary sample sizes to obtain estimates of the mean frequencies of sites per sample unit with an 80% confidence level and 10% error were calculated with the two formulas. The results following the application of the finite population correction are shown in Table 3-5.

The required sample sizes indicated by formulas were too large to be completed within the scope of the survey. Even using Formula 2, 394 sampling units would have been needed for the high sensitivity stratum and 309 sampling units for the moderate sensitivity stratum.

Analysis of the results of this initial 1% sample suggested that the remainder of the survey effort should be focussed on smaller areas within both high and moderate sensitivity strata where it would be possible to complete subsurface investigations of the sample units necessary to achieve an 80% confidence level and a 10% error. Five areas were chosen, three of which were ranked as high sensitivity and two in sections of the moderate sensitivity stratum. A total of nine 30 x 30 m sampling blocks

Table 3-5. Estimated sample size for high and moderate sensitivity strata based on 1% sample.

Areas	*Estimated sample size* *formula 1*	*formula 2*
High Sensitivity	610 units	394 units
Moderate Sensitivity	959 units	309 units

or units randomly placed in these areas provided a 10% sample of these areas. Three previously unknown prehistoric sites were identified; two of these were in a moderate sensitivity area and one was in an area ranked as having high sensitivity.

Estimates of the frequency of prehistoric sites in the five areas based on the results of a 10% random sample are presented in Table 3-6.

Using the second formula (Formula 2) discussed above, an analysis of these results to estimate the sample size required to achieve reasonably high confidence limits and low error was done for the two areas (Nelson Road high sensitivity, Folly Pond moderate sensitivity) that contained prehistoric sites. To achieve confidence limits of 80% and an error factor of 30% would have required the excavation of 34 sampling units in the Folly Pond area (64% of all available sampling units) and 24 sampling units in the Nelson Road area (54% of all available sampling units). Since the total number of sampling blocks availahle for random sampling within MIMA was limited to 55, this would not have been feasible.

During a third stage of probabilistic sampling, additional blocks were investigated in three areas to determine if additional prehistoric sites could be located, thereby improving the statistical confidence level and error for estimation purposes. A total of 12, 30 x 30 m sampling blocks were placed in the Fiske Hill (1), Nelson Road (3), and Folly Pond (8) areas. This increased the sample size to 20% of the total area within these areas.

Only one additional prehistoric site was found in the Folly Pond area as a result of this third stage of subsurface sampling, raising the total in this section of MIMA to three sites. The fact that archeological investigations of additional randomly chosen sampling units within the Folly Pond and Nelson Road areas yielded only one additional site suggested that at this stage subsurface testing had reached a point of diminished return. Because of this, it was anticipated that the investigation of additional sampling units within these two areas probably would not result in the identification of more sites or any substantial improvement of the statistical certainty and error factor.

The excavation of a total of 10, randomly placed 30 x 30 m sampling units in the Nelson Road area identified two prehistoric sites. Of a total of 13, 30 x 30 m sampling units in the Folly Pond area, five contained prehistoric cultural material designated as three separate sites. Statistical analysis indicated that the Nelson Road sample had a confidence limit of 60% with an error factor of 55%. The sample of five blocks in the Folly Pond area with prehistoric material provided an estimate of site frequency with a confidence limit of 70% and an error factor of 46%.

Table 3-6. Estimated frequencies of prehistoric sites within five areas based on 10% random sample.

Areas	*Number of sample units*	*Mean frequency of sites per sample unit*
Fiske Hill (high)	1	none discovered
Nelson Road (high)	4	.50 ± .57
Elm Brook (high)	1	none discovered
Folly Pond (moderate)	5	.40 ± .54
Nelson Road (moderate)	2	none discovered

Out of the total of 55 randomly-generated sampling units, the remaining units were placed in two other areas to further test the stratification scheme in different sections of MIMA. Random samples (20%) comparable to those completed in the other areas were excavated in the Hardy Hill (moderate sensitivity) and Massachusetts Avenue/Marrett Road (high sensitivity) area. Excavation of 10, 30 x 30 m sampling units (five units in each area) in these sections of MIMA resulted in the identification of one prehistoric site in the Massachusetts Avenue/Marrett Road area. No new sites were found in the Hardy Hill area, previous random sampling (1% sample run) had located a very small "find spot" site (Ox Pasture) there. These results provided an estimate of site frequency with very low confidence limits (below 60% certainty) and a high error factor (more than 50%). The identification of the site in the Massachusetts Avenue/Marrett Road area contributed new information about the presence and distribution of prehistoric cultural resources in the eastern end of the park, but provided an estimate of site frequency with a low confidence limit (60%) and wide error factor (50%) for that particular area. The final estimates of site frequency for the four high and moderate sensitivity areas found to contain prehistoric sites are presented in Table 3-7.

The estimated mean frequencies of prehistoric sites in all areas appear to be quite low with only one major difference. The Folly Pond area had the highest frequency of sites. It may mean that the sensitivity rank assigned to this section of the park should be changed from moderate to high, based on the results of subsurface testing. The estimates of site frequency obtained by combining all the random sampling conducted in both the high and moderate strata throughout MIMA are presented in Table 3-8.

This indicates that the estimated mean frequencies of prehistoric sites were slightly higher in the moderate sensitivity stratum within MIMA. This could be due to the fact that a larger number of sample units were investigated in the moderate sensitivity stratum. However, prehistoric sites were more frequent in the high sensitivity substra-

Table 3-7. Estimated frequencies of prehsitoric sites within areas of MIMA after completion of random sampling.

Area	*Number of sample units*	*Mean frequency of prehistoric sites per sample unit*	*Standard error of sample mean*
Nelson Road	10	.20 ± .42	.11
Folly Pond	13	.69 ± 1.10	.16
Hardy Hill	7	.14 ± .37	.08
Mass. Ave/Marrett Road	5	.20 ± .44	.14

Table 3-8. Estimated frequencies of prehistoric sites for the entire high and moderate sensitivity strata.

Stratum	*Number of sample units*	*Mean frequency of prehistoric sites per sample unit*	*Standard error of sample mean*
High Sensitivity	20	.20 ± .44	.09
Moderate Sensitivity	29	.27 ± .45	.07

tum, within larger areas designated as moderatelly sensitive. It is possible that some large areas originally stratified as moderate sensitivity zones, such as along Elm Brook, may actually include smaller areas of high sensitivity containing prehistoric sites. In addition, two areas originally ranked as having high sensitivity near Elm Brook and Meriam's Corner were found during fieldwork to contain soils with fair to poor drainage that would have limited prehistoric activity.

Seven, 30 x 30 m sampling units were judgmentally placed in areas of moderate and high sensitivity to further test some of the assumptions behind the stratification scheme. The observed frequencies of prehistoric sites provided by random sampling in the high sensitivity area at Nelson Road were quite low. For this reason limited judgmental testing was used to examine a section of this area and possibly increase the number of identified sites. Limited judgmental testing was also done in a high sensitivity zone immediately adjacent to the Folly Pond moderate sensitivity area. The purpose was to test an assumption that prehistoric sites would be clustered around the rim of the glacial kettle hole feature containing Folly Pond. Included in this judgmental testing were several small areas of suspected high sensitivity near Bedford Lane and north of Virginia Road typical of upland zone settings. Four of the seven judgmental sampling units contained small "find spot" sites and one unit (Folly Pond high sensitivity zone) located a somewhat larger (ca. 250 sq m) site. These results provided confirmation that the stratification criteria used to initially subdivide MIMA into zones of expected sensitivity for prehistoric cultural resources were valid.

In summary, the application of summary statistics to the results of staged random sampling within areas of expected high and moderate sensitivity provided initial estimates of the frequency of prehistoric sites. Several factors probably affected the outcome of this study, including the relatively low frequency of identified sites and the tendency for a majority of them to consist of very small, low density deposits of chipping debris. The size of sampling units used may also have been a factor. The 30 x 30 m sampling units are effective for finding very small, low density sites, however they cover less area than larger size (50 x 50 m, 100 x 100 m) test pit blocks or patterns and may miss certain distributions of sites. One possible drawback to the use of the estimation approach is that it requires large samples to be taken if only a few sites are found in the early stages of subsurface testing. This may be a problem in areas like the interior, upland settings typified by much of MIMA, where many sites are small (less than 500 sq m) and distributed in relatively low density, widely dispersed patterns even in some high sensitivity zones.

Subsurface Investigations: Historical-Period Cultural Resources

During the survey for prehistoric cultural resources within MIMA, a total of six historical-period sites were also identified. All of these sites are located in Lincoln, in the western and central portions of the park in the Meriam's Corner, Old Bedford Road, and Virginia Road subdivisions (Figure 3-15). The six sites found during the survey are representative of the general patterns of historical-period domestic/agrarian and transportation land use. Included are: a cart path/farm road with a small stone bridge (transportation), two house sites (rural residential use), and a possible barn foundation (agricultural/pastoral activity). These historical cultural resources were identified due to their close proximity to locations tested for prehistoric sites with random or judgmentally placed 30 x 30 m test pit blocks. No additional testing was conducted at these six historical sites.

Site specific information, including location, condition, size, and probable periods of construc-

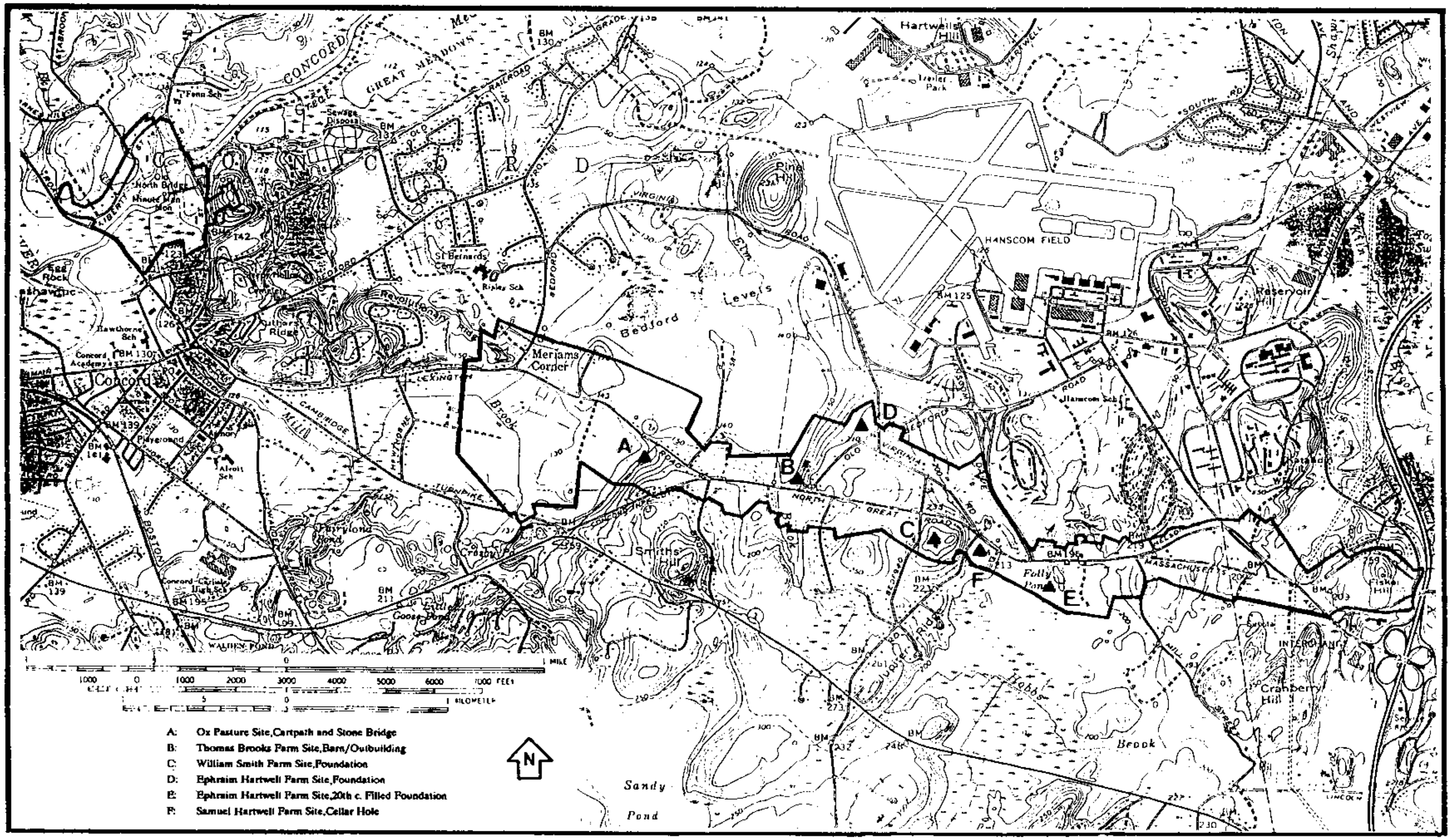


Figure 3-15. Location of historical-period cultural resources identified during survey within Minute Man National Historical Park.

tion and occupation, is presented in Appendix B. Where available, sketch maps, historical map details, photographs, and an inventory of cultural material collected are also provided in Appendix B.

Analysis of Recovered Historical-Period Cultural Material

Analysis of the historical-period cultural assemblage recovered during the MIMA survey focused on several issues. These include: evidence for changing refuse disposal practices through time; documentation of agricultural practices which resulted in the distribution of refuse; temporal associations of the historical cultural materials recovered; and distribution patterns for "field trash" across the historical landscape relative to known historical and modern structures and transportation routes. Data compiled for each 30 x 30 m testing block included: counts or presence/absence of various categories of historical cultural material; calculated dates based on these artifacts; relative mass of selected artifact categories; distances from each testing block to the nearest known or identified historical site/structure and historical road, and to the nearest modern site/structure and road; and average depth of the plow zone. A variety of simple analysis techniques were used to identify patterns and relationships within this data base. The results of this analysis are presented below.

The majority of the historical cultural material recovered during the survey at MIMA was not recovered in direct association with a known or identified historic site (Table 3-9). Rather, the bulk of this material fits into the category of "field trash," historical cultural material recovered from the plow zone within a non-site context. It is indicative of historical patterns of refuse disposal and agricultural practices. A number of basic issues relating to patterns of rural refuse disposal are briefly examined below. These issues involve the manner in which refuse was disposed of, effects of different agricultural practices on distribution of field trash, and changes in this behavior through time. The data collected from MIMA is then briefly analyzed in terms of these issues.

Patterns of Refuse Disposal

As Deetz (1977:125-126) pointed out:

> disposal of refuse is one of our most unconscious acts. . . it is most unlikely that in removing food remains, broken dishes, and other debris from a household, people were making any conscious statement about themselves or others.

However, through time the disposal of trash and refuse has been handled in a variety of different ways. During the 17th century household debris and refuse was commonly thrown out into the houseyard, resulting in a typical pattern of sheet refuse. Deetz (1977) argued that refuse disposal behavior changed abruptly shortly after 1750. After this date deep rectangular pits begin to appear, with many dug intentionally for trash disposal, while some may have served a double function as privies. Mrozowski (Mrozowski, personal communication 1990) suggests that this shift of refuse behavior occurred during the 16th century in England as a response to space constraints in urban areas. He found a significantly greater amount of cultural material in an urban area was deposited as sheet refuse than in trash pits well into the 19th century at the Narbonne House. These studies did not focus on rural refuse disposal patterns which, lacking the same space constraints, could differ significantly from urban behavior.

The method of refuse disposal is affected by a number of variables, most significant of which are societal norms for a given time period and personal ideosyncracies. Factors which are involved in-

Table 3-9. Distribution of historic sites and historical-period cultural material by areas and testing blocks.

Area	Block No.	Historic Cultural Material Recovered	Historic Site Identified	Site Name	Functional Type
Aaron Brooks Farm	612	yes	no		Field Trash
Aaron Brooks Farm	615	yes	no		Field Trash
Aaron Brooks Farm	624	yes	no		Field Trash
Aaron Brooks Farm	636	yes	no		Field Trash
Joshua Brooks Farm	215	no	no		---
Joshua Brooks Farm	289	no	no		---
Thomas Brooks Farm	213	yes	yes	Thomas Brooks Farm	Agrarian
Ebenezer Fiske Farm	605	no	no		Field Trash
Jacob Foster Farm	716	yes	no		Field Trash
Ephraim Hartwell Farm	361	yes	yes	E.H.F., Found.	Domestic/Agrarian
Ephraim Hartwell Farm	403	yes	no		Field Trash
Ephraim Hartwell Farm	412	yes	no	E.H.F., 20th c.F.F.	Field Trash
Ephraim Hartwell Farm	641	yes	no		Field Trash
Ephraim Hartwell Farm	646	yes	no		Field Trash
Ephraim Hartwell Farm	647	yes	no		Field Trash
Ephraim Hartwell Farm	650	yes	no		Field Trash
Ephraim Hartwell Farm	655	yes	no		Field Trash
Ephraim Hartwell Farm	662	yes	no		Field Trash
Ephraim Hartwell Farm	667	yes	no		Field Trash
Ephraim Hartwell Farm	669	yes	no		Field Trash
Samuel Hartwell Farm	622	yes	yes	S.H. Farm, Cellar	Domestic/Agrarian
Holt Pasture	238	yes	no		Field Trash
Josiah Nelson Farm	740	yes	no		Field Trash
Thos. Nelson Jr. Farm	486	yes	no		Field Trash
Thos. Nelson Jr. Farm	491	yes	no		Field Trash
Thos. Nelson Jr. Farm	498	yes	no		Field Trash
Thos. Nelson Jr. Farm	501	yes	no		Field Trash
Thos. Nelson Jr. Farm	505	yes	no		Field Trash
Thos. Nelson Jr. Farm	513	yes	no		Field Trash
Thos. Nelson Jr. Farm	515	yes	no		Field Trash
Thos. Nelson Jr. Farm	517	no			---
Thos. Nelson Jr. Farm	522	yes	no		Field Trash

Table 3-9 (cont.). Distribution of historic sites and historical cultural material by testing blocks and substrata.

Area	Block No.	Historic Cultural Material Recovered	Historic Site Identified	Site Name	Functional Type
Thos. Nelson Jr. Farm	526	yes	no		Field Trash
Thos. Nelson Jr. Farm	528	yes	no		Field Trash
Thos. Nelson Jr. Farm	794	yes	no		Field Trash
Thos. Nelson Jr. Farm	808	yes	no		Field Trash
Ox Pasture	63	no	yes	Ox Pasture	Cart path & Stone Bridge
Ox Pasture	68	no	no		---
Ox Pasture	78	no	no		---
Ox Pasture	80	no	no		---
Ox Pasture	95	yes	no		Field Trash
Ox Pasture	98	yes	no		Field Trash
Ox Pasture	103	yes	no		Field Trash
William Smith Farm	327	yes	yes	W. Smith Farm, Found.	Domestic
William Smith Farm	366	yes	no		Field Trash
William Smith Farm	374	yes	no		Field Trash
Unknown Owner	83	yes	no		Field Trash
Unknown Owner	525				
Abner Wheeler Farm	105	yes	no		Field Trash
Abner Wheeler Farm	248	yes	no		Field Trash
Jacob Whittemore Farm	537	yes	no		Field Trash
Jacob Whittemore Farm	540	yes	no		Field Trash
Jacob Whittemore Farm	546	yes	no		Field Trash
Jacob Whittemore Farm	547	yes	no		Field Trash
Jacob Whittemore Farm	554	yes	no		Field Trash
Jacob Whittemore Farm	610	yes	no		Field Trash
Jacob Whittemore Farm	617	yes	no		Field Trash

clude: everyday beliefs concerning health and sanitation; ideas concerning nature and beauty which suggested that trash should not be seen, resulting in use of trash pits or privies for trash disposal as opposed to surface disposal; agricultural use of all or portions of the refuse generated (i.e., whether manure and compost is applied to fields); and use of refuse as fill material in discrete episodes of dumping (e.g., filling an erosional gulley or cellar hole). Agricultural practices affecting the distribution of field trash include plowed versus unplowed acreages; depth and frequency of plowinging; composted/fertilized versus uncomposted fields; and, filling of erosional gulleys or depressions in fields.

One clear cut example of dumping to fill a cellar hole was encountered during the MIMA survey. A large amount of 20th century cultural material was recovered from test pits within Block 412. This testing block happened to fall on, or adjacent to, a modern structure (not shown on the project maps) which was removed prior to, or soon after, MIMA acquired the property. It appeared that dirty fill (i.e., imported fill material containing historical and/or contemporary cultural material from elsewhere) had been used, at least in part, to fill the cellar hole. This filled cellar hole was identified as a site (Ephraim Hartwell Farm Site, 20th c. Filled Foundation) and is described in more detail in Appendix B.

The term "field trash" is commonly used to refer to the low density scatter of historical cultural material recovered during archeological testing in previously cultivated fields or pastures. Field trash consists of small fragments of ceramics, glass, nails, bone, shell, coal, and/or fragments of other discarded historical materials. It is the remains of every day household items and food remains, discarded as trash or refuse, which has become incorporated into the archeological record at a distance from its place of acquisition and use. One way in which field trash was distributed across the landscape was by becoming mixed with manure, muck, and other soils or fertilizers which were distributed across the landscape as a result of the plowing, composting, filling, and/or landscaping of fields, pastures, and yards (Gallagher 1987).

Agricultural Practices, Manure, and Field Trash

The presence of small fragments of cultural material away from known historical structures is a possible indicator that an area was once farmed. Other indicators of agricultural land use include: presence of a plowzone visible in soil profiles and/or plow scars; elevated levels of certain compounds in the soils as examined through soil chemistry; increased percentages of pollen from cultigens and certain weed species and lowered percentages from trees or native flora; presence of wolf trees; stone walls which enclosed fields; and ecological analysis of plant communities and succession (Jorgensen 1978:207-212). The prevalent historical agricultural practice which spread historical cultural material from houseyards and barnlots into fields was the use of animal dung, sometimes mixed with human waste, as fertilizer.

Historical cultural material could be introduced into the "fertilizer" supply at several points. Some cultural material, particularly barn or yard debris might be tossed into the barnyard and mixed directly into the manure. Composted household organic refuse (especially food remains and kitchen waste), probably containing small amounts of kitchen trash (broken ceramics, glass, etc.), could be added when the manure, collected from stables and barn yards, was piled up awaiting transportation to the fields.

Cultural material intermixed with the manure could have been introduced into the manure from several sources or contexts. The primary source of this material was probably the farm, either in the form of barnyard refuse, household refuse, or a mixture of both.

Alternatively, if nightsoil was being purchased and hauled to MIMA, cultural material in this fertilizer could have been introduced as trash discarded into an urban privy. Roberts and Barrett's (1984:110-111) study of Philadelphia privies demonstrated that large concentrations of artifacts often occur in functioning privies, having been purposely placed there to serve as percolation fill to facilitate dispersal of liquid waste. Artifacts occurring in such a privy fill may have been redeposited coincidentally with nightsoil sold as fertilizer.

> Accordingly, the practice suggests the possible surficial distribution of 19th century cultural material in some agricultural communities wholly unrelated to the prevailing patterns of domestic and market behavior in those communities and opens to question the extent to which artifacts recovered from historical plowzone proveniences can be utilized for inferences about rural lifestyles and cultural patterning (Roberts and Barrett 1984:111).

This would be most likely to affect farming areas within a short distance of large urban areas and/or fields which were intensively cultivated for commercial production. Both of these factors hold true for the farmlands within the bounds of MIMA. The towns of Concord, Lexington, and Lincoln are located close and connected to the Boston urban core via Battle Road (i.e., Massachusetts Avenue/Route 2). During the mid-19th through early 20th century, dairying, fruit raising, and market gardening for the urban Boston market formed an important component of the local economy (MHC 1980a, 1980b, 1980c; Gross 1982).

A local avocational archeologist and member of the Massachusetts Archaeological Society, Mr. Everett Talbot (personal communication, 1990) mentioned a similar experience with "imported" historical garbage. A pig farmer near the Heard Pond Site in Concord regularly collected restaurant garbage (primarily food scraps) to feed to his livestock. Mr. Talbot noted that broken ceramics, occasional whole dishes, and stray pieces of tableware were found on this farm. It is not known whether restaurant slop was similarly collected historically, but it suggests another source of "contamination" from urban refuse "imported" to rural sites.

Temporal and Spatial Associations of the Historical-Period Cultural Material

Certain diagnostic artifacts (specifically ceramics, pipe stems, and nails) were analyzed to determine their probable temporal affiliations. South's mean ceramic date formula (see Table 2-3) (South 1978), the Binford-Harrington clay pipestem dating formula (Binford 1978; Harrington 1978) (see Table 2-4), and manufacturing indicators on nails (see Table 2-5) were considered as methods of determining the approximate age of these historical cultural materials. It must be understood that the manufacture date of the various items does not directly date their deposition in the field trash context. Rather, these dates merely provide a *terminus post quem* for at least one episode of trash deposition. The materials could have been deposited any time after they began to be manufactured (i.e., the day after or yesterday).

Insufficient numbers of ceramic sherds, pipestems, and nails were recovered during the subsurface testing at MIMA to provide adequate samples for calculation of reliable mean dates based on these methods. It was not possible to assign reliable dates to the historical cultural material assemblages recovered from each of the testing units.

Only two pipestem fragments with measurable bore diameters were recovered during the survey.

The stem diameters measured for these two pipestems were: 5/64ths in (1710 to 1750) from Block 103 (Ox Pasture) and 4/64ths in (1750 to 1800) from Block 366 (William Smith Farm). Neither was recovered in association with a site, but rather, both were found in field trash contexts.

As with the ceramics and pipestems, the number of nails recovered was too small to provide a sufficient sample for statistically significant analyses. No hand-wrought nails (17th c. to early 19th c.) were recovered from any of the testing blocks excavated in MIMA. A total of 110 nails were recovered during this survey. Twenty-eight (25.5%) were machine cut and 82 (74.5%) were wire nails. Machine cut nails (c. 1790 to present) were recovered from seven blocks (Blocks 95, 213, 361, 505, 610, 612, and 716), with the majority (20, 71.4%) from Block 213 (Thomas Brooks Farm Site). Wire nails (post-1850 to present) were recovered from 14 blocks within MIMA (Blocks 95, 105, 213, 366, 374, 403, 412, 528, 537, 540, 546, 554, 610, and 612). Some 78 per cent of the wire nails were recovered from only two blocks, 39 (47.6%) from Block 412 (Ephraim Hartwell Farm Site, 20th c. Filled Foundation) and 25 (30.5%) from Block 374 (William Smith Farm Site, Foundation).

Nails are not generally as temporally sensitive as ceramics. They did not go out-of-style, nor were they frequently replaced by new patterns. Unlike easily breakable ceramic vessels or clay pipes, nails are less likely to be broken and discarded, except with building rubble. One possible interpretation of the lack of hand-wrought nails, small number of machine cut nails, and preponderance of wire nails might be that this distribution, heavily weighted toward the mid-18th through 20th centuries, is indicative of the intensive agriculture practiced in the area during this period.

Average plow zone depths were calculated for each of the testing blocks (Table 3-10). The base of the plow zone is identified as being the interface between darker A horizon soils and the B horizon subsoils. The plow zone depths indicated that sometime in the past (possibly merely during the most recent plowing episode) farmers in the MIMA project area appeared to have followed Greeley's deep plowing suggestion. Average plow zone depths recorded from testing units ranged from 18 to 44 cm (7 to 17.5 in) below modern ground surface. Thirty-nine (72.2%) of the blocks had an average plow zone depth of greater than 25 cm (10 in). The A/B soil interface was located at an average depth of between 18 to 25 cm (7 to 18 in) in 15 blocks (27.8%). It must be noted here that it is not possible to determine when a particular plow zone was created. Repetitive cultivation of a field through time would tend to obliterate earlier plow scars, possibly deepening the plow zone as well. Further, technological improvements during the late 19th and 20th centuries (i.e., new farm equipment, especially tractors) made it possible to cultivate deeper than was possible with an animal-powered plow.

Organic material, fragments of bone and shell, was recovered from 32 blocks (59%) (see Table 3-10). No organic material, either bone or shell, was recovered from 22 (41%) of the testing blocks. Such organic material probably was applied to fields along with manure. Its presence could have been either intentional, as in the case of a supplement to the animal waste, or from household food refuse. Shell, unlike bone, could not naturally occur in upland interior soils. The presence of organic material appeared to be directly correlated with the depth of the plow zone. While shell was present in only 26.7% of testing blocks with shallow A horizons (18 - 25 cm), shell fragments occurred in 62% of the blocks with plow zones greater than 25 cm. This could be interpreted as indicating that the presence of shell and bone fragments seemed to indicate plowed and fertilized fields.

To test the assumption that the variables measured are indicative of agricultural land use and additional analysis was conducted. The average

Table 3-10. Distribution of historical-period cultural materials and mean plow zone depths with regard to distances from historical-period and modern structres and roads by area and block number.

Area	Block Number	Historic Site (m)	Historic Road (m)	Modern House(m)	Modern Road(m)	Ceramic R Mass	Str. Mat. R Mass	Bone R Mass	Shell yes/no	Plowzone Depth (cm)
Aaron Brooks Farm	612	75	40	20	40	39,000	16,250	52,000	yes	23
Aaron Brooks Farm	615	105	15	45	35	39,000	81,250	99,125	yes	41
Aaron Brooks Farm	622	15	90	45	20	53,625	6,500	118,625	yes	35
Aaron Brooks Farm	624	45	60	60	30	19,500	0	17,875	yes	40
Aaron Brooks Farm	636	60	0	15	80	16,250	1,625	65,000	no	32
Joshua Brooks Farm	213	0	>225	45	15	13,000	55,250	0	no	25
Joshua Brooks Farm	215	10	>225	15	10	0	0	0	no	20
Joshua Brooks Farm	289	75	>225	75	45	0	0	0	no	19
Ebenezer Fiske Farm	605	210	>225	0	60	0	0	0	no	27
Jacob Foster Farm	716	45	>225	5	10	3,250	1,625	0	no	22
Ephraim Hartwell Farm	361	0	>225	30	60	3,250	13,000	0	no	24
Ephraim Hartwell Farm	403	120	>225	90	60	4,875	3,250	11,375	no	29
Ephraim Hartwell Farm	412	70	>225	150	155	21,775	224,250	13,000	yes	28
Ephraim Hartwell Farm	641	45	0	50	15	6,500	24,375	0	no	29
Ephraim Hartwell Farm	646	90	90	75	55	19,500	0	1,625	yes	36
Ephraim Hartwell Farm	647	60	90	45	30	22,750	1,625	1,625	yes	33
Ephraim Hartwell Farm	650	55	120	70	35	4,875	30,875	3,250	yes	44
Ephraim Hartwell Farm	655	120	150	107	90	26,000	3,250	6,500	yes	37
Ephraim Hartwell Farm	662	90	160	31	8	50,375	9,750	73,125	yes	32
Ephraim Hartwell Farm	667	135	225	100	90	30,875	4,875	9,750	yes	33
Ephraim Hartwell Farm	669	90	215	70	30	45,550	16,250	52,000	yes	40
Holt Pasture	238	420	>225	15	45	8,125	0	11,375	yes	18
Josiah Nelson Farm	740	75	>225	45	10	3,250	0	0	no	29
Thos. Nelson Jr. Farm	486	310	>225	120	120	0	1,625	0	no	30
Thos. Nelson Jr. Farm	491	240	>225	150	105	0	1,625	0	yes	24
Thos. Nelson Jr. Farm	498	300	>225	105	30	1,625	0	0	no	31
Thos. Nelson Jr. Farm	501	>500	>225	75	90	3,250	3,250	0	no	35
Thos. Nelson Jr. Farm	505	160	>225	120	15	40,625	81,250	16,250	yes	32
Thos. Nelson Jr. Farm	513	100	>225	20	45	30,875	0	6,500	yes	27
Thos. Nelson Jr. Farm	515	150	>225	40	30	42,250	1,625	53,625	yes	30
Thos. Nelson Jr. Farm	517	180	>225	30	45	0	0	0	no	19
Thos. Nelson Jr. Farm	522	180	>225	15	45	3,250	16,250	0	no	25

Table 3-10 (cont.). Distribution of historical-period cultural materials and mean plow zone depths with regard to distances from historical-period and modern structres and roads by area and block number.

Area	Block Number	Historic Site (m)	Historic Road (m)	Modern House(m)	Modern Road(m)	Ceramic R Mass	Str. Mat. R Mass	Bone R Mass	Shell yes/no	Plowzone Depth (cm)
Thos. Nelson Jr. Farm	526	210	>225	25	78	0	16,250	0	no	23
Thos. Nelson Jr. Farm	528	150	>225	75	15	30,875	3,250	40,625	yes	26
Thos. Nelson Jr. Farm	794	120	>225	35	40	45,500	11,375	143,000	yes	32
Thos. Nelson Jr. Farm	808	60	>225	15	1	40,625	4,875	32,500	yes	34
Ox Pasture	68	130	70	90	80	0	0	0	no	25
Ox Pasture	95	90	180	0	70	0	11,375	0	yes	30
Ox Pasture	98	120	210	10	30	29,250	19,500	0	yes	31
Ox Pasture	103	90	210	10	30	8,125	30,875	1,625	no	29
William Smith Farm	327	25	60	120	120	0	0	0	no	20
William Smith Farm	366	75	>225	60	90	58,500	81,250	146,250	yes	26
William Smith Farm	374	60	>225	10	90	13,000	52,000	30,875	yes	30
Unknown Owner	83	>500	>225	90	45	3,250	0	0	yes	41
Unknown Owner	525	75	0	70	105	0	0	0	no	20
Abner Wheeler Farm	105	60	120	0	45	1,625	1,625	0	yes	20
Abner Wheeler Farm	248	130	60	60	50	24,375	4,875	0	no	34
Jacob Whittemore Farm	537	100	>225	10	75	4,875	81,250	0	no	27
Jacob Whittemore Farm	540	90	>225	40	105	43,875	13,000	4,875	yes	31
Jacob Whittemore Farm	546	30	>225	5	35	24,375	3,250	6,500	no	32
Jacob Whittemore Farm	547	75	>225	90	110	6,500	1,625	0	no	34
Jacob Whittemore Farm	554	10	>225	20	45	13,000	1,625	0	no	35
Jacob Whittemore Farm	610	>500	5	75	35	8,125	16,250	1,625	yes	30
Jacob Whittemore Farm	617	>500	10	30	15	9,750	21,125	0	no	26

observed plow zone depth, presence/absence of shell, and relative mass of recovered material for each block was compared with the 1775 land use for the parcel as determined by Malcolm (1985). Of the total number of testing blocks excavated within MIMA during the PAL, Inc. survey, 17.9 percent were located within 1775 "tilled fields". The majority of the blocks, some 53.6 percent, were located in "pastures". Of the remaining blocks, 17.9 percent were in "meadow" lands, 5.4 percent in "woodlands", and 1.8 percent each were sited in "rocky fields" or "swamp" land.

Plow zone depths within 1775 tilled fields averaged 30.8 cm (12 in). One testing block (Block 289) within this land use category according to Malcolm (1985) had a significantly shallower plow zone (only 19 cm or 7.5 in) than all the others in the category. If this testing block is eliminated from the calculation of tilled context plow zones the mean depth becomes 32.4 cm (12.75 in). Plow zone depths within the other land use categories were: pasture, 29.3 cm (11.75 in); meadow, 29.1 cm (11.5 in); rocky field, 25 cm (10 in); woodland, 24.8 cm (9.75 in) and swamp, 27 cm (10.5 in).

Historical cultural material was recovered from all but one of the testing blocks located within a 1775 tilled field land use type as indicated by Malcolm (1985). The single exception was the block with the shallow plow zone (Block 289) which was sterile. This apparently anomalous block was eliminated from consideration in this analysis. The mean relative mass was calculated for both the ceramic and structural material categories for blocks within each land use type. Testing blocks within tilled field contexts had significantly higher means in both categories (ceramics 37.7; structural material 44.5). In order, the mean relative mass figures calculated for the other land use types were: pastures (ceramics 16.9; structural material 11.6); meadow (ceramics 10.1; structural material 13.2); and woodland (ceramics 4.5; structural material 13.4). This figure was not calculated for the single blocks in the rocky field and swamp land use types. A brief examination of the presence/absence of shell within the testing blocks by 1775 land use type showed that 77.8 percent of the blocks within tilled field contexts contained shell. Shell was present in 51.7 percent of pasture, 50 percent of meadow, and 25 percent of woodland blocks. Neither the single rocky field nor the swamp block contained shell.

This brief examination indicated that the three measured variables (plow zone depth, relative mass of cultural material, and presence/absence of shell) did appear to correlate with historical agricultural land use. On average, testing blocks excavated within areas determined by Malcolm (1985) to have been tilled fields in 1775 had deeper plow zones, a greater mean relative mass of both ceramics and structural materials, and a higher percentage contained shell. Blocks within 1775 pasture contexts were ranked next in all three categories, followed by meadow and woodland. This analysis also suggests the possibility that at least some areas which were pasture (and not tilled) in 1775 may have been cultivated during some later period. Alternatively, this could indicate that pastures were periodically cultivated. This would explain the relatively high average relative mass figures for ceramics and structural materials from these blocks and the presence of shell in more than half of them. Similar analyses comparing these variables with later historical-period land use types within MIMA might clarify the relationship between field trash distribution and agricultural patterns.

The distribution of "field trash" within MIMA was examined through calculating the relative mass of two categories of historical cultural material recovered per block. In order to simplify the analysis, only two categories were examined. The two categories selected, ceramics and structural material (i.e., nails and window glass), were the artifact types most frequently recovered during the survey. Brick was not included in the density calculations of structural material as it was weighed rather than counted. The location of each testing unit relative to known historical (17th through 19th c.) sites/structures and roads/cartpaths was identified and measured, as was the distance to modern (20th c.) sites/structures and roads.

This information was then used to examine two research questions relating to the distribution of field trash. The first issue examined concerned the relationship between the location of historical houses or sites and the distribution of refuse. It is generally assumed that the density (or relative mass) of historical cultural material (often referred to as "sheet refuse" when associated with a house yard) decreases with increased distance from the structure and/or activity areas. The relative mass of historical cultural material with respect to historical and modern sites and structures was compared for each testing block excavated in MIMA, controlling for the temporal period represented by the cultural material. No obvious relationship was identified between the distance to either a historical or modern site/structure and the density of ceramic or structural materials based on visual or graphic examination of the data. It is possible that the assumption is invalid in this situation. The random sampling strategy employed for this survey was designed to provide information on the prehistoric occupation of MIMA. Different results might be obtained with a strategy designed to examine this question.

The second research question examined concerned the possible association between the historical and/or modern road and the distribution of field trash. The basic assumption being that a greater quantity and/or density (relative mass) of historical cultural material would be expected near historical roadways, with density of such materials decreasing with increasing distance from the road. This could result from farmers dumping or storing loads of manure on the road edge of fields or immediately inside barways [openings providing access into stonewalled enclosures; often closed with wooden bars or gates (Martha Lance, personal communication 1990)] leading to roads. Such roadside concentrations of cultural material could also result from littering behavior of travelers along a heavily traveled road. The measurements of the distance between each testing unit and the nearest roadway dating to the same general temporal period as the recovered historical cultural material was compared to differences in the relative mass of ceramics and structural material. This data was closely examined, but no pattern was detected through visual or graphic examination to indicate a direct, or indirect, relationship between the distribution of these historical cultural materials and the distance to the nearest period roadway. Statistical examinations of the data might point to some correlation. Alternatively, the assumption may be invalid for this data. It may be that this analysis is not appropriate based on the random sampling strategy employed for this primarily prehistoric survey of MIMA.

The source of the historical cultural material occurring in a field trash context is another issue which deserves some consideration. An examination of the historical cultural material recovered from MIMA could not identify any items which could definitely be ascribed to a barn context (e.g., broken tools, harness parts, etc.). The majority of the material appeared to be derived from a domestic or house context (e.g., food packaging, preparation, serving, and consumption items; objects relating to personal clothing, decoration, and activities; house furnishings; etc.). Structural material recovered could be from either of these contexts, or a combination of both.

Additional site and/or area-specific examinations of 17th through 20th century agricultural patterns and refuse disposal behavior within MIMA could contribute valuable information toward a better understanding of these issues within New England.

Chapter 4

Archeological Significance and Recommendations

Archeological Significance and Historical Contexts

The standard used to determine the significance of cultural resources, a task required of Federal agencies and of archeologists working in cultural resource management, has been the guidelines provided by the National Park Service (USDI, NPS 1985:17) as National Register Criteria for Evaluation. Four criteria are listed by which the "quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association:

> a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
> b) that are associated with the lives of persons significant in our past; or
> c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
> d) that have yielded, or may be likely to yield, information important to prehistory or history.

Most archeological sites listed on the National Register of Historic Places have been determined eligible under criterion (d). For eligibility under criterion (d) a number of issues must be addressed, including: the kinds of data contained in the site; the relative importance of research topics which can be addressed by this data; whether this data is unique or redundant; and the current state of knowledge relating to the research topic(s) (McManamon 1990:14-15). Sites are not significant merely because an archeologist decrees that they are. Rather, a convincing argument must establish that the site(s) in question "have important legitimate associations and/or information value based upon existing knowledge and interpretations have been made, evaluated, and accepted" (McManamon 1990:15).

A symposium at the 1987 Society for Historical Archeology meetings held in Savannah, Georgia highlighted the problems and grappled with various solutions of assessing the significance of historical sites. Among the problems outlined by the symposia organizers were:

> differences between data bases representing the historic and prehistoric periods, long-standing biases in American archeology, the numbers and seeming redundancy of many types of historic sites, the recent age and closeness of many sites to modern-day culture, and the fact that sites of the Historic period may

> be studied by archeologists, architectural historians, and historians, among others (Lees and Noble 1990:11).

While no single solution or approach resulted from the symposia, the presentations reached a common conclusion:

> the consideration of archeological significance for Historic period sites is a dynamic, interactive process that must consider a hierarchy of site characteristics, contexts, and integrity. One answer will never suffice (Lees and Noble 1990:13).

The concept of "context", which has been widely used in cultural anthropology, is now being used as a framework for evaluating the significance of individual sites. Context was defined in a 1988 National Register Bulletin as follows:

> At a minimum, a historical context is a body of information about past events and historical processes organized by theme, place, and time. In a broader sense, a historic context is a unit of organized information about our prehistory and history according to the stages of development occurring at various times and places (National Park Service 1988 cited in Lees and Noble 1990:10).

State and Federal agencies are increasingly using a contextual approach to organize their database and as evaluation criteria. For example, the New Hampshire Division of Historical Resources (NHDHR) held a Statewide Survey Workshop on March 2, 1990 in which one of the major themes was the development of historical contexts, identified as the "cornerstone of the planning process" (Potter 1990:3).

Historical contexts provide an organizational format that groups information about related historical properties, based on a theme, geographic limits, and chronological period. An historical context may be developed for prehistoric, historical, and/or recent cultural resources. Each individual historical context is related to one or more aspects of the developmental history of an area or region, and it identifies the significant patterns that an individual resource can represent. With a comprehensive set of historical contexts, a summary of all aspects of an area's history can be developed.

Historical contexts are created by:

> 1) identifying the concept, time period, and geographic limits for this historical context;
> 2) assembling the existing information about the historical context, which includes both collecting and assessing the information;
> 3) synthesizing this information in a written narrative;
> 4) defining the property types related to each historical context by identifying them and characterizing their location patterns and current condition; and
> 5) identifying information needs (Gallagher, Ritchie, and Davin 1985:19).

Property types refers to groupings of individual sites or properties based on their common physical and associative characteristics. They serve to link the concepts presented in the theoretical historical contexts with actual types of historical properties which illustrate those ideas.

A series of historical contexts have been developed to organize the data relating to the prehistoric and historical-period cultural resources identified and predicted within MIMA. These historical contexts are summarized in Table 4-1 along with associated property types, expected locational patterns, and representative physical remains.

Historical Context No. 1: Prehistoric Settlement/Land Use Systems in the Southern Merrimack River Basin, ca. 9500 to 400 B.P.

At the regional level, an important historical context is the organization of prehistoric settlement/land use systems in the southern Merrimack River basin. The largest river drainages in northeastern Massachusetts such as the Nashua, Assabet, Sudbury/Concord, and Shawsheen flow into it. The Sudbury and Assabet River drainages form the southern end of the Merrimack basin and have their headwaters in the eastern slope of the elevated Worcester plateau.

A diversified body of information suggests that river drainages (and related topographic features) were a strategic unit of resource exploitation territories and prehistoric settlement systems. From the Middle Archaic to the early historical-period, various types of data such as lithic resource use and ethnohistoric descriptions of traditional land holding suggest that Native American land use systems were oriented to regional drainage systems (Dincauze 1974; Snow 1980; Hudson 1887).

Therefore it is necessary to consider a larger geographical context in order to understand cultural resources in relation to both regional and local patterns. The research design developed for the survey within MIMA presented a general hierarchy of geographical/physical contexts ranging from physiographic zones to very localized, small-scale settings. These contexts provide the larger framework within which specific results of the survey can be discussed. The historical context described below reviews the broad processes of change in prehistoric settlement/land use patterns and those observed characteristics of prehistoric sites within MIMA that are relevant to this particular theme or context.

SUMMARY

The earliest prehistoric settlement/land use patterns in the southern Merrimack River basin spaced network of site locations within a very large territory. About 7500 to 6000 B.P., prehistoric populations were beginning to restrict settlement activities to territories that appear to correspond to the boundaries of the larger river drainages within the Merrimack basin. Due to either an increase in total population or changes in the distribution and density of natural resources, settlement became concentrated within defined territories between 4500 to 3000 B.P. A general period of environmental change that affected the entire southern New England region sometime after 4000 B.P. appears to have had a profound influence on contemporaneous settlement/land use activities. A noticeable restructuring of earlier settlement patterns during the period between 3500 and 2000 B.P. is probably due to this event. There may have been a general decline in population across the region and an increase in the utilization of coastal zone environments. Interior, upland environments appear to contain fewer sites from this period, however, this may be due to biases present in the current available data base (Ritchie 1983a).

There is an increasing body of data that suggests prehistoric populations may have developed different resource utilization strategies between 3500 and 2000 B.P. These included intensive exploitation of many plant and animal resources from a wider range of environmental zones, particularly in upland areas. There is evidence that interior river

Table 4-1. Summary of the historic contexts for prehistoric and historical-period cultural resources identified at MIMA.

Historic Context	Temporal Boundaries	Property Types	General Distribution Patterns	Representative Physical Remains
#1 - Prehistoric Settlement/ Land Use Patterns in the Southern Merrimack River Basin	9000 - 400 BP	Large base camps (lg, hi density), lg site areas used for temp camps (lg, low density), many other small sites used for specific purposes (sm, hi density) (sm, low density) such as processing stations, lithic workshops/tool maintenance loci.	Intensive settlement was near zones of hi nat res potential. By 7000 BP patts incl expansion of sett/ land use to incl many sm-scale upland environments. Sett/land use in upland environments peaked after 4000 BP. Some evidence of reuse of earlier upland & terr defined by river drainages.	Sites consisting of deposits of chipping debris, burnt rock, discarded stone tools. Facilities for resource processing, heating, etc. (hearths, burnt rock spreads, pits) and remains of faunal or floral resources (calcined bone, carbonized nutshell, seeds).
#2 - Lithic Resource Use in the Sudbury/Concord River Drainage	8500 - 500 BP	Large base camps, small sites where specific lithic reduction activities (manufacture, retouch/maintenance of stone tools) were carried out.	Non-local lithic mat occur primarily as preforms, finished tools, or debitage from final stages of lithic reduction/ maint on upland sites. Some local mat in workshops near source areas. Widest range of lithic raw mat in base camps. Isolated lithic workshop/tool maint sites tend to contain fewer types of materials.	Tools and debitage of local & non-local lithic material. Lithic workshop features.
#3 - Land Use in a Peripheral Zone	18th - 20th c.	Incl domestic (residence), agrarian (farm, barn, outbuilding, fields, etc.), industrial (small mill, shop, res extraction site), & landscape features (stone walls, burial grounds, etc.).	Correlated in some degree with env variables (arable lands, water power, bedrock outcrops, gravel banks, etc.). Usually assoc with woodland & cleared areas outside of core areas.	May incl standing structures &/ or archaeological sites or site remnants.

Table 4-1 (cont.). Summary of the historic contexts for prehistoric and historic period cultural resources identified at MIMA.

Historic Context	Temporal Boundaries	Property Types	General Distribution Patterns	Representative Physical Remains
#4 - Transportation Networks in Eastern Massachusetts	17th - 20th c.	Direct transp related structures, sites, & landscape features (rdbed, rail line, airport, bridge, switching station, depot, tollbooth, etc.). Indirect transp related structures (taverns, inns, stage-coach stops, etc.).	Aligned with natural topog in earlier periods, later influenced by spatial patterning of local & regional core areas.	Modern and abandoned transp routes. Standing structures, archaeological sites or site remnants.

drainages and some upland settings were a vital component of settlement systems by roughly 1600 to 1000 B.P. A return to well-defined river basin territories in the latter part of the prehistoric period seems to have taken place although settlement patterns within interior sections of the Merrimack basin remain unclear (Dincauze 1974, Thorbahn 1982).

Within the southern Merrimack basin, as in other parts of the southern New England regions, prehistoric settlement/land use patterns were closely related to environmental zones with high natural resource potential. In this basin, the varied marsh and wetland environments along major river drainages like the Sudbury, Assabet, Concord, and Shawsheen were the primary focus of settlement patterns during the entire prehistoric period. The broad, marshy floodplain and wooded wetlands along the middle and lower Sudbury and upper Concord Rivers and the fall-lines at Saxonville (Framingham), Billerica, and Lowell were zones of particularly intensive settlement and subsistence activities. A large regional study of prehistoric site distributions covering east and central New England identified four general classes of high density habitats (Dincauze and Meyer 1977).

Within these high density habitats, known site densities were considered to be minimal predictions of site density for similar habitats. The majority of the southern end of the Merrimack River Basin, including the combined Sudbury/Assabet/Concord Rivers, was characterized by two high density habitats: ponds, streams, swamps, and broad valleys below 200 feet. Some of the highest site densities (7.2 to 1.3 sites per square mile) were in a 48 square mile area from the Sudbury River and the confluence of the Sudbury and Assabet Rivers on the west, to the headwaters of the Shawsheen River (Bedford) and Cambridge Reservoir (Route 128) on the east, and Route 20 (Weston, Wayland) on the south. This block area includes a large concentration of known prehistoric sites centered around the town of Concord and MIMA.

Prehistoric settlement patterns also appear to correlate to environmental locales containing open water such as lakes, ponds, tributary streams, and large wetlands, particularly white cedar swamps (Hudson 1889; Ritchie 1980; Hoffman 1983). There is variation throughout time and in the ways hunters/gatherers of different cultural traditions arranged settlement and resource use activities within the various environmental settings in the southern Merrimack River Basin. Differences in prehistoric settlement patterns are reflected in the structural characteristics of sites of varying size. They included large base camps as well as less complex sites used temporarily during hunting or other foraging and resource collection activities in fairly isolated locations. Others contain evidence of tool manufacture/maintenance and specific resource processing activity.

Riverine environmental zones, fall lines, river meadow and marsh, ponds located in or adjacent to the floodplain, and tributary streams draining from upland areas are all examples of settings with high natural resource potential. The sites in these zones cover the widest range of sizes and internal structures ranging from large complex, multi-component sites to very small, activity specific loci. Upland environmental zones tend to contain lower densities of known prehistoric cultural resources and these are generally smaller sites with less complex internal structures. A few sites on large wetlands or ponds were areas for concentrated activities that contributed to the support of prehistoric hunter/gatherer populations.

Historical Context No. 2: Lithic Resource Use in an Interior Drainage, ca. 8500 to 500 B.P.

The reconstruction of the lithic technological subsystem of prehistoric cultural systems within defined geographical study units can provide insights into various processes. The manner in which lithic raw materials were obtained, distributed, and utilized were interconnected with other components of the cultural system. Patterns of lithic resource use may reflect something about the basic adaptive strategies and economic arrangements employed by prehistoric cultural groups. Many potential sources of lithic raw materials in eastern and central Massachusetts have been identified. By examining the distribution of lithic materials in discrete environmental units such as river drainage basins it may be possible to reconstruct general patterns of procurement and distribution through time.

Other studies of prehistoric lithic resources use within river basin study units have demonstrated, among other things, that it is possible to investigate a range of research problems. These include resource procurement by varied cultural groups, the distribution of lithic technological (and maintenance) processes across the region, and interaction between groups in different physiographic provinces (i.e., coastal lowland versus interior upland) (House 1975:81,90).

Models of lithic resource use based on ethnographic and archeological data have described significant variation in the ways that non-local versus locally available lithic materials were used at sites that represented different segments of a settlement pattern. These models suggest that the manufacture of chipped stone tools from difficult to obtain, higher quality non-local materials generally took place at base camps or large habitation loci. However, lithic reduction activities at smaller sites used for more specific purposes (i.e., resource extraction) were restricted to tool maintenance (resharpening, rejuvenation of damaged tools) (Gould 1974; House and Wogaman 1978:52).

Within the southeastern and central Massachusetts region several data recovery programs have provided the opportunity to assemble general diachronic schemes of lithic resource procurement/distribution and utilization patterns using materials from various cultural contexts. The sites involved in these programs were located in the coastal lowland province (Taunton River basin) and in the elevated, interior highlands (Worcester Plateau/Blackstone River drainage) of Massachusetts. Artifacts and debitage from the same source areas (Blue Hills, Lynn, Mattapan Volcanic Complexes) were recovered from these sites and illustrated interesting differences between lithic resource use in coastal lowland and upland, interior physiographic provinces (Thorbahn, Cox, and Ritchie 1983; Ritchie 1985a).

This thematic context is of value for interpreting sites within MIMA for two reasons. First, MIMA is located just outside the western boundary of the Boston Basin, a distinct physiographic zone that is bounded by fault zones, including a section of the Bloody Bluff fault in Lincoln and Lexington. Almost all of the regionally important lithic source areas in eastern Massachusetts are located in complexes of volcanic rocks within or near the boundaries of the Boston Basin to the northeast and southeast of MIMA. In addition, smaller source areas of metamorphic rocks used by prehistoric groups are located along the Bloody Bluff fault zone.

The second reason this context is relevant to the interpretation of prehistoric sites within MIMA is the observed characteristics of these sites. The assemblages of cultural materials from many small, upland zone sites, including those in MIMA, frequently consist primarily of chipping debris with a few chipped stone tools (projectile points, bifaces, etc.). In the absence of categories of temporally diagnostic items like projectile points or certain biface forms, the types of lithic material found are the primary source of information on possible periods of occupation or the role of a particular site within larger settlement systems.

Several source areas for economically useful lithic raw materials (i.e., quartzite, vein quartz, steatite) are located in the Worcester Plateau, 15 to 25 miles (24 to 40 km) to the west and southwest of MIMA. The Sudbury and Assabet drainages provided natural transportation routes, or corridors, along which these lithic materials were brought in various forms to sites in the coastal lowlands. The middle and lower sections of these drainages are areas where patterns of lithic resource use within varied temporal and cultural contexts should reflect in some way the different dynamics involved in the procurement and distribution of local versus non-local lithic materials. Lithic materials (i.e., rhyolite, felsite, argillite) from in and around the Boston Basin and materials (i.e., quartzite, vein quartz) from the eastern Worcester Plateau may have been moved in opposite directions across or along these drainage systems.

SUMMARY

By 8500 B.P., during the Early Archaic Period, hunter/gatherer groups occupying the Sudbury/Concord/Assabet drainages had already begun to utilize raw materials from several extensive lithic source areas in eastern/southeastern Massachusetts. These non-local sources of fine-grained, extrusive volcanic rocks, including a wide range of porphyritic and aphanitic felsites, rhyolite as well as several types of metamorphosed sedimentary rocks were used in varying amounts throughout the entire prehistoric periods.

Following the Early Archaic Period and particularly during the Middle and Late Archaic (ca. 7500 to 2500 B.P.) locally available materials became increasingly important as settlement and resource exploitation activities became more restricted to defined territories. During the Middle Archaic lithic materials from source areas in the elevated upland sections of the Assabet and Sudbury drainages were locally important. Raw materials such as quartzite from the Westboro Quartzite Formation and amphibolite schist from parts of the Marlboro Quartzite Formation were used for projectile points and other chipped stone tools.

The increased emphasis on locally available lithic materials after about 7000 B.P. was first noticed in Middle Archaic assemblages from the Merrimack basin in southern New Hampshire. This also seemed to be a regional trend across much of eastern Massachusetts (Dincauze 1976). For Middle Archaic hunter/gatherers occupying the Sudbury/Assabet/Concord drainage area Cambridge argillite from sources in the northern half of the Boston Basin was the most important non-local material. Fine-grained, silicic tuff or mylonite, probably derived from outcrops along the Bloody Bluff Fault zone on the northwestern edge of the Boston Basin, was extensively used in the first half of the Middle Archaic. Volcanic materials from source areas on the northern and southern edges of the Boston Basin were also used, particularly the porphyritic felsites found within the Lynn and Mattapan Volcanic Complexes (Chute 1966) and rhyolite from the Blue Hill Range (Naylor and Sayer 1976, Ritchie 1979).

After about 6000 B.P. more diversified sets of non-local and local lithic materials were utilized, probably reflecting a broad trend in the general approach to exploiting resources of all types. The Late Archaic Period cultural groups developed lithic technologies based on different sets of preferred local and non-local raw materials. Laurentian Tradition affiliated groups, active from 5500 to 4500 B.P., relied heavily on the quartzite found in various parts of the Westboro Quartzite Formation. Source areas along the western edge of the

Worcester Plateau probably provided almost all of this raw material, which was the primary local lithic type found on sites in the upper Sudbury and Assabet river drainages. Fine-grained volcanics from the major source areas to the north (Lynn Volcanic Complex) and on the southern edge of the Boston Basin (Blue Hill Igneous Complex, Mattapan Volcanic Complex) were also widely used.

Small Stem Point Tradition lithic technologies demonstrate the most extensive use of local lithic sources. This probably reflects a basic pattern of resource use that was dependent on the raw materials available within the well defined river drainage exploitation territories around 4000 to 3000 B.P. Cobbles of quartz collected from deposits of glacial outwash were used throughout the area. Vein quartz extracted from bedrock outcrops provided a majority of the raw material for groups around the headwaters of the Sudbury/Assabet/Concord drainage system. Lithic resources used by Small Stem Point groups included some of the same distinctly local materials (lithic tuff, mylonite) used during the Middle Archaic Period.

Primary dependence on non-local volcanic materials from many different sources in eastern Massachusetts is one of the features of the Susquehanna Tradition lithic technologies in the study area. Fine-grained porphyritic felsites obtained from quarry sources in the uplands between the Neponset and Charles drainages and rhyolite from the Blue Hills were the materials most often used by groups occupying the Assabet/Sudbury/Concord drainage. Porphyritic and aphantic-textured felsites (e.g., Saugus jasper) from the Lynn Volcanic Complex north of the Boston Basin were also used. Exchange networks of considerable extent were apparently employed in the procurement of these and many other varieties of fine-grained, extrusive volcanic materials including cherts from source areas in east/central New York (Dincauze 1968). Susquehanna Tradition stoneworkers also made use of lithic resources found in the Worcester Plateau area, exploiting a group of steatite sources in the upper Blackstone drainage. The only locally derived materials used with any regularity were fine-grained varieties of Westboro Quartzite Formation.

After about 3000 B.P. the basic patterns of resource use practiced by hunter/gatherer populations seem to have changed from earlier patterns. Aspects of lithic resource use during the Terminal Archaic/Early Woodland Period are not well known, especially in interior areas like the Sudbury/Assabet/Concord drainage basin. Some cultural groups such as the Orient complex continued to use non-local volcanic materials possibly obtained through the exchange networks initiated by the earlier Susquehanna Tradition people. Materials from extra-regional source areas, such as chert, often appeared in specific forms such as Meadowood bifacial preforms or projectile points. This may indicate long range economic connections with contemporaneous groups to the west (New York).

For reasons that are not known, Middle Woodland groups in eastern and southeastern Massachusetts were procuring large amounts of exotic lithic materials (e.g., cherts and jasper) from source areas outside the southern New England region (New York, Pennsylvania). Ceramic wares from this time period (ca. 1600 to 1200 B.P.) show design influences from areas to the west and southwest. It seems likely that lithic raw materials as well as stylistic information were passed along well-maintained trade networks. Intensive use of hornfels from a specific source area in the Blue Hills is also a distinctive feature of Middle Woodland lithic technologies across eastern Massachusetts. Groups of hunter/gatherers occupying the Sudbury/Assabet/Concord drainage system were involved in these regional patterns.

Late Woodland to Protohistoric period (ca. 1000 to 500 B.P.) lithic resource use contrasts sharply with the preceding Middle Woodland pattern. Inspection of Late Woodland chipped stone tools (mostly projectile points from the Sudbury/Concord drainage indicates that most of the non-local volcanic material used for these items was obtained from the Lynn Volcanic Complex. Porphyritic and aphanitic-textured felsites (Saugus jasper and Melrose green felsite) from this general source supplemented local supplies of quartz and quartzite.

Historical Context No. 3: Rural/Peripheral Settlement/Land Use, 18th to 20th c.

The core-periphery relationship has been used as a framework in which to discuss and analyze the historical development of Massachusetts and subregions within the state by various researchers (MHC 1982, 1984; Paynter 1982). It provides a theoretical framework, largely derived from geography, which allows the study of development in terms of core areas, peripheral areas, and corridors.

Core areas are central places, characterized by overlapping focal points of activity, including population, civic, ecclesiastical, institutional, transportation, and economic. They are ranked in relation to the areas they influence, with variation in ranking linked to the degree of intensity or complexity of the activities within it. The hierarchy of cores range from purely local, where the activities of the core take place on a town level only, to regional, national, and international. A specialized type of core is the corridor, a regional transportation route used successfully over time. Peripheral areas, on the other hand, are characterized by the absence or infrequent occurrence of focused activities. When focused activities do occur in peripheral areas, they are usually specialized and relate to a specific zone, or may be perceived as unpleasant or undesirable. Places where such negative activities take place are known as fringes (MHC 1984:9-10). Through time a peripheral area may become incorporated within a core area or may develop into a local or regional core. Frontiers are a specialized type of peripheral area, usually temporally specific. Frontier towns serve as local cores, connecting the frontier peripheral zone with a core area.

In New England the distribution of cores, or central places, and their associated peripheries is dependent upon a series of economic conditions. The major guiding principal in settlement pattern distribution is the collection and distribution of goods. This distribution is closely tied to issues of social and economic stratification.

For much of the Colonial Period (1650 to 1775), the entire New England region operated as a peripheral zone on an international level of Western Europe, most notably Great Britain. On a regional scale, specifically in regard to New England, cores were concentrated in coastal zones, consisting of the "urban villages" (McManis 1977:76). Boston was the primary core area of colonial Massachusetts for most of the 18th century. It served as the primary central place and largest urban village of New England. A pattern of concentric zones of decreasing complexity radiated out from the Boston core. A decline in the concentration of wealth, one measure of social and economic stratification, can be observed with increasing distances from Boston. On the other hand, a strictly zoned pattern is not directly applicable, as there is a relatively wide distribution of higher order central places, or secondary cores, such as towns in the Connecticut River Valley (e.g., Springfield). There were also local cores, such as Norton, Hadley, Sudbury, and Concord that existed in all parts of the region. Below these were widely distributed "egalitarian villages", with little social and economic stratification, such as Fitchburg (Cook 1976:78).

Peripheral zones have distinctive spatial characteristics. The property types that exemplify such areas reflect these characteristics. They include a diverse assemblage of structures and landscape features that are essentially rural. These include: domestic and agrarian sites, outbuildings, small mills, resources extraction sites such as quarries, and landscape features such as stone walls, cleared or abandoned fields, and cranberry bogs which are the reflections of a primarily agricultural land use pattern. In general, the spatial characteristics of the property types within peripheral zones are low density, and in many cases specifically keyed into environmental zones.

The locational patterns of these property types tended to remain stable through time. The earlier agricultural settlement was established with a small population within a largely uninhabited region. At this period, choice of land use differentiation was guided by the constraints of land division. Sections of land in specific environmental zones were apportioned to individual families to provide a full range of resources necessary for subsistence (i.e., wood, arable land, meadow hay, etc.).

During the early period of settlement, houses were clustered and oriented to the cartways and paths that crossed the small settlements. Through time the communal system began to break down and settlement became more widely dispersed, though still oriented toward roads and cart paths. Locations of individual dispersed farmsteads were determined by a combination of natural and cultural variables, including inherited ownership, soil and drainage characteristics, and proximity to transportation networks. The density and type of residential structures remained relatively unchanged throughout the 19th century.

Other property types were of necessity located within specific environmental zones. Cranberry bogs, for example, are frequently created within naturally occurring inland wetlands. Resource extraction sites, such as stone or gravel quarries, are located within close proximity to bedrock outcrops, boulder fields, or gravel banks.

Mills, used to process or manufacture locally produced grain, wood products, and textiles, had technical requirements in terms of the volume of water needed to power their hydraulic mechanisms. The competition for mill seats led, in some cases, to the placement of mills on less desirable water sources.

Historical Context No. 4: Transportation Networks in Eastern Massachusetts, 17th to 20th c.

Transportation networks in any region are related to aspects of the region's topography, economic development, and social stratification (Lewis 1976; Paynter 1982; Cook 1976). The evolution of transportation networks in eastern Massachusetts, the area comprising the towns immediately west of Boston, has been summarized by the Massachusetts Historical Commission (MHC 1982).

The earliest transportation routes in eastern Massachusetts followed aboriginal trails and major waterways (MHC 1982:34). Later, as the number of settlements and population density increased, these paths were improved and new roads were constructed by groups of proprietors, towns, and/or individuals. During the late 18th and early 19th centuries, the expansion of commercial networks and industrialization encouraged the construction of turnpikes and canals. These were later superseded hy railroads and street railways in the mid to late 19th century. With the advent of widespread automobile travel in the early 20th century, the road network was improved and numerous state and federal highways were built. Local and regional airports were built during the 20th century to accommodate increasing air travel.

Each means of transportation was associated with specific property types, i.e., the physical reflections or types of sites, structures, and features commonly representative of a particular mode of travel. They include active roadways and rail lines, abandoned and reused roadbeds and railways, railroad switching yards, stagecoach or railroad stations, and other transportation support structures such as depots, taverns, inns, toll booths, bridges, causeways, airports, and helipads.

Significance and Recommendations for Identified Prehistoric Cultural Resources

The potential significance of 14 prehistoric period archeological sites identified within MIMA during the 1989/90 survey by PAL, Inc. can be discussed in terms of their relevance to two general historical contexts or themes (see Table 4-2). Most of the identified sites are best evaluated within the context summarizing prehistoric settlement/land use systems in the southern Merrimac River basin, ca. 9500 to 400 B.P. Many of them also contain small amounts of information relevant to the context describing lithic resource use. With the exception of three sites, all of the identified prehistoric cultural resources consist of very small "find spots" or activity areas. The locational attributes and structural characteristics of these very small sites can be used to reconstruct prehistoric settlement/land use patterns and are a source of information on the distribution and relative intensity of prehistoric activity in non-riverine, upland sections of the southern Merrimac drainage basin. For example, the fact that the survey within MIMA identified a sample that consisted mostly of very small loci (less than 100 sq m) and a few small to moderate sized (500-1000 sq m) sites, but did not include any larger sites provides support for current models that place large, complex sites mostly in the riverine zone. The 14 very small "find spots" are distributed in a range of microenvironmental settings within MIMA.

Four of these sites (Joshua Brooks Farm P1, Holt Pasture, Thomas Nelson Jr. Farm P1, P2) are located along the margins of tributary stream and wetland corridors. These sites are on the upper sections of tributary streams (Elm Brook, Hobbs Brook) that form the headwaters of two major river drainages (Shawsheen, Charles).

Three other sites (Ox Pasture, William Smith Farm P1, William Smith Farm P2) are in settings more typical of upland areas located at some distance (100-200 m) from a stream or other permanent water source. The William Smith Farm P1 site, in particular, is a good example of a small site located in hilly, upland terrain on knolls or within sheltered hollows. A few other examples in the current inventory from the combined Assabet/Sudbury/Concord and Mystic/Shawsheen drainages in relatively elevated (from 250 to 300 ft above sea level) areas are evidence that small sites were located in these settings. These known sites were used during the Middle/Late Archaic period interface ca. 6000 to 4500 B.P. Sites of this type are potentially significant because they provide data to test current concepts that sites are mostly within 100 to 200 m of a water source.

Another group of five sites in the area near Folly Pond includes four very small find spots, or loci, (Ephraim Hartwell Farm P1, P2, P3, P4) and one moderate sized (ca. 1000 sq m) site (Aaron Brooks Farm P1). This cluster of sites is potentially significant because it illustrates a kind of prehistoric land use pattern in which certain areas were used for activities that generate very low densities of cultural material. In settings that were used for recurrent, brief episodes of foraging or other resource collecting there may be numerous loci like these. The pattern of widely dispersed, low density find spots in the Folly Pond section of MIMA is analogous to a general depositional pattern observed in other surveys in eastern/southeastern Massachusetts. Low density deposits of cultural material (i.e., chipping debris, burnt rock) were

Table 4-2. Significance and recommendations for identified prehistoric period cultural resources.

Site Name	Block Number	Town	Functional Type	Time Period	Condition	Significance	Recommendation
Ox Pasture P1	68	Concord	Very small activity area	Unknown	Good	Settlement & land use in upland zone	Preservation & Avoidance
Holt Pasture P1	238	Lincoln	Very small activity area	Unknown	Good	Settlement & land use in upland tributary stream zone (Upper Shawsheen)	Preservation & Avoidance
Joshua Brooks Farm P1	215	Lincoln	Very small activity area	Unknown	Good	Settlement & land use in upland tributary stream zone (Upper Shawsheen)	Preservation & Avoidance
William Smith Farm P1	327	Lincoln	Very small activity area	Unknown	Good	Settlement & land use in upland zone (- upland hill zone site)	Preservation & Avoidance
William Smith Farm P2	374	Lincoln	Small temporary camp?	Unknown (Archaic Period?)	Good	Contributes to cluster of moderate-small sites in Shawsheen River headwaters	Preservation & Avoidance

Table 4-2 (cont.). Significance and recommendations for identified prehistoric period cultural resources.

Site Name	Block Number	Town	Functional Type	Time Period	Condition	Significance	Recommendation
Aaron Brooks Farm P1	612 615 636	Lincoln	Moderate sized (ca. 1500m^2) temporary camp	Unknown	Good	Settlement & land use in upland zone (Shawsheen/Charles)	Preservation & Avoidance
Ephraim Hartwell Farm P1	655	Lincoln	Very small activity area	Unknown	Good	Settlement & land use in upland zone (Shawsheen/Charles)	Preservation & Avoidance
Ephraim Hartwell Farm P2	667	Lincoln	Very small activity area	Unknown	Good	Settlement & land use in upland zone (Shawsheen/Charles)	Preservation & Avoidance
Ephraim Hartwell Farm P3	412	Lincoln	Very small activity area(?)	Unknown	Fair - Poor	Settlement & land use in upland zone (Shawsheen/Charles)	Preservation & Avoidance
Ephraim Hartwell Farm P4	403	Lincoln	Small (ca.250m^2) temporary camp(?)	Unknown	Good	Settlement & land use in upland zone (Shawsheen/Charles)	Preservation & Avoidance
Jacob Foster Farm P1	716	Lincoln	Very small activity area	Unknown	Good(?)	Settlement & land use in upland zone (Shawsheen)	Preservation & Avoidance

Table 4-2 (cont.). Significance and recommendations for identified prehistoric period cultural resources.

Site Name	Block Number	Town	Functional Type	Time Period	Condition	Significance	Recommendation
Thomas Nelson Jr. Farm P1	505	Lincoln	Small activity area	Unkown	Good	Settlement & land use in upland tributary stream/wetland zone	Preservation & Avoidance
Thomas Nelson Jr. Farm P2	491	Lincoln	Very small activity area	Unknown	Good	Settlement & land use in upland tributary stream/wetland zone	Preservation & Avoidance
Whittemore Farm P1	537 540	Lexington	Small (ca. $500m^2$) temporary camp w/ lithic workshop	Possibly Middle Archaic	Good	Contains evidence of primary reduction of locally available lithic material (lithic resource use)	Preservation & Avoidance

found along the margins of streams, wetlands, and environmental zones displaying a kind of "edge effect" (Gallagher, Ritchie, and Davin 1985; Ritchie and King 1988). The position of the Folly Pond Site cluster along the boundary between two major watersheds (Charles and Shawsheen drainages) may be meaningful. This area may have been used more frequently than other locations by prehistoric groups moving between these drainages, or using larger base camp sites closer to the riverine "core" areas along the Shawsheen, Charles, or Concord Rivers. In general, while probably not potentially significant on an individual basis, these "find spots" sites are important when considered as a category or group of sites because of what they indicate about the nature of prehistoric settlement and land use in upland area.

One of the prehistoric sites identified during the survey appears to be an example of a moderate sized (ca. 1500 sq m) temporary camp. The Aaron Brooks Farm P1 Site was the only site of this general type found during the survey and could be a potentially significant source of information. The site consisted of a low density scatter of felsite chipping debris found in three 30 x 30 m sampling units within the Folly Pond substratum. The temporal period and cultural affiliation of this site is unknown, however it is similar in some ways to another site located outside MIMA north of Virginia Road (Black Rabbit) (Mowchan, Schneiderman, and Ritchie 1987) with a single Late Archaic Susquehanna Tradition component.

The prehistoric sites identified during the survey all yield some information that is relevant to the historical context describing lithic resource use. While the assemblages of lithic material from the "find spot" sites were generally small they have some potential value as sources of information about various activities such as raw material procurement, tool manufacture/ maintenance, and discard of lithic items in upland areas.

The "find spot" sites, while usually consisting of only one or a few pieces of chipping debris, form an interesting pattern when viewed as a group. With one exception (Ox Pasture Site) all the chipping debris recovered from these sites was of lithic materials other than quartz. Most of the chipping debris was varieties of gray or black felsites with a few pieces of gray-green felsite or argillite. The gray or black felsites were likely derived from sections of the Lynn or Mattapan Volcanic Complexes. Source areas within sections of the Lynn Volcanic Complex to the northeast of MIMA may have been the origin of most of the felsites. The almost total absence of quartz chipping debris on these sites was unexpected since this locally available material is usually found. The predominance of non-local materials on some upland zone sites is a pattern that has been observed in other sections of the Sudbury/Assabet Drainage area. Volcanics (rhyolite, felsite) from Boston Basin sources made up most of the non-local material found on sites in one upland area adjacent to the middle section of the Assabet River. A possible explanation for this observed pattern may be the use of many small sites in upland locations where lithic reduction activities were primarily the maintenance/repair of chipped stone tools (projectile points, bifaces, etc.) being actively used in various tasks like hunting and resource processing. These tools may have been made mostly of non-local materials brought to sites (larger camps) in other parts of a group territory.

Indirect evidence for procurement and use of locally available lithic material was found on one site in the park. The Whittemore Farm P1 Site near Fiske Hill contained what appeared to be a small, relatively dense deposit of chipping debris of mylonite or silicic tuff. This site may consist of a small lithic workshop and is probably within the "supply zone" surrounding the source of this material, which is known to be associated with the Bloody Bluff Fault zone. The source area for mylonite is not known to be within MIMA but could be within a few miles, most likely in the

Lexington or Woburn area. Mylonite has a strong association with Middle and some Late Archaic (Small Stem Point tradition) lithic technologies and the Whittemore Site is a potentially significant source of information.

Recommendations for Additional Inventory and Evaluation

It may be useful to view the results of this investigation as a type of pilot study for designing more specific or problem-oriented surveys within MIMA. Further evaluation of the identified prehistoric sites within MIMA could help to delineate settlement/ land use patterns in upland settings since many questions remain. For example, it appears from this survey that "high density" may need to be defined in different ways in upland areas versus the better documented riverine areas. The relative frequencies of sites, their spatial distribution and density, and structural characteristics in upland high sensitivity zones are different than those in riverine areas. The results of the survey suggest that most upland high sensitivity zones in MIMA contain primarily small, low visibility loci and a few moderate sized sites, but very few, if any, large internally complex sites. This is generally consistent with what is known from the surrounding area. One of the outcomes of statistical analysis of the random sampling was the apparent low contrast in mean site frequencies between the designated high and moderate sensitivity substrata. The frequency of mean sites per sample unit ranged from .14 to .69 and this may be typical of other upland, non-riverine locations that would be ranked as high or moderate sensitivity zones. It suggests that a range of site frequency should be expected for upland areas that would be stratified as high sensitivity based on the typical location attributes (soil, distance to water, etc.) used to define sensitivity. The Folly Pond area with a mean site frequency of .69 sites is the best example of a high sensitivity area. The predominance of small "find spot" sites in this area may be replicated in other environmentally similar locations. The moderate sized site (Aaron Brooks Farm P1) found in this area appeared to be a rare category of site. However, it is still possible that some upland non-riverine locations ranked as high sensitivity within MIMA could be found to contain higher frequencies of sites than those observed in the areas intensively examined in this survey. An expanded inventory survey of MIMA could expose this problem by sampling a wider range of both high and moderate sensitivity areas. Based on the results of the survey just completed, the ratio of random or probabilistic sampling to judgmental testing is likely to strongly affect the numbers of sites that would be discovered.

Some of the "find spot" sites should be further examined with close internal (2.5 m) testing to determine their actual horizontal extent and internal densities of cultural material. This could establish a basis for evaluating sites of this type. At present, there is not enough known about these very small sites to readily evaluate their significance. Other sites, such as the Aaron Brooks and Whittemore Farm Sites, could also be examined in more detail to confirm their temporal/cultural affiliation.

In summary, the prehistoric cultural resources identified during the survey are important additions to the extant data base for the region surrounding MIMA. While this inventory of sites is fairly small and includes many "low visibility" sites or loci, when viewed within larger contexts (Southern Merrimac Basin) it should contribute to a more complete reconstruction of prehistoric settlement/land use systems.

Significance and Recommendations for Identified Historical-Period Cultural Resources

The six historical-period sites identified within MIMA during the 1989/90 PAL, Inc. survey fall within two broad, related historical contexts (Table 4-3). The first concerns Transportation Networks in Eastern Massachusetts, 1650 to 1950. The site identified as the Ox Pasture Site, Cartpath and Stone Bridge (Block 63) fits within this context. This small bridge is located in a rural/peripheral zone on a cartpath which appeared on a 1775 map. Preservation and avoidance are recommended; no additional field work is recommended for this site.

The second historical context relates to Rural/Peripheral Settlement/Landuse, 18th to 20th c. The four remaining sites fitting into this context, all appear to be agrarian/residential sites located in peripheral areas. The Thomas Brooks Farm Site, Barn/Outbuilding (Block 213) consists of the structural remains of a probable barn or outbuilding. The exact function and construction date of this structure are not known. However, occupation/use is tentatively dated to the early-to-mid 19th century based on the cultural material recovered from Block 213 (Table B-1, Appendix B). Preservation and avoidance of the site is recommended. Additional documentary research, focusing on a title examination to determine ownership, date of construction, and function, is recommended.

The William Smith Farm Site, Foundation (Block 327) consists of a slumped cellarhole and attached, partially cobbled, foundation. Little cultural material was recovered from the vicinity of this site, Block 327 (Table B-2, Appendix B). A tentative late 19th to 20th century construction/occupation date for the site is based on the structural use of cement and appearance of the foundation. Additional documentary research/title examination is recommended to determine ownership and date of construction. Avoidance and preservation is not recommended at this site due to its probable late date, poor condition, and limited integrity.

The Ephraim Hartwell Farm Site, Foundation (Block 361) is a probable domestic/agrarian site consisting of a pile of fieldstone and brick rubble, the remains of a house foundation, and an adjacent well. Historical cultural material recovered from Block 361, located approximately 15 m north of this site across a stonewall, suggests a possible late 19th to 20th century occupation date (Table B-3, Appendix B). However, as this cultural material cannot be clearly associated with the site, further archeological fieldwork is recommended. Additional documentary research is recommended, focusing on identifying ownership and construction date through title examination. Preservation and avoidance is recommended for this site, at least until the date can be firmly established.

The Ephraim Hartwell Farm Site, 20th c. Filled Foundation (Block 412) appears to be the remains of a razed 20th century house. The probable 20th century construction date is based on the presence of concrete blocks in a small exposed portion of the foundation. A large amount of historical cultural material was recovered from Block 412 (Table B-4, Appendix B), representing primarily 19th to 20th century trash and building rubble which was used to fill the cellarhole. Documentary research/title examination is recommended to determine ownership and date of construction for this site. Avoidance and preservation is not recommended at this site due to its probable late date and poor condition.

Finally, the Samuel Hartwell Farm Site, Cellarhole (Block 622) is a domestic/agrarian site consisting of a mortared fieldstone cellar hole. The nearest testing block, Block 622, was excavated approximately 24 m south of this site. Therefore, like the Ephraim Hartwell Farm Site, Foundation, the cultural material from this block is not clearly associated with the site. If associated, the cultural

Table 4-3. Significance and recommendations for identified historical-period cultural resources.

Site Name	Block Number	Town	Functional Type	Time Period	Condition	Historic Context & Significance	Recommendation
Ox Pasture, Cartpath & Stone Bridge	63	Lincoln/ Concord	Transportation - Bridge on Cart path	pre-1775	Good - Very Good	#4-Transsportation Network - 18th c.	Preservation & Avoidance
Thomas Brooks Farm, Barn/Outbuilding	213	Lincoln	Agrarian - probable barn/ outbuilding	probable early - mid 19th c.?	Good struct. remains; Unknown subsurface	#3-Rural/Peripheral Sett./Landuse - 19th c.	Preservation & Avoidance; Add. document- ary research
William Smith Farm, Foundation	327	Lincoln	Domestic - house found.	probable late 19th - mid 20th c.?	Poor struct. remains	#3-Rural/Peripheral Sett./Landuse - 19th - 20th c.	Add. document- ary research
Ephraim Hartwell Farm, Foundation	361	Lincoln	Domestic/Agrarian - house found. & well	probalbe late 19th - 20th c.?	Poor struct. remains	#3-Rural/Peripheral Sett./Landuse - 19th - 20th c.	Preservation & Avoidance; Add. document- ary research; Subsurface testing
Ephraim Hartwell Farm, 20th c. Filled Foundation	412	Lincoln	Domestic/Agrarian - filled found.	probable 20th c.?	Poor	#3-Rural/Peripheral Sett./Landuse - 19th - 20th c.	Add. document- ary research
Samuel Hartwell Farm, Cellar Hole	622	Lincoln	Domestic/Agrarian - cellar hole	probable late 19th c.?	Good	#3-Rural/Peripheral Sett./Landuse - 19th c.	Preservation & Avoidance; Add. document- ary research; Subsurface testing

material from Block 622 would suggest a probable late 19th century occupation date. Subsurface testing is recommended for this site. Additional documentary research is also recommended to determine date, ownership, and function. Preservation and avoidance is recommended for this site.

Recommendations for Additional Inventory and Evaluation

The six historical-period sites located incidental to the prehistoric survey have some potential to contribute additional information to local and regional research issues and to MIMA's interpretive program. Research questions which could be addressed include: transportation networks (Ox Pasture site) and settlement/landuse patterns in rural/peripheral areas (Thomas Brooks Farm site, William Smith Farm site, Joshua Brooks Farm site, and Samuel Hartwell Farm site). Only the Ox Pasture Site, Cartpath and Stone Bridge appears to potentially overlap the main interpretive period covered at MIMA. The limited evidence currently available suggest that the other five sites post-date April 19, 1775, with probable construction/occupation dates in the 19th to 20th century. These five sites could provide interpretive information relating to rural/peripheral landuse/settlement of MIMA since the Revolutionary War. In addition, the non-site field trash recovered during the survey could contribute information toward a variety of research questions, including such issues as changes in refuse disposal behavior, landuse patterns, and agricultural practices within MIMA through time.

Considerations for Further Research Relating to Refuse Disposal Behavior and Field Trash

Further examination of changing patterns of refuse disposal through time within MIMA should consider a number of additional variables, beyond the scope of this study, based on town and region-specific data. Among these variables are the dates of changes in town regulations concerning the collection, deposition, or burning of trash; evidence for trash discard practices from previously tested sites within MIMA and the surrounding area (i.e., trash pits, composting, filling of erosional or cultural depressions, unauthorized dumping in vacant lots, organized town dump facilities, or rural/suburban garbage collection). All of these issues can affect practices of individuals in various settings; urban, rural, or suburban.

Collection of more detailed 19th through 20th century site or MIMA-specific agricultural land use data, similar to that collected by Malcolm (1985) for 1775, could help to elucidate field trash contexts. It is clear from the available data that the lands encompassed within MIMA continued to be utilized agriculturally from April 20, 1775 to the present. It is likely, based on a general knowledge of 19th through 20th century American agricultural practices and technology, that more recent use of these lands may have altered or obscured earlier period field trash patterns. Without more detailed agricultural and land use data for more recent periods it is difficult to come to any conclusions concerning the meaning of the field trash distribution observed during the PAL, Inc. survey of MIMA.

As was indicated in the preceding discussion of nightsoil and restaurant refuse, future consideration could also be given to determining the source of field trash or "dumped" historical cultural material. While it is often assumed that such material came from a nearby house or farm, this is not easy to prove or disprove. When a trash pit, privy, or filled feature is located in close proximity to a known site it is reasonably safe to make such an assumption. When dealing with historical cultural material not clearly associated with a site, such as is the case with the majority of field trash, this assumption may be highly misleading. Seldom does refuse recovered from archeological contexts carry a signature of its creator. Contemporaneity of the material can provide a clue, as could recovery of ceramic pieces from matching place settings, cross-mendable sherds, or monogrammed silverware. However the chance of recovering such finds, or indeed of noting them within a collection are slim. The field trash recovered from MIMA during this survey carried no signatures or clear clues as to the identity of those individuals who once made, used, and later discarded these materials. Cross-checking ceramic wares and patterns gleaned from probate inventories for specific households with those recovered archeologically from field contexts historically associated with the same households, though difficult and time-consuming, could provide further interesting information toward dealing with this topic.

The potential research questions outlined above are only a small number of those which could be examined relative to the broad issues and interpretation of refuse disposal behavior, agricultural practices, and field trash within MIMA or New England.

List of References

Alvord, D. C., M. Y. Pease, Jr., and R. J. Fahey
1976 The Pre-Silurian Eugeosynclinal SequenceBounded by the Bloody Bluff and Clinton-Newbury Faults, Concord, Billerica, and Westford Quadrangles, Massachusetts. In *Geology of Southeastern New England*, ed. by Barry Cameron, pp. 315-333. Science Press, Princeton, NJ.

Bailey, L. H.
1916 *Manual of Gardening: A Practical Guide to the Making of Home Grounds and the Growing of Flowers, Fruits, and Vegetables for Home Use*. The Macmillan Company, New York.

Baker, Vernon G.
1980 *Archeological Overview and Evaluation, Minute Man National Historical Park, Massachusetts*. Cultural Resources Management Study No. 2. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Barber, John
1839 *Historical Collections Relating to the History and Antiquities of Every Town in Massachusetts*. Dorr, Howland & Company, Worcester, MA.

Barber, Russell
1979 A Summary and Analysis of Cultural Resource Information on the Continental Shelf from the Bay of Fundy to Cape Hatteras. In *Volume II - Archaeology and Paleontology*. Institute for Conservation Archaeology, Peabody Museum, Harvard University, Cambridge, MA.

1983 *Research Design: Archaeological Data Recovery at Four Sites on Annasnappet Pond, Proposed Route 44 Location, Carver, Massachusetts*. Institute for Conservation Archaeology, Peabody Museum, Harvard University, Cambridge, MA.

Barosh, Patrick J.
1976 Faults and Related Deformation in the Clinton-Newbury-Bloody Bluff Fault Complex of Eastern Massachusetts. In *Geology of Southeastern New England*, ed. by Barry Cameron, pp. 301-314. Science Press, Princeton, NJ.

Benes, Peter (editor)
1988 *The Farm*. The Dublin Seminar for New England Folklife Annual Proceedings 1986. Boston University, Boston.

Bernabo, Christopher J.
1977 Sensing Climatically and Culturally Induced Environmental Changes Using Palynological Data. Unpublished Ph.D. dissertation, Department of Geological Sciences, Brown University, Providence, RI.

Binford, Lewis R.
1978 A New Method of Calculating Dates from Kaolin Pipe Stem Samples. In *Historical Archaeology: A Guide to Substantive and Theoretical Contributions*, ed. by Robert Schuyler, pp. 66-67. Baywood Publishing Company, Inc., Farmingdale, NY.

Blancke, Shirley
1978 Analysis of Variation in Point Morphology as a Strategy in the Reconstruction of the Culture History of an Archaeologically Disturbed Area. Unpublished Ph.D. dissertation, Boston University, Boston.

1982 A Survey of Pre-Contact Sites and Collections in Concord. Ms. on file, Massachusetts Historical Commission, Boston, MA.

Bolian, Charles, R. Scott Dillon, and Eugene Winter
1982 *A Cultural Resource Survey of the Great Meadows National Wildlife Refuge, Massachusetts*. Submitted to U.S. Fish and Wildlife Service, Region IV, Newton, MA and Inter-Agency Archaeological Services, Atlanta, GA.

Bradshaw, Richard, Sheldon Nelson, and Katrina McGown
1981 PaleoEcological Reconstruction in the Taunton Quadrangle, Massachusetts. In *Methodological and Analytical Studies on the Prehistoric Sites in the I-495 Project*, vol. III, ed. by Peter F. Thorbahn. Department of Anthropology, Brown University Report. Submitted to the Massachusetts Department of Public Works, Boston.

Braun, E. Lucy
1950 *Deciduous Forests of Eastern North America*. Blakiston Company, Philadelphia.

Bullen, Ripley
1949 Excavations in Northeastern Massachusetts. *Papers of the Robert S. Peabody Foundation for Archaeology* 1(3). Phillips Academy, Andover, MA.

Carlson, R. W.
1964 The Washakumaug Site. *Bulletin of the Massachusetts Archaeological Society* 25:29-35.

Casjens, Laurel
1978 *Archaeological Site Catchments and Settlement Patterns in the Concord River Watershed, Northeastern Massachusetts*. Institute for Conservation Archaeology Report, Peabody Museum, Harvard University, Cambridge, MA.

Chute, Newton
1966 Geology of the Norwood Quadrangle, Norfolk and Suffolk Counties, Massachusetts, *Geological Survey Bulletin, 1163-B*, U.S. Government Printing Office, Washington, DC.

Clapp, Frederick G.
1902 Geological History of the Charles River in Massachusetts. *The American Geologist*, vol. 29. The Geological Publishing Company, Minneapolis.

Cochran, William G.
1963 *Sampling Techniques*. John Wiley and Sons, Inc., New York.

1977 *Sampling Techniques*. John Wiley, New York.

Cook, Edward M. Jr.
1976 *The Fathers of the Towns*. Johns Hopkins University Press, Baltimore.

Copeland, R. Morris
1859 *Country Life: A Handbook of Agriculture, Horticulture and Landscape Gardening*. John P. Jewett & Co., Boston.

Cox, Deborah C., Peter F. Thorbahn, and Alan Leveillee
1983 *An Archaeological Assessment Survey of the Pettaquamscutt River Basin*. The Public Archaeology Laboratory, Inc. Report #12-1. Submitted to the Rhode Island Historical Preservation Commission, Providence.

Deetz, James
1977 *In Small Things Forgotten: The Archaeology of Early American Life*. Anchor Books, Garden City, NY.

Dincauze, Dena F.
1968 Cremation Cemeteries in Eastern Massachusetts. *Papers of the Peabody Museum of Archaeology and Ethnology* 59(1). Peabody Museum, Harvard University, Cambridge, MA.

1974 An Introduction to the Archaeology in the Greater Boston Area. *Archaeology of Eastern North America* 2(1):39-67.

1976 The Neville Site: 8000 Years at Amoskeag, Manchester, New Hampshire. *Peabody Museum Monograph*, No. 4. Peabody Museum, Harvard Unversity, Cambridge, MA.

1980 Research Priorities in Northeast Prehistory. In *Proceedings of the Conference on Northeastern Archaeology*, ed. by James A. Moore, pp. 29-48. Research Report 19, Department of Anthropology, University of Massachusetts, Boston.

Dincauze, Dena F., and Judith Meyer
1977 *Prehistoric Resources of East-Central New England: A Preliminary Predictive Study.* Cultural Resource Management Study, Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Dincauze, Dena F., and Mitchell Mulholland
1977 Early and Middle Archaic Site Distributions and Habitats in Southern New England. In *Amerinds and Their Paleoenvironments*, ed. by W. S. Newman and B. Salwen, pp.439-456. Annals of the New York Academy of Sciences 288.

Donahue, Brian
1984 The Forests and Fields of Concord: An Ecological History, 1750-1850. In *Chronos: A Journal of Social History* No. 2, Fall 1983. Department of History, Brandeis University, Waltham, MA.

Dwyer, Alison D., and Alan T. Synenki
1990a Archeological Investigations of the David Brown Farmstead. In *Archeological Investigations of Minute Man National Historical Park*, Vol. I: *Farmers and Artisans of the Historical Period*, ed. by Alan T. Synenki, Chapter 4. Cultural Resources Management Study 22, Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston, forthcoming.

1990b Of Roads, Barns, and Stone Walls: Archeological Investigations of the Jonas Bateman Site. In *Archeological Investigations of the Minute Man National Historical Park*, Vol. I: *Farmers and Artisans of the Historical Period*, ed. by Alan T. Synenki, Chapter 6. Cultural Resources Management Study 22, Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston, forthcoming.

Fenneman, N. E.
1938 *Physiography of the Eastern United States.* McGraw Hill, New York.

Filios, Elena
1983 To Vote With Your Feet. Address presented to the Annual Meeting of the Northeastern Anthropological Association, Syracuse, NY.

Fowler, William S.
1950 The Heard Pond Site. *Bulletin of the Massachusetts Archaeological Society* 12.

Gallagher, Joan
1987 *A Phase I Archaeological Survey, Vantage Point Property, Bristol, Rhode Island.* The Public Archaeology Laboratory, Inc., Report No. 999. Submitted to Carl Benevides, Bristol, RI.

Gallagher, Joan, Duncan Ritchie, and Ann K. Davin
1985 *An Intensive Archaeological Survey of the Sudbury Training Annex, Sudbury, Massachusetts.* The Public Archaeology Laboratory, Inc., Report No. 58-1. Submitted to National Park Service, Mid-Atlantic Region, Philadelphia, PA. and Department of the Army, Headquarters FORSCOM, Fort Devens, MA.

Gaudreau, Denise, and Thompson Webb III
1985 Late-Quaternary Pollen Stratigraphy and Isochrone Maps for the Northeastern United States. In *Pollen Records of Late-Quaternary North American Sediments*, ed. by V. Bryant, Jr. and R. G. Holloway.

Goodhy, Robert
1988 *The Seabrook Phase and Post-Hopewellian Interaction in the Northeast.* Unpublished M.A. research paper, Department of Anthropology, Brown University, Providence.

Goodyear, Albert
1977 Regional Model Building in the Contract Framework: The Hecla Projects of Southern Arizona. In *Conservation Archaeology: A Guide for Cultural Resource Management Studies*, ed. by Michael Schiffer and George Gumerman, pp. 413-426, Academic Press, New York.

Gould, Richard A.
1974 Ethno-archaeology or, Where Do Models Come From? (A Closer Look at Australian Aboriginal Lithic Technology). Paper presented at the 1974 meeting of the Australian Institute of Aboroginal Studies, Canberra.

Greeley, Horace
1881 *What I Know of Farming: A Series of Brief and Plain Expositions of Practical Agriculture as an Art Based Upon Science.* G. W. Carleton and Co., New York.

Gross, Robert A.
1982 Culture and Cultivation: Agriculture and Society in Thoreau's Concord. *The Journal of American History* 69(1):42-61.

1984 *The Minute Men and Their World.* Hill and Wang, New York.

Harrington, J. C.
1978 Dating Stem Fragments of Seventeenth and Eighteenth Century Clay Tobacco Pipes. In *Historical Archaeology: A Guide to Substantive and Theorectical Contributions*, ed. by Robert Schuyler, pp.63-65. Baywood Publishing Company, Inc., Farmingdale, NY.

Hoffman, Curtiss
1979 The Astra Pharmacuetical Site Archaeological Survey. *Archaeological Quarterly,* W. Elmer Ekblaw Chapter, Massachusetts Archaeological Society 2(3):1-7.

1983 A Dated Feature Complex from Charlestown Meadows and its Implications for Regional Prehistory. *Bulletin of the Massachusetts Archaeological Society* 44(2): 43-54.

1984 Traditions in the Backwaters: The Westborough Archaeological Survey, Training and Excavation Project. Paper presented at the Northeastern Anthropological Association, Hartford.

1985 Lithic Materials at Cedar Swamp 3. *Archaeological Quarterly,* W. Elmer Ekblaw Chapter, Massachusetts Archaeological Society 7(1):1-15.

1986 Cedar Swamp #3 Features, *Archaeological Quarterly* W. Elmer Ekblaw Chapter, Massachusetts Archaeological Society 8(1): 1-50.

1987 National Register Nomination Forms for the Cedar Swamp Archaeological District, Westborough, MA.

Holland, Martha
1990 Documentary Research on the Brooks Tanyard. In *Archeological Investigations of Minute Man National Historical Park,* Vol. I: *Farmers and Artisans of the Historical Period,* ed. by Alan T. Synenki, Chapter 18. Cultural Resources Management Study 22. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston, forthcoming.

House, John, H.
1975 Prehistoric Lithic Resource Utilization in the Cache Basin: Crowley's Ridge Chert and Quartzite and Pitikin Chert. In *The Cache River Archaeological Project, Arkansas Archaeological Survey Research Series*, No. 8. Fayetteville, AK.

Hudson, Alfred
1889 *History of the Town of Sudbury.* Town of Sudbury, MA.

Hume, Ivor Noel
1985 *A Guide to Artifacts of Colonial America.* Alfred A. Knopf, New York.

Huntington, Frederick W.
1982 *Preliminary Report on the Excavation of Flagg Swamp Rockshelter.* Institute for Conservation Archaeology Report, Peabody Museum, Harvard University, Cambridge, MA.

Johnson, Eric, and Thomas Mahlstedt
1982 *The Ben Smith Archaeological Collection: A Preliminary Report and Assessment.* Massachusetts Historical Commission, Boston.

Joliffe, F. R.
1986 *Survey Design and Analysis.* Ellis Harwood Ltd. Chichester. Halsted Press, New York.

Jorgensen, Neil
1978 *Naturalist's Guide to Southern New England.* Sierra Club Books, San Francisco.

Kenyon, Victoria
1983 *River Valleys and Human Interaction: A Critical Evaluation of Middle Woodland Ceramics in the Merrimack River Valley.* Unpublished Ph.D. dissertation, Boston University, Boston.

1986 Eddy Site Radiocarbon Dates. Newsletter of the New Hampshire Archaeological Society.

Kerber, Jordan E.
1985 *An Intensive Level Archaeological Survey of the Town of Wayland, Massachusetts.* Submitted to the Wayland Historical Commission, Wayland, MA.

Kimenker, James
1984 The Concord Farmer: An Economic History. In *Chronos: A Journal of Social History* No. 2, Fall 1983. Department of History, Brandeis University, Waltham, MA.

Kintigh, Keith
1987 *EVALSTP, Subsurface Testing Evaluation, Performed at Monte Carlo Evaluation of a Subsurface Testing Program.* Department of Anthropology, Arizona State University, Tempe, AZ.

Koteff, Carl
1963 Glacial Lakes near Concord, Massachusetts. *U.S.G.S. Professional Paper,* 475-C-142-144. U.S. Geological Service, Reston, VA.

1964 Surficial Geology of the Concord Quadrangle, Massachusetts. *Geologic Quadrangle Map GQ-331.* U.S. Geological Survey, Reston, VA.

Krakker, James J., Michael J. Shott, and Paul D. Welch
1983 Design and Evaluation of Shovel Test Sampling in Regional Archaeological Survey. *Journal of Field Archaeology* 10:469-480.

Largy, Tonya
1983 Controlled Surface Collection: An Example from the Watertown Dairy Site. *Man in the Northeast* 25:95-107.

League of Women Voters
1963 *Sudbury, Assabet, Concord River Basin Study.* Suasco River Basin Group, League of Women Voters Education Fund. Washington, D.C.

Lees, William B., and Vergil E. Noble
1990 Other Questions that Count: Introductory Comments on Assessing Significance in Historical Archaeology. *Historical Archaeology* 24(2):10-13.

Lewis, Kenneth
1976 Camden: A Frontier Town in Eighteenth Century South Carolina. *Anthropological Studies No. 2.* Institute of Archaeology and Anthropology, University of South Carolina, Columbia, SC.

Luedtke, Barbara
1985 *The Camp at the Bend in the River: Prehistory at the Shattuck Farm Site,* Occasional Publications in Archaeology and History, Massachusetts Historical Commission, Boston.

1987 The Pennsylvania Connection: Jasper in Massachusetts Archaeological Sites. *Bulletin of the Massachusetts Archaeological Society* 48(1).

MacMahon, Darcie A.
1987 Methodology. In *Archeological Collections Management at Minute Man National Historical Park, Massachusetts.* Vol. 1, ACMP Series No. 4, ed. by Linda A. Towle and Darcie A. MacMahon. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

MacMahon, Darcie A., and Linda A. Towle
1988 *Archeological Collections Management Project: Methodological Document.* Eastern Archeological Field Laboratory, Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Mahlstedt, Thomas F.
1985 *Report on the Data Recovery Program of the Reedy Meadow Brook Site, Pepperell, Massachusetts.* Submitted to the Pepperell Sewer Commission, Pepperell, MA.

Mahlstedt Thomas F., and Eric S. Johnson
1982 *An Analysis and Assessment of the Roy Athearn Archaeological Collection, Fall River, Massachusetts.* Massachusetts Historical Commission, Boston.

Malcolm, Joyce
1985 *The Scene of the Battle, 1775, Historic Grounds Report, Minute Man National Historical Park, Cultural Resources Management Study, No. 15.* Submitted to Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston, MA.

1986 *History of Lincoln-Lincoln North Project Area.* Submitted to Lincoln Meadows/Lincoln North Housing Development, Lincoln, MA.

Massachusetts Historical Commission
1980a *Reconnaissance Survey Report, Town of Concord, Massachusetts.* Massachusetts Historical Commission, Boston.

1980b *Reconnaissance Survey Report, Town of Lexington, Massachusetts.* Massachusetts Historical Commission, Boston.
1980c *Reconnaissance Survey Report, Town of Lincoln, Massachusetts.* Massachusetts Historical Commission, Boston.

1981 *An Archaeological Survey and Documentary History of the Shattuck Farm, Andover, Massachusetts.* Massachusetts Historical Commission, Boston.

1982 *Historical and Archaeological Resources of the Boston Area: A Framework for Preservation Decisions.* Massachusetts Historical Commission, Boston.

1984 *Historic and Archaeological Resources of the Connecticut Valley.* Massachusetts Historical Commission, Boston.

Mather, Eugene, and John Fraser Hart
1967 The Geography of Manure. In *Cultural Geography: Selected Readings*, ed. by Fred E. Dohrs and Lawrence M. Sommers, pp. 333-347. Thomas Y. Crowell Company, New York.

McManamon, Francis P.
1976 Cultural Resource Management in the Plowzone. Ms. on file, Massachusetts Historical Commission. Unpublished report submitted to the National Park Service, Washington, D.C.

1978 Middle Archaic Chipped Stone Variation Collections Research and Hypothesis Testing. In *Early and Middle Archaic Cultures in the Northeast*, ed. by D. Starbuck and C. Bolian. Occasional Publications in Northeastern Anthropology No. 7, Franklin Pierce College, Rindge, N.H.

1981 Probability Sampling and Archaeological Survey in the Northeast: An Estimation Approach. In *Foundations of Northeast Archaeology*, ed. by Dean Snow, pp. 195-227. Academic Press, New York.

1990 A Regional Perspective on Assessing the Significance of Historic Period Sites. *Historical Archaeology* 24(2):14-22.

McManis, Douglas R.
1977 *Colonial New England: A Historical Geography.* Reprinted. Oxford University Press, NY. Originally published 1975.

McNiff, John J., and Deborah C. Cox
In prep. The Application of Computer Models to Subsurface Testing Strategies: Utilizing the EVALSTP Program. Manuscript on

file, The Public Archaeology Laboratory, Inc., Pawtucket, R.I.

Mitchell, D.G.
1867 *Rural Studies with Hints for Country Places.* Charles Scribner and Company, New York.

Moorehead, Warren K.
1931 *The Merrimack Archaeological Survey: A Preliminary Paper with Supplementary Notes by Benjamin L. Smith on the Concord Valley.* Peabody Museum Publications, Salem, MA.

Movius, Hallam
1941 First Interim Report on the Excavations at Site M-23-26, Sudbury. *Bulletin of the Massachusetts Archaeological Society,* 2(2).

Mowchan, Denise
1988 *An Intensive Archaeological Survey of the Hayes Farm Subdivision, Carlisle, Massachusetts.* The Public Archaeology Laboratory, Inc., Report No. 226. Submitted to Carlin Realty Trust, Concord, MA.

Mowchan, Denise, Robert Goodby, and Duncan Ritchie
1989 *An Intensive Archaeological Survey of the Proposed Monument Street Development, Concord, Massachusetts.* The Public Archaeology Laboratory, Inc., Report No. 223. Submitted to MetWest Development, Inc., Sudbury, MA.

Mowchan, Denise, Faline Schneiderman, and Duncan Ritchie
1987 *Reconnaissance and Intensive Archaeological Survey of the Lincoln Meadows/ Lincoln North Project Area, Lincoln, Massachusetts.* The Public Archaeology Laboratory, Inc., Report No. 151. Submitted to Lincoln House Associates, Jamaica Plain, MA.

Mueller, J. W.
1978 Pioneering Practitioners of Contemporary Sampling: Comments on the State of the Art in New England Cultural Resource Management. In *Conservation Archaeology in the Northeast: Toward a Research Orientation,* ed. by A. E. Spiess, pp. 107-112, Peabody Museum Bulletin No. 3, Cambridge, MA.

Nance, Jack D.
1981 Statistical Fact and Archaeological Faith: Two Models in Small Sites Sampling. *Journal of Field Archaeology* 8:151-165.

National Park Service
1963 Master Plan: Minute Man National Historical Park. Manuscript on file, Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Naylor, Richard, and Suzanne Sayer
1976 The Blue Hills Igneous Complex, Boston Area, Massachusetts. In *Geology of Southeastern New England,* ed. by Barry Cameron, pp. 135-146. Science Press, Princeton, NJ.

Nelson, Arthur E.
1975 Bedrock Geology Map of the Framingham Quadrangle, Middlesex and Worcester Counties, Massachusetts. *Geologic Quadrangle Map GQ-1274,* U.S. Geological Survey, Reston VA.

Nelson, Lee H.
1968 Nail Chronology As An Aid To Dating Old Buildings, American Association for State and Local History Technical Leaflet 48, *History News* 24 (11).

Nelson, Sheldon
1984 Upland and Wetland Vegetational Changes in Southeastern Massachusetts: A 12,000 Year Record. *Northeastern Geology* 6(4):181-191.

Newby, P., R. S. Webb, and T. Webb III
1986 *Pollen and Sediment Records for Houghton's Pond in Eastern Massachusetts: Final Report.* Department of Geological Sciences, Brown University. Submitted to The Public Archaeology Laboratory, Inc., Pawtucket, RI.

Newby Paige, P. Tzedakis, and T. Webb III
1986 *Regional Pollen Records from Cape Cod, Massachusetts: Preliminary Report.* Department of Geological Sciences, Brown University Report. Submitted to The Public Archaeology Laboratory, Inc., Pawtucket, RI.

1987 *Pollen and Sediment Records for Nipmuck Pond, Mendon, Massachusetts.* Department of Geochemistry, Palynology Laboratory, Brown University Report. Submitted to The Public Archaeology Laboratory, Inc., Pawtucket, RI.

Paynter, Robert W.
1982 Modes of Production and New England Farmsteads. Paper presented at Society for Historical Archaeology Meetings, Philadelphia.

Potter, Parker B.
1990 Historic Contexts and the Place of the Survey in Preservation Planning. Presentation at Statewide Survey Workshop, New Hampshire Division of Historical Resources, Concord.

Ritchie, Duncan
1979 Middle Archaic Lithic Technology: Examples from Eastern and Southeastern Massachusetts. Paper presented at Conference on New England Archaeology, Amherst, MA.

1980 Prehistoric Cultural Resources in the Suburban Fringe: A Preliminary Assessment of the Sudbury/Assabet Drainage. In *Widening Horizons*, ed. by C. Hoffman. Massachusetts Archaeological Society, Attleboro.

1982 A Review of Past and Current Research in the Sudbury and Assabet Drainages. Paper given in symposium on Prehistoric Archaeology in the Merrimack River Valley. 22nd Annual Meeting of the Northeastern Anthropological Association, Princeton, NJ.

1983a A Review of Past and Current Research in the Sudbury and Assabet Drainages. In *Man in the Northeast* 25:83-93.

1983b *An Archaeological Reconnaissance and Site Verification Survey of the Shick Farm Tract, Wayland, Massachusetts.* The Public Archaeology Laboratory, Inc., Report No. 19. Submitted to the Farmer's Home Administration, USDA, Amherst, MA.

1984 Musketaquid, 8,000 B.P.: Early Archaic Settlement and Resource Use in the Sudbury/Concord River Drainage. Paper presented at the 24th Annual Meeting of the Northeastern Anthropological Association, Hartford, CT.

1985a *Archaeological Investigations at the Hartford Avenue Rockshelter, Uxbridge, Massachusetts: The Data Recovery Program.* The Public Archaeology Laboratory, Inc., Report No. 40-2. Submitted to the Massachusetts Depart-ment of Public Works, Boston.

1985b *Archaeological Investigations of a Maintenance Building Site, Weir Hill Tract, Great Meadows, National Wildlife Refuge, Sudbury, Massachusetts.* The Public Archaeology Laboratory, Inc., Report No. 75-1. Submitted to U.S. Fish and Wildlife Service, Newton Corner, MA.

Ritchie, Duncan, and Marsha King
1988 *Archaeological Reconnaissance Survey of West Hill Dam and Reservoir in Uxbridge, Northbridge, Upton, and Mendon, Massachusetts.* The Public Archaeology Laboratory, Inc., Report No. 158-1. Submitted to the Army Corps of Engineers, New England Division, Waltham, MA.

Roberts, Daniel G., and David Barrett
1984 Nightsoil Disposal Practices of the Nineteenth Century and the Origin of Artifacts in Plowzone Proveniences. *Historical Archaeology* 18(1):109-115.

Robinson, Barbara
1980 Reflections from Castle Hill. In *Widening Horizons*, ed. by C. Hoffman, pp. 130-134. Massachusetts Archaeological Society, Attleboro, MA.

Root, Dolores
1978 *Predictive Model of Prehistoric Subsistence and Settlement on the Outer Continental Shelf.* Institute for Conservation Archaeology, Peabody Museum, Harvard University, Cambridge, MA.

Russell, Howard S.
1982 *A Long Deep Furrow: Three Centuries of Farming in New England.* Reprinted. University Press of New England, Hanover, MA. Originally published 1976.

Schiffer, Michael B. (editor)
1978 *Advances in Archaeological Method and Theory*, Vol. 1. Academic Press, New York.

1987 *Formation Processes of the Archaeological Record.* University of New Mexico Press, Albuquerque.

Sheehan, Nora, and Alan T. Synenki
1990 Archeological Investigations of the Brooks Tanyard. In *Archeological Investigations of Minute Man National Historical Park*, Vol. I: *Farmers and Artisans in the Historical Period,* ed. by Alan T. Synenki, Chapter 19. Cultural Resources Management Study 22. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston. forthcoming.

Shennan, Stephen
1988 *Quantifying Archaeology.* Edinburgh University Press and Academic Press, Inc., New York.

Smith, Benjamin L.
1931 Supplementary Notes on the Concord Valley. In *The Merrimack Archaeological Survey*, edited by Warren K. Moorehead. Peabody Museum, Salem, MA.

1944 Site Characteristics in the Concord River Valley. *Bulletin of the Massachusetts Archaeological Society*, 5(3).

Sneddon, Lesley
1987 *Late Glacial and Post-Glacial Vegetation History of Black Pond, Norwell, Massachusetts.* Unpublished M.A. thesis on file at University of Massachusetts, Boston.

Sneddon, Lesley, and Lawrence Kaplan
1987 Pollen Analysis from Cedar Swamp Pond, Westborough, Massachusetts. *Archaeological Quarterly*, W. Elmer Ekblaw Chapter, Massachusetts Archaeological Society 9(2).

Snow, Dean
1980 *The Archaeology of New England.* Academic Press, New York.

South, Stanley
1978 *Method and Theory in Historical Archaeology.* Academic Press, New York.

Speiss, Arthur E. (editor)
1978 Conservation Archaeology in the Northeast: Towards a Research Orientation. *Peabody Museum Bulletin* No. 3. Harvard University, Cambridge, MA.

Starbuck, David
1985 The Garvins Falls Site (NM37-1): The 1982 Excavations. *The New Hampshire Archaeologist* 26(1):19-42.

Stilgoe, John R.
1982 *Common Landscape of America, 1580 to 1845.* Yale University Press, New Haven, CT.

Suter, Suzanne
1985 *Late Glacial and Holocene Vegetation History in Southeastern Massachusetts: A 14,000 Year Pollen Record.* Department of Geological Sciences, Brown University, Providence, RI.

Synenki, Alan T.
1986 An Archeological Research Design for Minute Man National Historic Park. Manuscript on file, Division of Cultural Resources, North Atlantic Regional

Office, National Park Service, Boston.

1987 A History of Archeology at Minute Man National Historical Park. In *Archeological Collections Management at Minute Man National Historical Park, Massachusetts*, vol. 1, ACMP Series No. 4, edited by Linda A. Towle and Darcie A. MacMahon. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

Talmage Valerie, and Olga Chesler
1977 *The Importance of Small Surface and Disturbed Sites as Sources of Significant Archeological Data.* Cultural Resource Management Studies, North Atlantic Regional Office, National Park Service, Boston.

Temple, J. H.
1887 *History of Framingham, Massachusetts, 1640-1880.* Town of Framingham, MA.

Thorbahn, Peter F.
1982 The Prehistoric Settlement Systems in Southern New England. In *Final Report of the Interstate Highway 495 Archaeological Data Recovery Program*, Vol. I. Department of Anthropology, Brown University Report. Submitted to the Massachusetts Department of Public Works, Boston.

Thorbahn, Peter F., Deborah C. Cox, and Duncan Ritchie
1983 *Archaeological Investigations at the G. B. Crane Site, Norton, Massachusetts: the Data Recovery Program.* The Public Archaeology Laboratory, Inc., Report No. 13-1. Submitted to Camp, Dresser and McKee, Inc., Boston.

Thorbahn, Peter F., Leonard W. Loparto, Deborah C. Cox, and Brona Simon
1980 *Prehistoric Settlement Process in New England: A Unified Approach to Cultural Resource Management and Archaeological Research.* Brown University, Department of Anthropology Report. Submitted to Massachusetts Historical Commission, Boston.

Towle, Linda
1984 *Quartz Flakes and Turtle Bone: The North Bridge Site.* Division of Cultural Resources, National Park Service, North Atlantic Regional Office, Boston.

Towle, Linda, and Darcie A. McMahon (editors)
1986 *Archeological Collections at Minute Man National Historical Park*, Vol 2-4. Division of Cultural Resources, North Atlantic Regional Office, National Park Service, Boston.

United States Bureau of the Census
1808 *The Second Census of the United States: 1800.* Government Printing Office,(GPO), Washington, D.C.

1852 *The Seventh Census of the United States: 1850.* Robert Amstrong, Washington, D.C.

1864 *Population of the United States in 1860; Compiled from the Original Returns of the Eighth Census.* (GPO), Washington, D.C.

1883 *Statistics of the Population of the United States at the Tenth Census (June 1, 1880).* GPO, Washington, D.C.

1908 *Heads of Families at the First Census of the United States Taken in the Year 1790: Massachusetts.* GPO, Washington, D.C.

1913 *Thirteenth Census of the United States Taken in the Year 1910.* Vol. II: Population 1910, Alabama-Montana. GPO, Washington, D.C.

1922 *Fourteenth Census of the United States Taken in the Year 1920.* Vol. III: Population 1920. GPO, Washington, D.C.

1952 *Census of Population: 1950.* Vol. II: Characteristics of the Population. Part 21: Massachusetts. GPO, Washington, D.C.

1982 *1980 Census of Population.* Vol. 1: Characteristics of the Population. Chapter A: Number of Inhabitants. Part 23: Massachusetts.

United States Department of Agriculture

1986 *Middlesex County, Massachusetts: Interim Soil Survey Report*. Soil Conservation Service, Government Printing Office, Washington, D.C.

United States Department of the Interior

1983 Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines. *Federal Register* 48:190 (29 Sept. 1983), Washington, D.C.

1985 Cultural Resources Management Guidelines: *NPS-28*. National Park Service, Washington, D.C.

United States Department of the Interior, National Park Service

1985 National Register Criteria for Evaluation. *National Register Bulletin 16*. National Park Service, Washington, D.C.

Wayland Archaeology Group

1981 *The Wayland Prehistoric Site Survey*. Report submitted to the Wayland Historical Commission, Wayland, MA. and the Massachusetts Historical Commission, Boston.

Whitney, Gordon G., and William C. Davis

1986 From Primitive Woods to Cultivated Woodlots: Thoreau and the Forest History of Concord, Massachusetts. *Journal of Forest History* 30(2):70-81.

Zen, E-an, Richard Goldsmith, Nicholas Ratcliffe, Peter Robinson, Rolfe Stanley, Norman Hatch, Andrew Shride, Elaine Weed, and David Wones

1983 *A Bedrock Geologic Map of Massachusetts*. U.S. Geological Survey prepared in cooperation with the Commonwealth of Massachusetts, Department of Public Works, Boston.

Appendix A
Prehistoric Site Forms

Site Name: Ox Pasture
Town: Lincoln
USGS Quad: Concord

Location and Environmental Setting: The Ox Pasture site is located on the western slope of Hardy Hill about 67 m south of Lexington Road and 150 m north of the Concord Turnpike Cutoff. This site is within an area of glacial till/ground moraine deposits at an elevation of 180 feet above sea level. The land surface is nearly level with a slope of 0-3%. Soils near the site area are classified as Windsor loamy sand. To the west are areas of wooded wetland draining into Mill Brook (Concord River drainage) (see Figure 3-8).

Site Extent: The total horizontal extent of the site is not known but it probably does not exceed a few square meters. Prehistoric cultural material (chipping debris) was recovered from the center southeast test pit of Block 68. This material was found in the B1 subsoil horizon at a depth of 28-40 cm below surface.

Features and Cultural Material: No features were identified at the Ox Pasture site during the phase I testing. The cultural material collected consisted of one piece of quartz chipping debris.

Previous Research: No previous investigations of the Ox Pasture site are known.

Present Condition: The site appears to be in good condition; the only evidence of previous disturbance is an unpaved road following the Concord/Lincoln town line a short distance to the west of the site. Current vegetation near the site is a second growth forest of oak, pine, and red maple.

Interpretation and Significance: The Ox Pasture site is one of a number of very small "find spot" sites marked by single pieces of prehistoric cultural material. It suggests that prehistoric land use in the immediate vicinity was limited to brief occupations for resource collection/foraging activities. The temporal and cultural affiliation of this find spot site is unknown.

Site Name: Joshua Brooks Farm
Town: Lincoln
USGS Quad: Concord

Location and Environmental Setting: The Joshua Brooks Farm site is located about 30 m north of the intersection of Old Bedford Road and Massachusetts Avenue and about 180 m east of Elm Brook. Surficial deposits in the area consist of glacial till/ground moraine and the site is at an elevation of 190 feet above sea level. The site is within an area of Montauk sandy loam series and the slope is between 3 and 8%. West of the site are wooded wetlands along the upper portion of Elm Brook (Shawsheen River drainage) (see Figure 3-8).

Site Extent: The exact horizontal extent of the site is unknown but it probably does not exceed about 56 square meters, since cultural material was found in only one center southeast) test pit in Block 215. This material (chipping debris) was recovered from the B1 subsoil horizons at a depth of 20-30 cm below surface.

Features and Cultural Material: No features were identified during subsurface testing. Prehistoric cultural material recovered from the site was limited to two pieces of dark grey felsite chipping debris. One of those flakes was quite large, in the 3-5 cm size range.

Previous Research: No previous investigations of the Joshua Brooks Farm site are known.

Present Condition: The current condition of the site is good with only minor disturbance to the ground surface from recent trash dumping and construction of a doghouse associated with a nearby residence. The site is covered with a second growth oak/pine forest.

Interpretation and Significance: The Joshua Brooks Farm site may be the remains of a small, temporary camp or station used by prehistoric hunter/gatherers engaged in resource collection (hunting, foraging activities). Like the small "find spot" designated as the Holt Pasture site (Block 238), the Joshua Brooks Farm site provides evidence of the range of prehistoric settlement/land use along upland tributary streams like Elm Brook.

Site Name: Holt Pasture
Town: Lincoln
USGS Quad: Concord

Location and Environmental Setting: The Holt Pasture site is located about 60 m south of Massachusetts Avenue and about 40 m east of Sunnyside Lane. Surficial deposits in this area consist of glacial till/ground moraine and elevations on the site are around 210 feet above sea level. The ground surface is slightly sloping (3-8%) and the soils have been classified as Montauk sandy loam. A small seasonal pond is located about 50 km to the east of the site. About 250 meters to the west are wooded wetlands bordering the upper part of Elm Brook (Shawsheen River drainage) (see Figure 3-8).

Site Extent: The total horizontal extent of this site is not known but probably does not exceed several square meters. Prehistoric cultural material was recovered from the southwest pit of Block 238 at depths between 18 and 30 cm below surface in a modified B1 subsoil horizon.

Features and Cultural Material: No features were identified on the Holt Pasture site during limited subsurface testing. The recovered prehistoric cultural material consisted of one piece of patinated, light grey felsite resembling material from a section of the Lynn Volcanic complex.

Previous Research: No previous investigations of the Holt Pasture site are known.

Present Condition: The soil horizons on the Holt Pasture site show evidence of previous disturbance. A residential development surrounding the site is the likely source of this disturbance and some modern trash dumped on the surface. The current vegetation near the site is a mix of abandoned, overgrown pasture and second growth oak/pine forest.

Interpretation and Significance: The Holt Pasture site represents a small "find spot" site where subsurface testing yielded very low densities of prehistoric cultural material. Together with the other nearby "find spot" in Block 215, the Holt Pasture site suggests that some types of prehistoric land use in the upland terrain along Elm Brook resulted in the deposition of small amounts of cultural material. This contrasts with some other known sites along upper Elm Brook that contained more dense deposits of cultural material from several depositional episodes.

Site Name: William Smith Farm P1
Town: Lincoln
USGS Quad: Concord

Location and Environmental Setting: The William Smith Farm P1 site is located about 200 m south of Massachusetts Avenue and 100 m east of Bedford Lane in a an area of glacial fill/ground moraine deposits. The site is near the crest of a small hill at an elevation of 270-272 feel above sea level. The sloping (8-15%) terrain near the site includes small knolls and hollows. The soil has been classified as Montauk sandy loam (see Figure 3-9).

Site Extent: The exact horizontal dimensions of the site is unknown. Since cultural material was found in only one test pit and all the adjacent test pits were sterile, it is probable that the site covers an area of less than 56 square meters. Prehistoric cultural material was recovered from the North test pit of Block 327 at a depth 20-25 cm below surface in the B1 subsoil horizon.

Features and Cultural Material: No features were identified on the William Smith Farm P1 site during the survey. The only cultural material collected from the site was a single piece of dark grey felsite chipping debris.

Previous Research: No previous investigations of the William Smith Farm P1 site are known.

Present Condition: This site is in good condition but a portion of it may have been disturbed by the construction of a small modern period structure (cottage?) located a few meters north. Current vegetation on the site consists of a mature second growth hardwood forest (oak, black birch).

Interpretation and Significance: This small "find spot" site of unknown temporal period is location and could be a potential source of information for reconstructing prehistoric settlement and other activities in this general setting. The absence of a water source within about 200 m of this site is unusual and suggests some variation in settlement patterns in this area.

Site Name: William Smith Farm P2
Town: Lincoln
USGS Quad: Concord

Location and Environmental Setting: The William Smith Farm P2 site is located about 180 m north of Virginia Road and about 100 m west of the access road for Hanscom Field. This site is on the crest of a large knoll composed of sand/gravel glacial outwash deposits at an elevation of about 200 feet above sea level. The surface of the site is slightly (3-8%) sloping and the soil consists of Paxton fine sandy loam. Wetlands to the northwest and east originally formed the headwaters of the Shawsheen River (see Figure 3-9).

Site Extent: The total horizontal extent of this site is unknown but may be in the range of 250 square meters. Prehistoric cultural material was recovered from the center northeast and southwest test pits of Block 374 at depths ranging from 20 to 40 cm below surface in the B1 subsoil horizon.

Features and Cultural Material: No features were identified on the William Smith Farm P2 site. A small, roughly ovate bifacial tool blade of felsite was recovered from the center northeast pit of Block 374. This biface was made of a dark grey-black felsite probably derived from the Lynn Volcanic complex. The only other cultural material was a single piece of grey felsite chipping debris.

Previous Research: No previous investigations of the William Smith Farm P2 site are known.

Present Condition: This site appears to be in good condition. The physical structure of the site was probably altered by past agricultural land use. The current vegetation on the site consists of an old field succession (shrubs, saplings) and an abandoned orchard.

Interpretation and Significance: The William Smith Farm P2 site is probably a small, temporary camp. Together with three previously known sites located just outside the park boundary, the William Smith Farm P2 site indicates that the uplands surrounding the headwaters of the Shawsheen River may have been a focus of prehistoric activity (hunting, foraging/collecting). The bifacial tool blade found on the William Smith Farm P2 site is not diagnostic of any specific temporal period or cultural tradition. Two of the other nearby sites outside MIMA contained evidence of occupation during the Middle and Late Archaic periods and the William Smith Farm P2 site may also be a small, Archaic period locus.

Site Name: Aaron Brooks Farm
Town: Lincoln
USGS Quad: Concord

Location and Environmental Setting: The Aaron Brooks Farm site is located about 55 m south of Massachusetts Avenue and about 120 m east of Bedford Street on the crest and northwest slope of a small ridge. The surface of the site is slightly (3-8%) sloped and is at an elevation of 206 to 215 feet above sea level. The ridge is composed of glacial till/ground moraine and the soil has been classified as Montauk sandy loam. A small, seasonal wetland is located about 30 m northwest of the site (see Figure 3-10).

Site Extent: The total horizontal extent of the site is unknown, but based on the results of limited subsurface testing the site probably covers about 1500 m2. Prehistoric cultural material was recovered from the center and center northwest test pits of Block 612, the east test pit of Block 615, and the north and northwest test pits of Block 636. This material was distributed from about 10 to 54 cm below the ground surface in the A1 plowzone and B1 subsoil horizon.

Features and Cultural Material: No features were identified on the Aaron Brooks site during subsurface testing. Cultural material collected consisted of eight pieces of felsite chipping debris. Five pieces were dark gray to black in color and two other flakes were of a patinated, light gray felsite. Some of these flakes resemble felsites derived from the Lynn Volcanic complex.

Previous Research: No previous investigations at the Aaron Brooks Farm site are known.

Present Condition: The site appears to be in good condition. Sources of previous disturbance include alteration of topsoil horizons from plowing/cultivation and the construction of a cart path or roadway (eighteenth century) which may have created an artificial boundary on the east edge of the site.

Interpretation and Significance: This site is potentially important as one of a group of previously unrecorded sites in the Folly Pond area. With an estimated horizontal area of at least 1500 square meters, this site appears to be an example of a moderately-sized, temporary camp comparable to some other previously known sites in the vicinity (Elm Brook, Shawsheen River headwaters). These other sites were occupied during the Middle and Late or Terminal Archaic periods and the Aaron Brooks Farm site could contain similar components. The felsite chipping debris recovered from the site is an indication that activities carried out here included the manufacture of chipped stone tools (bifacial tool blades, projectile points, etc.). This felsite is probably derived from a section of the Lynn Volcanic complex based on visual characteristics. The Aaron Brooks Farm site could be a potentially important source of information on prehistoric settlement patterns in the upland sections of MIMA outside the riverine zone along the Concord River.

Site Name: Ephraim Hartwell Farm P1
Town: Lincoln
USGS Quad: Concord

Location and Environmental Setting: The Ephraim Hartwell Farm P1 site is located about 75 m south of Massachusetts Avenue and about 180 m west of Folly Pond. The gently sloping terrain (0-3%) consists of a glacial outwash plain with an elevation of 195-196 feet above sea level. The soil on the site is classified as Windsor loamy sand. There is a small pond (artificial?) located about 60 m west of the site. Extensive wetlands draining into Hobbs Brook (Charles River drainage) are located to the south and Folly Pond, a small body of open water within a glacial kettle hole feature is directly east of the site (see Figure 3-10).

Site Extent: The total horizontal extent of this site is unknown, but is not likely to exceed 7.5 m. Prehistoric cultural material was collected from the east test pit of Block 655 in the B1 subsoil horizon. This material (chipping debris) was found at a depth of 41 to 55 cm below the present ground surface.

Features and Cultural Material: No features were identified at the Ephraim Hartwell Farm P1 site during the survey. Cultural material collected from the site consisted of one piece of chipping debris of a dark gray to black felsite probably derived from the Lynn Volcanic complex.

Previous Research: No previous investigations of the Ephraim Hartwell Farm P1 site are known.

Present Condition: The site appears to be in good condition; the only evidence of previous disturbance is a deep (ca. 30-40 cm) plowzone created by a long history of agricultural land use. The site is currently an open field used for truck farming.

Interpretation and Significance: The Ephraim Hartwell Farm P1 site appears to be the remains of a very small activity area created by prehistoric hunter/gatherers. The chipping debris found on the site could have been produced during the manufacture or maintenance of a stone tool being used for basic resource procurement activity (hunting, foraging, etc.). The temporal or cultural affiliation of this site is unknown.

Site Name: Ephraim Hartwell Farm P2
Town: Lincoln
USGS Quad: Concord

Location and Environmental Setting: The Ephraim Hartwell Farm P2 site is located about 80 m south of Massachusetts Avenue and about 120 m west of Folly Pond. The site is situated within a large, nearly level (0-3%) area of glacial outwash plain at an elevation of 195-196 feet above sea level. About 30 m east of this site is the edge of a large glacial kettle bole feature. Soils on the site are classified as the Windsor loamy sand series. A wooded wetland draining into Hobbs Brook (Charles River drainage) is about 80 meters soutb of tbe site (see Figure 3-10).

Site Extent: The total horizontal extent of the site is unknown, but is probably no more than 7.5 m. Prehistoric cultural material was recovered from the center northeast test pit of Block 667 in the A1 plowzone horizon at a depth between 4 and 23 cm below the present ground surface.

Features and Cultural Material: No features were identified at the Ephraim Hartwell Farm P2 site during the survey. Prehistoric cultural material recovered consisted of one piece of medium to light grey felsite chipping debris. This material may be derived from a section of the Lynn Volcanic complex.

Previous Research: No previous investigations of the Ephraim Hartwell Farm P2 site are known.

Present Condition: The site appears to be in good condition. Topsoil horizons on the site consist of a deep (ca. 30-40 cm) plowzone created by intensive agricultural land use. The site is currently an open field used for truck farming, a second growth white pine forest is located to the east.

Interpretation and Significance: Like the other small "find spots" located nearby, this site probably represents a locus of temporary activity by prehistoric hunter/gatherers using the area around Folly Pond and the other nearby wetlands. The site may be typical of a general category of very small activity areas which are frequently found in upland environmental settings and are restricted to just a few categories of cultural material. The temporal or cultural affiliation of this site is unknown.

Site Name: Ephraim Hartwell Farm P3
Town: Lincoln
USGS Quad: Concord

Location and Environmental Setting: The Ephraim Hartwell Farm P3 site is located about 60 m south of Massachusetts Avenue on the western edge of the large glacial kettle hole containing Folly Pond. This site is within a large area of glacial outwash plain deposits at an elevation of about 190 feet above sea level. The surface of the outwash plain surrounding the kettle hole is nearly level with 0-3% slope. Soils in this area are classified as Windsor loamy sand. To the south are wetlands draining into Hobbs Brook (Charles River drainage) (see Figure 3-10).

Site Extent: The horizontal extent of the site is unknown. Prehistoric cultural material was found in only the southwest test pit of Block 412 suggesting that this site is very small (less than 56 square meters?). This material was recovered from the A1 plowzone at a depth of 20-30 cm below the ground surface.

Features and Cultural Material: No features were identified during the limited subsurface testing conducted in this area. Prehistoric cultural material recovered from the site consisted of one piece of grey felsite chipping debris.

Previous Research: No previous investigations of the Ephraim Hartwell Farm P3 site are known.

Present Condition: The site may be in fair condition since evidence of extensive previous disturbance in the form of a dump area containing modern refuse and demolition debris was found in almost all the test pits in Block 412. Vegetation on the site consists of white pine trees and some open, grassy meadow areas.

Interpretation and Significance: The Ephraim Hartwell Farm P3 site is one of four small "find spot" sites or loci identified in the Folly Pond sub-stratum. These very low density deposits of cultural material (chipping debris) may mark locations where one or a few activities (maintenance of stone tools, field processing of resources from immediate vicinity etc.) were carried out by prehistoric hunter/gatherers. The small find spot sites of this type in the Folly Pond area provide some information about the scale and intensity of prehistoric settlement/land use in this setting. The temporal or cultural affiliation of this site is unknown.

Site Name: Ephraim Hartwell Farm P4
Town: Lincoln
USGS Quad: Concord

Location and Environmental Setting: The Ephraim Hartwell Farm P4 site is located about 180 m south of Massachusetts Avenue on the southern edge of the large glacial kettle hole containing Folly Pond. This site is within a large glacial outwash plain at an elevation of 190 feet above sea level. The surface of the outwash plain is nearly level with 0-3% slope and soils formed on this surficial deposit are classified as Windsor loamy sand. Wooded wetlands a short distance south of this site drain into Hobbs Brook (Charles River drainage) (see Figure 3-10).

Site Extent: The exact horizontal area of the site is unknown but it probably does not exceed about 250 square meters, since prehistoric cultural material was found in only the northwest and west test pits of Block 403. This material (chipping debris) was recovered from the A1 plowzone and B1 subsoil horizons at depths ranging from 10-40 cm below surface. Most of the material was recovered from the 10-30 cm range.

Features and Cultural Material: No features were identified during the limited investigation of this site. Cultural material recovered included five pieces of chipping debris. There were two flakes each of a light green to gray volcanic material and a light to dark grey felsite. The other flake was of a grey-green argillite-like material.

Previous Research: No previous investigations of the Ephraim Hartwell Farm P4 site are known.

Present Condition: The current condition of the site is good; the only source of previous disturbance appears to have been agricultural land use which created a plowzone horizon on the site. The vegetation on the site area is a second growth white pine forest.

Interpretation and Significance: The Ephraim Hartwell Farm P4 site is generally similar to the other small find spots or loci of prehistoric cultural material found in proximity to Folly Pond. Together with these other loci the Hartwell Farm P4 site suggests that prehistoric use of the Folly Pond area included many small temporary camps where activities resulting in the discard of very low densities of cultural material took place.

Site Name: Jacoh Foster Farm P1
Town: Lincoln
USGS Quad: Concord

Location and Environmental Setting: The Jacoh Foster Farm site is located about 75 m north of Massachusetts Avenue and 150 m east of the plaque commemorating the Paul Revere Capture site. The site is within an area of sand/gravel outwash deposits at an elevation of about 200 feet above sea level. The land surface near the site is slightly sloping (3-8%) and soils in the vicinity belong to the Canton fine sandy loam series. The site is covered with a second growth oak/pine forest (see Figure 3-11).

Site Extent: The exact horizontal dimensions of the site are not known hut do not appear to he more than 56 square meters since prehistoric cultural material was found in only one test pit (center northeast) in Block 716. This cultural material (chipping dehris) was found at a depth of 10 cm helow surface in the A1 plowsoil horizon.

Features and Cultural Material: No features were identified at the Jacoh Foster Farm site during the survey. Prehistoric cultural material recovered consisted of one piece of grey-green felsite or very fine grained argillite chipping debris.

Previous Research: No previous investigations of the Jacoh Foster Farm areknown.

Present Condition: If this site is limited to the single test pit containing cultural material then it is in good condition within a wooded area. A large area of previous disturhance from the demolition of buildings and a parking lot is located south of Block 716 and a section of the site could have been destroyed if it included the area outside this sampling unit.

Interpretation and Significance: The Jacob Foster Farm site is a very small "find spot" of prehistoric cultural material similar to those found nearhy in the vicinity of Folly Pond. As a group these find spots indicate that prehistoric settlement/resource use in the area forming the divide between the Charles and Shawsheen drainages included activities that resulted in the discard of very low densities of lithic debris. The temporal/cultural affiliation of the Jacoh Foster Farm site is unknown.

Site Name: Thomas Nelson Jr. Farm P1
Town: Lincoln

Location and Environmental Setting: The Thomas Nelson Jr. Farm site is located about 195 m south of Nelson Road and 60 m north of Massachusetts Avenue between a small wetland and the parking lot for the Battle Road Visitors Center. This wetland drains south towards the headwaters of Hobbs Brook. This site is on a low terrace of sand/gravel glacial outwash deposits at an elevation of 204 to 206 feet above sea level. The surface of the site has a slope in the 3-8% range. The soil is classified as Deerfield loamy sand (see Figure 3-12).

Site Extent: The total horizontal extent of this site is unknown, but may be in the range of 7.5 to 15 m. Prehistoric cultural material was collected from the north and center northeast test pits of Block 505 in the A1 plowzone and B1 subsoil horizon. The site appears to extend from 4 to 50 cm below the present ground surface.

Features and Cultural Material: No features were identified on the Thomas Nelson Jr. Farm site during this survey. Prehistoric cultural material collected from test pits consisted of one piece of dark grey felsite chipping debris and a large (5 cm) flake of Braintree Slate with unifacial retouch. The dark grey felsite is typical of material derived from the Lynn Volcanic Complex.

Previous Research: No previous investigations of the Thomas Nelson Jr. Farm site are known.

Present Condition: This site appears to be in good condition except along the west edge of Block 505 where it may have been impacted by construction (grading/landscaping) of the Visitor's Center parking lot. Vegetation on the site consists of buckthorn and other shrubs and some open, grassy areas.

Interpretation and Significance: The Thomas Nelson Jr. Farm site may be the remains of a small, temporary camp or station used by prehistoric hunter/gatherers engaged in resource collection (hunting, foraging activities, etc.) along the edge of the nearby wetlands. This site appears to be representative of a general category of sites which are small, have less complex internal structures and assemblages restricted to just a few categories of cultural material (chipping debris, burnt rock fragments, broken discarded tools). The temporal and cultural affiliation of this site if unknown.

Site Name: Thomas Nelson Jr. Farm P2
Town: Lincoln
USGS Quad: Concord

Locational and Environmental Setting: The Thomas Nelson Jr. Farm P2 site is located about 100 m south of Massachusetts Avenue roughly 150 m west of the entrance for Minuteman Vocational Technical School. The site is at the base of a steeply sloping (3-8%) hillside with bedrock outcrops at an elevation of 220 feet above sea level. The surficial deposits on the site are glacial till and the soil has been classified as Deerfield sandy loam. Wetlands located about 75 m east of the site drain south into Hobbs Brook (Charles River drainage) (see Figure 3-12).

Site Extent: The horizontal extent of the site is unknown but based upon the lack of cultural material in more than one test pit within a sampling block it is likely that the site areas does not exceed .5 m. Prehistoric cultural material was recovered from the center pit of Block 491 at depths of 20 to 30 cm and 33 to 40 cm below surface in the A1 plowzone and B1 subsoil horizons.

Features and Cultural Material: No features were identified on the Thomas Nelson Jr. Farm P2 site during limited testing. Cultural material collected consisted of two pieces of chipping debris of light and dark grey felsite.

Previous Research: No previous investigations of the Thomas Nelson Jr. Farm P2 site are known.

Present Condition: The present condition of the site is good. The only possible source of previous disturbance would have been the formation of a plowzone during use of this area for farmland in the eighteenth and nineteenth centuries. The current vegetation pattern near the site consists of a second growth oak/pine forest with some hemlock and black birch.

Interpretations and Significance: The Thomas Nelson Jr. Farm P2 site is an example of a small "find spot" of prehistoric cultural material. Together with the Thomas Nelson Farm P1 site, this find spot indicates that prehistoric hunter/gatherers used the margin of nearby wooded wetlands for activities that resulted in the discard of very small amounts of cultural material (hunting, expeditious manufacture/maintenance of stone tools, etc.).

Site Name: Whittemore Farm P1
Town: Lexington
USGS Quad: Concord

Location and Environmental Setting: The Whittemore Farm site is located about 150 m southwest of the intersection of Massachusetts Avenue and Marrett Road on the edge of a wooded wetland/marsh. The site is within a an area of glacial outwash plain, at an elevation of about 195 feet above sea level. The land surface near the site is nearly level (0-3% slope) and the soils have been classified as Deerfield sandy loam. Wetlands and small streams near the site drain to the south into Hobbs Brook (Charles River drainage) (see Figure 3-13).

Site Extent: The total horizontal extent of the site is unknown, but it extends for at least 30 m in one direction and probably covers an area of less than 500 square meters. Prehistoric cultural material (chipping debris) was recovered from the southwest and southeast test pits of Blocks 537 and the northwest test pit of Block 540. This material was distributed from 20 to 70 cm below surface in the A1 plowzone and B1 and B2 subsoil horizons.

Features and Cultural Material: No features were identified on the Whittemore Farm site during the survey. A total sample of 37 pieces of chipping debris was collected from the site. With the exception of one piece of medium grey felsite, all of the chipping debris was of a translucent grey/green, quartzite like material known as mylonite. This lithic material is derived from local source areas, possibly in the Lexington quadrangle area to the northeast of MIMA.

Previous Research: No previous investigations of the Whittemore Farm site are known.

Present Condition: The present condition of the site is good. Possible sources of previous disturbance which could have affected the site include an apple orchard and earlier agricultural land use (plowing/cultivation). The current vegetation cover on the site is an old field succession of white pine, birch, and oak with buckthorn and other shrubs.

Interpretation and Significance: This site is potentially significant as an example of a small lithic workshop site where raw material obtained from a nearby, local source area was manufactured into chipped stone tools. Attributes (size, thickness, platform shape) of the mylonite chipping debris suggest that the primary activity was the manufacture of bifacial tool blades or preforms rather than maintenance or resharpening of finished tools. No clearly diagnostic material was found on the Whittemore site however, the presence of mylonite chipping debris deeply buried in the lower (B2) subsoil horizon suggests that the site could contain a Middle Archaic period component. This lithic material has a strong association with Middle Archaic (Neville complex) components on many sites along the Sudbury/Concord River drainage. If the Whittemore site does contain a Middle Archaic component, it would be a potentially significant addition to the inventory of known sites dating to this temporal period, particularly because of its upland zone location.

TABLE A-1. CULTURAL MATERIAL RECOVERED FROM PREHISTORIC SITES, MINUTEMAN NATIONAL HISTORICAL PARK

SITE	UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
AARDN BROOKS FARM P1	B612-C-20-51-3	BONE	MAMMAL	UNDIAGNOSTIC	1
		CHARCOAL			0
		FELSITE	FLAKES (2)		2
		FERROUS	CRDWN CAP		1
			MACHINE CUT INDETERMINATE		1
	B612-C-7-20-2	EARTHENWARE	REDWARE	PLAIN	1
				UNIDENTIFIED	4
			WHITEWARE	PLAIN	1
		GLASS	MOLDED	CONTACT MOLDED	2
			PLATE		1
			POSSIBLE DECORATIVE OBJECT FRAGMENT	WHITE AND BLUE (1)	1
	B612-CNW-0-33-1	BONE	MAMMAL	UNDIAGNOSTIC	21
		EARTHENWARE	REDWARE	PLAIN	2
		FERROUS	REINFORCEMENT PLATE (1)		1
	B612-CNW-33-47-2	FELSITE	FLAKE (1)		1
	B615-E-0-30-1	RHYOLITE	FLAKES (2)		2
	B615-E-8-54-2	BONE	MAMMAL	DIAGNOSTIC	3
				UNDIAGNOSTIC	11
		EARTHENWARE	WHITEWARE	PLAIN	3
		FERROUS			1
		GLASS	MOLDED	CONTACT MOLDED	2
			PLATE		2
		MILKGLASS			1
		RHYOLITE	FLAKE (1)		1
		SHELL	INDETERMINATE SHELL		0
	B636-N-0-36-1	BONE	MAMMAL	DIAGNOSTIC	3
				UNDIAGNOSTIC	10
		FERROUS	CROWN CAP		2
			INDETERMINATE		1
		GLASS	MOLDED	CONTACT MOLDED	2
		LEAD			1
		RHYDLITE	FLAKE (1)		1
	B636-NW-0-37-1	COAL			0
		EARTHENWARE	CREAMWARE	PLAIN	1

TABLE A-1. CULTURAL MATERIAL RECOVERED FROM PREHISTORIC SITES, MINUTEMAN NATIONAL HISTORICAL PARK

SITE	UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
AARON BROOKS FARM P1	B636-NW-0-37-1	FELSITE	FLAKE (1)		1
		GLASS	LAMP CHIMNEY FRAGMENT		1
TOTAL- AARON BROOKS FARM P1					89
EPHRAIM HARTWELL FARM P1	B655-E-0-41-1	BONE	MAMMAL	DIAGNOSTIC	1
				UNDIAGNDSTIC	2
		BRICK	BRICK		0
		GLASS	MOLDED	MACHINE MADE MANUFACTURE	1
		PLASTIC	POSSIBLE ELECTRICAL HARDWARE (1)		3
		SHELL	BIVALVE	CRASSOSTREA VIRGINICA	0
				MERCENARIA MERCENARIA	0
	B655-E-41-55-2	RHYOLITE	FLAKE (1)		1
TOTAL- EPHRAIM HARTWELL FARM P1					8
EPHRAIM HARTWELL FARM P2	B667-CNE-4-23-2	BONE	MAMMAL	UNDIAGNOSTIC	1
		FELSITE	FLAKE (1)		1
		GLASS	MOLDED	CONTACT MOLDED	2
		SHELL	BIVALVE	CRASSOSTREA VIRGINICA	0
				MERCENARIA MERCENARIA	0
TOTAL- EPHRAIM HARTWELL FARM P2					4
EPHRAIM HARTWELL FARM P3	B412-SW-20-30-3	FELSITE	FLAKE (1)		1
TOTAL- EPHRAIM HARTWELL FARM P3					1
EPHRAIM HARTWELL FARM P4	B403-NW-10-20-3	FELSITE	FLAKES (2)		2
	B403-NW-20-23-4	EARTHENWARE	REDWARE	TRAILED SLIPWARE	1

TABLE A-1. CULTURAL MATERIAL RECOVERED FROM PREHISTORIC SITES, MINUTEMAN NATIONAL HISTORICAL PARK

SITE	UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
JACOB WHITTEMORE FARM P1	B540-NW-60-70-4	MYLONITE	FLAKES (5)		5
	B540-NW-70-80-5	MYLONITE	FLAKES (2)		2
TOTAL- JACOB WHITTEMDRE FARM P1					50
JOSHUA BROOKS FARM P2	B215-CSE-2D-30-2	FELSITE	FLAKES (2)		2
TOTAL- JOSHUA BROOKS FARM P2					2
OX PASTURE P1	B68-CSE-28-40-3	QUARTZ	FLAKE (1)		1
TOTAL- OX PASTURE P1					1
THOMAS NELSDN JR. FARM P1	B505-CNE-4-31-2	BONE	MAMMAL	DIAGNOSTIC	1
				UNDIAGNOSTIC	1
		EARTHENWARE	CREAMWARE	DECAL	1
				HANDPAINTED	1
				PLAIN	3
				UNIDENTIFIED	1
			WHITEWARE	PLAIN	1
		FERROUS			1
			MACHINE CUT INDETERMINATE		2
		GLASS	MOLDED	CONTACT MOLDED	1
			PLATE		1
		PORCELAIN	PORCELAIN	UNDECORATED	2
		SHELL	UNIVALVE	INDETERMINATE	0
		SLATE	UNIFACE		1
	B505-N-41-50-3	FELSITE	FLAKE (1)		1
	B505-N-5-41-2	BONE	BIRD	UNDIAGNOSTIC	1
		BRICK	BRICK		0
		EARTHENWARE	CREAMWARE	PLAIN	1

TABLE A-1. CULTURAL MATERIAL RECOVERED FROM PREHISTORIC SITES, MINUTEMAN NATIONAL HISTORICAL PARK

SITE	UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
THOMAS NELSON JR. FARM P1	B505-N-5-41-2	EARTHENWARE	REDWARE	UNIDENTIFIED	1
			UNIDENTIFIED EARTHENWARE		1
			WHITEWARE	PLAIN	1
		GLASS	JAR, JELLY	RIM FRAGMENT	1
			MOLDED	CONTACT MOLDED	4
		PORCELAIN	PORCELAIN	GILTED	1
				UNIDENTIFIED	1
TOTAL- THOMAS NELSON JR. FARM P1					30
THOMAS NELSON JR. FARM P2	B491-C-20-30-2	FELSITE	FLAKE (1)		1
	B491-C-33-40-3	FELSITE	FLAKE (1)		1
TOTAL- THOMAS NELSON JR. FARM P2					2
WILLIAM SMITH FARM P1	B327-W-20-25-3	FELSITE	FLAKE (1)		1
TOTAL- WILLIAM SMITH FARM P1					1
WILLIAM SMITH FARM P2	B371-CNE-0-35-1	BONE	BIRD	UNDIAGNOSTIC	10
			MAMMAL	UNDIAGNOSTIC	4
		EARTHENWARE	WHITEWARE	PLAIN	1
		FERROUS	INDETERMINATE		3
			WIRE		25
		GLASS	PLATE		1
	B371-CNE-30-40-2	FELSITE	BIFACE (1)		1
	B371-SW-0-26-1	BRICK	BRICK		0
		COAL			0
		FERROUS			10
			SARDINE CAN KEY		1
		GLASS	LAMP CHIMNEY FRAGMENT		1

TABLE A-1. CULTURAL MATERIAL RECOVERED FROM PREHISTORIC SITES, MINUTEMAN NATIONAL HISTORICAL PARK

SITE	UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
EPHRAIM HARTWELL FARM P4	B403-NW-23-30-5	FELSITE	FLAKE (1)		1
	B403-NW-30-40-6	FELSITE	FLAKE (1)		1
	B403-W-20-30-4	FELSITE	FLAKE (1)		1
TOTAL- EPHRAIM HARTWELL FARM P4					6
HOLT PASTURE P1	B238-SW-18-30-2	FELSITE	FLAKE (1)		1
TOTAL- HOLT PASTURE P1					1
JACOB FOSTER FARM P1	B716-CNE-0-10-1	BRICK	BRICK		0
		FELSITE	FLAKE (1)		1
	B716-CNE-10-20-2	FERROUS	MACHINE CUT INDETERMINATE		1
	B716-CNE-30-40-4	EARTHENWARE	REDWARE	PLAIN	1
TOTAL- JACOB FOSTER FARM P1					3
JACOB WHITTEMORE FARM P1	B537-SE-0-34-1	FERROUS			2
	B537-SE-40-50-3	FELSITE	FLAKE (1)		1
		MYLONITE	FLAKES (4)		4
	B537-SE-50-60-4	CHARCOAL			0
		MYLONITE	FLAKES (2)		2
	B540-NW-0-40-1	BRICK	BRICK		0
		EARTHENWARE	CREAMWARE	PLAIN	1
			REDWARE	LEAD GLAZED 1 SURFACE	1
				UNIDENTIFIED	1
		FERROUS	EYE-BOLT		1
		PORCELAIN	PORCELAIN	UNIDENTIFIED	1
		STONEWARE	DOMESTIC STONEWARE		2
	B540-NW-40-50-2	MYLONITE	FLAKES (9)		9
	B540-NW-50-60-3	MYLONITE	FLAKES (18)		18

TABLE A-1. CULTURAL MATERIAL RECOVERED FROM PREHISTORIC SITES, MINUTEMAN NATIONAL HISTORICAL PARK

SITE	UNIT	MATERIAL	OESCR 1	DESCR 2	COUNT
WILLIAM SMITH FARM P2	B371-SW-0-26-1	GLASS	MOLDED	CONTACT MOLDED	1
	B371-SW-20-30-2	FELSITE	FLAKE (1)		1
TOTAL- WILLIAM SMITH FARM P2					59
TOTAL					257

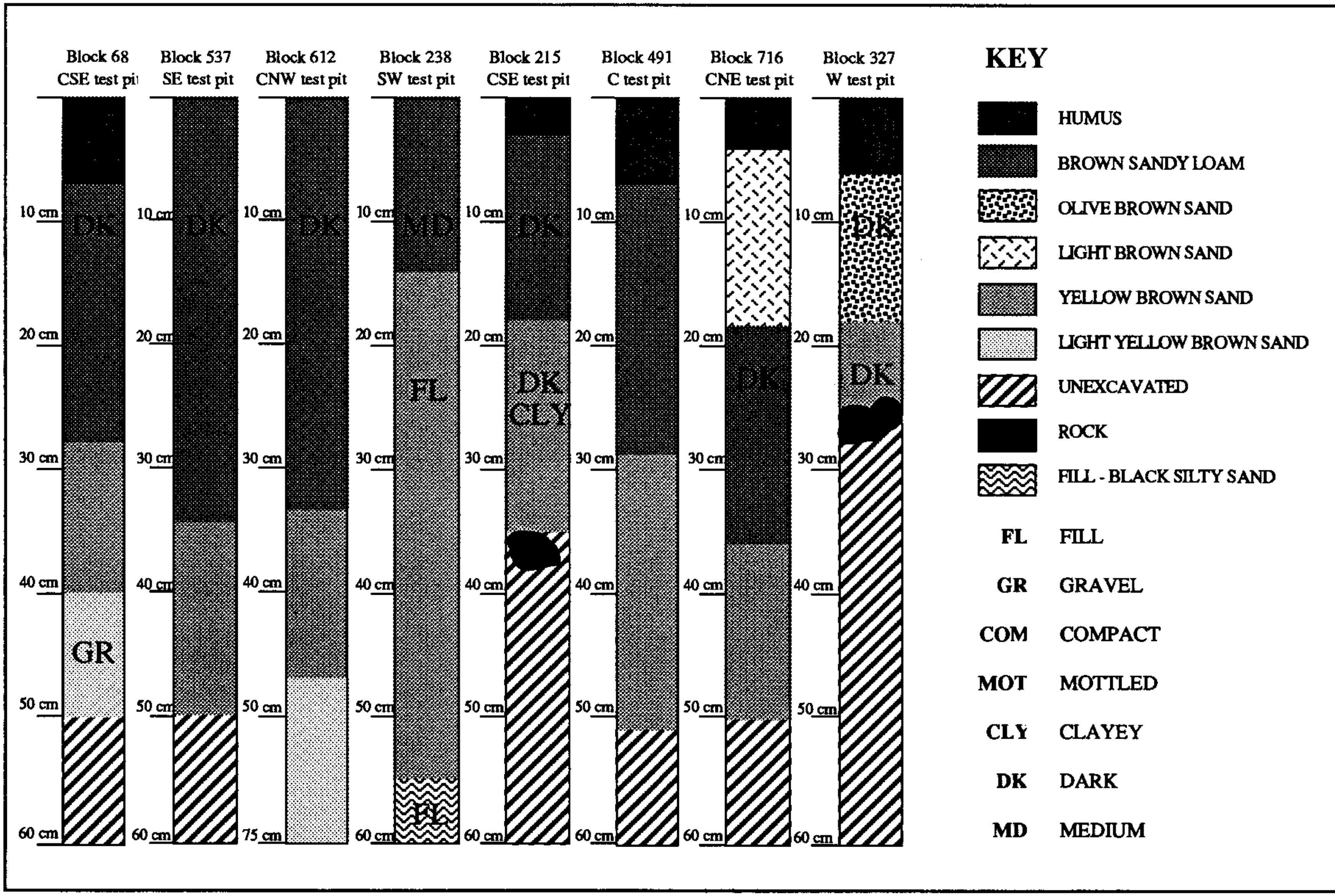


Figure A-1. Representative soil profiles from test pits excavated within MIMA.

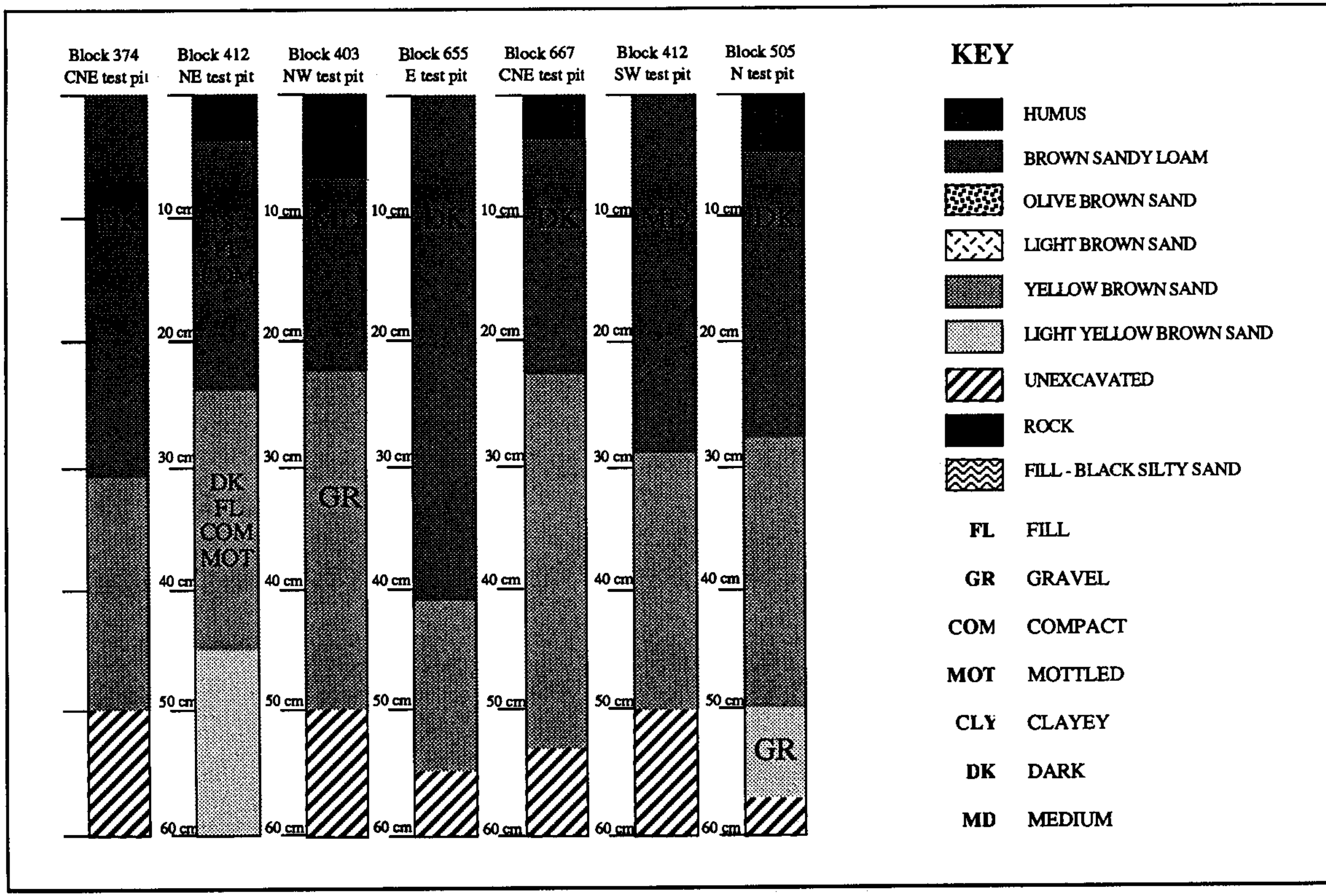


Figure A-1. Representative soil profiles from test pits excavated within MIMA (cont.).

Appendix B
Identified Historical Sites:

Site Forms and Accompanying Documentation

Site Name: Ox Pasture Site, cartpath and stone bridge
Town: Lincoln
USGS Quad: Concord

Location: Approximately 120 meters south of Lexington Road on the Lincoln/Concord town line. Near Blocks 63 and 80.

Functional Type: Transportation -- small stone bridge built on an unimproved cartpath/farm road.

Description: Small bridge constructed of local fieldstone on Concord/Lincoln town line road.

Site Extent: This bridge is approximately three meters long, three meters wide and two meters in height.

Date: Probably predates Malcolm's 1775 map which shows the cart path.

Map History: The cart path leading to the bridge is shown as a fence-lined road on the 1775 (Malcolm) map.

Previous Research: Previous investigation by Joyce Lee Malcolm (1985) show the land here belonged to Eleazer and Mary Brooks in 1769 and Job Brooks shortly after. The road is referred to as "slip of land for a way." (Malcolm 1985: 85).

Present Condition: Road is in good condition but unusable due to growth of trees, bridge is in very good condition.

Interpretation and Significance: This bridge appears to have been built before 1775 and could be a source of information on rural land use and the system of secondary roads and cart paths.

Accompanying Documentation: Sketch map (Figure B-1); Photograph (Figure B-2).

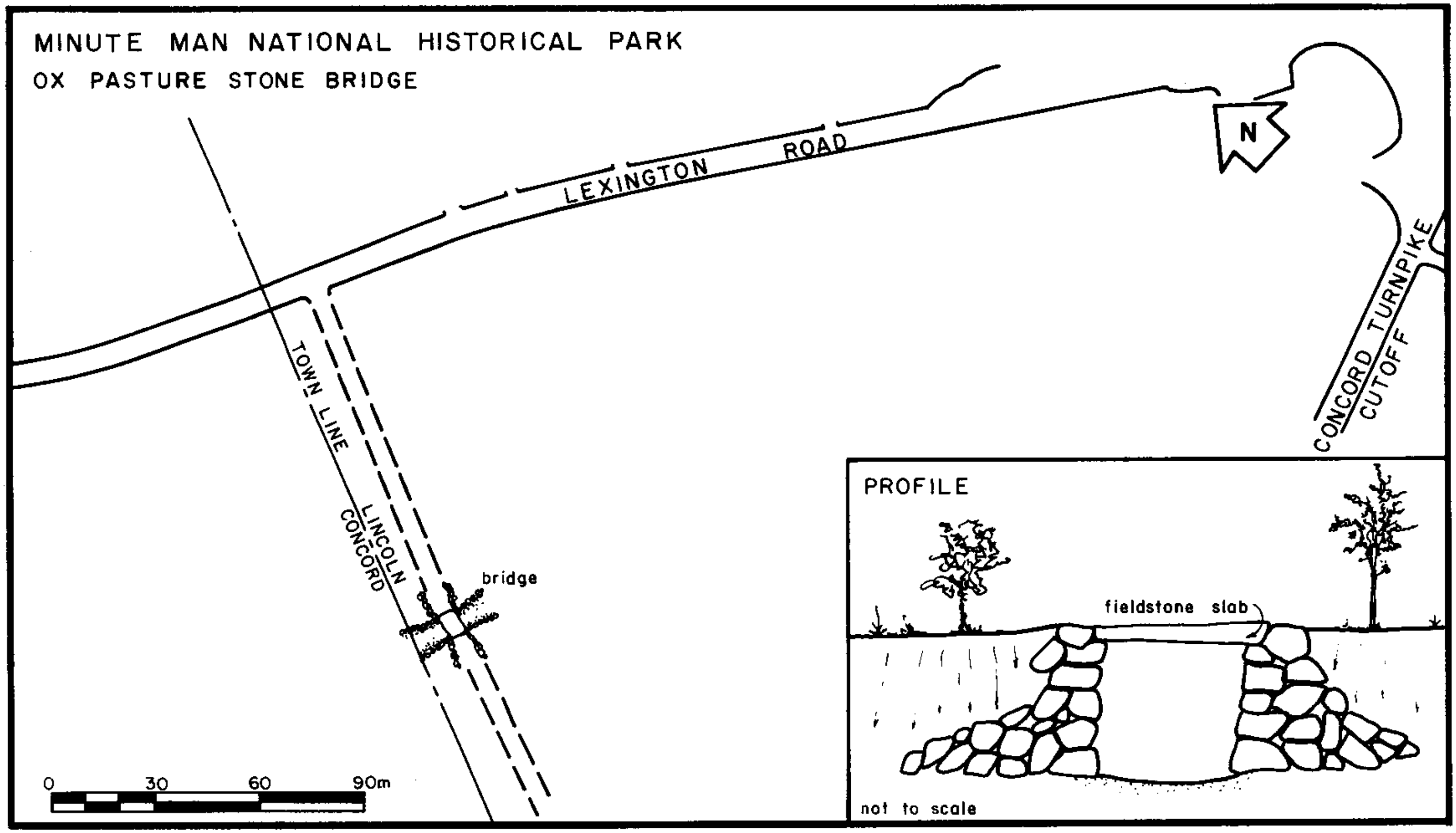


Figure B-1. Sketch map of Ox Pasture site, cart path, and stone bridge.

Figure B-2. Photograph of Ox Pasture site, cart path and stone bridge.

Site Name: Thomas Brooks Farm site, barn/outbuilding
Town: Lincoln
USGS Quad: Concord

Location: Approximately 45 meters northwest of junction of Old Bedford Road and Massachusetts Avenue. Immediately southeast of Block 213.

Functional Type: Agrarian -- probable barn/outbuilding.

Description: This site is a fieldstone foundation open on the west side and built into a sloping hillside on the east side. A stone lined well is located approximately 14 meters west of the foundation. This structure consists of a series of five masonry walls that appear to have formed a foundation for a barn or other large structure.

Site Extent: The foundation is about 18 m in length on a southwest to northeast axis and 10 m wide along a southeast to northwest axis.

Date: Artifacts recovered from Block 213 adjacent to the site suggest a probable early-mid 19th century construction/occupation date for this structure.

Map History: A 1775 map shows this area as pastureland (Malcolm 1985) and a tannery and slaughter house were just west of the site.

Previous Research: Historic land use research by Malcolm (1985) showed this area as a pasture in 1775.

Present Condition: Parts of the foundation wall have fallen, otherwise good preservation.

Interpretation and Significance: The Thomas Brooks Farm site is situated on a parcel of land which appears to have been used as pasture land for much of its colonial occupation. It is a potential source of information on land use practices particularly in regard to the sequence of activity on the land owned by the Brooks family in the eighteenth and nineteenth centuries.

Accompanying Documentation: Sketch map (Figure B-3); Photograph (Figure B-4); Table B-1.

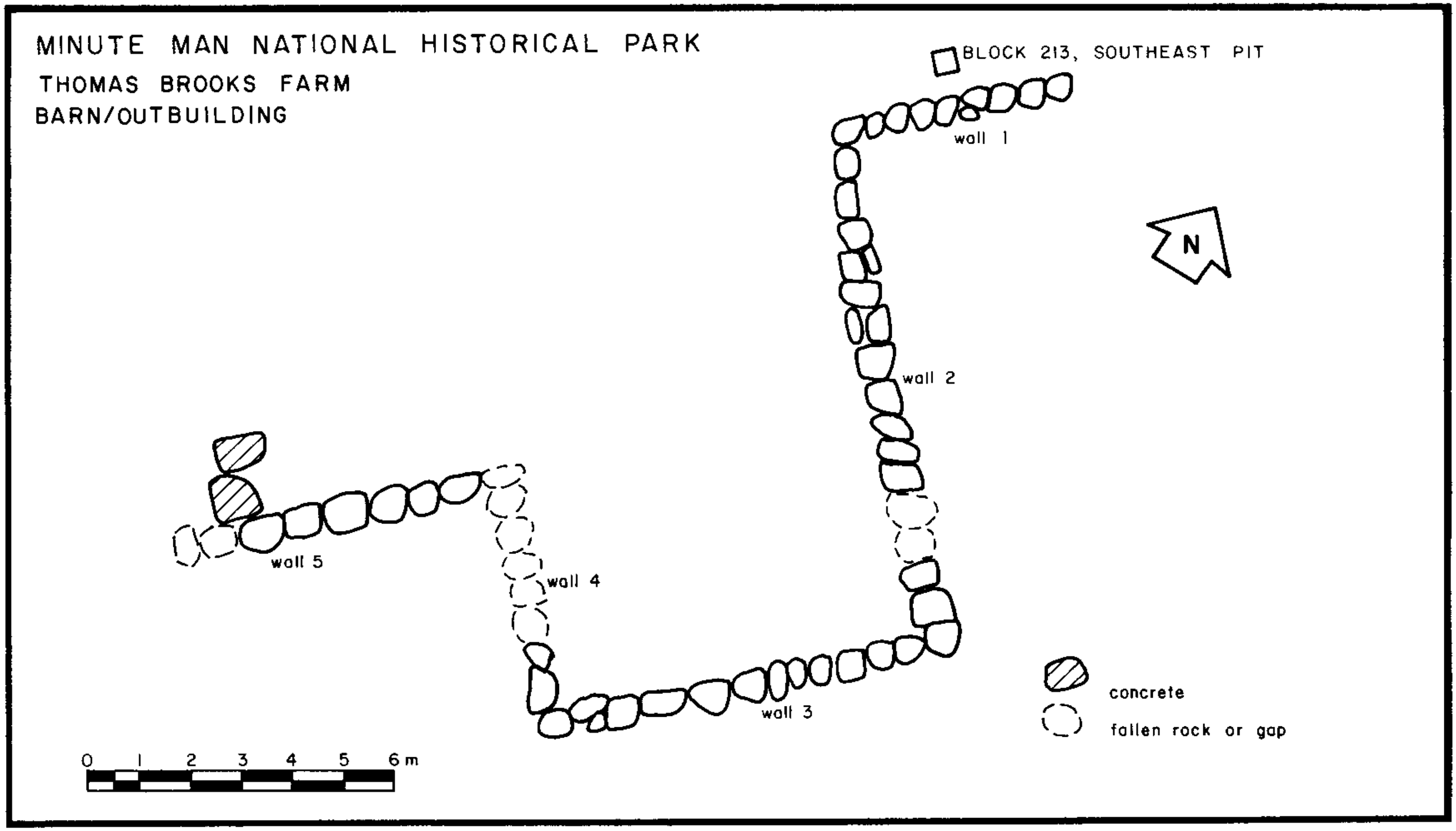


Figure B-3. Sketch Map of Thomas Brooks Farm site, barn/outbuilding.

Figure B-4. Photograph of Thomas Brooks Farm site, barn/outbuilding.

TABLE B-1. CULTURAL MATERIAL RECOVERED FROM THE THOMAS BROOKS FARM SITE, BARN/OUTBUILDING.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
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B213-CSE-10-20-2				0
	BRICK	BRICK		0
	CHARCOAL			0
	EARTHENWARE	UNIDENTIFIED EARTHENWARE		2
			POSSIBLE TRANSFER-PRINTED	1
	FERROUS			2
		INDETERMINATE		5
		MACHINE CUT INDETERMINATE		9
	GLASS	INDETERMINATE	RIM FRAGMENT	1
		MOLDED	CONTACT MOLDED	2
		PLATE		1
	INDETERMINATE			1
TOTAL- B213-CSE-10-20-2				24
B213-CSE-20-25-2				0
	EARTHENWARE	REDWARE	PLAIN	1
		WHITEWARE	PLAIN	2
	FERROUS	MACHINE CUT INDETERMINATE		2
	GLASS	MELTED		2
TOTAL- B213-CSE-20-25-2				7
B213-CSE-4-10-2	CHARCOAL			0
	FERROUS			1
		INDETERMINATE		2
		MACHINE CUT (1840-1885)		6
		MACHINE CUT INDETERMINATE		3
		WIRE		1
	GLASS	MOLDED	CONTACT MOLDED	1
	INDETERMINATE			2
TOTAL- B213-CSE-4-10-2				16
B213-E-4-10-2	BRICK	BRICK		0
TOTAL- B213-E-4-10-2				0
B213-NE-10-20-2	COAL			0
TOTAL- B213-NE-10-20-2				0
B213-S-0-10-1	GLASS	MOLDED	CONTACT MOLDED	1
		PLATE		1
TOTAL- B213-S-0-10-1				2

TABLE 8-1. CULTURAL MATERIAL RECOVERED FROM THE THOMAS BROOKS FARM SITE, BARN/OUTBUILDING.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B213-S-10-20-2	GLASS	MOLDED	CONTACT MOLDED	2
	MILKGLASS	INDETERMINATE	FRAGMENTS	2
		MOLDED	CONTACT MOLDED	3
TOTAL- B213-S-10-20-2				7
B213-SE-0-8-1	EARTHENWARE	PEARLWARE	PLAIN	2
		REDWARE	PLAIN	1
	FERROUS	INDETERMINATE		1
		WIRE		1
	GLASS	MOLDED	CONTACT MOLDED	1
		PLATE		1
TOTAL- B213-SE-0-8-1				7
B213-SE-10-20-2	ALUMINUM			1
	EARTHENWARE	CREAMWARE	UNIDENTIFIED	1
	FERROUS	INDETERMINATE		1
	PORCELAIN	PORCELAIN	UNDECORATED	1
TOTAL- B213-SE-10-20-2				4
TOTAL				67

Site Name: William Smith Farm site, foundation
Town: Lincoln
USGS Quad: Concord

Location: This site is located about 60 meters east of Bedford Lane and 150 meters south of North Great Road. It is situated on the crest of a small knoll in a relatively isolated location. Approximately 3 m north of Block 327.

Functional Type: Domestic -- small house or cottage foundation.

Description: The site consists of a small foundation built of local fieldstone and cement, with a brick and fieldstone chimney base on the south side of the foundation. Attached to the east of the foundation is a rectangular depression marking a cellar hole. The stone foundation is partially filled with cobblestone.

Extent: The foundation and cellarhole cover an area roughly 11 m in length and 5.5 m wide.

Date: Unknown, probably late 19th to 20th century.

Map History: The land is unoccupied on both the 1775 map (Malcolm 1985) and the 1875 Beers map.

Previous Research: Deed search and 1775 ownership map done by Joyce Lee Malcolm (1985) shows the land as pasture.

Present Condition: The structural remains on the site appear to be in good condition. The condition of any subsurface archaeological component is unknown; soil profiles recorded from test pits in Block 327 a few meters from the foundation were intact with no evidence of previous disturbance.

Interpretation and Significance: This site appears to have been the location of a small house or cottage intentionally built in an isolated, wooded location. No driveway or other access road was observed near the site. This site does not appear to be potentially important; the limited amount of available information makes it difficult to assess significance.

Accompanying Documentation: Sketch map (Figure B-5); Table B-2.

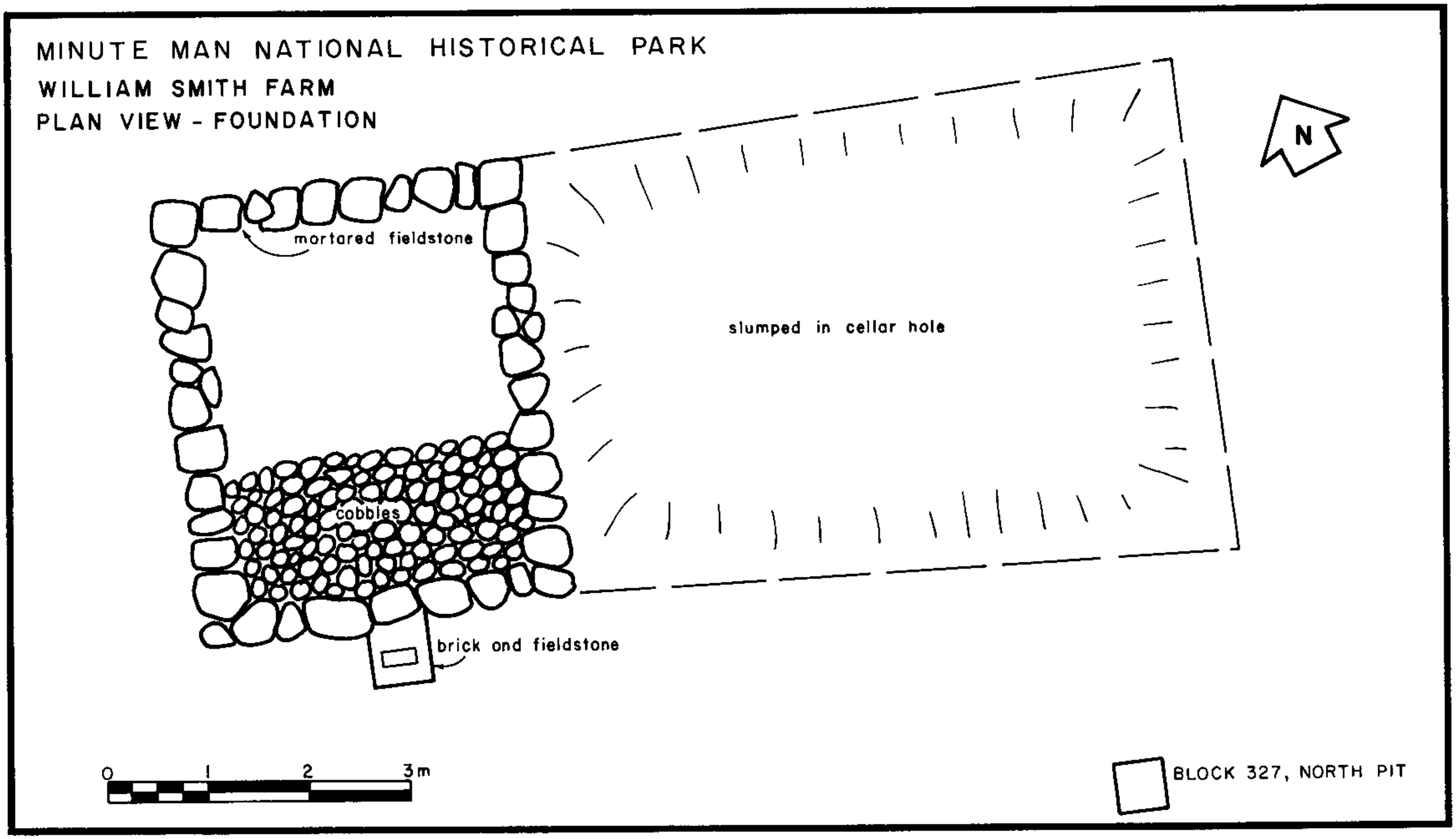

Figure B-5. Sketch map of William Smith Farm site, foundation.

TABLE 8-2. CULTURAL MATERIAL RECOVERED FROM THE WILLIAM SMITH FARM SITE, FOUNDATION.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
8327-CNW-13-31-2	FERROUS	TACKS (11)		11
	NUTSHELL			2
TOTAL- 8327-CNW-13-31-2				13
TOTAL				13

Site Name: Ephraim Hartwell Farm site, foundation
Town: Lincoln
USGS Quad: Concord

Location: This historic period site is located 90 m west of Virginia Road and 60 northwest of Bedford Road in a wooded area to the west of the intersection of these two roads. Approximately 15 m south of Block 361.

Functional Type: Domestic/Agrarian -- small house/cottage foundation? and well.

Description: This site marked by a large pile of fieldstone and some brick rubble left from the demolition of the foundation A small well is located to the southeast of the house site.

Site Extent: Approximately 40 square meters in horizontal extent. Vertical extent unknown since no subsurface testing was conducted in or near the structure.

Date: Cultural material recovered from a random sampling unit (Block 361) located about 15 m north of the structure suggests a possible late 19th to 20th century construction/occupation for this site. This cultural material may not be directly associated with this site.

Map History: Neither the 1775 Malcolm nor the 1875 Beers maps show any structures in this area. In 1775, the area was meadowland belonging to Ephraim Hartwell.

Previous Research: Documentary research by Malcolm (1985).

Present Condition: The condition of any below ground structural remains or archaeological deposits is unknown. No intact structural elements remain above ground. Dense vegetation covers the general vicinity of the site.

Interpretation and Significance: The Ephraim Hartwell Farm Site, Foundation appears to be a late nineteenth to twentieth century house site. The significance of this site is difficult to assess given the limited information available.

Accompanying Documentation: Sketch map (Figure B-6); Table B-3.

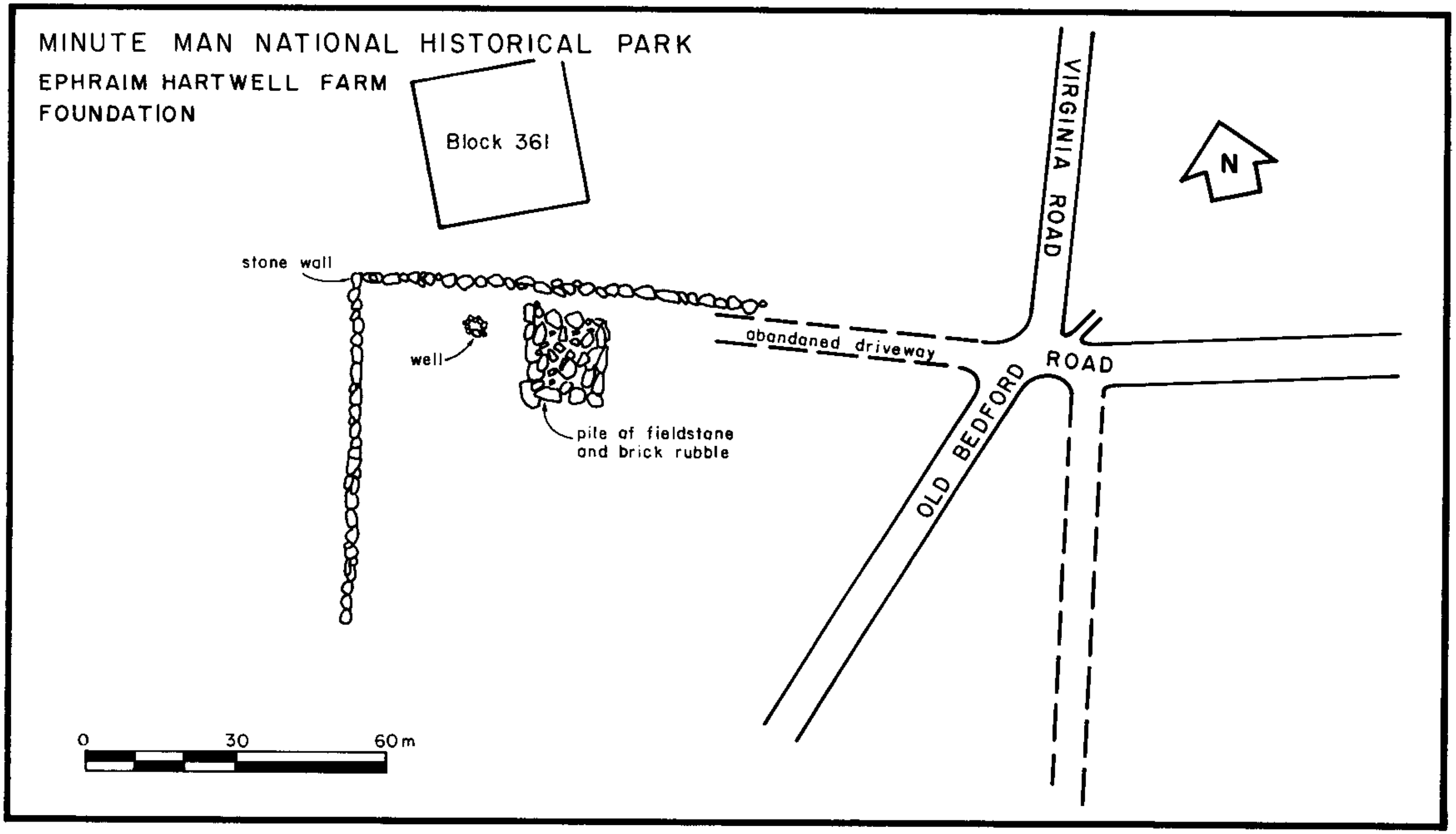

Figure B-6. Sketch map of Ephraim Hartwell Farm site, foundation.

TABLE B-3. CULTURAL MATERIAL RECOVERED FROM THE EPHRAIM HARTWELL FARM SITE, FOUNDATION.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B361-CNE-10-20-2	FERROUS	INDETERMINATE		1
		MACHINE CUT INDETERMINATE		1
		TACK (1)		1
	GLASS	MOLDED	CONTACT MOLDED	2
		PLATE		4
TOTAL- B361-CNE-10-20-2				9
B361-CSE-10-20-2	FERROUS	WIRE (1)		1
TOTAL- B361-CSE-10-20-2				1
B361-CSW-0-9-1	FERROUS			3
		CROWN CAP (2), INDETERMINATE		3
	INDETERMINATE			4
TOTAL- B361-CSW-0-9-1				10
B361-E-0-10-1	GLASS	MOLDED	CONTACT MOLDED	1
	MICA			2
TOTAL- B361-E-0-10-1				3
B361-E-10-20-1	ASPHALT	ROOFING TILE FRAGMENTS		12
	MICA			3
	PORCELAIN	PORCELAIN	UNDERGLAZE HANDPAINTED MONOCHROME	1
TOTAL- B361-E-10-20-1				16
B361-E-20-30-1	ASPHALT	ROOFING TILE FRAGMENTS		5
TOTAL- B361-E-20-30-1				5
B361-E-43-50-2	ASPHALT	ROOFING TILE FRAGMENTS		16
TOTAL- B361-E-43-50-2				16
B361-N-0-10-1	GLASS	MOLDED	CONTACT MOLDED	3
TOTAL- B361-N-0-10-1				3
B361-NW-4-10-2	GLASS	MOLDED	CONTACT MOLDED	2
	SLAG			0
TOTAL- B361-NW-4-10-2				2

TABLE B-3. CULTURAL MATERIAL RECOVERED FROM THE EPHRAIM HARTWELL FARM SITE, FOUNDATION.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B361-S-10-20-2	GLASS	MOLDED	CONTACT MOLDED	1
			MACHINE MADE MANUFACTURE	1
	PORCELAIN	PORCELAIN	UNDECORATED	1
TOTAL- B361-S-10-20-2				3
B361-SE-0-10-1&2	FERROUS			1
	GLASS	MOLDED	CONTACT MOLDED	1
		PLATE		2
	MILKGLASS	MOLDED	CONTACT MOLDED	2
TOTAL- B361-SE-0-10-1&2				6
B361-SE-20-28-2	FERROUS			1
TOTAL- B361-SE-20-28-2				1
TOTAL				75

Site Name: Ephraim Hartwell Farm site, 20th c. filled foundation
Town: Lincoln
USGS Quad: Concord

Location: This site is located on the south side of Concord Road, southwest of Folly Pond. In Block 412.

Functional Type: Domestic/Agrarian -- probable filled cellarhole.

Description: This site consists of a dense deposit of primarily 19th to 20th century domestic trash and building remains filling a probable 20th century house foundation. A path leading to this site off of Concord Road may be an overgrown driveway.

Site Extent: The structure covers an area of about 200 sq m.

Date: Unknown, but historic cultural materials found within Block 412 overlying the site includes a large quantity and wide variety of historical cultural material, with the majority dating to the late 19th to 20th century.

Map History: A 1775 map (Malcolm 1985) places this parcel of land in the ownership of Ephraim Hartwell. The structure lies near the dividing line between meadow and tilled land uses (Malcolm 1985). The 1875 Beers map shows no structure in this area.

Previous Research: Documentary research by Joyce Lee Malcolm (1985) shows this area as a tilled field.

Present Condition: The site appears to have been razed and to be in poor condition.

Interpretation and Significance: The Ephraim Hartwell Farm Site, 20th c. Filled Foundation appears to be the trash and rubble filled remains of a 20th century dwelling. Its potential significance appears to be minimal based on the limited amount of available information.

Accompanying Documentation: Map (Figure B-7); Table B-4.

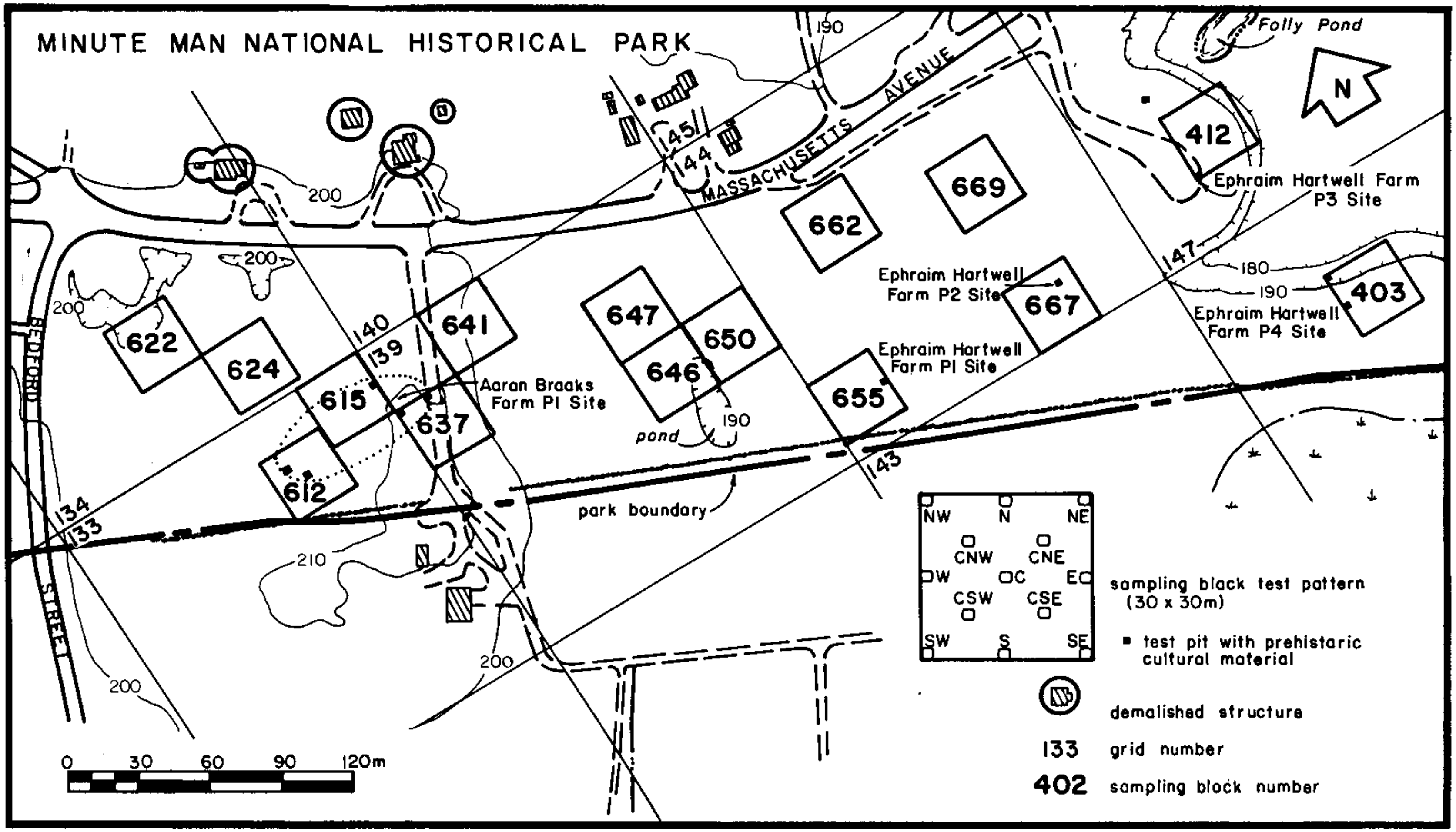

Figure B-7. Location of Ephraim Hartwell Farm site, 20th century, filled foundation.

TABLE B-4. CULTURAL MATERIAL RECOVERED FROM THE EPHRAIM HARTWELL FARM, 20TH C. FILLED FOUNDATION.

UNIT	MATERIAL	DESCR 1	BESCR 2	COUNT
B412-S-6-24-2	WOOD			2
TOTAL- B412-S-6-24-2				64
B412-SE-43-76-3	CHARCOAL			0
	EARTHENWARE	CERAMIC TILE FRAGMENT		1
		WHITEWARE	DECAL	1
	FERROUS			3
		WIRE		5
	GLASS	FUSE		1
		MELTED		3
		MOLDED	MACHINE MADE MANUFACTURE	6
		PLATE		1
TOTAL- B412-SE-43-76-3				21
B412-SE-5-43-2	BONE	MAMMAL	UNDIAGNOSTIC	1
	BRICK	BRICK		0
	EARTHENWARE	REDWARE	PLAIN	3
		UNIDENTIFIED EARTHENWARE		2
		WHITEWARE		3
	FERROUS	CAN FRAGMENT		1
		CAR PART		1
		COTTER PIN		1
		INDETERMINATE		5
		WIRE		3
	GLASS	MOLDED	MACHINE MADE MANUFACTURE	19
	MILKGLASS	MOLDED	CONTACT MOLDED	1
	PLASTIC			2
	SLATE	ROOFING TILE FRAGMENT		1
	TIN			2
	WOOD			2
TOTAL- B412-SE-5-43-2				47
B412-W-12-24-3	GLASS	MOLDED	MACHINE MADE MANUFACTURE	1
TOTAL- B412-W-12-24-3				1
B412-W-5-12-2	COAL			0
	EARTHENWARE	REDWARE	PLAIN	2
		WHITEWARE	DECAL	1
	FERROUS	WIRE		2
	GLASS	MOLDED	CONTACT MOLDED	5
		PLATE		8
	PORCELAIN	PORCELAIN	UNDECORATED	1
TOTAL- B412-W-5-12-2				19
TOTAL				1,327

TABLE B-4. CULTURAL MATERIAL RECOVERED FROM THE EPHRAIM HARTWELL FARM, 20TH C. FILLED FOUNDATION.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B412-S-24-50-3	CHARCOAL			0
	COPPER	LIGHT BULB FRAGMENT		1
	EARTHENWARE	CERAMIC TILE FRAGMENT		1
		CREAMWARE	GILTED	1
			PLAIN	1
		REDWARE	PLAIN	3
		UNIDENTIFIED EARTHENWARE		5
		WHITEWARE	TRANSFER-PRINTED	1
	FERROUS			16
		CAN FRAGMENT		1
		INDETERMINATE		5
		MACHINE CUT INDETERMINATE		2
		WIRE		2
	GLASS	JAR, FOOD	RIM FRAGMENT	1
		LAMP CHIMNEY FRAGMENTS		2
		LIGHT BULB FRAGMENTS		1
		MELTED		19
		MOLDED	CONTACT MOLDED	2
			MACHINE MADE MANUFACTURE	77
		PLATE		9
	INDETERMINATE			3
		UNIDENTIFIED		1
	PLASTIC			2
	PORCELAIN	PORCELAIN	UNDECORATED	11
			UNDERGLAZE HANDPAINTED POLYCHROME	2
	SLATE	ROOFING TILE FRAGMENT		1
TOTAL- B412-S-24-50-3				174
B412-S-6-24-2	BRICK	BRICK		0
	COAL			0
	EARTHENWARE	CERAMIC TILE FRAGMENTS		3
		REDWARE	PLAIN	1
		WHITEWARE	PLAIN	1
			UNIDENTIFIED	1
	FERROUS			4
		CHAIN, CHAIN-SAW		1
		INDETERMINATE		6
	GLASS	MELTED		4
		MIRROR FRAGMENT		1
		MOLDED	MACHINE MADE MANUFACTURE	29
	MILKGLASS	MOLDED	CONTACT MOLDED	1
	PLASTIC			3
		TUBE, TOOTHPASTE		2
	PORCELAIN	PORCELAIN	OVERGLAZE HANDPAINTED POLYCHROME	2
			TRANSFER-PRINTED	1
			UNDECORATED	2

TABLE B-4. CULTURAL MATERIAL RECOVERED FROM THE EPHRAIM HARTWELL FARM; 20TH C. FILLED FOUNDATION.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B412-NE-4-24-2	GRAPHITE	BATTERY ROD		1
	INDETERMINATE			6
		ZIPPER FRAGMENT		1
	LEATHER			1
	MILKGLASS	MOLDED	CONTACT MOLDED	1
	PLASTIC			1
	PORCELAIN	TEAPOT FRAGMENT		1
	SLATE	ROOFING TILE FRAGMENT		1
	STONEWARE	UNIDENTIFIED STONEWARE		1
	WOOD			1
TOTAL- B412-NE-4-24-2				129
B412-NE-45-60-4	EARTHENWARE	REDWARE	PLAIN	1
		UNIDENTIFIED EARTHENWARE		1
	FERROUS	CAN FRAGMENTS		8
		CROWN CAP		2
	GLASS			1
		MOLDED	CONTACT MOLDED	30
			MACHINE MADE MANUFACTURE	28
		PLATE		1
	INDETERMINATE	POSSIBLE CONSTRUCTION MAT		1
	PLASTIC			1
TOTAL- B412-NE-45-60-4				74
B412-NW-6-36-2	BONE	BIRD	UNDIAGNOSTIC	2
	BRICK	BRICK		0
	COPPER ALLOY	GUN SHELL CASING		1
	EARTHENWARE	REDWARE	LEAD GLAZED 2 SURFACES	1
			PLAIN	2
		UNIDENTIFIED EARTHENWARE		1
		WHITEWARE	PLAIN	1
			TRANSFER-PRINTED	1
	FERROUS	INDETERMINATE		2
		WIRE		2
	GLASS	MOLDED	CONTACT MOLDED	2
		PLATE		5
	SHELL	BIVALVE	CRASSOSTREA VIRGINICA	0
TOTAL- B412-NW-6-36-2				20
B412-S-24-50-3	ALUMINUM	CAN FRAGMENT		1
		EYELET		1
		TUBE, ARTIST'S PAINT		1
	ASPHALT	ROOFING TILE FRAGMENT		1
	BRICK	BRICK		0

TABLE B-4. CULTURAL MATERIAL RECOVERED FROM THE EPHRAIM HARTWELL FARM, 20TH C. FILLED FOUNDATION.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B412-N-58-81-4	SLATE	ROOFING TILE FRAGMENT		1
	STONEWARE	UNIDENTIFIED STONEWARE		1
TOTAL- B412-N-58-81-4				73
B412-N-81-93-5	EARTHENWARE	UNIDENTIFIED EARTHENWARE		1
		WHITEWARE	PLAIN	2
	GLASS	MOLDED	MACHINE MADE MANUFACTURE	34
	PLASTIC	HEEL PART		1
	PORCELAIN	PORCELAIN	UNDECORATED	1
	RUBBER			1
TOTAL- B412-N-81-93-5				40
B412-NE-24-45-3	CHARCOAL			0
	EARTHENWARE			1
		WHITEWARE	DECAL	3
			PLAIN	3
	FERROUS			3
		CROWN CAP		1
		INDETERMINATE		2
	GLASS	MOLDED	CONTACT MOLDED	10
			MACHINE MADE MANUFACTURE	13
	GRAPHITE	BATTERY ROD		1
	INDETERMINATE			6
		KEY CHAIN, BEADED		1
	PLASTIC			1
	PLASTIC, COPPE	INSULATED WIRE		1
TOTAL- B412-NE-24-45-3				46
B412-NE-4-24-2	BRICK	BRICK		0
	COPPER			1
	EARTHENWARE	BASAL SHERDS	INDETERMINATE	2
		CERAMIC TILE FRAGMENT		1
		REDWARE	UNIDENTIFIED	2
		WHITEWARE	DECAL	2
			PLAIN	4
	FERROUS			6
		INDETERMINATE		3
	GLASS	MELTED (6)		8
		MIRROR FRAGMENT		1
		MOLDED	CONTACT MOLDED	6
			MACHINE MADE MANUFACTURE	21
			MACHINE MADE MANUFCATURE	53
			PRESS MOLDED	1
		PLATE	REINFORCED WITH METAL (1)	3

TABLE B-4. CULTURAL MATERIAL RECOVERED FROM THE EPHRAIM HARTWELL FARM, 20TH C. FILLED FOUNDATION.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B412-CNE-39-60-4	PLASTIC			1
	PORCELAIN	PORCELAIN FIGURINES		5
	SLAG			0
TOTAL- B412-CNE-39-60-4				64
B412-CNE-5-26-2	BRICK	BRICK		0
	FERROUS			2
		MACHINE CUT INDETERMINATE		1
		WIRE		2
	GLASS	MELTED		1
		MOLDED	CONTACT MOLDED	13
			MACHINE MADE MANUFACTURE	6
		PLATE		1
	PORCELAIN	PORCELAIN	UNIDENTIFIED	1
TOTAL- B412-CNE-5-26-2				27
B412-CNW-9-31-2	BRICK	BRICK		0
	COAL			0
	EARTHENWARE	CERAMIC TILE FRAGMENT		1
		REDWARE	PLAIN	1
		UNIDENTIFIED EARTHENWARE		3
		WHITEWARE	GILTED	2
			PLAIN	2
	FERROUS			2
		INDETERMINATE		6
		WIRE		1
	GLASS	MOLDED	MACHINE MADE MANUFACTURE	72
		PLATE		5
	PORCELAIN	PORCELAIN	UNDECORATED	1
TOTAL- B412-CNW-9-31-2				96
B412-CSE-31-70-3	CHARCOAL			0
	EARTHENWARE	WHITEWARE	PLAIN	1
	FERROUS			2
		INDETERMINATE		3
	GLASS			2
		MOLDED	CONTACT MOLDED	2
			MACHINE MADE MANUFACTURE	10
	SLATE	ROOFING TILE FRAGMENT		1
TOTAL- B412-CSE-31-70-3				21
B412-CSE-6-31-2	COAL			0
	EARTHENWARE	REDWARE	PLAIN	1

TABLE B-4. CULTURAL MATERIAL RECOVERED FROM THE EPHRAIM HARTWELL FARM, 20TH C. FILLED FOUNDATION.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B412-CSE-6-31-2	EARTHENWARE	UNIDENTIFIED EARTHENWARE		1
		WHITEWARE	DECAL	1
			PLAIN	3
			TRANSFER-PRINTED	1
			UNIDENTIFIED	2
	FERROUS			6
		INDETERMINATE		5
		WIRE		1
	GLASS	INDETERMINATE		3
		MIRROR FRAGMENTS		3
		MOLDED	MACHINE MADE MANUFACTURE	60
		PLATE		5
	INDETERMINATE			1
	MILKGLASS	MOLDED	CONTACT MOLDED	1
	PLASTIC			1
	WOOD			1
TOTAL- B412-CSE-6-31-2				96
B412-CSW-0-22-1	EARTHENWARE	REDWARE	PLAIN	1
		WHITEWARE	PLAIN	1
	FERROUS			1
	GLASS	INDETERMINATE		1
		MOLDED	CONTACT MOLDED	12
TOTAL- B412-CSW-0-22-1				16
B412-E-26-38-3	FERROUS	CAN FRAGMENT	GLASS ATTACHED (1)	1
	GLASS	MOLDED	CONTACT MOLDED	14
	INDETERMINATE	POSSIBLE CONSTRUCTION MAT		1
TOTAL- B412-E-26-38-3				16
B412-E-6-26-2	EARTHENWARE	UNIDENTIFIED EARTHENWARE		1
		WHITEWARE	UNIDENTIFIED	1
	FERROUS			3
		CAR PART		1
		WASHER		1
		WIRE		3
	GLASS	MELTED		3
		MOLDED	MACHINE MADE MANUFACTURE	26
	LEATHER	SHOE		1
	MILKGLASS	MOLDED	MACHINE MADE MANUFACTURE	2
	PLASTIC			4
		TUBE, FIRST AIO CREAM		1
	PORCELAIN	PORCELAIN	UNIDENTIFIED	1
TOTAL- B412-E-6-26-2				48

TABLE B-4. CULTURAL MATERIAL RECOVEREO FROM THE EPHRAIM HARTWELL FARM, 20TH C. FILLED FOUNDATION.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B412-N-23-58-3	BONE	MAMMAL	UNDIAGNOSTIC	1
	EARTHENWARE	WHITEWARE	DECAL	4
	FERROUS			2
	GLASS	LAMP CHIMNEY FRAGMENT		1
		MELTED		1
		MOLDED	CONTACT MOLDED	12
			MACHINE MADE MANUFACTURE	2
	INDETERMINATE			2
	MORTAR/PLASTER	MORTAR/PLASTER		0
TOTAL- B412-N-23-58-3				25
B412-N-5-23-2	ALUMINUM	TUBE		1
	BONE	BIRD	UNDIAGNOSTIC	1
		MAMMAL	DIAGNOSTIC	1
	COAL			0
	EARTHENWARE	REDWARE	UNIDENTIFIED	1
		WHITEWARE	DECAL	16
			TRANSFER-PRINTED	1
	FERROUS			9
		CASE, LIPSTICK		1
		INDETERMINATE		2
	FERROUS, RUBBE	CAN FRAGMENT		1
	GLASS	LAMP CNIMNNEY FRAGMENTS		2
		MOLDED	CONTACT MOLDED	1
			MACHINE MADE MANUFACTURE	33
		PLATE		1
	INDETERMINATE	LIGNT BULB FRAGMENT		1
	PORCELAIN	PORCELAIN	UNDECDRATED	1
TOTAL- B412-N-5-23-2				73
B412-N-58-B1-4	BONE	INDETERMINATE	UNDIAGNDSTIC	2
	BRICK	BRICK		0
	COPPER	LIGNT/BULB FRAGMENT		1
	EARTNENWARE	CERAMIC TILE FRAGMENTS		4
		UNIDENTIFIED EARTHENWARE		6
		WHITEWARE	GILTED	1
			TRANSFER-PRINTED	1
	FERROUS	INDETERMINATE		7
	GLASS	MELTED (9)		11
		MOLDED	MACHINE MADE MANUFACTURE	34
	INDETERMINATE			1
		HANDLE FRAGMENT	INDETERMINATE	1
	MORTAR/PLASTER	MORTAR/PLASTER		0
	PLASTIC	TUBE, TOOTNPASTE		2
	SHELL	BIVALVE	INDETERMINATE	0

TABLE B-4. CULTURAL MATERIAL RECOVERED FROM THE EPHRAIM HARTWELL FARM, 20TH C. FILLED FOUNDATION.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B412-C-31-50-3	ALUMINUM			4
	BRICK	BRICK		0
	EARTHENWARE	COARSE BUFF-BODY	UNIDENTIFIED	1
		UNIDENTIFIED EARTHENWARE		6
	FERROUS			8
		COTTER PIN (2)		2
		CROWN CAP		1
		INDETERMINATE		3
		WIRE		7
	GLASS	LAMP CHIMNEY FRAGMENTS		2
		MELTED		14
		MIRROR FRAGMENTS		2
		MOLDED	CONTACT MOLDED	1
			MACHINE MADE MANUFACTURE	52
		PLATE		3
	MILKGLASS	MOLDED	CONTACT MOLDED	1
	MORTAR/PLASTER	MORTAR/PLASTER		0
	PLASTIC			1
	PORCELAIN	PORCELAIN	DECAL	1
			UNDECORATED	1
			UNIDENTIFIED	1
	SLAG			0
	WOOD			1
TOTAL- B412-C-31-50-3				112
B412-CNE-26-39-3	FERROUS			3
	GLASS	MELTED		1
		MOLDED	CONTACT MOLDED	14
			MACHINE MADE MANUFACTURE	4
		PLATE		1
	PORCELAIN	PORCELAIN FIGURINES		2
TOTAL- B412-CNE-26-39-3				25
B412-CNE-39-60-4	ALUMINUM	CAN FRAGMENT		1
	CHARCOAL			0
	EARTHENWARE	REDWARE	PLAIN	1
		WHITEWARE	TRANSFER-PRINTED	1
	FERROUS			5
		INDETERMINATE		7
		SCISSORS FRAGMENT		1
		WIRE		8
	GLASS	MARBLE		1
		MOLDED	MACHINE MADE MANUFACTURE	23
	MILKGLASS	MOLDED	CONTACT MOLDED	6
			MACHINE MADE MANUFACTURE	4

Site Name: Samuel Hartwell Farm site, cellar hole
Town: Lincoln
USGS Quad: Concord

Location: This site is located about 19 m south of the intersection of Bedford Road and Massachusetts Avenue (east of Bedford Road, south of Massachusetts Avenue) on the edge of a low lying, poorly drained area. Approximately 24 m north of Block 622.

Functional Type: Domestic/Agrarian -- possible cellarhole.

Description: This site consists of a roughly rectangular foundation with an opening in the southeastern corner. Material used in the construction of this foundation was local fieldstone joined with mortar.

Site Extent: The structure covers an area of about 25 sq m. The vertical extent of the site is unknown since no subsurface testing was conducted.

Date: Unknown, but historic cultural materials recovered about 24 m south of the site in a randomly placed 30 x 30 m block (Block 622) suggest 19th century disposal of domestic refuse. This historical cultural material may not be directly associated with this site.

Map History: A 1775 map (Malcolm 1985) places this parcel of land in the ownership of Samuel Hartwell but is vague as to its use. The 1875 Beers map shows no structure in this area. Documentary research has indicated that a cider mill existed on Hartwell property in the late eighteenth century, however this was apparently located about 600 feet east of the foundation identified during the 1989 survey.

Previous Research: Documentary research by Malcolm (1985) shows this area as pasture.

Present Condition: The site appears to be in good condition with no evidence of damage to the structure.

Interpretation and Significance: The Samuel Hartwell Farm site appears to be the remains of a small dwelling or outbuilding. Its potential significance is difficult to assess given the limited amount of available information.

Accompanying Documentation: Sketch map (Figure B-8); Photograph (Figure B-9); Detail of cellar wall (Figure B-10); Table B-5.

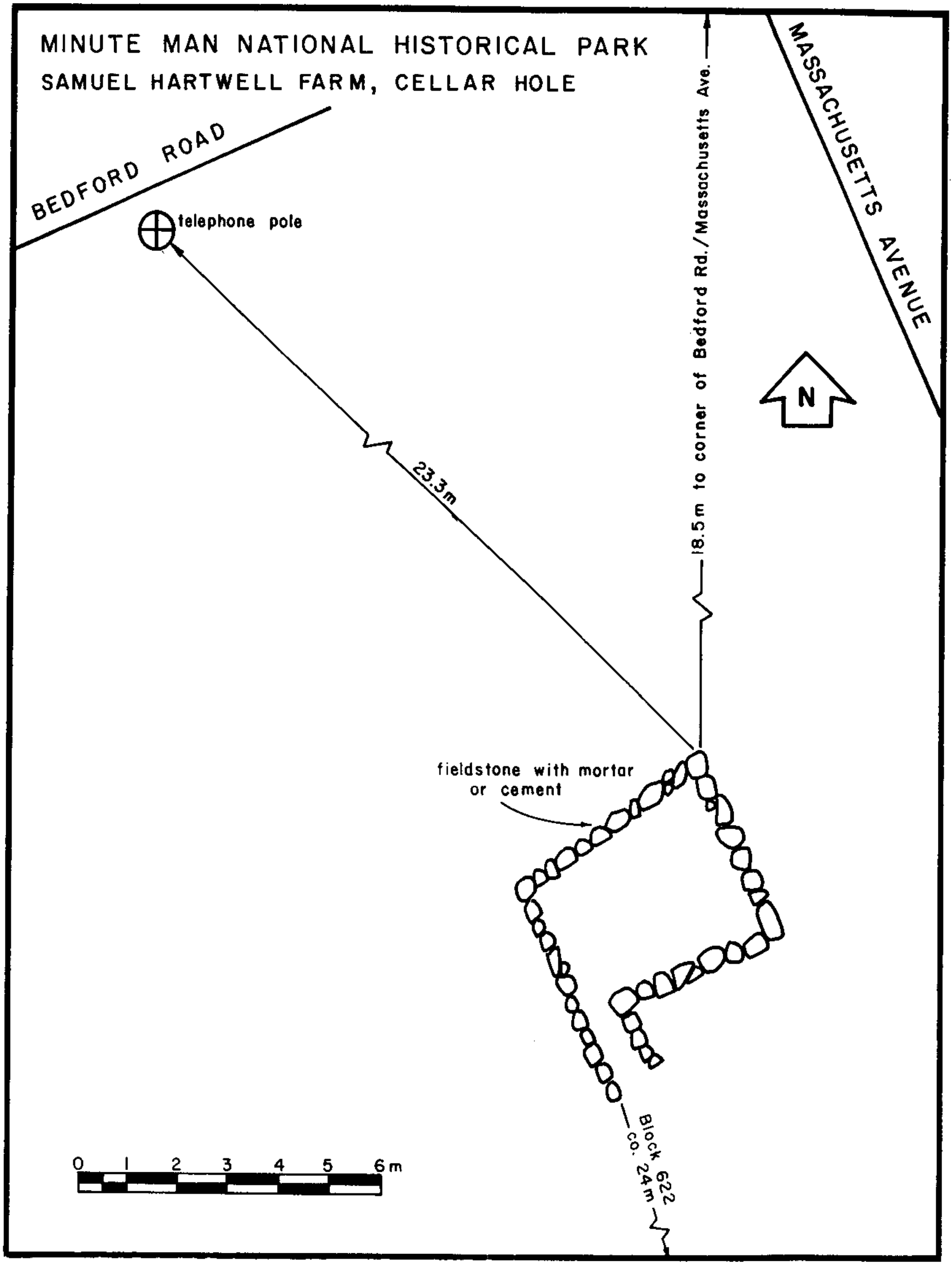

Figure B-8. Sketch map of Samuel Hartwell Farm site, cellar hole.

Figure B-9. Photograph of Samuel Hartwell Farm site, cellar hole, southwest wall.

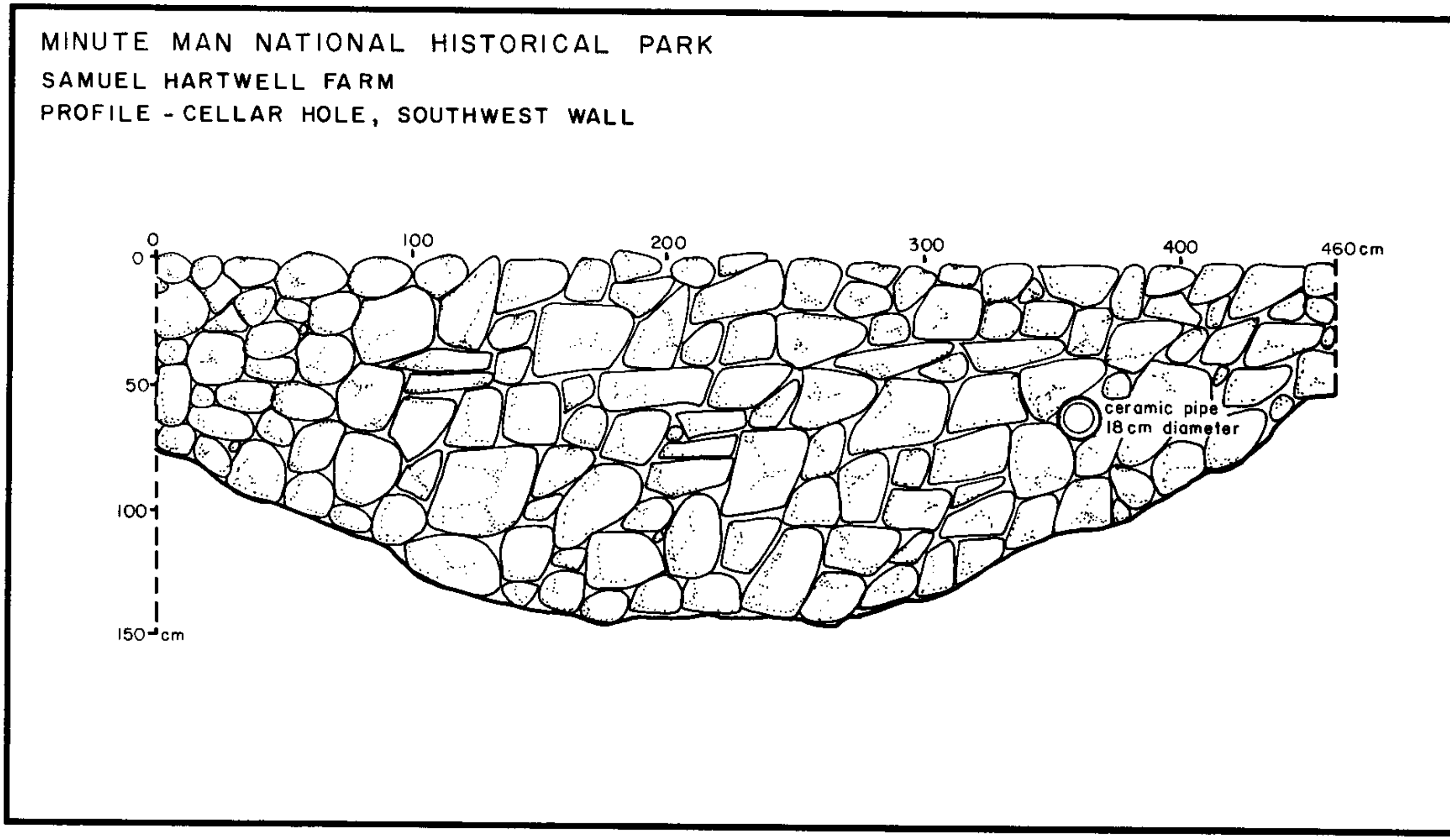

Figure B-10. Profile of Samuel Hartwell Farm site, cellar hole, southwest wall.

TABLE B-5. CULTURAL MATERIAL RECOVERED FROM THE SAMUEL HARTWELL FARM SITE, CELLAR HOLE.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B622-CSW-0-25-1	BONE	BIRD	UNDIAGNOSTIC	1
		MAMMAL	DIAGNOSTIC	1
	EARTHENWARE	WHITEWARE	DECAL	1
	GLASS	MOLDED	CONTACT MOLDED	1
	PORCELAIN	PORCELAIN	OVERGLAZE HANDPAINTED POLYCHROME	1
TOTAL- B622-CSW-0-25-1				5
B622-E-0-6-1	EARTHENWARE	WHITEWARE	PLAIN	1
	GLASS	MOLDED	CONTACT MOLDED	1
	PORCELAIN	PORCELAIN	UNIDENTIFIED	1
TOTAL- B622-E-0-6-1				3
B622-E-6-42-2	BONE	BIRD	UNDIAGNOSTIC	1
		MAMMAL	DIAGNOSTIC	4
			UNDIAGNOSTIC	2
	EARTHENWARE	WHITEWARE	DECAL	1
			PLAIN	2
			TRANSFER-PRINTED	1
	GLASS	MOLDED	CONTACT MOLDED	1
	MILKGLASS	MOLDED	CONTACT MOLDED	1
	SHELL	BIVALVE	INDETERMINATE	0
	STAINLESS STEE	KNIFE FRAGMENT		1
TOTAL- B622-E-6-42-2				14
B622-NE-0-2-1	GLASS	PLATE		1
TOTAL- B622-NE-0-2-1				1
B622-NE-2-31-2	BONE	MAMMAL	DIAGNOSTIC	1
			UNDIAGNOSTIC	1
	EARTHENWARE	WHITEWARE	PLAIN	1
	GLASS	FLAT GLASS WITH BEVELED ED		1
TOTAL- B622-NE-2-31-2				4
B622-NW-4-19-2	BONE	MAMMAL	UNDIAGNOSTIC	2
	EARTHENWARE	WHITEWARE	PLAIN	1
	GLASS	MOLDED	CONTACT MOLDED	1
TOTAL- B622-NW-4-19-2				4
B622-S-4-35-2	BONE	MAMMAL	DIAGNOSTIC	1
			UNDIAGNOSTIC	1

TABLE 8-5. CULTURAL MATERIAL RECOVERED FROM THE SAMUEL HARTWELL FARM SITE, CELLAR HOLE.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B622-S-4-35-2	EARTHENWARE	WHITEWARE	PLAIN	2
	FERROUS			1
	GLASS	MOLDED	CONTACT MOLDED	1
	PORCELAIN	PORCELAIN	DECAL	1
			UNDECORATED	1
TOTAL- B622-S-4-35-2				8
B622-SW-6-33-2	BONE	MAMMAL	DIAGNOSTIC	1
			UNDIAGNOSTIC	3
	EARTHENWARE	WHITEWARE	PLAIN	1
			UNIDENTIFIED	1
	GLASS	PLATE		1
	MILKGLASS	MARBLE		1
	SHELL	BIVALVE	CRASSOSTREA VIRGINICA	0
		UNIVALVE	INDETERMINATE	0
TOTAL- B622-SW-6-33-2				8
B622-W-5-40-2	BONE	BIRD	UNDIAGNOSTIC	1
		MAMMAL	DIAGNOSTIC	3
			UNDIAGNOSTIC	3
	EARTHENWARE	PEARLWARE	TRANSFER-PRINTED	1
		WHITEWARE	PLAIN	2
	GLASS	FLAT GLASS WITH BEVELED ED		1
		MOLDED	CONTACT MOLDED	2
	SHELL	INDETERMINATE SHELL		0
TOTAL- B622-W-5-40-2				13
TOTAL				143

TABLE 8-5. CULTURAL MATERIAL RECOVERED FROM THE SAMUEL HARTWELL FARM-SITE, CELLAR HOLE.

UNIT	MATERIAL	DESCR 1	DESCR 2	COUNT
B622-C-0-38-2	BONE	BIRD	UNDIAGNOSTIC	3
		MAMMAL	UNDIAGNOSTIC	5
	GLASS	MOLDED	CONTACT MOLDED	1
		POSSIBLE DECORATIVE OBJECT		1
	PORCELAIN	PORCELAIN	UNIDENTIFIED	1
	SHELL	BIVALVE	INDETERMINATE	0
TOTAL- B622-C-0-38-2				11
B622-CNE-0-49-1	BONE	BIRD	UNDIAGNOSTIC	4
		MAMMAL	DIAGNOSTIC	6
			UNDIAGNOSTIC	13
	EARTHENWARE	CREAMWARE	PLAIN	3
		WHITEWARE	PLAIN	4
	FERROUS	INDETERMINATE		1
	GLASS	MOLDED	CONTACT MOLDED	6
		PLATE		1
	PLASTIC			1
	PORCELAIN	PORCELAIN	UNIDENTIFIED	1
	SHELL	BIVALVE	MERCENARIA MERCENARIA	0
		INDETERMINATE SHELL		0
TOTAL- B622-CNE-0-49-1				40
B622-CNW-4-32-2	ALUMINUM			2
	BONE	BIRD	UNDIAGNOSTIC	1
		MAMMAL	DIAGNOSTIC	6
			UNDIAGNOSTIC	3
	EARTHENWARE	CREAMWARE	PLAIN	1
		WHITEWARE	GILTED	1
			PLAIN	2
	FERROUS			4
	GLASS	INDETERMINATE		1
		POSSIBLE DECORATIVE OBJECT		1
	SHELL	BIVALVE	CRASSOSTREA VIRGINICA	0
			MERCENARIA MERCENARIA	0
TOTAL- B622-CNW-4-32-2				22
B622-CSE-7-48-2	BONE	MAMMAL	DIAGNOSTIC	1
			UNDIAGNOSTIC	5
	GLASS	MOLDED	CONTACT MOLDED	2
	MILKGLASS	MOLDED	CONTACT MOLDED	1
	PORCELAIN	PORCELAIN	UNDECORATED	1
TOTAL- B622-CSE-7-48-2				10