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Cultural Landscape Report

for

Minute Man

National Historical Park

Treatment Options

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CHAPTER ONE: INTRODUCTION

1.1 Overall Introduction

This study is driven by the planned rehabilitation of the cultural landscape of Minute Man National Historical Park, located in the Concord-Lexington area of eastern Massachusetts. The rehabilitation of the landscape will be guided by a Cultural Landscape Management Plan developed by the National Park Service (NPS) and the METLAND Research Group, Department of Landscape Architecture of the University of Massachusetts, Amherst. This plan will address the identification and management of the cultural, agricultural and natural resources of the Park. In addressing the identification, assessment and management of these resources now, the Cultural Landscape Management Plan can successfully guide the rehabilitation of a landscape known world-wide for its role in the birth of this country.

Minute Man National Historical Park (MMNHP): it was here, along the three-mile stretch of country road, now called the "Battle Road," that Colonial farmers attacked retreating British troops on April 19, 1775 -- an action known as the Running Battle. Some of the most intense fighting of the day happened in the fields and farmyards along the road, making this landscape one of the most important places in American history. In addition, Minute Man NHP is also an important cultural landscape. Farmers have tilled the soils for over three hundred years, leaving remnants of their work in the form of field patterns, stone walls, hedgerows, farmhouses and barns. Some areas of the Park are still farmed.

The primary period of significance for the Battle Road unit of this park is the Revolutionary War era, and in particular, 1775, the year of the "Running Battle" and the start of the Revolution. Thus, since the Park's inception in 1959, Park management has focused on interpreting the beginning of the American Revolution through the military events of April 19, 1775, along the "Battle Road" between the North Bridge in Concord and Fiske Hill in Lexington. Minute Man NHP therefore evolved out of the context of NPS policies that considered historic landscapes, and their cultural elements, to be valuable resources. This is in contrast

to the NPS management policies for natural parks which attempts to "restore the landscape to its 'native' state by removing remains of human activity" (Webb, 1987, pg. 77).

In Minute Man NHP the agricultural landscape of the time of the battle and the ensuing 200 years of continuity of this agricultural land use history is also potentially of historical significance and may represent a secondary period of significance although historical context has not been developed. The historical findings of this study indicate that understanding the changes that took place in this landscape is critical to fully comprehending the history of the Running Battle.

It is the the main objective of the Cultural Landscape Treatment Plan for Minute Man NHP to define a clear direction for the rehabilitation of the landscape of the Battle Road Unit. Recently, in 1992, the core mission of Minute Man NHP was expanded in amendments to the authorizing legislation. The new legislation adds the responsibility of preserving and interpreting the Park's historic landscape and of addressing the "causes and consequences of the American Revolution" (Public Law 102-488, 1992). This change has profound implications for interpretation and resource management, for April 19, 1775, is now to be placed in a broader historical context. Preservation and interpretation of the cultural landscape at Minute Man NHP will be accomplished through a landscape rehabilitation, defined as "allowing for improvements to a historic property, that makes possible an efficient contemporary use while preserving those portions or features of the property which are significant to its historical or cultural values" (*U.S. Department of the Interior, 1992, pg. 11*).

1.2 Description of Study

Minute Man National Historical Park was established in 1959 to "preserve, selectively restore and interpret portions of the Lexington-Concord Battle Road, as well as its associated structures, properties and sites so that the visitor may better appreciate and understand the beginning of the American Revolution..." (House Document 57, 78th Congress, January 27, 1959). Today, the mission of the National

Park Service and Minute Man National Historical Park is to interpret more than the events surrounding April 19, 1775, the date of the beginning of the Revolutionary War. Public Law 102-488, enacted by the 102nd Congress in 1992, states

> 'The purposes of the park shall include the preservation and interpretation of (1) the historic landscape along the road between Lexington and Concord, [and] (2) sites associated with the causes and consequences of the American Revolution' (Public Law 102-488, October 24, 1992).

The goals of the Park have expanded since the original mandate and it is the main objective of the Cultural Landscape Treatment Plan for Minute Man National Historical Park to "define a clear direction for preservation and interpretation of the landscape" (Mitchell, Gall and Donahue, Minute Man National Historical Park Cultural Landscape Preservation Philosophy, in draft). The wider purpose of the study is to provide an opportunity for people to learn not only about the Revolutionary period, but in addition, the rich cultural landscape and natural history and how these three forces influence each other.

The cultural landscape in Minute Man NHP provides a great opportunity to resolve interesting questions relating to historic preservation practices, historic landscape interpretation and cultural landscape management. For example, the Park's primary "Period of Significance" relates to the events of April 19, 1775. The landscape at that time consisted of small farms and open fields (Malcolm, 1985). Since then, however, the landscape continued to evolve and change. Layer upon layer of landscape elements such as stone walls, farm houses, barns and roads were added, so today it contains an abundance of artifacts from different time periods, many of them on the same farms. Since the landscape that exists today is a culmination of over 300 years of human use, this is not the kind of landscape where the clock can be turned back to recapture a bygone era in order to interpret the events of the Revolution or the evolution of farming. The Park Service is moving away from policies that "museumize" the landscape, that is, to freeze one specific period. Rather, the NPS is embracing new historic preservation policies that allow

for landscape change, and new ways of interpreting the past through "rehabilitation," i.e. putting the landscape to new use (Feierabend, 1989).[1] Minute Man NHP is currently 70% forested and has a long way to go before it becomes an agricultural landscape again. Even with the reintroduction of agriculture, this will not be a landscape "restoration,"[2] something new is being created with reference to and respect for the historic significance of the landscape. Planning and designing the cultural landscape part of the transformation is at the heart of this study.

What should this new landscape look like? Information on the landscape's history should be used to help inform the design. Where did the Minute Men gather to ambush the retreating "Red Coats?." Which hilltops did they use to watch for the approaching troops? Can these important historic views be reopened? How should the landscape be shaped as a tool to interpret both the military events of 1775 and two centuries of farming history? Where? In addition, there are important questions concerning the interpretation of the landscape history. For example, how did subsistence farming and the limitations of the 18th century agrarian landscape

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[1]According to the NPS, "The goal of rehabilitation is ... to retain the historic character of a property, but this treatment allows for alterations and additions that are necessary for contemporary use. Rehabilitation allows for improvements to a historic property, that makes possible an efficient contemporary use while preserving those portions or features of the property which are significant to its historic or cultural values." (U.S. Department of the Interior, 1992, pg. 11).

[2]"Restoration differs from preservation and rehabilitation since it may involve the removal of later historic features, or the addition of missing historic features in order to depict the appearance of the landscape at a specific earlier period. This treatment is used to illustrate a narrow period in the landscape's history, not its history as evolved. As a result, materials or features that relate to a later period of significance may be removed or substantially altered. Therefore, restoration is a treatment that should only be considered when the landscape's earlier history is so significant that it justifies removal or alteration of features or materials that would ordinarily be retained" (U.S. Department of the Interior, 1992, pg. 11)

influence the Revolution? According to METLAND Team consultant Landscape Historian Brian Donahue,

> 'The farms along the Battle Road in 1775 were part of a traditional agrarian society in trouble. There was no "subsistence crisis", however there was a strong sense of diminishing prospects. This was a result of a farm system that had reached its ecological limits: the land had all the subsistence farms it could support, given the traditional farming methods...This situation may not have been the principal "cause" of the Revolution, but it did make farmers feel strongly that they needed to defend their endangered way of life, when they saw Britain attempting to place them under a tighter imperial economic and political rein'. [3]

1.3 Cultural Landscape Management Plan

In September 1991, a Cultural Landscape Management Plan was initiated. Two phases have been completed to date. Both were conducted under a cooperative agreement between the University of Massachusetts and the National Park Service (NPS), and provides a "case study in cultural landscape management for the National Park Service, the historic preservation community, and the public" (Cooperative Agreement 1600-0-9004, Amendment #5). Phase I of the plan initiated the compilation of a digital spatial data base and the assessment of land suitable for agricultural reintroduction. The concept of "agricultural reintroduction" refers to the process of changing some of the Park landscape from forest back to fields. Some of the forests may be cleared, and new fields created. This concept is especially relevant to Minute Man NHP as shown by historical research which discovered that this landscape was intensively farmed between 1650 and 1900. In addition to assessing and evaluating the opportunities for agricultural reintroduction, the interpretive potential of the Park's historic resources, such as restored buildings, stone walls, and 1775 battle sites, was also studied.[4] Phase II of this research is summarized in this report.

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[3]See Appendix A: The Battle Road Landscape and the Causes and Consequences of the Revolution, by Brian Donahue, pg. 1.

[4]See Appendix B: Executive Summary Of Phase I of the Cultural Landscape Management Plan.

The goal of this study is to develop a cultural landscape treatment plan[5] to guide the Park's programs in both cultural landscape management[6] and interpretation. The project's three objectives are to (1) describe a treatment/rehabilitation of the overall cultural landscape identifying and preserving all significant historical landscape features, preserving and/or enhancing natural resource conservation, and utilizing opportunities for agricultural reintroduction where appropriate; (2) identify individual properties in high priority areas and evaluate treatment options to enhance landscape interpretation; and (3) provide linkages with the surrounding communities for agricultural use, conservation, and opportunities for recreational walking trails.

Understanding the landscape history, the circumstances contributing to the American Revolution and its consequences is a key part of the Park's interpretive goals. The very farms and fields of Minute Man NHP were the stage upon which the drama of the outbreak of the war took place. Who were these people? Why did they rise up against the most powerful army in the world? Historical research suggests that "the terms of life were tightening" (Gross, 1975, pg. 106). The stone walls, agricultural fields, the houses and barns that dot the landscape are tangible reminders of the people who participated in the struggle for independence.

It is crucial to include the Running Battle history, because of its importance to the Park's mandate to commemorate the events of April 19, 1775. Currently, over 1 million people per year visit the Park in order to see where the American Revolution began. In particular, highlighting the relationship between the cultural landscape and the events of the Running Battle supports the NPS's interpretive goals because the landscape played such a large role in determining the course of events on the day of the battle.

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[5]Treatment: to subject to an action, process or change. The National Park Service recognizes six treatments which involve physical work: protection, stabilization, preservation, rehabilitation, restoration and reconstruction (National Park Service. NPS 28: Cultural Resources Guidelines. Washington, D.C.: U.S. Department of the Interior, NPS, History Division (draft release number 4), 1992).

[6]Management: (cultural resource management) the range of activities aimed at understanding, preserving and providing for the enjoyment of cultural resources. It includes research related to cultural resources, planning for action affecting them, and stewardship of them in the context of overall historic property operations (National Park Service. NPS 28: Cultural Resources Guidelines. Washington, D.C.: U.S. Department of the Interior, NPS, History Division (draft release number 4), 1992).

As plans for cultural landscape treatment and management increase, natural resources located within the same landscape should not be overlooked. In developing a new Treatment Plan for Minute Man National Historical Park, the National Park Service has the opportunity to address the need for management guidelines for the natural resources, as well as the cultural resources of the Park. The identification and management of the agricultural and natural systems of Minute Man National Historical Park will move the National Park Service towards their goal of interpreting more than just the events of the Revolutionary War era. The soils, natural history, wildlife habitats, and wetland and riparian systems are examples of valuable resources that can be used in expanding interpretation potential.

The natural resources can be used to further the understanding of the cultural landscape, as it is the result of human interaction over time with the natural landscape. Interpretation of the natural landscape will help the visitor understand how the natural history of the area not only had a great influence on the running battle and its outcome, but also greatly influenced the use of the land and settlement patterns. For example, settlers began farming in the wet meadows, because of the hay that grew there naturally. Upland areas were farmed later, when technology enabled it. Stony soils and erratic boulders, consequences of glacial activity, forced the farmers to clear their land of rocks and hence they built stone walls. These walls and larger boulders helped the Minute Men in their attack of the retreating British troops. Understanding these and other aspects of the natural landscape is essential to fully interpret the cultural landscape.

In addition to the natural history of the area, wildlife habitats and wetland and riparian systems existing in the Park should be identified and managed as important natural resources, as part of the cultural landscape management plan. Existing plant and animal species and habitats, as well as wetland and riparian systems could be damaged by the planned rehabilitation of the cultural landscape. The Park Service can prevent this from happening and commit to the proper management of natural resources in the Park.

Since the National Park Service will use agricultural reintroduction as a tool to transform the landscape from forest to farm, soil types and capabilities, field size, the

type of farming and pest management techniques all should be addressed. By identifying and assessing the existing agricultural resources, the Park can implement the most strategic agricultural reintroduction plan, leasing the most productive land to farmers.

Adding the natural and cultural factors to the interpretation of the battle history is the goal of the study. This integration of factors illustrates a new approach by the NPS. At Minute Man National Historic Park the interpretation of the Running Battle History is greatly enhanced by the interpretation of the Landscape History and the Natural History. The Cultural Landscape Management Plan will illustrate where the cultural and natural resources can best be interpreted and where modern farming can be reintroduced. Once this is determined, a system of trails will be designed to link the interpretive areas together, providing visitors with a series of rich experiences as they learn about the dawning of the American Revolution, as well as three centuries of cultural landscape history.

1.3.1 Four Components of the Plan

This study incorporates four main components, (1) the Landscape History, (2) the Running Battle History, (3) Agricultural Resources and (4) Natural Resources. Figure 1 shows the overall study framework.

The goal of this study is to develop a treatment plan to guide the Park's programs in landscape management and interpretation. Where and how the landscape will be modified to evoke a rural agricultural scene is the main focus. More specifically, the six objectives are:

1. To inventory the cultural landscape (present and past) in order to identify character-defining features to define and assess historic character.
2. To identify and assess areas within the Park which are important to interpreting the cultural landscape history and the story of the battle of April 19, 1775.
3. To identify the agricultural and natural resources within Minute Man National Historic Park.

4. To assess which of these agricultural and natural resources are most important to the Park and its goals of managing and interpreting the resources of the Park.
5. To develop management guidelines showing where and how the landscape could be used in order to convey the sense of history needed for cultural landscape and military history interpretation.
6. To develop management guidelines for the agricultural and natural resources.

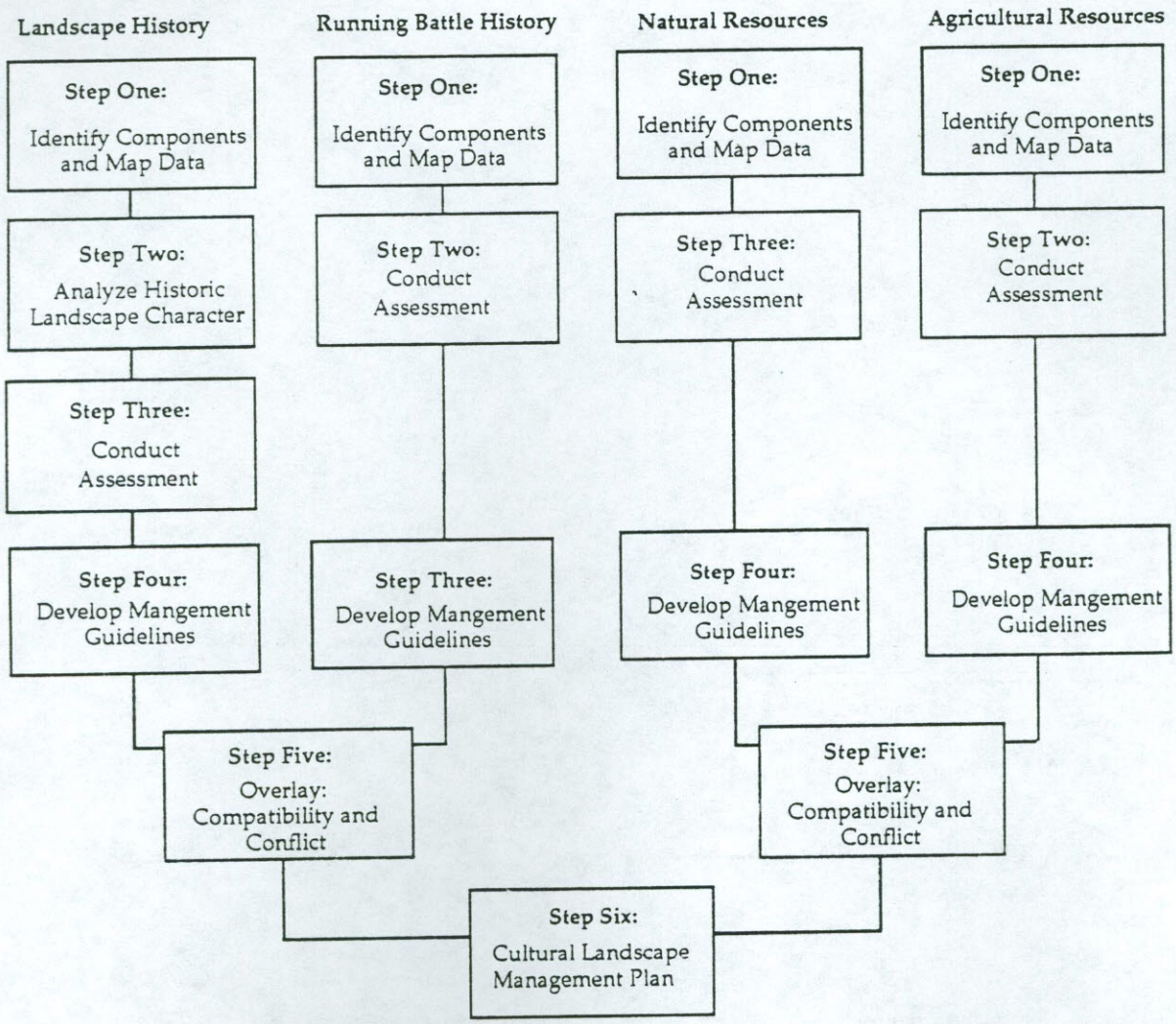


Figure 1: Framework of the Phase II Study. The framework shows the four study components including Landscape History, Running Battle History, Natural Resources and Agricultural Resources.

1.4 Description of Study Area

This study focuses on the Battle Road Unit of Minute Man National Historical Park, centrally located within the larger Boston metropolitan region. It lies within the towns of Concord, Lincoln and Lexington and is divided into three sections: the North Bridge Unit, the Wayside and the Battle Road Unit. The Battle Road Unit, where the Running Battle that started the American Revolution began, is approximately 725 acres in size, and follows a three-mile long section of Route 2A. Meriam's Corner lies at the western end of the Park, and Route 128 along its eastern border. Route 2 runs parallel to the Park to the south and Hanscom Air Force Base and the Laurence G. Hanscom Field lie directly north of the Park. The Park is surrounded by the suburban landscape that grew up around Rt. 128. Indeed, at its inception the Park was part of that suburban landscape, containing homes and commercial development. Since the early 1960's the NPS has removed approximately 200 structures and nearly 100% of the commercial development. Figures 2 and 3 show the regional and local context of the Park.

1.5 Report Organization

This report continues with the development of methods to determine management guidelines in Chapter Two. Chapter Three highlights the results of the application of the methodology to Minute Man National Historical Park and develops an interpretive trail system for the Park. The study, summarized in Chapter Four, is followed by Appendices and the study Bibliography.

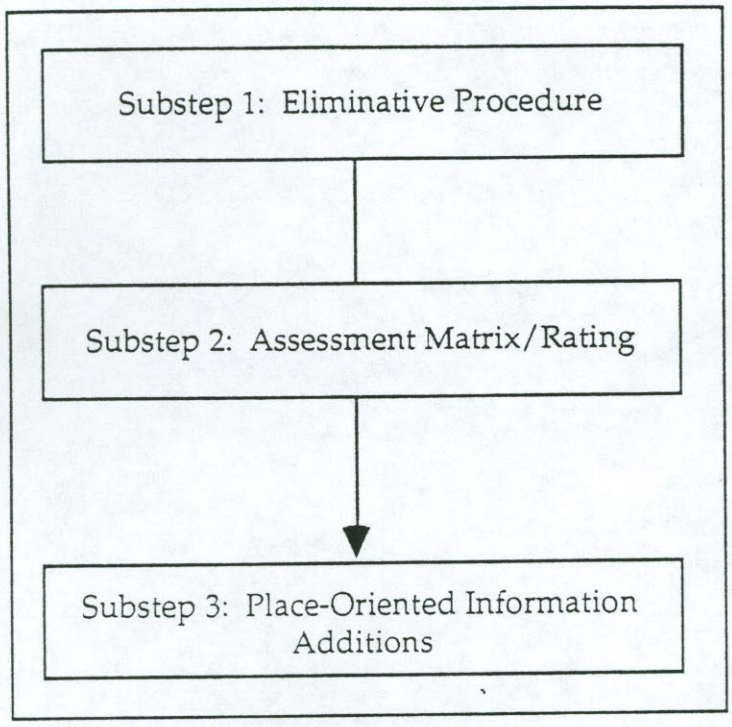


Figure 13: Agricultural Resource Assessment Procedure

Substep 1: Eliminative Procedure -- Areas such as wooded wetlands and their 100' buffers, 100' buffers of ponds, rivers and streams, and other sensitive areas in which farming should or can not take place, are eliminated from consideration as potential agricultural areas.

Substep 2: Assessment Matrix/Rating -- Land is assessed for agricultural potential. Each soil type has corresponding information regarding agricultural suitability and potential productivity. Each soil type is assessed by the SCS as to land capability classification. As discussed in the literature review chapter, this classification shows, in a general way, the suitability of soils for most kinds of field crops (SCS Middlesex County, Massachusetts Interim Soil Survey Report, 1991, p. 68).

The land is assessed by capability class and present land use, a procedure adapted from the METLAND Agricultural Productivity Method (Fabos and Caswell, 1977, pp. 28-41, see Figure 14).

minimum of 300 feet to serve as an effective wildlife habitat and migration corridor" (McGregor, 1992, p. 3; Binford and Buchenau, 1991).

Substep 3: Ponds, Rivers, Streams, and their 100' buffers -- Hydrography existing in the cultural landscape is identified and a protective 100' buffer delineated. Studies have indicated that the 100' buffers filter and cleanse surface run-off (see Substep 2). Both are functions necessary for the health of the ecosystem. Many states, including Massachusetts, are enacting laws, such as the Massachusetts River Protection Act, that protect rivers and wetlands with buffers (McGregor, 1992, p. 3; Binford and Buchenau, 1991).

Substep 4: Current land cover/land use -- This information aids in determining the amount of effort needed to reintroduce agriculture into any area in the landscape. If the land today is covered by forest, for example, more cost and energy will be needed to prepare the land for farming than if the land use was pasture.

Substep 5: Place-oriented information -- Expert opinions from sources such as local farmers or agricultural specialists can also be incorporated in this sub-step, and entered into the GIS using a place-oriented approach. Place-oriented information is defined as "information that is either: a) non-spatial or of a generalized nature ... or b) spatial in the sense of anecdotal or 'fuzzy' information that is not readily mappable." Place-oriented information also includes an aggregation of "all the factors that are known or remembered, including personal associations, memories, and even folklore" (Ahern, et. al., 1993). Information such as which areas were farmed historically, what was grown and how successful they were can be included in this step.

Step Two: Assessment

Step Two of the agricultural resources method is divided into three substeps: an eliminative procedure, an assessment rating with the use of a matrix, and re-assessment with the addition of place based information (see Figure 13).

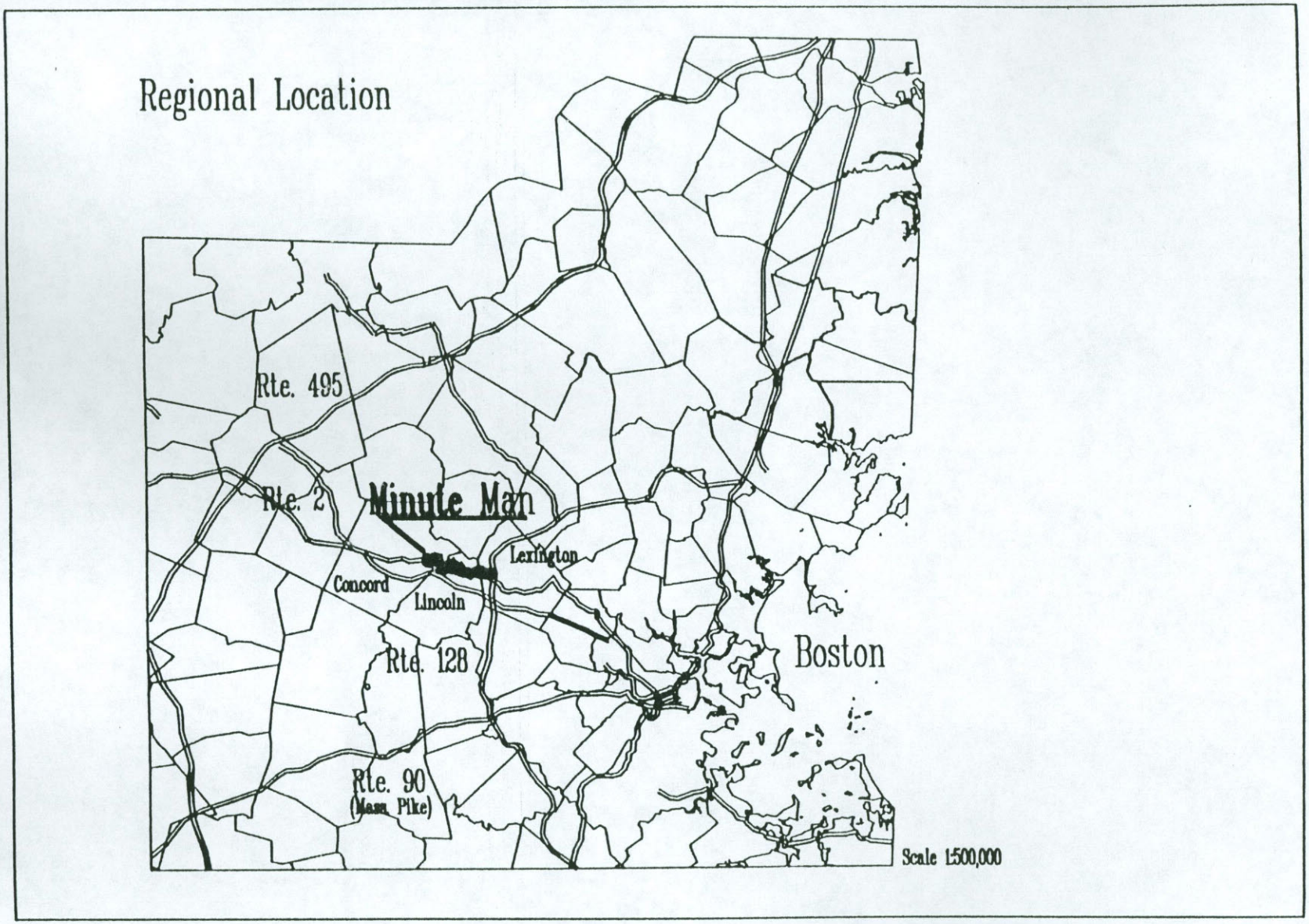


Figure 2: Map of Regional Context showing Minute Man National Historic Park located approximately 16 miles northwest of Boston in the towns of Concord, Lincoln and Lexington.

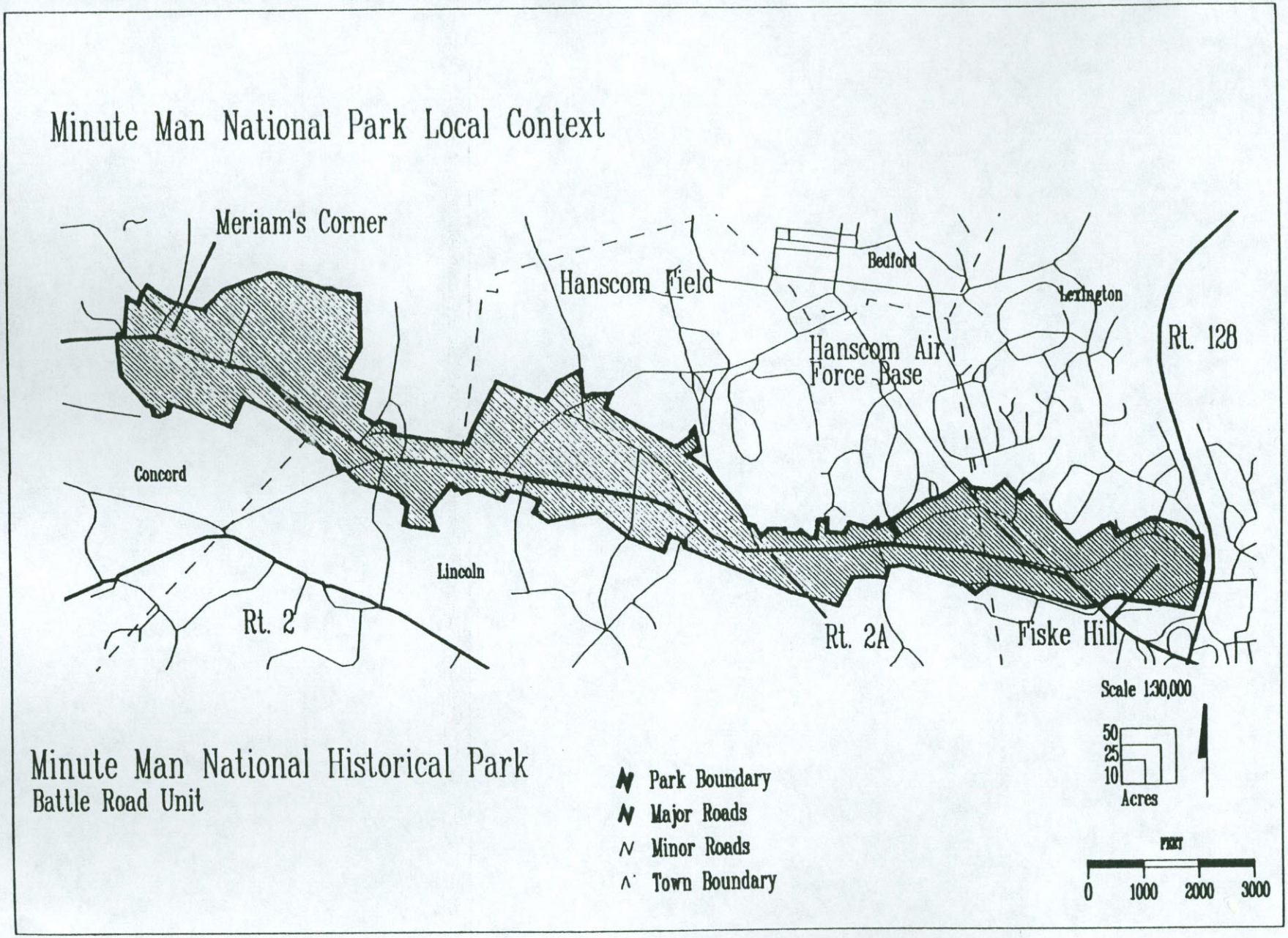


Figure 3: Map of Local Context showing Route 128 to the east, Route 2 to the south and Hanscom Air Force Base to the north.

CHAPTER TWO: METHODS

2.1 Introduction

This chapter describes a step-by-step process for developing management guidelines for preservation and interpretation of: (1) landscape history, (2) Running Battle history, (3) agricultural resources, and (4) natural resources. It then defines management/treatment options for the Park's interpretive places and develops methods for the design of an interpretive trail system.

Regarding methods relating to the management of cultural landscapes and battlefields, there is general agreement in the state of the art literature on the steps needed to develop management guidelines (McClelland, 1991). These steps include: (1) identifying and mapping the relevant components - spatial and historical information, (2) conducting an assessment in order to ascertain the value of the resources and, (3) using the results to develop management guidelines. The "identification-assessment-management guidelines" sequence was adopted for this study, although modified slightly. As shown in Figure 4, the guidelines focused on protecting the Park's rich cultural resources and interpreting two primary themes: (1) the landscape history and (2) the story of the Running Battle.

An additional step was added in the Landscape History component before the assessment was conducted in which the landscape character is defined.[5] This definition of historic landscape character along with the mapped spatial and historical data give a more complete description of Minute Man NHP as a place and is essential to conduct the assessment. After the management guidelines are developed for each theme, the two will be overlaid in a Composite Cultural Landscape Treatment Plan to determine where proposed treatments are compatible, and where (or if) they conflict. The purpose of the overlay is to assist the NPS staff with decisions on landscape treatments balancing the objectives of interpreting both the landscape history and the Running Battle history.

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[5]Historic character: the physical appearance of a property as it has evolved over time, i.e. the original configuration together with losses and later changes. The qualities of a property conveyed by its materials, features, spaces and finishes are referred to as character-defining (U.S. Department of the Interior, 1992, pg. 4).

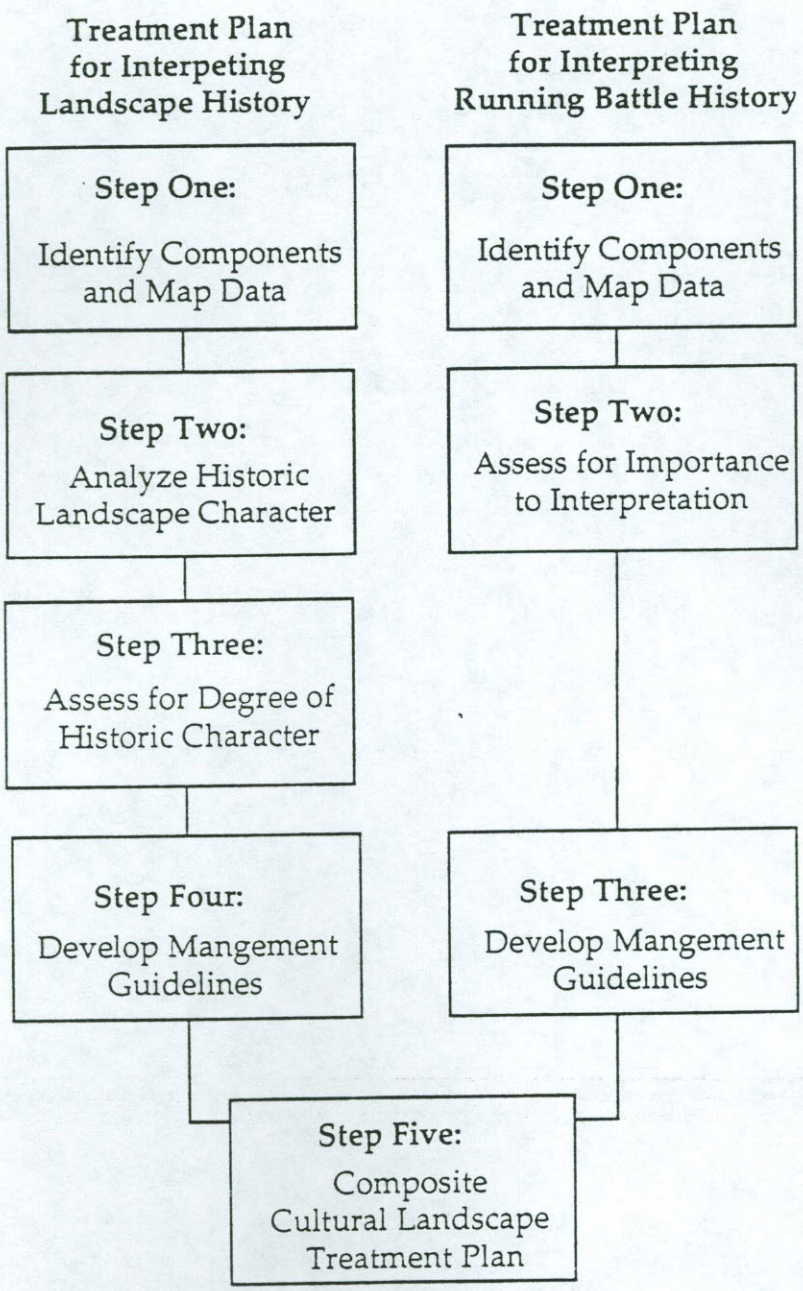


Figure 4: Framework for the Cultural Landscape Treatment Plan. Two components will be covered in developing management guidelines for preservation and interpretation of (1) the Landscape History and (2) the Running Battle History.

The methods relating to identification, assessment and development of management guidelines for agricultural resources, whether located in natural or cultural landscapes, are generally well developed in the state of the art literature. While methods for the identification of natural resources are well developed, the state of the art is lacking in assessment and management procedures for these resources when they are located in a cultural landscape. In all cases, the state of the art literature review provides a means to adapt and develop methods for the integration of agricultural and natural resource management with cultural landscape management. The methods developed for this study, based on the state of the art work in the respective fields, are as follows (see Figure 5):

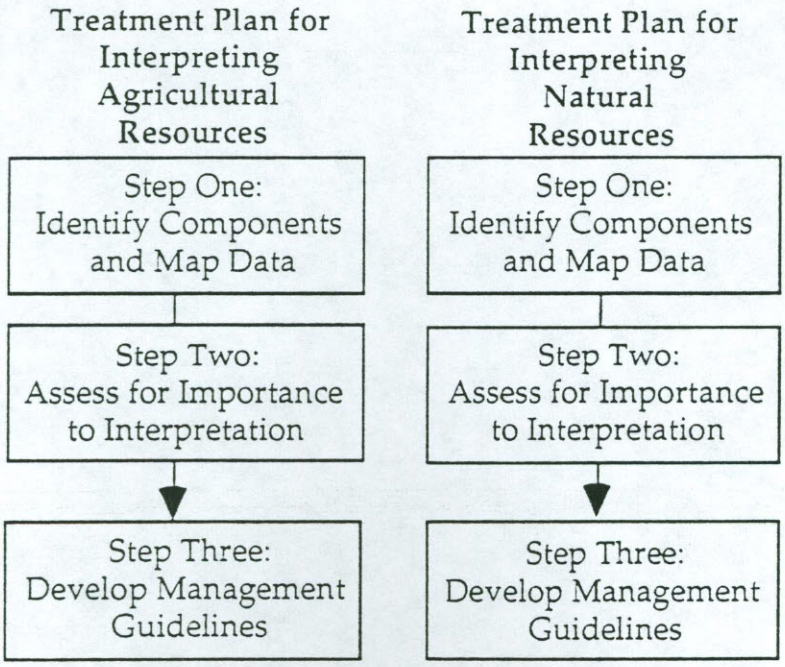


Figure 5: Methods for Agricultural and Natural Resource Identification, Assessment and Development of Management Guidelines

After these four separate factors are identified, assessed and management guidelines developed, the factors are overlaid in order to determine the locations of significant interpretive "places" in the Park. The compatibilities and conflicts of the four components are determined, and treatment options are defined. Finally, an interpretive trail system is developed that links the interpretive places.

In summary, the methodology consists of four separate methods relating to landscape history, battle history, agricultural resources and natural resources. Each method of identification, assessment and development of management guidelines is divided into steps and substeps. In addition, the overall methodology includes a sub-method for the determination of significant interpretive places and the development of an interpretive trail system.

2.2 Landscape History Methods

Figure 6 illustrates the four-step process to be used in developing management guidelines for the protection of cultural landscape resources and the interpretation of the Park's landscape history. In Step One, the cultural landscape is identified; not only the existing cultural landscape, but the cultural landscapes of the past will be mapped as historical information allows. These data layers are to be used for identifying the existing cultural landscape character through analysis of its' "processes" and "components." This method was adapted from Bulletin #30 *(U.S. Department of the Interior, 1992).*

Using this information, the historic landscape character is to be analyzed in Step Two. In the *Draft Guidelines for Treatment of Historic Landscapes (U.S. Department of the Interior, 1992).* "historic character" is defined as "the physical appearance of a property as it has evolved over time, i.e. the original configuration together with losses and later changes. The qualities of a property conveyed by its materials, features, spaces, and finishes are referred to a character-defining" (US Department of the Interior, 1992, p. 4). This approach is advocated in both Bulletin #30 (McClelland, 1991) and in the *Draft Guidelines for the Treatment of Historic Landscapes (U.S. Department of the Interior, 1992);* the methods outlined here are adapted from both publications. Specifically, not only are the character-defining features of the existing cultural landscape analyzed, but also the character-defining features of this landscape in the past are described. The kinds of land use typical for each of six "landscape periods" are mapped in order (1) to identify the Park's general historic landscape character and (2) to identify aspects of continuity and change that took place in this landscape over time. The analysis is done in two ways. There is a detailed inventory of the character-defining features (spatial organization, land use, circulation, vegetation, structures and small-scale elements) of the 1775 landscape.

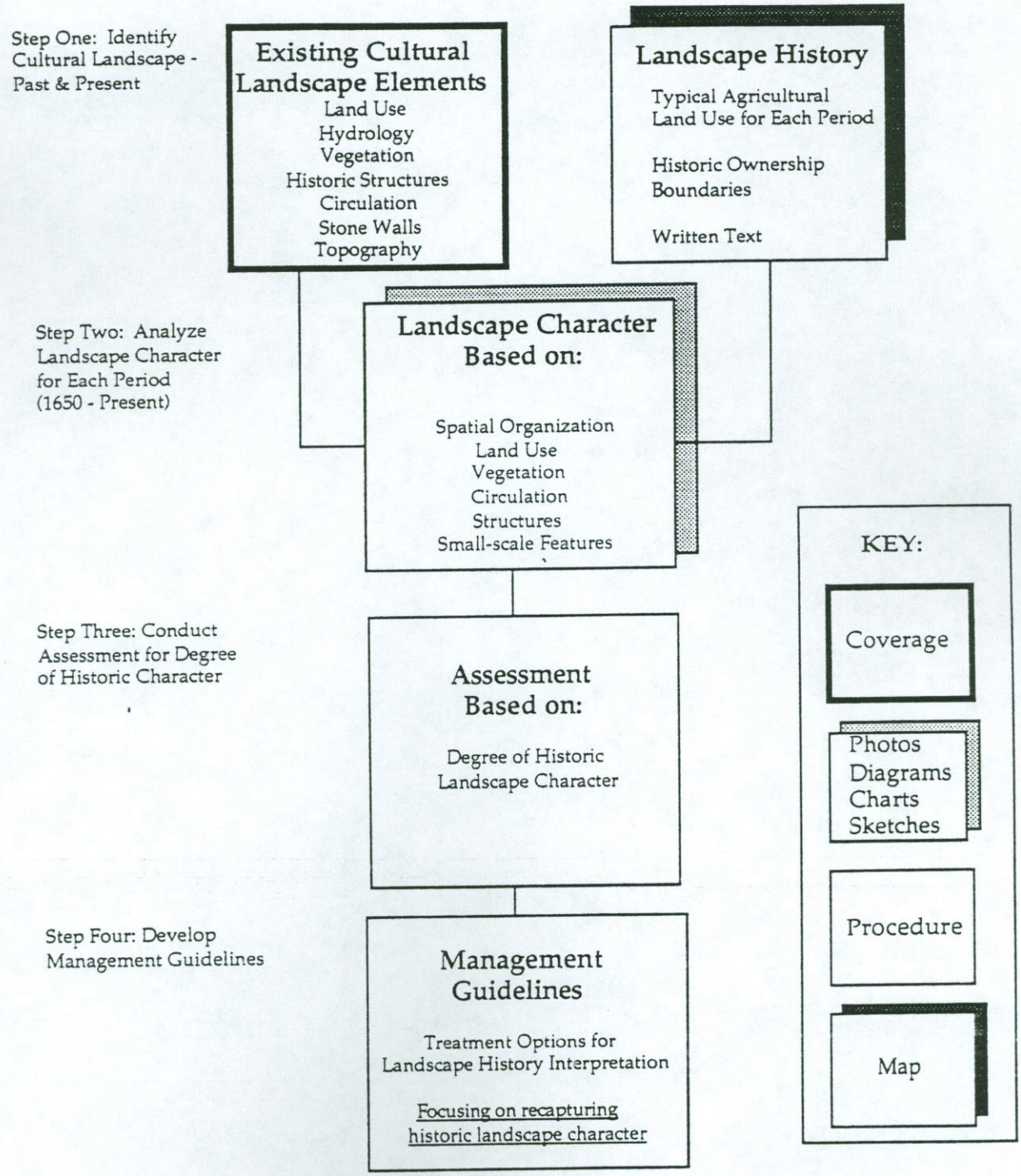


Figure 6 Methods for Developing Management Guidelines for Interpretation of Landscape History.

These features are then analyzed through maps, text and sketches. In addition, there is a more general analysis of the historical character for the other six historic periods. This is done using the historic land use information. Maps were produced to represent the general pattern of land use and ownership. Because the maps are not spatially accurate, the analysis uses data in the form of graphs and text to describe the spatial organization, land use and circulation as far as the data available currently will allow.

In Step Three, the landscape is assessed for the degree to which the historic landscape character still exists. Using the methods described in the *Bulletin #30* the landscape is to be assessed based on "the survival of significant characteristics"(*U.S. Department of the Interior, 1991, pg. 24*). The purpose of the assessment is to locate areas where the landscape retains its historic character.

Finally, in Step Four, management guidelines are developed for reinforcing the historic landscape character of the Park in order to interpret themes related to its history. The guidelines focus on using agricultural reintroduction as a way to recapture some of the historic landscape character in order to better interpret the overall landscape history. The specific guidelines depend on the interpretive themes and goals of a particular area and the amount of intervention needed to achieve these interpretive goals. The specific rehabilitation options are adapted from the *Draft Guidelines for Treatments of Historic Landscapes (U.S. Department of the Interior, 1992).*

The step-by-step processes are as follows:

Step One: Identify Cultural Landscape Past and Present

First landscape history is researched. The data includes:

Typical agricultural land use for each historic period: The historical land use maps represent "snap-shots" at the end of each period of development. They give a preliminary, approximate picture of land use in different parts of the Park at different times and are compiled from tax valuations, State Census returns, deeds and in some cases, educated guesses.

Historic ownership boundaries: The ownership boundaries data is also compiled from town deeds and tax records. This data is also mapped.

Written text: In addition to the mapped data, the landscape and the forces that shaped is described in a written report. This data will be used to identify historic character for each of the historic periods and show how the landscape evolved through time.

Next, the existing cultural landscape features are mapped. The data needed for cultural landscape identification are as follows:

Land Use: Open fields and agricultural land use are mapped because they help describe the spatial organization needed to analyze the cultural landscape (McClelland, 1991). Land use data is compiled by Massachusetts Geographic Information Systems (Mass/GIS) through aerial photographs or detailed field surveys by the Massachusetts Natural Heritage Program.

Hydrology: Spatial organization is further defined by mapping wetlands which may either be open (emergent wetlands and wet meadows) or forested (deciduous wetlands, coniferous wetlands, sapling swamp, and shrub swamps).

Vegetation: Forest cover is mapped in order to define spatial organization as well. Categories include: deciduous forest, coniferous forest and mixed deciduous/coniferous forest.

Buildings, Structures and Objects: These important character-defining features are mapped including farmhouses and barns.

Circulation networks: Paths, roads, streams or canals, highways, railways and waterways are mapped as part of the circulation networks (McClelland, 1991). The data is compiled by Mass/GIS from aerial photographs.

Stone Walls: Stone walls are an important small-scale character-defining feature listed in Bulletin #30 (McClelland, 1991). The data is developed through interpretation of aerial photography as well as field surveys.

Topography: Two foot contours are mapped in order to help understand the relationship between the cultural landscape features and the land itself. Topography is compiled from town surveys.

Step Two: Analyze Historic Landscape Character for Each Period

As described by Robert Melnick (Melnick, 1983, pg. 89), it is essential to identify the character-defining features of a landscape in order to "read" it and understand it.

A general inventory and analysis is first conducted for the five historical periods and includes:

Spatial Organization
Land Use
Circulation

Next, there is a detailed inventory and analysis of the existing landscape as well as the 1775 landscape. The character-defining features analyzed are:

Spatial Organization
Land Use
Circulation
Vegetation
Structures
Small-scale Elements

In addition to analyzing the historic character of each period, an overall historic landscape character is synthesized. In effect, this synthesis describes Minute Man NHP as a unique place, rather than a collection of separate character-defining features. Text, maps, sketches and photographs are used to describe the historic landscape character.

Step Three: Conduct Assessment for Degree of Landscape Character

The landscape is assessed to determine the degree to which the historic landscape character still exists. Areas are ranked into four categories as described in Figure 7.

Rating	Description
Highest Degree of Historic Landscape Character	Spatial organization, land use, response to natural features, structures, circulation and small-scale elements refect historic patterns.
High Degree of Historic Landscape Character	Curent land use is different than historic land use, but spatial organization, structures, circulation and small-scale features reflect historic patterns.
Moderate Degree of Historic Landscape Character	Land use and spatial organization are different than historic land use but structures, circulation, and small-scale elements reflect historic patterns.
Low Degree of Historic Landscape Character	Spatial organization, land use, response to natural features, structures, circulation and small-scale elements do not reflect historic patterns.

Figure 7: Rating System for Assessing Degree of Landscape Character. The rating system is primarily based on agricultural land use and open spatial organization. However, structures and stone walls also play a role in the assessment.

Step Four: Develop Management Guidelines

As recommended in the *Draft Guidelines for Treatment of Historic Landscapes (U.S. Department of the Interior, 1992)*, a primary treatment is selected as a first step in developing treatment guidelines. For the Battle Road Unit, the primary treatment is a rehabilitation. Within the overall rehabilitation approach, specific actions for retaining and reinforcing the historic character for interpretation are outlined below.

Management Guidelines in the form of options are developed for each of the categories determined by the assessment. Figure 8 describes the rating system which is to focus on the amount of intervention needed to increase the degree of historic character in a given area.

Rating	Description
Highest Degree of Historic Landscape Character	Least amount of intervention needed to increase the degree of historic character. Treatments should include "preservation" and "protection and stabilization" of character-defining features.
High Degree of Historic Landscape Character	Some intervention needed to increase degree of historic character. Treatments should include "preservation", "rehabilitation" and "protection and stabilization" of existing cultural resources.
Moderate Degree of Historic Landscape Character	A higher degree of intervention is needed to increase historic character. Treatments should include "rehabilitation" and "protection and stabilization" of existing cultural resources.
Low Degree of Historic Landscape Character	Since only drastic measures such as "reconstruction" and "restoration" could increase historic character, a better approach is to screen these areas to minimize their impact on the surrounding landscape.

Figure 8: Management Options to Retain and Reinforce Historic Character for Interpretation.

2.3 Running Battle Methods

Figure 9 details the methods used to develop the management guidelines for interpreting the Running Battle. It also follows the "identification-assessment-management guidelines" approach to be taken in developing management guidelines for the landscape history theme.

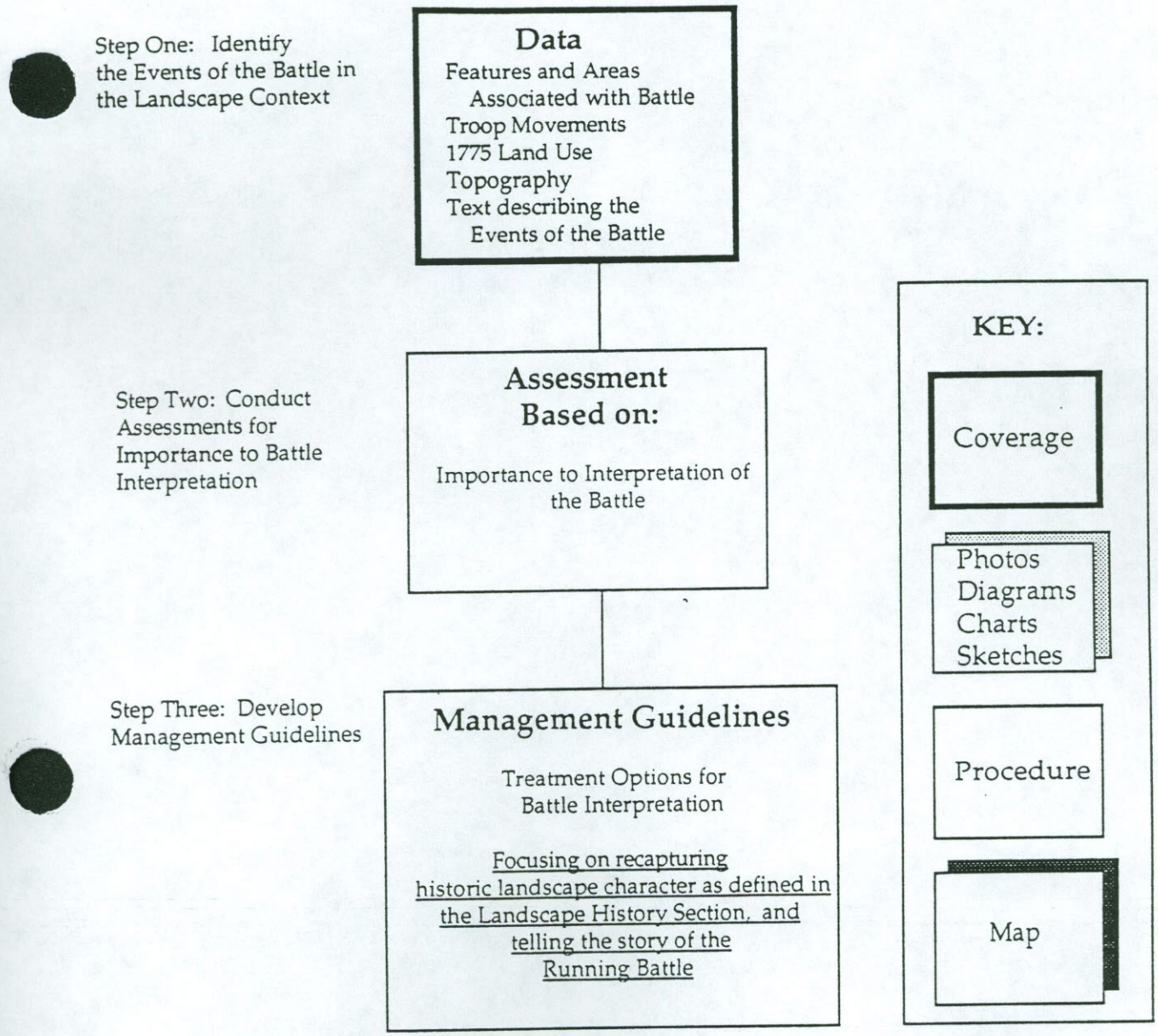


Figure 9: Methods for Developing Management Guidelines: Running Battle History. The procedure follows an "identification-assessment-management guidelines" approach.

The data mapped in Step One are a combination of historic spatial data (1775 land use) and text describing battle events associated with particular places in the Park, a method adapted from Bulletin #40 (Andrus, 1992). In Step Two, an assessment is

conducted to determine where the important areas for interpretation of the battle are located. This method was guided by the current interpretive practices at Gettysburg National Military Park (Gettysburg NMP), and by practices suggested in Bulletin #40 (Andrus, 1992). In Step Three, management guidelines are developed to enhance the battle interpretation through specific landscape management; again, following treatment options described in the rehabilitation section of Draft *Guidelines for the Treatment of Historic Landscapes.*

The step-by-step processes are as follows:

Step One: Identify the Events of the Battle its Landscape Context

The method for identifying the extent of the running battle is adapted from Bulletin #40 (Andrus, 1992). Not all of the "Features and Areas" are included because the Running Battle took place on the move, it was not a battle fought to gain territory. Therefore it is important to map the routes taken by the combatants. The data mapped include:

Features and areas associated with the battle: Battlefield components are mapped in order to "understand the nature of the opposing forces, the importance of the terrain to the direction and outcome of the battle, and the series of military actions before, during and after the battle" (Andrus, 1992, pg. 7). The features and areas mapped include engagement areas, commander's observation points and their viewsheds and areas associated with pre-battle events. This data is compiled with the help of expert historians.

Troop Movements: The routes used by the combatants are mapped in order to show the extent of the battle, how the participants moved through the landscape and where fighting occurs. This data is also compiled by historical consultants with detailed knowledge of the battle.

1775 Landscape Context: In addition to mapping the areas where fighting occurred, the historic landscape context is mapped and includes, fields, orchards woodlots, roads, farm houses and outbuildings. These land use types and cultural landscape features are critical to understand the course of the battle because they help illustrate the relationship between the landscape

and the battle itself. For example, the battle may intensify in areas where there is forest cover; in turn, fighting may die down in areas where open fields afford little cover for attackers.

Topography : Two foot contours are mapped in order to help understand how topography affected the events or outcome of the battle. Topography is compiled from town surveys.

Text describing the events of the battle: Since many of the features and areas associated with the battle are of a generalized spatial nature, text is used in tandem with the maps to help clarify the events of the battle.

Step Two: Conduct Assessment for Importance to Interpreting the Battle

Using the map generated in Step 1, the landscape is assessed for the importance of interpreting the battle associated with particular places in the Park. This assessment method takes the "Features and Locations" described in Bulletin #40 (Andrus, 1992), although not all of the features and locations are applicable, and some are added because of the nature of the battle, i.e. a series of small skirmishes fought on the run along a roadway. Figure 10 shows the rating system to be used when assessing the landscape for importance to interpreting the battle.

Step Three: Develop Management Guidelines

As a primary treatment, rehabilitation allows for new uses of the landscape within the context of "preserving those portions or features of the property which are significant to its historical or cultural values" (*U.S. Department of the Interior*, 1992, pg. 11). Interpretation to the public is an example of an appropriate new use for the Battle Road Unit. Since the aim is to use the landscape as a tool for interpreting the battle, there is an assumption that the more important the area for interpretation, the more it should resemble the historic landscape character. Specific recommendations are to be made for management to increase the historic character of each category defined by the assessment. Figure 11 describes the management options to be included in the Guidelines.

Rating	Description
Highest Importance to Interpreting the Battle	Engagement Areas Commander's observation points and their viewsheds
High Importance to Interpreting the Battle	Troop movements Flanking movements during the battle.
Moderate Importance to Interpreting the Battle	1775 Landscape Context

Figure 10 Rating System for Assessing Importance to Battle Interpretation. Engagement Areas and important viewsheds are in the highest category of this rating system. However, the routes used by the combatants and aspects of the historic landscape (landscape context) are also important interpretive elements.

Rating	Description
Highest Importance to Interpreting the Battle	The most intervention is needed in these areas in order to interpret the battle. Consideration should be given to reintroducing missing character-defining features that are documented sufficiently .*
High Importance to Interpreting the Battle	A high degree of intervention is needed in some of these areas. Consideration should be given to reintroducing missing character-defining features that are documented sufficiently .*
Moderate Importance to Interpreting the Battle	Agricultural reintroduction should be taken in these areas to help interpret the landscape context of the Running Battle.

* See section on rehabilitation and requirements for historic documentation for replacement of missing features in the *Draft Guidelines for the Treatment of Historic Landscapes* (U.S. Department of the Interior).

Figure 11: Management Options for Battle Interpretation

2.4 Agricultural Resources Method

The methodology is divided into three steps (Figure 12). Step One identifies resources that influence agriculture, such as soils. Step Two assesses the resources, and Step Three determines management guidelines for the cultural landscape biased towards development of the agricultural resources. Methods regarding purely agricultural factors, such as identification, assessment and management of soils, are well developed. However, methods relating to assessment and management of other factors that come into play when dealing with agriculture in a cultural landscape, are based on the literature review, but primarily developed here.

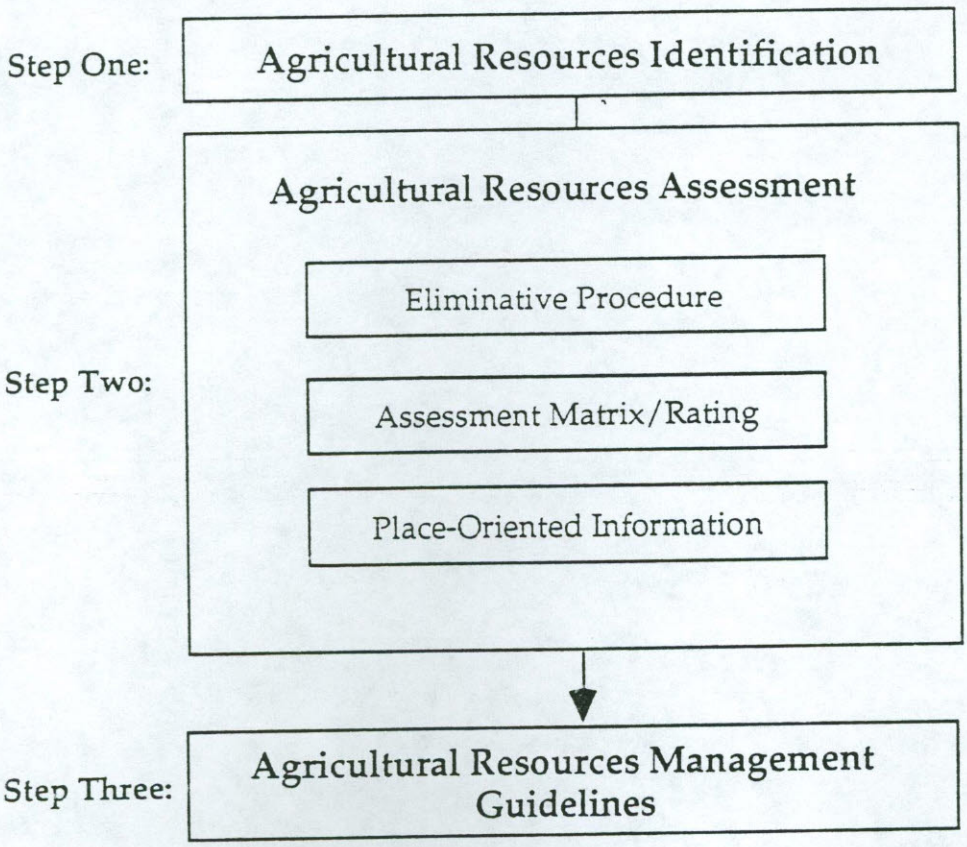


Figure 12: Agricultural Resources Methodology

Step One: Identification

As documented in the state-of-the-art literature review, resources relevant to agriculture are identified in order to determine the best places in the landscape to reintroduce farming. The initial step in the agricultural resources method, identification of all agriculturally related resources, is based on mapping of resources by agencies such as the Soil Conservation Service (SCS), the National Wetland Inventory (NWI), the US Geographic Survey (USGS), the Federal Emergency Management Agency (FEMA) and through site visits.

Step One is divided into five substeps as follows:

Substep 1: Soils by soil series
Substep 2: Wetlands and their 100' buffers
Substep 3: Ponds, Rivers, Streams and their 100' buffers
Substep 4: Current land cover/land use
Substep 5: Place-oriented information

The information is identified and mapped.

Substep 1: Soils -- Soil Conservation Service Soil Surveys are used to identify the soils existing in the cultural landscape. Soils are mapped by soil series and entered into a GIS. General descriptions of the soils, especially as they relate to agriculture, are also identified.

Substep 2: Wetlands and their 100' buffers -- Wetlands are identified by National Wetland Inventory, mapped by the U. S. Fish and Wildlife Service, or other more precise sources, such as aerial photography interpretation and field visits by qualified scientists. The type of wetland, especially the distinction between wooded and non-wooded wetlands, is essential to map, as significant areas of both are present. This distinction is based on the assumption that haying can take place in non-wooded wetlands, as done throughout history. The haying of salt-marshes has been practiced throughout history and is considered a major value of salt marshes (Teal, 1969, Chapter 3). The included 100' wetland buffers are based on ecological principles as "studies have shown that the minimum widths necessary for effective buffer strips range from 100 feet for the absorption of nitrates and phosphates from septic tank effluent to a

Land Use \ Cap. Class	II, III	IV	V, VI, VII	VIII
Ag. Land, Old Fields, Mowed Areas	1	1	2	2
Non-wooded wetlands	1	2	2	3
Forest cover	2	2	3	3
Wooded wetlands	4	4	4	4
Buildings, roads, water	4	4	4	4

Assessment Ratings: 1 = Most Suitable for Agriculture
2 = Suitable for Agriculture
3 = Least Suitable for Agriculture
4 = Unsuitable for Agriculture

Figure 14: Assessment Matrix based on Capability Class and Land Use

Once soils are assessed by capability class, field size, and land cover/land use, the areas of land are given an Agricultural Resource Assessment Rating. Land with the least constraints (i.e., soils with high capability class ratings, non-forested) receive highest assessment rating, while those areas that have many constraints (i.e., soils with low capability class rating and forested) receive a low assessment rating.

Substep 3: Place-Oriented Information Additions: At this stage, any expert information from local "experts" such as farmers, historians or agricultural specialists can be added. Folklore or other non-spatial data may also be added, either boosting ratings or taking away from them. For example, remnants of old orchards add a special value to an area of land, information that does not appear in the capability class or land use data. Also, improvements to certain areas of land, such as where stones have been removed from the soil or drainage ditches added, may be of more value than the basic capability class rating indicates.

Step Three: Management Guidelines

Management guidelines are developed for agricultural resources based on the above identification and assessment procedures. For example, in areas where the land has the least constraints (the most suitable for agriculture), reintroduction of farming to the cultural landscape can take place. Land with the most constraints (not optimal for agricultural reintroduction), should be managed for other cultural or natural landscape resource purposes, such as historical interpretation, wetland management, or wildlife habitat.

These management guidelines should be used at a future point in conjunction with other resource management guidelines to determine conflicts and compatibilities for cultural landscape resource management. Procedures combining management guidelines for agricultural and natural resources, as well as cultural and historical resources, need to be developed in order to generate various landscape rehabilitation options that will assure a well balanced cultural landscape treatment plan.

2.5 Natural Resources Methods

This section discusses the methodology for the identification, assessment and development of management guidelines for three types of natural resources common to all landscapes: natural history and physiography; wildlife and their habitats; and wetland and riparian systems. Step One identifies resources that exist in the landscape while Step Two assesses them. Step Three develops guidelines for the management of natural resources within a cultural landscape setting (see Figure 15).

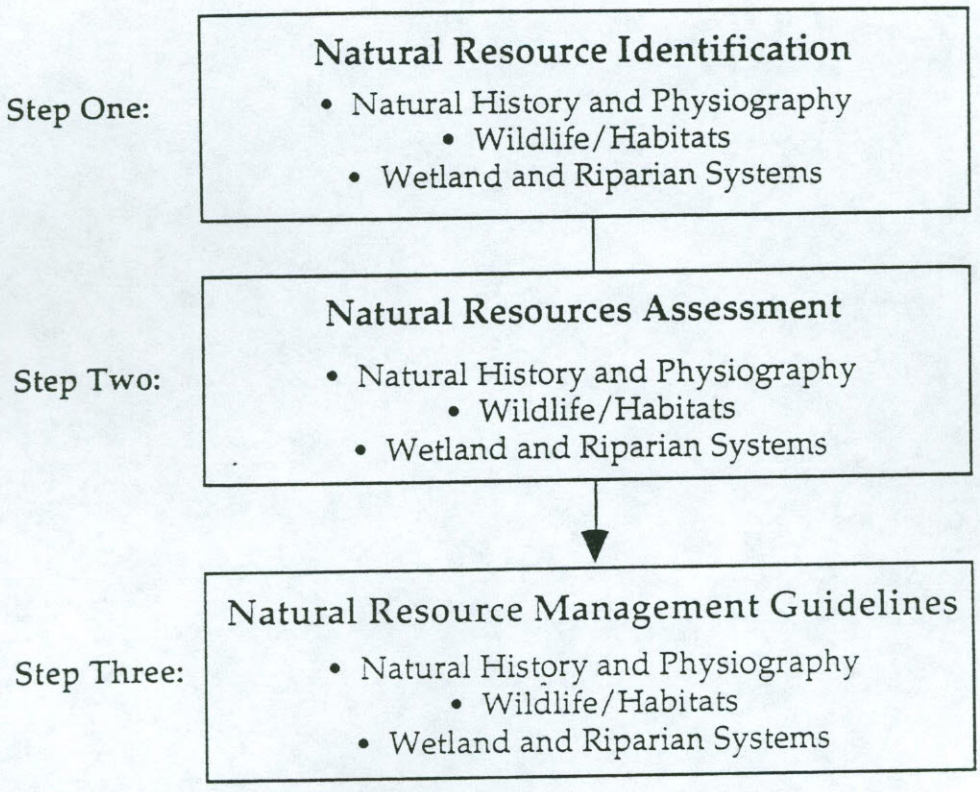


Figure 15: Natural Resource Methodology

2.5.1 Natural History and Physiography Method

Based on the premise that cultural landscapes are the result of human interaction with the natural landscape, the history of the land must be understood in order to fully comprehend the cultural landscape. As Jorgensen said, "To appreciate the landscape, one must understand it," (1977, p. 9). The history of the land, its geology and physiography are identified as part of this method. Identification methods are relatively well developed, but assessment techniques and management guidelines for these resources when located within a cultural landscape are not. Therefore, assessment techniques and management guidelines have been developed here, using existing state of the art thinking as a guide.

Step One: Identification

Resources relevant to the history of the land must be identified in order to determine the best places in the landscape to interpret the formation and physiography of the landscape. The initial step in the natural history method

includes four substeps in which natural history and physiography related resources are identified and entered into a GIS.

Substep 1: Natural History
Substep 2: Surficial Geology
Substep 3: History and Classification of Soils
Substep 4: Topography

Substep 1: Natural History -- Sources such as Jorgensen's *A Guide to New England's Landscape* (1977) and Soil Conservation Service Soil Surveys are used to identify the natural history of the landscape. The history of the formation of the bedrock foundation, glacial history and resulting landforms (such as rivers, lakes, drumlins, eskers, and soils), and the geography of the resultant vegetation are identified from sources such as Jorgensen, or others for different regions, in this substep. Additional information on geology and soil formation history can be found in SCS Soil Surveys for the particular region or landscape in question. The soil surveys include graphics explaining the relationship of soils to the geology and topography of the landscape (SCS Middlesex County, Massachusetts Interim Soil Survey Report, 1991, p. 68).

Substep 2: Surficial Geology – Surficial geology is identified and mapped in this substep. Data, classified by type, is entered into a GIS for later manipulation and overlays. The surficial geology of the landscape is identified from US Geologic Survey sources including detailed 7.5-minute geologic maps at a scale of 1:31,680 or 1:24,000.

Substep 3: History and Classification of Soils -- Similar to the identification of soils in the agricultural resources method section, Soil Conservation Service Soil Surveys are used to identify the soils that exist in the landscape and their history. Time, climate, parent material, topography, and plant and animal life are the five major factors that influence soil formation (SCS Soil Survey of Barnstable County, Massachusetts, 1993, p. 121). Those five factors are identified in this substep. The interaction of the five soil formation factors results in the development of a soil profile, or vertical section of the soil from the surface to the depth of approximately 60 inches.

Substep 4: Topography -- The surficial geology and soils of the cultural landscape can be further understood when viewed in the context of the topography. For example, if a glacial lake bed is identified in Substep 2, the flat character of the area, as identified by the topography, will be reinforced. The topography of the landscape is identified, mapped and entered into the Geographic Information System (GIS). Topographic information can be obtained from engineering surveys or city planning departments at a larger scale than that of the US Geographic Survey maps, where topography is mapped at a scale of 1:24,000.

Step Two: Assessment

This step determines how the story of the natural history of the landscape, identified in Step One, can be told through the physiographic elements (surficial geology, topography and soils) visible in the landscape today. Unique physiographic features, or ones that are uncommon or rare in the cultural landscape or region, are most significant, while other physiographic features, ones that are common to the landscape in question, can tell other parts of the natural history story, and therefore have some significance (see Figure 16).

Component	Rating	
	Most Significance	Significance
Uniqueness	Unique physiographic feature	Common physiographic feature

Figure 16: Natural History/Physiography Assessment Rating

Physiographic features that are important in the interpretation of other components of the landscape, such as the cultural or battle stories in the case of Minute Man National Historical Park, also receive a "most significant" rating.

Step Three: Management Guidelines

Management guidelines are developed for natural history resources based on the above identification and assessment procedures. Areas with the highest interpretive potential, the unique physiographic areas, should be managed for interpretive potential. Rehabilitation of the landscape should not obscure or alter the physiographic elements that are unique and can be interpreted as such. Other areas that do not tell an unusual part of the natural history story can be managed for other resource and interpretation purposes.

2.5.2 Wildlife/Habitats Method

The methodology is divided into three steps (Figure 17). Steps One and Two identify and assess wildlife and habitat resources. Step Three defines guidelines for the cultural landscape biased towards the management and interpretation of wildlife and their habitats. The latter do not have well developed state of the art methods, so methods based on existing state of the art are developed here.

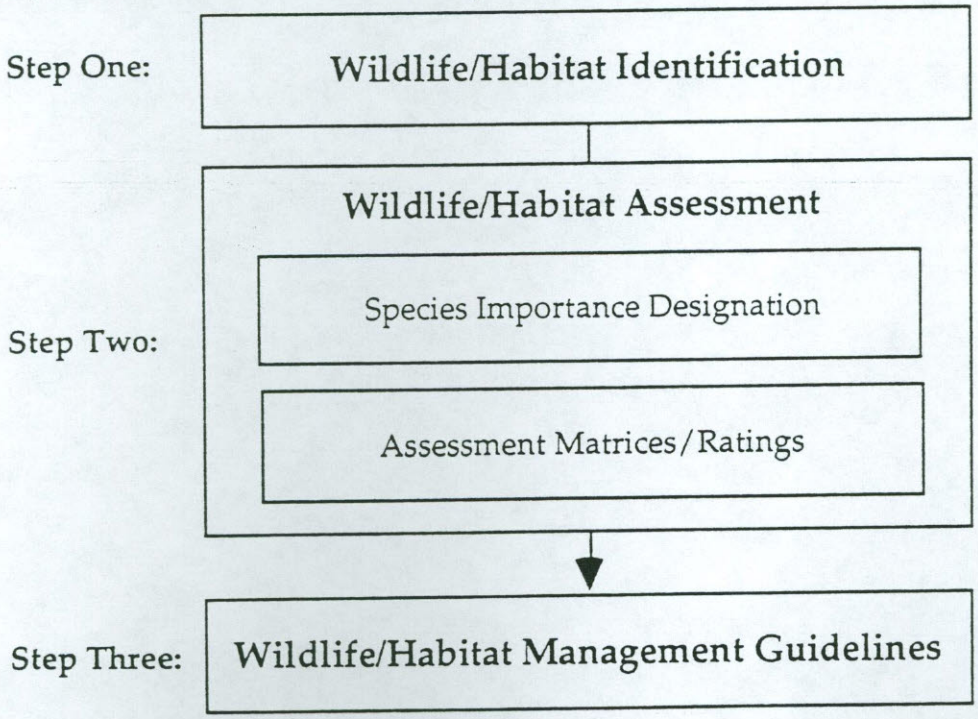


Figure 17: Wildlife/Habitat Methodology

Step One: Identification

The first question to ask regarding the cultural landscape under investigation is: Which wildlife species/habitats exist in the landscape and which will be selected as "target species"? The first step in the Wildlife/Habitat Natural Resource method is divided into three substeps:

Substep 1: Wildlife species and their habitats
Substep 3: Selection of target species
Substep 2: Other areas of similar habitat

Substep 1: Identification of wildlife species and their habitats -- Species data is collected from such agencies as the Massachusetts Natural Heritage Program, the Audubon Society, or local wildlife advisory committees. More precise data should be obtained with the help of qualified biologists who must survey the landscape in question.

Substep 2: Identification of other areas of similar habitat -- Once existing habitats within the cultural landscape are determined, the species' metapopulation, or population at a larger landscape scale, should also be identified, as most species depend on the larger scale population for continued existence (Merriam, 1990; Opdam, 1990). Therefore, other areas in the landscape that are of similar habitat to the ones identified in Substep 1, both in the cultural landscape and in the region surrounding the landscape, are identified from land use data, such as the 1985 MassGIS Land Use/Land Cover coverage, developed from aerial photography. Metapopulations and their habitats are identified within a radius of the known habitat within the cultural landscape. The radius is determined according to the habitat and movement requirements of the species in question.

Substep 3: Selection of Target Species -- Target species, whether existing or introduced, and their habitat requirements are determined (Soulé, 1991a, pp. 93-94). Target species are identified by expert and/or public opinion of which wildlife species are likely or known to have habitats in the area.

Step Two: Assessment

The assessment step for the wildlife/habitat natural resource method is divided into two substeps to help determine which habitats are the most important to manage carefully when rehabilitating the cultural landscape (see Figure 18).

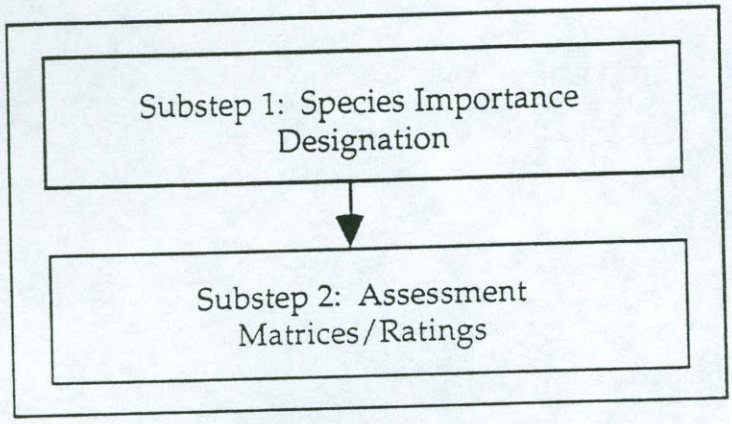


Figure 18: Wildlife/Habitat Assessment Procedure

Substep 1: Species Importance Designations: Wildlife species that exist in the cultural landscape are assessed for importance based on endangered, rare or watch-listed species listings (see Figure 19). Species that fall into these categories are in some danger of extinction, whether locally, regionally, or globally. The habitats associated with these species must be protected and otherwise managed properly.

Other species that are desired in the landscape, known as target species, and their habitats, as identified in the Step One, Substep 3, are set apart from other species existing in the landscape (see Figure 19).

Species \ Type	Rare/Endangered	Watch-Listed	Target
Bobolink			X
Towhee			X
Shiner		X	
Borer Beetle	X		
Frosted Elfin		X	

Figure 19: Example of Species Importance Designation Matrix

Substep 2: Habitat Assessment Matrices/Ratings: Habitats are assessed for their importance based on the following factors: 1) existence of rare, watch-listed or target species; and 2) habitat proximity and connectivity to the metapopulation and other areas of like habitat (see Figures 20 and 21). (Merriam, 1990, p. 123; Soulé, 1991a, p. 92; MacArthur and Wilson, 1967, Chapter 3). Connectivity refers to the proximity and ease of movement between habitat patches, or islands, with other habitats of a similar ecosystem.

Component	Rating		
	Most Significance	Some Significance	Significance
Habitat Significance	Rare Species	Watch Listed Species	Target Species
Connectivity to Metapopu-lation	High Level of Connectivity	Medium Level of Connectivity	Low Level of Connectivity

Figure 20: Habitat Assessment Ratings

Habitat Type / Con-nectivity	Rare/Endangered	Watch-Listed	Target
High Level	1	1	1
Medium Level	1	1	2
Low Level	2	2	3
None	2	3	3

Habitat Assessment Ratings: 1 = Most Significance
2 = Some Significance
3 = Significance

Figure 21: Habitat Assessment Matrix

Step Three: Management Guidelines

Based on the question "how can a cultural landscape rehabilitation affect wildlife and their habitats?" management guidelines need to be developed for the proper management and/or protection of wildlife and habitat resources within a cultural landscape. The management guidelines are based on the above identification and assessment procedures.

Areas determined in the assessment procedure to have the most significance for rare and target species are fully protected when rehabilitating the cultural landscape. Buffers around the habitats for further protection are suggested. Wildlife biologists should be consulted to determine proper protection guidelines for the species in question. Areas with some significance should also be protected to the greatest possible extent.

If the goal of the landscape management plan is to attract other species, or to reintroduce species that once inhabited the landscape, habitat requirements again must be determined for those selected species. As agricultural reintroduction is a landscape management goal, the habitat requirements of certain bird species, such as bobolinks, can be met. Habitat requirements for such species include fallow fields; therefore, management guidelines should include a system of long-rotation islands. Under this system, patches in the landscape are managed on a rotational basis, thus ensuring that recently disturbed, semi-mature, and mature ecosystems are all present at any given time. This type of maintenance insures the availability of required habitats, while still incorporating productive agricultural fields into the rehabilitation plan. Surrounding land uses must be compatible, as must the edges of the islands. Potential corridors for species movement must exist, and the size and number of fields in the rotation sufficient for the target species for the system to be successful. In general, the fields in the long-rotation system should be located with regard to the functioning of the overall system and the overall landscape management plan (Harris, 1984, Chapters 9 & 10). The proper management of wildlife species and their habitats can be compatible with other cultural landscape management goals.

2.5.3 Wetland and Riparian Systems Method

The methodology is divided into three steps (Figure 22). Step One identifies wetland and riparian system resources. Step Two assesses the resources, and Step Three determines management guidelines for the cultural landscape biased towards proper management of natural resources. However, the state of the art is lacking in assessment and management procedures for wetland and riparian systems located in a cultural landscape.

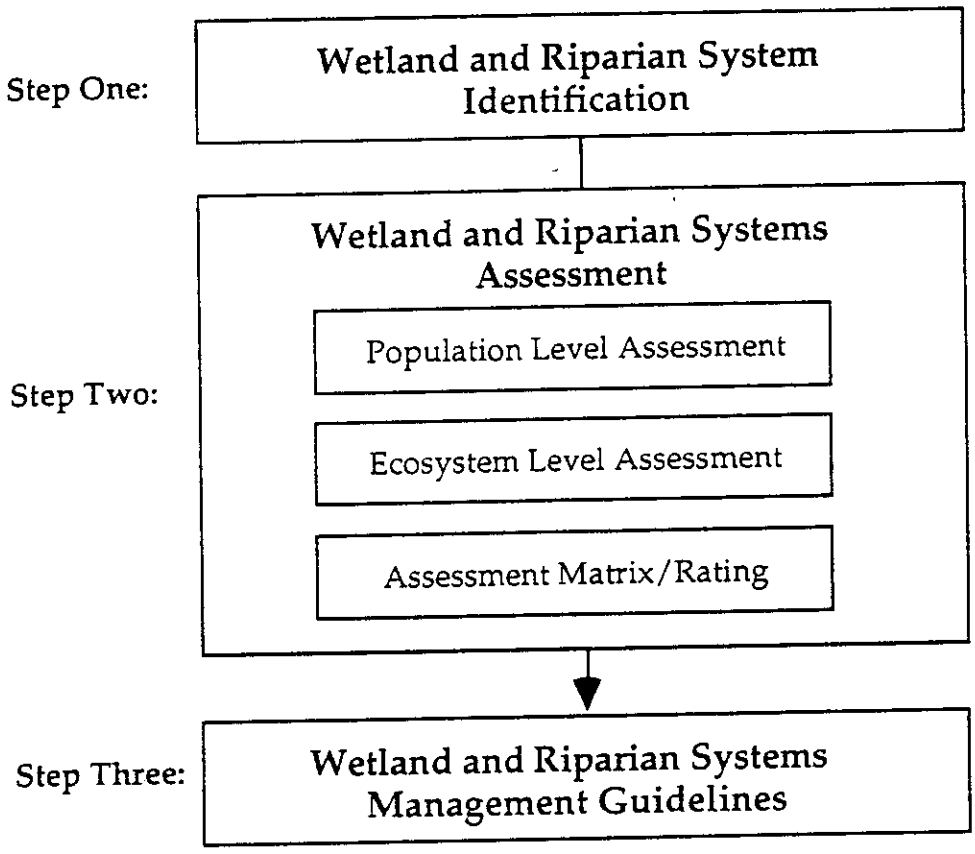


Figure 22: Wetland and Riparian System Methodology

Step One: Identification

Resources that are part of wetland and riparian systems are identified in order to determine which areas of the landscape should be managed for proper wetland and/or river functioning. The identification step can be divided into two substeps:

Substep 1: Wetlands by system and type, and their 100' buffers
Substep 2: Ponds, Rivers, and Streams, their 100' buffers

Substep 1: Wetlands and their 100' buffers -- Wetlands within the cultural landscape are identified and mapped in this step. Wetlands are identified with the National Wetland Inventory maps, produced by the US Fish and Wildlife Service or through air photo interpretation. Aerial photographs are interpreted with a stereoscope and zoom transfer scope. A minimum mapping unit of 0.1 ha is used on photographs at a scale of 1:4800. After interpreting the photos, field verify the data and determine vegetative cover. Also, identify the system, type and function(s) of each wetland. Wetland systems are as follows: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. Wetlands are identified as one of the following types: deciduous forested wetlands, coniferous forested wetlands, sapling swamps, bushy shrub swamps, compact bog shrub swamps, narrow-leaved emergent marshes, robust emergent marshes, and wet meadows.

The wetlands are then buffered by 100', a distance based on ecological principles and legal regulations. Buffers protect wetlands from agricultural pesticide/herbicide run-off (Forman and Godron, 1986, pp. 397-398), and aid in the absorption of nitrates and phosphates (McGregor, 1992, p.3; Binford and Buchenau, 1991).

Substep 2: Ponds, Rivers, Streams, and their 100' buffers -- Hydrography existing in both the cultural and regional landscape is identified and a protective 100' buffer delineated. Studies have indicated that the 100' buffers, the minimum width, are needed to filter and cleanse surface run-off, functions necessary for the health of the ecosystem (McGregor, 1992, p. 3). The 100' setback is legally required.

Step Two: Assessment

The assessment step in the wetland and riparian systems method is divided into three substeps (see Figure 23).

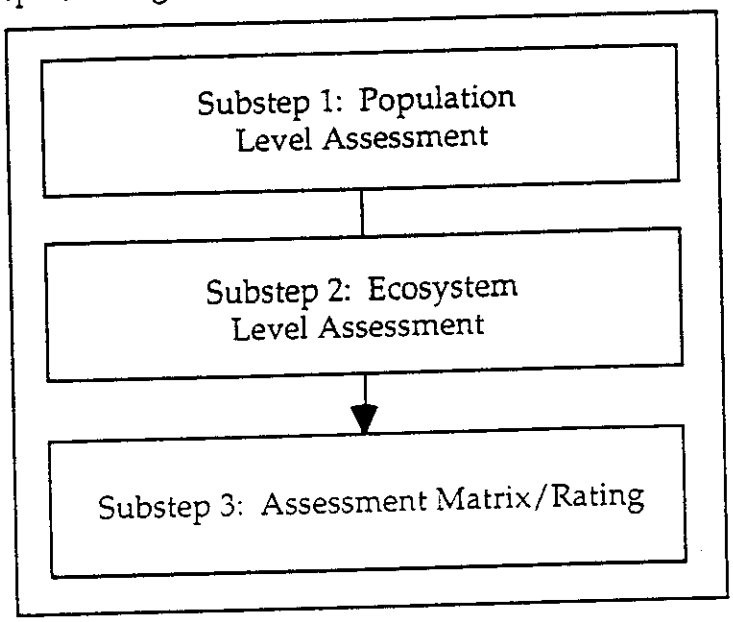


Figure 23: Wetland and Riparian Systems Assessment Method

Substep 1: Population Level Assessment -- Wetland and riparian systems are assessed for population level values (Mitsch and Gosselink, 1986, p. 393-405, see Figure 24).

Pop. Level Value / River/ Wetland	Waterfowl Habitat	Fish Habitat	Timber Harvest	Rare Species Habitat
Wetland A	X			
Wetland B		X		X
Wetland C			X	X
River D	X	X		X

Figure 24: Example of Wetland and Riparian Population Level Assessment.

Substep 2: Ecosystem Level Assessment -- The next substep includes assessing the various wetland and riparian systems for ecosystem level values. Ecosystem level values include flood mitigation, storm abatement, aquifer recharge, water quality and aesthetics. This assessment procedure is adapted from recent research in the field (Mitsch and Gosselink, 1986, pp. 393-405; Larson, Adamus and Clairain, 1989, pp. 11-54, see Figure 25).

Eco. Level Value / River/ Wetland	Flood Mitigation	Aquifer Recharge	Water Quality	Aesthetics
Wetland A	X		X	
Wetland B			X	X
Wetland C		X	X	
River D	X			X

Figure 25: An Example of Wetland and Riparian Ecosystem Level Assessment

Substep 3: Assessment Matrix/Rating: As wetlands and riparian systems are multiple-value systems, they must be assessed for their overall value (Mitsch and Gosselink, 1986, p. 407). Based on E. P. Odum's (1979) scaling and weighting approach to assessment, each wetland and river system receives a check mark for each population level or ecosystem level value. If a system is unique to the landscape, and therefore provides a function unmatched elsewhere in the landscape, its uniqueness is noted. Unique wetland and riparian systems and those that have three or more population and ecosystem level values receive high assessment ratings (see Figure 26).

Step Three: Management Guidelines

Based on the above identification and assessment steps, management guidelines for the wetland and riparian systems within the cultural landscape are developed. The state of the art for management guidelines of wetland and riparian systems within a cultural landscape are not well developed. Therefore, the following methods are only based loosely on the state of the art literature.

River/Wetland \ Overall Values	# of Pop. Level Values	# of Eco. Level Values	Total # of Values	Unique?
Wetland A	1	2	3	
Wetland B	2	2	4	Yes
Wetland C	2	2	4	
River D	2	2	5	
Ratings: Most Significant = 3 or more values and/or unique Some Significance = 2 values Significance = 1 value				

Figure 26: Example of Wetland and Riparian System Assessment Matrix/Rating

The most significant wetland and riparian systems, those that provide the landscape with unique or multiple functions, receive the strictest management guidelines. As these systems provide the highest interpretive potential as well as accomplishing special functions in the landscape ecosystem, the status quo of the landscape, including the existing vegetation, should be retained, both within the wetland and river systems as well as within the 100' minimum buffer areas. This will help protect surface water from increased pollution due to run-off from agricultural fields, roads and other development (McGregor, 1992, p. 3; Binford and Buchenau, 1991). If trails or other intrusions into the landscape are necessary, boardwalks and like construction techniques are used.

Other significant wetland and riparian resources should be managed as carefully as possible, as they all provide services to the landscape. The management guidelines for these areas should be as close to those for the most significant systems as possible. These natural systems are easily disturbed by human activities, such as draining and filling wetlands for agriculture or increasing the amounts of polluted runoff that enter the system (Mitsch and Gosselink, 1986, pp. 418-428).

2.6 Management Treatment Options

Once the landscape history, Running Battle, agricultural and natural resources are identified and assessed, and management guidelines for each separate factor are developed, the four resources are looked at once again in a composite view, and then combined, as they exist in the landscape. The locations of significant interpretive places in the Park are determined in this overlay process, as the co-occurences of the four resources are determined. Finally, an interpretive trail system is developed that links the interpretive places.

Step One: Determination of Treatment Options for Minute Man NHP
Management options are described and evaluated for the Park as a whole. The evaluation is a synthesis of the important factors relating to the four study components (Landscape History, Running Battle History, Agricultural Resources and Natural Resources.) Issues relating to agricultural reintroduction are addressed in the evaluation. In addition, interpretation and protection of cultural landscape features and natural resources are included in the treatment options for the Park.

Step Two: Determination of Interpretive Places and Their Treatment Options
High priority management areas for each of the four resources (landscape history, Running Battle, agricultural and natural resources), determined in the previous methods (Sections 2.2 - 2.5), are combined, bringing the individual resources together. The conflicts and compatibilities of the separate management guidelines are determined for the overall landscape. For example, if the Running Battle methods have determined that a particular agricultural field that existed in 1775 is of high importance for interpreting the battle, and the agricultural resources inform us that the land is most suitable for agricultural use today, all potential interpretive themes are compatible. However, if the landscape history assessment informs us that a particular area is important for interpretive purposes, yet it is a rare species wildlife habitat, the potential interpretive themes conflict.

The overall landscape is divided into significant interpretive places based on these conflicts and compatibilities. The places are found wherever concentrations of important resources exist.

Step Three: Development of Interpretive Trail System

In order to bring the visitors to the resources for interpretation purposes, a trail system is needed. The trail system includes trails ranging from a main trail, a direct trail to small loop trails. The first level in the trail system is the main trail, accessible to all, and suitable for people on bicycles as well as on foot. The next level of trail is the intermediate trail, a spur of the main trail, that brings visitors to parts of the Park not accessible by the main trail. A third level of trail, the loop trail, brings people off the main or intermediate trails to a special part of the landscape, perhaps a vernal pool or wetland area. These trails must be developed carefully with consideration to the fragility of the resources found there.

2.7 Chapter Summary

An "identification-assessment-management guidelines" sequence is used for developing guidelines for the interpretation of landscape history, running battle history, agricultural resources and natural resources. In terms of the landscape history, the existing cultural landscape as well as the historic cultural landscape is mapped. The character-defining features of both are analyzed through a process adapted from Bulletin #30 (McClelland, 1991). The Park's "historic character" is to be synthesized as a result of the analysis. An assessment is to be conducted to compare the historic character with the Park's existing character in order to determine locations of:

- Highest Degree of Landscape Character
- High Degree of Landscape Character
- Moderate Degree of Landscape Character
- Low Degree of Landscape Character

Management guidelines are then to be developed based on options for retaining and reinforcing the Park's historic character.

The procedures for the Running Battle History follow a similar step-by-step approach. First the relevant "Features and Areas" are mapped in the context of the 1775 landscape. Second, the landscape is assessed to determine the locations of:

- Highest Importance to Battle Interpretation
- High Importance to Battle Interpretation
- Moderate Importance to Battle Interpretation

Third, management options are described that retain and in some cases reinforce historic character in order to better interpret the Running Battle in each of the assessment categories.

The procedure for agricultural resources consists of three steps. Step One identifies resources that influence agriculture, such as soils. Step Two, the assessment of the resources, includes four substeps: an eliminative procedure, potential field delineation, an assessment matrix rating system, and the addition of place-oriented information. Step Three determines management guidelines for the cultural landscape biased towards development of the agricultural resources.

The methodology applied to natural resources consists of the same three basic steps: identification, assessment and development of management guidelines. The procedures are applied to the following natural resources: natural history and physiography, wildlife and habitats, and wetland and riparian systems.

After these four separate factors are identified, assessed and management guidelines are developed, the factors are overlaid in the fifth sub-method in order to determine the locations of significant interpretive places in the Park. The compatibilities and conflicts of the four resources are determined, and places are defined. Finally, an interpretive trail system is developed that links the interpretive places.

These assessment procedures will be applied to the cultural landscape of Minute Man National Historical Park in the following chapter.

CHAPTER THREE: APPLICATION

3.1 Introduction

In order to develop management guidelines for interpreting the landscape history, the Running Battle history, and the agricultural and natural resources, the step-by-step procedures outlined in the Methods Chapter were applied to Minute Man NHP. First, characteristics of the historic landscape are identified as well as the existing cultural landscape features. Second, the Park's historic character is analyzed. Third, an assessment is conducted to determine the degree of historic character[7] existing currently and finally, management options designed to retain and in some cases reinforce the historic character are described. Reinforcing the historic character in Minute Man NHP will heighten the interpretation of both the landscape history and the Running Battle history. The number of visitors to the Park is expected to grow in the future. As visitors experience a landscape that more closely resembles the historic character of the Period of Significance they will get a better understanding of the meaning of the Revolution and the rich agricultural history of the Park.

In addition to the landscape history and Running Battle history, the agricultural and natural resources are identified and assessed, and management guidelines for the resources are developed. The procedure for agricultural resources, as described in the previous chapter, consists of three steps. Step One identifies resources in Minute Man NHP that influence agriculture, such as soils. Step Two, the assessment of those resources, includes four substeps: an eliminative procedure, potential field delineation, an assessment matrix rating system, and the addition of place-oriented information. Step Three determines management guidelines for Minute Man National Historical Park biased towards the reintroduction of agriculture.

The methodology applied to natural resources consists of the same three basic steps: identification, assessment and development of management guidelines. The procedures are applied to the following natural resources located within Minute

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7 Defined as "the physical appearance of a property as it has evolved over time, i.e. the original configuration together with losses and later changes. The qualities of a property conveyed by its materials, features, spaces and finishes are referred to as character-defining" (US Department of the Interior, 1992, pg. 4).

Man National Historical Park: natural history and physiography, wildlife and habitats, and wetland and riparian systems. Again, the final step, Step Three, determines management guidelines for Minute Man NHP biased towards the proper management of the natural resources.

After these four sets of resources (cultural landscape history, Running Battle history, agricultural and natural resources) are identified, assessed and management guidelines for each resource are developed, the results are overlaid in order to determine the locations of significant interpretive places in Minute Man National Historical Park. The compatibilities and conflicts of managing the four sets of resources are determined, and treatment options for the interpretive places within the Battle Road Unit are defined. Finally, an interpretive trail system is developed that links the interpretive places.

3.2 Application of Landscape History Methods

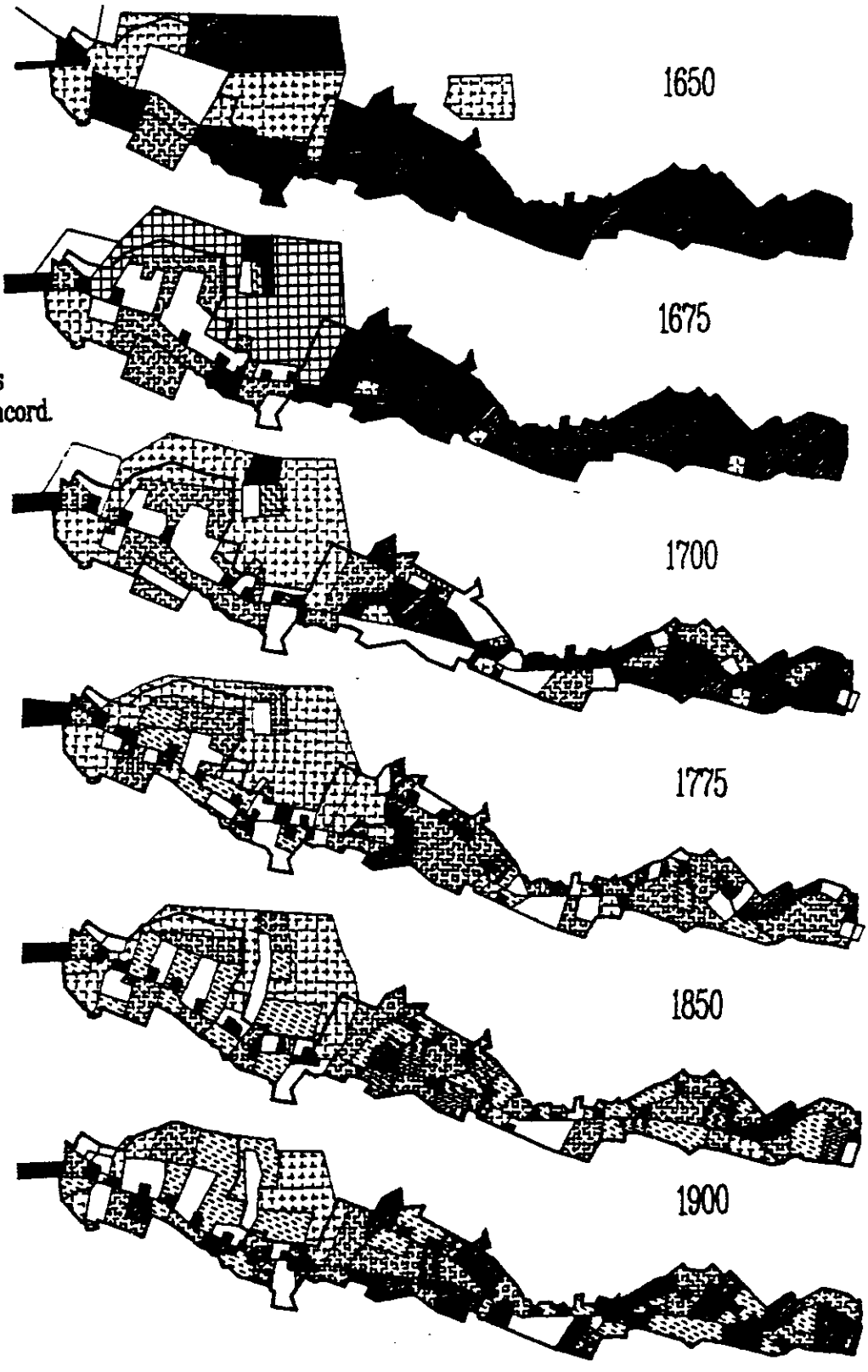
The results of the four-step procedure presented in the previous chapter are as follows:

Step One: Identify the Cultural Landscape, Past and Present.
The first part of Step One is to understand the landscape's history. Brian Donahue, the historical consultant, compiled a series of land use maps which were used to describe the mix of agricultural land uses typical for Concord during six different historic periods[8]. The maps, shown in Figures 27, were generated from Concord tax records and census data. While they are not spatially accurate, they clearly illustrate the landscape's predominantly agricultural land use, and the dynamic changes it underwent between 1650 and 1900. These maps represent conceptual"snap-shots" of the landscape near the end of each period of development, and each of the five periods is described below. Following the description of each historic period, there is a discussion of continuity in this landscape, i.e. aspects common to all five periods.

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8 See Appendices C & D: Battle Road Unit Historic Landscape Analysis and Historic Landscape Periods for a detailed description of the landscape between 1650 and the early 1900's.

Typical Land Use 1650 - 1900



Note: Maps are conceptual representations of land uses typical for the Town of Concord. They were developed using tax records and deeds.

KEY

- Houselots
- Tillage
- Orchard
- Wet Meadow
- Upland Hay
- Pasture
- Woodland
- Unimproved/ Abandoned

Figure 27: Typical Land Use Maps: 1650 - 1900 showing the evolution of the agricultural landscape over a 250 year period. These maps also illustrate the dynamic nature of the landscape, especially in terms of forest clearing.

1650

During the first generation of English settlement, from 1635 into the 1650's farming in Concord was practiced under a "common field" system similar to those being used in many part of England. Houselots were clustered in the village, tillage lots were located among several large planting fields (probably formerly cultivated by the Indians) mostly near the center; hay mowing lots were scattered in a few dozen large and small meadows throughout town and special pastures were enclosed in certain areas for various specific types of stock (the Ox Pasture, the Hog Pen Walks). Most of the town's outlands were left as common grazing and woodland (Donahue, 1992, Appendix C).

1675

With the Second Division of land beginning in 1652, the great bulk of Concord's common land was privatized, and the pattern of family land subdivision and farm development for the next several generations was set. The elaboration of the basic system of ways, ditches and walls brought lowland areas of meadows and "islands" into cultivation (Donahue, 1992, Appendix C).

1700

By the end of the 17th century, settlement in Concord was reaching more remote areas such as the uplands east of Elm Brook. During this time, a pattern of colonial farming emerged by which older sons established farms on fresh ground, while the youngest sons inherited the homestead and the responsibility of caring for aging parents. During the 1690s, with the establishment of the Town of Lexington imminent, the mother Town of Cambridge moved to sell off the undivided common lands on its western frontiers. The land was surveyed and sold within a system of rectangular 40 acre blocks (with one rod "rangeways" left along the borders of each block for access), although it is not clear that the entire 40 acre parcels were sold in many cases. It was during this period that the eastern part of the Park was settled and "improved" (Donahue, 1992, Appendix C).

1775:

During the mid-18th century, an integrated system of land use in towns such as Concord and Lexington reached its fullest development. Although farmers did have some connections with Boston markets for commodities such as ship timber, live cattle and barreled beef, overall the agrarian economy was overwhelmingly subsistence oriented. This does not mean that every homestead provided for itself: there was very lively local exchange of goods and services. Many farmers also practiced a trade, and women were involved in economic networks as well, making dairy products, spinning and weaving wool and linen cloth, and practicing as midwives.

Every part of the environment was involved in this system of local production and consumption. Tillage was used to its fullest capacity as farmers grew their own subsistence grains of corn and rye; there would never again be as much land in tillage in these towns as there was in 1775. Cider was the local beverage , and small orchards had proliferated across the landscape. Meadows were fully utilized, and farmers had just begun the process of expanding their hay production by converting some of their drier meadows to higher quality "English hay". Pastures that provided grazing for cattle were the most prominent agricultural feature of the uplands. Cattle tied this agrarian economy together, providing butter, cheese, meat, tallow, hides, locomotion , and manure. There was scope to clear more pasture, but only if more hay could be grown for winter fodder, and only at the expense of forest. Forest was also essential, providing not only fuel, fencing and building timber, but also material for crafts and trades such as staves for cooperage and bark for tanning leather (Donahue, 1992, Appendix C).

1850:

After the Revolutionary war, farmers began to alter their practices in response to the limitations they had encountered in their subsistence system, and to take advantage of increasing commercial opportunities. Among the complex of changes they made over a period of more than half a century was a decrease in subsistence production of grain, and an increase in market production of beef and dairy cattle.

While some prospered in the new commercial environment, many did not. In this period, estate sales to cover debts became increasingly common. The environment also suffered as a result of the expansion of commercial agriculture during the first half of the 19th century. After 1820, there was an explosion of pasture clearing and hayfields across the uplands. Deforestation reached 90%, causing increased river flooding. Farmers could not keep depleted upland pastures and hayfield productive, and many began to revert to brush and forest. Farmers were unable to perfect a system of commercial farming based on sustainable use of local resources. This was a process of clearing and abandonment (Donahue, 1992, Appendix C).

1900:

During the second half of the 19th century and into the 20th, farmers in the region concentrated on commercial markets. The influx of cheap meat and grain from the Midwest led local farmers to specialize in market gardening, orchards, and diary. Cheap western grain actually provided cheap high-protein feed for cows. Agriculture boomed economically, but began to contract geographically onto the better soils, and to rely less on local resources. Worn out upland pastures reverted to pine (Donahue, 1992, Appendix C).

Historic Landscape Characteristics

In summary, in the first part of Step One, characteristics of the historic landscape are identified by describing it in five important periods. In the first period ending around 1650, the majority of the landscape was wooded (80%) and large common fields were tilled. From 1675 to 1775 agriculture expanded as land was privatized and marginal lands were opened up through a system of ditches and walls. This expansion put pressure on the landscape as the larger farms fragmented into smaller subsistence holdings, reaching a climax in the late Colonial period - by the time of the Revolution (Gross, 1975). By the mid-19th century, increasing commercial opportunities shifted the farms from subsistence holdings to production of grain, beef and dairy cattle. At this time, the process of forest clearing reached its highest point. In the 20th century commercial farming

continued to expand its markets, but farming also contracted geographically as marginal lands reverted to forest again.

In addition to identifying the distinct aspects for each of the five periods, aspects of continuity are identified, i.e. historic character common to all periods. Again, historic character is defined as "the physical appearance of a property as it has evolved over time, i.e. the original configuration together with losses and later changes. The qualities of a property conveyed by its materials, features, spaces and finished are refereed to as character-defining" (U.S. Department of the Interior, 1992, pg. 4). One of the most profound changes influencing spatial organization was how the forest was cleared to make way for agriculture. Figure 28 shows the changing percentage of the landscape covered by forest as it went from a high of 80% in 1650 to a low of 10% in 1850 and back up to 40% in 1900. The spatial organization therefore, changed over time from open fields surrounded and defined by forest to a matrix of open fields containing small woodlots. Between 1850 and 1900 the forest began to grow back.

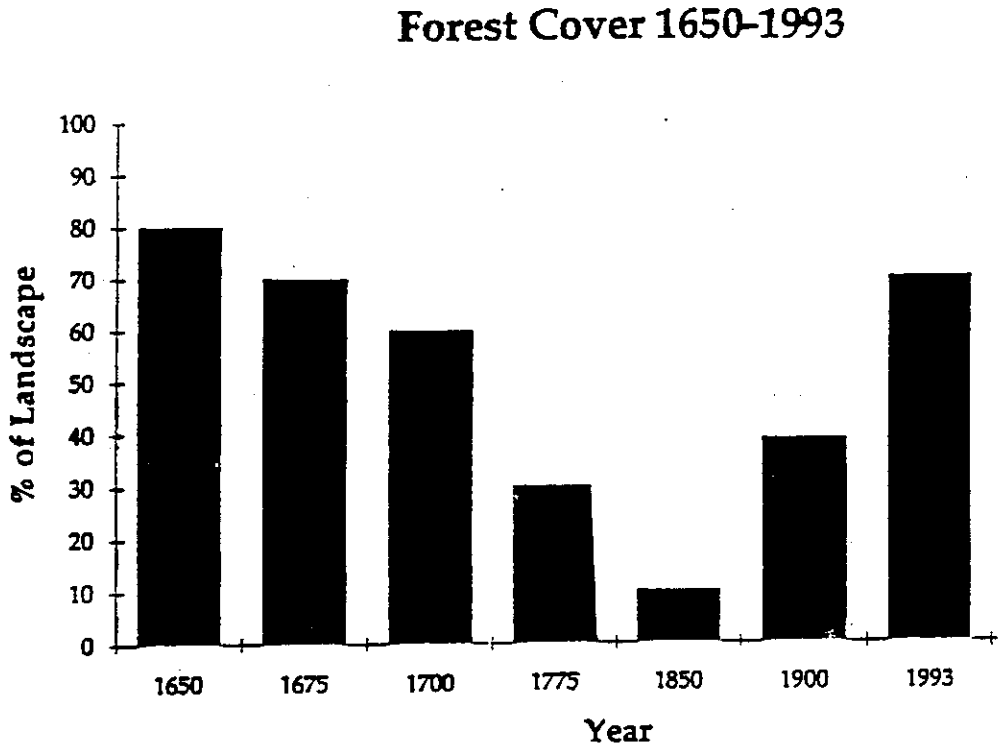


Figure 28: Percentage of Forested Landscape 1650 - 1900. A substantial decrease in forest cover occurred as agriculture increased between 1650 and 1850. A trend toward reforestation can be seen starting at the end of the 19th century.

The historic land use data also show that as the landscape was cleared, it was then farmed, and this continuity of land use is an important aspect of the landscape history. These types of agriculture fluctuated somewhat in terms of their percentage of the overall mix as shown in Figure 29, however, through time, there was a general continuity of agricultural land use.

From the landscape descriptions of the five historic periods as well as the identification of aspects of continuity, the following important points are made concerning the appearance of the historic cultural landscape:

- A high proportion of the land (well over 50% at most times) was open and farmed. Forest land was comparatively restricted compared to today. What forest remained was frequently cut.
- A high proportion of this open agricultural land (again wall over 50% at most times) was in grass - either pasture, meadow, or mowing. This grassland was often in a scruffy, rundown condition.
- Livestock, particularly cattle, were economically central and prevalent.
- Apple orchards were common, first for "hard cider" then for desert apples.
- The landscape was intricately divided by lanes, walls, fences and ditches into rather small (typically less than 10 acres), intermixed parcels with different uses; rather than lying in large, uniform blocks.
- Houses and barns tended to be found very close to the road (often on opposite sides), with their farms extending back behind them on both sides, often in several detached parcels interspersed with parcels belonging to neighbors. Other scattered pieces lay up to a mile away (woodlots and meadows especially). Compact, nucleated farms were not as common.[9]

[9] From an unpublished report entitled, Battle Road Historical Research Areas - 11/23/1992 by Brian Donahue, pg. 1.

In summary, more research is needed to complete the picture of the Park's landscape history. However, using land use data from the town of Concord, the landscape appearance in each of the five historic periods begins to emerge. In addition, identifying aspects of continuity such agricultural land use, field size, stone wall pattern can be used in analyzing an overall historic character for the Park.

The second part of Step One was to identify the cultural landscape elements still present in the Park. Minute Man NHP's landscape is filled with artifacts left by the people who lived, worked and farmed the land in the past. These existing cultural landscape components were mapped including land use, topography, structures, stone walls, hydrology, circulation and vegetation as shown in Figure 30. This map shows how little open landscape consisting of open fields and non-forested wetlands exists within Minute Man NHP presently (70 acres), as most of the landscape is forested (75%). In addition, the map shows that the Park's 17 miles of stone walls represent are an important landscape component.

Step Two: Analyze Historic Landscape Character for each Period

Using the data mapped in Step One, the landscape character for each period was analyzed in order to describe a general historic character. The six historic periods were defined as:

- 1650 - 1675
- 1675 - 1700
- 1700 - 1775
- 1775 - 1850
- 1850 - 1900
- 1900 - 1950

The overall spatial organization, land use types and circulation patterns were analyzed for each of the historic landscape periods based on the data collected in Step One. Some conclusions were made from the analysis of historic character and from other historical research.[10] Throughout history, the land use was

[10] See Appendix A: The Battle Road Landscape & the Causes and Consequences of the Revolution, and Appendix X Historical Features of Four Study Areas, by Brian Donahue for an overview of continuity and change in the Park landscape.

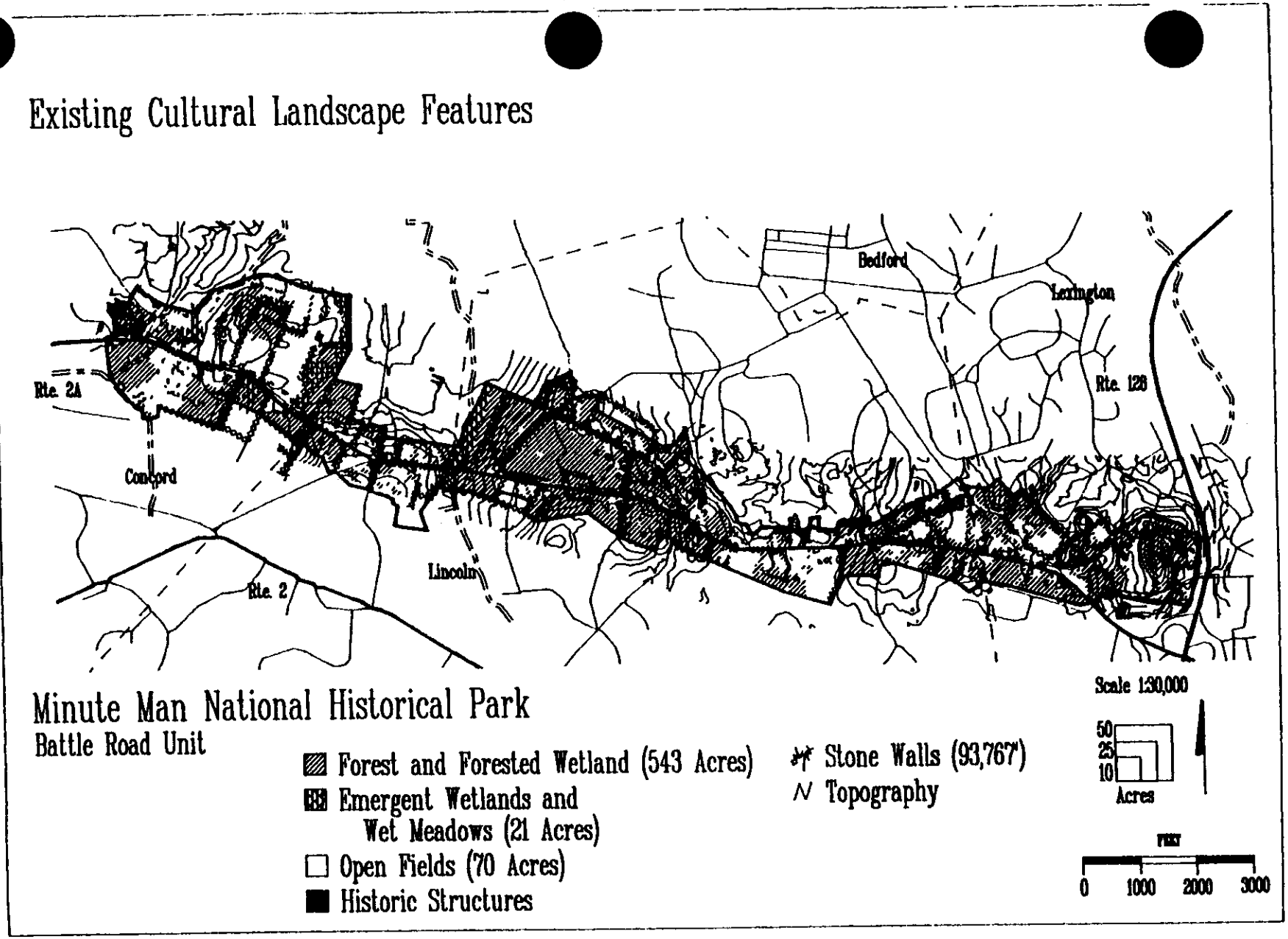


Figure 30: Existing Cultural Landscape Features Map showing the forest covering 75% of the landscape. Small 2 - 12 acre fields are located primarily in the western end of the Park. In addition, a 17-mile stone wall network runs throughout the landscape.

predominantly agricultural. As the forest was cleared, the spatial organization was generally open and field sizes averaged from 2-12 acres. There was continuity through time of the circulation pattern, although the experience from the road became more uniform, with less contrast between the open, agricultural fields and alternating forest. The most important small-scale features were the stone walls which outlined a field pattern or network that changed very little through time. The field pattern was in place by 1675. Therefore historic character in this landscape consists of open, agricultural fields bounded by stone walls or hedgerows. These fields are generally small, between 2 and 12 acres. An important point in analyzing the historic character (based on available data) is that there is a great deal of continuity in its appearance.

It was also found that there was also a general continuity in the Park's circulation pattern. There were references to the Battle Road, or "Concord Road" since 1636 when the first division of Concord's town land took place. Though the exact right of way "varied considerably" (Malcolm, 1985, p. xii) it was found that the Battle Road followed generally the same path as it does today. The ownership boundary maps were used to analyze the circulation pattern, and they showed a continuity of road location through time.

As described in the Methods Chapter, a detailed analysis was done for the 1775 landscape because there is the most data available for this time. The 1775 land use is shown in Figure 31 shows a predominantly agricultural landscape, with the largest area in pasture, interspersed with smaller tilled fields and meadows. Small (1-2) acre orchards punctuate the fields. Figure 32 shows the spatial organization in terms of woodlands and orchards, contrasting with open agricultural fields. Neither the orchards nor woodlands define the edges of the fields, so the spatial organization could be characterized as generally open in nature. Figure 33 combines the circulation, stone walls and structures in the 1775 landscape. It highlights the location of the Battle Road as a main spine through this landscape, with narrow lanes and secondary roads leading off from it. There is also a strong relationship between the stonewalls and the circulation system. The Battle Road is lined almost continuously by walls in the central and eastern parts of the Park. The fewer walls in the western end of the Park may be attributed to the better soils located there, so there were fewer rocks to pull out before the soil could be farmed. Rock walls were also used to outline the

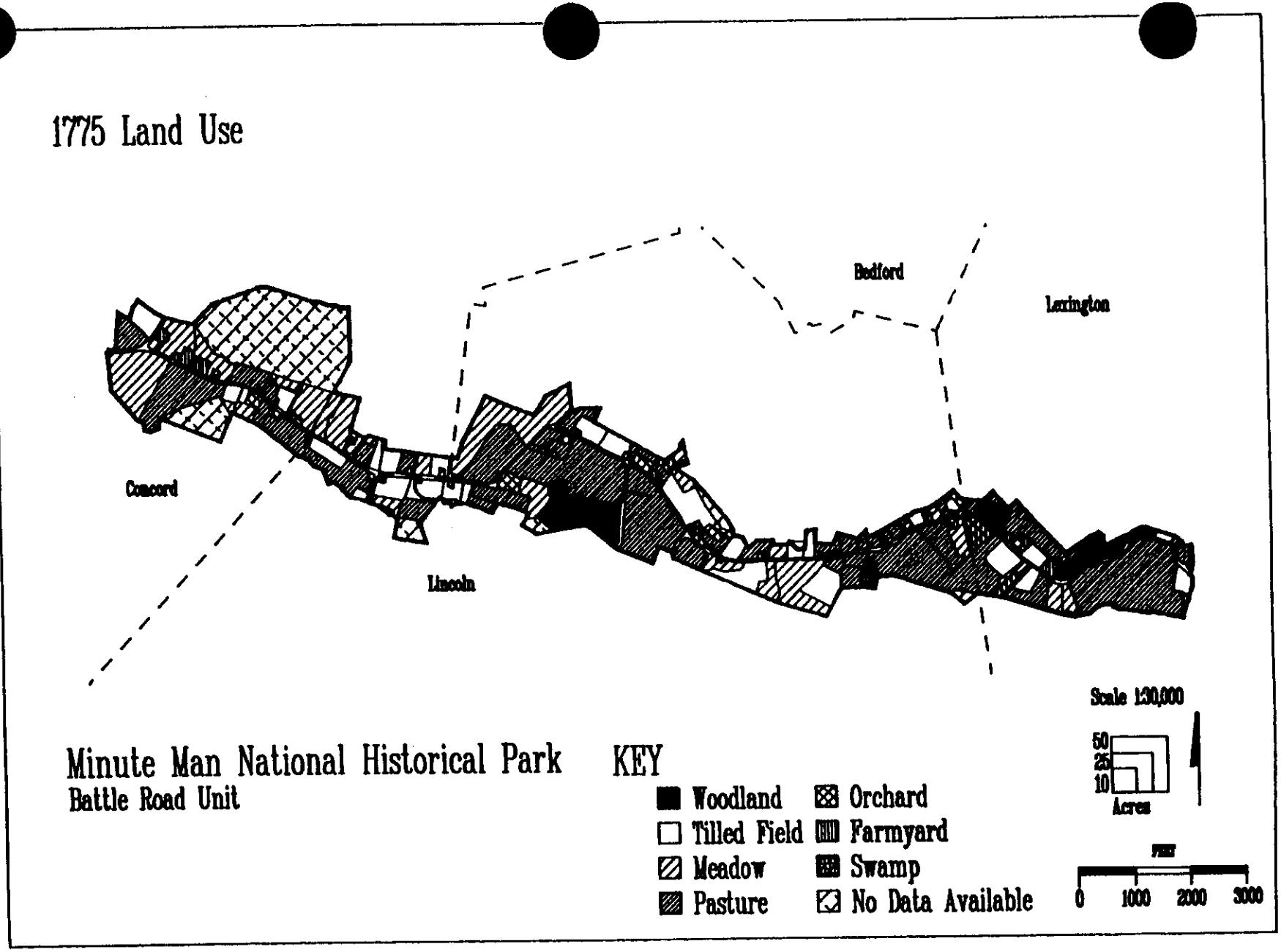


Figure 31: 1775 Land Use Map showing a predominantly agricultural landscape made up of pasture interspersed with tilled fields, meadows, orchards, woodlands and farm yards.

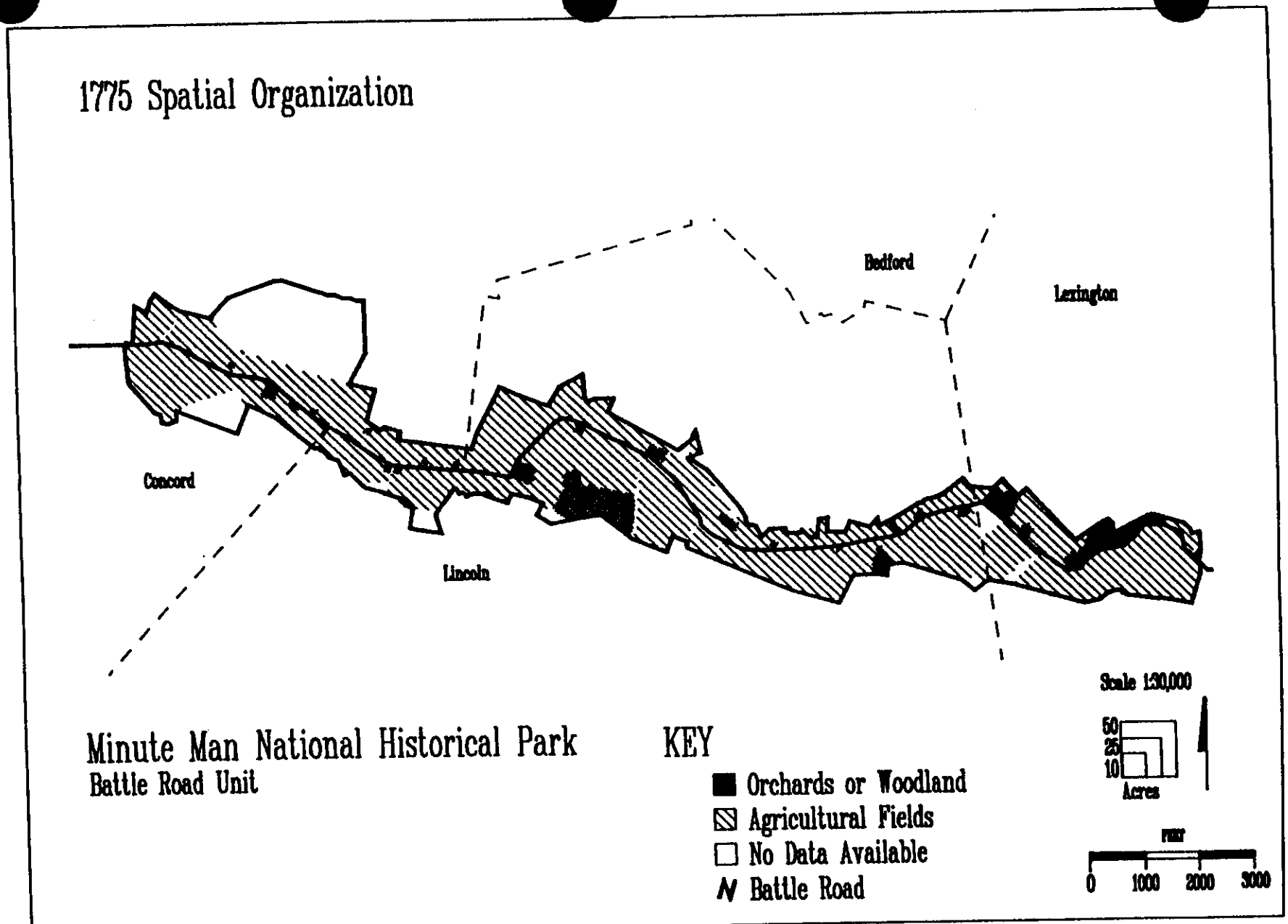


Figure 32: 1775 Spatial Organization. The open agricultural fields dotted with small areas of woodland and orchards characterize this open agricultural landscape.

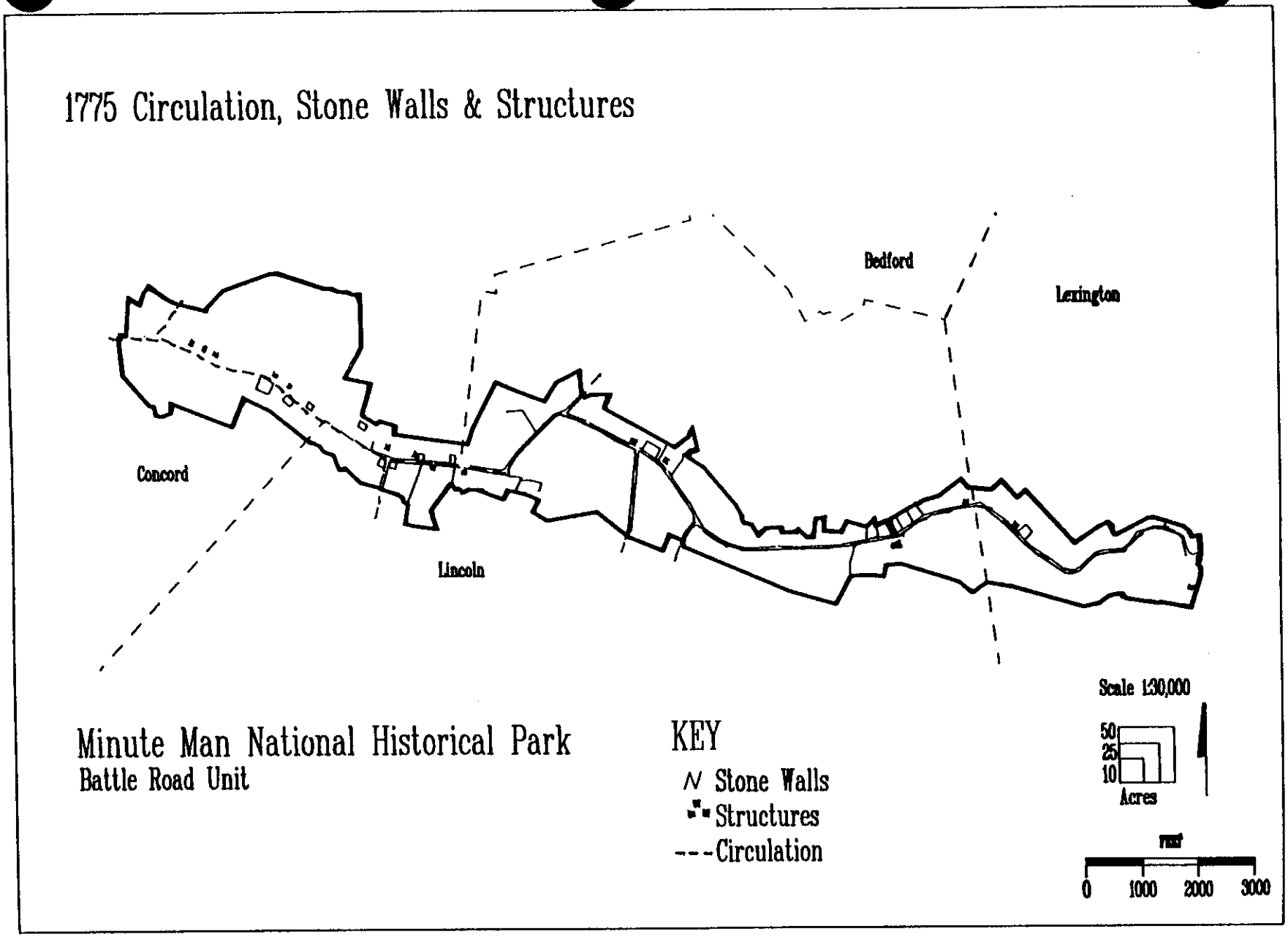


Figure 33: 1775 Circulation, Stone Walls and Structures Map illustrating the location of the Battle Road as the spine of the circulation system. Stone walls line 75% of the roadways

orchards. Structures are spaced relatively evenly along the road with clusters at Meriam's Corner and Brooks Farm.

It is important to point out that the methods used to define the historic character is biased toward the time periods for which there is the most information, i.e. 1775 and today. Further research on the other time periods is necessary before their historic character and integrity can be fully analyzed.

Following the analysis of historic landscape character, the existing cultural landscape's processes and components were analyzed by conducting a Cultural Landscape Inventory.[11] In terms of spatial organization, there is a contrasting forest cover and open landscape pattern. The forest dominates the landscape in some places, pushing right up against the roadway. Primarily second-growth deciduous, evergreen and mixed vegetation, it limits views to the larger landscape in many areas. However, in some parts of the Park, particularly in the western end, agricultural fields push back the forest, opening vistas to the surrounding landscape. Figure 34 shows the contrasting spatial organization found in the Park.

The analysis of the circulation system shows that Route 2A, a busy two-lane highway is the dominant road. 2A and the Battle Road follow the same course through most of the Park, but they diverge at Virginia Road, Nelson Road and Fiske Hill. Where the Battle Road separates from Rte. 2A at Virginia Road, it has a very different character. It is narrower, and lined on both sides by stone walls and mature sugar maples and oaks. At Nelson Road and Fiske Hill, portions of the Battle Road surface has been returned to gravel. These roads are unpaved and lined with stone walls. Figure 35 illustrates the typical roadway character of Rte 2A, one of the types of roads that make up the Park's circulation system.

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[11] For a detailed inventory of Spatial Organization, Land Use, Response to Natural Features, Circulation, Vegetation, Structures and Small-scale Elements, see Appendix E: Park Scale Cultural Landscape Inventory

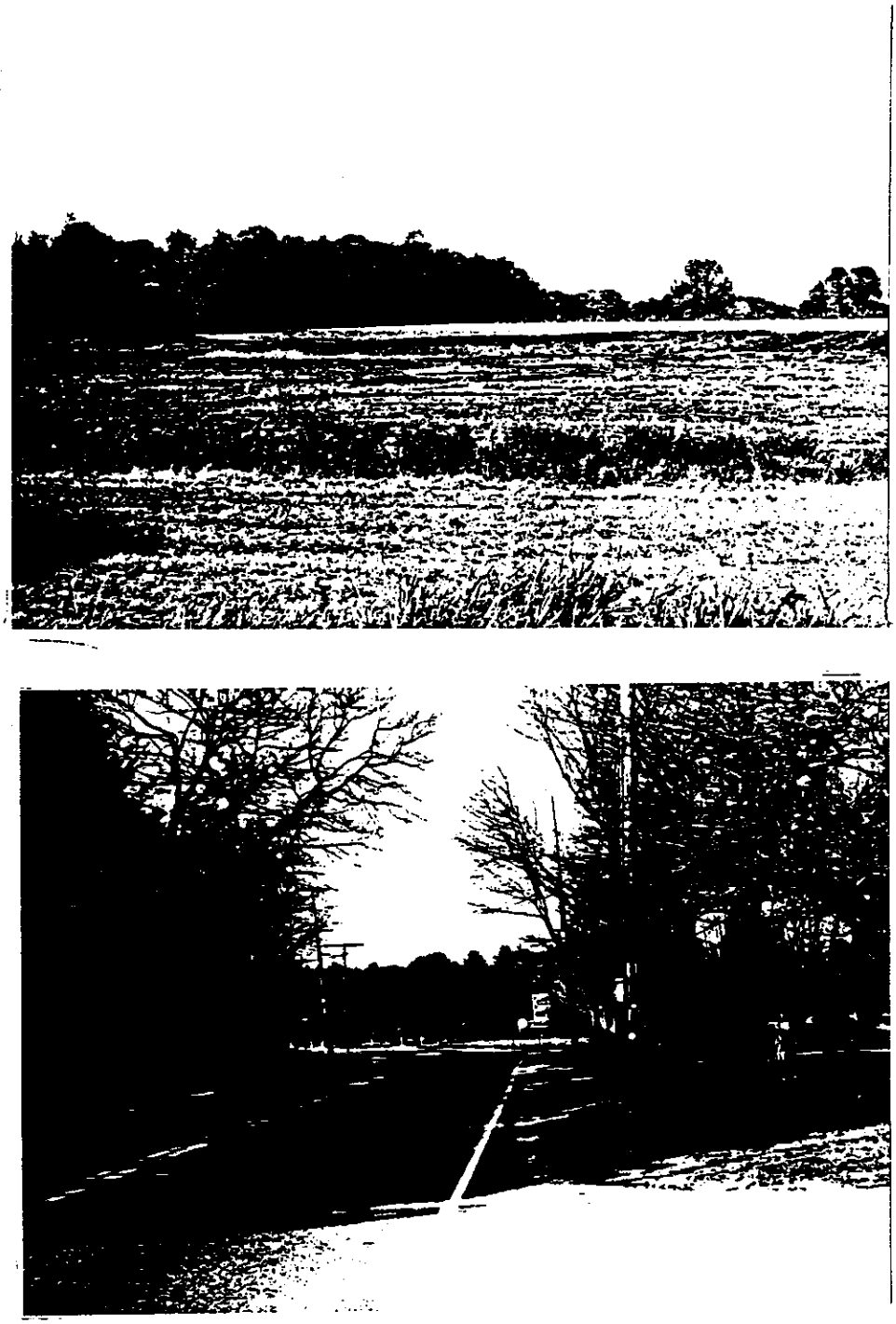


Figure 34: Contrasting Spatial Organization in the existing Minute Man NHP. The top photograph shows how some areas are open and views across the agricultural fields are possible in the western part of the Park. The bottom photograph show the forest enclosure near the Brooks Farm along the Battle Road.

There are twenty-two historic farmhouses and barns located in the Park. Eight of these date from before 1775; the remainder were built in the 19th century. The structures are located throughout the Park with a pattern of almost regular spacing along the roadway, however, there is a cluster of houses at Brooks Farm[12]). Hartwell Tavern, shown in Figure 36, illustrates the materials and architecture typical of most of the Park's historic structures. In terms of small-scale features, perhaps the most important is the network of stone walls found throughout the entire Park. These walls in effect knit the landscape together. They are "dry" fieldstone walls (made without mortar), generally 2-3' tall and 2' wide, as also shown in Figure 36.



Figure 35: Typical Roadway Character. This photographs shows Rte. 2A, a busy two-land highway.

[12] See Appendix E: Park-Wide Cultural Landscape Inventory, Map #6.



Figure 36: Hartwell Tavern. The original house (on the right) was built in 1732. An addition (on the left) was built in 1783 and the rear kitchen was added in 1830. This house is an example of the architecture and materials typically found in the Park. The stone wall in the foreground is representative of many of the Park's walls.

Step Three: Conduct Assessment for Degree of Landscape Character

One of the Park Service's goals is to retain and, where appropriate to reinforce the historic landscape character. In order to interpret the continuum of landscape history identified and assessed through the five periods, the Park was assessed in terms of the degree to which it retains the historic character described in Step Two. Figure 37 shows the results of applying the rating system. There are areas in the western end of the Park where the spatial organization, land use, small-scale components (stonewalls and hedgerows) retain the "Highest" degree of historic character found in the Park. These areas comprise 9.8% of the landscape. Figure 38 illustrates this highest degree historic character. The results of the assessment for the Park landscape are shown in Figure 39.

Rating	Description
Highest Degree of Historic Landscape Character	Agricultural land use within historic stone wall framework Historic field patterns outlined by stone walls and/or hedgerows intact Clusters of historic structures or single historic structures present
High Degree of Historic Landscape Character	Open spatial organization reflects historic character but area is not in agricultural land use. Historic field patterns discernable by stone wall fragments. Historic structures present
Moderate Degree of Historic Landscape Character	Historic agricultural character masked by forest cover Historic field patterns discernable by stonewall fragments Few or no historic structures
Low Degree of Historic Landscape Character	Modern structures, roadways, parkinglots or powerlines present Few or no stone walls Few or no historic structures

Figure 37: Results of Assessment for Degree of Historic Landscape Character describing cultural landscape features and how they retain or reinforce the Park's historic character.

Figure 38: Highest Degree of Historic Character illustrated by open, agricultural landscape in the western end of the Park.

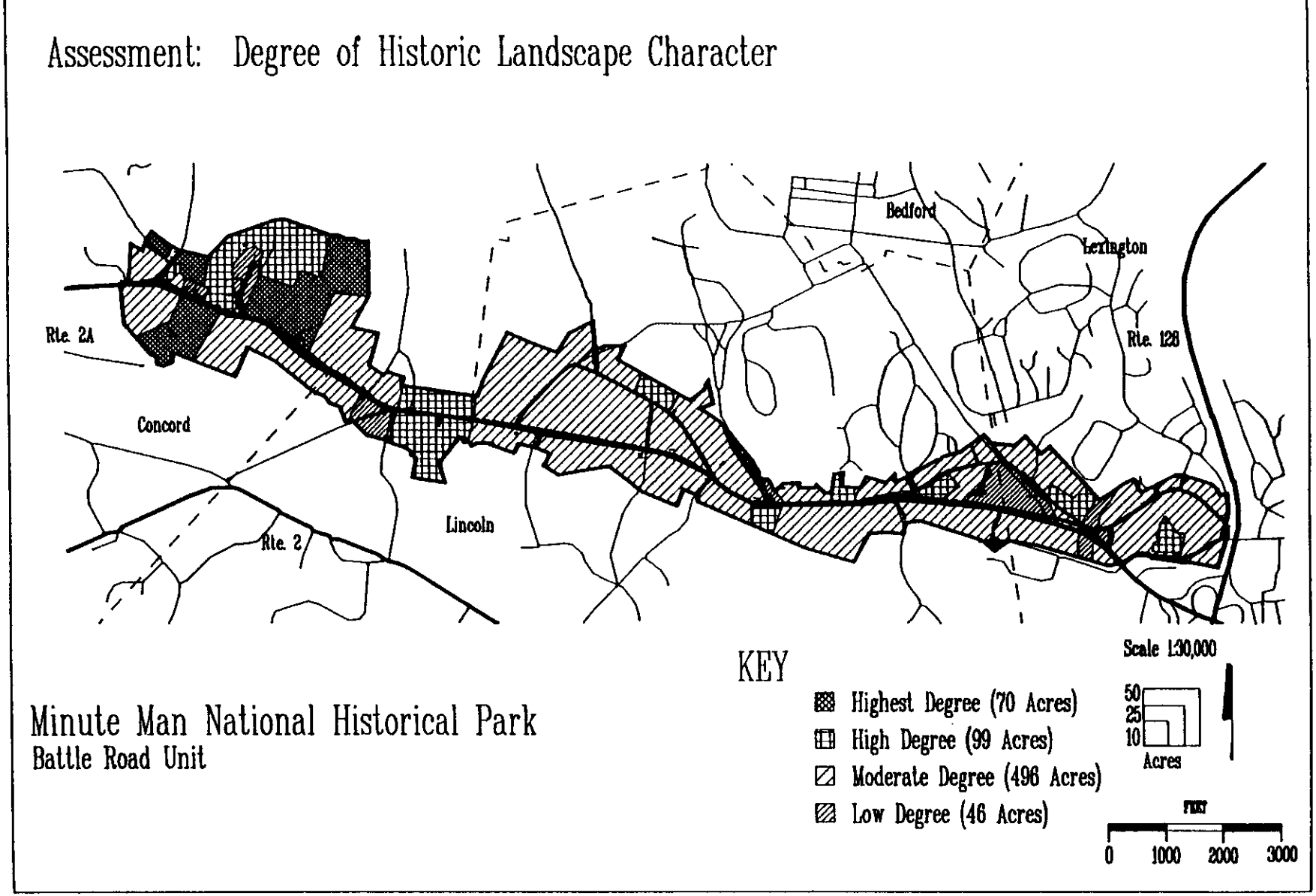


Figure 39: Assessment: Degree of Historic Character Map showing 9.8% of the landscape is rated as "Highest Degree," 14% rated as "High Degree," 70% is rated "Moderate Degree" and 6.2% is rated as "Low Degree."

Areas with a "High" degree of historic character are located near many of the Park's historic structures. For example at Meriam's Corner and Brooks Farm and Hartwell Tavern. While these areas have a relatively high degree of open spatial organization, contain historic structures and stone walls, they are not in agricultural land use, another critical feature of the historic character. 70% of the Park has a "Moderate" degree of historic character because while there are remnants of the stone wall framework, the open spatial organization, a critical feature of the historic character, is masked by second-growth forest cover.

Areas with a "Low" degree of historic character are located primarily in the eastern end of the Park, although a small area is also found near Meriam's Corner as shown in Figure 38. Specifically, Minute Man Vocational Technical High School and Hanscom Air Force Base structures detract from the historic character as do the parking lots and power lines located in that area. Figure 40 illustrates this type of landscape.

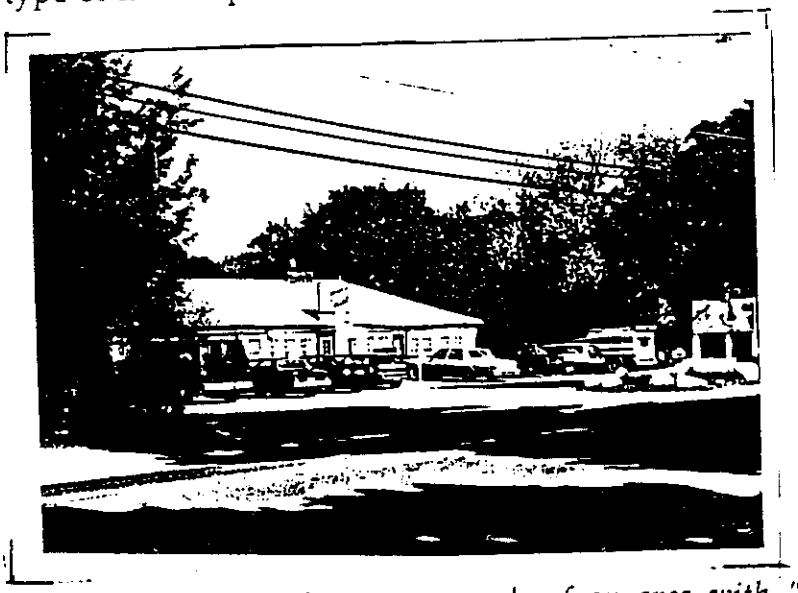


Figure 40: The Willow Pond Kitchen, an example of an area with "Low Historic Character" because of its modern structure and parking lots.

Step Four: Management Guidelines

Using the results of the assessment conducted in Step Three, management guidelines were developed based on the degree of existing historic character as shown in Figure 41. Park-wide recommendations which include retaining and reinforcing historic landscape character by retaining areas currently in agriculture and by reintroducing agriculture within current stonewall framework to

maintain historic agricultural field patterns. In addition to the overall Park-wide guidelines, specific recommendations are to reinforce historic character for each of the four categories described as a result of the assessment using management options consistent with *Draft Guidelines for Treatments of Historic Landscapes* (U.S. Department of the Interior, 1992).

Rating	Description
Highest Degree of Historic Landscape Character	Least amount of intervention needed to retain historic character. Character-defining features should be protected.
High Degree of Historic Landscape Character	Some intervention needed to retain and reinforce historic character. Existing cultural resources should be protected, replacement of missing character-defining features should be considered.
Moderate Degree of Historic Landscape Character	A higher degree of intervention is needed to retain and reinforce historic character. Existing cultural resources should be protected and replacement of missing character-defining features should be considered.
Low Degree of Historic Landscape Character	Since only drastic measures such as "reconstruction" and "restoration" could reinforce historic character, a better approach is to screen these areas to minimize their impact on the surrounding landscape.

Figure 41: Management Guidelines for Landscape History showing recommendations for retaining or reinforcing historic character within each of the four assessed categories.

3.3 Application of Running Battle Methods

The results of the three-step procedures presented in the Methods Chapter are as follows:

Step One: Identify the Events of the Battle in the Landscape Context:
With the help of Park Historian, Doug Sabin, the chronology of the Running Battle was mapped in terms of some of the "Features and Areas" described in Bulletin #40. Figure 42, shows where these features and areas in association with the Running Battle (lettered A - O) were located[13]. As the map shows, the battle was fought primarily along the Battle Road. It was a lineal battle, with scattered areas of fighting all along its length.

Step Two: Conduct Assessment for Importance to Interpreting the Battle
The landscape was assessed in terms of importance to interpreting the battle, as described in the Methods Chapter. Figure 43 shows the results of the assessment and Figure 44 shows where these places are located in the Park. It was found that there were ten places in the Park rated as having the "Highest Importance to Interpreting the Battle. These areas cover roughly 10% of the landscape, and are scattered throughout the Park. It is difficult to map these places however because they are only of a generalized spatial nature. It must be remembered that their boundaries are "fuzzy" i.e. they are located approximately where actions took place, but the fighting may not have been restricted to the shaded polygons.

In addition, the routes used by both the British and the Colonists are rated as having "High Importance to Interpreting the Battle." The Battle Road and the approximately located "Routes Used by Colonists" comprise these areas. Finally, the remaining landscape context is rated as having a "Moderate Importance to Interpreting the Battle makes up 90% of the landscape.

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[13] See Appendix F: The Running Battle for text corresponding to map

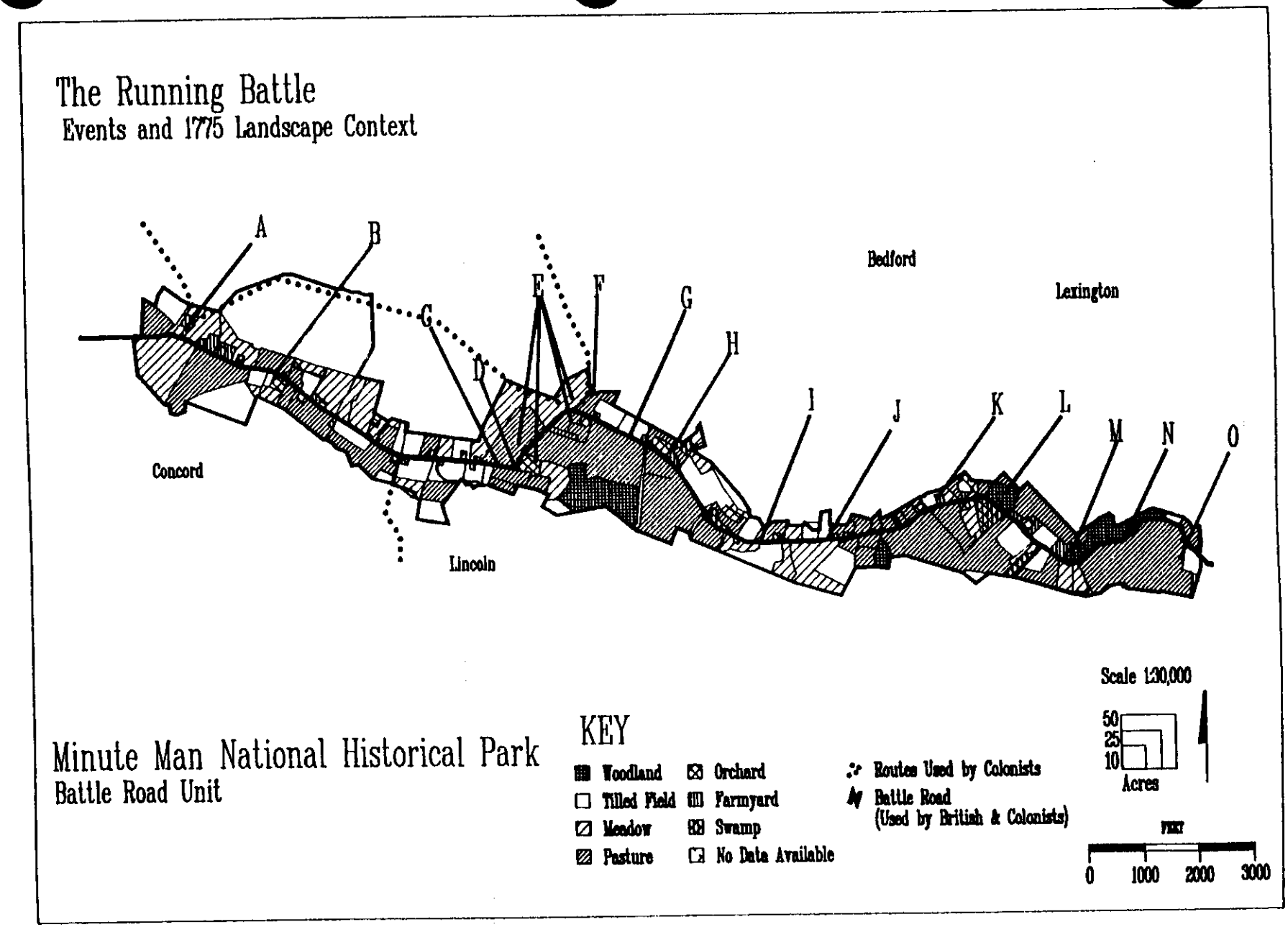


Figure 42: The Running Battle, Events and 1775 Landscape Context. This map illustrates "Features and Areas" associated with the Running Battle as well as the 1775 land use.

Rating	Description
Highest Importance to Interpreting the Battle	**Features and Areas Associated With the Battle** Engagement Areas: Meriam's Corner Hardy's Hill Bloody Angles Hartwell Farm Nelson Road Area "Parker's Revenge" Area "The Bluff" Fiske Hill Commander's Observation Points and Their Viewsheds: Captain Loaman's View Areas Associated with Pre-battle Events: Paul Revere Commemorative Site
High Importance to Interpreting the Battle	**Troop Movements:** Routes used by Colonists Routes used by the British.
Moderate Importance to Interpreting the Battle	**Landscape Context**

Figure 43: Results of the Assessment for Importance to Battle Interpretation showing ten places rated as having the "Highest Importance to Interpreting the Battle." These places are scattered along the Battle Road and comprise approximately 10% of the landscape. The routes used by the Colonists and the British are rated "High Importance to Interpreting the Battle" while the remaining 90% of the landscape is rated as "Moderate Importance to Interpreting the Battle."

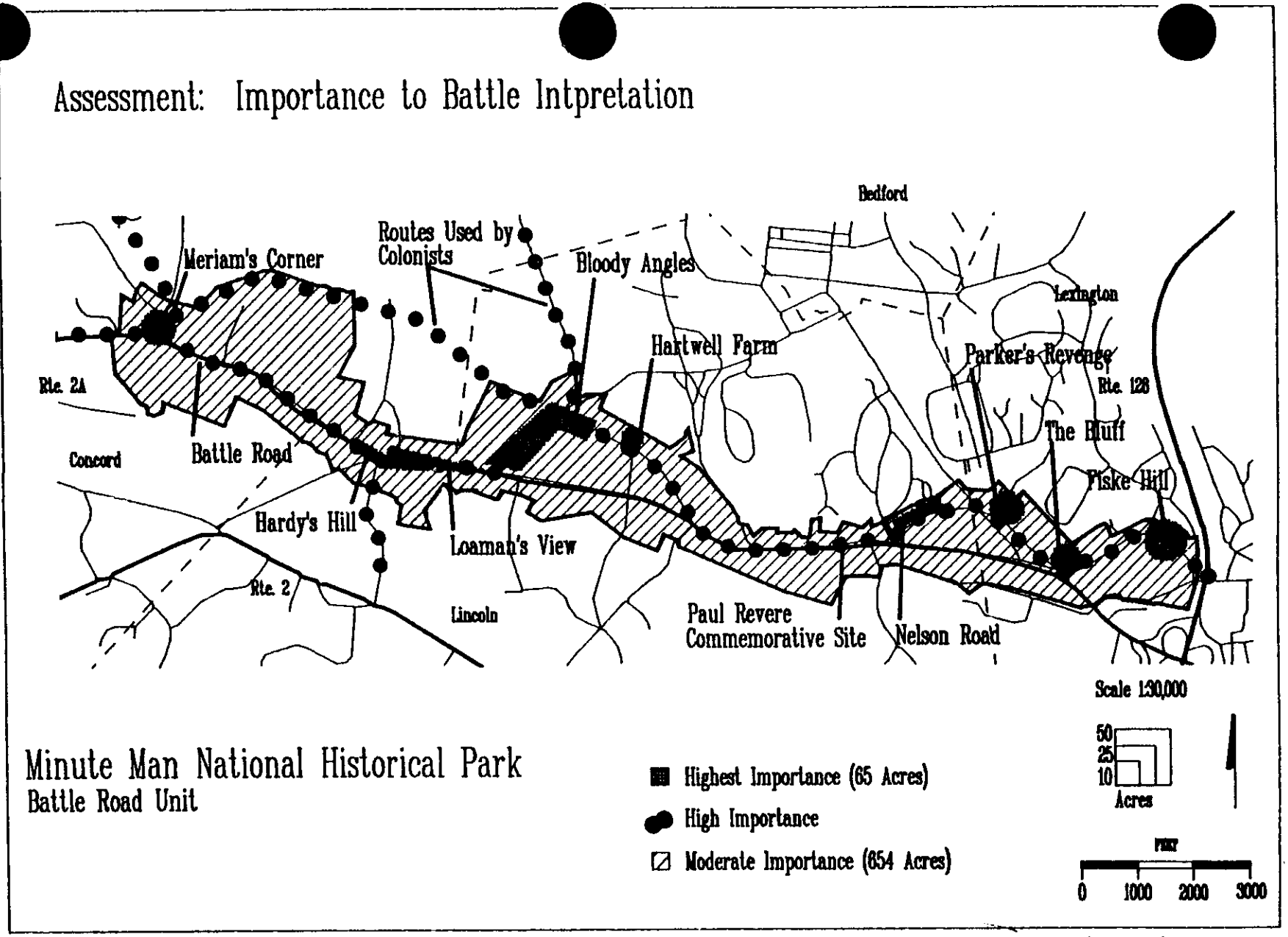


Figure 44: Results of the Assessment for Importance to Battle Interpretation showing ten places rated as having the "Highest Importance to Interpreting the Battle." These places are scattered along the Battle Road with concentrations around Bloody Angles and Nelson Road. Approximately 10% of the landscape falls into this category. The routes used by the Colonists and the British are rated as having "High Importance to Interpreting the Battle." As the landscape context, the remaining 90% of the Park is rated as having "Moderate Importance to Interpreting the Battle."

Step Three: Management Guidelines

In the context of the overall rehabilitation[14], management options were described as in the previous section for retaining and reinforcing historic character. The object was to focus attention on those areas assessed as "Highest Importance to Battle Interpretation" for the highest degree in intervention. Figure 45 describes the specific treatments.

Rating	Description
Highest Importance to Interpreting the Battle	The most intervention is needed in these areas in order to interpret the battle. Consideration should be given to reintroducing missing character-defining features that are documented sufficiently .*
High Importance to Interpreting the Battle	A high degree of intervention is needed in some of these areas. Consideration should be given to reintroducing missing character-defining features that are documented sufficiently .*
Moderate Importance to Interpreting the Battle	Agricultural reintroduction should be taken in these areas to help interpret the landscape context of the Running Battle.

* See Draft Guidelines for the Treatment of Historic Landscapes section on rehabilitation pg. 45-66 and requirements for historic documentation for replacement of missing features.

Figure 45: Management Guidelines for Running Battle History. In the areas with the Highest Importance to Interpreting the Battle agricultural reintroduction is recommended to reinforce the historic character. In the areas with Moderate Importance to Interpreting the Battle a restoration of the Battle Road at Virginia Road is recommended. In the areas with Moderate Importance to Interpreting the Battle, again, agricultural reintroduction is recommended to reinforce historic character.

14 To reiterate, the goal of rehabilitation is to retain the historic character of a property while allowing for contemporary use.

3.4 Application of Agricultural Resources Methods

The agricultural resources methods outlined in the previous chapter were applied to the cultural landscape of Minute Man National Historical Park with the goal of developing management guidelines that will lead to the reintroduction of agriculture into the park setting. Potential agricultural fields were delineated within the Park's landscape, and assessed for suitability for agricultural reintroduction. The fields were rated most suitable, suitable, and least suitable.

106.3 acres of land, or 14.2% of the Park was determined most suitable, while 75.2 acres (10%) are deemed suitable. 114.0 acres, or 15.2% are least suitable for agricultural reintroduction, suggesting that those areas, as well as all areas unsuitable for agriculture, be managed by the National Park Service for interpretive farming (not leasing) or other interpretive goals. Approximately 10% of the Park is currently used for agricultural purposes. The remaining area of land, making up approximately 60% of the Park, is unsuitable for agricultural uses. These areas consist mainly of wooded wetlands.

The following results were obtained from each step of the methodology:

Step One: Identification

The resources existing in the landscape were identified in a series of substeps.

Substep 1: Soils

- **Canton** soils (102.1 acres) are extremely stony or bouldery and are likely to erode due to slope factors.
- **Deerfield** soils (47.1 acres) are nearly level to gently sloping, deep and moderately well drained.
- **Freetown** soils (12.2 acres) are hydric, and would therefore be considered wetlands if hydrophytic plants were present and hydrologic conditions met.
- **Hinckley** soils (53.8 acres) are excessively well drained and have a tendency toward droughtiness. They are an excellent source of gravel.
- **Merrimac** soils (15.4 acres) are gently sloping, deep soils with a tendency toward droughtiness.
- **Montauk** soils (129.1 acres) have major limitations. The limitations are slope, stoniness and presence of a hardpan at 18 to 36 inches.

• **Paxton** soils (13.9 acres) are deep, well-drained till soils with some erosion potential due to texture. The presence of a slowly permeable hardpan at 15 to 38 inches can be a limitation.
• **Raynham** (27.9 acres) is a deep, poorly drained, heavy silt loam. With a seasonal high water table at 6 to 18 inches, it is classified as a hydric soil.
• **Scarboro** is another poorly drained hydric soil series that constitutes 66.1 acres of the Park.
• **Scio** soils (29.9 acres) are deep, moderately well drained, very fine silt loam with a seasonal high water table of 18 to 24 inches.
• **Scituate** soils (7.0 acres) tend to be extremely stony, and with a hardpan at 18 to 24 inches that limits permeability, land uses of this soil are limited due to wetness.
• **Swansea**, another hydric soil series, most likely classified as wetland, constitutes 21.5 acres of Minute Man NHP.
• **Wareham** soils (31.2 acres) are also hydric. A high water table is present at 6 to 18 inches for up to nine months of the year.
• **Windsor** soil (78.7 acres) tends towards droughtiness as it is excessively drained loamy sand with slopes up to 8-15%.
• **Woodbridge** series (22.7 acres) are steep, stony, moderately well drained soils located on drumlins with a substratum at 15 to 38 inches which has slow or very slow permeability (SCS, 1991, pp. 17-28).

Substep 2: Wetlands and their 100' buffers -- 222.2 acres of wetlands (more than 30% of the Park) were identified in Minute Man NHP, with 163.5 acres of wooded wetlands and 58.5 acres of non-wooded wetlands, vegetated with species including cattail *(Typha latifolia)*, reed canarygrass *(Phalaris arundinacea)*, sedges (*Carex*, spp.), soft rush *(Juncus effusus)*, and mannagrass *(Glyceria canadensis)*.

Substep 3: Ponds, Rivers, Streams and their 100' buffers -- Ponds, rivers and streams in Minute Man National Historical Park account for 14.3 acres of land.

Substep 4: Current land cover/land use -- The current land use/land cover of the Park was interpreted from aerial photographs by the University of Rhode Island Department of Natural Resources Science Environmental Data Center.

The land cover data are summarized in their report, entitled "Ecological Reconnaissance of the Minuteman National Historical Park" (August, LaBash and Keniski, 1993, pp. 11-12). 100' buffers were placed around the 31 historic structures for future archaeological investigations.

Substep 5: Place-oriented information -- At this stage, place-oriented information from local experts was added. Place-oriented information, or non-factor based information, is either non-spatial or of a generalized spatial nature. Place-oriented information can also be anecdotal in nature, and is therefore not readily mappable. The information can include relationships between specific combinations of landscape features that vary with specific combinations or over time.

Place-oriented information was identified by pomologist and Agricultural Extension Specialist Dr. William Coli and Landscape Historian Brian Donahue. Additional place information was identified in a public workshop, held on February 18, 1993, at the Concord Town House (see Appendix H for more details). Figure 46, the middle section of Minute Man NHP, is representative of the type of place-oriented information identified for the whole cultural landscape.

Through the history of the landscape, agricultural activities and values changed, as did the types of land used for agriculture. For example, as the demand for hard cider increased, forested land was cleared for apple orchards, which could be grown on steep, stony, marginal soils. The National Park Service would like to rehabilitate these orchards to assist in interpreting the cultural landsape, although these areas may not be attractive for leasing (Ahern, et. al., 1993).

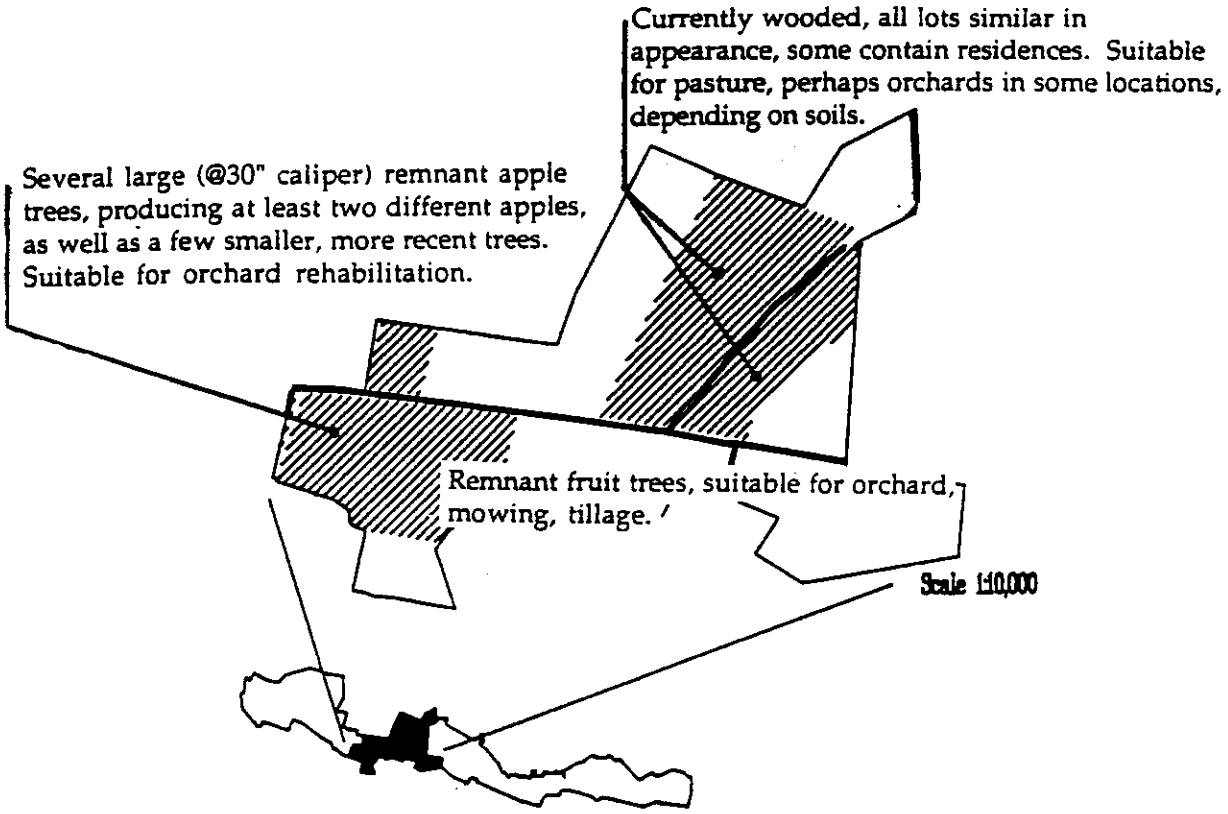


Figure 46: Place Oriented Information. This is an example of agricultural resource information that is added by local experts, information that is not available from traditional sources of information, such as the Soil Conservation Service.

Step Two: Assessment

Step Two of the agricultural resource procedure first determined which land was unsuitable for farming, and was therefore eliminated. Potential fields, after being delineated by existing physical constraints such as roads and topography, were assessed for soil capability class rating and present land use/land cover.

Substep 1: Eliminative Procedure -- Wooded wetlands and their 100' buffers, 100' buffers of ponds, rivers and streams, and other sensitive areas in which farming should not take place were eliminated from consideration as

potential agricultural areas. This land accounted for 426.6 acres (58.8%) of Minute Man NHP (see Figure 47, the map "Areas Eliminated from Potential Agricultural Reintroduction").

Substep 2: Assessment Matrix/Rating -- Fields were assessed for agricultural potential according to the SCS capability class rating. Based on these ratings, the soils of Minute Man National Historical Park are as follows: 78.8 acres of Capability Class II, 85.9 acres of Capability Class III. These soils are the "most flexible" in the Park: that is, they are suitable for the greatest variety of agricultural uses. There are 15.3 acres of Capability Class IV soils and 15.3 acres of Capability Class V soils. These soils are considered "flexible," suitable for some agricultural uses. In the "least flexible" category, 0.1 acres of Class VI soils and 80.3 acres of Class VII soils exist (see Figure 48, the map "Existing and Potential Agricultural Reintroduction Areas"). There are also 22.7 acres of land not eliminated, but deemed "unsuitable" for agriculture by SCS Capability Class ratings.

The same fields were then assessed for present land use, with present agricultural land, old fields, and mowed areas possessing few constraints for agricultural reintroduction. Non-wooded wetlands were considered to have some constraints, with only certain types of farming appropriate, such as the haying of the natural wetland grasses. Forested areas and wooded wetlands were considered to have many constraints. Developed areas (buildings, roads and parking lots) and water were considered unsuitable for agriculture.

Potential fields were assessed by both land use and soil capability class together. As a result (see Figure 49, the map "Agricultural Resource Assessment/Management Guidelines"), 106.3 acres of land in Minute Man National Historical Park were determined to be most suitable for agriculture, while 75.2 acres are suitable. 114.0 acres are least suitable, and 21.2 acres unsuitable. Due to missing land use information, the suitability of 30.6 acres are unknown.

Substep 3: Place-Oriented Information Additions: Expert information from William Coli, Brian Donahue and some farmers from the Minute Man NHP area were added in this substep. Improvements to certain areas of land, such

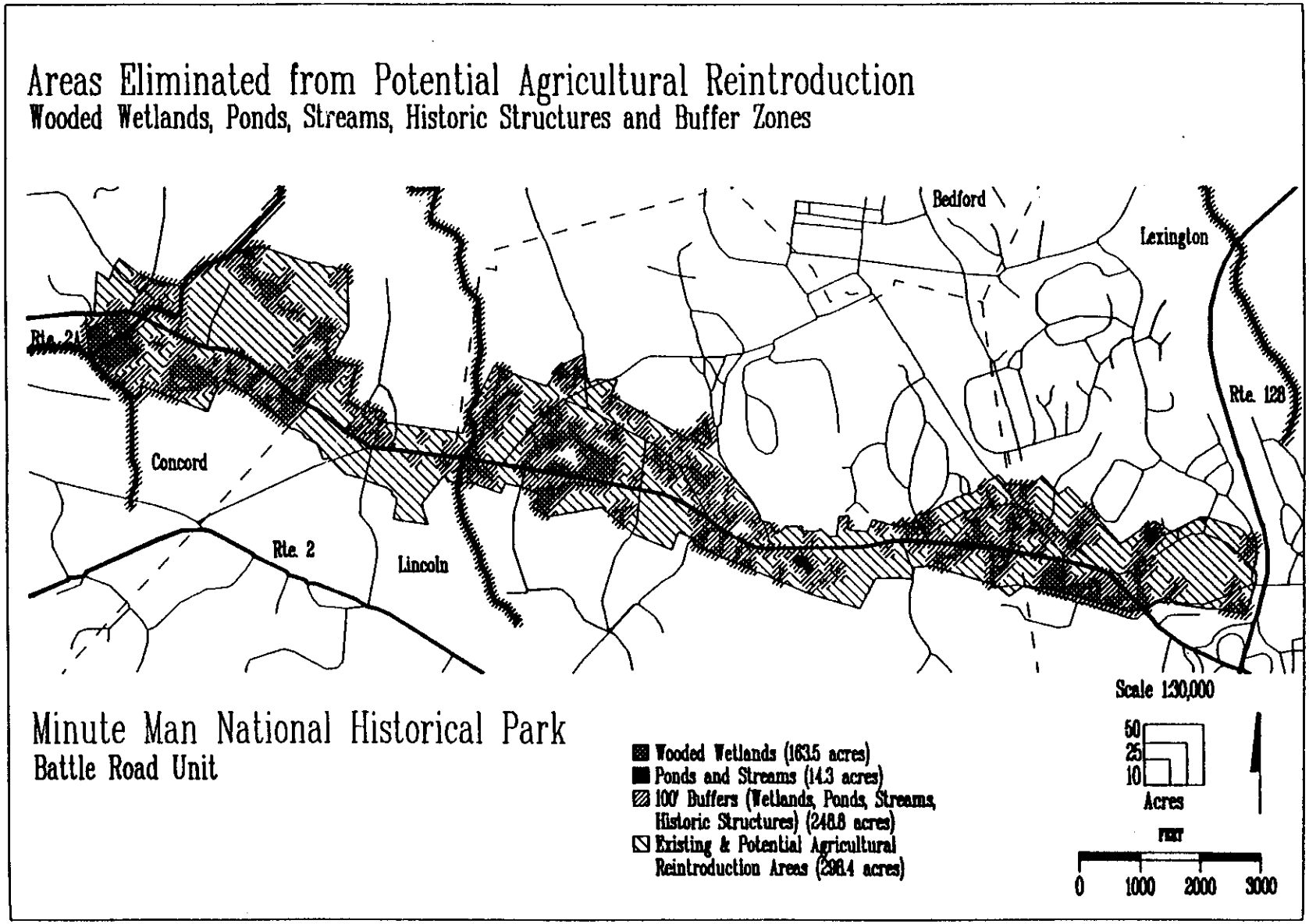


Figure 47 *Areas Eliminated from Potential Agricultural Reintroduction*

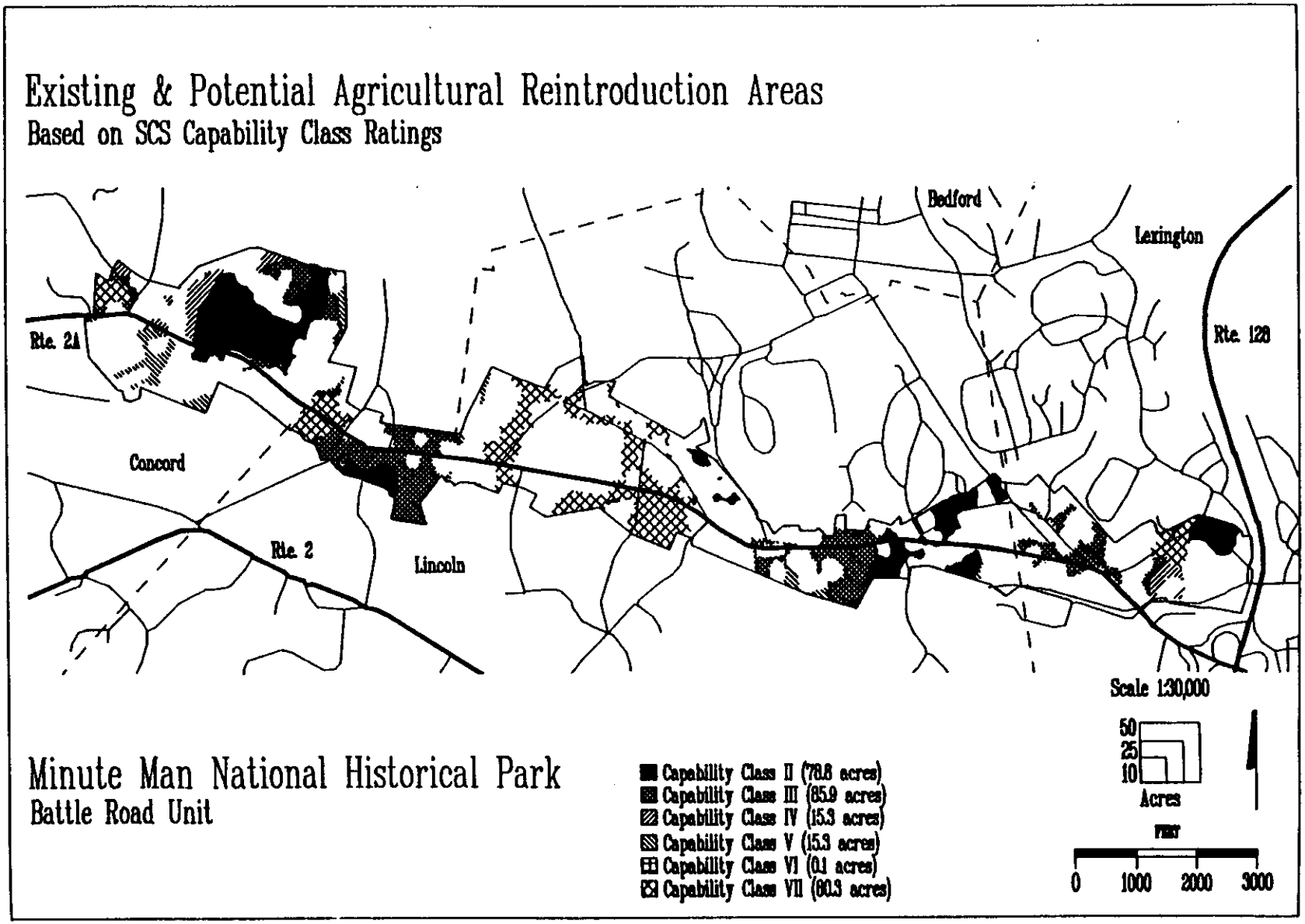


Figure 48: Existing & Potential Agricultural Reintroduction Areas

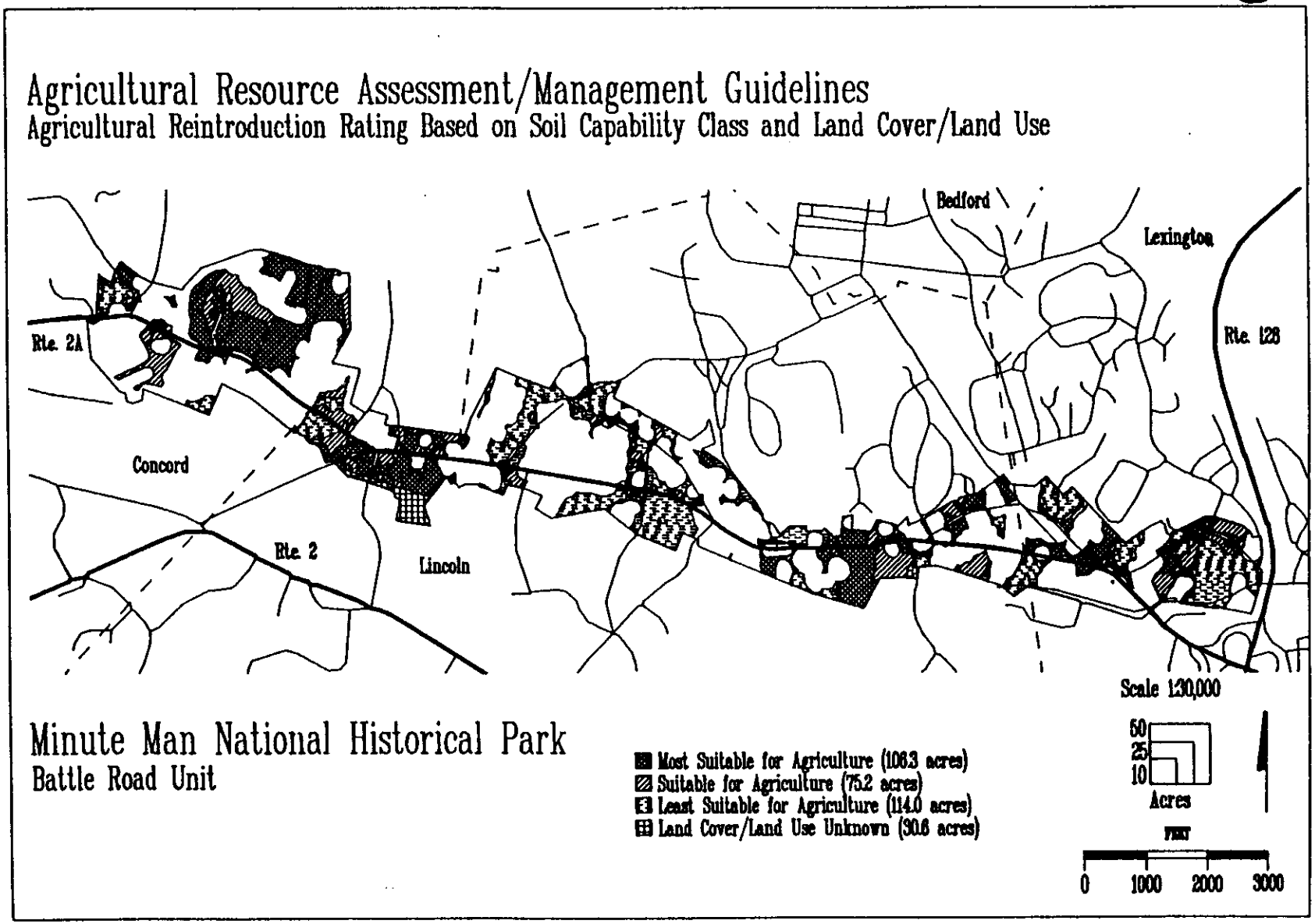


Figure 49 Agricultural Resource Assessment/Management Guidelines

as where stones were removed from the soil or drainage ditches added, boost the ratings of particular fields. For example, Coli and Donahue found an overgrown old pasture in the Meriam's Corner area that could be managed as a woodlot, or with some thinning, could be rehabilitated as a pasture. In another pasture, they found animal feed bunks in place, and the barbed wire fence in good condition. Near the Brooks Tavern, they found remnant apple trees, and determined the area suitable for orchard rehabilitation.

Step Three: Management Guidelines

Management guidelines for the Park's agricultural resources were based on the above identification and assessment procedures. For example, in areas where the land has the least constraints and are therefore the most suitable for agriculture, continuation of existing farming and reintroduction of agriculture to the cultural landscape can take place. Land with the most constraints, and therefore not optimal for agricultural reintroduction, should be managed for other cultural or natural landscape resource purposes, such as historical interpretation, wetland management, or wildlife habitat.

The western end of the Park, including the most actively farmed areas of the Park today, are the most suitable for agriculture. Large areas of land deemed "Most Suitable" are located in the Concord part of the Battle Road Unit, and in areas in Lincoln, just over the Concord-Lincoln border, south of Rte. 2A. Additional "Most Suitable" lands are located near the Paul Revere Commemorative Site. The map shown in Figure 49, "Agricultural Resource Assessment/Management Guidelines," illustrates where land is most suitable, suitable, or least suitable for agriculture.

3.5 Application of Natural Resources Methods

This section summarizes the application of the methodology to the cultural landscape of Minute Man NHP. The Park's natural resources were identified, assessed and management guidelines developed for three types of natural resources that exist in the Park: natural history and physiography; wildlife and their habitats; and wetland and riparian systems.

3.5.1 Application of Natural History and Physiography Method

Based on the premise that the cultural landscape of Minute Man National Park is the result of human interaction with the area's natural landscape, the history of the land must be understood in order to fully comprehend the cultural landscape. Therefore, the natural history of the landscape, including the surficial geology, soil formation and topography was identified, assessed, and management guidelines developed for the cultural landscape.

Step One: Identification

The history of the land was described to further understand the cultural landscape and determine the best places to interpret the formation and physiography of the natural landscape.

Substep 1: Natural History -- Although the landscape of New England looks quite flat from a distance, it actually consists of hundreds of square miles of rolling hills and valleys, created by millions of years of geologic action. The earth's tectonic plates converged parallel with the Atlantic Coast, causing sheets of rock to fold, fault and rise high above their original elevations. As the plates converged in an east-west direction, the resulting ridges run roughly north-south, parallel to the plate edges (see Figure 50).

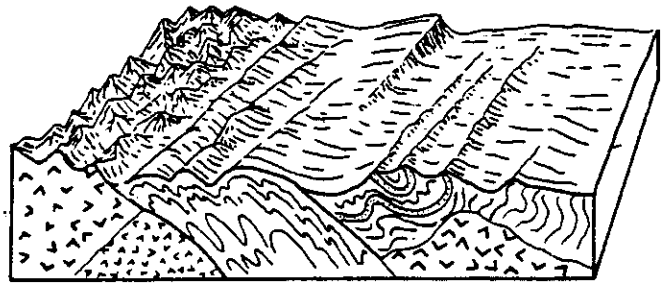


Figure 50: Evolution of the Southern New England Landscape. This diagram shows the early stages of the development of the landscape after a period of mountain building (from Jorgensen, 1977, p. 22).

How the landscape was shaped during the intervening years is not completely known, but geologists theorize that over a period of fifteen million years, the mountains formed by the plate convergence were slowly eroded by wind, water and ice until flattened almost to sea level. This resulting plain, or peneplain, contains streams and occasional mountains. The mountains are made of the hardest bedrock, granite, gneiss and schist, and have therefore been able to resist the years of erosion (see Figure 51).

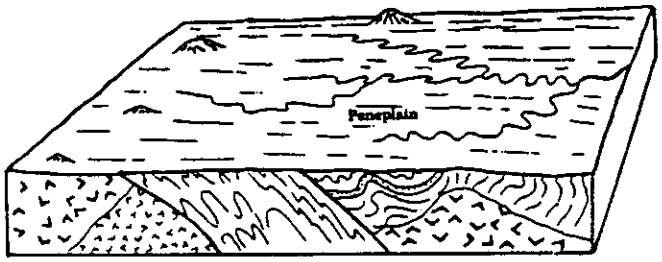


Figure 51: Continued Evolution of the Southern New England Landscape. The same area is shown after a long period of erosion, as the streams have gradually reduced the land to a peneplain (from Jorgensen, 1977, p. 22).

Within the past eight million years, the peneplain was again pushed upward, from 200 feet along the coast to 2,000 feet farther inland. As a result, the streams and rivers quickened in speed and began to carve the landscape into a system of hills and valleys (see Figure 52).

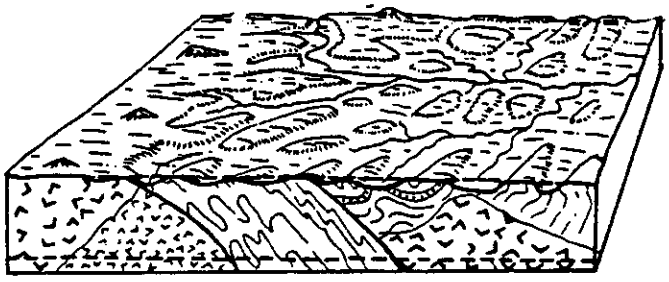


Figure 52: Continued Evolution of the Southern New England Landscape. After a period of peneplain uplift, the streams carve the peneplain surface into an area of hills and valleys (from Jorgensen, 1977, p. 23)

In addition to tectonic and erosive activities, glaciation has also shaped the landscape of New England. Approximately two million years ago, a slight change in the climate started the Pleistocene Ice Age in northern Canada, marked by a series of glaciations. The Wisconsin glaciation was the last in the series, and shaped the landscape of New England that we see today. The glacier began to retreat northward 15,000 years ago, and 8,000 years ago it receded back to northern Canada (see Figure 53).



Figure 53: Map of North America Showing the Extent of the Pleistocene Ice Age Approximately 2,000 Years Ago (from Jorgensen, 1977, p. 83).

As the glaciers advanced and then retreated, they dislodged some of the solid bedrock and dragged the pieces of rock, depositing them across the landscape. These "glacial erratics" are abundant in the landscape of Minute Man National Historical Park, and were used as cover by the Minute and Militia Men during the Running Battle against the British Army. Also present in the landscape surrounding the Park, "drumlins" were also created by glacial action. Drumlins have a unique topography, as they are smooth, rounded hills, usually less than a mile long and rarely rising more than 250 feet above the land (see Figure 54). They are generally composed of till with a high percentage of clay.

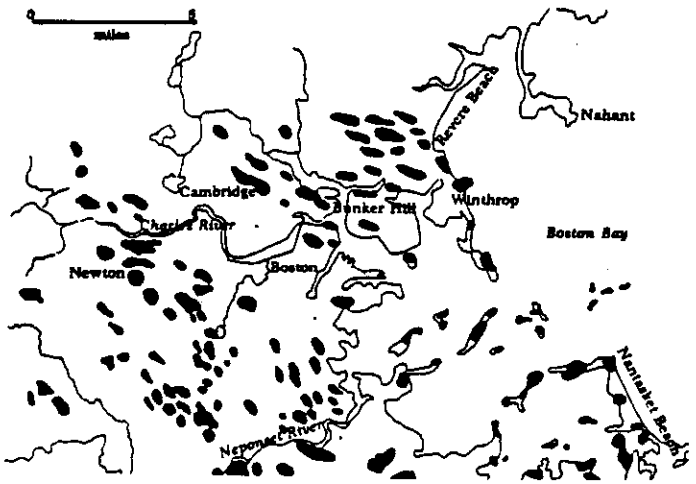


Figure 54: Drumlins in the Landscape Near Minute Man NHP. The most famous drumlin in the area is Bunker Hill, the site of a Revolutionary War battle (from Jorgensen, 1977, p. 107).

Glacial lakes were also a result of glaciation. A glacial lake filled the area of Concord, Massachusetts, where the western end of Minute Man NHP is located, and another was located just to the south, in the Sudbury River Valley (see Figure 55). The western end of the Park, the area located in the town of Concord, was once under water. Glacial Lake Concord, as shown in the figure below, as well as Glacial Lake Sudbury, left deposits in the soils at the western end of the Battle Road Unit. Today, these are some of the most productive agricultural soils in Minute Man NHP.

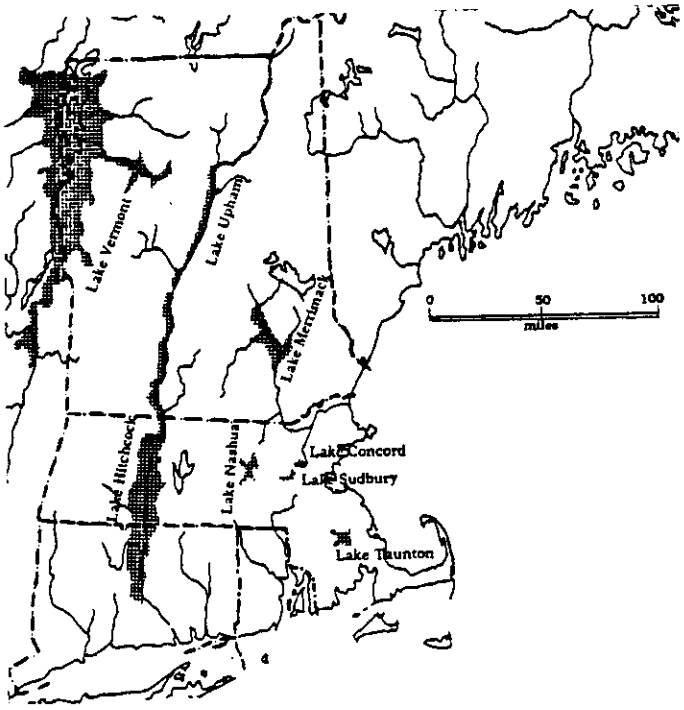


Figure 55: New England's Major Glacial Lakes. The western end of Minute Man NHP is located at the eastern extents of Lake Concord (from Jorgensen, 1977, p. 127).

Just as the glacial history resulted in a certain geologic and physiographic landscape, the glaciers also affected the vegetation. After the glaciers retreated, tundra plants and then forests covered the landscape. The forest returned within 2,000 years after the glaciers receded, and have covered New England more or less since then. The geologic history of the region created conditions that support a specific vegetative community (Griscom, 1949; Kricher, 1988). As Griscom states, "the geology and climate come first. The underlying rocks and soils condition the flora. The climate also controls the length of the vegetative season, and therefore the composition of the flora" (Griscom, 1949). Climatic change, species immigration, natural catastrophes and human impact, both Native American and especially European immigrants, have caused changes since. The latter group began to clear the land extensively for agricultural purposes. Whereas the landscape of southern New England is 80-90% forested today, at the height of clearing in the late 1700's, the landscape was only 10-20% forested. As the forests began to

grow again after agriculture was abandoned in the 1800's, man once again had a major impact on the vegetation of the area: almost every acre of land has been logged at least once and usually two or three times (Jorgensen, 1977, p. 142).

Minute Man NHP is located in the Eastern Deciduous Forest Province of North America. This area consists mostly of deciduous forest. The dominant forest element has been the oak-chestnut-hickory association (Jorgensen, 1977; Eaton, 1974) with an increasing amount of species normally found in the cooler upland forests of western and northern New England (i.e., hemlock, birch, beech and maple). Eaton states "before the land was cleared by the colonists for general farming, one may visualize a mature forest, broken only by river meadows, swamps, ponds and Indian clearings. Its understory must have been relatively free of shrubs and herbs, except in openings caused by blow-downs, fire, lightning and so on" (Eaton, 1974).

Today, the second- and third-growth forests are different that the mature forests that once grew. "Usually an entirely different community of trees will appear in woodlands that have been logged, cleared, or burned; often centuries will pass before the forest will once more return to its original state" (Jorgensen, 1977, p. 142). First, sun-loving trees that invade the open land grow, eventually giving way to shade-tolerant species. Eventually, the forest reaches a state of equilibrium with a more or less stable ecosystem. The forests of southern New England are in some stage of recovery, representing all of the successional steps.

Substep 2: Surficial Geology -- The surficial geology of the Park was identified and entered into a GIS. The surficial geology of Minute Man NHP consists of water, swamp deposits, till, gravel, silt and sand, and glaciofluvial deposits. Deposits from Glacial Lakes Concord and Sudbury are also present (see Figure 56). This information was obtained from "Surficial Geology of the Concord Quadrangle, GQ-331" (Koteff, 1964).

Substep 3: History and Classification of Soils -- The soils of the New England region and those of Minute Man NHP are a direct product of their glacial origins. Soil is a mixture of particles of three different sizes: clay, sand and

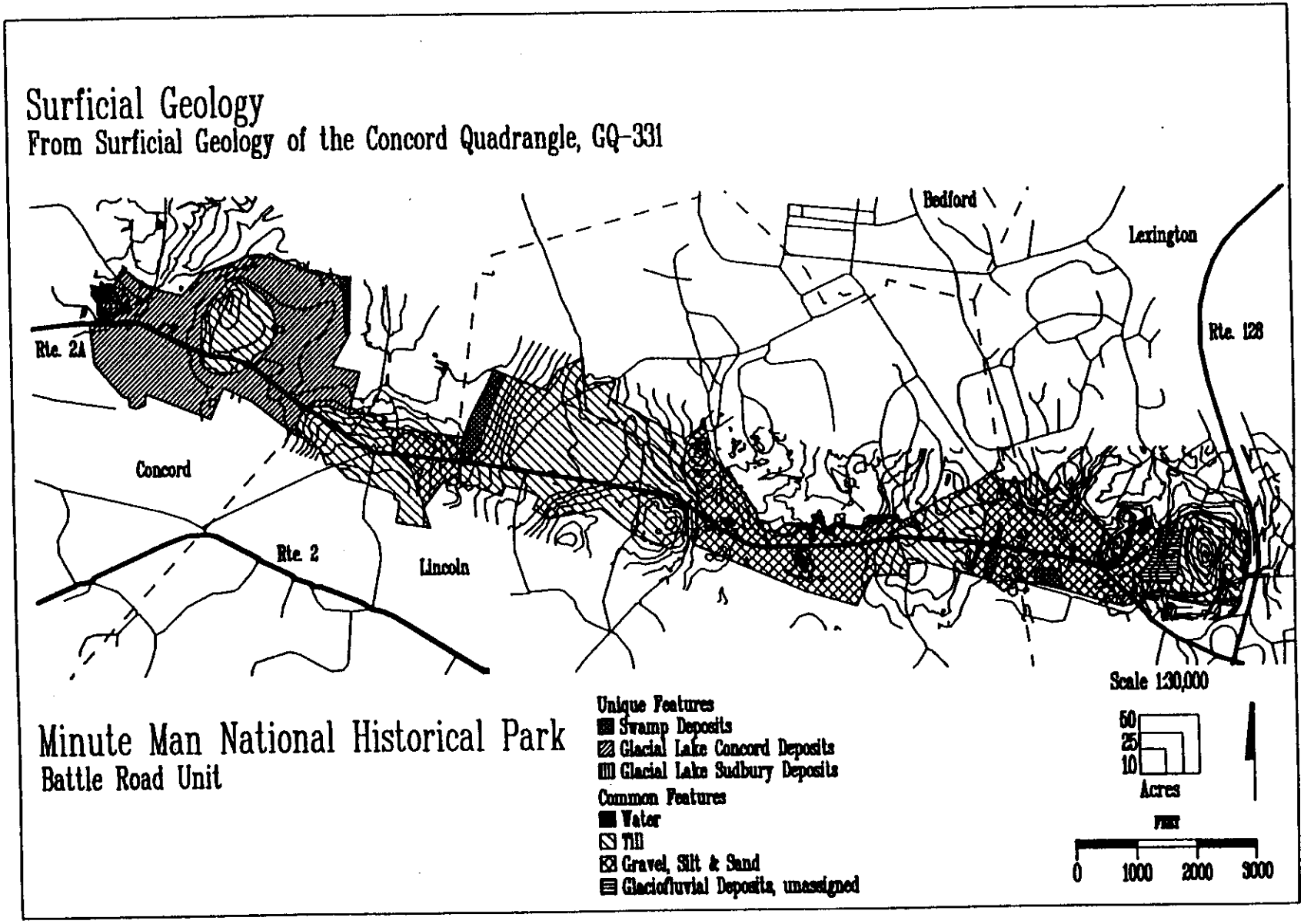


Figure 56: Surficial Geology

silt. In general in New England, larger particles exist, and although they do not contribute to the physical and chemical properties of the soil, they do influence the suitability of agricultural use of the land. As the glacier retreated, it deposited material it had scraped from the landscape during its advance, laying down an unsorted mixture of rubble, known as "till." The till ranges in size from clay particles to boulders. The glacier also dropped "glaciofluvial" (glacial-river) and "glaciolacustrine" (glacial-lake) deposits from flowing and pooling water that melted from the ice. The running water held the smaller clay and silt particles and carried them away, leaving the heavier sand and gravel particles behind. The resulting porous layer is called "outwash." Rainwater sinks through outwash, so the soils created from this material dry out quickly.

The soils of the glacial lake beds are quite different in make up compared to the soils of outwash plains. These lake beds are where the finer clay and silt particles were deposited as the water melting from the ice came to a rest. The soils in these areas, including the Scarboro and Swansea soil series, are poorly drained, and the landscape is characteristically flat. The eastern end of Minute Man National Historical Park is located in Glacial Lake Concord.

When sand, silt and clay are present in equal amounts, the soil is known as loam. When one predominates, for example, clay, the soil is further classified, in this case as clay loam. Loams, such as Wareham, are generally not too wet or too dry, thus supporting the richest variety of vegetation. In contrast, soils that are predominantly sandy or gravely, such as Scituate, are those found in outwash plains and tend to be porous and therefore dry. Silt and clay soils, found on drumlins and in some lake beds, such as Scarboro and Swansea Mucks, tend to be waterlogged.

Substep 4: Topography -- 1" = 100' topographic maps were obtained from Minute Man NHP. Ten foot contour lines were digitized and entered into a GIS for overlay purposes, as shown on the Surficial Geology map (Figure 56, previous page). The lake bed areas, located in the western portion of the Park, are characteristically flat, especially in comparison to the areas of till, which tend to have more of a sloping character.

Step Two: Assessment

The assessment of the natural history and physiography determined that the swamp deposits, Glacial Lake Concord deposits, and glacial erratics that exist in Minute Man National Historical Park are the most significant features in the landscape as they are the most unique. Due to their uniqueness, they are most suitable for natural history and physiography interpretation. The swamp deposits are located near the Concord-Lincoln town line and the Lincoln-Lexington town line. Glacial Lake Concord deposits cover most of the western end of the Park, while glacial erratics are located throughout the Park (but are unmapped due to lack of data and time constraints). See Figure 57.

Component	Rating	
	Most Significant	Significant
Uniqueness	Unique physiographic feature	Common physiographic feature
Features	Swamp Deposits Glacial Lake Deposits Glacial Erratics	Water Till Gravel, Sand & Silt Glaciofluvial Deposits

Figure 57: Natural History/Physiography Assessment Rating Results (see also Figure 56)

Step Three: Management Guidelines

The management guidelines for the cultural landscape of Minute Man National Historical Park, based on the natural history and physiography identification and assessment, indicate that areas of the Park with swamp deposits should be protected as such. No development or alteration of the landscape should take place that will destroy the resources and the interpretive potential of the swamp deposits. However, interpretive farming with methods that do not alter the swamp deposit areas should be considered. The haying of the natural wetland grasses with proper methods can simultaneously protect and aid interpretation of the swamp deposits.

Similarly, the deposits of Glacial Lakes Concord and Sudbury can be interpreted while activities such as farming take place. The flat topography and fertility of the soils of the glacial lake beds is demonstrated through farming land uses. Any land uses that would alter these areas is not recommended.

Glacial erratics can be protected and interpreted with little work. They should not be moved or removed, but almost any land use or rehabilitation of the landscape is compatible with the interpretation of glacial erratic boulders.

3.5.2 Application of Wildlife/Habitats Methods

As almost every landscape has wildlife species and habitats. Which wildlife species and habitats exist in Minute Man National Historical Park? How important are they? What guidelines should be adopted for their proper management? These questions were answered through the application of the Wildlife/Habitats Methods.

Step One: Identification

Substep 1: Identification of Wildlife Species and Their Habitats: At the time of this publication, data were available for only for only a portion of all wildlife species. Therefore, the identification, assessment and management guidelines are based solely on the report entitled "A Survey of Selected Fauna with Recommendations for Wildlife Conservation and Habitat Management," (Windmiller and Walton, 1992, excerpts included in Appendix G). Additional studies, including "A Salamander Survey at Minute Man National Historical Park" by Leslie A. Thomas, Minuteman Park Report Vernal Pool Survey," by Joe Martinez, and "Mammals of Minute Man National Historical Park" by Gwilym S. Jones, are since completed. A similar study of the plant communities in the Park, "Summary of Field Data from Minuteman National Park Plant Communities Study," by Elizabeth Thompson and Jerry Jenkins, is also being completed.

The Windmiller and Walton report indicates sixty-two species of birds were identified in the Park in surveys conducted during the 1992 nesting season. The bird species noted were "typical of the mixed deciduous/ coniferous

transitional forest, second growth fields, agricultural edges, and wetlands of this region of Massachusetts" (Windmiller and Walton, 1992).

In a survey of cold-blooded vertebrates (Windmiller and Walton, 1992), eleven species of amphibians were identified in Minute Man NHP, including four species of salamanders and seven species of frogs and toads. Three common turtle species and five snake species were identified as well, as were eight species of fish. Four additional fish species were identified just outside the Park, and their habitats likely include areas in the Park as well.

During May-July 1992, Minute Man NHP was censused for butterflies (Windmiller and Walton, 1992). Four-hundred and thirty individual butterflies were identified in nine different habitats, representing forty-two species.

Forty-one taxa of aquatic micro-invertebrates (28 insects, 6 crustaceans, 3 mollusks, and 4 worms) were identified in nine wetland habitats (Windmiller and Walton, 1992).

Substep 2: Identification of other areas of similar habitat -- Due to the lack of information, metapopulations and their habitats existing in the landscape surrounding Minute Man NHP were not identified. Further studies must complete this work for a true assessment of the wildlife/habitat resources of the Park. Agencies such as the National Park Service, Massachusetts Natural Heritage and US Fish and Wildlife Service are potential sources of information, and cooperative work between the National Park Service and wildlife researchers outside of the Park should be initiated.

Substep 3: Selection of Target Species -- A public workshop was held on Thursday, February 11th, at 7:30 pm for citizens of Concord, Lincoln, Lexington and Bedford, the towns that surround Minute Man National Historical Park. The workshop participants voiced opinion that the following species should be considered target species for the area of the Park: Indigo Buntings *(Passerina cyanea)*, Nesting Bobolinks *(Dolichonyx oryzivorus)*, Blue Jays *(Cyanocitta cristata)*, Brown Thrashers *(Toxostoma rufum)*, and Rufous-Sided Towhees *(Pipilo erythrophthalmus)*, (see Appendix H). All are

bird species requiring second-growth scrub, hayfield and meadow habitats. These habitat requirements can be met through a system of "long-rotation islands" (Harris, 1984, Chapter 9). This system involves the rotational maintenance of the desired habitats, or, in this case, the maintenance of old field, fallow farm fields and active agricultural areas for these bird species.

Step Two: Assessment

Substep 1: Species Importance Designation -- Mystic Valley Amphipods *(Crangonyx aberrans)*, one of the two state-listed rare invertebrates ("Species of Special Concern," List of Rare Wetlands Wildlife, Massachusetts Natural Heritage and Endangered Species Program, 1993) found in the Park, are small (~5 mm) aquatic shrimp-like organisms globally restricted to eastern Massachusetts and areas of Rhode Island and New Hampshire. The amphipods are typically found in small streams and marshes of coastal plain red maple and Atlantic white cedar swamps. Mystic Valley Amphipods "rarely occur in temporary (vernal) pools that are entirely isolated from more permanent wetlands" (Windmiller and Walton, 1992).

In the Spring of 1992, two separate populations of the amphipods were found in the Park.

Elderberry Borer Beetles *(Desmocerus palliatus)* are relatively large, brightly colored beetles of the bark beetle family. They deposit their eggs in the soft pith of common elderberry. Although the present status of the beetle in Massachusetts is uncertain, museum records indicate that the beetle may have been more abundant in the past (Windmiller and Walton, 1992). One population of Elderberry Borer Beetles was found in the Park.

In addition to the state-listed species, the Massachusetts Natural Heritage and Endangered Species Program maintains a "Watch-List" of species that are not rare but might possible become rare in the future. Two such species, the spotted salamander *(Ambystoma maculatum)* and the common shiner (*Notropis cornutus*, a small minnow), as well as a rare butterfly species, the Frosted Elfin *(Incisalia irus)*, were all identified in the Park boundaries (see Appendix H, Windmiller and Walton, 1992).

Figure 58 provides a sample listing of the species found in the Park and their relative importance. The habitats associated with these species are illustrated in Figure 59.

Species \ Type	Rare/Endangered	Watch-Listed	Target
Mystic Valley Amphipod	X		
Elderberry Borer Beetle	X		
Spotted Salamander		X	
Common Shiner		X	
Frosted Elfin		X	
Indigo Bunting			X
Nesting Bobolink			X
Canada Goose			
Red Spotted Newt			
Black Swallowtail			

Figure 58: Sample of Species Importance Designation Matrix

Substep 2: Habitat Assessment Matrices/Ratings -- Due to lack of information regarding existing wildlife species and their habitats in the region surrounding the Park at the time of this publication, the Habitat Assessment Ratings, a step of the methodology developed in the previous chapter, cannot be determined. In the absence of this information, all habitats containing rare species are considered most significant, while habitats containing watch listed and target species are considered significant for management guideline development purposes. Again, further research is needed to identify the missing information needed to complete the assessment properly. Minute

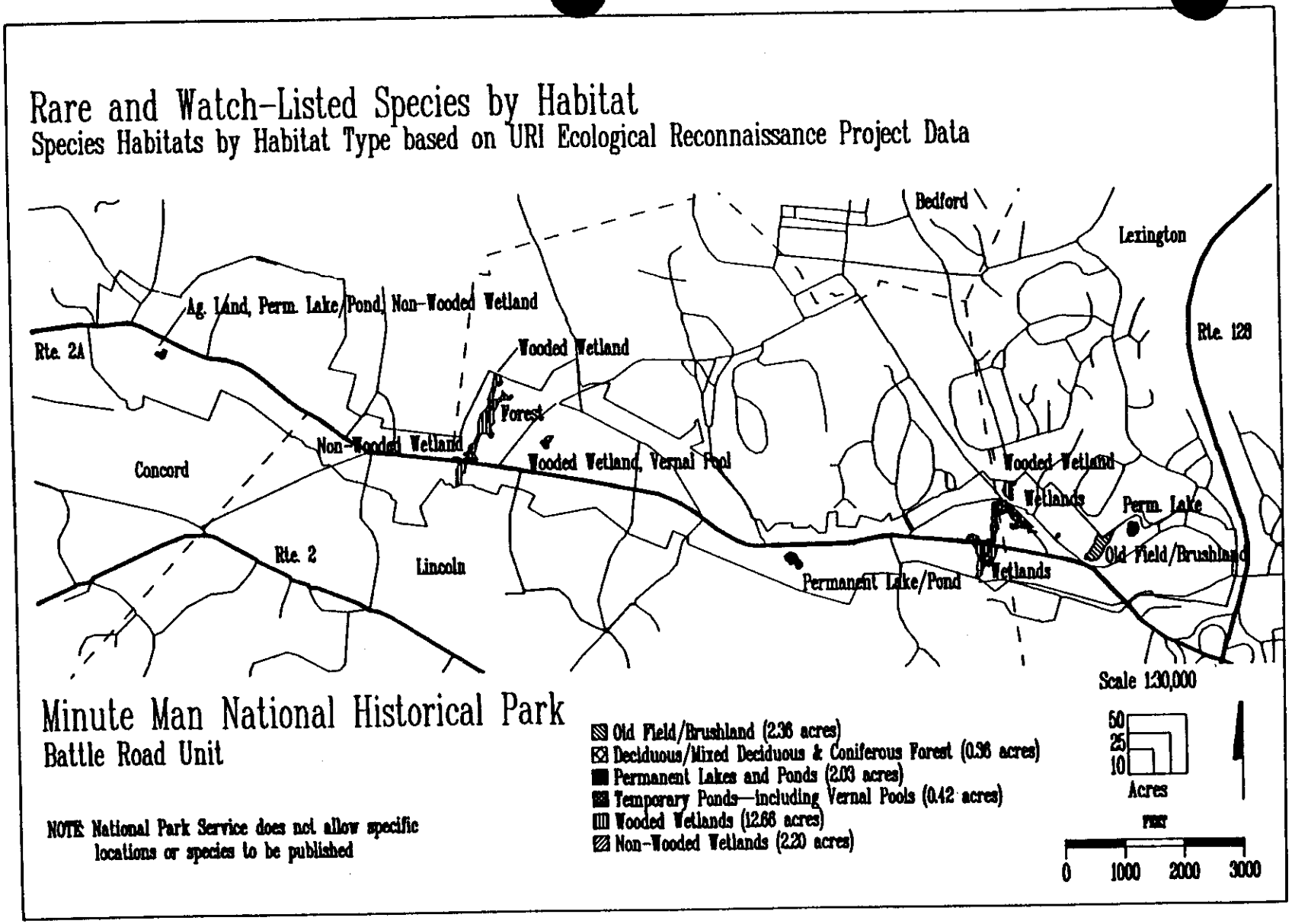


Figure 59: Rare and Watch-Listed Species by Habitat

Man National Historical Park and the four towns must work together to identify this information. Additional sources include town Wildlife Advisory Committees, Massachusetts Natural Heritage and the Audubon Society.

Step Three: Management Guidelines

In response to the question "How can a cultural landscape rehabilitation of Minute Man National Historical Park affect wildlife and their habitats?", the following management guidelines were developed for the Park. Rare species habitats within the Park's boundaries should be fully protected. Full protection involves maintaining the status quo of the vegetation both in the habitat and within a 100' buffer zone surrounding the identified habitat. For vernal pool habitats, a 300' buffer zone is recommended. These and other, more specific guidelines were developed by Brian Windmiller and Richard K. Walton, wildlife biologists. Their recommendations are illustrated in Figure 60, the map "Wildlife/Habitat Management Guidelines." It should be noted, however, that these recommendations are based on a limited survey of biological resources for the Park. The methodology described should be implemented when the remaining inventories are completed to arrive at a more comprehensive assessment and appropriate management guidelines.

In order to provide an increased amount of habitat to identified target species (Indigo Buntings, Nesting Bobolinks, Blue Jays, Brown Thrashers and Rufous-Sided Towhees) the maintenance of a rotation of agricultural fields is needed. Old fields, pasture, fallow fields and active crop land all need to exist within the area to provide necessary habitats for the above species. Potential agricultural areas, identified in Section 2 of this chapter, should be rotated in and out of active cropping. Old fields where agriculture is not reintroduced should be managed to maintain the vegetative cover for as long as possible (see Figure 61). These management guidelines incorporate the idea of long-rotation island theories (Harris, 1984, Chapter 9). The guidelines incorporate rotational maintenance of old fields, fallow farm fields and active agricultural areas for the targeted bird species.

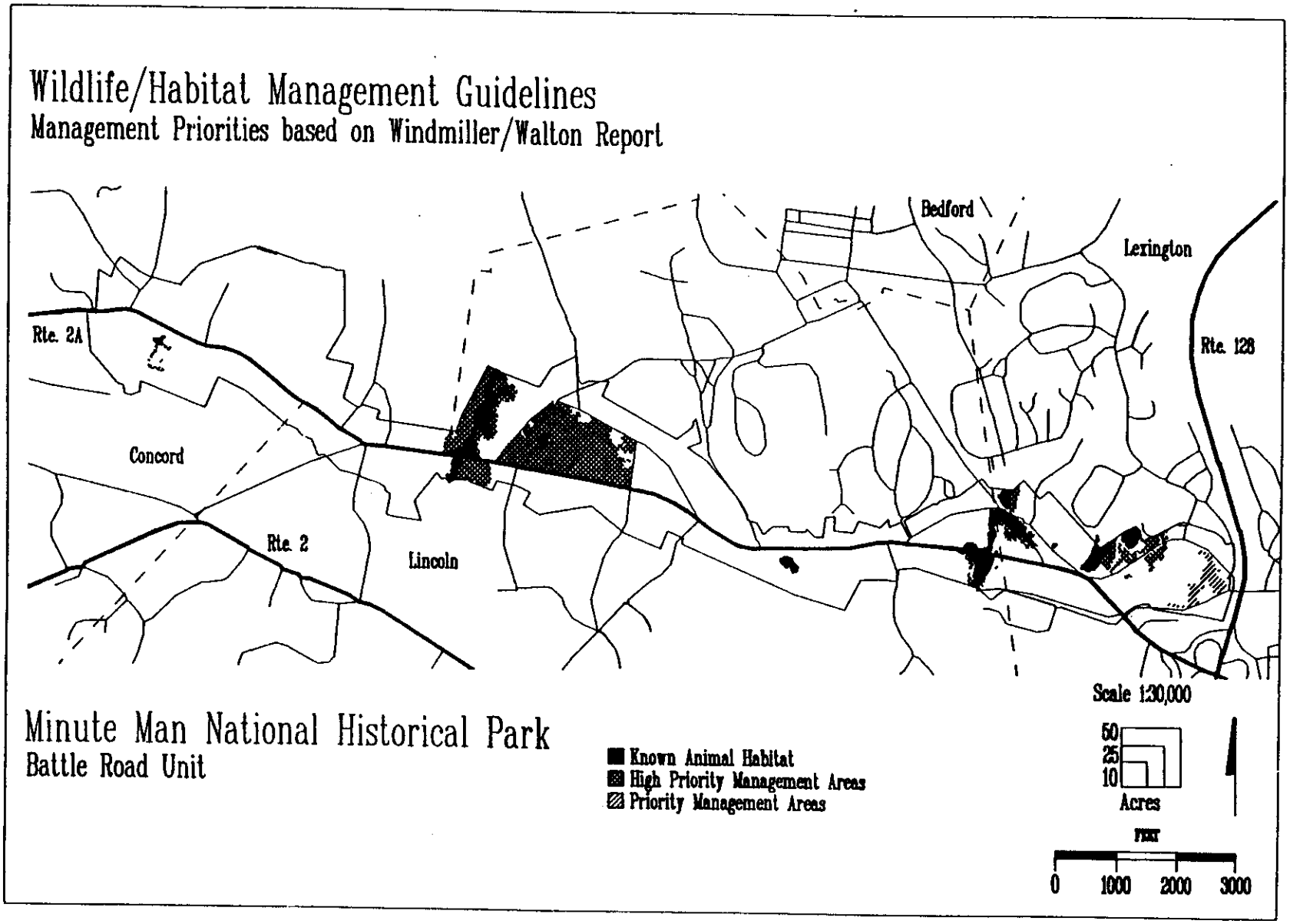


Figure 60: Wildlife/Habitat Management Guidelines

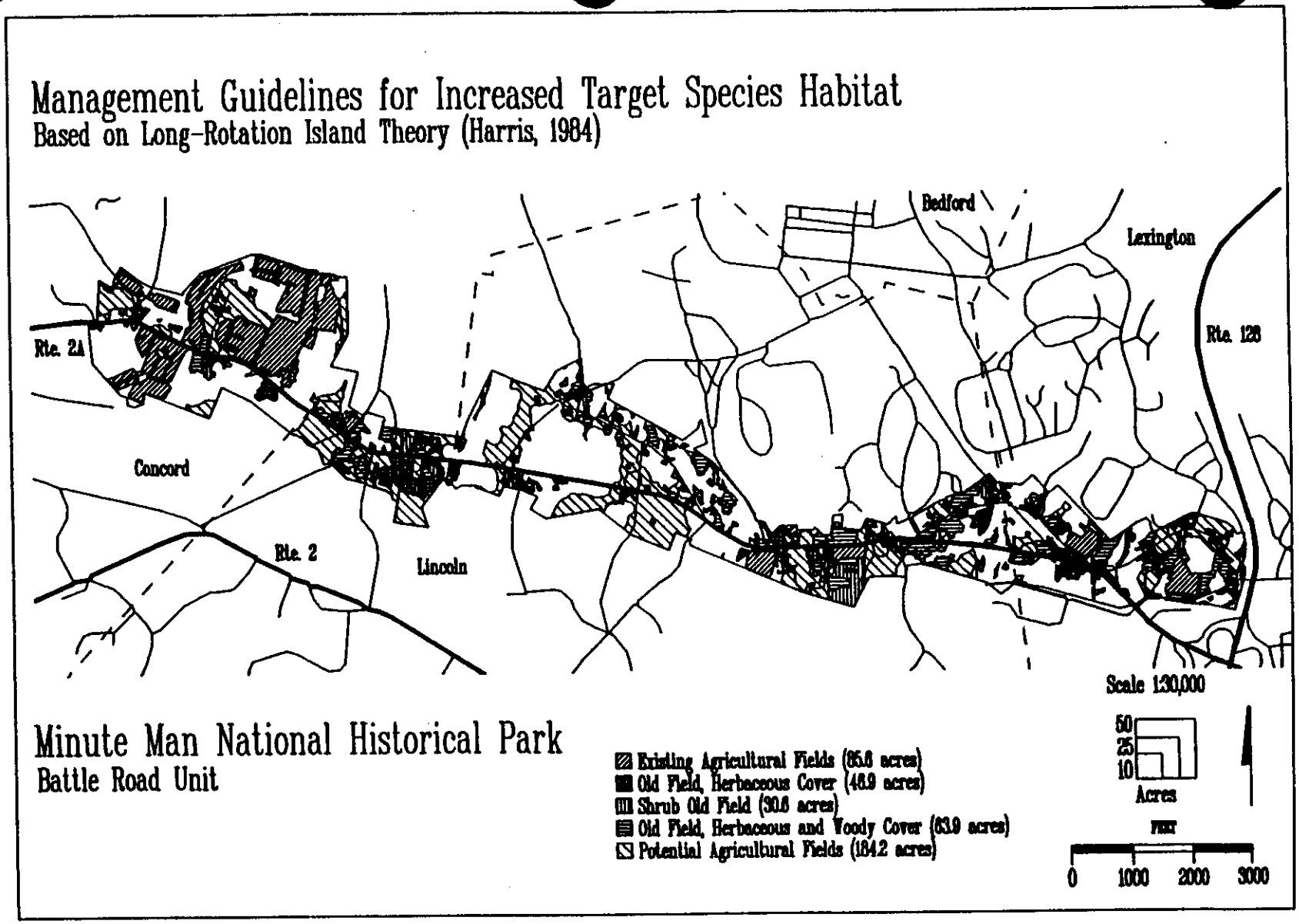


Figure 61: Management Guidelines for Increased Target Species Habitat

3.5.3 Application of Wetland and Riparian Systems Methods

Wetlands and riparian systems are another natural resource located within Minute Man National Historical Park boundaries that were identified and assessed in order to develop guidelines for their proper management. As these resources are located within a cultural landscape, management guidelines are different from those recommended for landscapes with other management goals.

Step One: Identification

Substep 1: Wetlands and their 100' Buffers -- Wetlands located within Minute Man National Historical Park, were identified by the University of Rhode Island Ecological Reconnaissance Mapping Project in 1992. Wetlands were identified through photo interpretation based on true color print reproductions at 1:4800 scale dated April 5, 1986. A minimum mapping unit of 0.1 ha was established, with the exception of vernal pools, which were detectable at less than 0.1 ha. Photos were interpreted using a Topcon Mirror Stereoscope (Model 3) at URI's Department of Natural Resources Science. A Bausch & Lomb Zoom Transfer Scope (Horizontal Model) was used to fit and transfer photo-delineations to a 1:4800 scale mylar base map, provided in digital form from the National Park Service and processed by URI/EDC (August, et. al., 1993).

Wetlands within the Park were identified (see Figure 62) as deciduous forested wetlands, coniferous forested wetlands, sapling swamps, bushy shrub swamps, compact bog shrub swamps, narrow-leafed emergent marshes, robust emergent marshes, and wet meadows. Deciduous forested wetlands (120.9 acres) are typical New England red maple swamps, and are the most prevalent type of wetland in Minute Man NHP. Red maple *(Acer rubrum)* dominates the overstory, with lesser amounts of yellow birch *(Betula alleghaniensis)*, American elm *(Ulmus americana)* and pin oak *(Quercus palustris)*. The shrub layer is dominated by highbush blueberry *(Vaccinium comymbosum)*, with northern arrowood *(Viburnum recognitum)*, swamp laurel *(Rhododendron viscosum)*, withe rod *(Viburnum cassinoides)*, sweet pepperbush *(Clethra alnifolia)*, European buckthorn *(Rhamnus frangula)*, and winterberry holly *(Ilex verticillata)*. The herbaceous layer is dominated by

cinnamon fern *(Osmunda cinnamomea)* with royal fern *(O. regalis)*, tussock sedge *(Carex stricta)* and patches of *Sphagnum* sp. moss (August, et. al., 1993).

Coniferous forested wetlands (0.8 acres) are limited to mixtures of white pine *(Pinus strobus)* and/or hemlock (*Tsuga* spp.) with red maple deciduous wetlands. Pure stands of coniferous forested wetlands were not found from photo interpretation or during field work. Sapling swamps (2.1 acres) are found in a few locations in the Park and consists predominantly of red maple communities in complex with mature red maple swamp bordering streams. Bushy shrub swamps (39.0 acres) are most commonly represented by silky dogwood *(Cornus amomum)*, speckled alder *(Alnus Rugosa)* and young red maple.

Clumped shrub swamp communities are found bordering perennial streamflow and often in complex with marsh emergent communities, such as found in the Elm Brook system. Ditched wetland communities often appear to contain shrub swamp communities dominated by European buckthorn *(Rhamnus frangula)* (August, et. al., 1993).

A compact bog shrub swamp (0.7 acres) is located at the southeast end of the Park, immediately north of the Minuteman Technical School. The bog complex includes leatherleaf *(Chamaedaphne calyculata)* and sedge mats (*Carex* spp.). In peripheral areas, semi-permanent open water is interspersed with buttonbush *(Cephalanthus occidentalis)* and thin, mature white pine *(Pinus strobus)*, highbush blueberry *(Vaccinium corymbosum)* and young red maple. Narrow-leafed emergent marshes (20.8 acres) are found bordering streams and in broad seasonally-flooded flats, dominated by blue-joint *(Calamagrostis canadensis)* with reed canarygrass *(Phalaris arundinacea)*, sensitive fern *(Onoclea sensibilis)*, sedges and mannagrass *(Glyceria canadensis)*. Some of these marshes are being invaded by purple loosestrife *(Lythrum salicaria)* (August, et. al., 1993).

Robust emergent marshes account for 31.8 acres of the wetlands within the Park and are characterized by broad-leaved cattail *(Typha latifolia)*, although in many robust marsh communities, purple loosestrife is present in varying amounts. Wet meadows (6.0 acres) are represented by soft rush *(Juncus*

effusus). Other wet meadow species include willow herb *(Epilobium coloratum),* tussock sedge *(Carex stricta)* and sensitive fern *(Onoclea sensibilis).*

In summary, wetlands cover 236 acres of Minute Man NHP. They are located throughout the Park's landscape, along streams and rivers, with additional heavy concentrations in the western end of the Park south of Rte. 2A, in the middle portion of the Park and again in the eastern end of the Park, just west of Fiske Hill see Figure 62). The wetlands range from wooded wetlands to sapling swamps, bushy to compact bog shrub swamps, and from marshes to meadows.

Once identified, the wetlands were buffered by 100', a need and distance based on ecological principles and legislative requirements (McGregor, 1992, p. 3). The 100' buffer is the minimum width needed to filter and cleanse surface run-off, both necessary functions for the health of the ecosystems.

Substep 2: Ponds, Rivers, Streams and their 100' Buffers -- Rivers, permanent lakes/ponds and temporary ponds (including vernal pools) were also photo interpreted from the 1986 aerial photography. Rivers account for 9.8 acres, permanent lakes/ponds for 2.9 acres, and temporary ponds 1.6 acres. In addition, perennial and intermittent streams (<6 m. wide) were also identified in the Park. The ponds, rivers and streams were buffered by 100' (see Figure 62).

Step Two: Assessment

Substep 1: Population Level Assessment -- The wetlands, ponds, rivers, and streams in Minute Man NHP were assessed for population level values, as described in the Methods Chapter. These values include existence of waterfowl habitat, fish habitat, timber harvest, and rare species habitat. Due to lack of sufficient information, a complete assessment of the population level values is not complete. The Windmiller and Walton report on rare invertebrate and bird species habitats was the only available information at the time of completion, and was therefore the only information used for the Park wetland and riparian systems assessment.

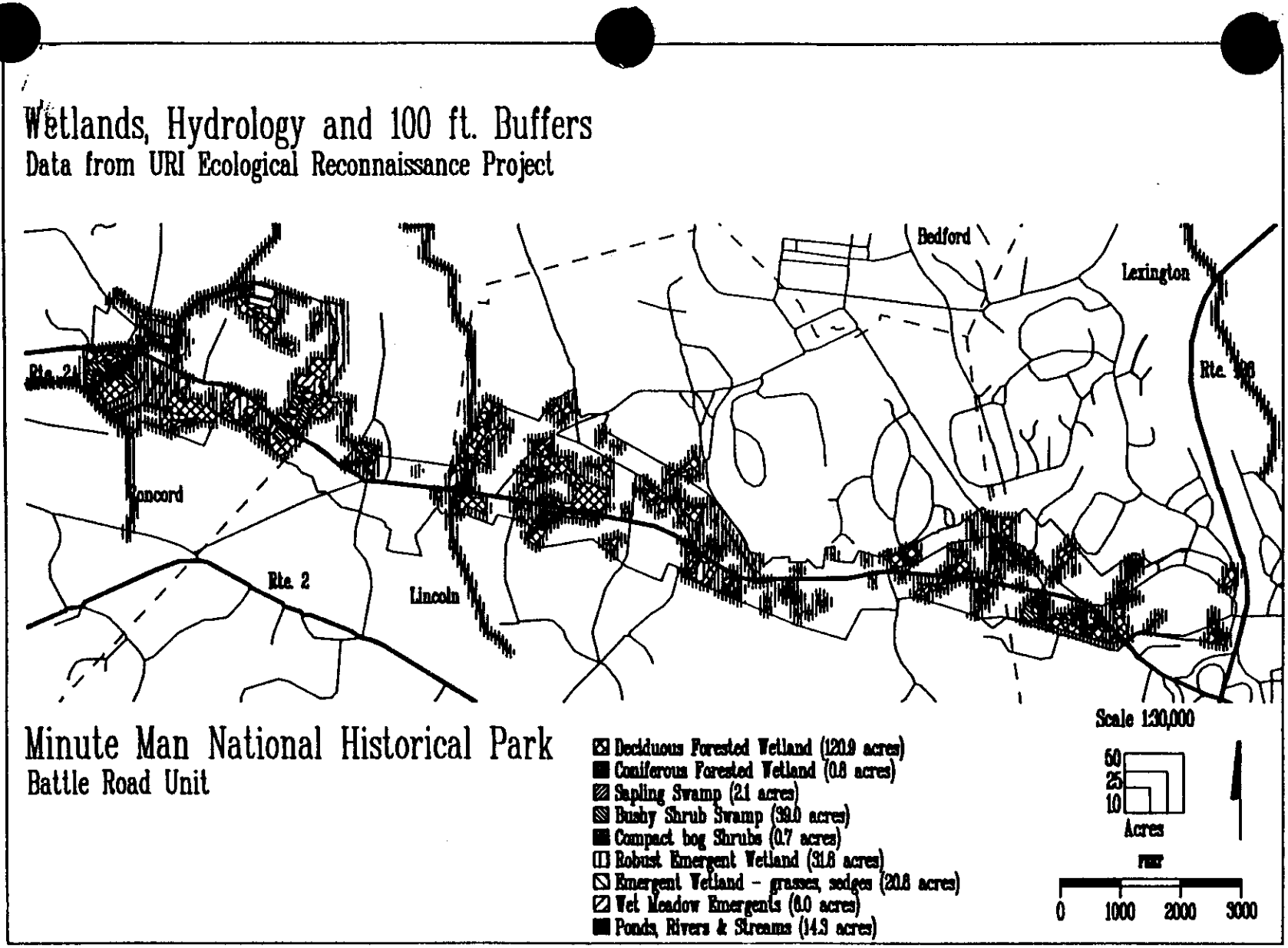


Figure 62: Wetlands, Hydrology and 100 ft. Buffers

Substep 2: Ecosystem Level Assessment -- The wetland and riparian systems were then assessed for ecosystem level values including flood mitigation, aquifer recharge, water quality and aesthetics. At the time this report was completed, the data necessary to assess the rivers and wetlands for ecosystem level values was not available. Therefore, this assessment procedure is not included in the results. Further research, including flood mitigation, aquifer recharge, water quality and aesthetics information, is needed. Once the data are gathered, the methods from this study can then be applied to integrate into the overall management plan.

Substep 3: Assessment Matrix/Rating -- Based on the population level data available, as well as on uniqueness, the wetland and riparian systems in Minute Man NHP were assessed. As indicated in Figure 63, Park wetlands and river systems comprising 16.4 acres were determined most significant. These include all wetland habitats for state-listed rare species as well as two small coniferous wetlands (total of 0.8 acres) and a compact bog shrub wetland (0.7 acres) that are unique to the Park's landscape.

Step Three: Management Guidelines

Based on the above identification and assessment steps, management guidelines for the wetland and riparian systems within the landscape of Minute Man National Historical Park were developed. The systems determined as most significant due to uniqueness and/or multiple functions provided, must be protected for resource function and interpretive purposes, whether or not they are located in a cultural landscape. The status quo of these systems must be maintained, including all vegetation within the system as well as within the 100' buffers. If trails are designed through the system, boardwalks or other similar construction methods must be used in order to protect the system.

Wetland and riparian systems that were determined to have some significance should be managed in ways as close as possible to those of the most significant evaluation. As a general rule, the draining and filling of wetlands for any purpose, including agriculture, should not take place.

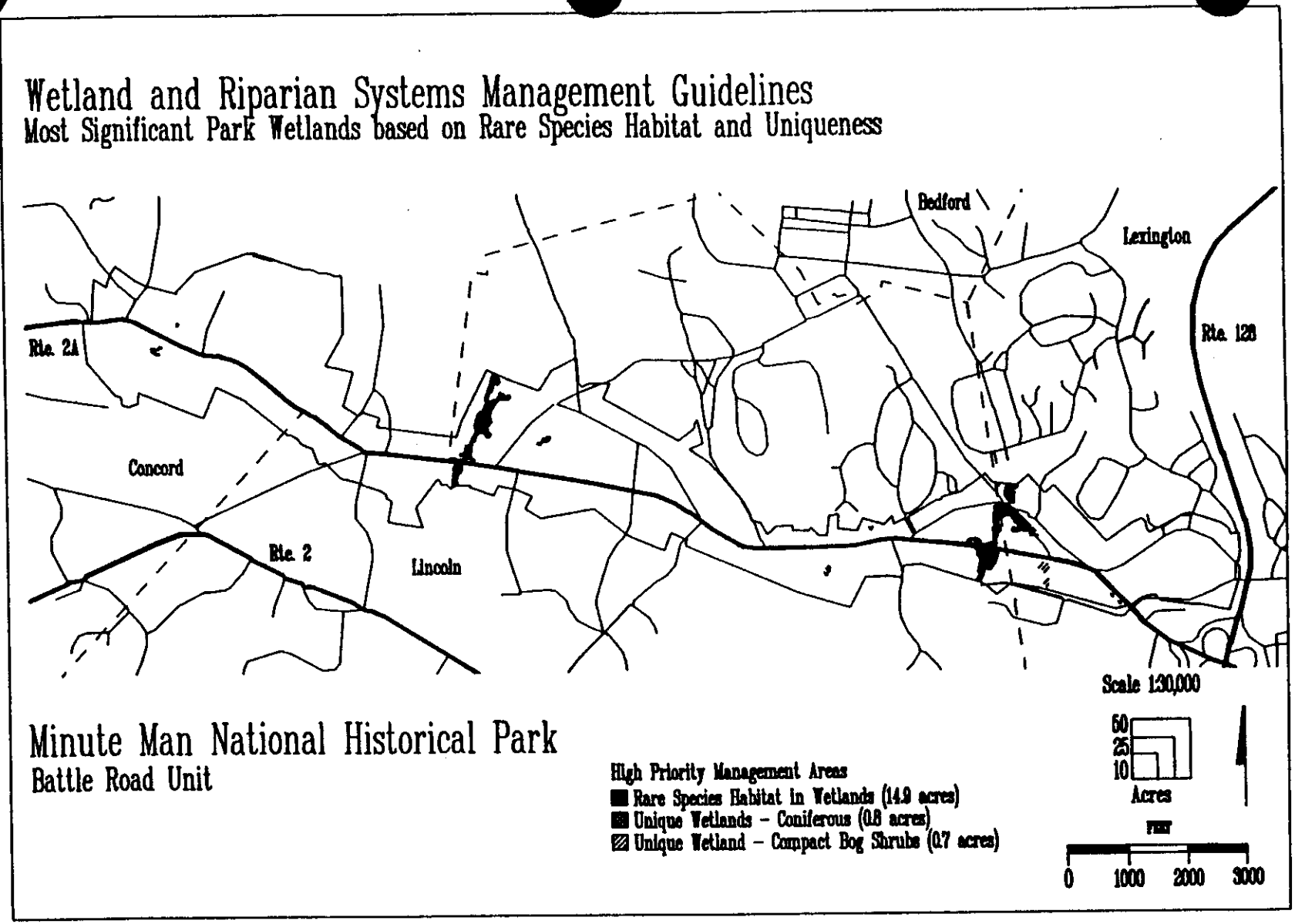


Figure 63: Wetland & Riparian Systems Management Guidelines

3.6 Management/Treatment Options

The management guidelines developed for each study component (Landscape History, Battle History, Agricultural Resources and Natural Resources) were synthesized into a series of management/treatment options. First, the Park as a whole was evaluated and patterns of compatibility and conflict between the management/treatment options were identified (see Step One). Second, eight specific "places" were identified in collaboration with the National Park Service staff and consultants. The patterns of compatibility and conflict for these eight places were identified in an evaluation (see Step Two). Following the evaluation, detailed management/ treatment options biased toward either Landscape History, Battle History, Agricultural Resources and/or Natural Resources is described. In Step Three, a trail network linking the interpretive places is developed.

Step One: Park-Wide Evaluation

In this first step, recommendations for management/treatment options were described for the Park as a whole. Patterns of compatibility and conflict were identified in the evaluation.

Landscape History

There are currently 70 acres of actively farmed land in this area as illustrated previously in Figure 30. These areas should continue to be farmed. A rehabilitation[15] approach is recommended to reinforce the Park's historic character. It is important to note that the whole landscape should not be cleared, as areas of forest cover were important parts of the historic character. This should not be a problem as limited soil suitability and state-listed rare wildlife habitats pose limits to agricultural reintroduction. However, some clearing and agricultural reintroduction within the Park is important for re-establishing the physical context of the Landscape History.

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[15]See definition in *Draft Guidelines for the Treatment of Historic Landscapes* (U.S. Department of the Interior, 1992, pg. 11).

In summary:

- Stone wall network should be preserved
- Ditches should be preserved
- New farmlands should be leased within the stone wall network, especially in some of the 99 acres rated as having a "High Degree of Historic Character" (see Figure 38). The types of crops planted in these areas should be compatible with the period being interpreted.
- In the 496 acres rated as having a "Moderate Degree of Historic Character",the types of agriculture are flexible, although again, the stone wall network and ditching systems should be preserved

Running Battle History

The key for using the landscape to interpret the Running Battle lies in reinforcing the Park's historic character through agricultural reintroduction. In its current condition, the Park does not reflect the agricultural landscape in which the battle was fought. The important existing landscape features relating to the Running Battle include:

- Stone walls which provided cover for the Colonists as they fired on the British.
- The Battle Road. A key element because the battle was fought on the move; most of the skirmishes occurred along the road.
- The Paul Revere Commemorative Site.
- Glacial erratics along Nelson Road.
- Historic structures.

Agricultural Resources

At the park scale, potential use of land for agricultural purposes exists in many areas. The largest areas are being used for farming today -- the areas of the Palumbo and Nowalk farms at the western end of the Park. Additional large areas of potential land are in the Brooks farm area, the Paul Revere Commemorative Site Area and Fiske Hill. The other areas of the Park are generally unsuitable for farming, due mainly to the existence of wetlands and their 100' protective buffers. Additional reasons include poor soils, historic structure buffers, and the existence of

ponds and streams. Existing and potential agricultural areas are represented in Figure 48.

- 106 acres are Most Suitable for agricultural uses
- 75 acres are Suitable for agricultural uses
- 114 acres are Least Suitable
- 400 acres are Unsuitable due to presence of wetlands, streams and their buffers
- 31 acres of SCS Class III soils (most suitable) are unassessed due to missing land use/land cover data.

Natural Resources

Two state-listed rare and three state watch-listed wildlife species and their habitats were identified in the Park. The habitats of these species habitats within the Park's boundaries should be fully protected (approximately 20 acres). The habitats demanding protection are located in the Bloody Angles area between Rte. 2A and Virginia Road, and in the wetland areas of Elm Brook and near the Visitor Center. Full protection involves maintaining the status quo of the vegetation both in the habitat and within buffer zones (100'-500', depending on species and habitat) surrounding the identified habitat. For example, a 300' buffer zone is recommended for vernal pool habitats by Wildlife Biologists Bryan Windmiller and Richard K. Walton (see Appendix G).

In addition to the rare wildlife habitats, other natural resources exist in the Park. 236 acres of the Park are considered wetlands, comprising over 30% of the Park. An additional 14 acres are ponds, streams or rivers. While all wetland and riparian systems should be protected, including 100' buffers around them, only 16.4 acres of the wetland and riparian systems are deemed most significant because of their uniqueness or functions they provide to the ecosystem. These special resources, the Elm Brook and Nelson Road wetlands, and two small, unique wetlands in the Paul Revere and Nelson Road areas, should be protected. This entails maintaining the status quo both within the wetlands and in the 100' buffer zone around them.

- Two state-listed rare wildlife species exist in the Park
- Three state watch-listed wildlife species exist in the Park
- There are 236 acres of wetlands in the Park

Trails

Trails within the Battle Road Unit of Minute Man NHP consist of a loop trail around Fiske Hill, and trails in and around the Hartwell Tavern and Home sites. An additional loop trail is under construction around the vernal pool in the Bloody Angles area in the middle of the Park. Potential to link trails within the Park to trails in the four towns, especially Lincoln, also exist.

Evaluation

The major conflict emerging within the recommendations for overall management/treatment options for the Park landscape occurs between reintroducing agriculture and preserving wetlands. Eliminating all wetlands from agricultural reintroduction will remove 236 acres or 32% of the landscape. An additional 163 acres falls into 100' buffer zones around the wetlands and streams. This leaves 326 acres for farming. However, only 106.3 acres of this land falls into the Most Suitable category based on soil suitability and land cover. 75.2 acres falls into the Suitable category, with 114.0 acres as Least Suitable. An additional 30.6 acres is unassessed due to missing land cover/land use information. Although this is a substantial amount of Park land to be excluded from agricultural use considerations, the reasons behind their elimination are substantial.

However, some leniency with respect to wetland regulations can occur within the non-wooded wetland areas (Robust Emergent Wetlands, Emergent Wetlands and Wet Meadow Emergent Wetlands, as shown previously in Figure 62) of the Park, constituting 23.7 acres. Within these areas, haying of natural wetland grasses, as done in various periods of the landscape's history, is possible. The wooded wetlands have less flexibility, and should be maintained as is.

Step Two: Determination of Significant Interpretive Places

In this step, the eight most significant places where interpretive opportunities exist were identified through an overlay procedure and input from the National Park Service staff and project consultants (see Figure 64). The eight places (beginning in the western end of the park and proceeding east) are named for their historic family associations or connection to the Running Battle and include:

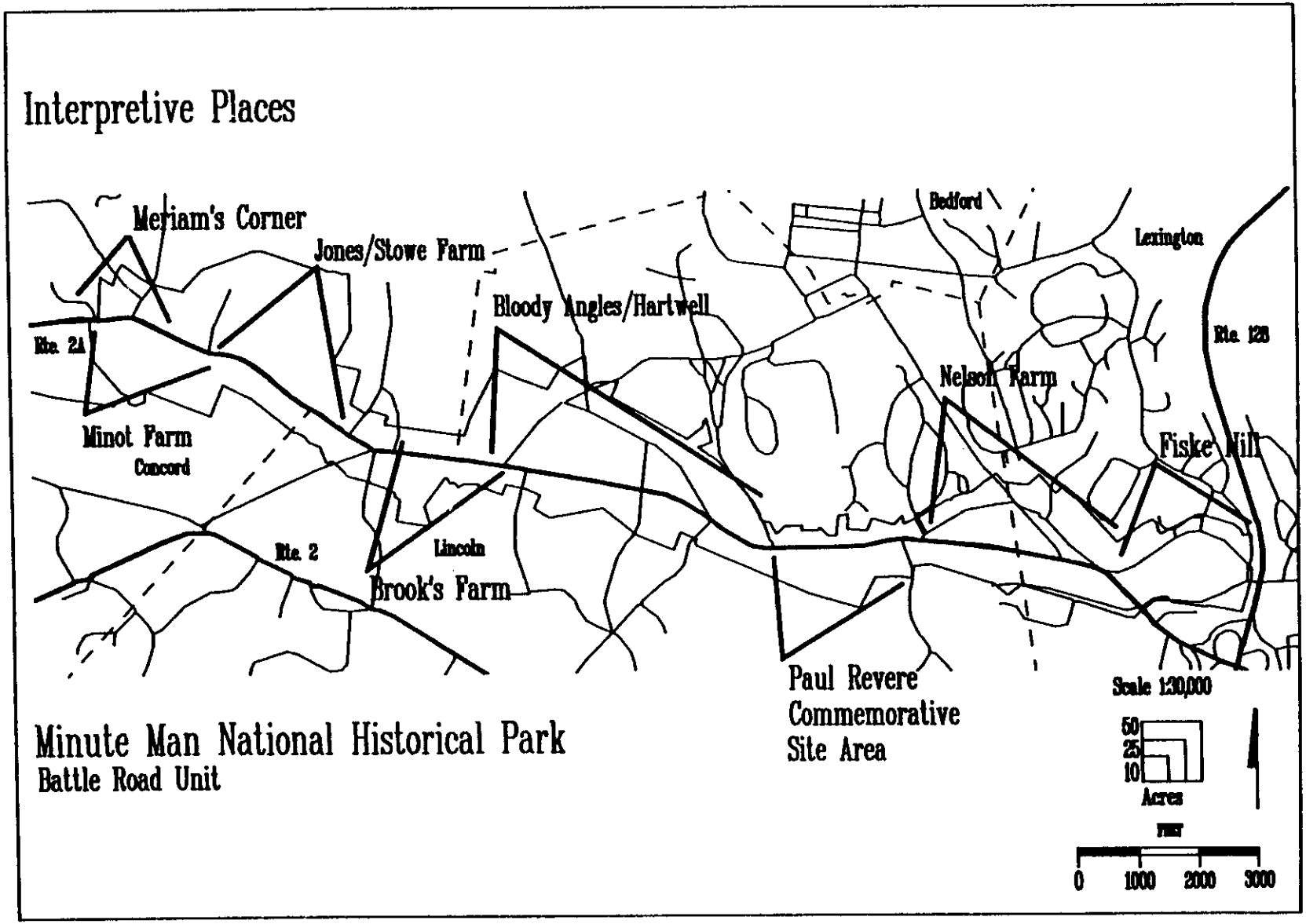


Figure 64: Eight Interpretive Places, identified through an overlay procedure and input from the National Park Service staff and project consultants

1. Meriam's Corner
2. Minot Farm Area
3. Jones/Stowe Farm
4. Brooks Farm Area
5. Bloody Angles/Hartwell Area
6. Paul Revere Commemorative Site Area
7. Nelson Farm Area
8. Fiske Hill Area

In addition, information gathered at three public workshops is included in the recommendations (see Appendix H for Workshop Minutes). Detailed, specific management/treatment options were outlined for each place biased toward either Landscape History, Battle History, Agricultural or Natural Resources. An evaluation describes the relationship of these management/treatment options and identifies some of the most important management issues.

Meriam's Corner



Figure 65: Meriam's Corner showing house dating from 1730. Overgrown trees and wetlands block views out to agricultural landscape

Meriam's Corner is the first of the interpretive places described here. It is located at the Park's western gateway and played a critical role in the events of April 19, 1775. The Running Battle began as the British flankers following the main column of troops crossed a small bridge in front of the Meriam House. The Colonists were positioned in and around the house and barn. Shots were fired, leaving three British soldiers dead. The Meriam House still stands today, although its original agricultural landscape context has been lost in some areas.

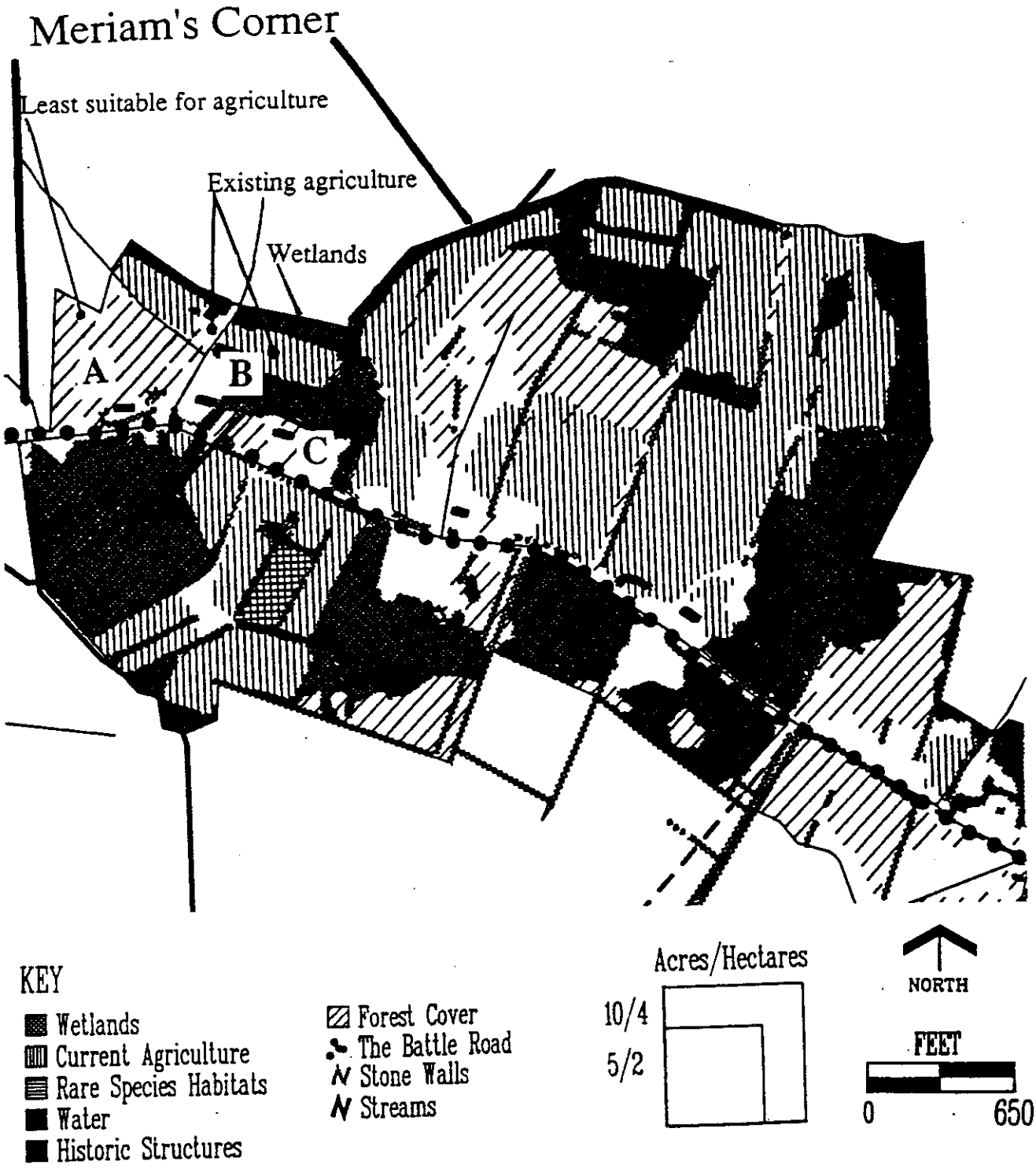


Figure 66: Map of Meriam's Corner area, showing synthesis of Landscape History, Running Battle History, Agricultural and Natural Resources (see Figure 64 for location within Park) Also shown is the Meriam House (A), Burke House (B) and East Quarter School House (C).

Landscape History

Meriam's Corner contains areas of "Highest," "High," and "Moderate Degree of Historic Character" as discussed in section 3.2 (Step Three: Conduct Assessment for Degree of Landscape Character). The objective should be to capitalize on the already existing open landscape by clearing views to it from the Meriam House back toward the northeast. Specifically, agriculture should be reintroduced in the areas with "High" and "Moderate Degree of Historic Character."

- East Quarter School House - Leasable ("A")
- Meriam House - Not Leasable (See Figure 66, "B").
- Burke House - Leasable ("C")
- Existing farmland probably farmed since 17th century
- Excellent views to agricultural landscape north and northeast of the Meriam House

Battle History

Meriam's Corner played an important part in the events of April 19th, 1775 and is rated as having the "Highest Importance to Interpreting the Battle" (see Figure 44).

- Beginning of the Running Battle
- Meriam House
- Agriculture should be reintroduced

Agricultural Resources

The Meriam's Corner area is generally appropriate for agriculture, although it consists of the least suitable soils and land cover, limiting agricultural potential to pasture, haying or woodlots. A small area of most suitable land does exist in the northern section of the area, along the border of the Park. This area is suitable for vegetable cropping, grains, orchards, hay, or pasture, and is presently leased and in agricultural use. Areas already in agriculture, although they lie within the wetland buffers, should continued to be farmed.

The Meriam's Corner area does contain wetlands and their desired 100' buffers, as well as a 100' historic structure buffer area around the Meriam House (see Figure 66). These factors limit potential agricultural use of the area.

- Areas north of Rte. 2A are appropriate for agriculture (See Figure 66 "D")
- Current agricultural area presently leased and farmed, is "Most Suitable" and should continue to be farmed
- Other areas are "Least Suitable," calling for NPS managed interpretive farming
- Wetlands, their buffers, and historic structure buffer around Meriam House are the limiting factors to agriculture in this area

Natural Resources

No special or noteworthy natural resources exist in this significant place, thereby causing no major conflicts between interpretive goals. Wetlands do exist in this area, eliminating approximately 25% of the area from potential agricultural use (see Figure 66).

- No state-listed rare or watch species exist in this area of the Park
- Protect the wetlands that do exist in this area although they are not unique

Trails

- End "node" of the Battle Road Unit
- Possible linkage point with town trails

Evaluation of Meriam's Corner Area

There is a conflict between agricultural reintroduction and wetlands protection in the wetland areas of Meriam's Corner surrounding the stream and on the northern border of the Park. The wetlands and their 100' buffer pose the most severe restrictions to agriculture. However, agriculture located in the northwestern corner of the Park, north of the Meriam House, should continue to be farmed on both sides of the road.

With the imminent removal of the Willow Pond Kitchen, there are opportunities to reinforce the historic character through agricultural reintroduction to the east of the Meriam House. This would also open up excellent views to the northwest. The forested slope to the north of the Battle Road as it enters the Park should not be farmed as it has been assessed as "Least Suitable" for agriculture however.

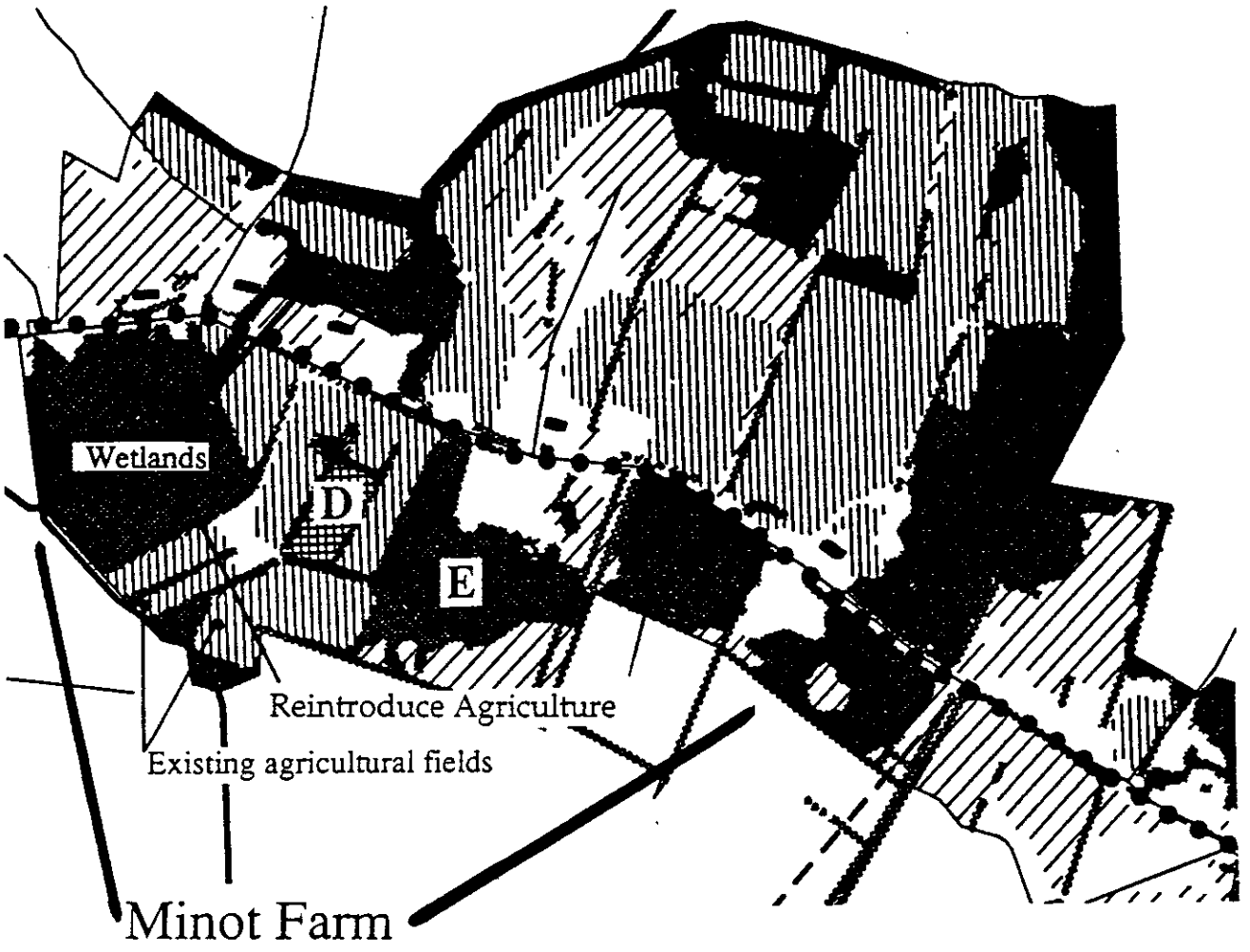
The critical issue in Meriam's Corner is where and how to expand agriculture to the north and northeast of the Meriam house as this is a wetland area. In spite of the fact that agricultural suitability based on agricultural and natural resources is least suitable, reintroducing agriculture would reinforce historic character. This would benefit interpretation of landscape history and Running Battle history. If agriculture was reintroduced here it would need to be subsidized because of the nature of its poor soils, forest cover and wetlands.

Minot Farm Area



Figure 67: View to Minot Farm located in the western part of the Park, showing agricultural fields and farm structure.

The Minot Farm area (see Figures 64 and 68) is the Park's second largest area still in agricultural production. The field is approximately 25 acres, bordered to the east and west by wetlands. Good views open up across the field to the south.



KEY

- Wetlands
- Current Agriculture
- Rare Species Habitats
- Water
- Historic Structures
- Forest Cover
- The Battle Road
- Stone Walls
- Streams

Acres/Hectares

10/4

5/2

NORTH

FEET

0 650

Figure 68: Map of Minot Farm area, showing synthesis of Landscape History, Running Battle History, Agricultural and Natural Resources. Also shown is an existing ditch system (D) and extensive wetlands (E).

Landscape History

Minot Farm contains important cultural landscape features that should be preserved. Specifically, the continuity of farming should be maintained. Approximately 30% of this area falls into the category of "Highest Degree of Historic Character" (see Figure 38). However, the historic character could be reinforced if the field could be enlarged, especially to the west of the existing field.

- Maintain ditches (see Figure 68, "D")
- Maintain existing agriculture
- Reintroduce agriculture to the east and west of fields to reinforce historic character (see Figure 68).

Running Battle History

Minot Farm is one of the most open areas in the Park due to the existing farm. This agricultural land use reinforces its historic character, adding to the sense of the 1775 landscape. In 1775 the area was predominantly pasture and meadow (see Figure 42). Therefore, the open, agricultural landscape is important for interpreting the context of the Battle. Since this part of the landscape was flat and relatively open, no skirmishes occurred there.

- Important only as landscape context to interpreting the Running Battle.

Agricultural Resources

A good portion of the Minot Farm lies within 100' buffers of wetlands. However, as this land is already farmed, farming should be allowed to continue, as permitted under Massachusetts wetland regulations. Land surrounding the existing fields was deemed suitable for agriculture, with orchards, haying, pasture or woodlots as potential uses. Limitations in this area are wetlands and their 100' buffers, comprising well over half the land in this area.

- Existing farmland should be maintained
- Agricultural land cannot be expanded due to presence of wetlands and buffers, as indicated in Figure 68 ("E").

Natural Resources

The habitat for a state-listed rare species exists in the farmland and ditch system part of this area. In addition to the wildlife considerations, over half of the land in the Minot Farm area is considered wetland. These wetlands, although not unique to the Park, as well as their protective buffer areas (minus the existing farmland), should be protected and managed for wetland values although this conflicts with agricultural reintroduction.

- Maintain status quo of farmland and ditch system for state-listed rare species habitat
- Increased agricultural uses are limited, as over 50% of landscape is wetland

Evaluation of Minot Farm Area

The conflicting issues at the Minot Farm involve protecting the wetlands or expanding the size of the agricultural fields. However, the management/treatment options are compatible within the existing farmland, as preserving the ditches and continuing the agricultural use of the farm supports landscape history, Running Battle, and agricultural resource assessments. Extensive wetlands on either side of the farm conflict with expanded agricultural use of the area, eliminating the potential of agricultural reintroduction.

Jones/Stowe Farm



Figure 69: View across agricultural fields in the Jones/Stowe farm area. The photograph illustrates the agricultural landscape found in this place. It is typified by open fields bounded by hedgerows and stone walls, with distant views to the surrounding landscape.

The Jones/Stowe Farm (see Figures 64 and 70) area contains the largest area within the Park still in agricultural production (approximately 50 acres altogether). It is also one of the areas in the Park continuously farmed since the 17th century, and is therefore very important area to keep in agricultural production. It affords long views to distant hills, and contains farm structures suitable for leasing.

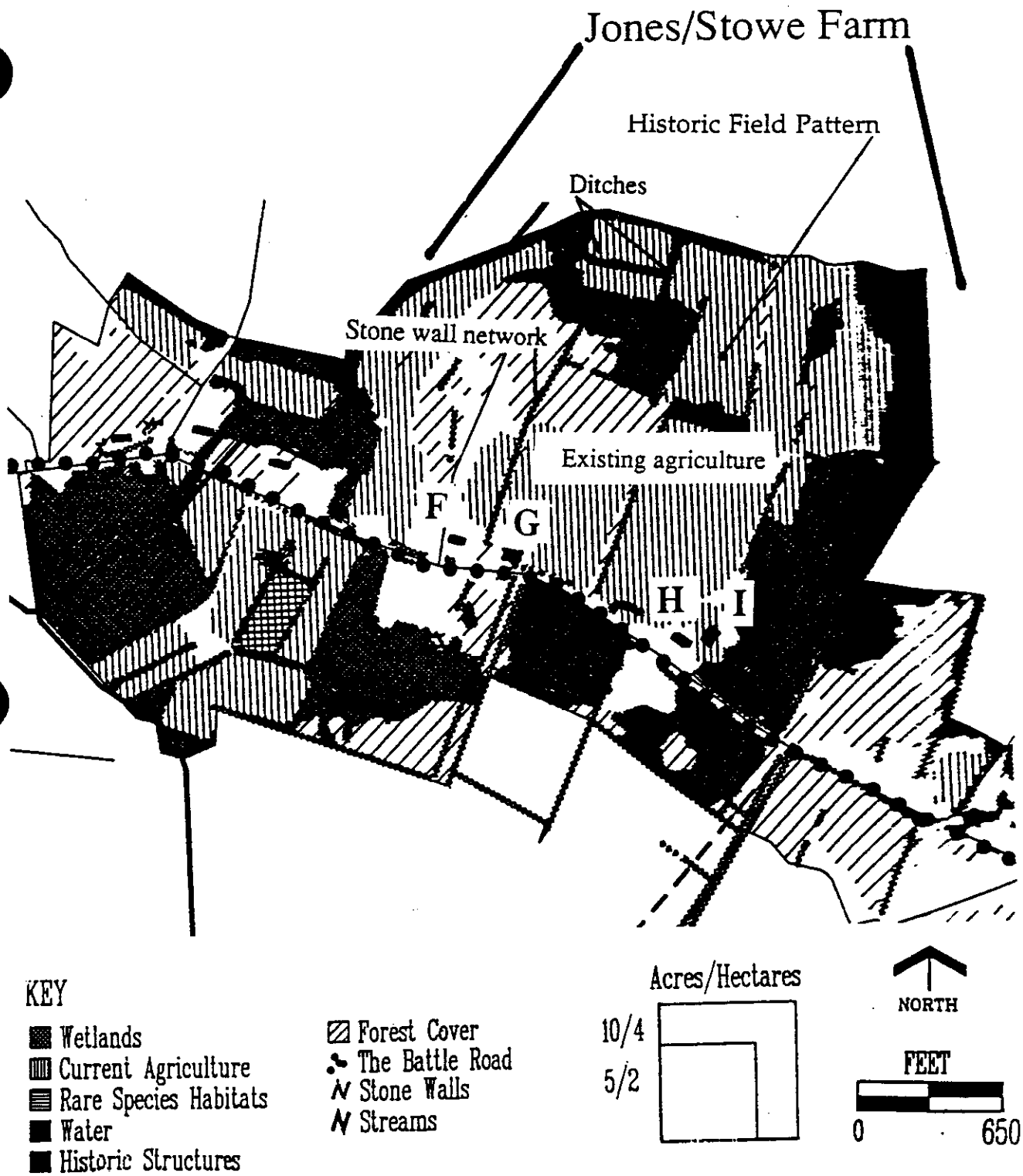


Figure 70: Map of Jones/Stowe Farm area, showing synthesis of Landscape History, Running Battle History, Agricultural and Natural Resources. Also shown are the Minot House (F), the Albano Residence (G), the Jones House (H) and the Jones Barn (I).

Landscape History

This is one of the most important places in the Park for illustrating the continuity of agriculture within a field pattern set up in the 17th century. It contains a large area of actively farmed land which should be maintained within the existing stone wall and hedgerow network. The historic character could be reinforced by reintroducing agriculture in the areas immediately adjacent to the farm.

- Historic field pattern intact
- Minot House - Leasable (see Figure 70 "F")
- Alabano Residence - Leasable ("G")
- Jones House - Leasable ("H")
- Jones Barn ("I")
- Stone wall network intact
- Good views out to larger landscape
- Preserve ditches

Battle History

- Important to interpreting the Battle as landscape context, although no events happened there.

Agricultural Resources

This area is the largest area within the Park appropriate for agriculture. It also contains the largest sections of land deemed Most Suitable (vegetables, grains, orchards, haying, pasture) for agriculture, based on soils and current land use/land cover. Most of this area is currently leased and farmed, and due to its Most Suitable rating, this area will continue to be easily leased in the future. This currently leased and Most Suitable area comprises approximately 75 acres. The agricultural limitations are based on wetlands and their 100' buffers as well as 100' buffers around the historic structures listed above. Approximately one-fifth of this area is considered wetland or buffer areas.

- Reintroduce agriculture in this area, as it contains some of best agricultural land in the Park
- The land is leased and farmed today, and it will be easily leased in the future

Natural Resources

There are no state-listed rare or watch species located in the Jones/Stowe area of the Park. However, due to the fact that this is a prime agricultural area within the Park, the agricultural fields can be managed, with no interpretive conflicts, to increase target species through long-rotation islands of active agricultural fields, fallow fields, and old fields. These ideas were discussed in the public workshop (see Appendix H).

Wetlands do exist, comprising approximately 20% of this area. Although these wetlands will limit potential agricultural uses, they will not preclude them in any way. These wetlands are not unique to the Park.

- No rare wildlife habitats to protect in this area
- There are some wetlands in this area, but they do not preclude agriculture
- Management of wetlands is compatible with landsape rehabilitation through agricultural reintroduction

Evaluation of Jones/Stowe Farm Area

This area is highly compatible with agricultural reintroduction in terms of interpreting the Landscape History and Running Battle History as well as the agricultural resources available. In addition, while the Jones/Stowe Farm area does contain some wetlands that may limit the area available for agricultural uses, the wetlands will not preclude farming. The most important cultural landscape features are the field patterns, stone walls, hedgerows and ditches. These should all be maintained. Any clearing and leasing should be done within the stone wall network.

Brooks Farm Area



Figure 71: View of Fields Adjacent to Brooks Tavern. This photograph shows field to the west of Brooks Tavern containing apple trees and opening good views to the south.

The Brooks Farm area is located east of the Jones/Stowe Farm and west of Bloody Angles (see Figures 64 and 72). The farm was created as part of Concord's Second Division in 1652 and granted to Joshua, Caleb and Gershom Brooks. The family continued to farm the land until 1862 when Joshua Brooks sold out as a result of failing to adapt and thrive in the new commercial environment of the 19th century.[16] The 210 year continuity of family ownership is unique in the Park.

Landscape History

As mentioned in the evaluation, this place contains cultural landscape elements dating from as early as 1730 (Samuel Brooks House) and as late as 1938 (Rogers Barn). The appearance of the landscape is a result of generations of farmers tilling

16 See Appendix G: Historical Features of Four Study Areas by Brian Donanhue, where the history of the Brooks farm is described in greater detail.

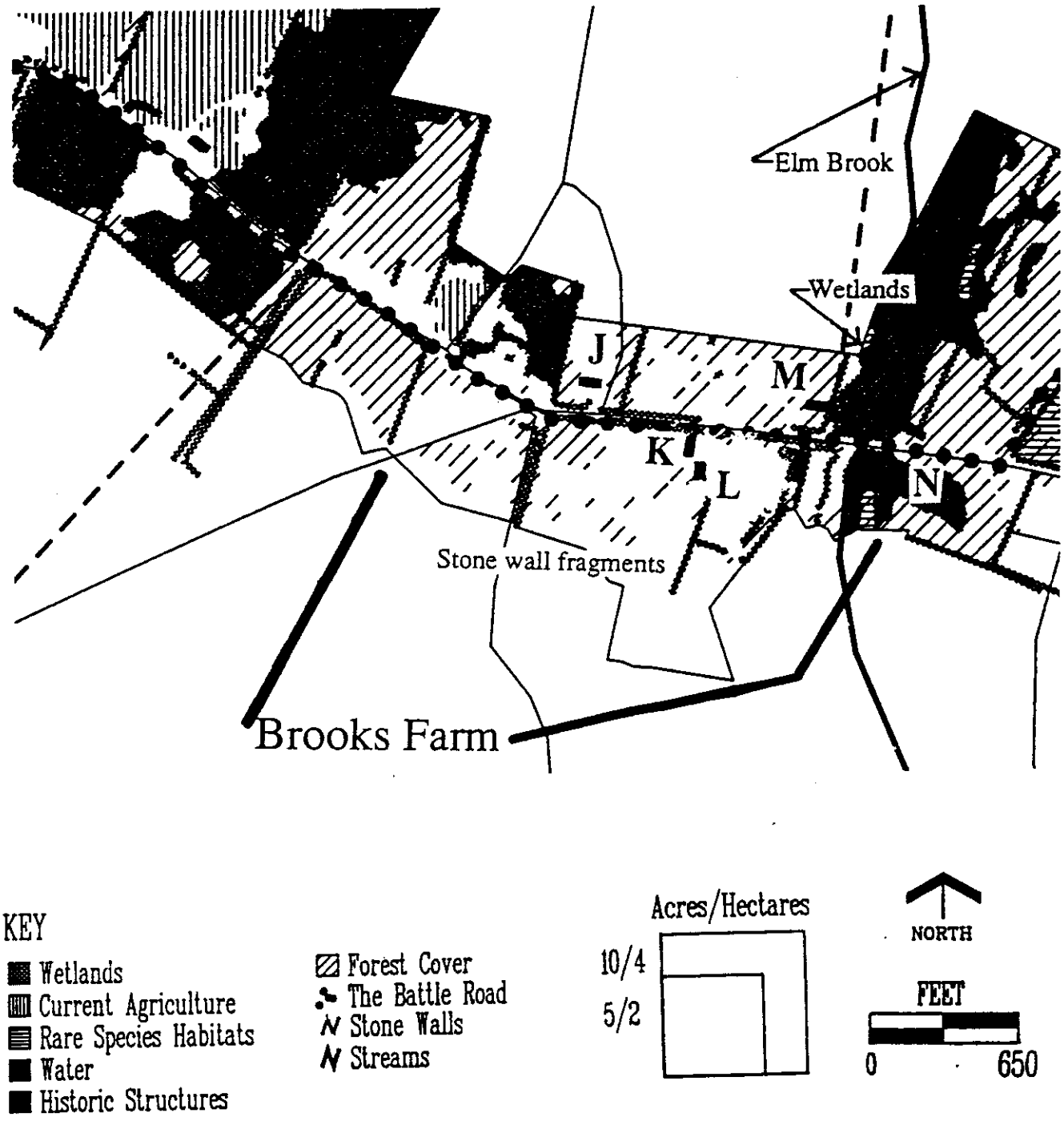


Figure 72: Map of Brooks Farm area, showing synthesis of Landscape History, Running Battle History, Agricultural and Natural Resources. Also shown are the Samuel Brooks House (J), the Noah Brooks House (K), the Rogers Barn (L), the Job Brooks House (M) and the Joshua Brooks House (N).

the land and building houses, barns and stone walls. Therefore it is an important area for interpreting the Park's Landscape History.

- Samuel Brooks House - Not leasable (see Figure 72 "J")
- Noah Brooks House - Not Leasable ("K")
- Rogers Barn - Not Leasable ("L")
- Job Brooks House - Not Leasable ("M")
- Joshua Brooks House - Not Leasable ("N")
- Stone wall fragments
- Reintroduce agriculture, apple orchards are appropriate given the landscape resources is this area.
- Potential views to Lincoln conservation land

Battle History

The British marched along the road through the landscape; there was no fighting.

- The Battle Road bisects the Brooks Farm area and it is important both as the landscape context and as an important viewshed. Rated as "Most Important for Battle Interpretation" (see Figure 44).

Agricultural Resources

The Brookds Farm area of the Park contains an approximately 25 acre area of land Most Suitable for agriculture. Additional land to the south of the Brooks Tavern, along the border of the Park, may be considered Most Suitable or Suitable agricultural land, depending on the present land cover/land use. The soils for these unknown areas are Capability Class III soils, which falls into the most flexible category. In addition to these areas, the Elm Brook area could possibly be hayed for natural freshwater wetland grasses, if the haying does not disturb the rare species of wildlife habitat located in the Elm Brook wetland ecosystem.

The public workshops (see Appendix H) and consultant Dr. William Coli also identified the potential for orchard rehabilitation in the Brooks Tavern area.

- Reintroduce agriculture in the extensive areas of land Most Suitable for Agriculture
- Elm Brook could be hayed for natural wetland grasses (see Figure 72)
- Rehabilitate apple orchard near Brooks Tavern (see Figure 72)

Natural Resources

The wetland and upland woodland areas surrounding Elm Brook is another important wildlife habitat area in the Park. Elm Brook is the only well-oxygenated stream habitat in Minute Man (containing the only brook trout and two-lined salamander populations, the only healthy stram-invertebrate fauna and unique wetlands with significant patches of elderberry) (Windmiller and Walton, 1992, p. 37). The existence of these species, especially the rare species, conflicts with the use of that area for agricultural reintroduction. More information from qualified wildlife scientists is needed to determine potential effects on the populations of wildlife species and the health of the wetland ecosystem if historic interpretation of the role of wetlands is to take place.

- Protect the rare-species habitat in Elm Brook wetland ecosystem
- Protect Elm Brook, the only well-oxygenated stream in the Park, contains species unique to the Park
- Determine if haying (historic interpretation) of Elm Brook wetlands will disrupt habitats

Evaluation of Brooks Farm Area

The recommendations are compatible in terms of reintroducing agriculture around the historic structures. Farming around the Elm Brook area might conflict with the protection the wildlife habitats (further investigation is needed). There is also a potential conflict between interpreting Cultural Landscape History and the Running Battle History. The cultural landscape elements located in the Brooks farm area were built in different periods and generally support interpreting the apple farming of the 19th century. However, the viewshed associated with the Running Battle should ideally over look a colonial landscape.

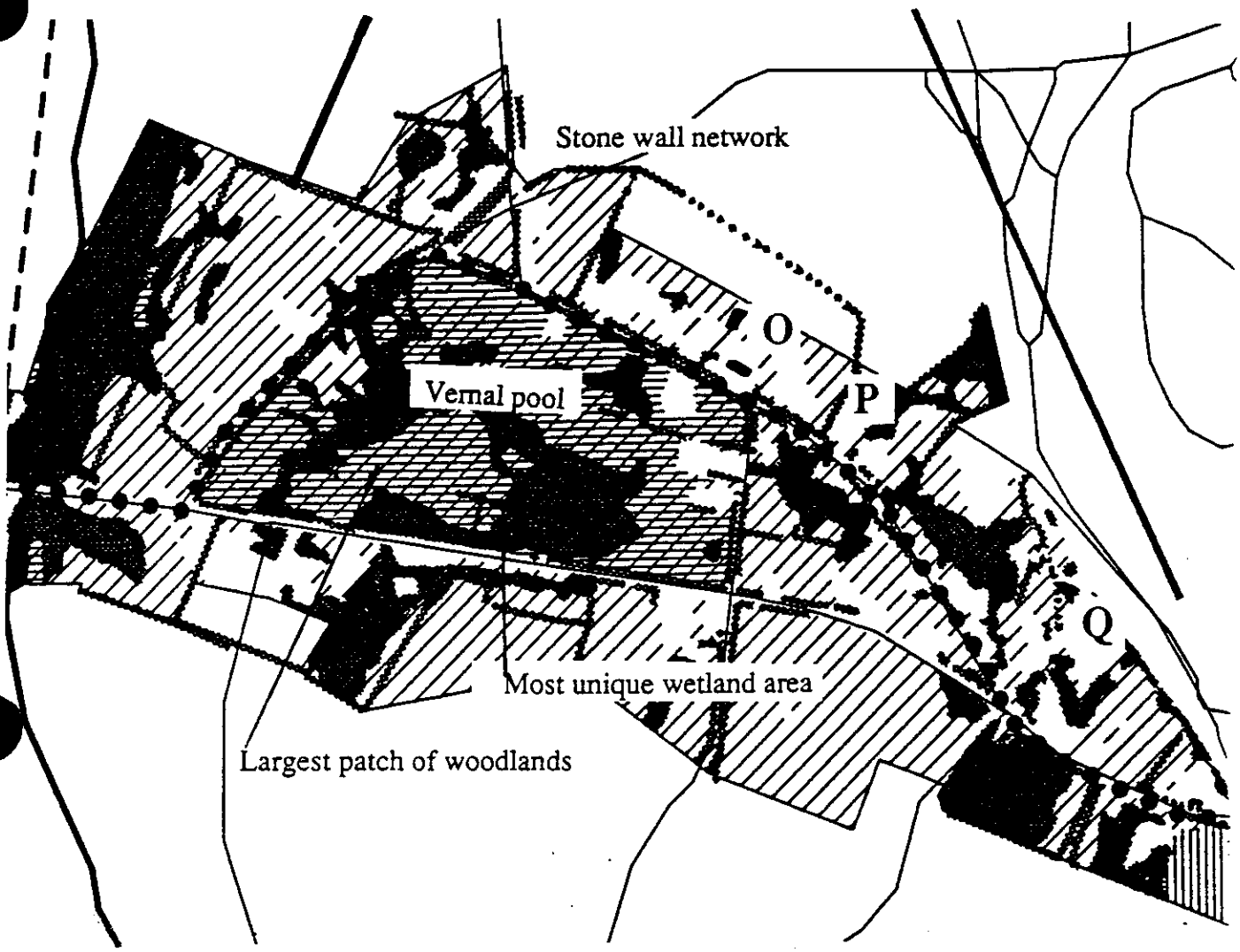
Bloody Angles/Hartwell Area



Figure 73: The Battle Road at Bloody Angles. This photograph shows the wooded landscape enclosing the roadway. The Bloody Angles area is one of the most heavily forested parts of the Park.

Bloody Angles is located in the center of the Park (see Figures 64 and 74). It is primarily forested and contains approximately 20 modern houses slated for removal in the future. It also contains four important historic structures. The Battle Road diverges from Rte. 2A at this point; traffic is light. The vernal pool and wooded wetlands between Virgina Road and Rte. 2A are the habitat for a state-listed rare species, and are part of the most intact interior wooded area of the Park. A Vernal Pool Loop Trail is currently under construction in this area.

Bloody Angles/Hartwell



KEY

- Wetlands
- Current Agriculture
- Rare Species Habitats
- Water
- Historic Structures
- Forest Cover
- The Battle Road
- Stone Walls
- Streams

Acres/Hectares

10/4

5/2

NORTH

FEET

0 650

Figure 74: Map of Bloody Angles/Hartwell area, showing synthesis of Landscape History, Running Battle History, Agricultural and Natural Resources. Also shown are the Hartwell Tavern and McHugh Barn (O), the Samuel Hartwell House Foundation and Shelter (P) and the William Smith House (Q).

Landscape History

This area contains many cultural landscape elements that are valuable for interpreting the Landscape History. As in the Brooks Farm area, cultural landscape features originated in different centuries, so no one historic period is represented. Rather, the appearance of the landscape shows the cumulation of approximately 300 years of use. In addition to the historic landscape features, there are currently 20 suburban houses slated for removal in this area. Their removal creates possibilities for change with minimal constraints.

- Hartwell Tavern and McHugh Barn - Not Leasable (see Figure 74 "O")
- Samuel Hartwell House Foundation and Shelter ("P")
- William Smith House - Not Leasable ("Q")
- Stone wall network
- Potential good views exist to the west
- Reinforce historic character by reintroducing agriculture.

Running Battle History

Bloody Angles is one of the most important places associated with the Running Battle. As the road turned the corner the retreating troops were forced to slow down. This combined with the existence of glacial erratics, stone walls and tree cover along the road made it possible for the Colonists to fire on the British (see Figure 42: The Running Battle, Events and 1775 Context map). Some of the fiercest fighting of the day happened at Bloody Angles.

- Historic character should be reinforced by reintroducing agriculture
- Hartwell Farm is an important feature and is part of the landscape context of the Battle
- The alignment and appearance of the Battle Road is also important to interpreting the Running Battle.

Agricultural Resources

This area of Minute Man NHP is generally not suitable for agriculture, except in small areas along the road. The area south of Virginia Road and north of Rte. 2A is

a state-listed rare species habitat (see Natural Resource section below) and consists, to a great extent, of wooded wetlands.

- The above mentioned wetlands, streams and vernal pool, as well as the historic structures (as listed above) and their associated buffers provide the major limitations to agriculture in this area
- Poor soil conditions and the wooded land cover provide additional limitations
- Area should be managed for wildlife and wetland values.
- NPS managed agriculture should be considered to support Running Battle and Landscape history.

Natural Resources

The woodlands and wetlands located north of Rte. 2A and south of the Hartwell Tavern area contains the most significant vernal pool in Minute Man NHP, the largest patch of fairly intact woodlands and the most unique wetland area in the Park (Windmiller and Walton, 1992, p. 37, see Appendix G for more details). The vernal pool and surrounding areas are the habitat for a state-listed rare invertebrate. The rare species population has been reported to the Massachusetts Natural Heritage Program and the vernal pool has been submitted for certification. The sensitivity of the species and woodland area needs to be determined by qualified scientists, as do the effects of the Vernal Pool Loop Trail currently under construction.

Small pockets of land south of Virginia Road, where modern homes are currently located, could possibly be used for interpretive farming, although soil conditions are poor.

Additional areas of wetlands, with large pockets south of 2A and near the eastern Virginia Road/2A intersection, also exist. These areas should be protected from agricultural run-off and otherwise managed for natural resource interpretation.

- Protect the state-listed rare species habitat
- Protect the most productive vernal pool in Park
- Protect the largest patch of intact woodlands
- Protect the most unique wetland area

Evaluation of Bloody Angles/Hartwell Area

There is a conflicting relationship between reintroducing agriculture and protecting wildlife habitats in the area south of Virginia Road and north of Rte. 2A. As the area is the habitat for a state-listed rare species, clearing of the area for agriculture is not advised. However, small scale fields could be farmed along the north side of Virginia Road, where views to the surrounding landscape can be opened, without disrupting the wildlife habitat on the other side of Virginia Road. The existence of stone walls also support landscape rehabilitation here. Route 2A should be sufficiently screened to support the interpretive programs.

Paul Revere Commemorative Site Area



Figure 75: The Paul Revere Commemorative Site. The area is currently mown by the National Park Service giving it an open character.

On April 18, 1775, Paul Revere and Samuel Dawes rode out to the countryside, spreading the alarm that British troops were marching toward Lexington and Concord. Unfortunately Paul Revere was captured by British scouts before he made it to Concord; Dawes managed to escape. However, the alarm had already been raised to a large extent by the time Revere was captured and so he played a critical role in readying the Colonists. His capture is commemorated in an area just east of the Bloody Angles area and west of the Nelson Farm area (see Figures 64 and 76).

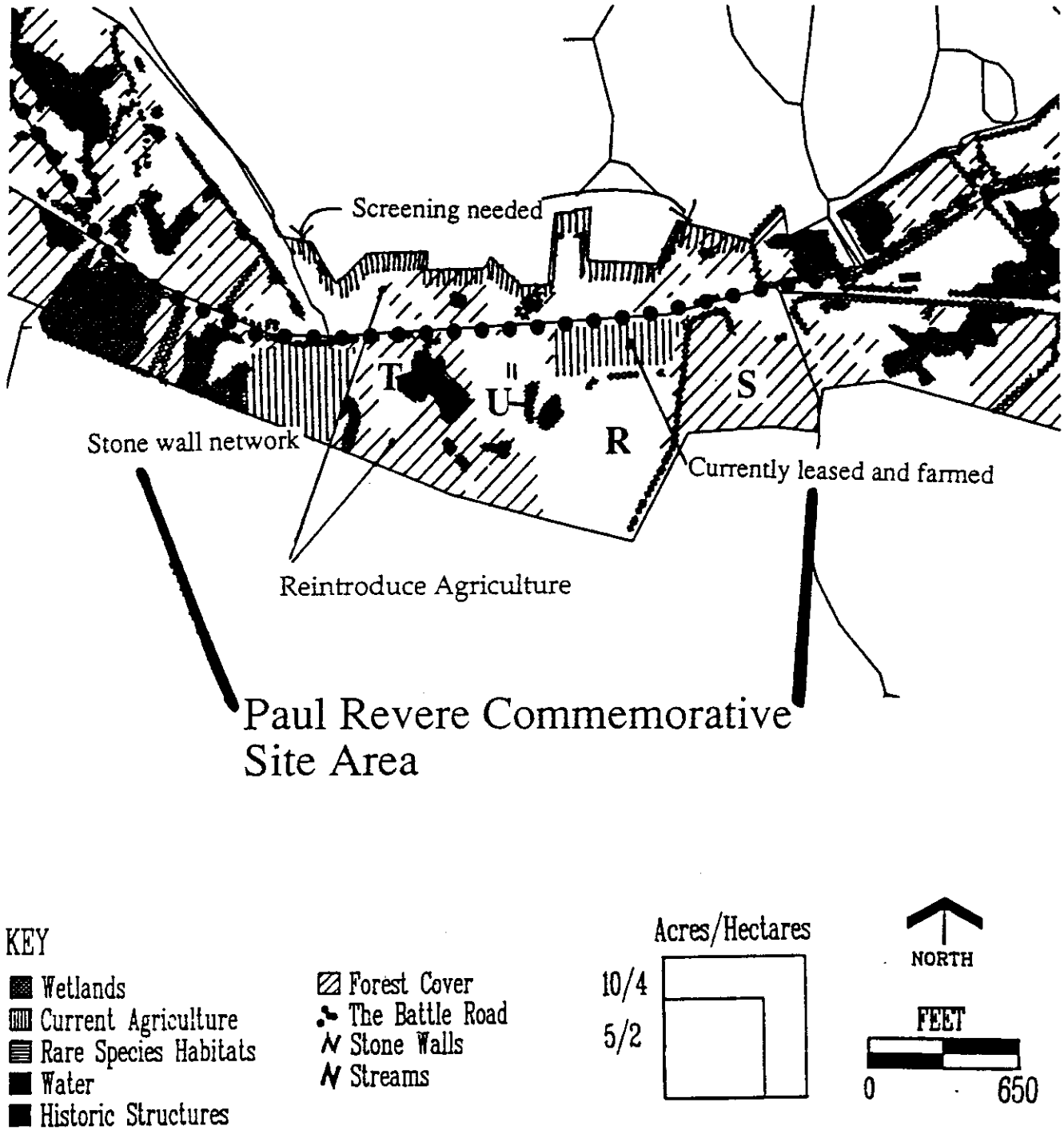


Figure 76: Map of Paul Revere Commemorative Site area, showing synthesis of Landscape History, Running Battle History, Agricultural and Natural Resources. Also shown is an area most suitable (R) and suitable (S) areas for agricultural uses, a watch listed species habitat (T), and two coniferous wetlands unique to the Park (U).

Landscape History

Although not one of the richest concentrations of cultural landscape features in the Park, the Paul Revere Commemorative Site Area does contain cultural landscape elements which should be maintained. The farm fields south of Rte 2A are fragments of the historic field pattern existing since the 18th century. In addition, there are lanes and stone walls which also represent continuity in the landscape.

- Existing agriculture to the south of Rte. 2A should be maintained
- The opportunities for agricultural reintroduction are limited to small-scale fields north of Rte. 2A because the Park is so narrow at this point
- Reinforce historic character through agricultural reintroduction
- Maintain stone wall network

Running Battle History

The Paul Revere Commemorative Site area is one of the places rated "Highest Importance to Interpreting the Battle"(see Figure 44) because of its association with Paul Revere described above. Currently the Paul Revere Commemorative site, with its open, mowed field and split rail fence, was assessed as having a "High Degree of Historic Character" (see Figure 38) The open area is approximately five acres. Its historic character would be reinforced by opening views to the south and west toward the Nelson Farm. As the two remaining suburban houses are removed this would provide and excellent opportunity for agricultural reintroduction. It is important however, that Hanscom Air Force Base, which lays just to the north, is sufficiently screened.

- Agriculture should be reintroduced to interpret the Running Battle and reinforce historic character.

Agricultural Resources

Although many small wetland areas, a pond, and historic structure buffers disrupt this section of the Park, there is a large area deemed Most Suitable for agriculture (see Figure 76, "R"). Additional, smaller areas are Suitable for agriculture as well. All land currently leased and farmed within this area should continue to be used for

agriculture. Large pockets of wetlands to the western end of this area are the major limiting factors for agriculture in this section of the Park.

- Reintroduce agriculture in the large area deemed Most Suitable for agriculture (see Figure 76, "R")
- Also possible to reintroduce agriculture in the areas considered Suitable as well ("S")
- Continue farming land that is currently leased and farmed (see Figure 76)

Natural Resources

The pond south of Route 2A is a watch-listed species habitat. In addition to the habitat, two small coniferous wetlands (totalling 0.8 acres) south of Rte. 2A, south of Hanscom Field, are unique to the Park's landscape. These areas should be protected and managed solely for natural resource interpretive purposes.

- Watch listed species habitat (see Figure 76, "T")
- Two coniferous wetlands to protect and interpret ("U")

Evaluation of Paul Revere Commemorative Site Area

The opportunities for agricultural reintroduction are limited to small-scale fields on the north side of Rte. 2A because the Park is so narrow at this point and there is a need to screen Hanscom Air Force Base. However, opportunities do exist for larger-scale agriculture on the south side of Rte. 2A, an area in which agriculture is appropriate for setting the landscape context of April 19th, 1775. At that time, the landscape consisted of tilled fields and meadows (see Figure 42). Specifically, reintroducing agriculture in the area covered by small forest patches would reinforce its historic character and aid in interpreting both the landscape history and the Running Battle history. These recommendations are compatible with utilizing the agricultural resources and protecting the wetlands. Opportunities exist for natural resource interpretation in the coniferous wetlands south of Rte. 2A.

Nelson Farm Area



Figure 77: The Nelson Farm Area. A portion of the Battle Road is restored connecting to the Battle Road Visitors Center. The roadway is lined with stone walls and mature sugar maple and oak trees.

The Nelson Farm area is located in the eastern end of the Park and begins where a portion of the Battle Road is restored near the Nelson House and Barn. Also included is the Battle Road Visitors Center, the Bluff and the Jacob Wittemore House (see Figures 64 and 78).

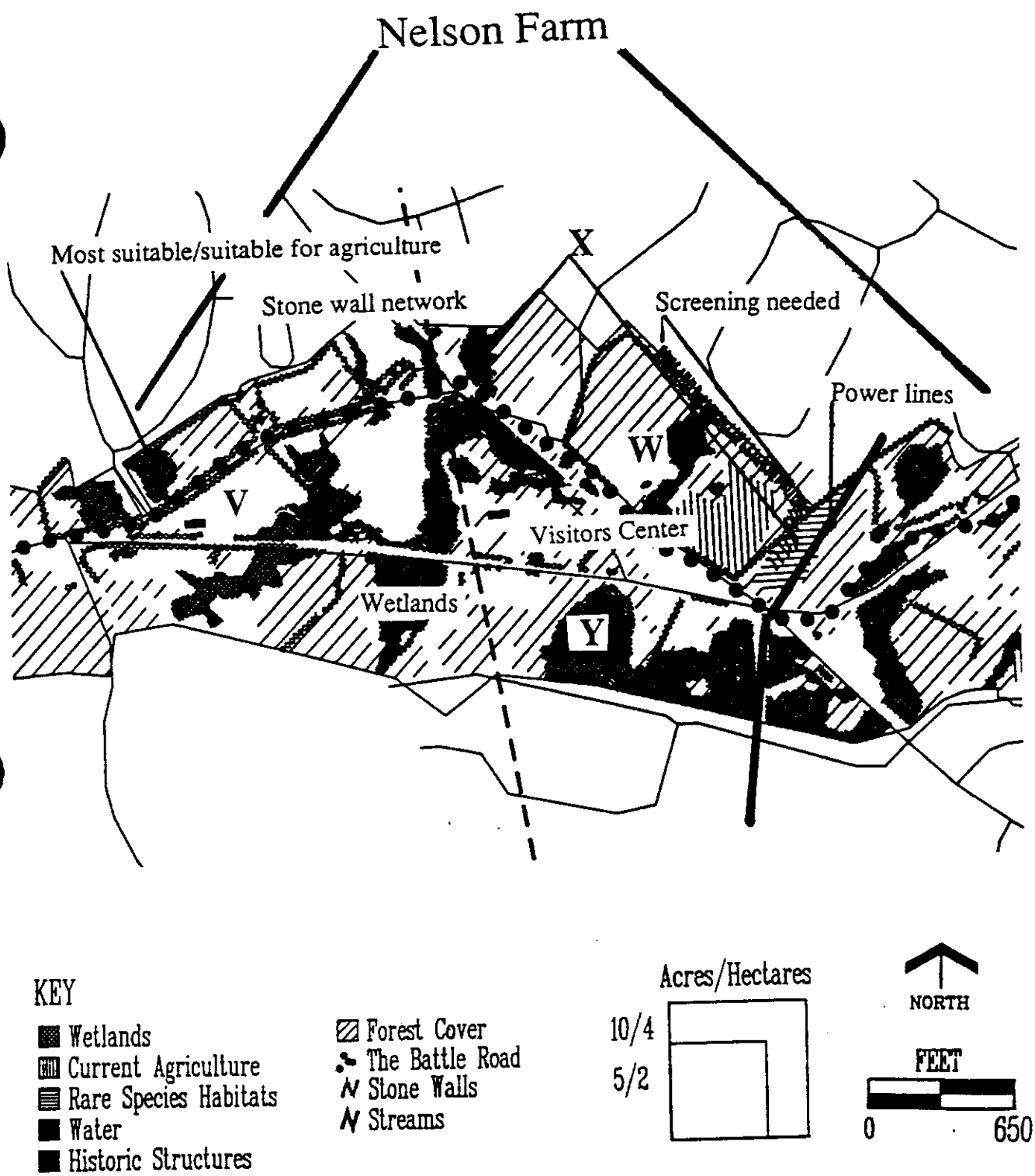


Figure 78: Map of Nelson Farm area, showing synthesis of Landscape History, Running Battle History, Agricultural and Natural Resources. Also shown are the Nelson House and Barn (V), the Whittemore House and Hargrove Barn (W), a state listed rare species habitat (X), and a compact bog shrub wetland unique to the Park (Y).

Landscape History

Agricultural reintroduction should be done at a smaller scale than in the western end of the Park. The Hanscom Air Force Base housing just to the north of Nelson Road should be screened, as should the Visitor's Center. However, with the Nelson House and Barn and the existence of stone walls in this area, historic character could be reinforced through agricultural reintroduction. There is a concentration of cultural landscape elements in the Nelson Farm area including:

- Existing stone wall network
- Nelson House and Barn - Leasable (see Figure 78 "V")
- Whittemore House and Hargrove Barn ("W")

Running Battle History

The Nelson Farm area is associated with important Running Battle skirmishes such as "Parker's Revenge" and the action at "The Bluff." In 1775 the Bluffs was woodland and so should be managed as woodland for interpreting the Running Battle. However, this option may be limited due to the power lines cutting across the Park in this location.

- The power lines should be screened as much as possible, and views should be directed away from Minute Man Vocational High School and the Visitor's Center.
- Agriculture should be reintroduced in order to interpret the landscape context as well as the skirmishes.

Agricultural Resources

The Nelson Farm area of the Park is generally not appropriate for agricultural uses. A large portion of the area is wetland and the habitat for a state-listed rare invertebrate (see Wildlife/Habitat section below). However, small pockets of land are Most Suitable and Suitable for agriculture, especially on the north side of the restored section of the Battle Road.

- Agricultural uses generally not appropriate, but,
- Small areas north of Nelson Road in the forested areas Most Suitable and Suitable for agricultural reintroduction

Natural Resources

The wetlands in the vicinity of the Battle Road Visitor Center, located within the Nelson Farm area, is habitat for a state-listed rare species. The extensive wetland system, encompassing both sides of Rte. 2A, should be preserved as it is, including all woodlands within 100 feet of the wetland edge. Similarly, the 0.6 acres of compact bog shrubs, located south of Rte. 2A, southwest of the intersection with Old Mass Ave. are unique to the Park and should be managed for natural resource interpretive purposes.

- Protect state-listed rare species habitat ("X" on Figure 78)
- Protect and interpret extensive wetland ecosystem on both sides of 2A
- Protect and interpret unique compact bog shrub wetland (0.7 acres) south of 2A ("Y")

Evaluation of Nelson Farm Area

The reintroduction of small-scale agriculture in the forested portions to the north of Nelson Road (in order to interpret the Landscape/Battle History) is compatible with the agricultural resources. Protection of the approximately 10 acre wetland areas (state-listed rare species habitat) is compatible with needed screening of the power lines in the Bluff area. Additional natural resource interpretive potential includes the interpretation of the compact bog shrub wetland (0.7 acres). Reintroducing small scale agriculture within the stone wall network to the north of the Battle Road and at the Nelson Farm is compatible with interpreting both the Landscape History and the Running Battle history. Additional places for agricultural reintroduction are at "Parker's Revenge" (see Figure 44).

Fiske Hill Area



Figure 79: Aerial View of Fiske Hill showing contrast between open fields and forest cover. Fiske Hill is located next to the first major beltway (Rte. 128) built around the Boston Metropolitan region. The Rte. 2A exit from 128 is the major gateway of the Park from the Boston Region.

Fiske Hill is located at the eastern border of the Park. The Battle Road runs on the north side of the hill, roughly along the same alignment as the existing road. Most of Fiske Hill is forested, although a 10 acre field is kept open by the NPS on its southern side. There are also cultural landscape elements such as stone wall fragments and a house foundation.

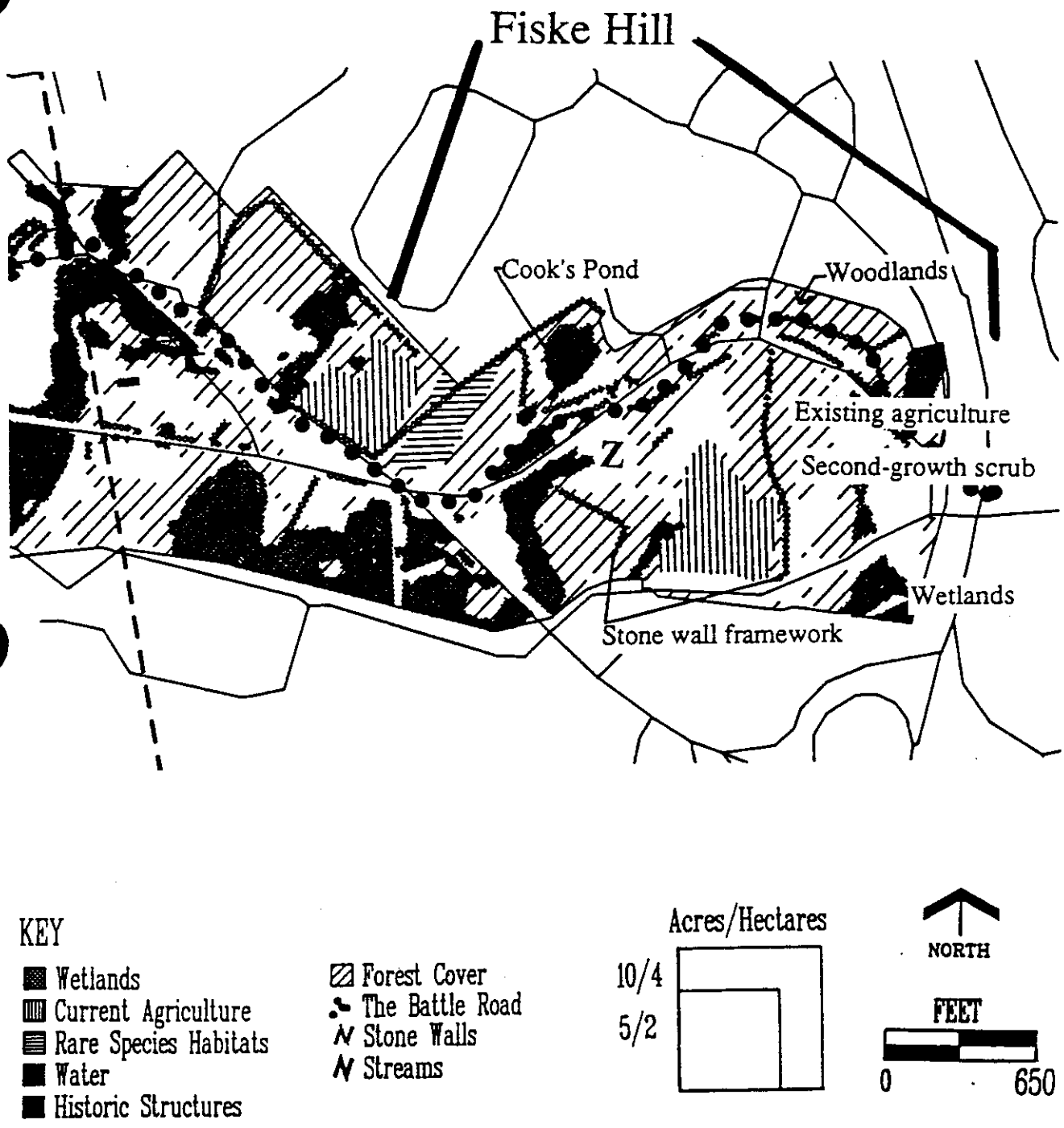


Figure 80: Map of Fiske Hill area, showing synthesis of Landscape History, Running Battle History, Agricultural and Natural Resources. Also shown are areas deemed "Most Suitable" or "Suitable" for agricultural uses (Z).

Landscape History

Fiske Hill is another important place for interpreting the continuum of landscape history. The historic land use pattern is apparent in the stone walls and in the forest cover that has grown up since it was abandoned.

- Agriculture should be reintroduced
- Stone wall framework should be maintained and cleared of trees wherever appropriate
- 200' of woodlands north of the Battle Road should be maintained for screening

Running Battle History

Fiske Hill is associated with the Running Battle in two ways. 1) The British re-grouped on the northern side of the hill before they proceeded back to Boston and, 2) there was an exchange of fire between a Colonist and a British soldier at the Fiske House.

- Agriculture should be reintroduced on Fiske Hill, and south of the Battle Road to improve interpretation potential of the Running Battle.
- Woodlands north of the Battle Road should be maintained because they were present in 1775.

Agricultural Resources

Besides historic structure buffers and a few small wetlands on the periphery, the Fiske Hill area of the Park is appropriate for agricultural uses, based on soil capability class and landuse/land cover assessments. However, soil conditions and present land cover suggests most of the land is Least Suitable, suggesting pasture or haying uses of the land. The existing agricultural land (presently leased) should be continued to used for agricultural purposes in the future. Additional small areas adjacent to existing agricultural land are Suitable and Most Suitable.

- Existing leased agricultural land exist in this area should continue to be farmed
- There are additional small areas of Suitable and Most Suitable agricultural

land, within which farming can be reintroduced (see Figure 80, "Z")
- Large areas of Least Suitable land also exist in this area, and are appropriate for haying or pasture (see Figure 33)

Natural Resources

The fields and second-growth scrub areas on Fiske Hill are the only known habitat in Minute Man NHP for the black racer snake, and is possible habitat for the equally uncommon milk snake (Windmiller and Walton, 1992, p. 38).

Cook's Pond (north of the restored section of the Battle Road), is the most diverse aquatic habitat in the Park. The woodlands within 500 feet of the edge of Cook's Pond contain resident populations of gray tree frogs and spotted salamanders (Windmiller and Walton, 1992, p. 37). Wetlands, in addition to those around Cook's Pond, are located near Rte. 128, and southeast of Fiske Hill. They are not unique to the Park, yet should be protected from agricultural run-off.

- Manage second-growth scrub and agricultural fields habitat for snake species
- Protect Cook's Pond as it is the most diverse aquatic habitat in the Park
- Protect and interpret small wetlands around periphery of Fiske Hill

Evaluation of Fiske Hill Area

The potential for agricultural reintroduction is compatible both in terms of interpretation of landscape history and existing agricultural resources. Agricultural reintroduction is also compatible with needed wildlife habitat protection in the Cook's Pond area as well as desired wildlife habitat management on Fiske Hill. The stone walls should be maintained and farming should be reintroduced within their framework. The open fields should continue to be farmed as they represent continuity of land use. The Fiske Hill area is also important as an entry, i.e. a gateway from Route 128 and the suburban landscape surrounding the Park at this end. The transition from a heavily developed landscape to the agricultural landscape within the Park's boundary, will strengthen Minute Man NHP's identity as an historic cultural landscape.

Step Three -- Development of a Potential Interpretive Roads and Trails System

Using the significant interpretive places determined in Step Two as a framework, a conceptual framework for an interpretive road and trail system was planned, that links the places together, as shown in Figure 81. The trail system is organized into a hierarchy of use categories. The spine of the system, designed for the most heavy use, is the Battle Road. The Battle Road brings visitors to the significant places, and from there they can experience the landscape through a series of secondary trails. The trails take the visitors off of the main road enabling them to experience the landscape from a different prospect. They will be able to learn about the landscape history and natural resources of the Park, in addition to the history of the Running Battle.

The criteria for determining potential trail locations is 1) to link significant places for interpretation, 2) to respect historic field patterns, 3) to respect natural resources, and 4) to respect existing and projected agricultural use. In addition, linkages to the town of Lincoln trail system and to conservation land in the town of Concord will be planned.

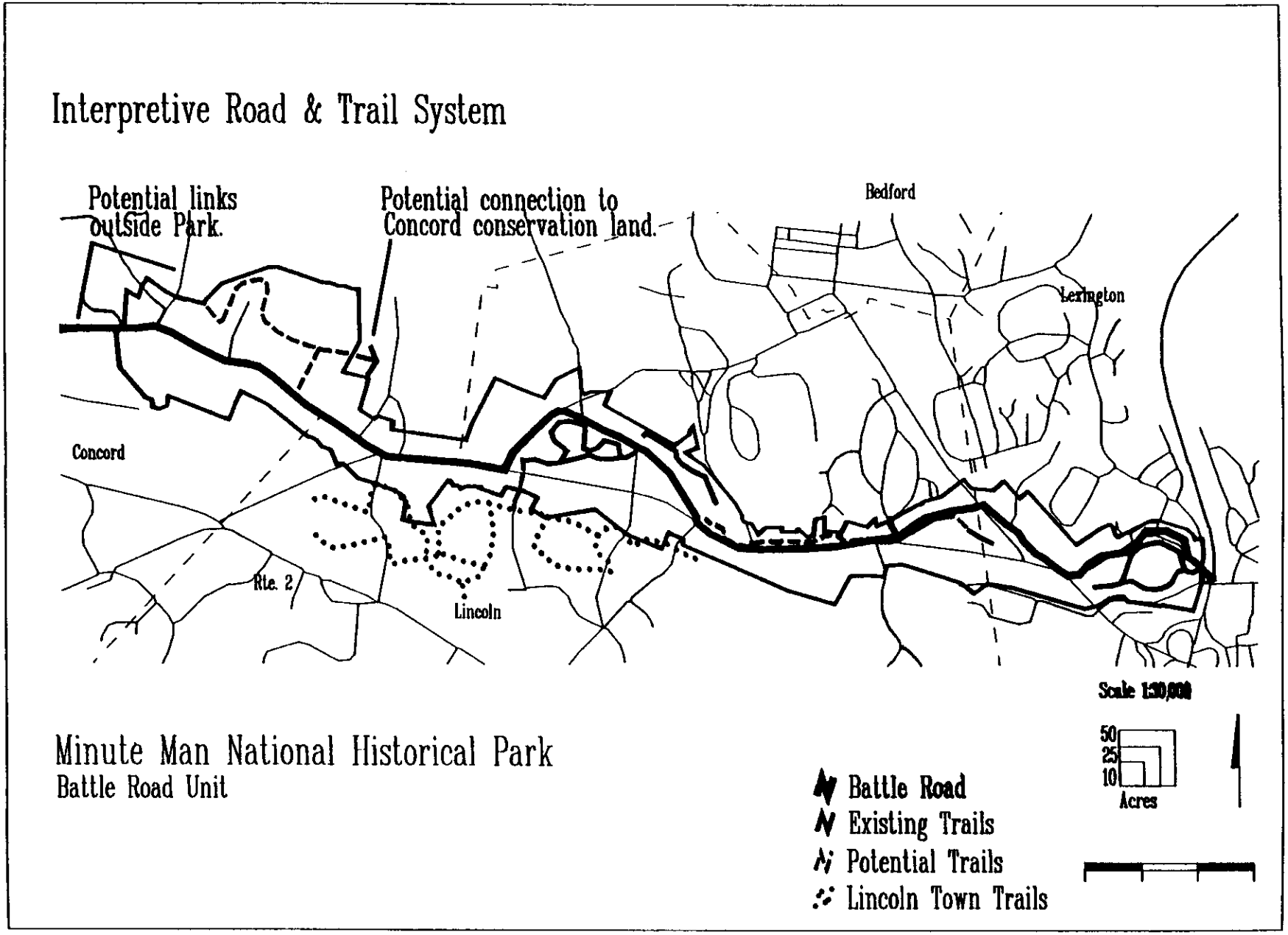


Figure 81: Interpretive Road and Trail System.

3.7 Chapter Summary

This chapter describes the results of applying the methods outlined in Chapter Two. The object was to develop management guidelines for preservation of the historic landscape and for using the landscape as a tool for interpreting the landscape history and the Running Battle History as well as the agricultural and natural resources of Minute Man National Historical Park. An "identification-assessment-management guidelines" sequence was applied. Also, the landscape of the Park was assessed for significant interpretive places, and eight were determined and management options presented. An interpretive trail system to link the interpretive places was developed as well.

The application of the landscape history sub-method highlighted some interesting aspects of the Park and its history. In mapping the existing cultural landscape features, a network of stone walls, altogether over 17 miles long, was found to be one of the most important character-defining features. The walls are not only a significant "small-scale feature," they also outline a field pattern that may be intact from the 17th and 18th centuries. These walls add to the integrity of the Park's landscape and indicate a great deal of continuity.

The agricultural land use present through history was also found to be an important character-defining feature in this landscape. Here too, there are parts of the Park with a high degree of continuity of land use. Finally, the Park's forests were also found to be another important character-defining feature. As the land was cleared, the spatial organization opened up; as the forests grew back in the early 20th century the landscape became more enclosed.

In the assessment for historic character there were several areas of the Park with the "Highest" and "High" degree of historic character cover 169 acres, or 23% of the landscape. Treatment options for these areas focused on retaining the spatial organization and stabilizing and protecting the cultural resources such as stone walls. Most of the Park fell into the "Moderate Degree of Historic Character" category. Approximately 68% (496 acres) of the Park could be rehabilitated through reintroduction of agriculture in order to reinforce historic character. Only 46 acres (6%) fell into the "Low Degree of Historic Character" category. These areas should be screened to decrease their impact on the rest of the landscape.

The Running Battle History sub-method found that since the fighting on April 19th, 1775 took place on the move, there were 10 areas (65 acres) rated "Highest Importance to Battle Interpretation" where specific battle events occurred. located along the Battle Road from Meriam's Corner to Fiske Hill. The Battle Road itself, along with the routes traveled by the Colonists were rated as having a "High Degree of Importance to Battle Interpretation." The remaining 654 acres, or 90% of the landscape, fell into the "Moderate Degree of Importance to Battle Interpretation" as the context of the fighting.

Management options focused on retaining and reinforcing historic character by reintroducing agriculture through a combination strategies in the "Highest" areas. In the "High" areas, there are opportunities for replacement of missing documented cultural landscape features of the Battle Road at Virginia Road, but options are limited for most of Rte. 2A at this time. In the "Moderate" areas, a more flexible approach was advocated. In these places, the reintroduction of agriculture would function as a backdrop to help visitors visualize the landscape in which the fighting took place.

Minute Man's agricultural and natural resources were also identified and assessed, and management guidelines for the resources were developed. In terms of agricultural resources, 106.3 acres of land in the Park were determined to be most suitable for agriculture, while an additional 75.2 acres are suitable, totaling 181.5 acres, or 25% of the Park. The areas most suitable and suitable for agricultural uses should be leased to farmers, while other areas of the Park should be managed by the National Park Service for agriculture or other resource management and interpretation. Approximately 10% of the Park is currently used for agricultural purposes. Most of this land is located at the western end of the Park, in the Minot and Jones/Stowe areas of the landscape.

In terms of natural resources, unique physiographic elements, including the glacial lake bed and swamp deposits, as well as glacial erratics, were determined most significant for natural history and physiography interpretive potential. These parts of the landscape should be managed for interpretive purposes. Two rare or endangered and three watch listed wildlife species and their habitats were identified in the Park, and 16.4 acres of wetland and riparian systems deemed most significant

because of their uniqueness or functions they provide to the ecosystem. Again, these areas should be carefully managed -- and the status quo preserved -- due to their significance in the landscape.

When these resources are combined, eight significant interpretive places stand out in the Park landscape. They are the areas around Meriam's Corner, Jones/Stowe Farm, Minot Farm, Brooks Farm, Bloody Angles, the Paul Revere Commemorative Site, Nelson Farm, and Fiske Hill. These places have significant landscape history, Running Battle, agricultural and/or natural resources that can and should be interpreted.

The development of an interpretive trail system that links these places was also developed. The system, consisting of a main trail, an intermediary trail and loop trails, moves visitors through the landscape on a hierarchy of paths. They can stay on the main trail and be exposed to all of the resources the Park has to offer, or go off on special trails that interpret a specific resource, such as the colonists' route during the Running Battle, or vernal pools and their role in the functioning of the ecosystem.

Shaping the landscape as an interpretive tool will greatly add to the Park's ability to convey the rich landscape history, the Running Battle history, as well as the agricultural and natural resources the Park has to offer to visitors. The landscape becomes the stage through which visitors can get a sense of what it must have been like to fire on the most powerful army in the world. In addition, this landscape was mostly agricultural since 1650, and provides a tremendous opportunity to describe the cultural landscape history of New England. Minute Man NHP is a unique place in the United States, and it has a powerful message to convey.

By reintroducing agriculture, the historic character of the Park will not only be enhanced, making it easier for visitors to understand what went on in this place, but a productive, working relationship between people and the land will also be enhanced. The agricultural resources of the Park inform us of the best places to reintroduce agriculture, while the natural resources in the Park can also be used to expand the interpretive potential of the Park. At the same time, these resources should be protected as valuable natural resources of the region.

CHAPTER FOUR: SUMMARY

4.1 Introduction

In fulfillment of Cooperative Agreement CA-1600-0-9904 between the National Park Service and the University of Massachusetts, this report will contribute to the development of a Cultural Landscape Management Plan for Minute Man National Historical Park. By developing management guidelines for the landscape history, Running Battle, agricultural and natural resources, the landscape can be properly managed and interpreted, expanding the potential of Minute Man beyond its present level.

There are some conclusions to make about developing guidelines for cultural landscapes and their application at Minute Man National Park. This project provided a great opportunity in historic preservation to challenge the notion of "freezing" time as a means of interpreting the history of a place. After all, years pass and the landscapes changes with each new generation. The cumulative effect of all of this time is represented in the landscape and should be appreciated.

Developing management guidelines for using the landscape as an interpretive tool for both the landscape history and the running battle history followed the same analytical framework; to identify the components of each, assess them and develop management guidelines within a rehabilitation framework for enhancing the landscape's "historic character." The management guidelines were designed to enhance the degree of historic character in order to help visitors visualize the historic landscape. The development of management guidelines for the agricultural and natural resources of the Park followed the same analytical framework. Management guidelines were designed to both protect the natural resources of the region while aiding interpretation of the cultural landscape. The management guidelines for all four components (Landscape History, Running Battle History, Agricultural Resources and Natural Resources) used rehabilitation as the primary treatment.

4.2 Summary of Landscape History Section

Some of the most important issues raised in this study of cultural landscapes were related to the definition and assessment of the key issues. Specifically, in identifying cultural landscapes as "Processes and Components" as advocated in Bulletin #30, it may be easy to fall into the trap of seeing the landscape as a collection of separate "data layers." However, it is only when these layers of information are seen as a whole, including their history, that the landscape becomes a unique place. It was suggested that one way to synthesize the landscape's processes and components was through an analysis of its historic character. This begins to answer the question, what exactly makes a landscape look the way it does? If the landscape is be understood in this comprehensive way, assessment and treatments will be more appropriate.

The analysis of the Park's current features and historic character showed a remarkable continuity over time. If a Colonial, Victorian or Early 20th Century farmer were to look across the landscape typical for Concord they would all see a similar scene. In general, they would see an open, agricultural landscape with small fields (2-12) acres, bounded by stone walls or hedgerows. They could walk down the same roads or lanes and they would see many of the same structures along the way. There is a great deal of continuity in this type of scene in Minute Man and although the forest has grown in since the early 1900's this type of character still exists in the Park.

The continuity in terms of historic character was the focus of the assessment applied to the Park. It was found that there were at total of 70 acres or approximately 10% of the Park where the "Highest Degree of Historic Character" still existed. These areas are located primarily in the eastern end of the Park in the Minot Farm Area. Here, the spatial organization, land use, structures and small-scale features have been relatively unchanged since the early 18th century. In addition, there were approximately 100 acres of land categorized as having a "High Degree of Historic Character," i.e., having all the same features as those rated higher except the land was not in agricultural use.

Most of the Park was found to have a "Moderate Degree of Historic Character" (496 acres in all). In most places, the stone wall framework still exists, although the

historic spatial organization and land use were lost in these areas, contributing to their lower rating. Only 46 acres were found to belong in the "Low Degree of Historic Character" category. These areas consisted of places where parking lots, power lines and modern structures were located (see Figure 38).

The treatment options described in Chapter Three suggested a rehabilitation approach for the Park as a whole, with more management guidelines for each category in the assessment. These treatment options included little or no intervention for those areas already having the "Highest Degree of Historic Character." Only certain types of agricultural should be reintroduced in those places with a "High Degree of Historic Character" while places with a "Moderate Degree of Historic Character" could have agriculture reintroduced with fewer restrictions. It was found that areas rated with a "Low Degree of Historic Character" should be screened (see Figure 38).

4.3 Summary of Running Battle History Section

Battlefield identification relies on many of the same concepts as cultural landscape identification. At Minute Man, the battle was fought along a three-mile stretch of roadway between Meriam's Corner and Fiske Hill. Since this was a linear battle, the "locations and areas" as defined by in Bulletin #40, break the battle down into its component parts along the Battle Road. These should be places to highlight for visitors so they can understand the chronology and the drama of what took place on April 19th, 1775. For example, the Running Battle began at Meriam's Corner and there was intense fighting at "Bloody Angles." The Colonists attacked and harassed the British all along the roadway, but the fight was punctuated by intense fighting. These places events and the places where they occurred should be highlighted for visitors.

In terms of an assessment, these highlighted places and the road that connects them were found to be in "Highest Importance to Battle Interpretation"(65 acres in all) and "High Importance to Battle Interpretation" respectively. In addition, it was found that the landscape context of the Battle was also "Moderately Important for Battle Interpretation" with a total area of 654 acres (see Figure 44). Treatment options for increasing the degree of historic character were developed based on the

assessment categories described above. The plan should employ an overall rehabilitation strategy for the entire Park, but within that larger framework, it was assumed that the more important an area for battle interpretation, the more it should resemble the 1775 landscape. Therefore, the most intense level of landscape management should be directed at those areas assessed "Most Important for Battle Interpretation." Agricultural reintroduction was found to be an excellent way to achieve a higher degree of landscape character in these areas.

4.4 Summary of Agricultural Resources Section

Methods for the identification, assessment and management of agricultural resources within a cultural landscape were developed and applied. The three steps in the method involved the identification of soils; wetlands; ponds, rivers and streams; current land use/land cover; and place-oriented information. After these resources were identified, agricultural suitability was assessed through a process that included the elimination of unsuitable areas; an assessment of the potential fields based on soil suitability class and land use/land cover; and revised rating of fields with the addition of the place-oriented information. Finally, management guidelines based on the results of the identification and assessment procedures were developed.

The application of these methods to Minute Man NHP resulted in the detection of 106.3 acres of land most suitable for agricultural practices and 75.2 acres of land that is suitable. It is in these areas, located for the most part in the western section of the Park, that agricultural reintroduction should take place. Additional small pockets of land exist throughout the Park's landscape. In the remaining 570 acres, farming or other resource management should be first priority. For example, in the 236 acres of wooded wetlands, wetland resource management, involving the protection of the wetlands and the habitats they provide for wildlife species, should be the main priority.

4.5 Summary of Natural Resources Section

Methods for the identification, assessment and management of natural resources, specifically wildlife and their habitats and wetland and riparian systems, within a cultural landscape were developed and applied.

In summary, the methods, based on state of the art research, developed procedures for the identification, assessment and management of natural resources in a cultural landscape. There were three steps in the method included the identification of the natural history and physiography of the landscape setting, existing and potential wildlife and their habitats, and wetland and riparian systems. After these factors were identified, they were assessed to determine the most significant features, wildlife, habitats, and wetland/river systems. Finally, management guidelines for these natural resources, based on the results of the identification and assessment procedures, were developed.

The application of these methods to Minute Man resulted in the detection of swamp deposits (scattered throughout the landscape), glacial lake deposits (at the western end of the Park) and glacial erratics (throughout the landscape) as the most significant natural history resources. The application also identified two rare or endangered wildlife species (Mystic Valley Amphipod and Elderberry Borer Beetle), three watch-listed species (Spotted Salamander, Common Shiner and Frosted Elfin), their habitats in the Park, and numerous target species (i.e., Indigo Bunting, Nesting Bobolink) requiring a variety of agricultural-related habitats. Finally, specific wetland and riparian systems were identified as having numerous values to the ecosystem, while others, including a coniferous wetland and compact bog shrub wetland, were determined to be unique to the landscape. These recommendations, however, are based on a limited survey of biological resources for the Park. The methodology described should be implemented when remaining inventories and research projects are completed to arrive at a more comprehensive assessment and appropriate management guidelines. Once the data are gathered, the methods from this study can then be applied to integrate into the overall management plan.

These resources should be protected and interpreted for their own value to the landscape as well as for their role in the shaping of the cultural landscape. These

resources should not be forgotten and destroyed as cultural landscape rehabilitation takes place in Minute Man NHP

4.6 Summary of Management Guidelines Section

Overlaying the landscape history, Running Battle, agricultural and natural resources resulted in the determination of eight significant interpretive places in the landscape of Minute Man National Historical Park. They are the Meriam's Corner, Minot Farm, Jones/Stowe Farm, Brooks Farm, Bloody Angles/Hartwell, Paul Revere Capture Site, Nelson Farm, and Fiske Hill areas.

An interpretive trail system was developed that links these interpretive places together. The system, consisting of a main trail along the Battle Road and additional secondary trails off of the main road, move visitors through the landscape, exposing them to all of the resources the Park has to offer, from the excitement imbedded in the story of the Running Battle to the role wetlands played in the historical landscape as well as their role in today's landscape.

4.7 Overall Summary

Interpreting the cultural landscape through agricultural reintroduction is being advocated more frequently by the National Park Service, as well as other agencies and organizations as a public/private partnership to advnace mutual goals for cultural landscape interpretation and to support contemporary agriculture. This report focused on the cultural and historical aspects of the larger Cultural Landscape Management Plan as well as the natural and agricultural resources. In taking this more comprehensive planning approach, the NPS can broaden its mission and interpret much more than the beginning of the Revolutionary War. Shaping the landscape as an interpretive tool will greatly add to the Park's ability to convey both the rich landscape history, the Running Battle history as well as the Park's natural resources to visitors. Minute Man is indeed a very important place, both in history and today. The issues explored in this study should help to ensure that the transformation the Park is about to undergo is a change for the best.

4.8 Suggestions for Further Research

Clearly, there are still some very important questions to be answered concerning the Park's history. More detailed, Park-specific land use maps would be invaluable for analyzing historic character. In addition, with more detailed historical information the stone walls and changes to the circulation system could be more precisely dated. Accurate historical data would also enable research on image processing techniques to be developed, adding another interpretive tool to the NPS.

As indicated in various parts of the report, further research and studies need to be undertaken in order to more fully comprehend the extent of the resources in the Park. This is especially the case for wildlife and habitat resources. Additional studies to determine the existence of *all* wildlife species, both flora and fauna, that have habitats both in the Park and in the surrounding landscape are needed. Identifying the species in the Park is a start, but the identification of their metapopulations, as well as the existence of additional species, is essential. The findings from the studies underway at press time ("Summary of Field Data from Minuteman National Park Plant Communities Study," Elizabeth Thompson and Jerry Jenkins; "Mammals of Minute Man National Historical Park," Gwilym S. Jones; "Minuteman Park Report Vernal Pool Survey," Joe Martinez; and "A Salamander Survey at Minute Man National Historical Park," Leslie A. Thomas) need to be applied to the methods developed in this report. In addition, the Park and the surrounding towns must work together to identify the flora and fauna existing at the larger landscape scale, as species in the Park depend on their metapopulations in the larger landscape for survival.

Similarly, a closer study of the wetland systems must take place, in order to determine their ecosystem values. This is especially important due to the large amounts of runoff from the numerous roads and lawns in the Park. Increasing amounts of agriculture in the Park will only increase the amount of runoff. Wetlands play an important role in the health of the ecosystem, and should be managed wisely.

Further research, planning and design should investigate the potential of and begin to design interpretive programs for the resources discussed in this report. An interpretive trail network is just the beginning; programs that will bring the history

and values of the multiple resources in the Park are needed. These programs should be developed for children and senior citizens, for families and for educational groups, for local citizens and for foreign tourists.

Finally, in addition to more historical research, the treatments options recommended in this study should be analyzed and applied at the site scale. Detailed management guidelines should be developed at this scale to aid agricultural reintroduction. In this type of design work, simulations of perspective views would better visualize the resources and issues identified and assessed in this report. In addition, the analysis of historic character could help parking lot design and screening by suggesting ways to knit those new elements into the existing cultural landscape fabric. Here again, visual simulation would help evaluate the design alternatives.

As more historic data becomes available, visual simulation could also be used to help interpret the cultural landscape history. For example, a series of photographs could be generated that depict the landscape during any given historic period, in any given location. Computers could be used to interactively interpret any of the Park's historic, cultural or natural themes through maps, photographs, and simulations. This new emerging technology could "revolutionize" the way visitors learn about the Park. Further research should be done to capitalize on opportunities presented by this computer technology.

The resources and interpretive potential of the Battle Road Unit of Minute Man National Historical Park extends far beyond its 725 acres.

APPENDIX A: THE BATTLE ROAD LANDSCAPE AND THE CAUSES AND CONSEQUENCES OF THE REVOLUTION

by Brian Donahue
Landscape Historian and Consultant to the METLAND Team

The farms along the Battle Road in 1775 were part of a traditional agrarian society in trouble. There was no "subsistence crisis", however, there was a strong sense of diminishing prospects. This was a result of a farm system that had reached its ecological limits: the land had all the subsistence farms it could support, given the traditional farming methods. In the words of Bob Gross, "the terms of life were tightening."[1] This situation may not have been the principal "cause" of the Revolution, but it did make farmers feel strongly that they needed to defend their endangered way of life, when they saw Britain attempting to place them under tighter imperial economic and political reins.

The traditional farm system was build on the hay meadows and the livestock they supported, other subsistence crops such as corn, rye and apples, and woodlots. The landscape along the road was being utilized to the full capacity of this system: all the meadows that could be found were in production, tillage was at its historical maximum, small orchards abounded, most of the uplands were in pastures that sustained cattle during the summer, and woodland was reduced about as low as it safely could be as long as the inhabitants continued to rely on local wood supplies for heat and other needs. This system was close to being ecologically stable, although a slow drain of pasture nutrients was underway, and tillage lands were probably overtaxed. But the system could not be expanded or intensified without being transformed, because the limit of the crucial resource, meadow hay, had already been reached.

However, the patriarchal social system by which this agrarian society functioned favored large families, which allowed these laborious farms and trades to be successfully run, and which guaranteed support for the parents in old age. Hence, the system was under pressure from population growth. Whether this was an intrinsic contradiction because large families were strictly necessary to the system, or whether it was simply the continuation of a habit from earlier days when there was land to fill up, and mortality from smallpox and other diseases was more common, is unresolved by historians. In any case, by the mid-17th century, it was becoming increasingly difficult for fathers to establish their children on local farms, because the land base was saturated. Hence, the prospects for young people were diminishing, and the traditional agrarian system was under stress.

This was not a crisis situation because, with the end of the French and Indian wars, there was room for surplus children to migrate to frontier settlements in New England, thus extending and replicating the traditional system in new areas.

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[1] Robert A. Gross, *The Minutemen and Their World*, New York: Hill & Wang, 1975, 106.

However, this still left the older towns feeling diminished. Most men aspired to the status of patriarches that their fathers and grandfathers had achieved, as comfortable farmers with their children well established on farms near by. Now, many children were leaving town, and it was difficult for most parents to find the means to give all their children a good start in life. Many children were sinking to a lower status on inadequate subsistence holdings, scraping for a living in poorly paying trades or as laborers. Most historians feel that while colonial society was not in crisis, it wasn't really prospering either: it was stagnating. Economic growth was slow at best.[2]

Along the Battle Road, we can find examples of these conditions in the dispersal of Joshua Brook's children throughout New England, and in the presence of families like that of Joseph Mason, working as a currier and occupying a very small farm between the Hartwells and the Brooks.

This condition of stagnation was not immediately improved by the Revolution: indeed, for a time, things continued to get worse. The 50 year period from 1775 to 1825 was one of difficult and painful transition. However, the Revolution did help create conditions that led to a new approach to farming, including the development of a domestic manufacturing economy, government that was responsive to entrepreneurs, and a sense of political and economic independence. Farmers needed to involve themselves more in the cash economy to get the means to give children a start. They gradually learned to substitute imported resources such as wheat and coal for local subsistence production of some crops, and to specialize their own production in other crops for the market. Along with this economic transition to "commercialism" went a social transformation toward aspirations to be middle class, and materially prosperous. Tied in with this was deliberately limited family size, women's desire to escape the grinding drudgery they had endured under the traditional patriarchal system, and temperance and a more rational, "managed" approach to farming and trades.[3]

Although some prospered in taking up these new ways, others failed. Along the Battle Road, these changes can be seen in the expansion of commercial livestock and dairy farming, and the appearance of larger, more prosperous houses and barns, often painted white, with front yards and trees;[4] but at the same time in the decline of orchards, and the failure of old trades such as the tannery.

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2 James A. Henretta, "Wealth and Social Structure," in Jack P. Greene & J.R. Pole, eds, *Colonial British America: Essays in the New History of the Early Modern Era*, Baltimore: Johns Hopkins, 1984.

3 Richard L. Bushman, "Opening the American Countryside," James Henretta et al, eds, *The Transformation of Early American History*, New York: Knopf, 1991. Also, Henretta, "The Transition to Capitalism in America," same volume.

4 Thomas C. Hubka, *Big House, Little House, Back House, Barn: The Connected Farm Buildings of New England*, Hanover: Univ. Press of New England, 1984.

APPENDIX B: EXECUTIVE SUMMARY OF CULTURAL LANDSCAPE MANAGEMENT PLAN - PHASE I

In 1989 a General Management Plan for Minute Man National Historical Park was published outlining the long-term goal of approximating the character of the landscape that existed along the Battle Road in 1775. To attain this goal, the National Park Service is considering a rehabilitation of the historic landscape which would include a land leasing program for compatible forms of agriculture within the Park. Landscape rehabilitation is defined as "the process of returning a property to a state of utility, through repair or alteration, which makes possible an efficient contemporary use while preserving those portions and features of the property which are significant to its historic, architectural and cultural values" (quoted from the Secretary of the Interior's Standards for Rehabilitation, revised 1990).

The purpose of this project, Phase I in a larger process, was to produce a preliminary agricultural potential map indicating areas within the Park which could be managed by the National Park Service or leased to farmers. A digital database was compiled, and a Geographic Information System (GIS) was used to generate and evaluate scenarios for historic leasing. Areas in the Park were assessed for their agricultural suitability based on physical factors such as soil types, slope, current vegetation and land use. In addition to assessing the land for agriculture suitability, interpretive potential of historic resources in the Park, such as restored buildings and stone walls, were included in the process, as were the sites of important skirmishes which took place on April 19, 1775. These important areas were treated differently in the evaluation of agricultural land.

A digital database was developed and used to analyze the spatial information in the Park. The methods developed by this study use this database and are flexible, incorporating new data as it becomes available. The GIS facilitates this process in an efficient, consistent and accurate manner. For example, as new wetlands are mapped, they too can be eliminated from the land available for farming. As additional historic data is uncovered, representing different periods in history, they can be incorporated into the methods and generation of agricultural leasing scenarios.

As information can easily be added into the methods, they create a framework for an ongoing process involving the National Park Service Staff as well as the public. The framework also works to answer the question "What if?" and can be employed in a public forum.

The scenarios generated in this phase are a starting point for further investigation into historic leasing potential. They are not plans or even specific proposals, but serve as the basis from which to develop leasing strategies. The scenarios can be used to advance the implementation of the Park's General Management Plan in terms of managing cultural landscape interpretive potential through agricultural

reintroduction. Additionally, they can be used as a starting point for visual and recreational landscape management, as well as for managing linkages with protected and ecologically significant landscapes adjacent to the Park.

APPENDIX C: BATTLE ROAD UNIT HISTORICAL LANDSCAPE ANALYSIS

by Brian Donahue
Landscape Historian and Consultant to the METLAND Team

Introduction

These historical landscape maps represent snapshots near the end of each period of development. They give a preliminary, approximate picture of land use in different parts of the Park at different times. *They do not attempt to give an accurate parcel by parcel picture.*

Land use category percentages for each map are estimates based on Concord tax valuations, Massachusetts State Census returns, and educated guesses for the first three maps. The picture of land use distribution across the Park was developed from deeds, tax and census data, Malcolm's 1775 map, and McConnell land use maps and aerial photos for the 1950 map. Differing mixes of land use were sketched in different parts of the Park in a schematic way, based on data collected to date. These do *not* represent actual fields: real fields were smaller, and land uses were more mixed up.

Areas have been circled on each map where research conducted to date indicates there are good opportunities to interpret the story of changing social and environmental conditions in the Park. A description of these opportunities, and of further research that would be required to develop each one follows.

1650 Map

17th Century Commons System

During the first generation of English settlement, from 1635 into the 1650s, farming in Concord was practiced under a "common field" system similar to those being used in many parts of England. Houselots were clustered in the village, tillage lots were located among several large planting fields (probably formerly cultivated by the Indians) mostly near the center, hay mowing lots were scattered in a few dozen large and small meadows throughout town, special pastures were enclosed in certain areas for various specific types of stock (the Ox Pasture, the Hog Pen Walks), while most of the town's outlands were left as common grazing and woodland.

Important elements of this system were located within the western end of the Park, including the Cranefield, the Brick Kiln Field, the Ox Pasture, and several meadows. Joseph Meriam's houselot was apparently the east end of Concord village in the first

generation of settlement. The houselot itself was small (only 1.5 ac); the bulk of his tillage land was "within Cranefield gate" across Billerica way to the west, while most of his meadow was in Elm Brook Meadow, along with some in the Great Meadow by the river. This houselot and tillage land remained in the Meriam family until the death of Rufus Meriam in 1870. The land east of the Meriam houselot contained small meadow lots well into the 18th century. Next east on land rising toward the Brick Kiln Field was a small tenant farm that had a house on it by 1663. This land was apparently part of the grant of the minister Peter Bulkeley, and was sold by his widow to Timothy Wheeler. It descended through the Wheeler family to James and Rebecca Minot in 1726. James gave it to his son Samuel, who became the first "owner-occupier" and built it up into a more substantial farm.

Almost as interesting as the workings of the commons system was its very gradual dissolution and consolidation into individual farms over the next several generations. Well into the 18th century, farms were still being worked in this area that looked very much like the original farms with their small scattered pieces. Bit by bit, farmers were able to buy up neighboring lots and in effect pull their tillage lots closer to the barn. This process was not circled on any single map because it was long and slow. It is well illustrated in the Meriam/Minot area, but even better on the Brick Kiln Field and Ox Pasture to the east that came to be Fletcher and Stow land.

Interpretive possibilities include maps of the original common field system and the distribution of parcels granted to families such as the Meriams within it; and perhaps maps showing the subsequent consolidation of farms in the area. A loop trail through these ancient fields could pass walls, lanes, and ditches identified as belonging to the common field landscape. It might be possible to have artists impressions of that landscape at selected points. We could have a graphic comparison of the workings of the Native system and the common field system of the English settlers. Both were community controlled subsistence systems adapted to the local environment, but they were very different.

Further research needed to realize these possibilities in this area is considerable. It would require deed research reconstructing enough of the Cranefield, Brick Kiln Field, Ox Pasture and adjacent meadow areas back to the original owners to get at the structure of this land use system and to identify early landscape features.

1675 Map

Brooks: Family Land Division and Farm Development

With the Second Division of land beginning in 1652, the great bulk of Concord's common land was privatized, and the pattern of family land subdivision and farm development for the next several generations was set. A good place to follow this development is in the area along Elm Brook that was granted to members of the

Brooks family. This was one of the earliest areas to be settled outside the original village. Although land holdings were still quite scattered, the pieces were somewhat larger and more consolidated than in the First Division. Instead of 4 or 6 acres, homelots in this area tended to be more like 20 acres, for example.

Joshua, Caleb, and Gershom Brooks, the three sons of Thomas Brooks, were all granted land in this area. Gershom also acquired the neighboring holdings of his brother-in-law Timothy Wheeler. Caleb moved to Medford, and his land was acquired by his brother Joshua. In the next generation, more homesteads (and more headaches for historians) were created as the land passed to Gershom's sons Daniel and Joseph, and Joshua's sons Noah, Hugh, Daniel, and Joseph. Meanwhile, the Brooks were acquiring more land from neighboring owners such as the Fletchers.

Interpretive possibilities here include a series of snapshot maps of Brooks land holdings and farm layout at each generation, every 25 years from 1675 to 1775. This would give visitors a sense of the way the landscape was progressively filled with farms, leading to the period when smaller land inheritances began to stress the social fabric of the community. Since several other nice interpretive possibilities exist involving the Brooks family later on, such an introductory exhibit would give visitors a better sense of how these farms were created.

Research required to reconstruct the entire Brooks territory would be monumental. The task can be reduced, and made more comprehensible for exhibition, by concentrating on those Brooks whose houselots were inside the Park along the Bay Road, and ignoring the branches that developed further south into Lincoln. Most of the necessary deeds have been collected and cataloged, but it would take some time to map them all the way back to the Second Division.

1700 Map

Hartwell: Farm Development

By the end of the 17th century, settlement in Concord was reaching more remote areas such as the uplands east of Elm Brook. The Hartwell family illustrates the pattern by which homesteads were extended to this area. William Hartwell settled in Concord's East Quarter in 1636, and received land grants throughout the general fields and meadows. Later, he was granted substantial 2nd Division lands on Elm Brook Hill, and near the Cambridge line. William's older son John was established with a houselot near his father, while his younger son Samuel inherited his father's homestead after William died in 1690.

At age 64, Samuel Hartwell passed the original homestead on to *his* youngest son Jonathan in 1709. He lived on with Jonathan until 1725. Meanwhile, his eldest son Samuel Jr established a new farm in the hills of what would become Lincoln, sometime before 1694. The original houselot may not have been on Virginia Road,

but further east on better tillage land by the Cambridge line, acquired from Richard Rice. Samuel Jr continued acquiring land in this area to add to that which was provided by his father.

Samuel set his son Ephraim up with a new farm on Virginia Road by 1733. Ephraim went about buying and selling land with neighbors until the Hartwell "Tavern Farm" was assembled. Ephraim afforded his eldest son Samuel, the clockmaker, with a smaller farm next door. Ephraim's younger son John inherited the Tavern Farm.

In the Hartwell family we see repeated several times a common colonial pattern of farm inheritance, by which older sons established farms on fresh ground, while the youngest son inherited the homestead and the responsibility of caring for aging parents. We can construct a picture of how outlying 2nd Division holdings were taken up and assembled into working farms. The way in which Samuel and Ephraim Hartwell put together the Hartwell homestead in Lincoln could be very effectively mapped, although the exact origin of some land acquisitions would be speculative. Exhibits of some of the Hartwell wills and deeds of gift would give visitors the flavor of the patriarchal structure of this family farm system.

I believe I have collected all the Hartwell deeds that were recorded. There are gaps. Constructing a reasonably accurate map of how the Hartwell farm was put together will require some more roundabout research into abutters and previous owners.

Cambridge Rangeways

During the 1690s, with the establishment of the Town of Lexington imminent, the mother Town of Cambridge moved to sell off the undivided common lands on its western frontiers. The land was surveyed and sold within a system of rectangular 40 acre blocks (with 1 rod "rangeways" left along the borders of each block for access), although it is not clear that entire 40 acre parcels were sold in many cases. Transcriptions of Town records I examined in Lexington were disappointingly sketchy on this; there may be a fuller accounting elsewhere in Lexington, or in Cambridge. In any event, it was during this period that the eastern part of the Park was settled and "improved". Some of the rangeways later apparently did serve as backroads and lanes.

There are interesting interpretive possibilities here in comparing this system of land distribution and its results to that used in Concord, and to the US Land Survey by which the Midwest was settled beginning a century later. However, reconstructing these ranges and squadrons and their subsequent dissolution appears to me to be a major research project. I would classify this as intriguing, but a low priority for now.

Ditching & Improvement of Hay Meadows

Draining and improving wet meadows was an ongoing labor from the time Concord was settled for the next two centuries. Generations of farmers dug networks of ditches, rendering the meadows accessible to cut hay and to cart it to the hard ground, and protecting low-lying meadows from damaging floods in rainy summers (winter flooding was beneficial). Drainage also helped improve wooded or brushy swamps and sedge marshes to grass meadows. The native grasses required land that flooded in winter but stayed fairly dry during the summer months, and that was annually burned or mowed. Drainage also converted some rich land on the fringes of meadows into cultivatable tillage.

Elm Brook Meadow provides a good opportunity to illustrate this long process of meadow improvement. The area was extensively ditched. A 1695 deed of agreement between Noah, Job, Daniel & Joseph Brooks concerning the relocation of a ditch gives a glimpse into how all this was done. It appears that the flow of Elm Brook was partially diverted west into the Mill Brook drainage. A 1730s map sketched by some Brooks scion clearly shows "the parting of the waters". In order for this system to function, it required miles of ditches to be connected and maintained all down the line.

Interpreting these meadows is crucial to understanding how the colonial farm landscape worked. We can create a detailed map of the drainage system in this area. We could also restore a small section (perhaps 1 acre or so) of meadow along Elm Brook by cleaning out a couple ditches, and mowing once a year with hand held brush cutters. Or scythes, for that matter - the meadow mowing season was a big social event in Concord, and would lend itself well to active re-creation. Much cider was consumed.

Research here will require field work to understand the hydrology of this area, and to locate ditches; together with mapping ditches mentioned in deeds.

1775 Map

Thomas, Noah & Joshua Brooks: Fully Developed Colonial Farming
Hartwell Tavern: Colonial Farm
Brooks Tannery

During the mid-18th century, an integrated system of land use in towns such as Concord and Lexington reached its fullest development. Although farmers did have some connections with Boston markets for commodities such as ship timber, live cattle and barreled beef, overall the agrarian economy was overwhelmingly subsistence oriented. This does not mean that every homestead provided for itself: there was very lively local exchange of goods and services. Many farmers also practiced a trade, and women were involved in economic networks as well, making

dairy products, spinning and weaving wool and linen cloth, and practicing as midwives.

Every part of the environment was involved in this system of local production and consumption. Tillage was maxed out as farmers grew their own subsistence grains of corn and rye: there would never again be as much land in tillage in these towns as there was in 1775. Cider was the local beverage, and small orchards had proliferated across the landscape. Meadows were fully utilized, and farmers had just begun the process of expanding their hay production by converting some of their drier meadows to higher quality "English hay". Pastures that provided grazing for cattle were the most prominent agricultural feature of the uplands. Cattle tied this agrarian economy together, providing butter, cheese, meat, tallow, hides, locomotion, and manure. There was scope to clear more pasture, but only if more hay could be grown for winter fodder, and only at the expense of forest. Forest was also essential, providing not only fuel, fencing, and building timber, but also material for crafts and trades such as staves for cooperage and bark for tanning leather.

Fortunately, we have detailed late 18th century inventories and surveys which will allow us to map this landscape in great detail between the adjacent farms of Job & Asa Brooks, Thomas & Noah Brooks, Joshua Brooks, Ephraim Hartwell, and Samuel Hartwell. These were all thriving, substantial farms representative of the period, but they would not all remain so prosperous in the period that followed. Using this material, we can give visitors a sense of the architecture of these farmers' complete relationship to the environment, and a sense of a system beginning to press against its environmental limits as population increased. This can be represented graphically for visitors using maps, blow-ups, and text.

We have a good opportunity to create a working representation of this landscape in the area beginning back of the Job Brooks house and running east along Virginia Road to the Hartwells. The possibility of restoring a small area of mowing in Elm Brook Meadow has already been mentioned. Half a dozen colonial orchard sites along this stretch of road can be located, and a selected few replanted with old New England apple varieties. Much of the land both sides of Virginia Road was in pasture: a good bit of this could be cleared and renovated, and populated with red Devon and Lineback cattle. Clearing the pasture on the slope west of the road, in particular, would provide a nice view over Elm Brook Meadow to distant farmland. Part of the Brooks pasture east of the road heading up to the Bloody Angle was referred to as "wood pasture" in 1790. This indicates woodland that had undergone selective cutting and grazing for generations, so that what remained were scattered mature trees over scruffy grazing. This widespread landscape feature could be recreated by "shelterwood" timber harvesting, and then turning in the cattle. We need to be careful to leave enough undisturbed or lightly managed woodland on this side of the road to provide an adequate buffer for the vernal pool, and to screen Route 2A. Any clearing north of the road in the Hartwell area would also require a protective strip at the back to screen development in that direction. This aspect of

cleared land along the road backed by woodlands in the distance would mimic (in a somewhat concentrated form) the actual colonial landscape of the area.

Very little (or none) of the land in this area would be considered suitable for row crop cultivation today, although parts of it were pressed into cultivation in the colonial period. However, we could break up a few acres of pasture every year in the course of renovation and reseeding, and take a low maintenance crop such as pumpkins. Following pumpkin harvest, winter rye (along with hairy vetch) could be planted, and allowed to mature early the following summer. This is bad farming but would add the visual element of ripening small grains to our landscape. After mowing and disking the rye (and perhaps harvesting a small portion for demonstration purposes), we could plant pasture with a nurse crop of oats. The maturing oats will provide the small grain aspect again, and then winter kill. The following year the land would return to grazing for a decade or so. Growing corn with modern equipment on any of this upland is problematic, but again every year a small area of half an acre or so could perhaps be done the old way (in hills) for demonstration purposes.

Two crafts were practiced in this part of the Park which have great interpretive potential. The first is cider making, which was universal, but is perhaps best interpreted at the Hartwell Tavern. They produced lots of cider at the Hartwell place - Ephraim Hartwell reported 40 barrels of cider in 1749. Cider vinegar also appears in a later Hartwell inventory. Cider was being made in Concord already during the 17th century, but during the 18th century it became the leading beverage throughout rural New England, replacing beer. This allowed more efficient use of land, because apples could be grown on marginal upland soils less suitable for grain. It also improved seasonal labor distribution, because cider is made in the fall after harvest. Cider is also interesting because by the late 18th century routine heavy alcohol consumption was a significant social problem. Sweet cider, cider vinegar, and cider jelly could be produced by an entrepreneur and marketed at the Hartwell Tavern, putting visitors in touch with this colonial tradition. Peddling hard cider is a bit more problematic, but perhaps not totally out of the question.

The second local industry of great interpretive interest was the Brooks tannery at Elm Brook. The tannery operated from the late 17th century into the 19th century. The Brooks also ran a slaughterhouse, and during the early part of this period they apparently also had a small sawmill a bit further upstream. These small scale industries illustrate how forest and farm resources were processed for use in the local economy. Lumber was sawed for building, obviously, while leather was used in shoes, harness, work aprons, and a host of other products. The tanning process required oak bark from the local forest, ground at a bark mill.

Unfortunately I have found no good accounts of any of these enterprises. The Brooks sawmill is shadowy, just a few references in later deeds to a lane that formerly led to it and a dam that formerly fed it. There was an interesting case involving the theft of sawn oak ship timber from Joshua Brooks by some erstwhile

business partners in the 1670s, but it wasn't clear where this timber was sawn. The tannery was obviously a going concern, and appears prominently in deeds and inventories. Several neighbors are referred to as "curriers" in deeds. However, there are no account books or other documents that give any insight into the operation of the tannery or the extent of its business.

The tannery could be interpreted at the Job Brooks house, drawing on research into colonial tanning operations elsewhere. While actual tanning, even on a demonstration scale, is probably neither practical nor environmentally desirable, a small currier and leather shop is a more practical possibility. It would be a simple matter to send hides from cattle kept in the Park out for custom tanning. Leather goods such as "Brooks Tannery" shop aprons might fetch a good price from visitors. Since Job Brooks worked as a currier, and Joshua's tannery was next door, this would be an historically appropriate use for part of this building.

Most of the deeds and tax data needed to map these farms are in hand, and the basic parcel mapping has been done. Mapping how the land was being used in greater detail will require long, careful analysis of the data, and field checking for internal land divisions. It takes some fiddling around because data from different sources never add up precisely, and there are always gaps. If we decide to develop interpretive cider or tannery programs, then extensive research into these colonial industries will be in order.

1850 Map

Asa Brooks & Emelius Leppelman: Commercial Livestock Farming

After the Revolutionary war, farmers began to alter their practices in response to the limitations they had encountered in their subsistence system, and to take advantage of increasing commercial opportunities. Among the complex of changes they made over a period of more than half a century was a decrease in subsistence production of grain, and an increase in market production of beef and dairy cattle. This development appears to be well illustrated on the farm which passed from Job Brooks to Asa Brooks, and then to Asa Brooks Jr. This farm was well endowed with meadow hay, and the Brooks responded by keeping large herds of cattle. Like many better-off farmers, they also owned summer pastures for dry stock in more remote towns, in this case Princeton. In the 1840s the farm passed into the ownership of a man from Denmark named Emelius Leppelman, who kept a substantial dairy herd. This was the same period that milk farming took off in Concord, taking advantage of the new rail connection to Boston - but whether Leppelman was a milk farming pioneer cannot be proven from Census data alone. For most of the rest of the 19th century, this farm was owned by a man from New Hampshire named Charles Sawyer who kept fancy stock - it appears to have become a gentleman's farm. It would be interesting to know to what extent the meadows north of the house were converted to cultivated hay by tile under-drainage, and when this was done.

Interpretive potential here centers on explaining the commercial transformation of agriculture, in particular milk farming, "English" hay and the drainage movement of the second quarter of the 19th century. Further research would include careful analysis of deed, tax and census data to specify changes in land use; searching all available sources for more information on the Brooks, Leppelman and Sawyer; and perhaps field work to discover traces of drainage.

Joshua & Isaac Brooks: Decline

While some prospered in the new commercial environment, many did not. In this period, estate sales to cover debts became increasingly common. Deacon Joshua Brooks (1720-1790), had been a prosperous farmer and tanner. However, he was hard-pressed to provide family farmlands in Concord and Lincoln for his children as his father had done. When he died, the bulk of his farm and tannery passed to his son Joshua. Abel, who worked as a currier in the family business, received only a 2 acre houselot and 6 acre barnlot down the road, along with 7 acres of river meadow. A third son, John, was provided with lands the Deacon had acquired in Pepperell. William had become established in Hollowell, Maine, and yet another son in Groton, New Hampshire.

The younger Joshua Brooks (1755-1825) had fourteen children. He was wealthy enough to provide a mortgage for his brother-in-law's farm and to engage in other land deals, but he also mortgaged his own property, and died in debt in 1825. The business and nucleus of the home farm were passed to his son Isaac in 1823, but Isaac failed to make a go of it. Isaac also acquired the neighboring Noah Brook's Tavern farm in 1828, but does not appear to have done any better as an innkeeper. In 1833 he sold the tannery but retained the right to erect a bark mill. He went bankrupt in 1844.

Both the Joshua and Noah Brooks farms were redeemed by Isaac's brother Nathan, a prominent Concord lawyer who had put himself through Harvard by keeping school. Through the 1850s Nathan leased the farms and the tavern to various tenants, including the widow Sarah Brooks (either Isaac's mother or his wife - both were named Sarah), and a tavern keeper named Charles Bigelow. He finally sold the bulk of the old Joshua Brooks place to his nephew Joshua in 1859, but this last Joshua sold out in 1862.

This is a story of failure to adapt and thrive in the new commercial environment. The Brooks tannery was either too small and antiquated to compete, or was mismanaged. The Brooks tavern probably declined as a result of the temperance movement, and perhaps the diversion of traffic to the new Cambridge turnpike. The Joshua Brooks farm was apparently too rocky and marginal to find a commercial niche. By the late 19th C much of it had already returned to forest.

This story can perhaps be interpreted with maps and genealogical charts showing the diaspora of the Brooks children. Visitors will take the point that the Brooks who chose to become a lawyer made good, while his brother who tried to carry on the family business as a tanner and farmer failed. They will also be interested in the temperance movement and the decline of cider. Taken with the more positive Asa Brooks story across the road, Isaac Brooks' failure provides a nice coda to the earlier presentation of land subdivision and farm development in the Brooks family during the colonial period.

Telling this story will require more research in Nathan Brook's papers at the Concord library. Court records may turn up more information on Isaac Brooks' bankruptcy. Secondary research is needed on the fate of the artisan economy (especially tanneries), the decline of taverns and the temperance movement in New England during the first half of the 19th century.

Fiske Hill: 19th Century Upland Hay, Pasture Expansion, & Abandonment

The environment also suffered as a result of the expansion of commercial agriculture during the first half of the 19th century. After 1820, there was an explosion of pasture clearing and hayfields across the uplands. Deforestation reached 90%, causing increased river flooding. Farmers could not keep depleted upland pastures and hayfields productive, and many began to revert to brush and forest. Farmers were unable to perfect a system of commercial farming based on sustainable use of local resources.

It appears that this process of clearing and abandonment is well represented by farms on and around Fiske Hill. This stony, marginal land contained a mix of pasture and woodland in the late 18th century. By the middle of the 19th century next to no woodland was being reported in tax valuations, while "unimproved" land was widespread. Tax data also suggest that a farmer named Patrick Fitzpatrick converted a large pasture on Fiske Hill into a mowed hayfield during the 1850s, which might explain a prodigious pile of field stones located on the north side of the hill. Later, much of the hill reverted to pasture pine.

An interpretive trail on Fiske Hill could lead visitors through the stages of upland clearing, depletion, abandonment and forest regrowth. The trail could pass through fields and woods, and by the rock pile. A long term rotation could even be established showing these stages at 5 or 10 year intervals. Since fields on the west side of Fiske Hill were part of the Muzzy and Nelson farms further west, considerably more research and analysis in deeds and taxes is needed to pin down the full history of land on Fiske Hill in the 19th century.

1900 Map

Samuel Hartwell: Orchards and Market Gardening

During the second half of the 19th century and into the 20th, farmers in the region concentrated on commercial markets. The influx of cheap meat and grain from the Midwest led local farmers to specialize in market gardening, orchards, and dairy. Western grain actually provided cheap high-protein feed for cows. Agriculture boomed economically, but began to contract geographically onto the better soils, and to rely less on local resources. Worn out upland pastures reverted to pine.

The highly specialized, professional form of agriculture that emerged in the late 19th C was exemplified by Samuel Hartwell. Samuel grew up on one of the old Hartwell family farms up the hill. In 1857 he acquired the Noah Brooks Tavern Farm, along with more land across the road, and established a thriving orchard and market garden. By 1880 he had 10 acres of apples and 5 of peaches. His census returns show that he had both a higher gross income, and higher expenses than his neighbors - hiring more labor, and purchasing far more fertilizer.

Interpreting this farm will depend on what is done with the land in this part of the Park. If the Brooks area is used for a small scale commercial orchard operation, it would be a continuation of Samuel Hartwell's farm, and could be interpreted in that way. Further research can be done in tax records to flesh out Hartwell's land use, and there may be papers and memories in the Rogers family to help with this reconstruction.

McHugh & Dee: Assimilation of Irish Farmers

As farmers commercialized in the 19th century, they began hiring more wage laborers. These laborers were Yankees, Nova Scotians, and increasingly after 1840, Irish immigrants. The Irish arrived during the construction of the Fitchburg Railroad, and some of them stayed on in the area, working as domestics and farm laborers. This is an interesting rural aspect of the Irish immigrant experience in America, which was usually urban. There was of course a great deal of social tension between Yankees and Irish, but there was social intimacy as well: census data reveal that many Yankee farmers had several Irish laborers and domestics living with them under the same roof.

By the second half of the 19th century, a few Irish farm laborers were able to purchase farms of their own - generally, although not always, smaller and more marginal enterprises than their better capitalized Yankee neighbors. During the 1870s, the McHugh and Dee families acquired the old Hartwell homesteads on Virginia Road, and carried on dairy and orchard operations.

This era provides an insight into the social relationships between Yankees and Irish and the role of immigrant laborers in the commercialization of agriculture, and into the willingness of poorer immigrants to try to make a go of marginal land that was being abandoned by Yankee farmers. Interpreting it would give visitors whose ancestors did not arrive on the Mayflower another way of identifying with the agricultural history of the Park. Since US Census agricultural data for individuals is not available after 1880, I have not yet attempted to follow the story of the McHughs and Dees in any detail. This might be done using tax data, and oral histories.

1950 Map

Palumbo: 20th Century Market Gardening
Agricultural Abandonment and Suburban Development
Rogers Farm: Orchards

After the First World War, more changes came to the agricultural landscape of the region. The major marketed crops came under increasing competitive pressure. Vegetables and fruits were undercut by refrigerated shipment from other parts of the country where production was on a larger scale. Dairy shifted to larger, mechanized operations on cheaper land upcountry. The hay market declined with the advent of the automobile. At the same time, the automobile made possible suburban residential and commercial development, driving up the price of land. As a result, agriculture steadily shrank, while the landscape came to be dominated by forests, residences and roads.

Commercial agriculture has survived in a few places on the best soils. The Palumbos are typical of the Italian immigrant framers who have played a major role in keeping agriculture alive in this region during the 20th century. In a manner similar to the Irish before them, these later immigrants typically began as gardeners on estates, and then acquired land and went into market gardening for themselves. This is an important story that again will give more visitors an opportunity to identify with the living history of land in the Park.

The Samuel Hartwell farm descended to the Rogers around the turn of the century and remained in orchards for many years - these trees, although no longer maintained in production, are still an important feature of this part of the Park landscape. Meanwhile, agriculture over the uplands, such as in the old Hartwell Tavern farm area taken over by the McHughs and Dees, succumbed completely to forest and development (including Hanscom Field) by the middle of the century.

These stories are best "interpreted" by the continuation and revival of productive agriculture that the Park hopes to encourage. Along with this, some sort of tribute should be paid to those who have kept farming going by telling their stories for visitors. Additional research for this would consist primarily of oral histories.

Conclusion: Continuity & Change in the Landscape

As these maps illustrate, the landscape of the Park has seen dramatic change over the past 350 years. The forest dominating the countryside was almost completely cleared away, the land was farmed for a few centuries, and now the forest has largely returned. Wetlands that once grew hay now grow brush and trees. Changes in crop mixes and farm methods made the landscape look different from one period to the next. In our century, automobiles and residential development obscure a substantial part of the rural landscape, and cloud nearly every part.

However, beneath all these changes lies remarkable continuity in the underlying framework of the landscape. A field pattern was established by the early 18th century, was extended almost everywhere by the mid-19th century, and has persisted to the present day. Tilled fields, meadows, orchards, and pastures were generally 2 to 12 acres in size, and occupied characteristic parts of the landscape. Woodlots were usually somewhat larger, and were often clumped together into more extensive forest areas. Meadow lots also tended to be aggregated. The stone walls, lanes, and ditches that delineated these fields mostly remain exactly where they were originally built, often still dividing one sort of land use or vegetation from another.

This diverse, small-scale mixture of land uses was created and has endured because of the diverse topography of the region, and because of a diverse agricultural economy that integrated tilled crops, livestock, and forest products. Farm systems changed over time, but not in any way that caused the structural lines to be reconfigured. Instead, change took place within the framework. Sweeping change such as might result from mechanization, systematic irrigation or drainage on a wide scale, was discouraged by the topography. There were no landowners large enough to initiate fundamental reorganization such as enclosure in England - and Concord's common field system never covered that much of the landscape anyway.

Over this stable structure, the face of the land was quite changeable, in both property ownership and land use. Working farms were constantly being reassembled as one generation of neighbors gave way to the next. Some farm cores descended intact within a family or through a string of owners, but many outlying pieces did time first in one farm, next in the neighboring farm, and then perhaps as part of a farm across the road. During the period of intensive subsistence use in the mid and late 18th century, some fields (particularly near the road) were further subdivided and fragmented, only to be reconsolidated in the 19th century. In general, the *field* pattern was stable, but the *farm* pattern changed.

There was also change in what was going on within these fields. The best fields probably were tilled at most times, but the crop mixtures changed. Corn persisted, but rye gave way to oats and potatoes, and then to fodder crops; meanwhile marketed fruits and vegetables joined the scene. Meadows were drained and improved for cultivated hay in the 19th century, then grew up to loosestrife and

swamp maple in the 20th century. Orchards blossomed throughout the landscape, then faded, then reappeared, then disappeared again. Pastures and hayfields spread across the forested uplands, then reverted to huckleberries and pines, as the cows retreated to their barns. Forest went, and forest came.

The most prominent skeletal remains of this landscape still visible are stone walls and ditches. But the enduring field pattern is more broadly reflected in two distinct ways, which often overlap. In lowland areas of rich soils remaining in agricultural production, such as the western end of the Park between Meriam's Corner and Elm Brook, the landscape remains open and gives a powerful visual impression of long historical continuity. Ancient fields are still being farmed on the same scale as they have been for centuries, because this is still reasonably economical for vegetable and hay cultivation in our area. Ways laid out in the 17th and 18th centuries are still being used as farm roads. Although meadow areas have been abandoned and the drainage system neglected, many of these wetlands have grown up only into wild marsh, so the open aspect of the landscape has survived. Forest has recovered some swamps and upland "islands", but historical evidence indicates there were always at least a few woodlots in this area. Living farm landscapes such as this one are now rare in these parts (Nine Acre Corner is another) and deserve protection.

In upland areas that have been largely reforested, the old field pattern is reflected in another way. Different types of land grow up into different characteristic types of forest stands when abandoned. To over-simplify, there are three dominant forest types that are common in our area: white pine stands representing abandoned pastures, red maple swamps representing abandoned drained hayfields, and upland hardwood stands (sometimes multiple-stemmed) representing old woodlots. The transition from one type to another is often quite dramatic upon crossing a stone wall. Other historical clues are sometimes hidden in the woods, such as stone dumps, overgrown apple trees, spreading pasture or fence-row trees, and so on. Over time, these upland forest stands are becoming less distinct, as successive natural and human disturbances create more complex communities of mixed pines and hardwoods.

So the character of the vanished agricultural landscape is still at least partly discernable, even in reforested areas. It is largely intact in areas that are still being farmed, although the casual observer has no better way of knowing this in the open than of seeing what lies hidden beneath the trees. Perhaps an interpretive task parallel to rehabilitating part of the farmscape of the past, is to help visitors learn how to reconstruct it mentally for themselves by looking through the overgrown landscape of today.

Sources

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Nathan Brooks Papers - Concord Town Archives
Eleazer Brooks Papers - Lincoln Town Archives - Lincoln Public Library
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Lincoln Tax Records - Lincoln Town Archives
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US Census - Population Schedules: 1850,1860,1870,1880 - Federal Archives
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Thanks to Tedd Osgood for able assistance researching deeds and mapping.

APPENDIX D: HISTORIC LANDSCAPE PERIODS

by Brian Donahue
Landscape Historian and Consultant to the METLAND Team

Period	Date	Description
Common Field System	1635-1670's	Houses clustered in village center. Large common fields divided into 3-5 acre individual strips. Strips of river and brook meadow divided among colonists for hay (a key crop for colonial farmers). 50% of landscape forested. 15-20% of town was fresh meadow (wild grasses growing along rivers and streams).
Individual Ownership	1670's-1790	20-25% of landscape was forest. Farms moved away from the center of town. Uplands were farmed as tilled fields and pasture. Hay production limited farm size because farmers could not grow enough hay to feed the animals that in turn fertilized the tilled fields. Land became progressively more stressed and unproductive. Cider orchards planted (by 1725 cider replaced beer as the primary drink). 75% of the landscape was clear, 40% of the land was "ragged pasture". Land holdings became more fragmented as farms were divided among sons. A typical subsistence farm was approx. 50 acres. Mainly subsistence farming.
Commercial Farming	1790's-1860's	Commercial farming expanded, farms consolidated. Market oriented produce. Cider orchards disappeared because of Temperance movement. Dessert orchards planted on a small scale (expanded later). "Beautification Movement" resulted in tree plantings along roadsides and around town commons. Hay was planted on the uplands (timothy & clover), and farmers could feed it to their

		own animals as well as sell it. Dairy farming became profitable. Forest cleared - only 10% of the land was forest in 1850's. 50% of landscape was grazed, 10% of landscape was tilled. Larger farms interspersed with smaller ones. 25% of land was "unimproved" (abandoned fields) resulting in a degraded landscape.
Pre-WW I	1850- 1917	Dairy farming expanded slightly as fluid milk could get into cities on trains. Market gardens expanded. Pasture declined. Concord gets into the national economy.

APPENDIX E: PARK SCALE CULTURAL LANDSCAPE INVENTORY

The Cultural Landscape Inventory (CLI) forms are used to identify the character defining features of a landscape. The landscape is classified into eleven "characteristics" for "reading a rural landscape and for understanding the natural and cultural forces that shaped it (*Bulletin #30, Guidelines for Evaluating and Documenting Rural Historic Landscapes,* McClelland, 1991, pg. 3). The following character-defining features or characteristics are inventoried: spatial organization, response to natural features, land use, cultural traditions, views and vistas (historic), circulation, vegetation, cluster arrangement, structures, archaeological sites and small scale features (*See Bulletin #30, Guidelines for Evaluating and Documenting Rural Historic Landscapes,* McClelland, 1991 for definitions). Therefore, the CLI is used as a tool for documenting the characteristics of the landscape as part of the first step towards analyzing and evaluating it.

CULTURAL LANDSCAPE INVENTORY

IDENTIFICATION

CLI Number _____

Assoc. CLI Number(s) _____

_____

Name(s):

Historic Minute Man National Historical Park

Current _____

Park Alpha Code _____

Sub Unit _____

Region _____

State Massachusetts

County Middlesex

PUBLIC ACCESS

☐ Unrestricted

☐ Restricted

☐ No Access

See Map 1

LOCATION MAP

USGS Quad Maynard, Massachusetts

T _____ R _____ Series 7.5X15min.

UTM Zone _____

UTM Easting _____

_____

UTM Northing _____

_____

UTM Elevation _____

_____

DESCRIPTION

Environmental Context Map

See Map 2

Context

Physiographic:

Cultural:

Political: Park is located within three towns: Concord, Lincoln & Lexington.

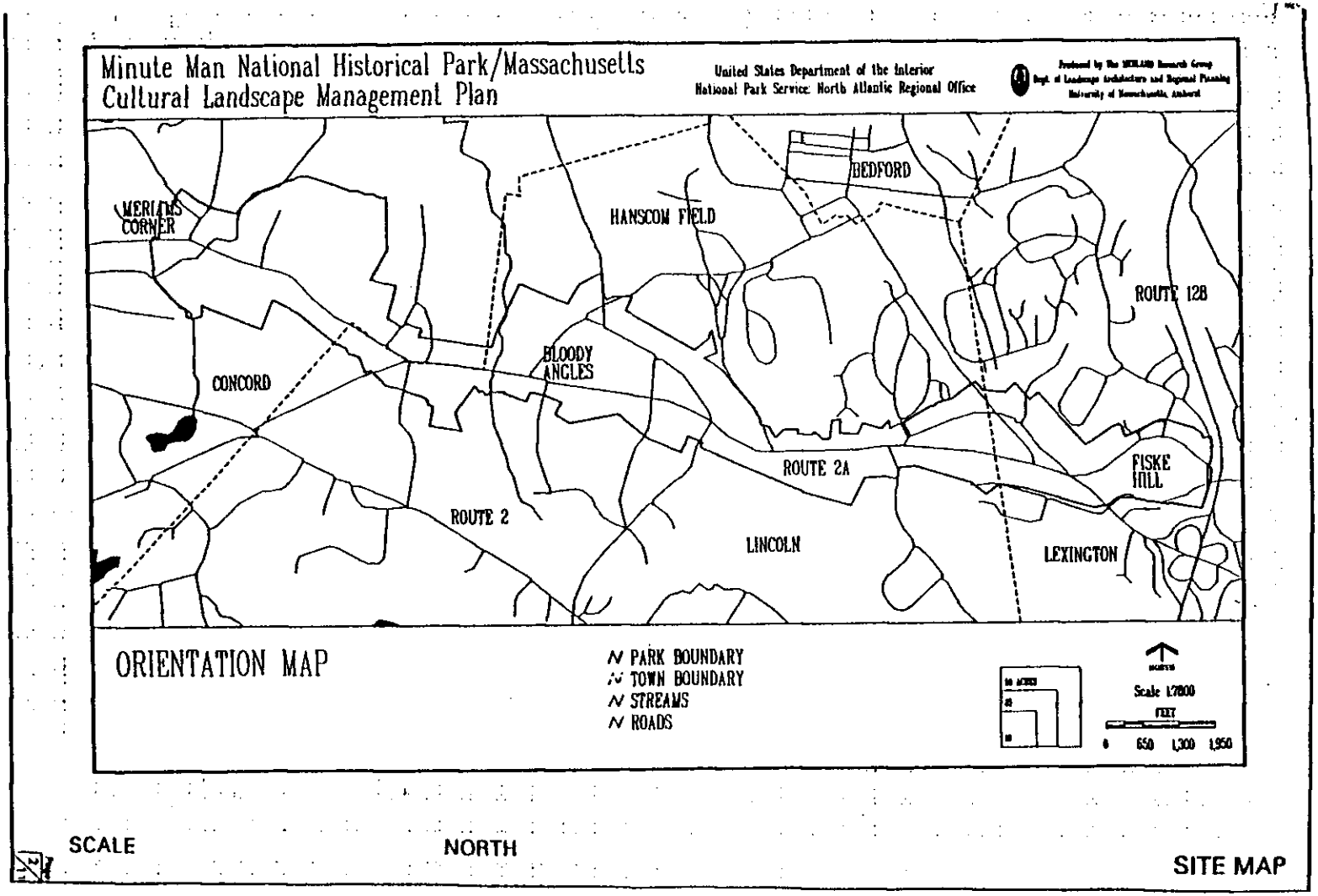
Boundary Description:

Property Description:

Acreage: Aprox. 700

Surveyed: ☐ Yes ☐ No

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Minute Man National Historical Park/Massachusetts
Cultural Landscape Management Plan
United States Department of the Interior
National Park Service: North Atlantic Regional Office
MERIAM'S CORNER
HANSCOM FIELD
BEDFORD
ROUTE 128
CONCORD
BLOODY ANGLES
ROUTE 2A
FISKE HILL
ROUTE 2
LINCOLN
LEXINGTON
ORIENTATION MAP
PARK BOUNDARY
TOWN BOUNDARY
STREAMS
ROADS
Scale 1:7800
FEET
0 650 1,300 1,950
SCALE
NORTH
SITE MAP

HISTORICAL INFORMATION

Period of Significance

1700 - 1799
1800 - 1899
____ - ____
____ - ____

Statement of Significance (Summary):

The sites & structures along the British route through Concord, Lincoln and Lexington are significant as the opening scene of the war of the American Revolution. The 18th & 19th century buildings within the district present a continuum of historic period life in New England. The progressions from an Anglo to a uniquely American culture; from an agricultural, rural outlook to one of attempted urbanity.

SIGNIFICANCE LEVEL ☐ International ☒ National ☐ State ☐ Local ☐ Contributing

TYPE OF CL:
- ☐ Designed
- ☒ Vernacular
- ☐ Historic Site
- ☐ Ethnographic

CHRONOLOGY: Date(s)	Event

Designed
Built/Settled
Altered
Stabilized
Preserved
Rehabilitated
Restored
Reconstructed
Removed
Other

DESIGNER(S):

DESIGNER TYPE
- ☐ Landscape Arch.
- ☐ Horticluturalist
- ☐ Architect
- ☐ Engineer
- ☐ Artist
- ☐ Client/Comm.
- ☐ Other _____

CHRONOLOGY: Text

NR STATUS	DATE	NR CONTEXT(S)	CLASS
☐ Entered and Documented			☐ District
☐ Entered But Not Documented			☐ Site
☐ Determined Eligible by Keeper			Notes:
☐ Determined Ineligible by Keeper			
☐ Determined Eligible by SHPO			
☐ Determined Ineligible by SHPO			
☐ Undetermined			

NHL STATUS	DATE	THEME(S)	WHS STATUS	DATE
☐ Yes			☐ Yes	
☐ No			☐ No	

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CHARACTER DEFINING FEATURES

ORGANIZATION

Text: As experienced from the road, the pattern is one of alternating opnings and forest enclosure. This spatial pattern reflects relationships between soil type, land use, topography and forest cover and are especially related to current agriculture.

See Map 3

RESPONSE TO NATURAL FEATURES

See Map 4

Text: 12 of 15 houses are sited on the north side of the roads, facing south. Agriculture is in Class II, III and IV soils on flat land. The original road to Cambridge (Battle Raod) spanned the shortest possible stretch of a large wetland which has since changed configuration but still exists along a stream.

LAND USE

Historic Function: Predominently Agriculture

Current Use: Agriculture/Residential

Graphic



Text: Openings in forest cover made by agricultural fields characterize the West end of the Park. Field sizes range from 10-50sq. acres. Crops include corn, squash, hay, vegetables. In the Eastern end, field sizes are small, approx. 3-10 acres. Hay and corn grown. Residences mostly located in the central portion of the Park.

Also see Map 5

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JRAL TRADITIONS

ITIAL ETHNOGRAPHIC VALUE: ☐ Yes ☐ No

hic

Text: _____

VIEWS AND VISTAS (HISTORIC)



Text: Most historic views are blocked or altered by forest vegetation. Some views to agricultural fields exist along Rt. 2A, evocative of earlier farm views. However, most views important to the events of April 19th are largely lost.

CIRCULATION



Text: Rt. 2A, approx. 48' wide runs the entire length of the park. It is a major commuter route. Virginia Road, part of the original Battle Road is approx. 20' wide lined with stonewalls and sugar maples. Nelson road has been restored to its 1775 historic character.

FEATURES

- ☐ Road(s) _____
- ☐ Parking At Willow Pond Kitchen, Bedford Lane, Visitors Center and Fiske Hill
- ☐ Walks & Trails Between Hartwell Tavern and Hartwell House site, Fiske Hill, Vernal Pool Trail.
- ☐ Railroad _____
- ☐ Bridge _____

Page 5



Graphic

Text One of the predominant character-defining features, second growth forest covers nearly 80% of the Park, defines strong edges along wetlands and roads. Does not contribute to the rural agricultural character of the historic landscape. The forest cover is most prevelant in the center of the Park.

PLANT ASSOC. & COMMUNITIES:

Text Mix of hardwoods - maple, ash oak. Softwoods: white pine, pitch pine, hemlock. See "Ecological Reconnaissance" Report for detailed inventory.

EATURES

] Trees

] Shrubs

] Groundcover

] Other

CLUSTER ARRANGEMENT

Graphic

See Map 6

Text Individual houses spaced fairly evenly along the roads. Clusters of farm buildings are located at Hartwell Tavern, Nowalk's Farm, Whittemore House and Nelson House. Clusters of structures are also grouped at Meriam's Corner, Brooks Tavern and Hartwell Tavern.

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Text: See attached appendix for detailed inventory. Abundance of historic structures gives the landscape character.

FEATURES

- ☐ Buildings
- ☐ Earthworks
- ☐ Irrigation Systems
- ☐ Dams
- ☐ Walls
- ☒ Monument/Memorial At Meriam's Corner, Paul Revere Capture Site
- ☐ Other

LCS Number(s):

ARCHEOLOGICAL SITES

Graphic

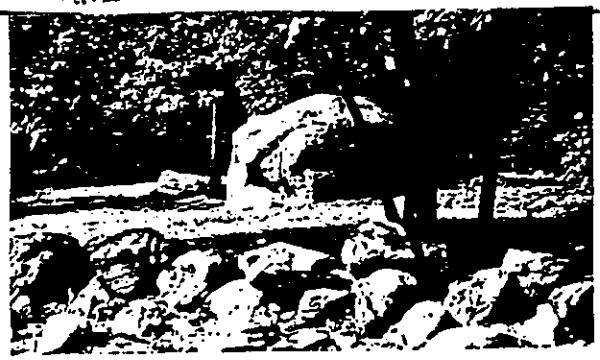
Text:

CSI Number(s):

SCALE FEATURES









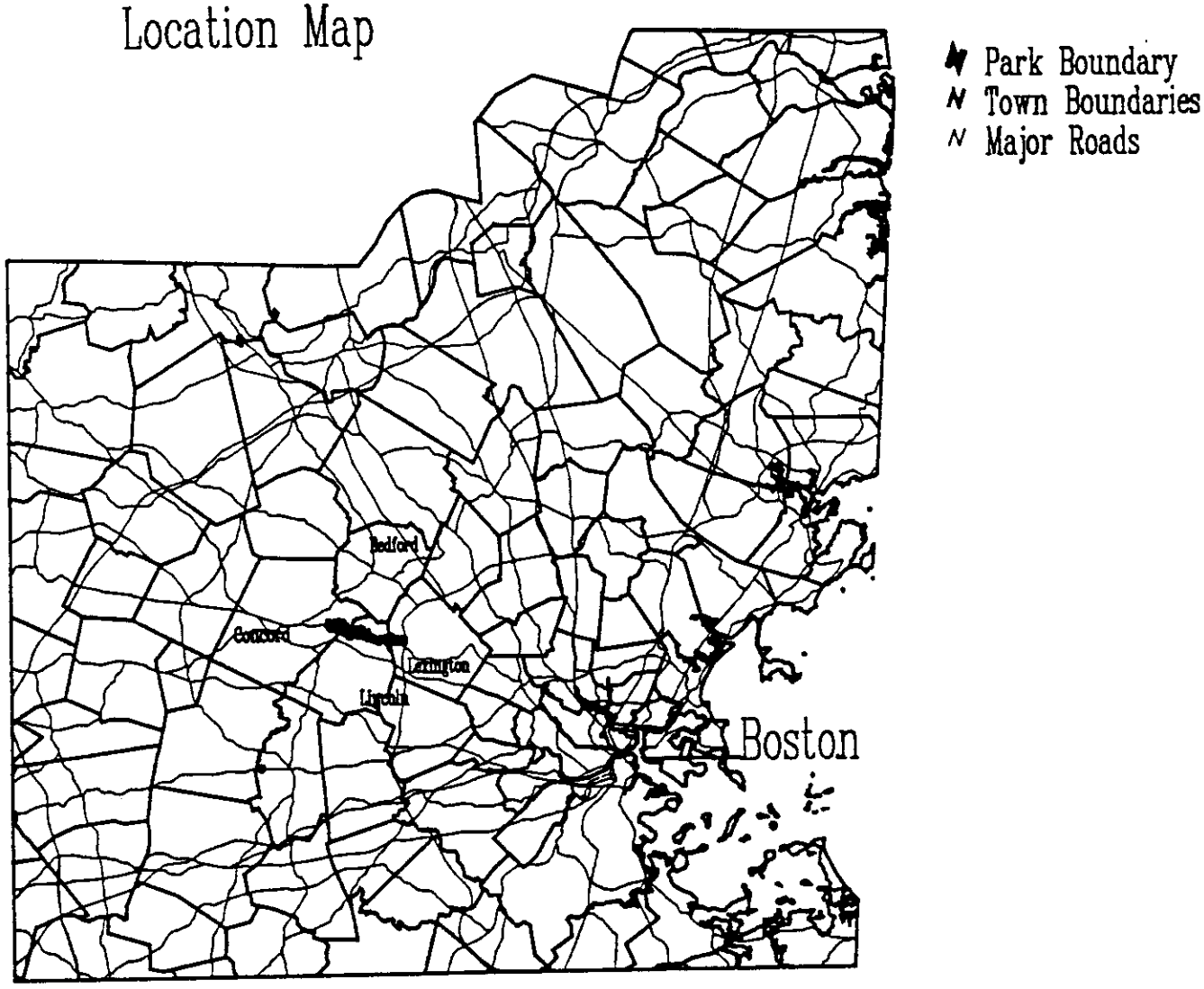
Text: Rock walls are the most abundant and character-defining small scale feature. They unify and knit the the landscape together. They range fron 2.5'tall, 1-2' wide, to remnants of walls, to mortared field stone walls Stone walls run along both sides of the road in many places, and run back into the woods demarcating old field patterns.

FEATURES

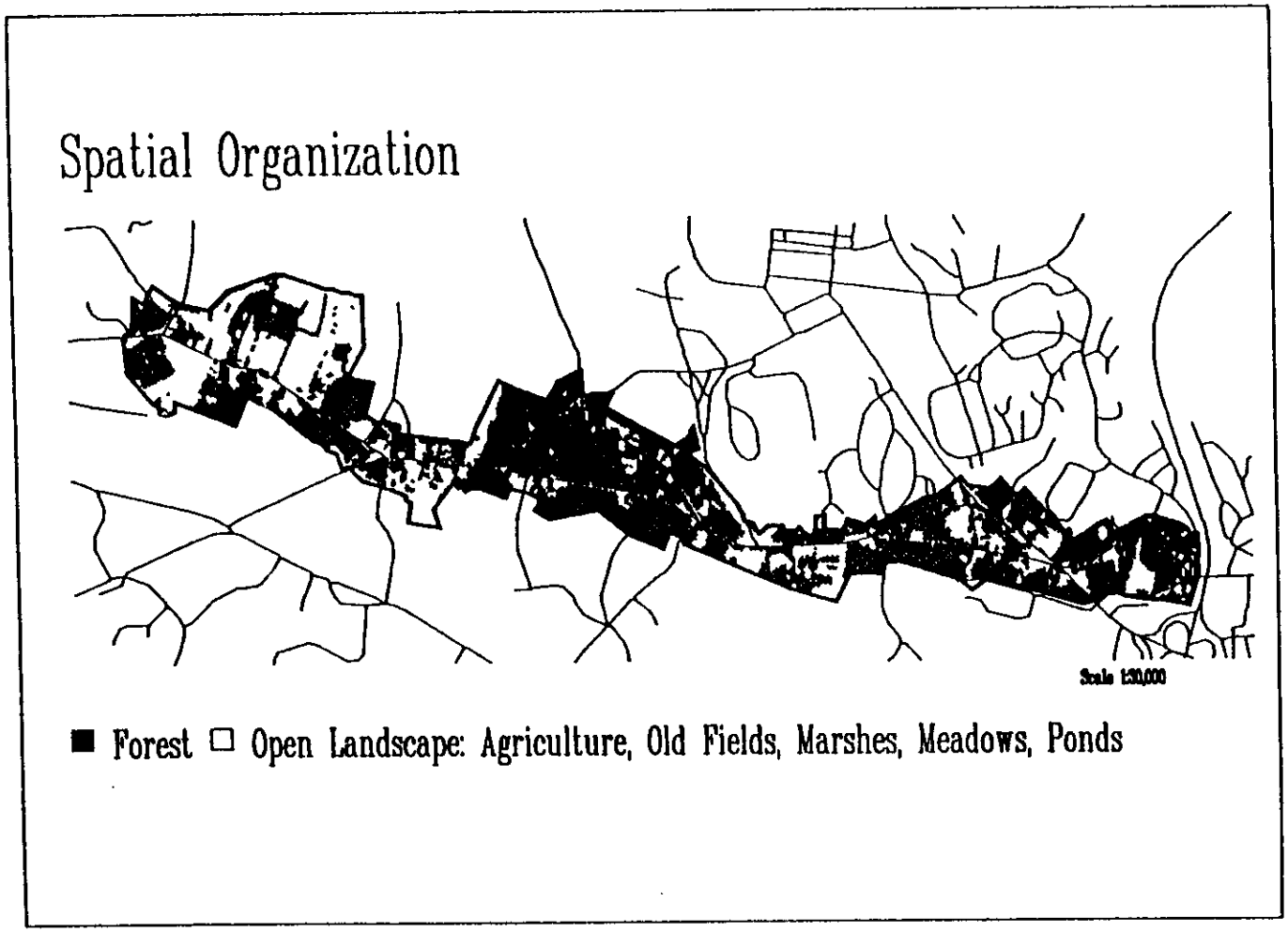
- ☐ Site Furniture
- ☐ Signs
- ☒ Fences Split rail, wire
- ☐ Utilities
- ☐ Water Features
- ☐ Monument/Memorial
- ☐ Cemetery Marker
- ☐ Sculpture
- ☐ Ruin
- ☒ Other Large boulders dot the landscape and were important to the battle events.

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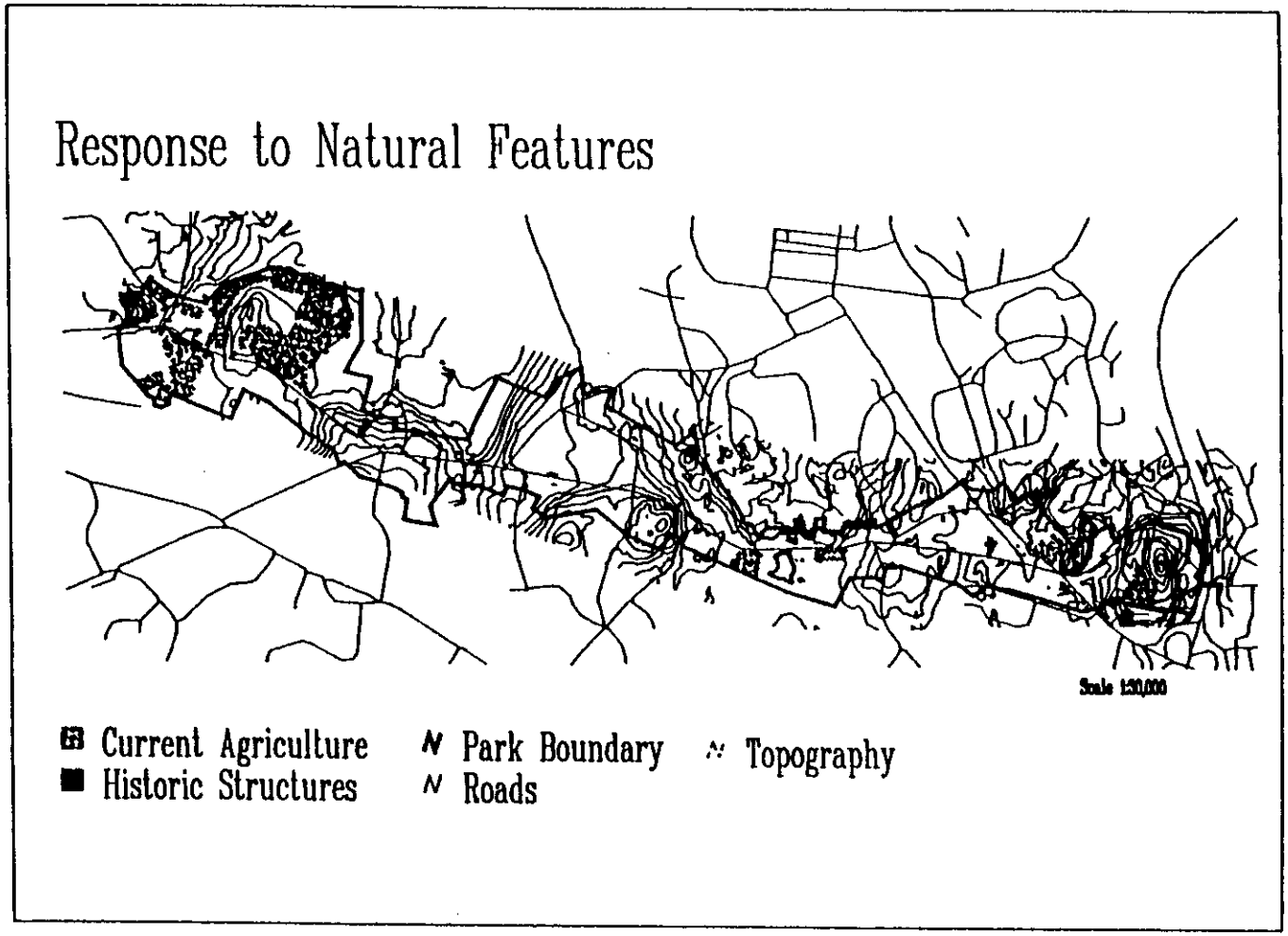
Location Map



Map 1


Spatial Organization
Scale 1:20,000
Forest
Open Landscape: Agriculture, Old Fields, Marshes, Meadows, Ponds

Map 3


Response to Natural Features
Scale 1:20,000
Current Agriculture
Historic Structures
Park Boundary
Roads
Topography

Map 4

Land Use

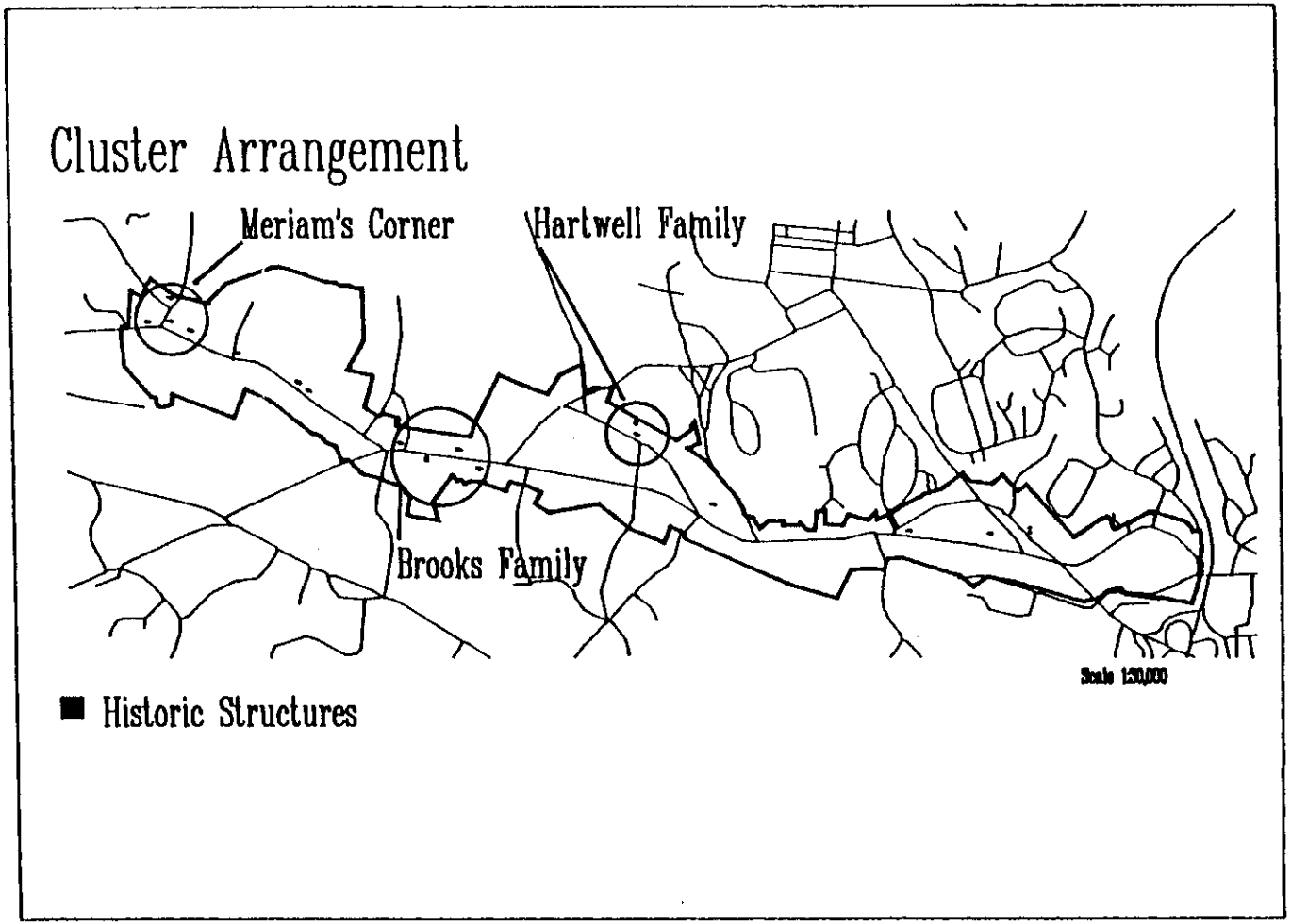


Transportation, Commercial, Industrial
Residential
Agriculture
Open Space/Recreation
Forest
Wetlands & Ponds

Scale 1:30,000

Source 1995 MacConnell Land Use Map

Map 5


Cluster Arrangement
Meriam's Corner
Hartwell Family
Brooks Family
Scale 1:20,000
Historic Structures

Map 6

APPENDIX F: THE RUNNING BATTLE KEY

This text is associated with "The Running Battle, Events and 1775 Landscape Context" map, Figure 42.

A Meriam's Corner. As the "flankers" came off the ridge to cross a bridge located here, there was an "exchange of fire" between them and the Colonists who were hiding behind the farm outbuildings. The Running Battle started at this point

B The "Battle Road." Route taken by retreating British as they marched back to Boston.

C From here, Coloinial Captain Loaman, splotted the British marching toward him and his men. They retreated back to where the road took a turn so as to suprise the British as they turned the corner.

D The British, who were marching in formation had to slow down in order to make the turn.

E "Bloody Angles." As the British turned the corners they wer attacked by Colonists taking advantage of the orchard and tree cover on either side of the road. Some of the fiercest fighting of the day took place here.

F Routes taken by Woburn and Billerica Colonial companies as they joined the battle.

G Captain Wilson killed behind Hartwell barn. The exact location of the original barn is unknown

H The fighting died down as the fields opened back up again. The flankers were able to fan out and keep the Colonists out of range of the main body of troops.

I No known action. Landscape was open with little cover.

J Paul Revere was captured on the night of April 18th as he rode out to spread the alarm that "The British Are Coming!". The exact location of the capture is unknown.

K Anecdotal stories associated with group of glacial erratics and Nelson farm.

L "Parker's Revenge." Lexington's Captain Parker attacked the British as they marched past, revenging the deaths of some of his men earlier in the day.

M "The Bluff." British flankers had to clear Colonists off this strategic bit of land before they could continue to march by.

N The British reformed their ranks here.

O Fiske Hill. Anecdotal information on exchanges of fire between British soldier and James Hayward

APPENDIX G: RECOMMENDATIONS FOR WILDLIFE CONSERVATION AND HABITAT MANAGEMENT

The following recommendations are excerpted from the report entitled "Minute Man National Historical Park, March - October 1992: A Survey of Selected Fauna with Recommendations for Wildlife Conservation and Habitat Management," prepared by Bryan Windmiller (65 Arrowhead Dr., Concord, MA) and Richard K. Walton (35 Stacey Circle, Concord, MA).

Recommendations

We have grouped our recommendations into three general categories:

A. Further resource inventory and research
B. Habitat Preservation
C. Habitat Management, Enhancement and Acquisition

We suggest that the recommendations be generally prioritized in that manner, with resource inventories and preservation schemes enacted with precedence over management, enhancement, and acquisition schemes.

Moreover, we have individually prioritized all our recommendations. We regard those recommendations given a "Priority 1" rating as generally more important than "Priority 2" recommendations.

Priority 1 Recommendations

Further Resource Inventory and Research

1. Seek our new populations of Elderberry Borer Beetle, particularly along farm ditches on lands north of Old Lexington Road, Concord.

2. Determine whether the *Cragonyx* amphipods found in the Mill Brook tributary behind the Willow Pond Kitchen are Mystic Valley Amphipods. Also seek out Mystic Valley Amphipods in the stream near the Battle Road Visitor Center.

3. Determine the approximate population size of the Elderberry Borer Beetles on Palumbo Farm with mark/recapture methods.

4. Determine the distribution and approximate population sizes of Mystic Valley Amphipods in the "Virgina Road" and "Visitor Center" populations.

Habitat Preservation

The following are areas in which we recommend no significant disturbance of existing soils and vegetation with the exception of enhancement, and management recommendations cited below.

1. All woodlands and wetlands in the trapezoidal area south of Virginia Rd., W. of Bedford La., E. of Old Bedford Rd., and North of Route 2A (state-listed rare species habitat, most productive vernal pool in MMNHP, largest patch of farily intatct woodlands, most unique wetland area).

2. All vegetation on the berms of the Palumbo Farm ditch system.

3. All wetlands and all woodlands within 100 feet of the wetland edge of the stream/wetland system that serves as habitat for the "Visitor Center" state-listed rare species population.

4. All areas of Elm Brook, its associated wetlands, and upland woodlands within 100 feet of the edge of the associated wetlands (the only well-oxygenated stream habitat in MMNHP, only brook trout and two-lined salamander populations, only healthy stream-invertebrate fauna, unique bordering wetlands with significant patches of common elderberry).

5. All woodlands within 500 feet of the edge of Cook's Pond (the most diverse aquatic habitat, vernal pool in MMNHP, the resident populations of gray tree frogs and spotted salamanders appear to move towards the woodlands southeast of Old Mass. Ave.)

Habitat Management, Enhancement, and Acquisition

1. If, after further research, the status of the Elderberry Borer Beetle in MMNHP proves as grave as it now appears, we recommend that MMNHP plant elderberries in wet soils along the edges of as many open fields as possible, particularly in that portion of MMNHP on either side of Old Lexington Road in Concord.

Priority 2 Recommendations

Further Resource Inventory and Research

1. Monitor, on a yearly basis, the nuber of egg masses laid by wood frogs and spotted salamanders in the vernal pool south of Virginia Road, this is the most important breeding site in MMNHP for both species.

2. Use minnow traps/seines to determine the status of the common shiner in Mill Brook, near its confluence with the Concord River.

3. Determine the approximate size and extent of the brook trout and two-lined salamander populations associated with Elm Brook.

4. Assess the population size of the Frosted Elfin in the powerline area west of Fiske Hill and determine the distribution of nectaring and larval host plants.

Habitat Preservation

1. All woodlands within 300 feet of any vernal pool used as a breeding site by spotted salamanders and wood frogs (terrestrial habitat for the spotted salamander and other species, movement corridors and habitat for wood frogs and other ranid frogs).

2. All woodlands in a roughly triangular area between the western shore of Cood's Pond and the eastern half of Whittemore Pond (a major migratory corridor for several amphibian species).

3. All fields and second-growth scrub areas on Fiske Hill (the only known habitat in MMNHP for the black racer, possible habitat for the equally uncommon milk snake).

Habitat Management, Enhancement and Acquisition

1. Use volunteer labor and inexpensive materials to enhance the capacity of Elm Brook to serve as brook trout habitat (a description of appropriate methods is available from Trotu Unlimited). Simultaneously, place addtional natural cover objects (logs, stones) along the brook to enhance two-lined salamander habitat.

2. Close Old Massachusetts Avenue southeast of Cook's Pond to through traffic during the breeding migrations of wood frogs and spotted salamanders in early spring (rainy nights, typically around March 20) and those of the gray tree frog (rainy nights at the end of May, first 10 days of June). Other than Route 2A, Old Mass. Ave. is the source of the greatest amphibian and reptile road-kill mortality.

3. Acquire additional wetlands and woodlands south of the present MMNHP boundary in the vicinity of Folly Pond. These extensive wetlands doubtless provide vernal pool habitat and appear to be possible spotted turtle habitat.

4. Acquire additional land North of Cook's Pond. The present small buffer around Cook's Pond certainly limits the potential habitat value of this otherwise productive and diverse wetland.

5. It is assumed that MMNHP's plans for future habitat management will create more "open space" and less shrub and forest cover in the park. In general this should encourage butterfly diversity throughout. Several factors will be important in complementing these efforts. Native plant species acting as larval hosts and/or nectaring sources for adult butterflies should be given priority if landscaping plans include introducing floral material. Careful consideration should be given to mowing schedules and the application of pesticides should be absolutely minimized. Presently, meadows such as those surrounding the visitors' center at the Battle Road are cut several times during the growing season. Mowing patterns and schedules might well take into consideration flight periods and nectaring resources for butterflies and at the same time provide the necessary public access.

While agricultural lands have been declining in Concord for well over a century, the loss of farmlands in Concord has been particularly severe during the last four decades. A commensurate decline in the wildlife associated with agricultural edges, fallow fields, and grazing land has also occurred. Bobolink and Eastern Meadowlark are two field nesting species whose breeding populations have declined dramatically over the last decades. In both cases we can attribute this decline to loss of nesting habitat and short mowing schedules.

Remnant populations of both species are still found in Concord and it seems reasonable to assume that an increase in suitable nesting habitat, a potential result of habitat changes at MMNHP, in combination with less frequent mowing, would result in increased numbers of these species. Bobolinks were seen prospecting in the hay fields on the north side of the Kaveski and McHue Farms and might be expected to successfully nest in the area if mowing was not commenced until early July.

Another class of habitat, second-growth scrub, is becoming less and less common in the Concord area. Historically, as farmers cleared and then left fallow certain fields for several years, second growth provided important habitat for nesting birds. Species including Brown Thrasher, Indigo Bunting, Prairie Warbler, and Field Sparrow are now relatively rare in Concord because many of these scrub areas have either been replaced by development and manicured lawns, or have grown up to shrub and forest communities. Small areas of this habitat already exist in MMNHP (Powerline cut west of Fiske Hill and north of William Smith House and west of Hanscom Drive). Management practices could encourage and maintain existing habitat as well as create additional areas.

APPENDIX H: MINUTES FROM PUBLIC MEETINGS

As part of the planning process for Minute Man National Historical Park, a series of three public workshops were held in Concord to receive comments and information from area residents, professionals in the field, and other interested parties. The following is a summary of the workshops.

Wildlife/Conservation Workshop
Thursday, February 11th, 7:30 pm
Concord Town Building

Larry Gall began the workshop by introducing the work that has been ongoing at the Park, as well as the UMass team.

Julius Fabos and **Jack Ahern** then reviewed the work that the UMass team did during Phase I, and explained the work to be done during Phase II.

Bryan Windmiller then introduced the work with which he was involved with Richard Walton. They researched and prepared a report entitled "A Survey of Selected Fauna with Recommendations for Wildlife Conservation and Habitat Management" (March - October 1992). He recommended a general procedure the park should follow:

- Identify species and habitats that exist today in the Park.
- Clarify goals and reasons behind planning. Decide which species to protect and why.
- Implement strategies in accordance with the goals.

Brian noted that the park's landscape is highly fragmented, and therefore people and their effects are everywhere. Therefore it is important to ask three questions when dealing with the existing landscape:

- Why are certain species present?
- How are they doing?
- If badly, why? How could they benefit?

Finally, Brian suggested six recommendations for wildlife conservation:

- Further research of existing wildlife, habitats
- Protect rare species habitats and buffer zones
- Design/maintain large habitat patches
- Manage for second growth scrub
- Consider options for reducing road-kill mortality (Cooks Pond wetlands, Old Mass. Ave.)
- Enhance degraded habitats (Elm Brook, Folly Pond)

Beth Gavrin then introduced the data that was mapped in preparation for the discussion groups.

Questions and Answers -

- *Have the wooded areas designated as "eliminated" in Phase I been continuously wooded since 1775?* Brian Donahue's research will attempt to determine that.
- *In planning for farmland, are there any areas large enough to attract open field species (hundreds of acres needed)?* Park is looking at linking ag. land within Park to town ag. land, an idea that is especially attractive to the town of Lincoln.
- *How does changing the canopy to open field affect animal habitats? What affect does canopy change have in the buffer zone? Will that be taken into account in Park planning?*

Group Discussions:

General desire to attract migrating birds and to encourage open field species (quite a lot of forested land around, open areas a good change visually, for species, and for interpreting history). Also desire to expand habitats for existing state-listed rare & endangered species. By naturally introducing state threatened species and expanding habitats, expansion of the air base can be prevented.

Towns can cooperate with Park by designating land surrounding the park for same purpose (land use/land cover) as within the park (woods abutting woods, farms next to farms, etc.). For towns to cooperate, Park must first decide priorities for the various areas. Additionally, trails and people should be kept away from special habitats; wide, wooded corridors should be maintained around streams and ponds (Sandy Pond in particular) to protect water quality. Suggestion for cooperation with Regional High School for animal road-crossings during migratory season. Also tunnels under roads, with lights to draw animals.

Additional questions include: Which IPM policies will affect animals? Will a change in cover affect salamanders?

Agricultural Reintroduction Workshop
Thursday, February 18th, 2:00 pm
Concord Town Building

Larry Gall began the workshop by introducing the work that has been ongoing at the Park, as well as the UMass team.

Julius Fabos then explained to the participants that there are six issues that are being studied in regards to the Cultural Landscape Management Plan. They are as follows:

- Military History
- Cultural Landscape Periods
- Cultural Landscape Inventory
- Natural Resources
- Recreation Linkages
- Agricultural Reintroduction

Julius continued by explaining how these issues overlap, and how, in this case, agricultural reintroduction can help accomplish many of these interpretive goals (i.e. the military history is hard to interpret/understand with the wooded character

of the park today, and increasing the amount of agricultural fields will make that story more easily interpreted/understood).

Jack Ahern then explained the work that the UMass team did last year, illustrated with slides of the maps produced during Phase I. **Beth Gavrin** then introduced the data that was mapped in preparation for the discussion groups at the workshop.

Dan Dattilio followed with a briefing of the status of farming in the Park as of today. 120 acres are farmed by eight farmers, many of whom are former owners of the land. The existing agriculture includes row crops, sweet corn, haying and pasture/grazing. The farmers hold one year leases, and receive assistance from Park staff in such areas as Integrated Pest Management by Flo Smith, the Park IPM coordinator. She helps the farmers fill out application, etc.

Dan continued by explaining future thoughts regarding leases - the Park would like to issue Special Use Permits, allowing a "lease" for a five year period, reviewed annually and renewed every five years. Dan indicated three- to four-hundred acres of land might be suitable for agricultural reintroduction. In addition, two houses are presently being renovated for farming families to use for living accommodations (Burke House for one family, Perry House for two or three families). The Park will also provide outbuildings for machinery storage, as they would like to minimize the exposure of equipment.

Jack Ahern, summarizing Brian Windmiller's information about wildlife habitats, explained how any change in land cover will have an impact on existing wildlife. As a result, there are three types of management responses:

- in certain areas, the land use/land cover will not be touched in an effort to protect existing habitats
- in other areas, there will be restrictions for clearing, with a buffer needed to protect certain, specific areas
- finally, agricultural reintroduction can benefit wildlife by replacing a wooded habitat with a new kind of habitat that attracts different wildlife. Different management techniques can be used, such as fallow cycles.

Terry Cacek, IPM Coordinator for the National Park Service, Washington, DC, introduced Park Service policies regarding pesticides and herbicides. He began with the overall goal of the Park Service to preserve and protect cultural and natural resources for future generations. If pesticides are used wisely, they are acceptable within general Park Service goals of preservation and protection. The first step to take is to monitor pest populations for most economical planning. Pesticides/herbicides are used as a last resort, after all other methods are tried. Finally, the most benign pesticide/herbicide is used that can do the job. Others are avoided at all costs, especially those carrying a "restricted" label from the EPA.

Terry continued by explaining sustainable agriculture as going one step beyond integrated pest management. Sustainable ag. employs crop rotations, providing needed nutrients like nitrogen naturally. Rotating crops also provide natural pest/weed control without pesticides/herbicides.

Bill Coli then explained the field visits he and Brian Donahue had taken in the Park, and what they had found, inviting others to challenge their findings. **Brian Donahue** then explained the farming that had gone on in the area from a historical

perspective, highlighting ag. uses such as orchards, pastures, wet meadows and livestock, as well as vegetables/row crops.

Larry Gall returned to emphasize that the Park wishes to continue working with the farmers they are working with today. He also mentioned certain types of ag. that are not consistent with interpretive goals, such as greenhouses and nurseries.

Questions and Answers -

- *Is the park looking to do period agriculture?* Yes, especially in interpretive areas. How it is to be done is open, perhaps by Park staff, volunteers, under lease, or special contract with farmers, or in some combination of the above. The park wishes to interpret various periods of agriculture.
- *Regarding sustainable agriculture, is the Park going to dictate the type of agriculture? Does is have to be organic agriculture?* The Park is not going to dictate what type in particular, but it will not allow certain types. It does not have to be organic, although that is certainly fine.
- *Does the park wish to interpret associated industries, such as blacksmithing, cider pressing, tanning?* That is a possibility, although it is not yet determined where, when, how. The Park does wish to tell those parts of the story.
- *What crops are currently being grown in the park?* Vegetables including pumpkins and squash, sweet corn, hay, and pasture/grazing, totalling 120 acres.
- *Is the Park interested in early farming techniques as they can inform techniques of today?* Yes, the Park is interested. For example, Codman Community Farms (Lincoln) raises rare breeds of livestock, and the Park would like to see them use Park land for grazing.
- *What is the water supply for the three- to four-hundred acres of ag. land possibly available?* It depends on the nature of the ag. use. Water, fencing, and other issues need to be dealt with depending on the intended use.
- *What is the current and projected rate for leasing land in the Park?* Today, the land is leased for $20/acre for row cropping and $10/acre for pasture under an annual permit. Future rates need to be determined, with a five year permit.
- *Is there any potential for subsidizing farmers for interpretive value of their work?* The Park will have to look at the total equation: value given and value received. They will also look at the initial investment the farmer must make, and credit will be given.
- *Are Sturbridge Village and Colonial Williamsburg examples of the type of interpretation the Park is looking for?* The park is not looking for anything as extensive, but maybe in parts of the park. For example, there is a small cider orchard to the east of the Hartwell Tavern. In the fall, the Park has a "Colonial Weekend" program, with people in costume doing craft activities. Any such interpretive work will happen incrementally. Also, important to remember that the Park is looking for modern agriculture for interpretation of general landscape over time, supplemented by period ag./interpretive farming.

Group Discussions:

Bill Coli/Dan Dattilio/Meg Rasmussen group: Focus on Brooks farm area, with possibility of interpreting story of historic apple farming. That area has great potential for hooking up with Lincoln's trails. Also possibility of restaurant,

selling apple products at Brooks house. Discussion of small-scale (30 acres) part-time farming as most feasible.

Julius Fabos/Brian Donahue group: General feeling that commercial farming difficult due to nature of soils as well as IPM and wetland restrictions. Farmers feel wildlife considerations such as leaving corn stubble a problem, although other options a possibility. Rising deer population a problem, as they eat apples, pumpkins. Pick-your-own farming also a possibility, especially for apples and maybe strawberries.

Jack Ahern/Beth Gavrin group: Issues of farming in wetlands needs to be cleared up. Drainage ditch issues also raise questions - can they be drained or are they considered wetlands now? The towns also need to drain ditches downstream for Park ditches to work. However, dredging ditches will have a big impact on wildlife habitat issues. Present farmer (Ed Nowalk) does not believe commercial farming possible due to wet and stony soils and NPS regulations. Need to target young, "high-tech" farmers. Other management possibilities include involving Codman Community Farms, Minuteman Vo. Tech., and subcontracting land through a farm manager/farm association, in an attempt to minimize regulations each farmer has to deal with. Co-op/association also possible for farm stands, perhaps located in visitor parking lots.

Trails Workshop
Wednesday, March 17th, 7:00 pm
Concord Town Building

There were two main topics of discussion that kept coming up again and again in different ways, intertwined with each other. The first was what kind of trail system would give visitors the best chance to catch the interpretive messages of the Park - primarily the battle, and secondarily the landscape history. The second topic, which actually took up most of the discussion, was the bike trail, and the potential difficulties integrating recreational bike use with the main interpretive purposes of the trail system.

Dan D. began by pointing out trail modifiers, or potential obstacles, including roads (especially 2A and Hanscom Road), tenants under various use and occupancy agreements for various terms, farmland, stonewalls, and wetlands (especially Elm Brook).

Dan M. added that Shadyside Avenue and the wetlands along it present another tough passage for a trail through the northern parts of the Bedford Levels. Larry agreed that the stretch from Elm Brook to Shadyside Ave. was a difficult link - long term we might be able to work something out with the Shadyside residents, but for

now a trail might need to drop down to Lexington Street further west, near Nowalks.

Lou raised the question of which side of 2A the bike trail should run. Larry said this raised the larger philosophical question of whether the bike trail should be the major spine of the Park, linking interpretive areas, or whether it should be designed to keep through bike traffic *away* from these areas. As far as Larry is concerned, the bike trail should be for interpretation first, recreation second.

Gordon raised the concern that bike recreational use was bound to interfere with interpretation, and that perhaps bike and walking trails should be separate, or we could have walking spurs. Others thought the way the bike trail was designed and paved could mitigate this problem. Dan D. thought that a moderate amount of bike use could be pretty tolerable to walkers, in his experience.

Gordon asked what was being planned to get people out of their cars. What about a bike livery, or shuttle vans?

Larry replied that once the bike trail was established, and the landscape and interpretive projects created a sufficient attraction, private shuttle services and bike liveries might get into business. In terms of parking lots, he thought several small parking lots along the way would be preferable to large, paved lots. Random parking along 2A would be dangerous. Dan M. and others warned that once there was an attraction, parking could be very hard to control - Walden Pond being the classic example.

Lou and Larry thought that loop trails were more attractive to visitors than a through trail for walkers. Brian thought that if sidewalks along 2A and closed sections of the battle road provided one spine for the Park, a second parallel bike or walking trail going through the landscape away from the road could provide a return route. Many lateral spurs connecting the two spines, along with interpretive "hooks" to draw walkers away from the road, would set up any number of possible loops for walkers. Brian advocated using the road trail primarily for battle interpretation, and the back trail mostly for landscape interpretation. Larry and others warned we should be careful about pushing that approach too far, and missing opportunities. We don't want to program visitors into a rigid interpretive plan, because people won't follow it. Visitors like to graze.

Several people thought sidewalks along the road were an obvious way to get at least one through route in while causing the least disturbance, and would only give us more flexibility to do other things. Dan M. returned to the recreational bike issue, pointing out that through bike use was bound to rise no matter what the Park did, so we better think about how to deal with it. One approach would be a bike trail along 2A, or on the south side of 2A, to keep the inevitable bike pressure away from the interpretive trail system.

Lou reiterated that Minute Man should build a trail to see the Park, not to avoid it. If somebody else wanted to build a "fast lane," that was another matter. There was some discussion about the possibility of two bike trails, one straight shot for the long range recreational riders, and another more winding one for interpretive purposes. But there isn't all that much room for several longitudinal trails in the Park, and who would fund that much construction? Larry returned to the principle that the Park had to put interpretation first.

Dan D. pointed out that the south side route presented many more difficult road crossings than the north. There was some discussion of road crossings, and the possibilities of tunnels or signals. Tunnels were pretty well ruled out, although Dan M. suggested that as long as the State was working on the Rt. 2 "Crosby's Corners" intersection, they might also be looking at the 2A Cutoff/Lexington Street intersection at the same time, and we ought to get in touch with them early in case we wanted to do anything about a crossing there. Everyone thought signals would be politically unpopular, but a few might eventually be needed - Larry thought particularly a pedestrian operated signal at Hanscom Rd would be in order.

Dan D. said that the speed of traffic on 2A was as much a problem as the volume, and half-jokingly suggested Park police could begin ticketing speeders. Larry ruled that out, but thought that eventually if 2A were made a scenic highway and our landscape rehabilitation made it more of a parkway, we could begin to think about slowing traffic down. Lou jokingly suggested we move 2A out of the Park, provoking general mirth.

Gordon wondered if the Park should just concentrate on loop trails in its interpretive areas, and avoid all the difficulties that come with a through trail for now.

Someone wondered about maintenance of a bike trail. Larry said that once you took on a responsibility like a bike trail, eventually you could shake loose the funding for maintaining it - that was the way the system worked. If the Park built a trail, the Park would maintain it. Larry also pointed out that other bike trails had been built, others had faced these problems, and we would do research to see how they have or haven't been dealt with as part of the planning.

Brian pointed out that bike traffic could be good for some kinds of farmstand and pick-your-own farm business.

Dan M. asked about ski use in the winter - should the bike trail be plowed? Larry favored ski use and thought the Park would not get into plowing. If there was heavy demand, they might consider plowing one parking lot. Some thought ski use could become very heavy, creating parking problems, but others thought the conditions (train stop and ski rental shop) that made this a problem in Lincoln were unique and wouldn't be repeated here.

Dan M. - what about dogs? Larry - Park has a lease law.

In closing, several attendees from outside the Park agreed strongly that the Park needed to put its interpretive program first with its trails, and not to give in to recreational pressures. Be aware of them, but don't let recreation drive the way the Park is developed. What this means in practical terms, everyone agreed, is a complicated, tough problem.

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