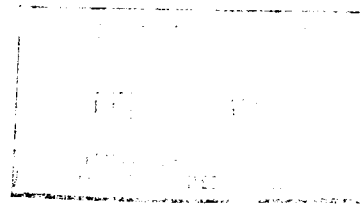


Project Summary and Data Documentation



*Ecological Reconnaissance of the
Minuteman National Historical Park*

Peter August, Charles LaBash, and Irene Keniski

*Department of Natural Resources Science
Environmental Data Center
The University of Rhode Island
Kingston, RI 02881*

*No page 10+15 in original
or in this copy
pg. 10 is Appendix A.*

January 1993



CENTENNIAL

Ms. Nigel Shaw
Office of GIS Operations
National Park Service
15 State Street
Boston, MA 02109

University of Rhode Island
Natural Resources Science
College of Resource Development

January 18, 1993

Dear Nigel:

Enclosed are three copies of our final report and database documentation for the Minuteman Project. The data have been written to disk in both ARC/INFO EXPORT and DLG formats. The READ.ME file on the disks explain how to extract the coverages.

We are providing you the following GIS datasets:

- VEGETATION – Land cover and vegetation for the Park
- WALLS – The stone walls in the Park
- ROCK-PILES – Remnant stone walls in the Park
- STREAMS – Streams in the Park
- RARE-SP – Habitats of ecological significance in the Park

The database documentation explains in detail each of the coverages.

The data we provide here are enclosed within the Park boundary that you provided us at the start of the project. Furthermore, the vegetation data consist entirely of Irene's delineations. We sent a .DXF format copy of the dataset to Jerry Jenkins (on Henry Woolsey's team) but he did not send us any corrections. We thought it prudent to deliver a final product on the original agreement before making any substantial changes to the scope and scale of the analysis. We will study the revised boundary maps Dan sent us and give you an estimate of updating the data with information for the new regions of the Park. We have exhausted our budget for this project and will therefore consider the updates a new assignment. I will forward to you the aerial photos and original mylar manuscripts when we send the estimate of getting the additional work done.

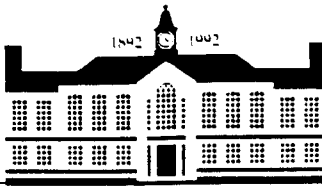
I trust you will find everything in order. Irene did a magnificent job in delineating the land cover for the Park and the data look beautiful. I will be very anxious to see how these data assist in managing the Minuteman National Historical Park.

Best wishes,

Peter V. August
Associate Professor

cc: H. Woolsey
I. Keniski
C. Roman

Kingston, RI 02881-0804
Phone: 401-792-2495 Fax: 401-792-4561



CENTENNIAL
University of Rhode Island
Natural Resources Science
College of Resource Development

Dan -
FYI - Nigel has the
data.

Best wishes

Rut

Project Summary and Data Documentation

Ecological Reconnaissance of the Minuteman National Historical Park

Peter August, Charles LaBash, and Irene Keniski

*Department of Natural Resources Science
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The University of Rhode Island
Kingston, RI 02881*

The objectives of this project were to:

- Develop a digital map of vegetation communities that existed in 1986 at the Minuteman National Historical Park (MNHP).
- Develop a digital map of areas of concern with respect to the presence of rare or unique species or habitats.
- Develop digital maps of stone walls and streams.

Mr. Henry Woolsey and his colleagues at the Massachusetts Heritage Program were responsible for the field reconnaissance. They will file a separate report of their work. The Environmental Data Center (EDC) in the Department of Natural Resources Science at The University of Rhode Island conducted all photo interpretation and digital database development using the hardware and software listed in Appendix A. Keniski was responsible for photo interpretation and recompilation. August and LaBash were responsible for digital database development. In this final report, we describe the methods used in the project and provide documentation for each new dataset developed.

Photo Interpretation and Recompilation

PROJECT LOCATION

Minuteman National Historical Park encompasses portions of Concord, Lincoln, and Lexington, Massachusetts in three sections. The dimensions of the Park are approximately 9.6 km east/west and 0.8 - 2.4 km north/south. The westernmost portion of the Park, the North Bridge Unit, is in the town of Concord; it borders the Concord River and is within about 0.4 km northeast of the confluence with the Assabet and Sudbury Rivers. A small central portion is known as the Wayside Unit. The easternmost portion, or Battle Road Unit, begins to the east at Fiske Hill in the town of Lexington and continues westerly for approximately 8 km, following north and south sides of Lexington Road (Route 2A).

MATERIALS & METHODS

Aerial photography for this project was provided by the National Park Service. Photo interpretation of land use and vegetative cover types was based on true color print reproductions at 1:4800 scale (1"=400') dated April 5, 1986. A minimum mapping unit of 0.1 ha was established for this project; exceptions were buildings, old foundations, rock piles, and vernal pools which were detectable at less than 0.1 ha.

The classification scheme developed for cover-typing various habitats and land use features is presented in Appendix B. This classification was developed by the photo interpreter and URI/EDC and agreed upon by representatives of the National Park Service and The Nature Conservancy at the onset of the project. Cover-typing is restricted to a single dominant class per area. In most cases where vegetation is a mix of two or more cover types, a single cover type comprising at least 50% relative dominance was derived from the signature. In mixed areas, other cover types occurring as uniform clumps or stands were delineated when they met minimum size thresholds.

Photos were interpreted using a Topcon Mirror Stereoscope (Model 3) at the University of Rhode Island's Department of Natural Resources Science. Data recompilation corrected for normal radial and relief displacement of aerial photography. The base map used for data recompilation was a 1:4,800 scale mylar map of property lines and roads of the Park. These data were obtained in digital form from the National Park Service and processed by the URI/EDC. A Bausch & Lomb Zoom Transfer Scope (Horizontal Model) was used to fit and transfer photo-delineations to the base map. The property lines were referenced only for those features expected to correlate with parcel boundaries; for example, stone walls, edges of agricultural fields and houses, and lawns on small lots.

Field work took place for five days in early December 1991, with the assistance of NPS rangers at Minuteman Park. Weather limitations were encountered at this time and could not be avoided due to scheduling of the project. At times, snow and sleet

adversely affected field verification of herbaceous cover. Many species protruding above snow cover were desiccated. For the scope of cover classification used with this project, however, seasonal constraints were not considered to significantly affect the ability to establish signature correlations on the photography. Most vegetative cover types needing field verification were able to be determined in the field; trees, shrubs, and many wetland emergent species were above snow cover and winter-identification by buds or persistent plant parts was generally possible. Certain wet meadow communities (especially where mowed) and complete species listing for old field habitats are considered to be most impacted by seasonal conditions.

REPRESENTATIVE VEGETATIVE COMMUNITIES

The following plant communities are representative of cover types found at Minuteman National Historical Park.

Active agricultural land (code 210) is most extensive through the west end of the large eastern section of the Park. These areas sometimes include hydric soil signatures, typed as *Farmed Hydric Soils (230)*. At the time of field verification, all agricultural fields were cut and plowed under.

Old fields dominated by herbaceous cover (code 310) are represented by species such as broomsedge (*Schizachyrium scoparium*), Kentucky bluegrass (*Poa pratensis*), tall goldenrod (*Solidago altissima*) and other *Solidago* spp., asters (*Aster* spp.) and other grasses (Graminae). Grasses were frequently desiccated and/or mowed at the time of field verification.

Old fields dominated by successional woody cover (code 320) contain species such as red cedar, buckthorn, staghorn sumac (*Rhus typhina*), red maple seedlings, apple, and honeysuckle (*Lonicera japonica*). Throughout the Park, old field succession by woody plants most commonly appears dominated by buckthorn. Due to photo-interpretive limitations, abandoned orchards (220) could not be distinguished from other successional woody cover. When woody vegetation was less than 6 m in height, orchards were included in the "320" classification.

Deciduous Forests (code 410) are typically red and black oak, sugar maple, red maple, and young beech on hills and sideslopes. This cover type also includes abandoned apple orchards (presumably domestic apple, *Malus sylvestris*). Due to photo-interpretive limitations, abandoned orchards where trees are greater than 6 m in height could not be consistently distinguished from other deciduous forest covers. Abandoned orchards often include regrowth of typical deciduous cover such as red maple, birch, and oak mixing in with apple trees.

Coniferous Forest (code 420) in the Park is predominantly white pine (*Pinus strobus*). Exceptions are stands of pitch pine (*P. rigida*) and exotics such as Norway spruce (*Picea abies*) in a few areas. Eastern hemlock (*Tsuga canadensis*) is common

throughout the Park, but rarely in pure stands meeting the minimum mapping threshold.

Mixed Forest (code 430) consists of various deciduous trees such as red oak (*Quercus rubra*), black oak (*Q. velutina*), sugar maple (*Acer saccharum*), red maple (*A. rubrum*), young beech (*Fagus grandifolia*), and occasional gray birch (*Betula populifolia*) in association with coniferous trees, most commonly white pine and/or Eastern hemlock. The understory may include species such as beech seedlings (*Fagus*), blueberries (*Vaccinium* spp), hazelnut (*Corylus americana*), teaberry (*Gaultheria procumbens*), tree clubmoss (*Lycopodium obscurum*), and other woodland shrubs and herbs.

Deciduous forested wetlands (code 611) in Minuteman Park are typical New England red maple swamps. These appear to be the most prevalent wetland type in the Park. Red maple dominates in the overstory, with lesser amounts of associates such as yellow birch (*Betula alleghaniensis*), American elm (*Ulmus americana*) and pin oak (*Quercus palustris*). The shrub layer is commonly dominated by highbush blueberry (*Vaccinium corymbosum*), along with other wetland shrubs such as northern arrowwood (*Viburnum recognitum*), swamp laurel (*Rhododendron viscosum*), with rod (*Viburnum cassinoides*), sweet pepperbush (*Clethra alnifolia*), European buckthorn (*Rhamnus frangula*) and winterberry holly (*Ilex verticillata*) in varying amounts. The herbaceous layer is most often dominated by cinnamon fern (*Osmunda cinnamomea*) with occasional royal fern (*O. regalis*), tussock sedge (*Carex stricta*) and patches of *Sphagnum* sp. moss. Ditching in red maple swamps appears frequently in the Park; in some areas, portions of swamps may be effectively drained. This type of hydrologic alteration can present wetland determination and delineation difficulties, both in the field and in photo-interpretation.

Coniferous forested wetland (code 612) is limited to mixtures of white pine and/or Eastern hemlock with red maple deciduous wetlands. Pure stands of coniferous forested wetland were not found during field work nor were any evidenced by photographic signatures. Individual Northern white cedar (*Thuja occidentalis*) may occur in association with red maple in some of the deciduous swamps. A small amount of mature but thin white pine is found in a bog complex also containing dead woody material in the overstory.

Sapling shrub swamp (code 613) is found in a few locations in the Park and is predominantly red maple communities in complex with mature red maple swamp bordering streams.

Shrub swamp (code 614) is 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 complexes often appear to contain shrub swamp communities dominated by European buckthorn.

Narrow-leaved emergent marshes (code 622) are found bordering streams and in broad seasonally-flooded flats, commonly dominated by blue-joint (*Calamagrostis canadensis*) and including other species such as reed canarygrass (*Phalaris arundinacea*), sensitive fern, sedges (*Carex* spp.), and mannagrass (*Glyceria canadensis*). In some cases, these marshes are ditched and/or undergoing invasion by purple loosestrife. Where purple loosestrife appears to be invading into narrow-leaved marsh at varying amounts, cover types are denoted as 622* on the photography.

Robust emergent marsh (code 621) is typically broad-leaved cattail (*Typha latifolia*); however, in many robust marsh communities, purple loosestrife may be present in varying amounts.

Wet meadow (code 624) is typically represented by soft rush (*Juncus effusus*). Other wet meadow species such as willow herb (*Epilobium leptophyllum*, *E. coloratum*), tussock sedge and sensitive fern may also occur. At least one large wet meadow is now dominated by purple loosestrife (*Lythrum salicaria*) and is located on the south side of Rte. 2A in the central region of the Park.

In addition to the above-listed typical communities of various habitat types, there are two other wetland complexes of distinction found in Minuteman. One of these areas is the riverine wetland system associated with the Concord River and its floodplain. Inundated, semi-permanently flooded areas are represented by buttonbush (*Cephalanthus occidentalis*) interspersed with open water. In some semi-permanently flooded areas, purple loosestrife is occurring, but not with prevalence. An exception to this is a loosestrife-dominated backwater area located southeast of the Visitor's Center and west/northwest of the North Bridge. Inundated but flooded at less duration than the buttonbush areas is red maple. The red maples likely occupy higher points of sedimentation along the river course and occur as pure stands interspersed (not as mixtures) with buttonbush and riverine open water. Other riverine trees tolerant of high flood levels such as silver maple (*Acer saccharinum*) and black willow (*Salix nigra*) were not found during field work; red maple appeared to dominate. Such species may occur in this riverine system and would be classified as red maple swamps (611).

Seasonally-flooded marsh in backwater areas of the Concord River is typically dominated by blue-joint, along with lesser amounts of emergents such as tussock sedge, sensitive fern and, in some areas, purple loosestrife. Clumps of silky dogwood (or red osier, *C. stolonifera*) and young red maple may also intersperse in these backwater marshes.

At the southeast end of the Park and immediately north of the Minuteman Technical School, a bog complex includes leatherleaf (*Chamaedaphne calyculata*) and sedge (*Carex* spp.) mats at central portions. Peripheral areas of this basin include semi-permanent open water interspersed with buttonbush and dead woody/shrub swamp represented by thin, mature white pine, dead wood, swamp laurel, highbush blueberry and young red maple. At the southeast corner of the basin is an area of invasive purple loosestrife. It appears the bog basin had been altered (impounded) by adjacent

development in the past, resulting in changes to the original vegetative character of the bog.

Appendix C of this report is a plant list of wetland communities field-checked at Minuteman Park.

WALLS, STREAMS, RARE SPECIES

Stone walls, rock piles, and streams were photo interpreted from the 1986 aerial photography used to delineate land cover types. They were transcribed and recompiled to a base map of parcel lines in the same manner as that described for land cover. Rare species and significant habitat data were provided on a mylar land cover map (created by the EDC) by Bryan Windmiller under contract with the Massachusetts Heritage Program.

PHOTO-INTERPRETIVE LIMITATIONS

Ambiguous signatures, particularly of wetlands, can be encountered in any inventory where disturbed or naturally-occurring problem areas are found. For this project, the following photo-interpretive limitations are noted.

- 1) *Ditched Wetlands*: In areas with a history of ditching activity, upper limits of wetlands are frequently difficult to determine as a result of altered hydrology. Entire wetlands or portions of them may be effectively drained. Soil saturation in a basin which has been ditched/draind may be inconsistent or not detectable in the signature. Interpretation of these areas as wetland was based on reasonably strong red maple crown signatures and micro-relief. Such areas are difficult to determine and delineate in the field as well as on aerial photography.
- 2) *Farming in/near wetland areas*: This was encountered at the northwest end of the eastern portion of the Park. Rectangular or otherwise geometric wetland areas are found, presumably farmed in the more recent past and left to revert to wetland vegetation. Some wet meadow areas are indicated by soft rush tussocks, but these tend to have high transition with that of the active agricultural areas. Density of tussocks and grades were used to photo-delineate such wetland. The Farmed Hydric Soils (230) code was conservatively applied to areas showing pronounced saturation in the signature.
- 3) *Sloping Wetlands ("Seeps")*: There are some areas through the center of the Park where saturated soils on an impervious layer appear to occur. An example is field site #16. Sloping wetlands are vegetated with hydrophytes such as sensitive fern, tussock sedge, willowherb, marsh fern (*Thelypteris thelypteroides*) and silky dogwood. On true color resolution, a saturated signature was consistently detected and the tone/textures of these hydrophytic species can mimic those of various upland old-field species (such as goldenrods and grasses).

- 4) *Vernal Pools* are included under the Semi-permanent Open Water classification (521). In nearly all cases, pools showed conclusively on this photography. The exception would be where pools may occur beneath shadows of conifers and are obscured from interpretation. For those pools inventoried, it is recommended that field inspection for hydrologic isolation and absence of fish predators be conducted towards certification as vernal pools.
- 5) At extreme *south-central portions of the Park*, aerial coverage did not extend to the outermost Park boundary. These two areas of missing coverage include approximately 27.6 ha of land. Access to other aerial photos and/or field visits is suggested for supplemental data for these areas.
- 6) *Abandoned apple orchards* could not be consistently distinguished from Deciduous Forest signatures. Therefore, apple orchards where trees exceed 6 m in height are included under cover type "410." Younger apple orchards (less than 6 m in height) would be included under cover type "320" as successional woody cover.

USER RECOMMENDATIONS:

- 1) As detailed in the previous section, it is suggested that all potential vernal pool habitats (521's) shown on the data base be field-checked for hydrologic isolation and absence of fish predators if these areas are to be certified as Vernal Pools under the Massachusetts Wetlands Protection Act.
- 2) Supplemental data may be obtained from other aerial photo sources and field visits for the extreme south-central portion of the Park, where photographic coverage did not extend far enough to the Park boundary.
- 3) Successional change in old field areas is apparent from the time of photography (1986) until present. In order to maintain consistency, all data presented is as interpreted on the '86 photos. It is suggested that users may update the data base to account for advancing stages of succession. For example, an old field dominated by herbaceous cover was interpreted as "310" on the '86 photography--field inspection revealed that the area is more appropriately classified as transitional old field (320) since at least 30% of the cover is now woody growth. Photo-interpretation cannot consistently account for successional changes and the data presented can only show land conditions in 1986.
- 4) Due to the inability to distinguish apple orchards from other deciduous cover, it is suggested that users may change those polygons known to be orchards to the appropriate "220" (Orchards) cover type.
- 5) Photo-interpreted determinations and delineations of wetlands presented on the data base are not to substitute for on-site regulatory purposes under local, state or federal wetland protection laws.

As presented, the mapped locations and boundaries of wetlands are intended for use as planning guidelines and inventory estimates. Further, inventory estimates of problem-area wetlands (for example, sloping wet meadows) and wetlands altered by ditching are advised to be conservative. These particular wetlands present delineation difficulties, both in the field and on aerial photography.

Digital Data Production

The planimetric base to all datasets developed in this project was the parcels (file = OWNERSH) and park boundary (file = BOUNDADJ) datasets provided by the National Park Service. These were retrieved on 10 December 1991 using FTP protocol from a Sun Workstation at the Boston University Center for Remote Sensing. They were transferred in ARC/INFO GENERATE format and were later converted into ARC/INFO coverages using the GENERATE command. Full documentation on these datasets can be obtained from Nigel Shaw at the National Park Service, Northeast Regional Office.

Vegetation, rock wall, and stream data were transferred to a mylar plot of the park boundary and parcel boundaries (process described in the preceding section). To this base we added 40 registration points (=TICS). Linework on the base maps were digitized to a standard of 90% within 0.25 mm. Lines that were coincident with the park border or a parcel boundary were not digitized anew; instead, they were excised from the BOUNDARY or PARCELS datasets and incorporated into the new dataset. By using lines from BOUNDARY and PARCELS as coincident features, future overlay operations among datasets should be much cleaner and result in far fewer sliver polygons.

Each digital map was proofed on multiple occasions by multiple examiners. The proofing process involved making a 1:4,800 scale plot of the newly digitized features and manually overlaying them atop the original map manuscript on a light table. Proofing attribute features was done on a polygon by polygon or line by line basis. Documentation for each digital dataset is provided in Appendix D.

The rare species dataset was provided to the EDC by field biologists from the Massachusetts Heritage Program in December 1992. This map represents the distribution of critical habitats and species occurrence sites in the park and is the product of the field surveys by teams of ecologists. Habitat areas were drafted on a mylar plot of vegetation polygons that the EDC provided field crews in the spring of 1992. All habitats of significance were bounded by vegetation polygons. Habitat boundaries were, therefore, obtained by extracting the lines from the VEGETATION data layer. Vernal pools constituted one of the significant habitats in the rare species dataset. In most, but not all, cases there was perfect agreement between polygons identified as vernal pools in the VEGETATION dataset and the corresponding polygons in the RARESP dataset. In one case however, a vernal pool in the RARESP layer was identified as a permanent pond in the VEGETATION coverage, and a series of adjacent wetland units in the VEGETATION map were identified as a single vernal pool in

RARESP. We did not change the identification of any of the polygons in the VEGETATION dataset to match the RARESP coverage because the sources and ages of information were so different between the two. In a number of cases on the RARESP map, adjacent closed polygons were given the same code values by the field biologists. Normally, the common boundary between the two polygons would be dropped forming a single large area instead of two smaller one's. We have, however, retained the exact notation of the biologists in the digital dataset.

Appendix B
Land Cover Classification.*

Dataset = Vegetation (hectares/category):

Developed and Disturbed Land

- 111 Single Dwelling (2.29)
- 112 Multiple Dwellings (0.08)
- 113 Foundations of Old Buildings (0.26)
- 140 Transportation and Parking Lots (23.99)
- 140u Unimproved Roads (these are distinguished on the photos only, they are classified as 140 on the digital representation)
- 170 Lawns and Mowed Roadsides (13.85)

Agricultural Land

- 210 Agricultural Fields (currently or recently farmed) (33.97)
- 230 Farmed Hydric Soils (0.69)

Fields and Brushland

- 310 Old Field, Herbaceous Cover Dominant (19.00)
- 320 Shrub Old Field, Woody Vegetation Dominant (12.40)
- 330 Transitional Old Field, Herbaceous and Woody Cover in Roughly Equal Proportion (25.87)
- 340 Exposed Slopes (exposed sand and gravel with little stabilizing vegetation) (0.18)

Forests

- 410 Deciduous Forest (includes successional cover >6 m ht.) (60.66)
- 420 Coniferous Forest (11.42)
- 430 Mixed Deciduous/Coniferous Forest (38.41)

Water

- 510 Rivers (>6 m wide) (3.95)
- 520 Permanent Lakes and Ponds (1.18)
- 521 Temporary Ponds (including Vernal Pools) (0.64)

Wetlands

- 611 Forested Wetland, Deciduous (>6 m ht.) (48.96)
- 611D Dead Woody Swamp *
- 612 Forested Wetland, Coniferous (>6 m ht.) (0.33)
- 613 Sapling Swamp (<6 m ht.) (0.85)

* The code values given here are the same one's marked on the mylar base map. For the GIS coverage, only the 3-digit numeric code was used. For areas that were a mix of two land cover types, the two codes are marked on the mylar base map. The first code is the dominant cover and this is the one that was assigned to the digital representation of the area in the GIS database.

- 614 Bushy Shrub Swamp (15.81)
- 614B Semi-permanently Flooded Shrub Swamp (these are distinguished on the photos only, they are classified as 614 on the digital representation)
- 615 Compact Bog Shrubs (0.29)
- 621 Robust Emergent Wetland (life forms such as cattail, purple loosestrife) (12.89)
- 622 Narrow- and/or Broad-leaved Emergent Wetland (narrow-leaved plants such as sedges, rushes and grasses; broad-leaved plants such as arrow arum) (8.43)
- 624 Wet Meadow Emergents (life forms such as tussock sedge on saturated soil) (2.41)

Misc.

- 999 Unclassified (3.16)

Appendix C Plant List

The following plant list documents dominants and co-dominants of sites inspected for this project. The wetland indicator status for each species is taken from National List of Plant Species that Occur in Wetlands: Northeast (Region 1), Reed (1988)¹.

Indicator Categories:

- Obligate Wetland (OBL)*: Occur most always (estimated probability >99%) under natural conditions in wetlands.
- Facultative Wetland (FACW)*: Usually occur in wetlands (estimated probability 67%-99%) but occasionally found in nonwetlands.
- Facultative (FAC)*: Equally likely to occur in wetlands or nonwetlands (estimated probability 34%-66%).
- Facultative Upland (FACU)*: Usually occur in nonwetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%).
- Obligate Upland (UPL)*: Occur in wetlands in another region, but occur almost always (estimated probability >99%) under natural conditions in nonwetlands in the region specified. If a species does not occur in wetlands in any region, it is not on the National List.
- A positive (+) or negative (-) sign was used with the Facultative Indicator categories to more specifically define the regional frequency of occurrence in wetlands. The positive sign indicates a frequency toward the higher end of the category (more frequently found in wetlands) and a negative sign indicates a frequency toward the lower end of the category (less frequently found in wetlands).

Species	Common Name	Indicator
<i>Acer rubrum</i>	red maple	FAC
<i>Acer saccharum</i>	sugar maple	FACU-
<i>Alnus rugosa</i>	speckled alder	FACW+
<i>Betula alleghaniensis</i>	yellow birch	FAC
<i>Betula populifolia</i>	gray birch	FAC
<i>Berberis vulgaris</i>	barberry	FACU
<i>Calamagrostis canadensis</i>	blue joint	FACW+
<i>Carex stricta</i>	tussock sedge	OBL
<i>Cephalanthus occidentalis</i>	buttonbush	OBL
<i>Chamaedaphne calyculata</i>	leatherleaf	OBL
<i>Clethra alnifolia</i>	sweet pepperbush	FAC+
<i>Cornus amomum</i>	silky dogwood	FACW
<i>Cornus stolonifera</i>	red-osier dogwood	FACW+
<i>Corylus americana</i>	hazelnut	FACU-
<i>Dicanthelium clandestinum</i>	deer tongue	FAC+
<i>Epilobium coloratum</i>	willow herb	OBL
<i>Fagus grandifolia</i>	beech, American	FACU
<i>Fraxinus americana</i>	white ash	FACU
<i>Glyceria canadensis</i>	mannagrass	OBL

¹ Reed, P.B., Jr. 1988. National list of plant species that occur in wetlands: Northeast (Region 1, U.S. Fish Wildl. Serv. Biol. Rept. 88(26.1). 111 pp

<i>Ilex verticillata</i>	winterberry holly	FACW+
<i>Juncus effusus</i>	soft rush	FACW+
<i>Juniperus virginiana</i>	red cedar, Eastern	FACU
<i>Kalmia angustifolia</i>	sheep laurel	FAC
<i>Lonicera japonica</i>	honeysuckle, Japanese	FAC-
<i>Lycopodium obscurum</i>	clubmoss, tree	FACU
<i>Lythrum salicaria</i>	purple loosestrife	FACW+
<i>Malus sylvestris</i>	apple, domestic	UPL
<i>Onoclea sensibilis</i>	sensitive fern	FACW
<i>Osmunda cinnamomea</i>	cinnamon fern	FACW
<i>Osmunda regalis</i>	royal fern	OBL
<i>Phalaris arundinacea</i>	reed canary grass	FACW+
<i>Picea abies</i>	Norway spruce	UPL
<i>Pinus rigida</i>	pitch pine	FACU
<i>Pinus strobus</i>	Eastern white pine	FACU
<i>Poa pratensis</i>	Kentucky blue grass	FACU
<i>Populus tremula</i>	quaking aspen	FAC
<i>Quercus palustris</i>	pin oak	FAC+
<i>Quercus rubra</i>	red oak	FACU-
<i>Quercus velutina</i>	black oak	UPL
<i>Rhamnus cathartica</i>	common buckthorn	UPL
<i>Rhamnus frangula</i>	European buckthorn	FAC
<i>Rhododendron viscosum</i>	swamp azalea	OBL
<i>Rhus typhina</i>	staghorn sumac	UPL
<i>Salix babylonica</i>	weeping willow	FACW-
<i>Salix discolor</i>	pussy willow	FACW
<i>Schizachyrium scoparium</i>	little bluestem	FACU-
<i>Scirpus cyperinus</i>	wool grass	FACW+
<i>Smilax rotundifolia</i>	common greenbrier	FAC
<i>Solidago altissima</i>	tall goldenrod	FACU-
<i>Sphagnum spp.</i>	sphagnum moss	OBL
<i>Spiraea tomentosa</i>	steepleshbush	FACW
<i>Tymlocarpus foetidus</i>	skunk cabbage	OBL
<i>Thelypteris thelypteroides</i>	marsh fern	FACW+
<i>Toxicodendron radicans</i>	poison ivy	FAC-
<i>Tsuga canadensis</i>	Eastern hemlock	FACU
<i>Typha latifolia</i>	cattail, broad-leaf	OBL
<i>Ulmus americana</i>	American elm	FACW-
<i>Vaccinium corymbosum</i>	highbush blueberry	FACW-
<i>Viburnum cassinoides</i>	withe rod	FACW
<i>Viburnum recognitum</i>	northern arrowwood	FACW-

Minimum Mapping Unit

Approximately 0.1 hectare

Coordinate System

UTM meters, Zone 19

Datum

NAD 1927; Spheroid, Clarke 1866

Projection

UTM, planimetry based on property boundaries provided by NPS

Coincident Feature

Property lines, park boundary

Size of Data Set

(Kb, ARC/INFO EXPORT Format, no compression) 1,895

Date of Automation

Spring and summer 1992

Method of Accuracy Verification

Manual overlay

Data Set Developed and Automated by

Environmental Data Center, Department of Natural Resources Science, University of Rhode Island, Kingston, RI 02881

Contact for Information on Data Set Development

Peter August or Charles LaBash, phone (401) 792-5406, Fax (401) 792-4561, Email pete@edcserv.edc.uri.edu or labash@edcserv.edc.uri.edu

Ownership

National Park Service; contact Nigel Shaw, National Park Service, 15 State Street, Boston, MA 02109, (617) 223-5127

Coded Variables in PAT file

COVER, integer value of 3 digits with the following values:

Developed and Disturbed Land

111 Single Dwelling

112 Multiple Dwellings

113 Foundations of Old Buildings

140 Transportation, Parking Lots, & Unimproved Roads

170 Lawns and Mowed Roadsides

Agricultural Land

- 210 Agricultural Fields (currently or recently farmed)
- 230 Farmed Hydric Soils

Fields and Brushland

- 310 Old Field, Herbaceous Cover Dominant
- 320 Shrub Old Field, Woody Vegetation Dominant
- 330 Transitional Old Field, Herbaceous and Woody Cover in Roughly Equal Proportion
- 340 Exposed Slopes (exposed sand and gravel with little stabilizing vegetation)

Forests

- 410 Deciduous Forest (includes successional cover >6 m ht.)
- 420 Coniferous Forest
- 430 Mixed Deciduous/Coniferous Forest

Water

- 510 Rivers (>6 m wide)
- 520 Permanent Lakes and Ponds
- 521 Temporary Ponds (including Vernal Pools)

Wetlands

- 611 Forested Wetland, Deciduous (>6 m ht.)
- 612 Forested Wetland, Coniferous (>6 m ht.)
- 613 Sapling Swamp (<6 m ht.)
- 614 Bushy Shrub Swamp
- 615 Compact Bog Shrubs
- 621 Robust Emergent Wetland (life forms such as cattail, purple loosestrife)
- 622 Narrow- and/or Broad-leaved Emergent Wetland (narrow-leaved plants such as sedges, rushes and grasses; broad-leaved plants such as arrow arum)
- 624 Wet Meadow Emergents (life forms such as tussock sedge on saturated soil)

Unknown

- 999 No photography available for this section of MNHP

Coverage Name
STREAMS

Keywords
Hydrography, Perennial Streams, Intermittent Streams

Description of Contents
Perennial and intermittent streams less than approximately 6 m wide in Minuteman National Historical Park, Massachusetts. Note, accurate determination of perennial or intermittent status is difficult to discern from aerial photos alone and requires field verification.

Data Source
1986 1:4,800 true color photography dated April 5, 1986 provided by the National Park Service

Scale of Source Data
1:4,800

Software Used for Automation
ARC/INFO (Environmental Systems Research Institute, Redlands, CA)

Hardware Used for Automation
Calcomp 9100 digitizing tablet, Calcomp 1044GT pen plotter

Data Model
Vector-topologic, Single Precision

Line Accuracy Relative to Source Document
0.25 mm (0.01 inch)

Absolute Positional Accuracy
These data have been recompiled to the parcel map of Minuteman National Historical Park provided by the National Park Service. The absolute positional accuracy of the parcel data is unknown.

Topology
Line

Number of Arcs
86

Coordinate System
UTM meters Zone 19

Datum
NAD 1927; Spheroid, Clarke 1866

Projection

UTM, planimetry based on property boundaries provided by NPS

Coincident Features

none

Size of Data Set

(Kb, ARC/INFO EXPORT Format, no compression) 52

Date of Automation

Summer 1992

Method of Accuracy Verification

Manual overlay

Data Set Developed and Automated by

Environmental Data Center, Department of Natural Resources Science, The
University of Rhode Island, Kingston, RI 02881

Contact for Information on Data Set Development

Peter August or Charles LaBash, phone (401) 792-5406, Fax (401) 792-4561, Email
pete@edcserv.edc.uri.edu or labash@edcserv.edc.uri.edu

Ownership

National Park Service; contact Nigel Shaw, National Park Service, 15 State Street,
Boston, MA 02109, (617) 223-5127

Coded Variables in the AAT file

TYPE, text value of 14 characters indicating whether a stream is "perennial" or
"intermittent."

CLASS, integer value of 1 digit with the following values:

- 1 -- Perennial Stream
- 2 -- Intermittent Stream

Coverage Name
WALLS

Keywords
Stone Walls, Rock Walls

Description of Contents
Rock walls in Minuteman National Historical Park, Massachusetts

Data Source
1986 1:4,800 true color photography dated April 5, 1986 provided by the National Park Service

Scale of Source Data
1:4,800

Software Used for Automation
ARC/INFO (Environmental Systems Research Institute, Redlands, CA)

Hardware Used for Automation
Calcomp 9100 digitizing tablet, Calcomp 1044GT pen plotter

Data Model
Vector-topologic, Single Precision

Line Accuracy Relative to Source Document
0.25 mm (0.01 inch)

Absolute Positional Accuracy
These data have been recompiled to the parcel map of Minuteman National Historical Park provided by the National Park Service. The absolute positional accuracy of the parcel data is unknown.

Topology
Line

Number of Arcs
375

Coordinate System
UTM meters, Zone 19

Datum
NAD 1927; Spheroid, Clarke 1866

Projection

UTM, planimetry based on property boundaries provided by NPS

Coincident Features

Property lines, park boundary

Size of Data Set

(Kb, ARC/INFO EXPORT Format, no compression) 116

Date of Automation

Fall 1992

Method of Accuracy Verification

Manual overlay

Data Set Developed and Automated by

Environmental Data Center, Department of Natural Resources Science, The
University of Rhode Island, Kingston, RI 02881

Contact for Information on Data Set Development

Peter August or Charles LaBash, phone (401) 792-5406, Fax (401) 792-4561, Email
pete@edcserv.edc.uri.edu or labash@edcserv.edc.uri.edu

Ownership

National Park Service; contact Nigel Shaw, National Park Service, 15 State Street,
Boston, MA 02109, (617) 223-5127

Coded Variables

None

Coverage Name
ROCK-PILES

Keywords
Stone Walls, Rock Walls

Description of Contents
Remnant stone wall piles in Minuteman National Historical Park, Massachusetts.
Note, these determinations were made from aerial photos and must be regarded as approximations at best.

Data Source
1986 1:4,800 true color photography dated April 5, 1986 provided by the National Park Service

Scale of Source Data
1:4,800

Software Used for Automation
ARC/INFO (Environmental Systems Research Institute, Redlands, CA)

Hardware Used for Automation
Calcomp 9100 digitizing tablet, Calcomp 1044GT pen plotter

Data Model
Vector-topologic, Single Precision

Line Accuracy Relative to Source Document
0.25 mm (0.01 inch)

Absolute Positional Accuracy
These data have been recompiled to the parcel map of Minuteman National Historical Park provided by the National Park Service. The absolute positional accuracy of the parcel data is unknown.

Topology
Polygon

Number of Polygons
17

Number of Arcs
19

Minimum Mapping Unit
Approximately 40 m²

Coordinate System

UTM meters Zone 19

Datum

NAD 1927; Spheroid, Clarke 1866

Projection

UTM, planimetry based on property boundaries provided by NPS

Coincident Features

none

Size of Data Set

(Kb, ARC/INFO EXPORT Format, no compression) 19

Date of Automation

Spring and summer 1992

Method of Accuracy Verification

Manual overlay

Data Set Developed and Automated by

Environmental Data Center, Department of Natural Resources Science, The
University of Rhode Island, Kingston, RI 02881

Contact for Information on Data Set Development

Peter August or Charles LaBash, phone (401) 792-5406, Fax (401) 792-4561, Email
pete@edcserv.edc.uri.edu or labash@edcserv.edc.uri.edu

Ownership

National Park Service; contact Nigel Shaw, National Park Service, 15 State Street,
Boston, MA 02109, (617) 223-5127

Coded Variables

None

Coverage Name
RARESP

Keywords
Rare Species, Significant Habitats, Ecological Communities,

Description of Contents
Locations of habitats of concern in Minuteman National Historical Park,
Massachusetts

Data Source
Field survey conducted in spring/summer 1992 by Massachusetts Heritage Program. Habitats of concern were drafted on a base map of vegetation communities of Minuteman (see documentation for VEGETATION). Data were forwarded to the EDC by Bryan Windmiller of the Massachusetts Heritage Program.

Scale of Source Data
1:4,800 and field verification

Software Used for Automation
ARC/INFO (Environmental Systems Research Institute, Redlands, CA)

Hardware Used for Automation
Calcomp 9100 digitizing tablet, Calcomp 1044GT pen plotter

Data Model
Vector-topologic, Single Precision

Line Accuracy Relative to Source Document
0.25 mm (0.01 inch)

Absolute Positional Accuracy
These data have been recompiled to the parcel map of Minuteman National Historical Park provided by the National Park Service. The absolute positional accuracy of the parcel data is unknown.

Topology
Polygon

Number of Polygons
30

Number of Arcs
42

Coordinate System

UTM meters, Zone 19

Datum

NAD 1927; Spheroid, Clarke 1866

Projection

UTM, planimetry based on property boundaries provided by NPS

Coincident Features

All polygons are bounded by vegetation polygons

Size of Data Set

(Kb, ARC/INFO EXPORT Format, no compression) 98

Date of Automation

December 1992

Method of Accuracy Verification

Manual overlay

Data Set Automated by

Environmental Data Center, Department of Natural Resources Science, The
University of Rhode Island, Kingston, RI 02881

Contact for Information on Data Set Development

Peter August or Charles LaBash, phone (401) 792-5406, Fax (401) 792-4561, Email
pete@edcserv.edc.uri.edu or labash@edcserv.edc.uri.edu

Ownership

National Park Service; contact Nigel Shaw, National Park Service, 15 State Street,
Boston, MA 02109, (617) 223-5127

Coded Variables in PAT file

TYPE1 is a 40 character description of the site.

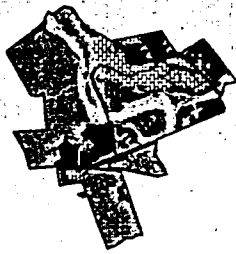
TYPE2 is a 40 character description of the site when it is significant for 2 or more
reasons.

TYPE3 is a 40 character description of the site when it is significant for 3 reasons.

There are 4 categories found in TYPE1, TYPE2 and TYPE3 and these are:

- *Habitat of Faunal Significance (see Mass Heritage report for reasons why)*
- *Vernal Pool as indicated by field survey (this corresponds to the vegetation data in most, but not all cases)*
- *Mystic Valley Amphipod Habitat*
- *Elderberry Borer Beetle Habitat*

Minuteman National Historical Park



- ☒ Developed lands
- ☒ Transportation
- ☒ Agriculture
- ☒ Fields and Brushland
- ☒ Forests
- ☒ Water
- ☒ Wetlands
- ☐ No Data

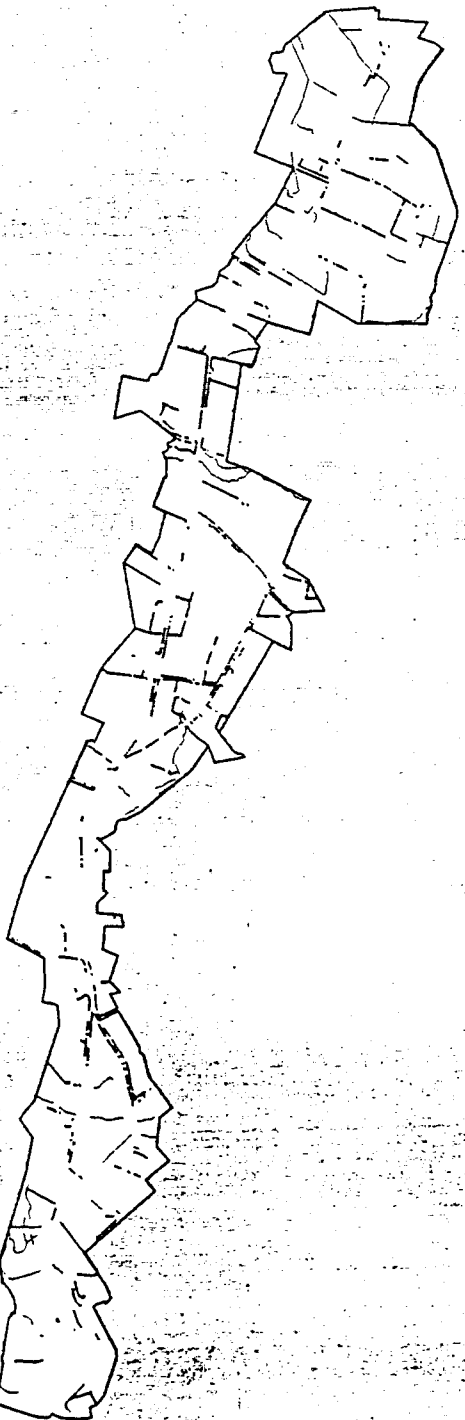
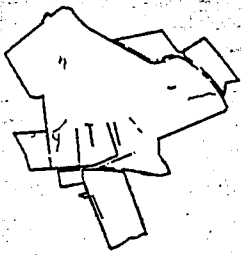
Land Cover



Kilometers



Minuteman National Historical Park



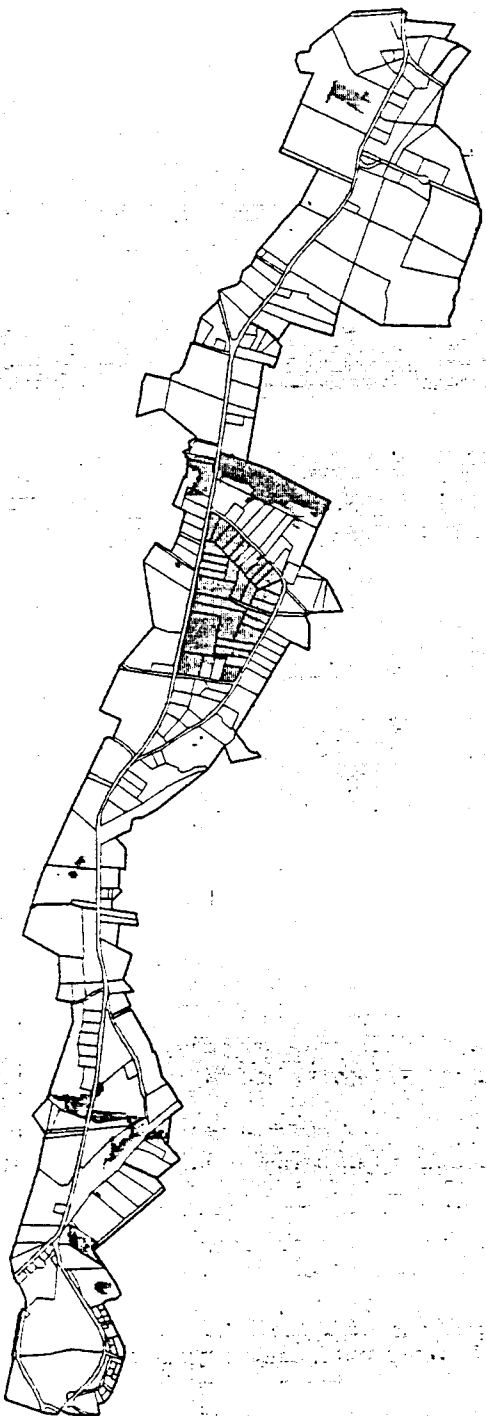
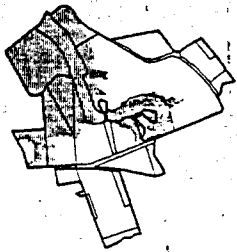
N Perennial Stream
N Intermittent Stream
N Stone Walls and Rock Piles



Streams and Stone Walls



Minuteman National Historical Park



44 Habitats of Concern
N Parcel Boundary



Areas of Biological Importance

