National Park Service
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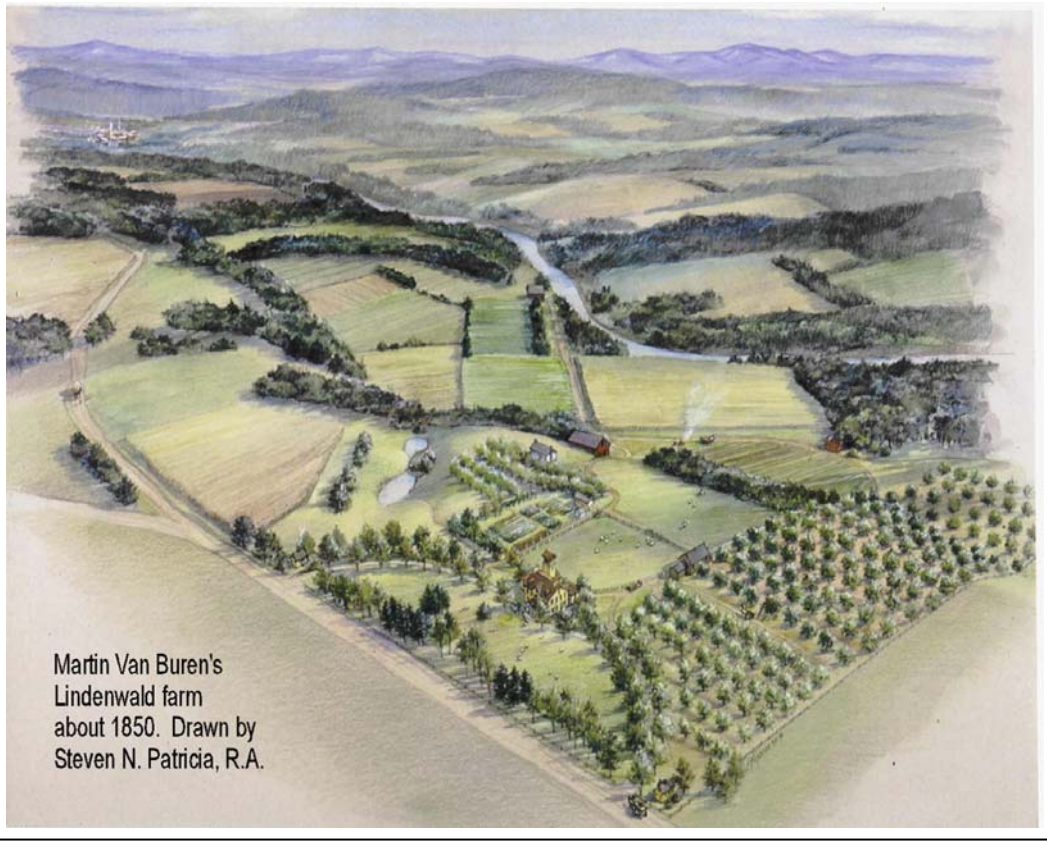
Northeast Region
Boston, Massachusetts

Biological Surveys at the Martin Van Buren National Historical Site, Columbia County, New York

Technical Report NPS/NER/NRTR—2005/011



ON THE COVER

Martin Van Buren's Lindenwald farm about 1850
Image courtesy of Martin Van Buren NHS
Drawn by Steven N. Patricia, R.A.

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U.S. Department of the Interior
National Park Service
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Boston, Massachusetts

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INTRODUCTION

The Martin van Buren National Historic Site is in the Town of Kinderhook in northwestern Columbia County, New York (US Geological Survey 7.5 minute Stottville quadrangle). The US National Park Service (NPS) has considered several alternatives for additions to the existing historic site parcel to protect some of the site's cultural, natural, and scenic resources. These options, which consider the configurations of the original farm, which Van Buren named Lindenwald, its setting, and some areas that can be viewed from Lindenwald, were outlined in a "Draft Boundary Study, Draft Environmental Assessment" prepared by the NPS in August 2001. To help inform decisions about future management planning and potential land acquisition, NPS asked Hudsonia to collect biological information on the existing National Historic Site (NHS) and an adjacent parcel owned by the Open Space Institute (OSI).

According to NPS (2001), the National Historic Site totals 15.6 hectares (38.6 acres), of which 8.3 ha (20.3 ac) are held by the NPS in full fee and 7.4 ha (18.3 ac) are protected through conservation easement. President Van Buren's home, which we refer to as Lindenwald house, is located on the NHS property. The adjacent OSI property totals approximately 51 ha (126 ac) (NPS 2001), and is currently leased to Roxbury Farm, an organic vegetable farm. The study area for this project, referred to below as "MAVA," comprises approximately 59 ha (145 ac) and includes managed grounds with buildings, constructed ponds, a streambank and riparian segment on Kinderhook Creek, a small tributary of Kinderhook Creek, forests, and agricultural fields. Past biological surveys at MAVA have focused on the historic site alone, and have not been conducted on the neighboring OSI property concurrently (Cook 1985, Clemants 1997, Kiviat 1997). Our report provides information on plants, fishes, amphibians, reptiles, and birds found on both of these properties, a habitat map, and an assessment of habitat quality and biodiversity potential.

PROJECT DESCRIPTION

This study included a review of existing biological information pertaining to the site, mapping of habitats, and surveys of vascular plants, breeding birds, reptiles, amphibians, and fishes conducted during various seasons in 2002-2004. We have also assessed the potential for occurrence of rare species that were not surveyed or were not found. Our study area consisted of the existing NPS-managed property and the neighboring Roxbury Farm (OSI lands). For consistency with a water quality inventory conducted at MAVA (Farris 2001), we have used the same study unit names whenever possible, but have assigned our own place names to additional areas as necessary (Table 1, Figure 1).

While the study units simply represent different physical areas of the site, each study unit contains one or more habitats. For example, the study unit called "Southern Swamp" contains hardwood swamp and stream habitats. The study unit called "Field 1" contains upland meadow and wet meadow habitats (figures 1 and 2). The OSI property boundary in and near Southern Swamp is not posted and we assumed the boundary to be at the foot of the slope on the southern edge of the swamp.

Fieldwork was conducted by James (Spider) Barbour, Catherine Dickert, Erik Kiviat, Don McClelland, Robert Schmidt, Gretchen Stevens, and Erin Talmage.

Table 1. Study unit names used in this report, cross-referenced to Farris (2001).

Study Unit names used in this report	Sampling locations from Farris (2001)
Field 1	---
Field 2	---
Field 3	---
Field 4	---
Field 5	---
Field 6	---
Sandbar	---
Southern Swamp	---
Gravel Pond (and vicinity)	Gravel Pond
Third Pond	Third Pond
Shed Pond	Shed Pond
Upper Pond	Upper Pond
Swamp Pond	---
Woodlot	---
SN Ditch	---
Station 1	Kinderhook
Station 2	---
Muddy Brook	Vegetated Wetland

STUDY AREA

The MAVA site is located in the southwestern corner of the Town of Kinderhook, and is bordered approximately by Kinderhook Creek on the northwest, Route 9H on the southeast, and other farm properties on the northeast and southwest. There is an undeveloped Columbia County park property on the southeast side of Route 9H opposite the eastern corner of the NPS parcel. Route 9H is a paved two-lane state highway. Agricultural areas and woodlots dominate the landscape on and near MAVA. Agricultural land use has predominated in this region for more than two centuries.

MAVA is located in the valley of Kinderhook Creek ca. 7 kilometers (4 miles) east of the tidal Hudson River. Elevations on the site range from 50 to 70 meters (170 to 230 feet) above sea level. According to the 1:250,000 scale Geologic Map of New York (Fisher et al. 1970), bedrock geology at MAVA includes three mapped geological formations: Austin Glen graywacke and shale, Mount Merino and Indian River shale, slate, and chert, and Stuyvesant Falls shale and siltstone. A fourth formation, Germantown shale, conglomerate, and limestone, is mapped west, north, and east of MAVA. We presume that glacial drift on the MAVA site is locally calcareous due to calcium carbonate transported from this limestone, which may explain the occurrence of certain plants that are often associated with calcareous or circumneutral soils in the Hudson Valley, such as pale jewelweed (*Impatiens pallida*) and lakeside sedge (*Carex lacustris*).

The Surficial Geologic Map of New York (Cadwell and Dineen 1987) shows the areas along Kinderhook Creek as underlain by Recent alluvium, and areas farther east and southeast as underlain

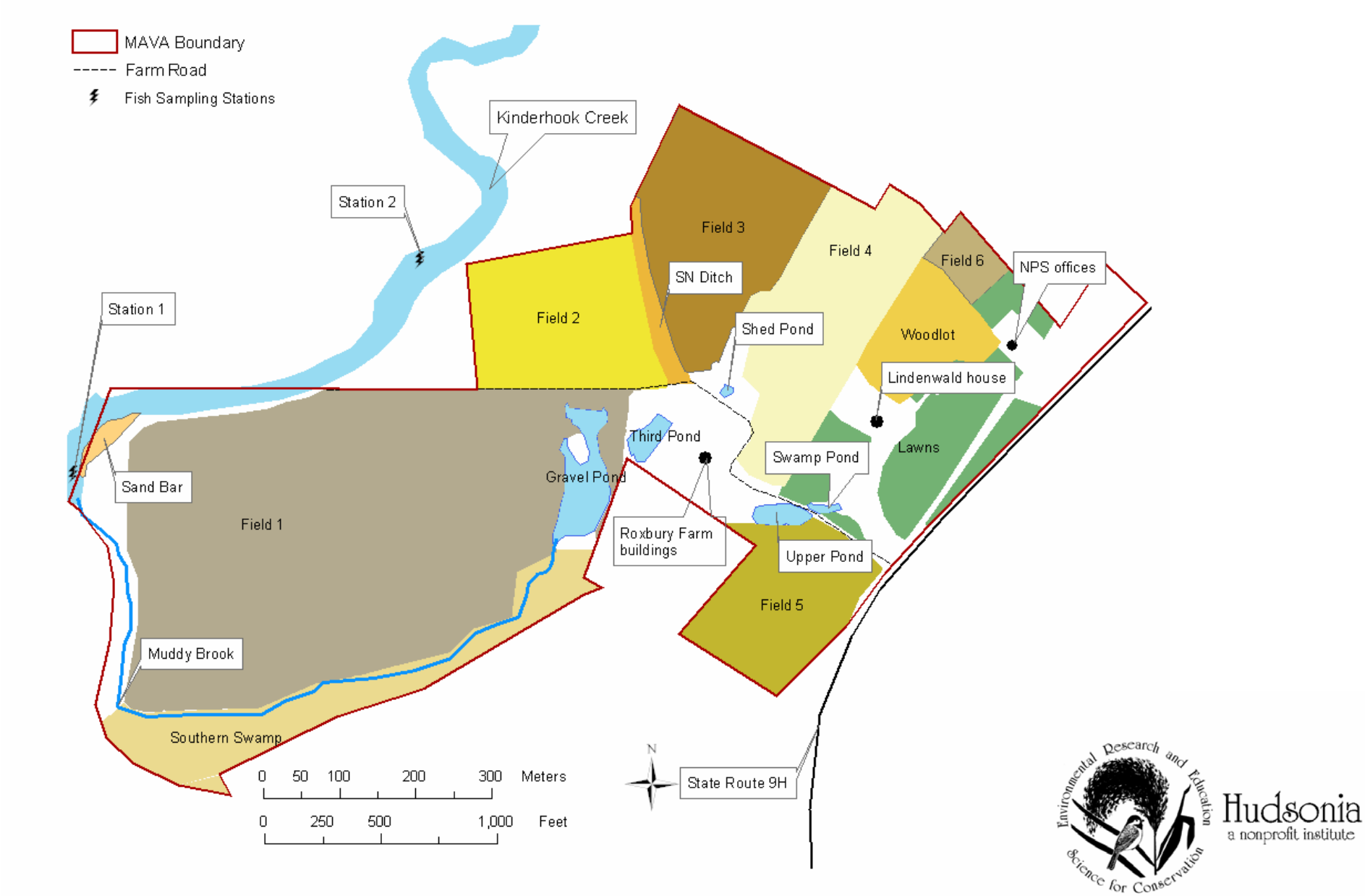
by lakeshore delta deposits. The county soil map (Case 1989) shows floodplain soils (Occum, Linlithgo, Limerick) corresponding with the alluvium on the surficial geology map, glacial outwash soils (Hoosic and Hoosic-Blasdell) corresponding with the lakeshore delta deposits, and an organic wetland soil (Palms muck) between. The sequence from Kinderhook Creek inland (southeastward) across Field 1 (Figure 1) is approximately Occum loam (well drained), Linlithgo silt loam (somewhat poorly drained), Limerick silt loam (poorly drained), and Palms muck (very poorly drained). This apparently corresponds to a broad, slightly elevated natural levee along the creek (Occum), supporting most of the cultivated portions of Field 1, through slightly lower, seasonally-wet meadows (Linlithgo and Limerick), to the lower, permanently wet backswamp on Palms. The eastern and northern portions of Roxbury Farm, and the NPS property, are mostly on Hoosic or Hoosic-Blasdell soils which are, respectively, gravelly-sandy loam and channery loam at MAVA. Gravel Pond (Figure 1) is on Hoosic soil, and the steep slopes forming the border between the southwestern portion of Roxbury Farm and the neighboring farm are apparently on Hoosic-Blasdell.

There is a network of old, partly silted drainage ditches on Roxbury Farm. A large, straight ditch (SN Ditch, Figure 1) separates Field 1 from Field 2 and apparently represents a channelized stream flowing from Third Pond northward into an offsite wetland adjoining Kinderhook Creek. Portions of the short slopes adjoining the eastern side of this ditch are seepage wetland. Another channelized stream (Muddy Brook) runs through the Southern Swamp near Field 1 and drains into Kinderhook Creek at the northwestern corner of the site. At least two shallow ditches drain the wet meadows of Field 1 into Muddy Brook. The ditching and channelization have probably shortened the hydroperiods (duration of flooding) of the wet meadows in Field 1. In Southern Swamp, perhaps due to a large flow of seepage from the slopes south of the swamp, channelization has not dried out the swamp but it has probably reduced the ponding of water.

Gravel Pond, the largest pond at MAVA, appeared on 1994 aerial photographs to have been newly excavated. Upper Pond, on the other hand, has a shoreline with well developed purple loosestrife (*Lythrum salicaria*) clumps and shrubs, and appears to be of much greater age. Swamp Pond (the swampy extension of Upper Pond on the north side of the Roxbury Farm entrance road) may have been an open ornamental pond in Martin Van Buren's life that has since filled in and become a wetland. Third Pond appears to be intermediate in age between Gravel Pond and Upper Pond. As far as we can tell all three ponds, plus the very small Shed Pond, are excavated artificial ponds. These ponds are probably fed by the abundant groundwater discharge we would expect in this extensive area of gravelly glacial outwash material; groundwater discharge is conspicuous east of Shed Pond. It is unclear whether Gravel Pond was constructed with the intention of supplying water for irrigation or other farm needs; irrigation water is currently drawn from Kinderhook Creek near the northwestern portion of Field 1. Three closely-spaced farm ponds are located offsite just east of Gravel Pond. The most northern pond of the three is heavily used by both domestic and wild waterfowl that appear to be fed by the pond owner. Wild waterfowl using this pond presumably also use Kinderhook Creek and probably Gravel Pond and Third Pond as well.

Roxbury Farm is an organic vegetable farm that was established here in the 1990s. According to Jean-Paul Courtens of Roxbury Farm (personal communication to Kiviat and Stevens), the farm that preceded Roxbury used agricultural chemicals intensively.

Figure 1. Study units at the MAVA site.



METHODS

EXISTING INFORMATION

We reviewed the botanical bibliography of House (1941), and available biological information for MAVA and its vicinity from published and unpublished sources. These sources included a treatise on Columbia County flora (McVaugh 1958), reports on biological surveys on the historic site (Cook 1984, Cook 1985), a report on vascular plant species of the National Historic Site (Clemants 1997), a habitat assessment of the National Historic Site and nearby county park (Kiviat 1997), records of the New York Natural Heritage Program, records of the Alan Devoe Bird Club, and personal communications with National Park Service and Roxbury Farm employees. We also contacted the Eastern New York Chapter of The Nature Conservancy, but they had no information to contribute.

HABITAT MAPPING

We mapped habitats by analyzing topographic maps, soil maps, and aerial photographs; digitizing predicted habitats onto orthophoto images; and field checking to correct and refine the habitat boundaries.

We used the following materials to identify and map habitats:

- *U.S. Geological Survey topographic map (Stottville 7.5 minute quadrangle).*
- *Soil Survey of Columbia County, New York (Case 1989).*
- *1:40,000 scale color infrared aerial photograph prints from the National Aerial Photography Program series taken in spring 1994, obtained from the U.S. Geological Survey.*
- *High resolution (3.25 ft [1 m] horizontal accuracy) infrared digital orthophotos (NY State Plane, NAD83) taken in spring 2001, obtained from the New York State Statewide Digital Orthoimagery Program.*

We prepared a preliminary map of predicted habitats based on map analysis and stereo interpretation of aerial photographs using an F-71 mirror stereoscope (Alan Gordon Enterprises, Inc). We digitized the predicted habitats onscreen over the orthophoto images using ArcView 3.2 mapping software on an IBM ThinkPad T30 computer. We field-checked the mapped habitats to verify their presence and extent, and corrected the preliminary map on the basis of our field observations to produce the final habitat map (Figure 2). Habitat mapping was conducted primarily by Dickert and reviewed by other Hudsonia staff.

The study area boundary (figures 1 and 2) is a visual approximation derived from Figure 7 of NPS (2001). The locations of habitat boundaries on Figure 2 are approximate, and should not be used for jurisdictional determinations. Habitat boundaries are depicted on our maps as discrete, but the actual transition zones between two habitats may have characteristics of both. Wherever the actual locations of wetland boundaries are needed to determine jurisdictional limits, for example, the boundaries must be identified and marked in the field by a wetland scientist and mapped by a land surveyor.

The GIS database that accompanies the map includes additional information about the mapped habitats, such as the dates of field visits and site names that agree with sites mentioned in the text of this report. Although the habitat map was carefully prepared and field-checked, there may still be inaccuracies. Also, certain habitat boundaries may change over time. For these reasons, we request that the following caveat be printed prominently on all reproductions of the habitat map (Figure 2):

> *"This map is suitable for general land use planning, but unsuitable for detailed planning and site design or for jurisdictional determinations. Boundaries of wetlands and other habitats depicted here are approximate."*

At the request of NPS, we created FGDC compliant metadata using the ArcView Metadata Collector version 2.0, developed by the National Oceanic and Atmospheric Administration.

PLANT SURVEY

We surveyed spontaneously growing vascular plants and excluded most planted or managed species. The survey was conducted by examining whole habitat units or, in the case of larger units, representative portions at least twice during the growing season (early and late summer). In addition, forested areas and other appropriate habitats were visited in spring for early-developing wildflowers and sedges. Specimens of selected rare native and introduced species were collected (only if collection would not pose a threat to the local stand) for deposition in the Bard College Field Station herbarium. We also collected for laboratory identification specimens that were difficult to identify in the field. Scientific nomenclature in this report follows Gleason and Cronquist (1991). Spider Barbour had primary responsibility for the plant survey, but Kiviat, McClelland, and Stevens contributed to the survey.

FISH SURVEY

On 26 September 2002 we sampled fish in Kinderhook Creek at two locations (Figure 1). Station 1 was near the confluence of Kinderhook Creek and the western tributary, Muddy Brook. Station 2 was upstream of Station 1 about 0.6 km (0.4 mi). We sampled each location with a backpack electroshocker along rocky shorelines and tree snags in the water. This method allows detection of fish in hiding areas in the creek. We used a 6 m (20 ft) bag seine to sample fish in gravelly riffles and creek runs. We recorded estimates of the numbers of fish of each species seen in both sampling efforts; these were the approximate numbers of individuals caught in the seine or seen when stunned by the shocker. In addition, we sampled the lower end of Muddy Brook using dipnets. All fish were released after identification. Bob Schmidt and field assistants conducted the fish sampling.

AMPHIBIAN AND REPTILE SURVEY

We surveyed reptiles and amphibians using visual encounter surveys in daylight and after dark during the periods April-September 2003 and April-July 2004. We used binoculars during daytime searches to spot wary animals that we could not approach. We used dipnets in Gravel, Shed and Third ponds and in Southern Swamp to search for amphibian larvae. Most animals were released after identification, but we collected and preserved some amphibian larvae for laboratory identification and for voucher specimens. We identified salamander larvae according to Bishop (1941) and Downs (1989). We

identified frog larvae according to Altig (1970). We preserved voucher specimens of all species of amphibian larvae found, in 70% isopropyl alcohol, and deposited them at the Bard College Field Station. On four calm evenings without rain on 3 June 2003 and during the period April through July 2004, we listened for frog choruses. Barbour, Dickert, and Kiviat conducted the reptile and amphibian survey.

BREEDING BIRD SURVEY

We surveyed breeding birds by visiting each habitat unit or representative portions of large units on 27 April, 29 May, and 29 June 2003. We recorded breeding activity including singing, carrying nesting material, and carrying food for young. Erin Talmage conducted the breeding bird survey. Barbour, Dickert, Kiviat, and Stevens also contributed bird observations incidental to other survey work on the site in 2002-2004.

OTHER FAUNA

Although we did not specifically conduct surveys for mammals or invertebrates, we noted interesting or unusual observations incidental to our other survey work. We observed and recorded mammals and their sign and summarized these observations to create checklists of mammals that we observed and of those that potentially occur on the study site. We made occasional observations of invertebrates that seemed unusual or noteworthy.

BIODIVERSITY ASSESSMENT

Using methods outlined in Kiviat and Stevens (2001), we assessed onsite habitats and their capability to support species of conservation concern.

RESULTS

HABITATS

We mapped approximately 50.7 ha (125.6 ac) of upland meadow, wet meadow, shrubby oldfield, upland deciduous forest, constructed pond, hardwood swamp, stream, and sandbar habitats in the study area. We mapped an additional 7.8 ha (19.2 ac) as either “developed” or “cultural habitat” areas (Table 2, Figure 2). Each of the mapped habitat types is briefly described below.

Upland meadow was the most extensive habitat in the study area. We included in this habitat type both actively cultivated and fallow fields. We mapped upland meadows divided by fences, hedgerows, and unpaved roads as separate polygons. Because cultivation patterns change from year to year and from season to season, we did not survey the plant communities of the cultivated fields. Plant communities of fallow fields and field edges were composed primarily of non-native grasses and forbs typical of upland meadows in this region. Some of the common plants were orchard grass (*Dactylis glomerata*), tall oatgrass (*Arrhenatherum elatius*), timothy (*Phleum pratense*), crabgrasses (*Digitaria*), foxtails (*Setaria*), smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), wild madder (*Galium mollugo*), goldenrods (*Solidago*), asters (*Aster*), Queen Anne’s lace (*Daucus carota*), and spotted knapweed (*Centaurea maculosa*). Herbaceous plant diversity was highest in uncultivated fields.

Most of the upland deciduous forest habitats on the site had young to medium-sized trees (15-40 cm [6-16 in] diameter-at-breast-height [dbh]) in the overstory, and were dominated by such species as black locust (*Robinia pseudoacacia*), black cherry (*Prunus serotina*), white ash (*Fraxinus americana*), elm (*Ulmus*), white pine (*Pinus strobus*), and occasional eastern hemlock (*Tsuga canadensis*). There were weedy species such as common buckthorn (*Rhamnus cathartica*) and Eurasian honeysuckle (*Lonicera* x *bella*) in the shrub layer. Upland forests bordering Southern Swamp had a less weedy plant community and included species such as bitternut, pignut, and shagbark hickories (*Carya cordiformis*, *C. glabra*, *C. ovata*), American beech (*Fagus grandifolia*), black oak (*Quercus velutina*), and bladdernut (*Staphylea trifolia*).

A hardwood swamp is a wetland dominated by deciduous woody vegetation. The largest swamp on the site, Southern Swamp, was relatively undisturbed compared to the surrounding agricultural areas. The soils were mapped by Case (1989) as Palms muck, a deep, organic, somewhat calcareous soil. There were few introduced plant species, and the vegetation, surface soils, and swamp floor had the complex structure characteristic of undisturbed swamps in the region. Overstory trees were in the range of 25-50 cm (10-20 in) dbh with occasional larger trees to greater than 90 cm (35 in). There was plentiful downwood. The deepest part of the swamp, in the southwestern corner of the property, had abundant woody hummocks with small intervening pools (10-20 cm deep) between. The swamp was dominated by red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), and slippery elm (*Ulmus rubra*) in the overstory; yellow birch (*Betula lutea*) and black willow (*Salix nigra*) were present but less abundant. Common shrubs were northern arrowwood (*Viburnum dentatum*), nannyberry (*V. lentago*), winterberry holly (*Ilex verticillata*), and spicebush (*Lindera benzoin*). Common plants in the herb layer were tussock sedge (*Carex stricta*), lakeside sedge (*Carex lacustris*), cinnamon fern (*Osmunda cinnamomea*), bog-hemp (*Boehmeria cylindrica*), and skunk cabbage (*Symplocarpus foetidus*). The boundaries between wetlands and neighboring habitats are approximate; delineating precise boundaries would require examination of soil profiles, which was beyond the scope of this project. The mapped boundaries of Southern Swamp should be understood to represent transitional areas between hardwood swamp and the neighboring habitat.

Wet meadows are wetlands dominated by herbaceous (non-woody) vegetation and having little or no standing water for much of the growing season. At the MAVA site, wet meadows occurred in small to large patches in Field 1, at the southeast edge of Field 3, and at the edges of some of the constructed ponds. There was evidence that some wet meadows had been cultivated intermittently, but others were apparently too wet for cultivation. Some of the common plants of wet meadows included reed canary grass (*Phalaris arundinacea*), purple loosestrife, grass-leaved goldenrod (*Euthamia graminifolia*), giant goldenrod (*Solidago gigantea*), willow-herbs (*Epilobium* spp.), obtuse spikerush (*Eleocharis obtusa*), and path rush (*Juncus tenuis*).

Shrubby oldfield is the name we use for lands in transition between meadow and young forest that have developed a substantial shrub component. We mapped only one occurrence of this habitat in the study area, on a small peninsula extending into Gravel Pond. This area had saplings of eastern cottonwood (*Populus deltoides*) and black locust, staghorn sumac (*Rhus typhina*), an ornamental hawthorn (*Crataegus*) and multiflora rose (*Rosa multiflora*), and a ground cover of herbaceous weeds.

Constructed ponds were created by excavation or by damming a stream, or both. We mapped five constructed ponds on the site ranging from ca 0.02 – 0.81 ha (0.05 – 0.1 ac). The ponds had large expanses of open water, often with abundant floating plants such as watermeal (*Wolffia* spp.) and common duckweed (*Lemna minor*), and emergent vegetation only around the edges. Some had a

substantial submerged aquatic plant community, including pondweeds (for example, *Potamogeton nodosus)*, naiad (*Najas minor*), waterweed (*Elodea canadensis*), and water purslane (*Ludwigia palustris*).

The sandbar created by deposition of sediments at a bend in Kinderhook Creek is a dynamic habitat that may expand or shrink in response to fluvial processes. The sandbar had exposed cobbles, gravel, sand, and silt, a few trees, patches of shrubs, and a diverse herbaceous plant community. The tree species included silver maple (*Acer saccharinum*), sugar maple (*A. saccharum*), boxelder (*A. negundo*), black locust, and sycamore (*Platanus occidentalis*). Common shrubs were pussy willow (*Salix discolor*), silky dogwood (*Cornus amomum*), Bell's honeysuckle, and staghorn sumac. Some of the common herbs were whitegrass (*Leersia virginica*), deer-tongue grass (*Panicum clandestinum*), purple loosestrife, evening primrose (*Oenothera biennis*), lambsquarters (*Chenopodium album*), American wormseed (*Chenopodium ambrosioides*), giant ragweed (*Ambrosia trifida*), and three species of sticktights: nodding (*Bidens cernua*), leafy-bract (*B. comosa*) and devil's (*B. frondosa*).

We mapped about 4 ha (10 ac) of what we call cultural habitat areas—places that are intensively managed (for example, mowed) but that lack pavement or permanent structures. The frequently mowed lawns around the Lindenwald house and the NPS administration building constitute most of the cultural habitat on the site. Although these areas support relatively few species of wild biota in their current state, they hold potential for greater biodiversity if eventually allowed to return to a more natural state. The large shade trees may be important for a diversity of birds, bats, other mammals, and invertebrates.

The areas mapped as developed were part of the built environment, including buildings, other structures, roads, and their immediate surroundings. We did not intensively survey developed areas or cultural habitats.

Table 2. Extent of mapped habitats and developed areas at MAVA.

Mapped Area	Approx. total ha	Approx. total ac
Shrubby oldfield	<0.1	0.2
Sandbar	0.2	0.5
Constructed pond	1.2	3.1
Wet meadow	2.4	5.9
Hardwood swamp	3.6	9.0
Upland forest	6.8	16.9
Upland meadow	36.4	90.0
Cultural habitat	4.3	10.5
Developed	3.5	8.7
TOTAL	58.6	144.8

Figure 2. Habitats at the MAVA site.

PLANTS

The vascular plant species observed in the study area are listed in Appendix A, and some of the plants characteristic of each of the mapped habitat types are mentioned in the habitat descriptions above. The complete list of plant species that we found at MAVA and the locations in which they were found can be generated from NPSpecies, the National Park Service species database. In this section we discuss plants of special interest due to their rarity in New York or the Hudson Valley. We also mention a few invasive species that are potentially of management concern.

In general, the flora of MAVA was typical of agricultural landscapes in the region, but we found a few species along Kinderhook Creek, in the wetlands, and in disturbed areas that are worthy of special mention. In the discussion below, we refer to statewide and regional rarity ranks of species. Statewide rare species and ranks are defined and assigned in the Environmental Conservation Law of New York, Section 11-0535 and 6 NYCRR (New York Code of Rules and Regulations) Part 182, and in regularly updated publications of the New York Natural Heritage Program (NYNHP). The statewide rarity ranks listed below correspond to those in the most recent NYNHP lists: July 2003 for animals, and May 2004 for plants. Statewide ranks are given below with the prefixes "NYS" and "NYNHP". The "regionally-rare" and "regionally-scarce" designations mentioned below are adapted from a list compiled from informal observations of Hudsonia biologists and other Hudson Valley biologists (Kiviat and Stevens 2001). Regionally-rare plants are thought to have less than 20 documented occurrences in the Hudson Valley, while regionally-scarce plants have been documented 20 to 100 times. These regional designations carry no legal authority. The statewide and regional ranks are explained in Appendix A.

We found several species of rare sedges at MAVA, including *Carex squarrosa*, a regionally-scarce sedge. This sedge is often found in open or partially shaded habitats with somewhat calcareous soils. We found it west of Field 1 in the forest along Muddy Brook. On the north-facing bank of Kinderhook Creek just west of the terminus of Muddy Brook, we found Davis' sedge (*Carex davisii*) (NYS Threatened) growing a few meters above the low water level. We found the regionally-scarce Gray's sedge (*Carex grayii*) in Southern Swamp. At the western margin of Field 1 we found a large stand of another regionally-rare sedge, *Carex trichocarpa*.

We found the regionally-scarce ostrich fern (*Matteuccia struthiopteris*) in an area on the north side of the mouth of Muddy Brook and also in Southern Swamp. The ostrich fern is the larval host for the ostrich fern borer moth (*Papaipema* sp. 2) listed as S1?, which means only a few individuals may remain in New York State (NY Natural Heritage Program 2003). We did not search for the moth, but simply note that habitat exists for it.

We found the regionally-rare false-mermaid (*Floerkea proserpinacoides*), an inconspicuous plant with very small white flowers, along Kinderhook Creek. We found bristly buttercup *Ranunculus pensylvanicus* north of Gravel Pond in the vicinity of the farm road and compost piles. This is a regionally-rare native plant associated with disturbed habitats in the Hudson Valley (Barbour, personal observation). We found another regionally-rare plant, pale St. Johnswort *Hypericum ellipticum*, in Southern Swamp.

In 2004, we found a high frequency of fasciated purple loosestrife tops in the wet meadow in the middle of Field 1. Purple loosestrife is an introduced species at MAVA and fasciation is a deformation that results in inflorescences that are bizarrely flattened, twisted, and often split. We found about 6

fasciated stems within about a 10 m long patch of dense purple loosestrife. Fasciation is common in vascular plants and may be caused by a mutation, an insect, or possibly other factors, but the cause in purple loosestrife is unknown. The typical frequency of fasciation in the Hudson Valley is probably one in thousands (Kiviat, personal observation). This may be a research opportunity at MAVA.

The New York State Natural Heritage Program lists two rare plant records from the vicinity of MAVA: a historic record for rattlebox (*Crotalaria sagittalis*) (NYS Endangered) on a dry hillside 1.6 km (1 mi) south of the Village of Kinderhook, and another historic record for spotted pondweed (*Potamogeton pulcher*) (NYS Threatened) at a nearby lake 2.4 km (1.5 mi) southeast of MAVA. The rattlebox was found in 1935 (also see McVaugh 1958), and there is no record of recent confirmation. We do not know the exact location but it would have been near MAVA. Gleason and Cronquist (1991) described the habitat of rattlebox as "[d]ry open soil and waste land" and opined that it was probably introduced in the northeastern U.S. but native farther south. It could occur in the dry, weedy field edges or fallow fields of MAVA, or in the well-drained soils around Gravel Pond. Spotted pondweed was found nearby in 1933, but we did not find it at MAVA. It could be absent from MAVA because the small ponds there do not provide adequate habitat. We have found this plant in ponds that are borderline oligotrophic, fairly deep, with some flow-through (Barbour, personal observation). Some of the ponds are newly excavated, such as Gravel Pond, and it is possible that this species has not had time to spread to them yet. Future surveys could find spotted pondweed at MAVA.

In a 1997 plant survey of the National Historic Site property, Clemants found no noteworthy native plants. He did find, however, 21 non-native species that he considered "invasive" species, and recommended NPS investigate control of three of those species—Oriental bittersweet, purple loosestrife, and common buckthorn—to prevent their potential spread into nearby habitats (Clemants 1997). We do not have an opinion concerning management of Oriental bittersweet or common buckthorn at MAVA. Purple loosestrife, although an introduced invasive species, appears to be a valuable resource for native insects at MAVA. We found several species of native butterflies, moths, and bees nectaring at loosestrife flowers, and larvae of two giant silkmoths, *Cecropia* and *Polyphemus*, feeding on loosestrife leaves at MAVA (see Barbour and Kiviat 1997). Purple loosestrife was abundant at MAVA along Kinderhook Creek, on the sandbar, in parts of Southern Swamp, in Field 1, along SN Ditch, and around Gravel Pond, Upper Pond, and Swamp Pond. However, purple loosestrife occurred in mixed stands at all locations and did not form dense, highly dominant, extensive stands. It would not be feasible to eradicate loosestrife at MAVA as floods and high winds will continually bring in new seeds. Furthermore, substantial reduction of the purple loosestrife population at MAVA would remove a floral resource for native pollinators, cover for birds, and food or habitat for a variety of other native animals that might not be replaced by native plant biomass. We recommend monitoring of purple loosestrife and implementing control measures only if dense, highly dominant stands exceeding about 0.04 ha (0.1 ac) become established. Loosestrife on seasonally-dry soil could be controlled effectively by repeated mowing. For wetter areas that cannot be mowed, NPS might consider introducing biological control beetles. These beetles (especially *Galerucella* spp.) have been introduced at a number of locations in the Hudson Valley. We found no native species of loosestrife at MAVA that could potentially be threatened by purple loosestrife biological control.

Of greater management concern might be Japanese knotweed (*Fallopia japonica*), which is capable of dominating large areas of riparian habitat in the Hudson Valley. We observed a very few small Japanese knotweed plants at the boundary between Field 1 and the bank of Kinderhook Creek. It would be efficient to excavate these plants (all material must be allowed to dry thoroughly before

disposal to prevent vegetative propagation) before they spread and become a pest (Talmage and Kiviat 2004).

Cook (1984, 1985) conducted a biological survey on the NHS for vascular plants and mosses. There were several species on his presence list that we did not document in our survey, but most of these were probably planted around the historic grounds. Our survey excluded most planted species. Cook (personal communication to Dickert, 2004) tentatively identified *Deparia acrostichoides*, silvery spleenwort, at the site, but was uncertain about this identification. This fern is regionally-rarely and its presence would be noteworthy.

McVaugh (1935) conducted plant surveys in and around the hamlet of Kinderhook in 1933, and it is likely that the MAVA site was included in his collecting. McVaugh cited a number of specimens from 1 mile or 2 miles south of Kinderhook, and some of these were probably collected on or very near MAVA. We cannot directly compare the results of our plant survey to McVaugh's list since we do not know which plants he observed at MAVA.

FISHES

The most commonly occurring fish species sampled by electroshocker was the tessellated darter (*Etheostoma olmstedi*) (Table 3, Figure 3). Rock bass, redbreast sunfish, and smallmouth bass were also found in large numbers at both stations. Smallmouth bass prefer rocky flowing streams with quiet nesting areas, small fishes and invertebrates to feed on, cool temperatures, and good, but not necessarily high, dissolved oxygen concentrations.

Table 3. Fishes sampled by electroshocker in Kinderhook Creek, 26 September 2002. Abundance is the approximate number sampled.

Common name	Scientific name	Abundance Station 1	Abundance Station 2	Total abundance
Spotfin shiner	*Cyprinella spiloptera*	1	0	1
Bluntnose minnow	*Pimephales notatus*	1	0	1
Rock bass	*Ambloplites rupestris*	18	0	18
Redbreast sunfish	*Lepomis auritus*	45	30	75
Bluegill	*Lepomis macrochirus*	3	0	3
Smallmouth bass	*Micropterus dolomieu*	20	28	48
Tessellated darter	*Etheostoma olmstedi*	80	35	115
American eel	*Anguilla rostrata*	0	1	1

The most commonly occurring fish sampled in bag seine surveys was the spotfin shiner (*Cyprinella spiloptera*) (Table 4). This fish is usually found in larger rivers, such as the Shawungunk Kill and the mainstem of the Wallkill (Orange and Ulster counties), but it also occurs in the Sawkill near Woodstock (Ulster County). Kinderhook Creek at MAVA is comparable in size to lower reaches of the Shawangunk Kill. The habitat that we sampled in Kinderhook Creek had very little structure, so the

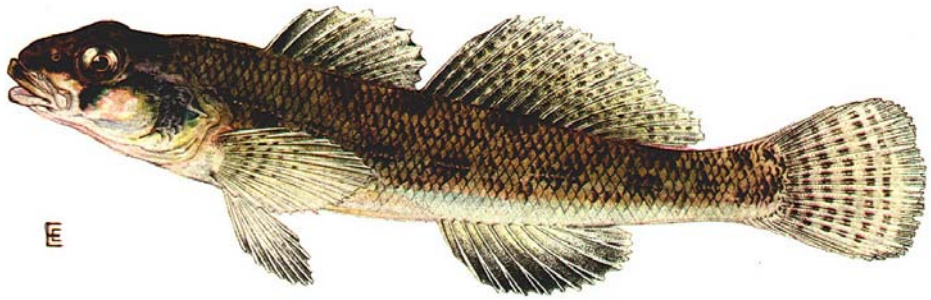
riffles were uniform in depth. The bottom was composed of uniform gravel and small cobble that was highly embedded (not loose). These features produce a swift laminar flow that spotfin shiners may prefer or at least tolerate, whereas most stream fishes do not. Most of the species captured in our surveys came from the riprap along the creek bank, which was essentially the only structured habitat in the area.

We also dipnetted some young-of-the-year bluegill (*Lepomis macrochirus*) from Muddy Brook. Incidental to other surveys, we observed common carp in Kinderhook Creek on multiple occasions, including spawning adults on 2 July 2003. During our larval amphibian surveys we observed juvenile largemouth bass (*Micropterus salmoides*) and unidentified juvenile sunfish (*Lepomis*) in Gravel Pond and Third Pond. A large adult bluegill was also seen during amphibian surveys in Third Pond.

Table 4. Fishes sampled by bag seine in Kinderhook Creek, 26 September 2002. Abundance is the approximate number sampled.

Common name	Scientific name	Abundance Station 1	Abundance Station 2	Total abundance
Fallfish	*Semotilus corporalis*	6	0	6
Spotfin shiner	*Cyprinella spiloptera*	95	40	135
Bluntnose minnow	*Pimephales notatus*	35	12	47
White sucker	*Castostomus commersonii*	1	0	1

Figure 3. The tessellated darter (total length 123 mm) was the most abundant fish captured in electroshocker surveys (New York State Department of Environmental Conservation, illustration collection).



AMPHIBIANS AND REPTILES

We found 11 amphibian species and two reptile species on the study site (tables 5 and 6), most of which are common species of farm ponds and upland habitats in the region. In the Southern Swamp, however, we found a salamander of the *Ambystoma jeffersonianum* complex. This complex is formed by hybridization of Jefferson salamander (*Ambystoma jeffersonianum*) and blue-spotted salamander

(*Ambystoma laterale*). In populations where hybridization is occurring, many of the individuals present will be female and will carry genetic material from both species. These individuals may have more than two sets of chromosomes; many will be triploid and some tetraploid (Bogart and Klemens 1997). Because of the great variability in salamanders of this group, we have identified these salamanders simply as *Ambystoma jeffersonianum* complex (or "Jefferson complex"). We collected four of these larval salamanders and deposited them in the Bard College Field Station's collection.

The most common salamander we encountered in our surveys was the woodland salamander (*Plethodon cinereus*). We found both red-backed and lead-backed color morphs in our surveys.

Table 5. Amphibians observed at MAVA, 2003 - 2004.

Common name	Scientific name	Year found	Life stages found
Jefferson complex salamander	*Ambystoma jeffersonianum* complex	2003, 2004	larvae
Spotted salamander	*Ambystoma maculatum*	2003	larvae
Woodland salamander	*Plethodon cinereus*	2003, 2004	adults
Two-lined salamander	*Eurycea bislineata*	2004	adults
American toad	*Bufo americanus*	2004	larvae, adults
Gray treefrog	*Hyla versicolor*	2004	larvae, adults
Spring peeper	*Pseudacris crucifer*	2004	larvae, adults
Bullfrog	*Rana catesbeiana*	2003	adults, metamorph
Green Frog	*Rana clamitans*	2003, 2004	adults, larvae, metamorphs
Wood Frog	*Rana sylvatica*	2003, 2004	adult, larvae, metamorphs
Pickerel frog	*Rana palustris*	2003, 2004	adults

We heard five species of frogs calling during night surveys, all of which we also saw during daytime surveys. Green frogs (*Rana clamitans*) were numerous and widespread on the study area. On 22 July 2004, we heard them call from Kinderhook Creek, Southern Swamp, Third Pond, and SN Ditch. We observed them in Upper Pond, Swamp Pond and in the Woodlot on the same evening.

Although we dipnetted for amphibian larvae in Gravel, Third, and Shed ponds, we captured larvae only in Shed Pond. These were collected, identified in the laboratory as green frog, and deposited in the Bard College Field Station collection. The fish that we observed in Gravel Pond and Third Pond could prey on amphibian larvae, especially those of ambystomid salamanders, and prevent successful reproduction in these ponds.

The only reptile species we found at MAVA were snapping turtle (*Chelydra serpentina*) and painted turtle (*Chrysemys picta*) (Table 6). We found no snakes. We were surprised not to find at least northern

water snake (*Nerodia sipedon*), garter snake (*Thamnophis sirtalis*), or brown snake (*Storeria dekayi*) based on our field experience in similar landscapes.

A complete list of amphibians and reptiles that we found at MAVA and their locations is in the NPSpecies database.

Table 6. Reptiles observed at MAVA, 2003 - 2004.

Common Name	Scientific Name	Year found	Life stages found
Snapping turtle	*Chelydra serpentina*	2003, 2004	adults
Painted turtle	*Chrysemys picta*	2003, 2004	adults

Although we found no snakes, several NPS employees told us that they occasionally saw garter snakes, especially around the Lindenwald house. NPS groundskeepers showed us window wells at the house in which they have seen snakes and frogs. We speculate that snakes come to the windows wells to feed on frogs that have become trapped there. The groundskeepers even saw a small squirrel (gray squirrel or chipmunk) eating one of the frogs. Judy Harris (NPS) has seen one other snake that was not a garter snake on the site. She tentatively identified it as a milk snake (*Lampropeltis triangulum*) based on a field guide illustration (Conant and Collins 1998). NPS employees mentioned, however, that snakes seem to be uncommon here. Employees of Roxbury Farm also reported that they see snakes infrequently. Sarah Bartz, a farm intern, saw a garter snake on the farm and a salamander in the northwest corner of Field 1. The garter snake was listed on Cook's (1984) animal presence list. The salamander that Bartz described could have been a juvenile blue-spotted or Jefferson salamander because it was black with many small blue spots. She estimated it was approximately 10 cm in total length. Roxbury Farm office workers mentioned that they have seen a painted turtle and three or four snapping turtles in Upper Pond.

BIRDS

Most of the birds we observed were common species typically associated with habitats such as woodlots, thickets, hardwood swamps, rivers, forest edges, wet meadows, shade trees, and fallow fields (Table 7). The complete species list is in the NPSpecies database. Among the prominent birds were mallard (*Anas platyrhynchos*), mourning dove (*Zenaida macroura*), American crow (*Corvus corax*), black-capped chickadee (*Poecile atricapilla*), American robin (*Turdus migratorius*), gray catbird (*Dumetella carolinensis*), European starling (*Sturnus vulgaris*), common yellowthroat (*Geothlypis trichas*), song sparrow (*Melospiza melodia*), and American goldfinch (*Carduelis tristis*). Certain places on the study area were especially productive, including SN Ditch and its adjacent hedgerow, and the Roxbury Farm entrance road area including Upper Pond, Swamp Pond, and the nearby coniferous shelterbelt. Many of our bird observations were clustered around the edges of the site where Roxbury Farm adjoins other farm properties; the farm fields themselves supported few grassland bird species. Probably many of the birds observed had territories partly on and partly off the site, so our observations cannot be interpreted on a pairs-per-acre basis.

In addition to common species, we also observed several uncommon, rare, or vulnerable bird species. We saw occasional, single great blue heron (*Ardea herodias*) in 2003 and 2004, but saw no evidence of nesting. Great blue heron is fairly common in the Hudson Valley, but nesting sites are uncommon. We also observed green heron (*Butorides virescens*) on several occasions in 2003 and 2004 foraging along the edges of the farm ponds. It could nest in thickets and other similar habitats at MAVA. The green heron is not a rare bird species in the Hudson Valley, but occurs at a very low population density.

We observed American black duck (*Anas rubripes*) on the site in 2003: on 10 September one flew over the farm fields, and on 29 December one was seen on Kinderhook Creek and 6 others flew over the farm fields. The black duck has been in decline throughout its range since perhaps the 1950s (references in Sibley 1988), and both breeding and non-breeding black ducks have become less common in recent decades in the Hudson Valley (Kiviat, personal observations). Kinderhook Creek may maintain ice-free reaches that provide winter foraging areas for this species.

We observed wood duck (*Aix sponsa*) in Kinderhook Creek on several occasions before and during the 2004 breeding season, including one observation of a duckling in a backwater of Kinderhook Creek. The wood duck experienced a drastic population decline beginning in the 1890's due to overharvest and destruction of habitat. Several conservation measures including international treaties, hunting regulations, and the building of artificial nest boxes have contributed to the species' recovery (references in Hepp and Bellrose 1995). Wood ducks depend on large trees in forest, farm, or ornamental settings for nest cavities, and the availability of cavities is thought to be a limiting factor for nesting (references in Hepp and Bellrose 1995). The mature trees in and near Southern Swamp and along Kinderhook Creek may provide nest sites for wood duck.

The only state-listed rare bird species that we observed during our survey work were the osprey (*Pandion haliaetus*) (NYS Special Concern) and the northern harrier (*Circus cyaneus*) (NYS Threatened). We saw an osprey flying over MAVA in April 2003 and flying over Kinderhook Creek on 22 August 2004. On 25 October 2002 we saw a male and a female (or immature) harrier foraging over the farm fields and on 16 October 2003 we saw a harrier perched on a hay bale. It would be interesting to know if MAVA has any special attraction as a foraging area for migrant birds as this might have significance in and of itself, or might presage breeding.

We observed spotted sandpiper (*Actitis macularia*) at the MAVA site on multiple occasions in 2003 and 2004. On 2 July 2003 we observed a single spotted sandpiper on Kinderhook Creek. At various times in 2004 we saw single spotted sandpipers at Upper Pond, foraging along Kinderhook Creek and at Gravel Pond. On 15 May 2004 we observed a singing bird and separately an apparent family group of four birds around the compost piles and large puddles in Field 2. These observations suggest the birds were breeding on the site. The spotted sandpiper is a rare breeder in the Hudson Valley, often found near its preferred nesting habitat; bare, dry soil such as railroad ballast and other habitats characterized by bare mineral soil. Spotted sandpipers forage in a variety of wet habitats including river and pond shorelines and the mudflats of marshes. We also observed a migrating solitary sandpiper (*Tringa solitaria*) and several least sandpiper (*Calidris minutilla*) in Field 1 in late August 2004.

We found American woodcock (*Philohela minor*) in the Southern Swamp on 22 August 2004. The woodcock uses moist thickets for foraging, open fields for springtime flight displays, and woodlands for nesting. The woodcock we observed during our survey probably uses Field 1 for flight displays and may nest in the Southern Swamp or nearby upland forest. Reduction in open field habitat as farm fields

become forested or developed may cause woodcock populations to decline in the Northeast (references in Keppie and Whiting 1994).

On 29 May 2003 we observed a willow flycatcher (*Empidonax traillii*), an uncommon breeding bird in the Hudson Valley. This species is associated with shrub swamp habitats and occasionally with upland thickets near water. On 29 June 2003 we observed least flycatcher (*Empidonax minimus*), an uncommon breeding bird in the region. Least flycatcher is found in association with forest edges, fencerows, or other habitats having small patches of trees.

On 22 August 2004 we heard a common raven (*Corvus corax*) call near the southwestern corner of the study site. The raven is recovering from a population decline in the last century.

On 2 July 2003, we observed a flock of five northern rough-winged swallows (*Stelgidopteryx serripennis*) perched on a snag on the sandbar in Kinderhook Creek. This was our only observation of rough-winged swallows at MAVA, and may represent a family group that bred nearby but offsite. Rough-winged swallow is a regionally-rare breeder in the Hudson Valley.

We observed eastern bluebird (*Sialia sialis*) on the MAVA site on two occasions. On 25 October 2002 we found eastern bluebird near the farm buildings and in or near the Southern Swamp. We also observed a flock of five eastern bluebirds perching on forbs in Field 3 on 29 December 2003. A male eastern bluebird from this flock was foraging on the ground.

We recorded a singing Nashville warbler (*Vermivora ruficapilla*) on 29 May 2003, and saw one bird on 29 June 2003 indicating that the species is breeding on the site. Nashville warbler is a regionally-rare breeder in the Hudson Valley. This low elevation agricultural landscape seems like an unusual breeding locale. Kiviat has found this species breeding in a lowland acidic bog (Zipfelberg Bog) and on a low-shrub dominated mountaintop at ca. 600 m elevation (Brace Mountain), both in Dutchess County.

On 29 June 2003 we observed single birds and small groups of savannah sparrow (*Passerculus sandwichensis*) at the edges of farm fields. We also observed them foraging in staghorn sumac on the same date. On 22 August and 9 September 2004, we observed a flock of savannah sparrows in the vegetable beds in Field 1. We believe the savannah sparrow is a scarce breeder in the Hudson Valley. The extensive, nearly-level fields at MAVA appear to be good breeding habitat for this species.

We observed a male orchard oriole (*Icterus spurius*) singing from a tree along the creek on 2 July 2003. This species is a rare breeder in the Hudson Valley where it is associated with mature hardwood trees in fencerows and other habitats in or adjoining farm fields, oldfields, or wet meadows on large active or inactive farms. We made no other observations of this species. The fact that it was singing suggests that at least part of this bird's breeding territory was on the study site. Habitats at MAVA are suitable for breeding and it is puzzling that we found a singing male only once.

Three common species included on Cook's (1984, 1985) presence list, but not detected in our surveys were eastern towhee (*Pipilo erythrophthalmus*), yellow-bellied sapsucker (*Sphyrapicus varius*), and brown thrasher (*Toxostoma rufum*). He also found American bittern (*Botaurus lentiginosus*) (NYS Special Concern) in surveys between 19 May and 21 July 1984 (Cook 1984). The American bittern is cryptic and secretive and can best be located when heard calling at night, especially in early May. MAVA has no marsh habitat, which is the typical breeding habitat for American bittern. Two hawk

species, sharp-shinned (*Accipiter striatus*) and broad-winged (*Buteo platypterus*), and the ruffed grouse (*Bonasa umbellus*) that Cook (1984) documented are species of forests, and may use the MAVA site intermittently. The ring-necked pheasant recorded in the 1984 survey may also be present intermittently. This introduced species is stocked for upland game hunters, so its presence on MAVA may depend on stocking patterns on neighboring lands.

The Alan Devoe Bird Club has also documented birds encountered on bird walks in and around the Martin Van Buren NHS. Three additional bird species appear on these lists: black-and-white warbler (*Mniotilta varia*) (Cook, unpublished data 2003), ovenbird (*Seiurus aurocapilla*) (Cook, unpublished data 2001), and Canada warbler (*Wilsonia canadensis*) (Cook, unpublished data 2003). Populations of the latter are declining, and the species is listed on the National Audubon Society's (2002) WatchList.

Roxbury Farm employees reported that they have observed a great blue heron and a great egret (*Ardea alba*) near Upper Pond. Sarah Bartz, a farm intern, has seen wild turkey (*Meleagris gallopavo*) in the farm fields. Justin Rich, another farm intern, kept a list of birds that he had seen on the farm property that included American kestrel (*Falco sparverius*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk, great-horned owl (*Bubo virginianus*), horned lark (*Eremophila alpestris*), and wood thrush (*Hylocichla mustelina*). He also observed an osprey flying overhead.

Table 7. Birds observed at MAVA, 2002-2004. Abundance ranks: C = common; U = uncommon; R = rare. A question mark (?) indicates uncertain identification or uncertain abundance rank.

Common Name	Scientific Name	Present during breeding season	Breeding evidence observed	Abundance
Great blue heron	*Ardea herodias*	*		R
Great egret	*Ardea alba*			R
Green heron	*Butorides virescens*	*		R
Turkey vulture	*Cathartes aura*	*		R
Mute swan	*Cygnus olor*	*		R
Canada goose	*Branta canadensis*	*	**	U
American black duck	*Anas rubripes*			R
Mallard	*Anas platyrhynchos*	*		C
Wood duck	*Aix sponsa*	*	**	R
Osprey	*Pandion haliaetus*			R
Northern harrier	*Circus cyaneus*			R
Red-tailed hawk	*Buteo jamaicensis*	*		R
Merlin (?)	*Falco columbarius*			R
American kestrel	*Falco sparverius*	*		R
Wild turkey	*Meleagris gallopavo*	*	**	R
Killdeer	*Charadrius vociferus*	*		R
Solitary sandpiper	*Tringa solitaria*			R
Spotted sandpiper	*Actitis macularia*	*	**	R
American woodcock	*Philohela minor*	*		R
Least sandpiper	*Calidris minutilla*			R
Common snipe	*Gallinago gallinago*	*		R
Great horned owl	*Bubo virginianus*			R
Rock pigeon	*Columba livia*	*		R
Mourning dove	*Zenaida macroura*	*		C
Chimney swift	*Chaetura pelagica*	*		R
Ruby-throated hummingbird	*Archilochus colubris*			R
Belted kingfisher	*Ceryle alcyon*	*		R
Red-bellied woodpecker	*Melanerpes carolinus*	*	**	R
Hairy woodpecker	*Picoides villosus*	*		R
Downy woodpecker	*Picoides pubescens*	*		R
Northern flicker	*Colaptes auratus*	*		U
Pileated woodpecker	*Dryocopus pileatus*	*		R
Eastern wood-pewee	*Contopus virens*	*		R
Willow flycatcher	*Empidonax traillii*	*		R
Least flycatcher	*Empidonax minimus*	*		R
Eastern phoebe	*Sayornis phoebe*	*	**	R

(continued)

Table 7. (cont.)

Common name	Scientific name	Present during breeding season	Breeding evidence observed	Abundance
Great crested flycatcher	*Myiarchus crinitus*	*		R
Eastern kingbird	*Tyrannus tyrannus*	*		R
Yellow-throated vireo	*Vireo flavifrons*	*		R
Warbling vireo	*Vireo gilvus*	*		R
Red-eyed vireo	*Vireo olivaceus*	*		U?
Blue jay	*Cyanocitta cristata*	*	**	U?
American crow	*Corvus brachyrhynchos*	*		C
Common raven	*Corvus corax*			R
Tree swallow	*Tachycineta bicolor*	*		U?
Northern rough-winged swallow	*Stelgidopteryx serripennis*	*		R
Barn swallow	*Hirundo rustica*	*		U?
Black-capped chickadee	*Poecile atricapilla*	*		C
Tufted titmouse	*Baeolophus bicolor*	*	**	R
White-breasted nuthatch	*Sitta carolinensis*	*		R
Carolina wren	*Thryothorus ludovicianus*	*		R
House wren	*Troglodytes aedon*	*		R
Blue-gray gnatcatcher	*Polioptila caerulea*	*		R
Eastern bluebird	*Sialia sialis*			R
Veery	*Catharus guttatus*	*		R
Wood thrush	*Hylocichla mustelina*	*		U?
American robin	*Turdus migratorius*	*	**	C
Gray catbird	*Dumetella carolinensis*	*		C
Northern mockingbird	*Mimus polyglottos*	*		R
European starling	*Sturnus vulgaris*	*	**	C
Cedar waxwing	*Bombycilla cedrorum*	*	**	U?
Blue-winged warbler	*Vermivora pinus*	*		R
Tennessee warbler (?)	*Vermivora peregrina*			R
Nashville warbler	*Vermivora ruficapilla*	*		R
Yellow warbler	*Dendroica petechia*	*		U?
Chestnut-sided warbler	*Dendroica pensylvanica*	*	**	R?
American redstart	*Setophaga ruticilla*	*		
Northern waterthrush	*Seiurus noveboracensis*			R
Common yellowthroat	*Geothlypis trichas*	*		C?
Scarlet tanager	*Piranga olivacea*	*		R?
American tree sparrow	*Spizella arborea*			U
Chipping sparrow	*Spizella passerina*	*	**	U

(continued)

Table 7. (cont.)

Common name	Scientific name	Present during breeding season	Breeding evidence observed	Abundance
Field sparrow	*Spizella pusilla*	*		?
Savannah sparrow	*Passerculus sandwichensis*	*	**	U
Song sparrow	*Melospiza melodia*	*	**	C
Swamp sparrow	*Melospiza georgiana*	*		R?
White-throated sparrow	*Zonotrichia albicollis*			U?
Dark-eyed junco	*Junco hyemalis*	*		?
Northern cardinal	*Cardinalis cardinalis*	*	**	C
Rose-breasted grosbeak	*Pheucticus ludovicianus*	*		R?
Indigo bunting	*Passerina cyanea*	*		R
Bobolink	*Dolichonyx oryzivorus*			R
Red-winged blackbird	*Agelaius phoeniceus*	*	**	C
Common grackle	*Quiscalus quiscula*	*	**	C
Brown-headed cowbird	*Molothrus ater*	*	**	U?
Orchard oriole	*Icterus spurius*	*		R
Baltimore oriole	*Icterus galbula*	*		U?
House finch	*Carpodacus mexicanus*	*		?
American goldfinch	*Carduelis tristis*	*		C
House sparrow	*Passer domesticus*	*	**	U?

OTHER FAUNA: MAMMALS AND INVERTEBRATES

We conducted no formal surveys for mammals, but the mammals and their sign we observed in the course of other fieldwork (Table 8) were mostly common species tolerant of intensive land uses. We found two species of particular interest, however—river otter and American beaver—on Kinderhook Creek. On 9 June 2004 we saw river otter tracks on the sandbar, and a den that could be used by a river otter in a steep bank near the confluence of Muddy Brook and Kinderhook Creek. The river otter (*Lutra canadensis*) once ranged throughout the state in ponds and other waterways, but was nearly extirpated from the state in the 1930s due to overharvesting for their pelts (NYS Department of Environmental Conservation 2004). Since that time, the state has regulated otter harvest, and, though otters can now be found in the eastern part of New York, they remain rare in areas where they are known to occur. Otters occupy large home ranges that usually include multiple water bodies. If MAVA is within the home range of a family group of otters, they would be expected to forage along Kinderhook Creek at intervals but not necessarily be present daily. On the other hand, the otter that left its tracks on the sandbar may have been a dispersing, rather than a resident, individual.

We found American beaver (*Castor canadensis*) in and around Kinderhook Creek in 2004. We heard beavers slap the water while swimming in the creek, saw their tracks on the sandbar, and saw their lodge on the north side of the creek opposite the sandbar. Though it is not rare, American beaver is an important species because of its capacity for extensive habitat modification. Beavers can alter the flow

of streams and creeks through damming, create ponded areas, remove trees, and create canals through previously dry areas, and thus dramatically alter the ecological landscape. The American beaver is common in the Hudson Valley and occupies most suitable complexes of habitat.

Formerly little brown bat (*Myotis lucifugus*) and possibly big brown bat (*Eptesicus fuscus*) used the space between a window and a closed shutter on the Lindenwald house (Kiviat 1997). The Lindenwald house is currently undergoing repairs and renovation and the bats have since abandoned their colony. The ability to see a bat colony through a window in a public museum was an unusual educational opportunity. Perhaps it will be possible to allow the bats to re-establish after renovations are completed.

There is undoubtedly a range of other bats, shrews, moles, and small rodents present at MAVA that would be detected in an intensive small mammal survey. Scattered large trees may provide cavities or spaces under loose bark usable in summer by several bat species, potentially including the federally Endangered Indiana bat (*Myotis sodalis*) and the small-footed bat (*Myotis leibii*) (NYS Special Concern). There is also some chance of finding the New England cottontail (*Sylvilagus transitionalis*) (NYS Special Concern), which has recently been confirmed elsewhere in Columbia County (Nancy Heaslip, NYS Department of Environmental Conservation, personal communication to Kiviat).

NPS employees mentioned several mammals that they have observed during their work at the site, including coyote (*Canis latrans*), little brown bat, big brown bat, muskrat (*Ondatra zibethicus*), eastern cottontail (*Sylvilagus floridanus*), and woodchuck (*Marmota monax*). Groundskeepers have observed apparently rabid raccoons (*Procyon lotor*) on the site and have called in the appropriate agency to dispatch these animals. A few years ago, Dr. Patricia West, curator of the National Historic Site, reported seeing a bobcat (*Lynx rufus*) crossing route 9H in front of the visitor's parking area.

There were several species of mammals that we did not observe at MAVA, but which could potentially occur there (Table 9). Species in this list were selected based on Kiviat's experience with the mammal fauna of the Hudson Valley, examination of specimens at the New York State Museum, and discussions with mammalogists who have conducted fieldwork in the region.

Hudsonia conducted no invertebrate surveys at MAVA, but we made a few interesting observations. On 27 August 2004 we found a rare damselfly, the American rubyspot (*Hetaerina americana*) (NYNHP S2S3), at the sandbar in Kinderhook Creek. On 10 September 2003, we observed a regionally-rare butterfly, checkered skipper (*Pyrgus communis*), visiting purple loosestrife flowers in the wet meadows south of Gravel Pond. The checkered skipper is a southern butterfly that disperses northward during the summer, but does not establish breeding populations north of Virginia (Glassberg 1999). It may have extended its year-round breeding range northward in recent years, but probably not into New York. This butterfly is a rare vagrant that is seen in some years, but not in others, in places with disturbed habitats. We observed another rare butterfly, a snout (*Libytheana carinenta*), on 27 August 2004. On 10 September 2003, and on 9 June, 21 June, and 17 August 2004, we saw adult phantom crane fly (*Bittacomorpha clavipes*) (Figure 4) in the Southern Swamp. This species is uncommon to rare and very locally distributed in the Hudson Valley, where it is closely associated with wet, organic, calcareous or circumneutral soils. We observed abundant adult phantom crane fly, including several mated pairs, on 17 August 2004 in the Southern Swamp. On three dates in late August 2004 and on 9 September, we observed cicada-killer wasps (*Sphecius speciosa*) active around Gravel Pond. This very large and colorful wasp is uncommon in the Hudson Valley and is closely associated with bare yet cohesive gravelly soil with short vegetation. We also observed tiger beetles

(*Cicindela* spp.) on the sandbar on 9 June and 21 June 2004. One of these beetles was *Cicindela hirticollis*, a common tiger beetle found in a variety of habitats. We believe that other species of tiger beetle may also be present on the sandbar. Some tiger beetle species are of conservation interest, so we recommend that future biological surveys on the site include the tiger beetles.

Figure 4. Phantom crane fly (actual body length ca. 20mm).

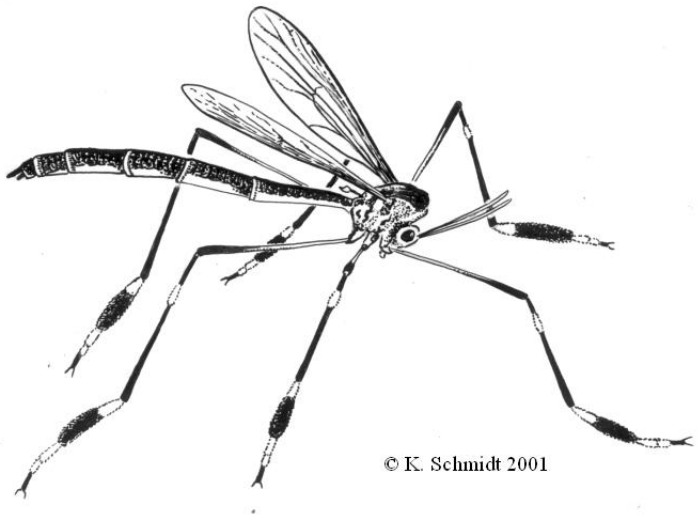


Table 8. Mammals or their sign observed at MAVA, 2002-2004.

Common name	Scientific name	Evidence	Location (for less-common species only)
Star-nosed mole	*Condylura cristata*	Sign (burrows)	Gravel Pond
Eastern cottontail	*Sylvilagus floridanus*	Seen	
Woodchuck	*Marmota monax*	Seen, sign (burrows)	
Gray squirrel	*Sciurus carolinensis*	Seen	
Eastern chipmunk	*Tamias striatus*	Seen, heard	
American beaver	*Castor canadensis*	Tracks, seen	Kinderhook Creek
White-footed mouse	*Peromyscus*[1]	Sign (food remains in winter nest)	
Meadow vole	*Microtus pennsylvanicus*	Seen	Field 1
Muskrat	*Ondatra zibethicus*	Seen, sign	SN Ditch, Third Pond
Coyote	*Canis latrans*	Tracks, scat	Field 1
Red fox	*Vulpes vulpes*	Seen (road kill)	Route 9H
Raccoon	*Procyon lotor*	Tracks	
Long-tailed weasel	*Mustela frenata*	Seen (road kill)	Route 9H
River otter	*Lutra canadensis*	Tracks	Kinderhook Creek
Striped skunk	*Mephitis mephitis*	Seen	Farm entrance
Domestic cat	*Felis catus*	Seen	Near woodlot
White-tailed deer	*Odocoileus virginianus*	Tracks, seen	

[1] *Peromyscus leucopus* is common and nearly ubiquitous in the lowlands of the Hudson Valley, and *P. maniculatus* is apparently rare. Animals at MAVA are probably the former species.

Table 9. Mammals potentially occurring at MAVA, but not observed during our study. An asterisk (*) indicates species most likely to occur, based on habitat availability and regional distribution.

Common name	Scientific name	Habitat
Opossum*	*Didelphis virginiana*	General
Masked shrew*	*Sorex cinereus*	Various
Smoky shrew	*Sorex fumeus*	Moist forest, wooded wetlands
Short-tailed shrew*	*Blarina brevicauda*	Various
Hairy-tailed mole	*Parascalops breweri*	Dry woods
Eastern mole	*Scalopus aquaticus*	Mesic open areas
Little brown bat (myotis)*	*Myotis lucifugus*	Buildings
Keen's bat (myotis)	*Myotis keenii*	Trees
Indiana bat (myotis)	*Myotis sodalis*	Large to mid-sized trees
Small-footed bat (myotis)	*Myotis leibii*	Trees, rocks
Silver-haired bat	*Lasionycteris noctivagans*	Trees
Eastern pipistrelle	*Pipistrellus subflavus*	Trees
Big brown bat*	*Eptesicus fuscus*	Buildings
Red bat	*Lasiurus borealis*	Trees, corn
Hoary bat	*Lasiurus cinereus*	Trees
New England cottontail	*Sylvilagus transitionalis*	Woods
Red squirrel*	*Tamiasciurus hudsonicus*	Conifers
Southern flying squirrel*	*Glaucomys volans*	Hardwoods incl. shade trees
Deer mouse	*Peromyscus maniculatus*	Woodlands
Woodland (pine) vole	*Microtus pinetorum*	Woodlands and orchards with friable soils
Southern bog lemming	*Synaptomys cooperi*	Rush or sedge areas
Meadow jumping mouse*	*Zapus hudsonius*	Herbaceous uplands or wetlands
Woodland jumping mouse	*Napaeozapus insignis*	Mature hardwoods with jewelweed
Gray fox*	*Urocyon cinereoargenteus*	Forests, etc.
Black bear*	*Ursus americanus*	Various
Mink*	*Mustela vison*	Water and wetlands
Short-tailed weasel*	*Mustela erminea*	Various
Bobcat*	*Felis rufus*	Various
Mountain lion[1]	*Felis concolor*	Various

[1] During the past two decades, there have been many reports of mountain lions in the Hudson Valley, including a substantial number of reports by credible observers. The existence of a population is hotly debated, and it is unclear whether the individuals seen are released or escaped from captivity (or their descendants).

BIODIVERSITY ASSESSMENT

The habitats on the MAVA site seem suitable for a number of animal species that we did not encounter. For example, the wood turtle (*Clemmys insculpta*) (NYS Special Concern) could use Kinderhook Creek and nearby upland habitats. It is typically associated with perennial streams, and uses a variety of wetland and upland habitats for foraging and nesting. Snorkeling in Kinderhook Creek during late summer or in early fall may be a good method by which to find these turtles in their underwater habitat. Potential nesting sites in non-forested upland areas with exposed soils could be surveyed during the May-June nesting season.

Several species of minnow are often found in creeks of a similar size in the region, but were not found in our fish survey in Kinderhook Creek. These include creek chub (*Semotilus atromaculatus*), common shiner (*Luxilus cornutus*), blacknose dace (*Rhinichthys atratulus*), longnose dace (*Rhinichthys cataractae*), and cutlips minnow (*Exoglossum maxillingua*). The appropriate habitats for these species may be lacking. Because this section of Kinderhook Creek lacks riffle and pool habitat with deep hiding areas, trout (for example, *Salmo trutta* and *Salvelinus fontinalis*) are unlikely to thrive here. The long-nose sucker (*Catostomus catostomus*) is a regionally-rare species found in other parts of Kinderhook Creek, but habitat near our sampling stations appeared poor for this fish.

The abundance of spotfin shiner in Kinderhook Creek appears to be due to the relatively featureless large stream habitat. This habitat might also be responsible for the occurrence of the American rubyspot damselfly, and the formation of the sandbar that proved to be a rich habitat for both animals and plants.

We did not find cerulean warbler (*Dendroica cerulea*) (NYS Special Concern) at MAVA, but it could occur and nest in the mature trees near Kinderhook Creek and in the Southern Swamp.

The golden-winged warbler (*Vermivora chrysoptera*) (NYS Special Concern) could use the upland fields, but we did not detect this species during our surveys. The golden-winged warbler nests in abandoned fields and shrubby oldfields, habitats that have become less common in the northeastern landscape in recent decades as farm fields are abandoned and become forested (references in Confer 1992). It is also threatened by brood parasitism by the brown-headed cowbird (*Molothrus ater*) which we observed breeding in the study area.

Habitat for both black-billed (*Coccyzus erythropthalmus*) and yellow-billed cuckoo (*Coccyzus americanus*) exists in the hedgerows at the margins of the upland fields. We did not find either of these species in surveys, but black-billed cuckoo was documented by Cook (unpublished data 1999) during a bird walk in the area.

The constructed ponds at MAVA appear to provide habitat for spotted turtle (*Clemmys guttata*), northern water snake, and eastern garter snake, but we observed none of these species during our surveys. Because we observed no snakes, we conclude that any snake species on the site occur at very low densities. Gravel Pond and its surroundings provide habitat for a variety of plant and animal species associated with poor mineral soils and low, sparse herbaceous vegetation. In our region insects such as grasshoppers, tiger beetles and digger wasps, for example, are relatively rare or lacking in species diversity because of a paucity of suitable habitat. The Gravel Pond site has potential for the

establishment of rare species in these and other groups of organisms. We recommend that Gravel Pond and the surrounding area of gravel soil be left undisturbed.

Along the floodplain of Kinderhook Creek, there is potential habitat for both winged monkey-flower (*Mimulus alatus*) (NYS Rare), and green dragon (*Arisaema dracontium*) (regionally-rare), but we found neither species. Both plants grow in areas that are flooded for part of the year. Green dragon has been found downstream of MAVA at the mouth of Stockport Creek in the 1990's (Kiviat personal observation).

In the Southern Swamp we found ostrich fern and larval *Ambystoma jeffersonianum* complex salamanders. The swamp appears to have habitat suitable for four-toed salamander (*Hemidactylium scutatum*), which seems to be closely associated with moss mats in swampy areas or in intermittent woodland pools. This species is not listed as threatened or endangered in New York, but little is known about its distribution and it may be regionally-scarce. Bird species that we did not observe but might expect to find in the swamp are breeding northern waterthrush (*Seiurus noveboracensis*), barred owl (*Strix varia*), and possibly red-shouldered hawk (*Buteo lineatus*).

The NPS-managed property and the neighboring Roxbury Farm share a history that has included a high degree of disturbance to the naturally occurring ecosystems. Much of the floodplain has been intensively farmed over the last two centuries, and extensive ditching has altered wetland habitat. Other flood control features, such as riprap along Kinderhook Creek, have altered the size and quality of remaining floodplain habitat. The most diverse habitats now are in narrow strips along the margins of the property. Davis's sedge is a member of this remnant floodplain community.

Floodplains support very dynamic habitats influenced by scouring and deposition of sediments and organic debris during seasonal flooding. Flooding leaves the largest trees, such as large sycamore, silver or red maple, basswood, and cottonwood, which are important to many animal species, such as the orchard oriole that we observed using this habitat. The structure and composition of the shrub and herbaceous components of the floodplain habitats depends on the regularity and intensity of flooding. Much of the floodplain at MAVA (for example, Fields 1, 2, and 3) has long been in intensive agricultural use. Ditching of fields and hardening of the Kinderhook Creek bank with riprap have presumably reduced the flooding frequency and duration in some areas of the farm fields, and thus improved the arability of the land. The swamp and lowland forest areas on the remaining strips of relatively unaltered floodplain are the source of much of the native biodiversity on the property, and should be protected, as much as possible.

The farmed areas provide habitats for certain wildlife species. The cultivated fields and their weedy edges, and the fallow fields and wet meadows, are suitable foraging habitat for a variety of animals that prey on small mammals, small birds, or large insects, such as northern harrier, red-tailed hawk, American kestrel, wild turkey, coyote, and red fox (*Vulpes vulpes*). The vegetable beds and associated weeds, fallow fields, and wet meadows provide food in the form of seeds and insects to eastern bluebird, song sparrow, savannah sparrow, bobolink, red-winged blackbird, and other songbirds. The agricultural areas, active and inactive, are potential display habitat for American woodcock. Recently plowed or otherwise disturbed soils could attract winter foraging by horned lark, snow bunting (*Plectrophenax nivalis*), and American pipit (*Anthus rubescens*).

A large share of the biological diversity of the MAVA site occurs on Roxbury Farm and the edges of neighboring farm properties, but not on the more intensively managed National Historic Site parcel.

We believe that the preservation of Roxbury Farm greatly enhances the biodiversity support provided by MAVA. If it is possible to preserve adjoining lands, especially any offsite portions of the Southern Swamp and the corridor of Kinderhook Creek adjoining Roxbury Farm, this would contribute substantially to protection of biological diversity.

MANAGEMENT CONCERNS

Based on our understanding of the biological resources of MAVA, and strictly from the viewpoint of the conservation of native biological diversity, we suggest consideration of the following management practices.

Agricultural and horticultural chemicals. Maintain organic farming practices on the OSI property. Minimize use of fertilizers and pesticides on the NHS property.

Vegetation management. Maintain hedgerows bordering farm fields. Do not cut or remove vegetation from the banks of SN Ditch. Remove Japanese knotweed plants wherever they occur (see above).

Bats. Return Lindenwald house window shutters to the condition that permitted existence of the little brown bat colony.

Window wells. Improve Lindenwald House window well covers to prevent the trapping of small terrestrial animals (salamanders, frogs, snakes, etc.).

Curbing. Design any new curbs in parking lots to allow passage by reptiles and amphibians such as salamanders and turtle hatchlings

Siltation. Assess the impact of siltation from MAVA runoff on Kinderhook Creek habitats and biota, especially fish and invertebrates. Explore and implement land management techniques to reduce siltation, if appropriate.

Wetlands and riparian areas. Protect (do not cultivate or drain) the wet meadows in Field 1. Protect buffer zones adjoining the banks of Kinderhook Creek and the Southern Swamp. Do not drive equipment across the SN Ditch and its associated wetland unless a bridge is provided for this purpose. Do not cut trees or remove other vegetation in Southern Swamp, Swamp Pond, or on the banks of Kinderhook Creek.

Mosquitoes. Fill temporary pools and puddles near the compost piles with sand or gravel. These pools, which contained mosquito larvae on 22 August 2004, are organically enriched from the compost and thus likely produce *Culex pipiens* and *Culex restuans*, which are the suspected bridge vectors of West Nile virus. Level roll-offs to allow rainwater to drain freely.

ATV use. On 27 August we observed tracks and crushed vegetation on the sand bar apparently from ATV use. ATVs and other sport vehicles (for example, dirt bikes) should be prohibited on the site.

SUGGESTED BIOLOGICAL MONITORING

Invasive Plants

Populations of purple loosestrife and common reed (*Phragmites*) can be monitored by means of sketch-mapping and standardized photo-stations. Large-scale expansion of loosestrife should be watched for. Movement of common reed into areas other than Third Pond and its associated wetlands should be watched for: it may be desirable to contain reed in Third Pond where it does not seem to be harmful. Japanese knotweed is very rare at MAVA and should be removed by repeated hand-pulling and safe disposal of the pulled material. Complete removal, including all root fragments, and thorough drying of all plant material is necessary to prevent vegetative reproduction (Talmage and Kiviat 2004). Spread of existing plants, or establishment of new colonies, should be watched for. All ponds should be monitored for the potential establishment of water-chestnut (*Trapa natans*), which does not now occur at MAVA, but is very abundant on the Hudson River and is spreading to inland ponds. If water-chestnut appears, it should be hand-pulled and all material disposed of distant from pond or wetland habitats.

Rare plants

Davis' sedge (NYS Threatened) should be monitored. Sedge "clumps" can be counted and the area could be photographed from a standardized photo-station. Counts may vary from year-to-year so it is best to watch for a longer-term trend. Some degree of soil or canopy disturbance may be necessary to maintain suitable habitat for Davis' sedge, as it occurs in habitats characterized by such disturbance.

Rare animals

A Roxbury Farm worker with some bird-watching experience or a member of the Alan DeVoe Bird Club might best be able to monitor northern harrier use of the MAVA fields for foraging and potentially for nesting. Use of the puddles and pools in Field 1 by breeding spotted sandpiper and migrant shorebirds of other species (for example, least sandpiper, solitary sandpiper) is also of interest. A volunteer could do this monitoring by visiting the area for an hour on each of 3 to 5 days during May and again during July and August. The same individual could also look and listen for orchard oriole territorial behavior associated with the larger trees in Field 1 along Kinderhook Creek on these days and a few times in June.

The rare damselfly, the American rubyspot, should be sought at the sandbar in Kinderhook Creek around late August, which is when we observed this species. We do not envision a need to monitor phantom crane fly; however, the species is common enough at MAVA in Southern Swamp that an interested researcher or graduate student might wish to establish a study.

FURTHER STUDIES

Based on our experience at MAVA in 2002-2004, we suggest additional biological surveys that would produce results useful in planning for land protection and management.

Small mammals. Survey small terrestrial mammals (rodents, shrews, moles) in the full range of habitats. Survey bats using ultrasonic bat detectors to identify breeding and migrant species at appropriate seasons.

Butterflies. Survey butterflies in the full range of habitats, especially the wet meadows.

Odonates. Survey damselflies and dragonflies associated with all flowing and still water habitats.

Terrestrial invertebrates. Survey invertebrates (Hymenoptera, Coleoptera, others) specialized to bare or sparsely vegetated sandy or gravelly soils, including the sandbar in Kinderhook Creek, and the area around Gravel Pond.

Flora. Another year of vascular plant surveys, since there were very wet summers in 2003 and 2004 and certain plants might appear in a drier year. Survey for bryophytes in Southern Swamp.

Other properties. Biological surveys on other farm properties adjoining MAVA, to determine if there are elements of biodiversity, in addition to historic features, that would justify acquiring easements on additional lands.

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LITERATURE CITED

Altig, R. 1970. A key to the tadpoles of the continental United States and Canada. Herpetologica 26: 180-207.

Barbour, J. G. & E. Kiviat. 1997. Introduced purple loosestrife as host of native Saturniidae (Lepidoptera). Great Lakes Entomologist 30(3): 115-122.

Bishop, S. C. 1941. The salamanders of New York. New York State Museum Bulletin 324. 365 p.

Bogart, J. P. and M. W. Klemens. 1997. Hybrids and genetic interactions of mole salamanders (*Ambystoma jeffersonianum* and *A. laterale*) (Amphibia: Caudata) in New York and New England. American Museum Novitates 3218. 78 p.

Cadwell, D. H. and R. J. Dineen. 1987. Surficial geologic map of New York. New York State Museum – Geological Survey Map and Chart Series 40, 1:250,000, contour interval 100 feet. Hudson-Mohawk Sheet.

Case, R. 1989. Soil survey of Columbia County, New York. U.S. Department of Agriculture, Soil Conservation Service. Washington, DC. 266 p. + maps.

Clemants, S. 1997. Martin van Buren National Historic Site vascular plant survey 1997. Unpublished report to US National Park Service. 4 p.

Cook, W. E. 1984. Survey of the flora and fauna, Lindenwald Martin Van Buren National Historic Site, Kinderhook, NY. Unpublished report to Martin Van Buren National Historic Site Interpretive Staff. 21p.

Cook, W. E. 1985. Additions to the survey of the flora and fauna, Lindenwald, Martin Van Buren National Historic Site, Kinderhook, NY. Unpublished report to Martin Van Buren National Historic Site Interpretive Staff. 3p.

Conant, R. and J. Collins. 1998. A field guide to reptiles and amphibians of eastern and central North America. Houghton Mifflin, Boston. 634 p.

Confer, J. L. 1992. Golden-winged warbler. *In* A. Poole, P. Stettenheim, and F. Gill, eds. The Birds of North America, No. 20, ed. The Academy of Natural Sciences, Washington, DC.

Downs, F. L. 1989. Key to the larval salamanders of Ohio. P. 60-64 *in* R. A. Pfingsten and F. L. Downs, eds. Salamanders of Ohio. Ohio State University, Columbus.

Farris, C. N. 2001. Water quality inventory – Martin Van Buren NHS. Unpublished report to National Park Service. 13 p.

Fisher, D., Y. W. Isachsen, and L. V. Rickard. 1970. Geologic map of New York. New York State Museum and Science Service Map and Chart Series 15, 1:250,000, contour interval 100 feet. Hudson-Mohawk Sheet.

Glassberg, J. 1999. Butterflies through binoculars: The East. Oxford University Press, New York, Oxford. 242 p.

Gleason, H. A. and A. Cronquist. 1991. Manual of vascular plants of northeastern United States and adjacent Canada. New York Botanical Garden, Bronx, NY. 910 p.

Hepp, G. R. and F. C. Bellrose. 1995. Wood duck (*Aix sponsa*). *In* A. Poole and F. Gill, eds. The Birds of North America, No. 169. The Academy of Natural Sciences, Washington, DC.

House, H. D. 1942. Bibliography of the botany of New York State 1751-1940. University of the State of New York, Albany. 433 p.

Keppie, D. M. and R. M. Whiting, Jr. 1994. American woodcock (*Scolopax minor*). *In* A. Poole and F. Gill, eds. The Birds of North America, No. 100. The Academy of Natural Sciences, Washington, DC.

Kiviat, E. 1997. Martin van Buren National Historic Site habitat assessment. Unpublished report to The Nature Conservancy. Hudsonia Ltd., Annandale, NY. 3 p. + figures.

Kiviat, E. and G. Stevens. 2001. Biodiversity assessment manual for the Hudson River Estuary Corridor. New York State Department of Environmental Conservation, Albany. 508 p.

McVaugh, R. 1935. Recent changes in the composition of a local flora. Bulletin of the Torrey Botanical Club 62:479-489.

McVaugh, R. 1958. Flora of the Columbia County area, New York. University of the State of New York, Albany. 233 p.

Mac, M. J., P. A. Opler, C. E. P. Haeker, and P. D. Doran. 1998. Status and trends of the Nation's biological resources. 2 vols. U.S. Department of the Interior, U.S. Geological Survey, Reston, VA.

Mitchell, R. and G. Tucker. 1997. Revised checklist of New York State plants. University of State of New York, Albany. 400p.

National Audubon Society, 2002. The 2002 Audubon WatchList. http://audubon2.org/webapp/watchlist/viewWatchlist.jsp#flycatchers, copyright 2002 National Audubon Society, accessed 12 Nov. 2004.

National Park Service. 2001. Martin Van Buren National Historic Site, Kinderhook, New York: Draft boundary study, draft environmental assessment. WASO Review Draft, US National Park Service, Boston Support Office, Boston. 53 p.

New York State Department of Environmental Conservation. 2003. List of Endangered, Threatened and Special Concern Fish & Wildlife Species of New York State. http://www.dec.state.ny.us/website/dfwmr/wildlife/endspec/etsclist.html, created 10 Oct 2003, accessed 12 Nov 2004.

New York State Department of Environmental Conservation. 2004. NYSDEC's Hudson River Otter Stewardship Program. http://www.dec.state.ny.us/website/dfwmr/habitat/hrottersp/, created May 17, 2004, accessed November 18, 2004.

New York Natural Heritage Program. 2003. Animal Species Actively Inventoried. New York Natural Heritage Program biological and conservation data system. New York Natural Heritage Program. Albany NY. 7 p.

Sibley, S. C. 1988. American black duck *Anas rubripes*. P. 64-65 *in* Andrle, R. F. and J. C. Carroll eds., The Atlas of Breeding Birds in New York State. Cornell University Press, Ithaca, NY.

Talmage, E. and E. Kiviat. 2004. Japanese Knotweed and Water Quality on the Batavia Kill in Greene County, New York: Background Information and Literature Review. Hudsonia Ltd., Annandale, NY. 29p.

APPENDIX A. EXPLANATION OF RANKS OF SPECIES OF CONSERVATION CONCERN LISTED IN THE MAVA REPORT

Explanations of New York State ranks and New York Natural Heritage Program ranks are from the New York Natural Heritage Program website, accessed December 2004.

New York State Ranks (Statewide)

The following categories are defined in regulation 6NYCRR part 193.3 and apply to New York State Environmental Conservation Law section 9-1503.

E **Endangered Species**. Any species which meets one of the following criteria: species with 5 or fewer extant sites or fewer than 1,000 individuals; species restricted to fewer than 4 USGS 7 ½ minute topographical maps; or species listed as endangered by the U.S. Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

T **Threatened Species**. Any species which meets one of the following criteria: species with 6 to 20 extant sites or 1,000-3,000 individuals; species restricted to not less than 4 or more than 7 USGS 7 ½ minute topographical maps; or species listed as Threatened by the United States Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

SC **Special Concern Species**: Those species that are not yet recognized as endangered or threatened, but for which documented concern exists for their continued welfare in New York. Unlike the first two categories, species of special concern receive no additional legal protection under Environmental Conservation Law section 9-1503.

New York Natural Heritage Program Ranks (Statewide)

S1 Critically imperiled in NY State because of extreme rarity (5 or fewer sites or very few remaining individuals) or extremely vulnerable to extirpation from NY State due to biological factors.

S2 Imperiled in NY State because of rarity (6-20 sites or few remaining individuals) or highly vulnerable to extirpation in NY State due to biological factors.

S3 Rare in NY State (usually 21-100 extant sites).

SH Historical. No extant sites known in New York State but it may be rediscovered.

Regional Status (Hudson Valley)

Hudsonia has compiled lists of native plants and animals that are rare in the Hudson Valley but do not appear on statewide or federal lists of rarities (Kiviat and Stevens 2001). We use ranking criteria similar to those used by the NYNHP, but we apply those criteria to the Hudson Valley below the Troy Dam. Our regional lists are based on the extensive field experience of biologists associated with Hudsonia and communications with other biologists working in the Hudson Valley. These lists are subject to change as we gather more information about species occurrences in the region. Species with New York State or New York Natural Heritage Program ranks are presumed to be regionally rare also, but are not assigned a regional rank.

Appendix B. Vascular plant taxa found at MAVA, 2002 - 2004.

Plant Name	Introduced (I)/Native (N)[1]
Abies balsamea	N
Acalypha rhomboidea	N
Acer negundo	N
Acer platanoides	I
Acer rubrum	N
Acer saccharinum	N
Acer saccharum	N
Actaea pachypoda	N
Agrimonia	N/I[2]
Agrostis hyemalis	N
Ailanthus altissima	I
Alisma subcordatum	N
Alliaria petiolata	I
Allium tricoccum	N
Allium vineale	I
Alnus incana	N
Amaranthus albus	I
Amaranthus retroflexus	N
Ambrosia artemisiifolia	N
Ambrosia trifida	N
Amelanchier	N
Amphicarpaea bracteata	N
Anagallis arvensis	I
Anemone canadensis	N
Anthoxanthum odoratum	I
Aquilegia canadensis	N
Arabis glabra	N
Aralia nudicaulis	N
Arctium lappa	I
Arctium minus	I
Arisaema triphyllum	N
Aronia melanocarpa	N
Arrhenatherum elatius	I
Artemisia vulgaris	I
Asclepias syriaca	N
Asplenium platyneuron	N
Aster ciliolatus	N
Aster cordifolius	N
Aster divaricatus	N

cont.

Appendix B cont.

Plant Name	Introduced (I)/Native (N)
Aster dumosus	N
Aster lanceolatus	N
Aster lateriflorus	N
Aster novae-angliae	N
Aster pilosus	N
Aster praealtus	N
Aster puniceus	N
Aster umbellatus	N
Athyrium filix-femina	N
Avena sativa	I
Barbarea vulgaris	I
Berberis thunbergii	I
Betula alleghaniensis	N
Betula lenta	N
Betula papyrifera	N
Betula populifolia	N
Bidens cernua	N
Bidens comosa	N
Bidens connata	N
Bidens frondosa	N
Boehmeria cylindrica	N
Botrychium virginianum	N
Brassica nigra	I
Bromus ciliatus	N
Bromus commutatus	I
Bromus inermis	I
Bromus secalinus	I
Bromus tectorum	I
Calamagrostis canadensis	N
Callitriche heterophylla	N
Calystegia sepium	N/I
Calystegia spithamaea	N
Capsella bursa-pastoris	I
Cardamine diphylla	N
Cardamine pensylvanica	N
Carex bebbii	N
Carex crinita	N
Carex davisii	N
Carex granularis	N
Carex grayi	N
Carex lacustris	N
Carex laxiflora	N

cont.

Appendix B cont.

Plant Name	Introduced (I)/Native (N)
Carex longii	N
Carex lupulina	N
Carex lurida	N
Carex prasina	N
Carex scoparia	N
Carex squarrosa	N
Carex stricta	N
Carex trichocarpa	N
Carex vulpinoidea	N
Carpinus caroliniana	N
Carya cordiformis	N
Carya glabra	N
Carya ovata	N
Catalpa bignonioides	I
Celastrus orbiculatus	I
Centaurea jacea	I
Centaurea maculosa	I
Ceratophyllum demersum	N
Chamaesyce maculata	N
Chamaesyce serpyllifolia	I
Chelone glabra	N
Chenopodium album	I
Chenopodium ambrosioides	I
Chenopodium botrys	I
Chrysanthemum leucanthemum	I
Chrysosplenium americanum	N
Cichorium intybus	I
Cinna arundinacea	N
Circaea lutetiana	N
Cirsium arvense	I
Cirsium canescens	I
Cirsium vulgare	I
Clematis terniflora	I
Clematis virginiana	N
Collinsonia canadensis	N
Commelina communis	I
Convolvulus arvensis	I
Conyza canadensis	N
Cornus alternifolia	N
Cornus amomum	N
Cornus racemosa	N
Cornus sericea	N

cont.

Appendix B cont.

Plant Name	Introduced (I)/Native (N)
Coronilla varia	I
Crataegus	I
Cryptotaenia canadensis	N
Cuscuta compacta	N
Cuscuta gronovii	N
Cuscuta megalocarpa	I
Cyperus erythrorhizos	N
Cyperus odoratus	N
Cyperus strigosus	N
Dactylis glomerata	I
Datura stramonium	N
Daucus carota	I
Dennstaedtia punctilobula	N
Desmodium canadense	N
Dianthus armeria	I
Digitaria ischaemum	I
Dipsacus sylvestris	I
Dryopteris carthusiana	N
Dryopteris cristata	N
Dryopteris intermedia	N
Echinochloa crusgalli	I
Echinochloa walteri	N
Echinocystis lobata	N
Echium vulgare	I
Elaeagnus	I
Eleocharis ovata	N
Elodea canadensis	N
Elodea nuttallii	N
Elymus glaucus	I
Elymus riparius	N
Elymus trachycaulus	N
Elymus virginicus	N
Epilobium ciliatum var. ciliatum	N
Epilobium coloratum	N
Epipactis helleborine	I
Equisetum arvense	N
Equisetum hyemale	N
Eragrostis pectinacea	N
Erechtites hieraciifolia	N
Erigeron annuus	N
Erigeron strigosus	N
Erysimum cheiranthoides	I

cont.

Appendix B cont.

Plant Name	Introduced (I)/Native (N)
Erythronium americanum	N
Eupatorium maculatum	N
Eupatorium perfoliatum	N
Eupatorium rugosum	N
Euphorbia	N/I
Euthamia graminifolia	N
Fagus grandifolia	N
Fallopia japonica	I
Fragaria virginiana	N
Fraxinus americana	N
Fraxinus pennsylvanica	N
Galinsoga parviflora	I
Galium aparine	N
Galium mollugo	I
Galium palustre	N
Galium tinctorium	N
Geum canadense	N
Geum laciniatum	N
Geum virginianum	N
Glechoma hederacea	I
Glyceria striata	N
Gnaphalium uliginosum	I
Hamamelis virginiana	N
Helianthus decapetalus	N
Helianthus tuberosus	I
Hemerocallis fulva	I
Hesperis matronalis	I
Hieracium caespitosum	I
Humulus lupulus	I
Hydrocotyle americana	N
Hydrophyllum virginianum	N
Hypericum boreale	N
Hypericum ellipticum	N
Hypericum mutilum	N
Hypericum punctatum	N
Ilex verticillata	N
Impatiens capensis	N
Impatiens pallida	N
Inula helenium	I
Iris	N/I
Juglans cinerea	N
Juncus effusus	N/I

cont.

Appendix B cont.

Plant Name	Introduced (I)/Native (N)
Juncus secundus	N
Juncus tenuis	N
Juniperus virginiana	N
Laportea canadensis	N
Leersia oryzoides	N
Leersia virginica	N
Lemna minor	N
Lemnaceae	N
Leonurus cardiaca	I
Lepidium campestre	I
Lepidium ruderale	I
Lepidium virginicum	N
Lespedeza	N/I
Leucanthemum vulgare	I
Ligustrum obtusifolium	I
Ligustrum vulgare	I
Lilium superbum	N
Lindera benzoin	N
Lindernia dubia	N
Lobelia inflata	N
Lonicera maackii	I
Lonicera x bella	I
Lotus corniculatus	I
Ludwigia palustris	N
Lychnis alba	I
Lycopus americanus	N
Lycopus uniflorus	N
Lysimachia ciliata	N
Lysimachia nummularia	I
Lysimachia terrestris	N
Lythrum salicaria	I
Maianthemum racemosum	N
Malus pumila	I
Matricaria discoidea	I
Matteuccia struthiopteris	N
Medicago sativa ssp. sativa	I
Melilotus alba	I
Melilotus officinalis	I
Menispermum canadense	N
Mentha arvensis	I
Mikania scandens	N
Mimulus ringens	N

cont.

Appendix B cont.

Plant Name	Introduced (I)/Native (N)
Mitchella repens	N
Morus alba	I
Muhlenbergia frondosa	N
Myosotis laxa	N
Myosotis scorpioides	I
Najas minor	I
Oenothera biennis	N
Onoclea sensibilis	N
Osmorhiza claytonii	N
Osmunda cinnamomea	N
Osmunda claytoniana	N
Ostrya virginiana	N
Oxalis dillenii	N
Oxalis stricta	N
Panicum clandestinum	N
Panicum dichotomiflorum	N
Panicum philadelphicum	N
Parthenocissus quinquefolia	N
Penstemon grandiflorus	I
Penthorum sedoides	N
Phalaris arundinacea	N/I
Philadelphus coronarius	I
Phleum pratense	I
Phragmites australis	N/I
Physalis heterophylla	N
Phytolacca americana	N
Picea	N/I
Pilea pumila	N
Pinus resinosa	N
Pinus strobus	N
Plantago lanceolata	I
Plantago major	I
Platanus occidentalis	N
Poa annua	I
Poa palustris	N
Poa pratensis	I
Polygala verticillata	N
Polygonum arifolium	N
Polygonatum biflorum	N
Polygonum caespitosum	I
Polygonum convolvulus	I
Polygonum hydropiperoides	N

cont.

Appendix B cont.

Plant Name	Introduced (I)/Native (N)
Polygonum hydropiperoides hydropiperoides	N
Polygonum lapathifolium	I
Polygonum orientale	I
Polygonum pensylvanicum	N
Polygonum persicaria	I
Polygonum punctatum	N
Polygonum sagittatum	N
Polygonum scandens	N/I
Polygonum virginianum	N
Polystichum acrostichoides	N
Populus deltoides	N
Populus tremuloides	N
Portulaca oleracea	I
Potamogeton foliosus	N
Potamogeton gramineus	N
Potamogeton natans	N
Potamogeton nodosus	N
Potentilla argentea	I
Potentilla canadensis	N
Potentilla intermedia	I
Potentilla norvegica	N
Potentilla recta	I
Potentilla simplex	N
Prunella vulgaris	I
Prunus pensylvanica	N
Prunus serotina	N
Prunus virginiana	N
Quercus alba	N
Quercus bicolor	N
Quercus coccinea	N
Quercus palustris	N
Quercus rubra	N
Quercus velutina	N
Ranunculus abortivus	N
Ranunculus acris	I
Ranunculus bulbosus	I
Ranunculus hispidus	N
Ranunculus pensylvanicus	N
Ranunculus recurvatus	N
Ranunculus hispidus	N
Rhamnus cathartica	I

cont.

Appendix B cont.

Plant Name	Introduced (I)/Native (N)
Rhus typhina	N
Robinia pseudo-acacia	I
Rorippa nasturtium-aquaticum	I
Rorippa palustris	N/I
Rorippa sylvestris	I
Rosa multiflora	I
Rosa palustris	N
Rubus allegheniensis	N
Rubus flagellaris	N
Rubus hispidus	N
Rubus idaeus	N
Rubus occidentalis	N
Rubus pensilvanicus	N
Rubus strigosus	N
Rumex acetosella	I
Rumex crispus	I
Rumex obtusifolius	I
Rumex pulcher	I
Sagittaria latifolia	N
Salix alba	I
Salix babylonica	I
Salix bebbiana	N
Salix discolor	N
Salix eriocephala	N
Salix fragilis	I
Salix nigra	N
Salix rigida	N
Sambucus canadensis	N
Sanguinaria canadensis	N
Sanicula canadensis	N
Saponaria officinalis	I
Scirpus atrovirens	N
Scirpus cyperinus	N
Scrophularia marilandica	N
Scutellaria lateriflora	N
Senecio aureus	N
Setaria faberi	I
Setaria geniculata	N
Setaria glauca	I
Setaria viridis	I
Sicyos angulatus	N
Silene noctiflora	I

cont.

Appendix B cont.

Plant Name	Introduced (I)/Native (N)
Sinapis arvensis	I
Sisymbrium altissimum	I
Sisymbrium loeselii	I
Sisyrinchium	N
Solanum dulcamara	I
Solanum nigrum	I
Solidago canadensis	N
Solidago canadensis var. scabra	N
Solidago gigantea	N
Solidago juncea	N
Solidago nemoralis	N
Solidago rugosa	N
Sonchus	I
Spiraea latifolia	N
Spirodela polyrrhiza	N
Staphylea trifolia	N
Stellaria media	I
Symplocarpus foetidus	N
Tanacetum vulgare	I
Taraxacum officinale	I
Taxus cuspidata	I
Teucrium canadense	N
Thalictrum dioicum	N
Thalictrum pubescens	N
Thelypteris noveboracensis	N
Thlaspi arvense	I
Tiarella cordifolia	N
Tilia americana	N
Toxicodendron radicans	N
Trifolium arvense	I
Trifolium aureum	I
Trifolium dubium	I
Trifolium pratense	I
Trifolium repens	I
Trillium erectum	N
Tsuga canadensis	N
Tussilago farfara	I
Typha angustifolia	N
Typha latifolia	N
Typha x glauca	N
Ulmus americana	N
Ulmus rubra	N

cont.

Appendix B cont.

Plant Name	Introduced (I)/Native (N)
Urtica dioica	N/I
Vaccinium corymbosum	N
Verbascum thapsus	I
Verbena hastata	N
Verbena urticifolia	N
Veronica anagallis-aquatica	N
Veronica arvensis	I
Veronica serpyllifolia	I
Viburnum acerifolium	N
Viburnum dentatum var. lucidum	N
Viburnum lentago	N
Viburnum opulus	N/I
Viburnum opulus var. opulus	I
Vinca minor	I
Viola pubescens	N
Viola sororia	N
Vitis aestivalis	N
Vitis labrusca	N
Vitis riparia	N
Wolffia brasiliensis	N
Wolffia columbiana	N
Xanthium strumarium	N/I
Zizia aurea	N

[1] Native or introduced status determined according to Mitchell and Tucker 1997.
[2] At lower taxonomic levels within these genera there are both native and introduced forms.

As the nation's primary conservation agency, the Department of the Interior has responsibility for most of our nationally owned public land and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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National Park Service
U.S. Department of the Interior

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