

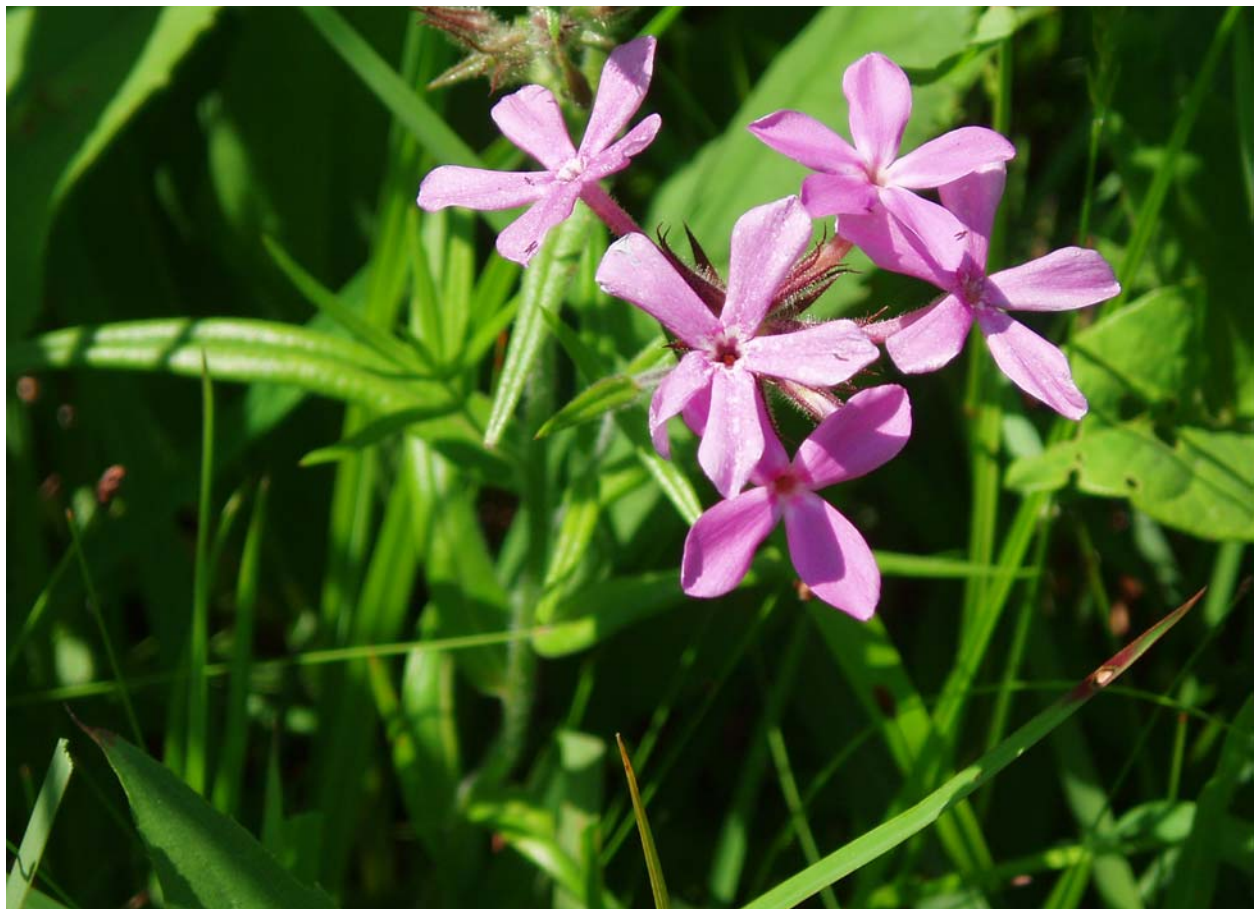
National Park Service
U.S. Department of the Interior

Northeast Region
Philadelphia, Pennsylvania



Inventory of Plant Species of Special Concern at Gettysburg National Military Park and Eisenhower National Historic Site

Technical Report NPS/NER/NRTR--2006/042



ON THE COVER

Phlox pilosa at Gettysburg National Military Park.
Photograph by: John Kunsman

Inventory of Plant Species of Special Concern at Gettysburg National Military Park and Eisenhower National Historic Site

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June 2006

U.S. Department of the Interior
National Park Service
Northeast Region
Philadelphia, Pennsylvania

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Executive Summary

Field surveys were conducted in 2004 and 2005 to document the presence of federally-listed and state-listed plant species of special concern in Gettysburg National Military Park and Eisenhower National Historic Site. The surveys attempted to confirm the presence of species of special concern that had been documented in previous years as well as to discover the presence of species of special concern that had not been previously documented.

Eleven state-listed species of special concern – Kalm's brome grass (*Bromus kalmii*), yellow lady's-slipper (*Cypripedium pubescens*), hoary frostweed (*Helianthemum bicknellii*), grass-leaved rush (*Juncus biflorus*), short-fruited rush (*Juncus brachycarpus*), Heller's panic grass (*Panicum oligosanthes*), smooth beardtongue (*Penstemon laevigatus*), Missouri gooseberry (*Ribes missouriense*), pencilflower (*Stylosanthes biflora*), crane-fly orchid (*Tipularia discolor*), and horse-gentian (*Triosteum angustifolium*) – had been documented in Gettysburg National Military Park and Eisenhower National Historic Site during various surveys prior to 2004, and all of these species, except for the crane-fly orchid, were confirmed as still being present during the field surveys in 2004 and 2005.

Ten state-listed species of special concern – puttyroot (*Aplectrum hyemale*), brown sedge (*Carex buxbaumii*), Short's sedge (*Carex shortiana*), rigid sedge (*Carex tetanica*), hoary puccoon (*Lithospermum canescens*), downy phlox (*Phlox pilosa*), lion's-foot (*Prenanthes serpentaria*), Shumard's oak (*Quercus shumardii*), low spearwort (*Ranunculus pusillus*), and eastern coneflower (*Rudbeckia fulgida*) – were documented for the first time in Gettysburg National Military Park and Eisenhower National Historic Site during the field surveys in 2004 and 2005.

Keywords: plant species of special concern, Gettysburg National Military Park, Eisenhower National Historic Site

Objectives

The main objective of the project was to document the presence and map the locations of federally-listed and state-listed plant species of special concern in Gettysburg National Military Park and Eisenhower National Historic Site. Tasks related to the documentation and mapping of the species of special concern included describing features of the habitat, identifying threats, and making management recommendations.

A secondary objective was to compile a list of vascular plants, whether listed as species of special concern or not, that were observed during the field surveys.

Methodology

Species of Special Concern

A species of special concern was defined as species having a U. S. Fish and Wildlife Service status of Endangered or Threatened, a Pennsylvania Department of Conservation and Natural Resources (DCNR)/Pennsylvania Biological Survey (PABS) state rarity status of Endangered, Threatened, Rare, Vulnerable, or Undetermined, and/or a Pennsylvania Natural Heritage Program (PNHP) state rank of S1, S2, or S3 (Appendix A).

Review of PNHP Databases and Other Information Sources

The PNHP databases, files, and maps were consulted to identify federally-listed or state-listed species of special concern that had been previously documented by extant or historical occurrences in Gettysburg National Military Park and Eisenhower National Historic Site.

The review of PNHP data revealed that as of the beginning of the current project in 2004, eleven state-listed species of special concern had been documented as extant in Gettysburg National Military Park and Eisenhower National Historic Site (Table 1). No federally-listed species of special concern were documented. Most of the previously documented extant occurrences had been the result of surveys conducted by PNHP staff, while engaged in other contracts with the National Park Service or other contractors, from the 1980s until the beginning of the current project in 2004. A few of the extant occurrences had been supplied prior to 2004 on a volunteer basis by well-regarded professors from nearby universities (PNHP 2006).

The PNHP databases, as well as plant distribution maps (Rhoads and Klein 1993), were also utilized to identify plant species of special concern that had potential to be present in Gettysburg National Military Park and Eisenhower National Historic Site, because of the documented presence of extant or historical occurrences of the species elsewhere in Adams County or surrounding counties (Table 2).

Table 1. Plant species of special concern documented as extant in Gettysburg National Military Park and Eisenhower National Historic Site, as of the beginning of the current project in 2004 (PNHP 2006). The state rarity status and global and state ranks are defined in Appendix A.

Species	State rarity status	Global Rank	State rank	Last seen by PNHP	Location
Kalm's brome grass; arctic brome (<i>Bromus kalmii</i>)	Undetermined	G5	S3	2001	Welcome Traveler campground
yellow lady's slipper (<i>Cypripedium pubescens</i>)	Vulnerable	G5	S3S4	1997	Culp's Hill
hoary frostweed (<i>Helianthemum bicknellii</i>)	Endangered	G5	S2	1996	Pardee Field
grass-leaved rush; bog rush (<i>Juncus biflorus</i>)	Threatened	G5	S2	1994	Sedgwick Avenue Meadow
short-fruited rush; whiteroot rush (<i>Juncus brachycarpus</i>)	Endangered	G4G5	S1	1994	Sedgwick Avenue Meadow
Heller's panic grass (<i>Panicum oligosanthos</i>)	Undetermined	G5	S3	1996	Pardee Field
smooth beardtongue (<i>Penstemon laevigatus</i>)	Undetermined	G5	S3	2001	Welcome Traveler campground
Missouri gooseberry (<i>Ribes missouriense</i>)	Endangered	G5	S1	1999	various locations
pencilflower (<i>Stylosanthes biflora</i>)	Endangered	G5	S2	1996	Pardee Field
crane fly orchid (<i>Tipularia discolor</i>)	Rare	G4G5	S3	1992	Country Club Lane
horse-gentian (<i>Triosteum angustifolium</i>)	Endangered	G5	S1	1996	Welcome Traveler campground

Table 2. Potential plant species of special concern in Gettysburg National Military Park and Eisenhower National Historic Site, as of the beginning of the current project in 2004 (PNHP 2006). The state rarity status and global and state ranks are defined in Appendix A.

Species	State rarity status	Global rank	State Rank	County/counties with documented occurrences
brown sedge; Buxbaum's sedge (<i>Carex buxbaumii</i>)	Rare	G5	S3	extant in Adams and Franklin
Short's sedge (<i>Carex shortiana</i>)	Rare	G5	S3	extant in Cumberland and Franklin
downy phlox (<i>Phlox pilosa</i>)	Endangered	G5	S1S2	extant in Adams
Shumard's oak (<i>Quercus shumardii</i>)	Endangered	G5	S1	extant in Adams, Franklin and York
early buttercup (<i>Ranunculus fascicularis</i>)	Endangered	G5	S1S2	extant in Franklin; historical in Adams
eastern coneflower; orange coneflower (<i>Rudbeckia fulgida</i>)	Undetermined	G5	S3	extant in York; historical in Adams

Vegetation association maps of Gettysburg National Military Park and Eisenhower National Historic Site (Perles et al. 2006; Appendix B), as well as previous knowledge of the investigator and NPS staff, were utilized to identify and select areas in Gettysburg National Military Park and Eisenhower National Historic Site that appeared to have the proper habitat and/or vegetation association for supporting species of special concern. Vegetation associations of particular interest, based on the species included in Table 1 and Table 2, included Bottomland Mixed Hardwood Forest, Dry Oak-Mixed Hardwood Forest, Modified Successional Forest, Pasture/Wet Meadow, Successional Old Field, Successional Old Field/Wet Meadow, and Wet Meadow. These vegetation associations were priorities for the field surveys of 2004 and 2005.

Field Surveys

The field surveys were utilized to confirm the presence and gather pertinent information about species of special concern that had been previously documented as extant or that might potentially be extant in Gettysburg National Military Park and Eisenhower National Historic Site.

The field surveys utilized a visual reconnaissance methodology, which has been used widely and effectively by the Natural Heritage Program network for nearly thirty years. This methodology focuses on surveying for species of special concern in areas where potential habitat was previously identified or where habitat was fortuitously encountered while in the field, and is largely based on the judgement and experience of the investigator and the habitat preferences of species of special concern. The visual reconnaissance methodology does not involve the use of transects and plots that are utilized in more ecologically-based studies.

The field data gathered during surveys that were successful in documenting the presence of a species of special concern included the size of the occurrence, habitat features and the vegetation association, associated species, latitude and longitude coordinates (measured by a Garmin III Plus or Garmin V GPS unit), threats, and management recommendations. These data were recorded on PNHP field forms and entered into the PNHP databases at the PNHP office in Middletown.

Although locating and documenting species of special concern was the primary focus of the field surveys, a list was compiled of all vascular plants observed while conducting the field surveys. Identification of specimens was mostly done by the investigator in the field, although some unknown specimens were collected and later determined in the office.

Scientific and Common Names

The scientific and common names used for vascular plants in this report generally follow the USDA/NRCS checklist (USDA 2006); however, in the case of most of the species of special concern, the DCNR scientific and common names have been used. In these cases, the names from both the USDA/NRCS checklist and the DCNR rare plant list are provided.

Voucher Specimens

Voucher specimens of species of special concern, if believed to be necessary by the investigator, were collected and their preparation followed the guidelines of the Vascular Plant Technical Committee (VPTC) of the Pennsylvania Biological Survey (PABS). The specimens were mounted at the PNHP eastern office in Middletown and will be housed in Middletown.

Results

Field Surveys – Dates and Locations

Field surveys were conducted for species of special concern in 2004 on May 10 and 25, June 21, July 14 and 19, and October 6 and 7. Field surveys were conducted in 2005 on April 13, May 11, June 2, 9, 15 and 23, August 5 and 17, September 22 and 30 (Table 3 and Figure 1).

The first year of the project concentrated on confirming the presence of the eleven previously documented species of special concern (Table 1), and the second year of the project concentrated on surveying for species of special concern in previously uninvestigated areas. The scheduling of the field surveys was based on the optimal time of the year for locating and identifying the species of special concern, as some species have a relatively narrow window of the year for positive identification. Autumnal surveys of some grassland and meadow locations were hampered by the mowing of these areas by NPS staff in late summer. The weather conditions during the two years of the project seemed to be relatively normal, and did not appear to have been a factor in locating the species.

Field Surveys – Species of Special Concern

The field surveys in 2004 and 2005 documented twenty state-listed species of special concern as having extant occurrences in Gettysburg National Military Park and Eisenhower National Historic Site (Table 4). The crane-fly orchid, originally documented in 1992, could not be confirmed in 2004 and 2005, but is included because this species was still very likely to be present. None of twenty species has a federal status.

The review of PNHP databases and maps that was conducted prior to the beginning of the field surveys in 2004 had identified eleven species as being extant in Gettysburg National Military Park and Eisenhower National Historic Site (Table 1), and all of these species except for the crane-fly orchid were documented in the field in 2004 and 2005.

Ten species (shown in bold print in the corresponding table) were documented for the first time by PNHP in the field in 2004 and 2005, including five species – brown sedge, Short's sedge, downy phlox, Shumard's oak, and eastern coneflower – that had been selected prior to the beginning of the field surveys in 2004 as having potential to be present (Table 2). The only species not found in 2004 and 2005 that was included on the list of potential species was the early buttercup (*Ranunculus fascicularis*). This species had been reported from Gettysburg National Military Park and Eisenhower National Historic Site (Yahner et al. 1992), but the occurrence was never entered in the PNHP databases because of the lack of a voucher specimen, which is particularly necessary for this species because of its very close resemblance to other species in the genus *Ranunculus*, most notably two exotic species, bulbous buttercup (*Ranunculus bulbosus*) and creeping buttercup (*Ranunculus repens*). The early buttercup will remain as a potential species in Gettysburg National Military Park and Eisenhower National Historic Site.

Table 3. Field surveys for plant species of special concern in Gettysburg National Military Park and Eisenhower National Historic Site, 2004 -2005. The vegetation associations (Perles et al. 2006) are described in Appendix B.

Date	Location	Vegetation Association(s) encountered
2004 May 10	Meredith Avenue	Dry Oak-Mixed Hardwood Forest Bottomland Mixed Hardwood Forest
2004 May 10	Country Club Lane	Dry Oak-Mixed Hardwood Forest
2004 May 10	McMillan Campground	Modified Successional Forest Bottomland Mixed Hardwood Forest
2004 May 10	Pardee Field West	Modified Successional Forest
2004 May 25	McMillan Woods to Biesecker Woods	Dry Oak-Mixed Hardwood Forest Bottomland Mixed Hardwood Forest Modified Successional Forest
2004 June 21	McMillan Field	Agricultural Field
2004 June 21	Meredith Avenue Field	Agricultural Field
2004 June 21	Plum Run South	Dry Oak-Mixed Hardwood Forest Bottomland Mixed Hardwood Forest
2004 June 21	Cavalry Field Woodlot	Dry Oak-Mixed Hardwood Forest
2004 July 14	The Wheatfield	Successional Old Field
2004 July 14	The Wheatfield Woods	Dry Oak-Mixed Hardwood Forest Bottomland Mixed Hardwood Forest
2004 July 14	Rock Creek/Culps Hill	Dry Oak-Mixed Hardwood Forest Bottomland Mixed Hardwood Forest
2004 July 14	Plum Run South	Dry Oak-Mixed Hardwood Forest
2004 July 14	Devils Den Glade	Successional Old Field
2004 July 19	Welcome Traveler	Modified Successional Forest Successional Old Field
2004 July 19	Pardee Field	Successional Old Field
2004 July 19	Pardee Field West	Modified Successional Forest
2004 July 19	Sedgwick Avenue Meadow	Wet Meadow
2004 July 19	Crawford Avenue West	Successional Old Field
2004 July 19	Crawford Avenue East	Wet Meadow
2004 July 19	Plum Run Intersection North	Wet Meadow
2004 October 6	Culps Hill	Dry Oak-Mixed Hardwood Forest Successional Old Field
2004 October 7	Slyder Farm South	Dry Oak-Mixed Hardwood Forest
2004 October 7	Plum Run South	Dry Oak-Mixed Hardwood Forest Bottomland Mixed Hardwood Forest
2005 April 13	Country Club Lane	Dry Oak-Mixed Hardwood Forest
2005 April 13	Big Round Top	Dry Oak-Mixed Hardwood Forest Chestnut Oak Forest
2005 May 11	Granite Schoolhouse Woods	Dry Oak-Mixed Hardwood Forest Bottomland Mixed Hardwood Forest Modified Successional Forest

Table 3 (continued). Field surveys for plant species of special concern in Gettysburg National Military Park and Eisenhower National Historic Site, 2004 -2005. The vegetation associations (Perles et al. 2006) are described in Appendix B.

2005 May 11	Shultz Woods	Dry Oak-Mixed Hardwood Forest
2005 May 11	Observation Tower Woods	Dry Oak-Mixed Hardwood Forest
2005 June 2	Weinbrenner	Wet Meadow
2005 June 2	Oak Ridge	Dry Oak-Mixed Hardwood Forest
2005 June 2	Barlow Knoll Woods	Bottomland Mixed Hardwood Forest
2005 June 9	Slyder Farm	Agricultural Field/Wet Meadow Pasture/Wet Meadow
2005 June 15	US Avenue Meadow	Wet Meadow Agricultural Field/Wet Meadow
2005 June 15	Plum Run Intersection South	Wet Meadow
2005 June 23	The Wheatfield	Successional Old Field
2005 June 23	Crawford Avenue West	Successional Old Field
2005 June 23	Plum Run Intersection North	Wet Meadow
2005 June 23	Sedgwick Avenue Meadow	Wet Meadow
2005 August 5	Warfield Ridge South	Dry Oak-Mixed Hardwood Forest
2005 August 5	Warfield Ridge	Dry Oak-Mixed Hardwood Forest Modified Succession Forest Successional Old Field
2005 August 17	US Avenue Woods	Dry Oak-Mixed Hardwood Forest
2005 August 17	Spangler's Spring Field	Successional Old Field
2005 September 22	Water Works	Sycamore-Mixed Hardwood Floodplain Forest
2005 September 30	Rock Creek/Culps Hill	Dry Oak-Mixed Hardwood Forest Bottomland Mixed Hardwood Forest



Figure 1. Field surveys for plant species of special concern in Gettysburg National Military Park and Eisenhower National Historic Site, 2004 –2005.

Table 4. Species of special concern documented as extant in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005 (PNHP 2006). The species that were found for the first time in Gettysburg National Military Park and Eisenhower National Historic Site in 2004 and 2005 are in bold print. The state rarity status and the global and state ranks are defined in Appendix A.

Species	State rarity status	Global rank	State Rank	Location(s)
puttyroot; Adam and Eve (<i>Aplectrum hyemale</i>)	Rare	G5	S3	Big Round Top
Kalm's brome grass; arctic brome (<i>Bromus kalmii</i>)	Undetermined	G5	S3	Welcome Traveler campground
brown sedge; Buxbaum's sedge (<i>Carex buxbaumii</i>)	Rare	G5	S3	various locations in the Plum Run watershed
Short's sedge (<i>Carex shortiana</i>)	Rare	G5	S3	Slyder Farm area
rigid sedge (<i>Carex tetanica</i>)	Threatened	G4G5	S2	various locations in the Plum Run watershed
yellow lady's-slipper (<i>Cypripedium pubescens</i>)	Vulnerable	G5	S3S4	Culp's Hill
hoary frostweed; Bicknell's hoary rockrose (<i>Helianthemum bicknellii</i>)	Endangered	G5	S2	Pardee Field
grass-leaved rush; bog rush (<i>Juncus biflorus</i>)	Threatened	G5	S2	various locations
short-fruited rush; whiteroot rush (<i>Juncus brachycarpus</i>)	Endangered	G4G5	S1	various locations in the Plum Run watershed
hoary puccoon (<i>Lithospermum canescens</i>)	Undetermined	G5	S2	vicinity of Pardee Field
Heller's panic grass; Scribner's rosette grass (<i>Panicum oligosanthes</i>)	Undetermined	G5	S3	various locations

Table 4 (continued). Species of special concern documented as extant in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005 (PNHP 2006). The species that were found for the first time in Gettysburg National Military Park and Eisenhower National Historic Site in 2004 and 2005 are in bold print. The state rarity status and the global and state ranks are defined in Appendix A.

smooth beardtongue; eastern smooth beardtongue (<i>Penstemon laevigatus</i>)	Undetermined	G5	S3	various locations
downy phlox (<i>Phlox pilosa</i>)	Endangered	G5	S1S2	The Wheatfield
lion's-foot; cankerweed (<i>Prenanthes serpentaria</i>)	Undetermined	G5	S3	various locations
Shumard's oak (<i>Quercus shumardii</i>)	Endangered	G5	S1	various locations in the Plum Run watershed
low spearwort (<i>Ranunculus pusillus</i>)	Endangered	G5	S1	Slyder Farm area
Missouri gooseberry (<i>Ribes missouriense</i>)	Endangered	G5	S1	various locations
eastern coneflower; orange coneflower (<i>Rudbeckia fulgida</i>)	Undetermined	G5	S3	various locations
pencilflower; sidebeak pencilflower (<i>Stylosanthes biflora</i>)	Endangered	G5	S2	Pardee Field and vicinity
crane-fly orchid; crippled crane-fly (<i>Tipularia discolor</i>)	Rare	G4G5	S3	not seen but still likely present at Country Club Lane
horse-gentian; yellowfruit horse- gentian (<i>Triosteum angustifolium</i>)	Endangered	G5	S1	Observation Tower woodland

The twenty extant species of special concern, plus the crane-fly orchid, are discussed in greater detail in the Discussion section under Individual Species of Special Concern.

Field Surveys – Other Vascular Plants

A total of 601 species and infraspecific taxa of vascular plants were observed during the field surveys of 2004 and 2005 (Appendix C).

Several of these species, although not considered to be species of special concern in Pennsylvania, are noteworthy for their presence because they are relatively infrequent species in the state as a whole or in this region of the state. The species include: purple milkweed (*Asclepias purpurascens*), shellbark hickory (*Carya laciniosa*), globe flatsedge (*Cyperus echinatus*), strawberry bush (*Euonymus americanus*), lanceleaf loosestrife (*Lysimachia lanceolata*), starry false lily of the valley (*Maianthemum stellatum*), and whorled rosinweed (*Silphium trifoliatum*).

Voucher Specimens

With the exception of the yellow lady's-slipper and downy phlox, which were found in such small numbers in 2004 and 2005 as to rule out collection, and the crane-fly orchid, which was not documented by a voucher specimen in 1992, the plant species of special concern known currently or historically in Gettysburg National Military Park and Eisenhower National Historic Site have been documented by mounted herbarium specimens. The specimens were collected and mounted during the present project in 2004 and 2005, or during previous years when PNHP conducted work under other contracts. The label data from the voucher specimens and the location of the specimens are included in Appendix D.

Discussion

Overview – Conservation Status

The twenty-one plant species of special concern documented currently or historically in Gettysburg National Military Park and Eisenhower National Historic Site (Table 4) represent species that have their entire geographical distribution in eastern North America (NatureServe 2006; Gleason & Cronquist 1991). None of the twenty-one species are considered to be in danger of extirpation in their overall geographical distribution. The species have neither a federal rarity status of Endangered or Threatened (as assigned by the U.S. Fish & Wildlife Service) nor a global rank of G1, G2, or G3 (NatureServe 2006) that would indicate the species to be globally imperiled (Appendix A). Most of the twenty-one species of special concern are common, sometimes even abundant, in other states or regions in their overall geographical distribution.

All twenty-one species are considered to be species of special concern within the boundaries of Pennsylvania. It is important to emphasize that the state rarity statuses and the state ranks (Appendix A) are based on current information. These statuses and ranks can be dynamic and may be amended as new data become available as the result of continuing field surveys and research. The statuses and ranks of species of special concern included in this report are current as of January 1, 2006.

The major state rarity statuses – Endangered and Threatened - are designed to reflect the overall status of the species and its risk of extirpation in the state, and in some instances may seem at odds with local situations. For example, PNHP surveys from 1991 through 2005 have demonstrated that the Missouri gooseberry, with a state rarity status of Endangered, was a relatively frequent species in Gettysburg National Military Park and Eisenhower National Historic Site; however, the species is documented from only three other locations in Pennsylvania, and fits within the current guidelines of Endangered as defined by DCNR and the Vascular Plant Committee of PABS.

Overview – Threats and Management

This section provides a general discussion of threats and management recommendations for the species of special concern, as a group, in Gettysburg National Military Park and Eisenhower National Historic Site. Threats and management recommendations for the individual species of special concern are discussed in more detail in the next section entitled Species of Special Concern.

Seven of the twenty-one species of special concern - puttyroot, yellow lady's-slipper, lion's-foot, Shumard's oak, Missouri gooseberry, crane-fly orchid, and horse-gentian - are forest species, at least as far as their occurrences in Gettysburg National Military Park and Eisenhower National Historic Site are concerned, and grow in relatively stable habitats. The primary threats in forested communities include competition from certain exotic species – particularly Japanese barberry (*Berberis thunbergii*), stilt grass (*Microstegium vimineum*), and multiflora rose (*Rosa multiflora*). In the past browsing by white-tailed deer (*Odocoileus virginianus*) was considered a

threat to some plant communities; however, through actively reducing the herd size to acceptable deer density goals, plant communities are at less risk from deer browsing pressures. Exotic plant species threats can be ameliorated by the chemical or mechanical control of exotic species in the immediate vicinity of the plant occurrence.

The remaining fourteen species of special concern – two-thirds of the total number of species of special concern - may be considered successional species in their ecological requirements. These species thrive in open, grassland-type habitats, such as old fields and meadows, where sunlight is abundant and the competing vegetation consists primarily or completely of herbaceous and graminoid plant species. These sorts of habitats tend to be relatively temporary, and unless artificially maintained by a management practice such as mowing, which is the common and effective practice utilized at Gettysburg National Military Park and Eisenhower National Historic Site, would proceed by natural succession toward the establishment of habitats more dominated or completely dominated by woody plants, and with the subsequent loss of the species of special concern adapted to the previous successional stage. Unlike the forest species described in the previous paragraph, which thrive in a relatively stable habitat and require comparatively passive management, the successional species face a major threat if their required ecological stage is not continually maintained by some form of active management.

The successional habitats that support this group of fourteen species of special concern in Gettysburg National Military Park and Eisenhower National Historic Site would be included in such vegetation associations such as Agricultural Field/Wet Meadow, Modified Successional Forest, Pasture/Wet Meadow, Successional Old Field, Successional Old Field/Wet Meadow, and Wet Meadow (Perles et al. 2006; Appendix B).

The management practice that is currently utilized in the successional, grassland-type habitats in Gettysburg National Military Park and Eisenhower National Historic Site – mowing in late summer after the main tourist season, and augmented in spring and summer by the chemical (e.g., spot-herbicide) and/or mechanical control of woody plants that resist the mowing - appears to have been effective in maintaining these habitats and the plant species of special concern that require these habitats. Based on observations by PNHP from 1991 through 2005, such species as hoary frostweed, grass-leaved rush, short-fruited rush, Heller's panic grass, and pencilflower have all continued to thrive at the locations where they were originally found by PNHP, and in the cases of the two rush species have even spread into new areas, apparently due in large part to the mowing and woody plant control, as well as the natural dispersal ability of the species (PNHP 2006).

Several of the species of special concern that occur in these successional habitats – particularly Heller's panic grass, smooth beardtongue, downy phlox, low spearwort, and eastern coneflower - tend to be relatively short-lived as individual plants, yet at the same time balance their longer term survival in a given area by being successful in dispersing their fruits or seeds around to establish new individuals within the habitat already occupied, or to disperse themselves around and establish new individuals in previously unoccupied, but suitable, habitats in the vicinity. For these relatively mobile species, the recommended management appears to be a "if the habitat is there, they will come" strategy, which concentrates on maintaining the proper habitat or successional stage that the species currently occupy or could potentially occupy, and allowing

the dispersal ability of the species to display itself, as opposed to emphasizing the year-to-year survival of individual plants that tend to be short-lived by nature.

In summary, based on observations by PNHP over the past fifteen years and a consideration of the life history of the species, it is recommended that the management regime of annual mowing and associated woody plant control that is currently utilized for the successional, grassland-type habitats in Gettysburg National Military Park and Eisenhower National Historic Site be continued. The annual mowing of these habitats is suggested because this schedule appears to be established as the norm, and in general the native species have responded well; however, a more infrequent mowing, such as every other year or every few years, would probably not be harmful to the vegetation as long as woody plant control is continued annually. It is suggested that the mowing be postponed from its current late summer time (more-or-less after the peak of the tourist season) until after the first heavy frost or first freeze has killed the herbaceous vegetation (typically mid October to early November). This change in the mowing schedule allows some of the later-flowering herbaceous species of these habitats, particularly members of the aster family, the opportunity to mature their fruits or seeds.

Grazing by cattle in some of the successional, grassland habitats that support species of special concern, such as the Slyder Farm area and the Sedgwick Avenue Meadow, has been utilized in the past and is not discouraged in the future, as long as the grazing is occasional and not permanently damaging to the vegetation. The grazing of sheep or goats would not be recommended.

Although the mowing and supplemental woody plant control appear to have been effective in maintaining the proper successional stage for these species of special concern, a major additional threat to the species and their habitat is posed by exotic and weedy native herbaceous species, particularly a few species of aggressively invasive grasses, that thrive in the grassland-type habitats. Especially noteworthy are two exotic species – stilt grass (*Microstegium vimineum*) and small carpgrass (*Arthraxon hispidus*) -and the native reed canary grass (*Phalaris arundinacea*). Based on observations by PNHP, the populations of the former two species seemed to increase greatly from 2004 to 2005, and certainly were more abundant than fifteen years ago, in the various grassland-type habitats in the Plum Run Valley from United States Avenue south to The Wheatfield and Little Round Top. The control of invasive species, especially the three species mentioned above, is important not only in maintaining the occurrences of the species of special concern, but also in maintaining the impressive native species diversity that these grassland-type habitats currently exhibit.

When controlling woody plants and invasive species with the use of chemicals in areas where species of special concern occur, it is suggested that the applicators schedule their work during the time of year when the species of special concern are most recognizable – generally flowering and fruiting time – so that possible damage to the species of special concern is lessened. The applicators should also be familiar with the morphological features of the major invasive species.

The control of the white-tailed deer population in Gettysburg National Military Park and Eisenhower National Historic Site has been a management priority for many years, and the continuation of this activity is strongly recommended.

Species of Special Concern

The following section contains a detailed discussion of the twenty-one species of special concern that have been documented currently or historically in Gettysburg National Military Park and Eisenhower National Historic Site. For each species, the topics include a general morphological and habitat description of the species, the global and state distribution and conservation status of the species, and information specific to the occurrence of the species in Gettysburg National Military Park and Eisenhower National Historic Site, including locations, threats, and management recommendations. Following the text, a photograph of the species and a map of the occurrence are included. The species are listed in alphabetical order by scientific name, and the state rarity status and the global and state ranks (current as of January 1, 2006) are included (Appendix A).

Puttyroot; Adam and Eve (*Aplectrum hyemale*; Orchidaceae) PABS Rare; G5 S3

The puttyroot, a member of the orchid family, is characterized by the presence of an elliptically-shaped, conspicuously veined, over-wintering leaf (one leaf is not always equivalent to one individual plant) that is present at ground level, and by an erect, leafless stem to about eighteen inches in height that produces purplish or yellowish flowers that appear in May and June. The species is most often encountered and is most conspicuous in its vegetative condition, and flowering stems are somewhat unpredictable from year to year (Figure 2).

The species grows in forests, particularly in rich soils derived from diabase, limestone, and schist.

The puttyroot has a wide ranging distribution in eastern North America. In Pennsylvania, most of the historical records occur in the southern half of the state, particularly the southeastern counties (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the puttyroot is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Delaware, New Jersey, and New York. In Pennsylvania, the puttyroot currently has a Rare status, as the species has been documented by PNHP at several dozen extant occurrences, and although the populations tend to be relatively small, it appears frequent enough and well protected enough not to qualify for an Endangered or Threatened status (NatureServe 2006; PNHP 2006).

The puttyroot had not been documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site prior to 2004. In October 2004, a group of twenty-eight leaves over a twenty-five square foot area was discovered at the western base of Big Round Top, just west of Plum Run. In April 2005, a larger group of approximately 150 leaves, over a one hundred feet by fifty feet area, was found farther upslope on Big Round Top and bordering the east side of South Confederate Avenue (Figure 3). Taken together, these two colonies represent one of the larger occurrences (based on the number of over-wintering leaves) of puttyroot currently known to PNHP in Pennsylvania (PNHP 2006).

Both puttyroot colonies were growing in hardwood forest dominated by species of *Quercus* and *Carya*, and with the conspicuous presence of diabase boulders. The vegetation association at both colonies has been classified as Dry Oak-Mixed Hardwood Forest (Perles et al. 2006).

Additional occurrences of puttyroot may be present elsewhere in Gettysburg National Military Park, particularly in forested areas of Little Round Top and Culps Hill.

A portion of the colony of the puttyroot along South Confederate Avenue was situated at the interface of the forest and a mowed grassy strip that borders the east side of the avenue. This portion of the colony could be threatened if the width of the mowed area were increased a few feet beyond its current size. This situation was shown to Zach Bolitho, Natural Resource Specialist, in June 2005.

Otherwise, the two puttyroot colonies did not appear to have any imminent threats from exotic plant species, browsing by deer, or impacts from tourists.

This species appears to have minimal and rather passive management requirements. It is recommended that the forest cover be maintained at the two colonies, as long as the presence of the forest is compatible with the NPS goal of simulating the 1863 appearance of the area. The mowed strip along South Confederate Avenue, which is immediately adjacent to a portion of the one colony, should be retained at its current width. The puttyroot colonies should be monitored at least every two years to check on the encroachment of exotic species, and if necessary, the exotics should be controlled.



Figure 2. Puttyroot (*Aplectrum hyemale*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

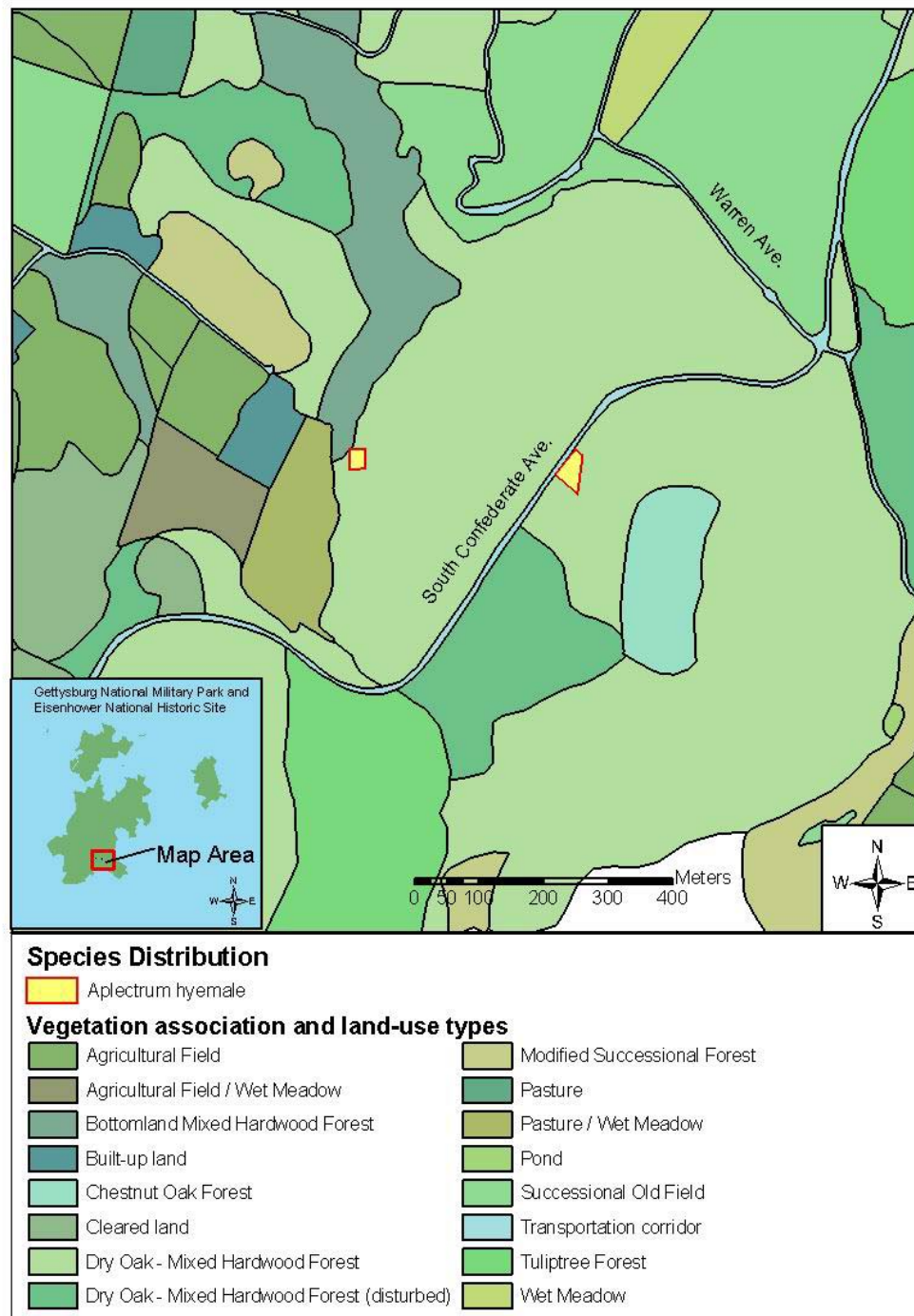


Figure 3. Species distribution of puttyroot (*Aplectrum hyemale*).

Kalm's brome grass; Arctic brome (*Bromus kalmii*; Poaceae) PABS Undetermined; G5 S3

Kalm's brome grass, a member of the grass family, is characterized by its slender stems that may reach three feet in height, and by its hairy spikelets and drooping inflorescence that are present in June and July, but can be separated with certainty from other species of the genus *Bromus* (several of which occur in Gettysburg National Military Park and Eisenhower National Historic Site) only by more microscopic, technical features (Figure 4).

The species grows in a variety of habitats, usually sunny areas such as openings, barrens, thickets and immature forests, particularly in soils derived from limestone, dolomite, and diabase.

Kalm's brome grass has a distribution in northeastern and northcentral North America. In Pennsylvania, the historical records are scattered more-or-less throughout the state (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although Kalm's brome grass is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania and the neighboring states of Maryland and New Jersey. In Pennsylvania, the species currently has an Undetermined status, which means that although the species appears to be deserving of being a species of special concern, more information is required before a more definitive status can be assigned. At present, six extant occurrences have documented by PNHP in the state, but much more field work remains to be done (NatureServe 2006; PNHP 2006).

Kalm's brome grass was first documented by PNHP (although the species was not then considered to be a species of special concern) in the former Welcome Traveler campground in June 1996. In July 2001, after the species became a species of special concern, the occurrence was confirmed again by PNHP, with approximately twenty fruiting stems being present. In July 2004, as part of the present project, the occurrence was confirmed again, with seven fruiting stems being present over approximately one hundred square feet (Figure 5).

The species grew with a variety of other herbaceous plants in a successional forest with scattered red-cedar (*Juniperus virginiana*) and hardwood trees, and a diabase substrate. The vegetation association at this occurrence has been classified as Modified Successional Forest (Perles et al. 2006).

There would appear to be suitable habitat for Kalm's brome grass elsewhere in the former campground, as well as possibly at other sites in Gettysburg National Military Park and Eisenhower National Historic Site, such as Pardee Field.

This small occurrence of Kalm's brome grass was greatly threatened by competing vegetation, such as stilt grass (*Microstegium vimineum*), native herbaceous species such as goldenrod (*Solidago* spp.), and woody plants. The increase in the abundance and density of these competing species have changed the appearance of this habitat at the Welcome Traveler campground very markedly from 2001 to 2004.

The occurrence did not appear to have any threats from deer browsing or impacts from tourists.

The Welcome Traveler campground did not appear to have been mowed for several years, possibly to allow the area to revert to forest in order to simulate its appearance in 1863; however, if the tract is to be maintained as a grassland-type area, then the mowing schedule that is utilized at the other grassland-type habitats in Gettysburg National Military Park and Eisenhower National Historic Site should be started in 2006. Until the mowing begins, and if time and budget allow, spot-herbiciding or mechanical removal of exotic species and aggressive native species in the immediate vicinity of the brome grass is recommended.



Figure 4. Kalm's brome grass (*Bromus kalmii*). Photograph by William Gleason; taken in Gettysburg National Military Park.

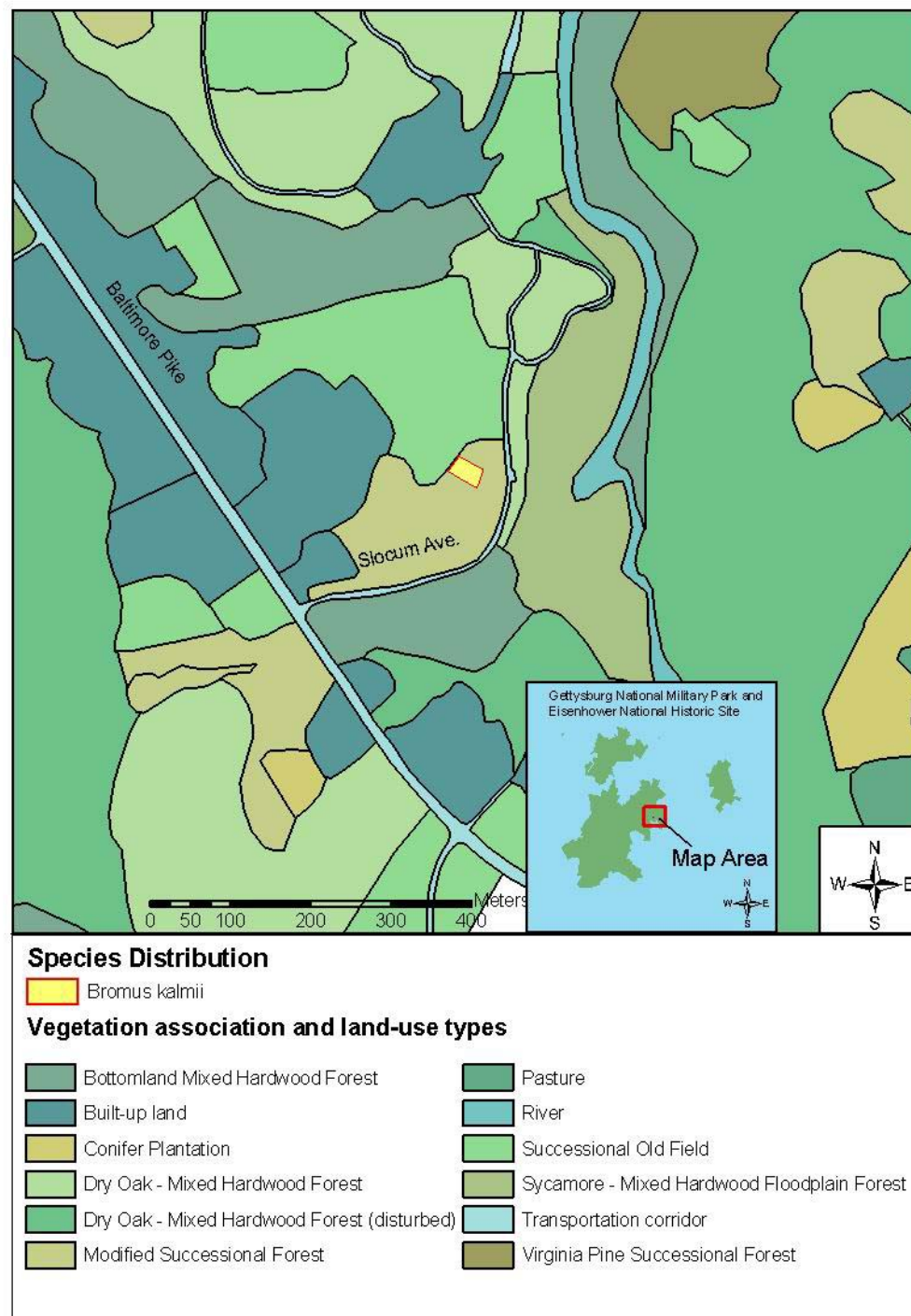


Figure 5. Species distribution of Kalm's brome grass (*Bromus kalmii*).

Brown sedge; Buxbaum's sedge (*Carex buxbaumii*; Cyperaceae) PABS Rare; G5 S3

The brown sedge, a member of the sedge family, is characterized by its colonial growth habitat and stems to three feet in height, by the narrow, grass-like leaves, and by the erect, short-cylindrical fruiting clusters that are present mostly in June and July, but can be separated with certainty from other species of the genus only by more microscopic, technical characters (Figure 6).

The species typically inhabits open, permanently or seasonally damp/wet meadows and old fields, but may be found in open forested situations where seasonal pools of water tend to occur. The brown sedge appears to have a preference for substrates of limestone and diabase.

The brown sedge has a large transcontinental distribution across North America. In Pennsylvania, the historical records are scattered mostly in the southern half of the state (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the brown sedge is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Delaware, Maryland, New Jersey, New York, and West Virginia. In Pennsylvania, the species currently has a Rare status, as it has been documented by PNHP at nearly twenty extant occurrences, and it appears frequent enough and well protected enough not to qualify for a PE or PT status (NatureServe 2006; PNHP 2006).

The brown sedge had not been documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site prior to 2004, although the species was a definite possibility to be present because of the type of habitat available and the occurrence of the species elsewhere in Adams County and adjoining Franklin County (Table 2). In June 2005, several colonies were discovered in The Wheatfield and in the meadow at the western base of Little Round Top ("Crawford Avenue East"), and also near Slyder Farm (Figure 7). A total of approximately 350 fertile stems, with many hundreds of additional vegetative stems probably also present (the latter are difficult to identify with certainty), were observed in the collective colonies, with most of the plants occurring in The Wheatfield. Taken together as one occurrence in the PNHP methodology, this brown sedge occurrence represents one of larger occurrences of the species known to PNHP in Pennsylvania (PNHP 2006).

The habitats at The Wheatfield and Little Round Top were very typical for the species, consisting of graminoid and herb dominated meadows and old fields, which were diverse in species and possessed a seasonally to permanently damp/wet, diabase-derived substrate. The vegetation associations here have been classified as Successional Old Field and Wet Meadow, respectively (Perles et al. 2006). The habitat at the colony near Slyder Farm was more unusual for the species, consisting of an open forest with seasonal, very shallow "pools" of standing water, and was classified as Bottomland Mixed Hardwood Forest and Dry Oak-Mixed Hardwood Forest (Perles et al. 2006). This forest colony may have been established from fruits that were deposited here from the larger occurrences upstream.

A major threat to The Wheatfield and Little Round Top colonies of this species – succession toward a habitat more dominated by woody plant species – has been greatly lowered by the annual mowing schedule and the spot-herbiciding or mechanical control of woody plants. There remains the problem of controlling invasive, exotic species such as stilt grass (*Microstegium vimineum*) and small carpgrass (*Arthraxon hispidus*), and to a lesser extent reed canary grass (*Phalaris arundinacea*), which constitute a major threat to these grassland-type habitats.

The Slyder Farm colony also had a long-term threat from exotic species, primarily Japanese barberry (*Berberis thunbergii*), multiflora rose (*Rosa multiflora*), and stilt grass (*Microstegium vimineum*).

The colonies of brown sedge did not have any threats from deer browsing or impacts from tourists.

The general practice of mowing the open grassland and meadow habitats in Gettysburg National Military Park and Eisenhower National Historic Site in late summer after the main tourist season, and augmented in spring and summer by the spot-herbiciding of woody plants that resist the mowing, would appear to be beneficial for the brown sedge and its habitat. It is recommended that this management activity be continued, with the suggestion that the mowing be done several weeks later in the year (typically mid October or early November), after the first heavy frost or first freeze has killed the herbaceous vegetation.

The control of the invasive species mentioned above is strongly recommended at all colonies of the brown sedge.



Figure 6. Brown sedge (*Carex buxbaumii*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

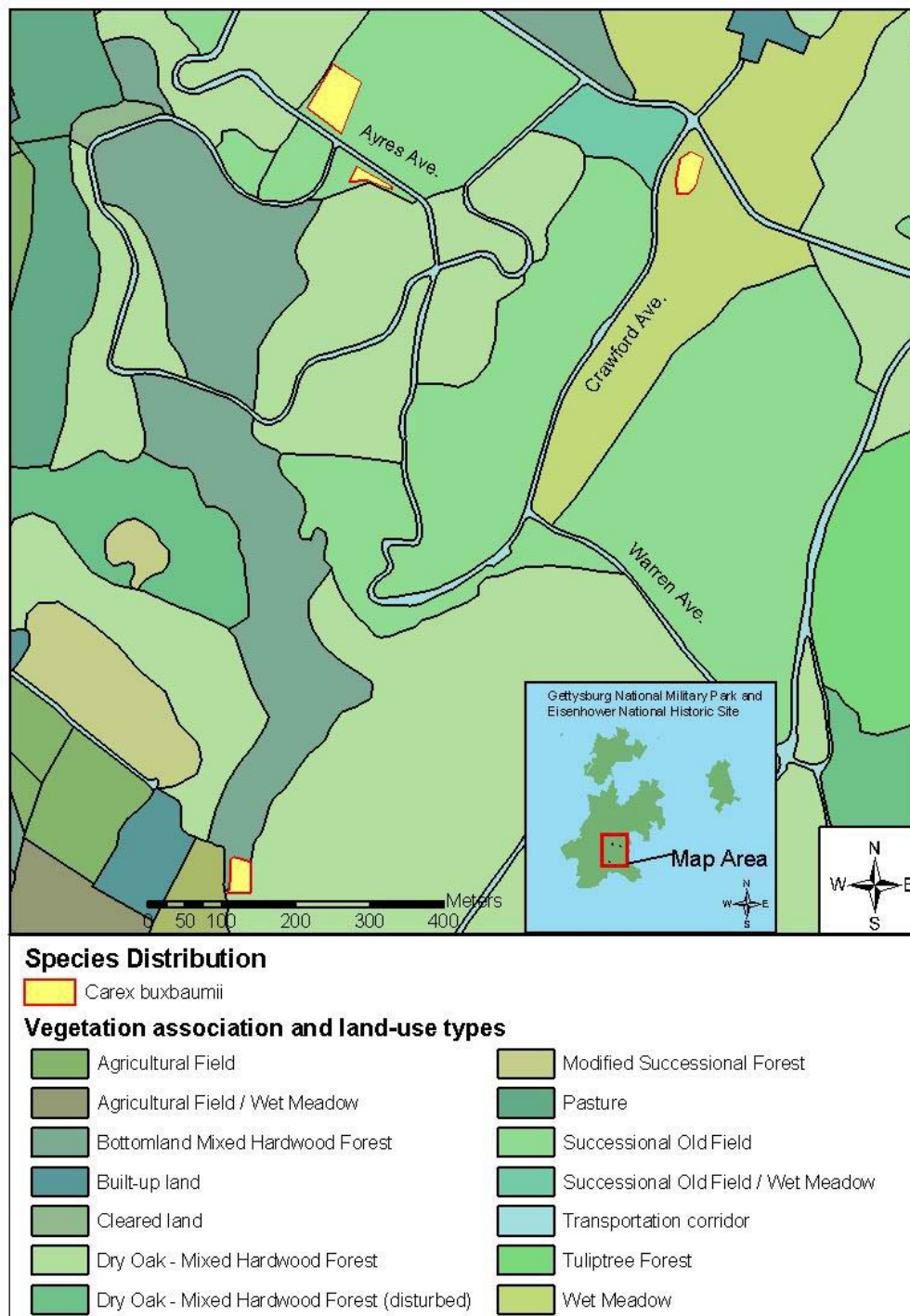


Figure 7. Species distribution of brown sedge (*Carex buxbaumii*).

Short's sedge (*Carex shortiana*; Cyperaceae) PABS Rare; G5 S3

Short's sedge, a member of the sedge family, is characterized by its tufted growth habit and stems to two feet in height, by the narrow, grass-like leaves, and by the densely-cylindrical and erect fruiting clusters that are present mostly in June, but can be separated with certainty from other species of the genus only by more microscopic, technical characters (Figure 8).

The species grows in a great variety of habitats, from grasslands and meadows to forested areas, typically in moist to somewhat wet soils derived from limestone, shale and diabase.

Short's sedge has a distribution that is centered in the Ohio and Mississippi drainage in midwestern North America. In Pennsylvania, where it appears to be at the northeastern edge of its range, with the historical records being concentrated in the southcentral and southwestern parts of the state (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although Short's sedge is not considered to be of conservation concern on a global basis and does not have a federal status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Maryland, New York, and West Virginia. It has not been documented from Delaware and New Jersey. In Pennsylvania, the species currently has a Rare status, as it has been documented by PNHP at about one dozen extant occurrences and it appears frequent enough and well protected enough not to qualify for a PE or PT status. It has also shown an ability to thrive in certain types of human-created disturbances, such as meadows and pastures that are not intensively grazed (NatureServe 2006; PNHP 2006).

Short's sedge had not been documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site prior to 2004, although the species was a definite possibility to be present because of the type of habitat available and the occurrence of the species in adjoining Cumberland and Franklin counties (Table 2). In June 2005, two vigorous individuals of the species were discovered growing side-by-side in the Slyder Farm area (figure 9).

The two plants were growing in open, disturbed ground, primarily with exotic species, just east of and outside of the fence that surrounds a pastured area. The site appeared to be mowed annually. The vegetation association was classified as Pasture/Wet Meadow (Perles et al. 2006).

There is much suitable habitat for Short's sedge elsewhere in Gettysburg National Military Park and Eisenhower National Historic Site, particularly in the grassland-type habitats located between United States Avenue and The Wheatfield and Little Round Top.

This small occurrence of Short's sedge did not appear to have any imminent threats. Exotic species, including multiflora rose, were present, but seemed to be under control due to the annual mowing. As mentioned above, this species has an ability to thrive in certain types of human-created disturbances, such as meadows and pastures that are not intensively grazed, which was exactly the situation at the Slyder Farm occurrence.

The occurrence of Short's sedge did not have any threats from deer browsing or impacts from tourists.

This species would appear to be a beneficiary of the “if the habitat is there, they will come” strategy of management discussed on pages 15-16. As a result, the general practice of mowing the open grassland and meadow habitats in Gettysburg National Military Park and Eisenhower National Historic Site on an annual basis, and augmented in spring and summer by the spot-herbiciding of woody plants that resist the mowing, would appear to promote the type of habitat favored by Short’s sedge. The natural dispersal ability of the species could eventually allow it to inhabit more of these areas. It is recommended that the mowing of these sorts of habitats be done after the first heavy frost or first freeze has killed the herbaceous vegetation (typically late October or early November).

The control of the invasive species mentioned on page 16 is very strongly recommended at these grassland-type habitats.



Figure 8. Short’s sedge (*Carex shortiana*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

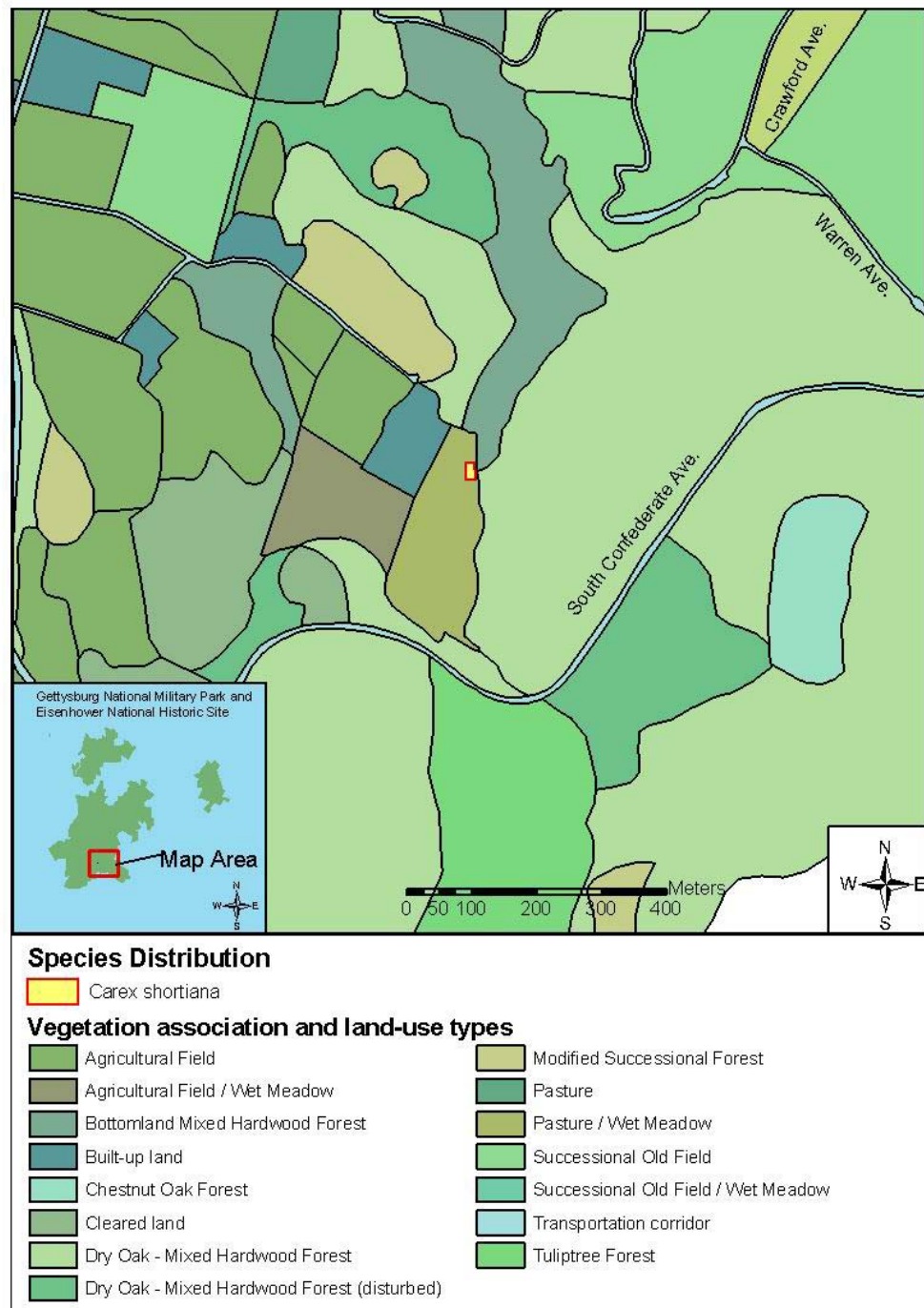


Figure 9. Species distribution of Short's sedge (*Carex shortiana*).

Rigid sedge (*Carex tetanica*; Cyperaceae) PABS Threatened; G4G5 S2

The rigid sedge, a member of the sedge family, is characterized by its colonial growth habit and stems to two feet in height, by the narrow, grass-like leaves, and by the loosely-cylindrical and erect fruiting clusters that are present mostly in June, but can be separated with certainty from other species of the genus only by more microscopic, technical characters (Figure 10).

The species grows in permanently or seasonally damp to wet meadows, old fields, and fens, especially on substrates of limestone and diabase.

The rigid sedge has a wide distribution in eastern North America. In Pennsylvania, the historical records are scattered throughout most of the state except for the more mountainous counties (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the rigid sedge is not considered to be of conservation concern on a global basis, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Maryland and West Virginia. In Pennsylvania, the species currently has a Threatened status, and has been documented by PNHP at about twenty-five extant occurrences. This species has proven to be more frequent than previously believed, because it appears to have a broader habitat tolerance than once thought, and because its resemblance to several other species in the genus *Carex* has caused it to be under-reported by botanists (NatureServe 2006; PNHP 2006).

The rigid sedge had not been documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site prior to 2004, although the species was a possibility to be present because of the habitat available and the occurrence of the species elsewhere in Adams County and surrounding counties (Table 2). In June 2005, several colonies of the species were discovered in various parts of the Plum Run watershed, more specifically in the grasslands between United States Avenue and Little Round Top, and at Slyder Farm (Figure 11). A total of several hundred fertile stems, with more than one thousand vegetative stems probably present (the latter are difficult to identify), were observed in total at the various colonies, with the two largest colonies being located between United States Avenue and Wheatfield Road.

The habitats at all locations were very typical for the species, consisting of graminoid and herb dominated meadows, which were diverse in species and had a permanently or seasonally wet, diabase-derived, substrate. The vegetation associations at the colonies have been classified as Agricultural Field/Wet Meadow, Pasture/Wet Meadow, and Wet Meadow (Perles et al. 2006).

A major threat to the colonies of this species - succession toward a habitat more dominated by woody plant species - has been greatly lowered by the annual mowing schedule and the spot-herbicide and mechanical control of woody plants. There remains the problem of controlling invasive, exotic species such as stilt grass (*Microstegium vimineum*), small carpgrass (*Arthraxon hispidus*), and to a lesser extent the weedy native reed canary grass (*Phalaris arundinacea*), which constitute an increasing threat to these grassland-type habitats.

The occurrence of the rigid sedge did not have any threats from deer browsing or impacts from tourists.

The general practice of mowing the open grassland and meadow habitats in Gettysburg National Military Park and Eisenhower National Historic Site in late summer or early fall after the main tourist season, and augmented in spring and summer by the spot-herbiciding/mechanical control of woody plants that resist the mowing, would appear to be beneficial for the rigid sedge and its habitat. It is recommended that this management activity be continued, with the suggestion that the mowing be done several weeks later in the year (typically late October or early November), after the first heavy frost or first freeze has killed the herbaceous vegetation.

The control of the invasive species mentioned above is strongly recommended at all colonies of the rigid sedge.



Figure 10. Rigid sedge (*Carex tetanica*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

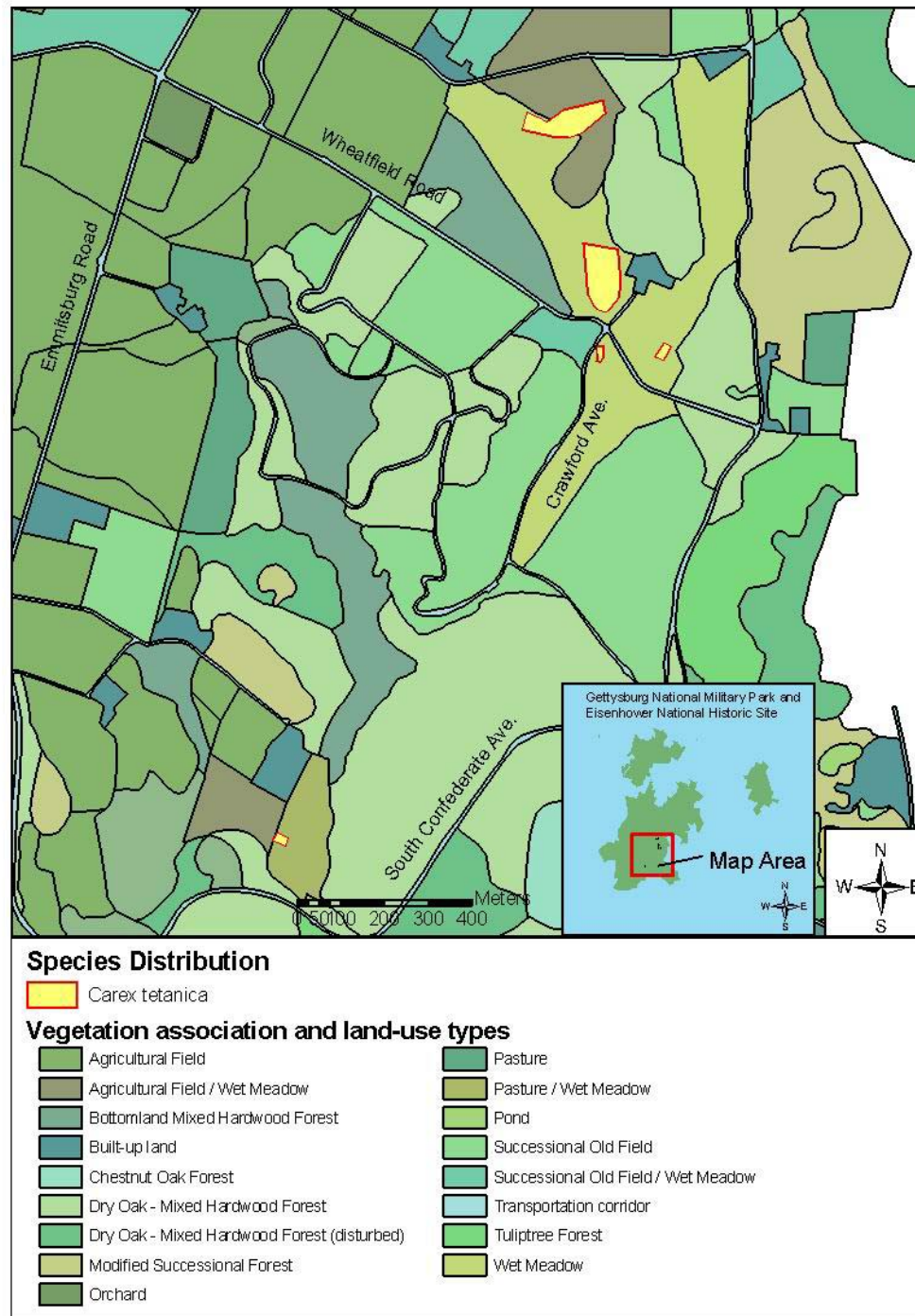


Figure 11. Species distribution of rigid sedge (*Carex tetanica*).

Yellow lady's-slipper (*Cypripedium pubescens*; Orchidaceae) PABS Vulnerable; G5 S3S4

The yellow lady's-slipper, a member of the orchid family, is characterized by an erect stem to about three feet in height, by the alternately arranged, hairy, entire leaves with prominent venation, and by the yellow flower, usually solitary on each stem and appearing in late April and May, that has the lower petal greatly enlarged and inflated in the form of a slipper (Figure 12).

The species grows in forests, particularly on rich slopes with soil derived from limestone or diabase.

The yellow lady's-slipper has a very wide distribution in eastern North America. In Pennsylvania, the historical records are scattered throughout the state (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the yellow lady's-slipper is not considered to be of conservation concern on a global basis, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Delaware and New Jersey. In Pennsylvania, the species currently has a Vulnerable status, and has been documented by PNHP at several dozen occurrences. The reason for the state rarity status of Vulnerable results from the desirability of the species for purposes of gardening and cultivation, and the practice of exploiting wild populations to fill this demand rather than obtaining the plants from nursery-grown sources (NatureServe 2006; PNHP 2006).

The yellow lady's-slipper was first documented by PNHP in 1997 in Gettysburg National Military Park and Eisenhower National Historic Site on the lower east slope of Culp's Hill, north of Spangler's Spring (Figure 13). This occurrence consisted in 1997 of three stems – probably a single individual - and had four stems when its presence was confirmed in 2004 and 2005. The photograph shown in Figure 12 was not taken in Gettysburg National Military Park and Eisenhower National Historic Site.

The habitat of this species consisted of a mixed hardwood forest with diabase outcroppings, and was classified as belonging to the Dry Oak-Mixed hardwood Forest vegetation association (Perles et al. 2006).

Additional habitat exists for this species elsewhere in Gettysburg National Military Park and Eisenhower National Historic Site, such as the forested areas of Little Round Top and Big Round Top.

The yellow lady's-slipper, although currently known from a single individual, did not appear to be facing any imminent threats. Although some exotic plant species were present at the occurrence, these plants had been treated with herbicide in 2004 and appeared to be under control for the moment.

This occurrence could potentially be threatened by browsing by deer (particularly the eating of the flowers) or the digging of the plant by gardeners.

The yellow lady's-slipper, a forest plant, appears to have minimal management requirements. The primary recommendation would be to retain the forest cover at the occurrence, as long as the

presence of the forest is compatible with the NPS goal of simulating the 1863 appearance of the area, which appears to be the case at this woodlot.

Because of the proximity of the plant to East Confederate Avenue and the distinctive appearance of the species, it is recommended that the occurrence be monitored annually by NPS staff during flowering time to detect possible impacts from exotic species or browsing by deer. In the case of the latter, which has been observed by PNHP at other occurrences of the species in eastern Pennsylvania, the protection of the plant by use of a small amount of fencing might be considered.



Figure 12. Yellow lady's-slipper (*Cypripedium pubescens*). Photograph by John Kunsman; taken in Juniata County, PA.

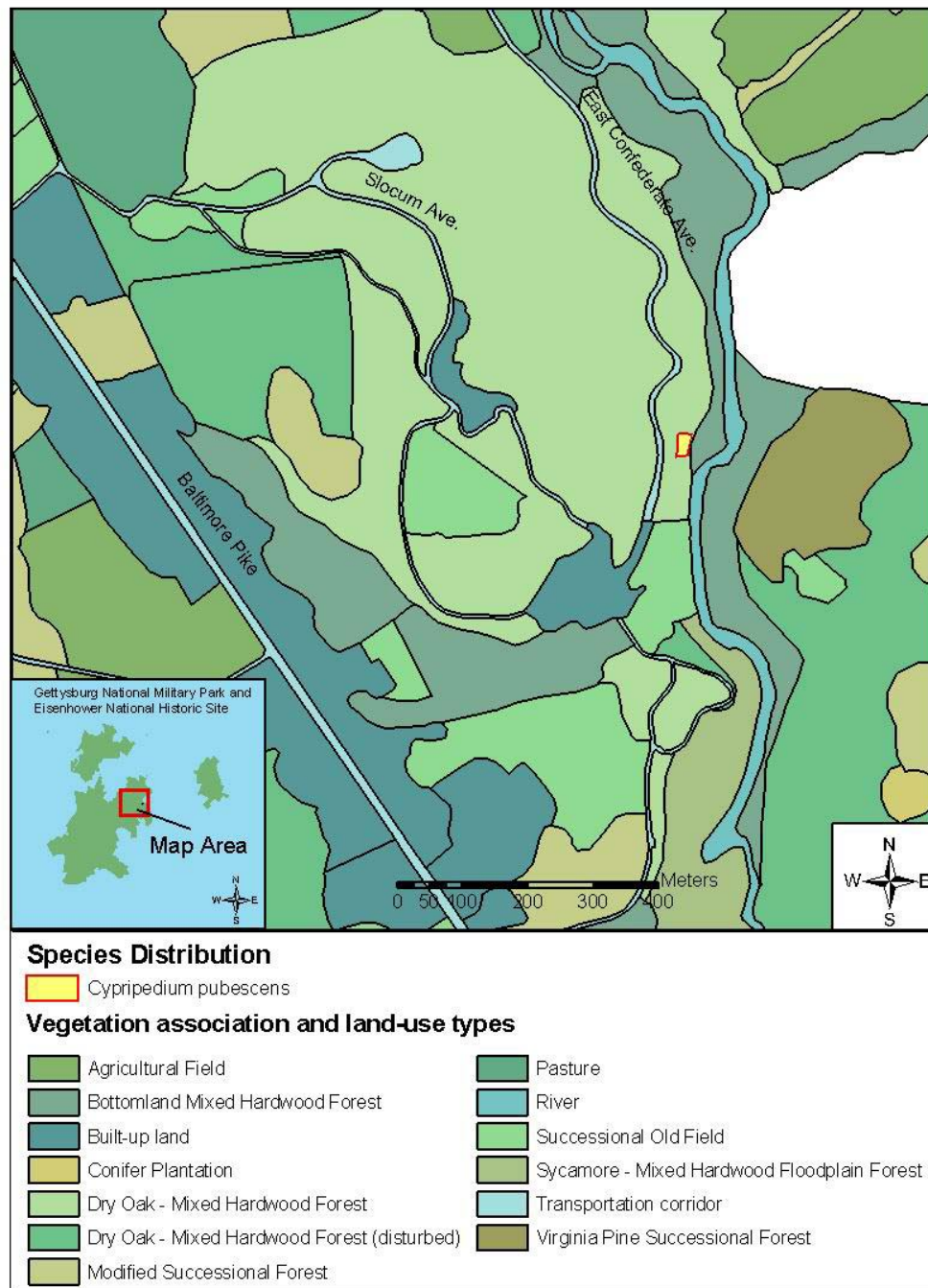


Figure 13. Species distribution of yellow lady's-slipper (*Cypripedium pubescens*).

Hoary frostweed; Bicknell's hoary rockrose (*Helianthemum bicknellii*; Cistaceae) PABS
Endangered; G5 S2

The hoary frostweed, a member of the rockrose family, is characterized by slender stems growing to about one foot high, by the small, alternately arranged, hairy leaves, by the yellow, five-petaled flowers that are present in June and July, and by the capsular fruits that are clustered in the leaf axils. Except for the brightly-colored, but small and ephemeral, flowers, this species can be very inconspicuous and very easy to overlook (Figure 14).

The species grows in dry, usually open, places, such as rock outcrops, exposed banks, sunny slopes, barrens, and open forests, where the soil is generally thin and subject to dryness.

The hoary frostweed has a wide distribution in midwestern and eastern North America. In Pennsylvania, the historical records are widely scattered throughout the state (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the hoary frostweed is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Delaware, Maryland, New Jersey, Ohio, and West Virginia. In Pennsylvania, the species currently has an Endangered status, and has been documented by PNHP at fewer than ten extant occurrences. The possibility remains that the species may be more common than currently believed, because of its inconspicuous habit (NatureServe 2006; PNHP 2006).

The hoary frostweed was first documented by PNHP in 1991 in Gettysburg National Military Park and Eisenhower National Historic Site on the upper slope on the east side of Pardee Field (Figure 15). This occurrence was updated by PNHP in 1994, 1996, and again in 2004, and during this period of time consistently maintained a population of several hundred stems. This occurrence appears to be one of the largest and most viable occurrences of the species known to PNHP in the state (PNHP 2006).

The habitat at Pardee Field consisted of a dry, open, old field type habitat, characterized by a thin soil (occasionally with outcroppings of diabase bedrock) and relatively low-growing herbaceous and graminoid plants. The area appeared to receive an annual mowing in late summer. The vegetation association has been classified as Successional Old Field (Perles et al. 2006).

The main threat to this species appeared to be the establishment and spread of woody plants, primarily native species, that were not controlled by the annual mowing.

Unlike the successional grassland habitats that occur on seasonally or permanently wet soils (e.g., wet meadows), the successional grassland habitats that occur on well-drained soils, such as Pardee Field, appeared to have a lower threat from exotic species.

The occurrence of the hoary frostweed did not have any threats from deer browsing or impacts from tourists.

The current management of Pardee Field, consisting of mowing in the late summer after the peak of the tourist season, and augmented in spring and summer by the spot-herbiciding/mechanical removal of woody plants that resist the mowing, has appeared to have been very effective in maintaining the occurrence of the hoary frostweed, as well as the surrounding vegetation association, for many years. It is recommended that the annual mowing schedule and the spot-herbiciding of woody plants be continued, with the suggestion that the mowing be postponed until after the first killing frost of the autumn (typically late October or early November).



Figure 14. Hoary frostweed (*Helianthemum bicknellii*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

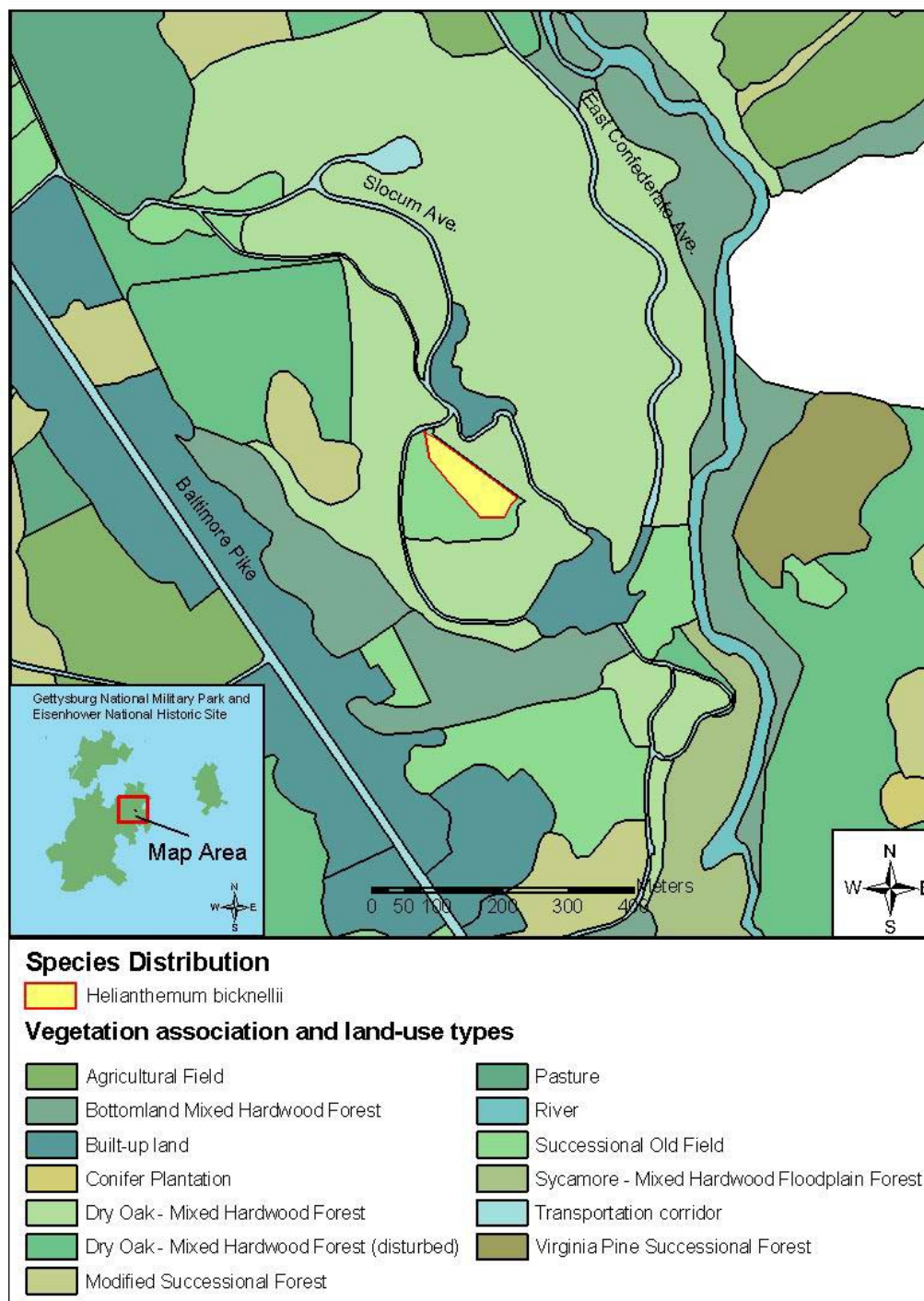


Figure 15. Species distribution of hoary frostweed (*Helianthemum bicknellii*).

Grass-leaved rush; bog rush (*Juncus biflorus*; Juncaceae) PABS Threatened; G5 S2

The grass-leaved rush, a member of the rush family, is characterized by its colonial growth habit with stems growing to about three feet in height, by the flat, grass-like leaves, and by the terminal clusters of small, reddish-brown capsule-like fruits that are most prominent in summer and early fall (Figure 16).

The species grows in permanently or seasonally damp or wet, open places, and seems to have an affinity for diabase-derived soil and certain types of soil disturbance. It often grows in association with another species of special concern, the short-fruited rush (*Juncus brachycarpus*). Both of these rush species appear to be somewhat short-lived, successional species, and individual plants may not persist for more than a few years even under optimal conditions.

The grass-leaved rush has a wide distribution in eastern North America. In Pennsylvania, it can be considered a southerly species, with the historical records being confined to the southcentral and southeastern counties (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the grass-leaved rush is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of New York and West Virginia. In Pennsylvania, the species currently has a Threatened status, as it has been documented by PNHP at fewer than twenty occurrences. Recent field work in the state by PNHP and collaborators has cast some doubt on the current rarity status of the species, however, because of the increasing number of occurrences that have been discovered, and the ability of the species to disperse itself around to colonize new areas, including areas disturbed by certain types of human activity (NatureServe 2006; PNHP 2006).

The grass-leaved rush was first documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site in 1991 in the Sedgwick Avenue Meadow, located north of Wheatfield Road and west of Sedgwick Avenue. This colony was updated by PNHP in 1994. In 2004 and 2005, this colony was seen again, and had obviously increased in size in the ten years since the previous update; in addition, several new colonies were observed in The Wheatfield, other parts of the Plum Run Valley, and Pardee Field (Figure 17). Over two thousand fruiting stems of grass-leaved rush were observed in total at the various colonies, making the occurrence of the species in Gettysburg National Military Park and Eisenhower National Historic Site one of the largest known to PNHP in the state (PNHP 2006).

The habitat was similar at all of the colonies, consisting of grassland or meadow that received abundant sunlight, had a seasonally or permanently wet substrate, and associated vegetation consisting of graminoid and herbaceous species. The vegetation associations at grass-leaved rush colonies were classified as Successional Old Field, Wet Meadow, and Successional Old Field/Wet Meadow (Perles et al. 2006).

A major threat to the colonies of this species - succession toward a habitat more dominated by woody plant species – has been greatly lowered by the annual mowing schedule and the spot-

herbiciding/mechanical removal of woody plants. There remains the problem of controlling invasive, exotic species such as stilt grass (*Microstegium vimineum*), small carpgrass (*Arthraxon hispidus*), and to a lesser extent the weedy native reed canary grass (*Phalaris arundinacea*), which constitute an increasing threat to these grassland-type habitats.

The occurrence of the grass-leaved rush did not have any threats from deer browsing or impacts from tourists.

This species would appear to be a beneficiary of the “if the habitat is there, they will come” strategy of management discussed on pages 15-16. As a result, the general practice of mowing the open grassland and meadow habitats in Gettysburg National Military Park and Eisenhower National Historic Site in late summer or early fall after the main tourist season, and augmented in spring and summer by control of woody plants that resist the mowing, has appeared to be very beneficial for the grass-leaved rush and its habitat. It is recommended that this management activity be continued, with the suggestion that the mowing be done several weeks later in the year (typically late October or early November), after the first heavy frost or first freeze has killed the herbaceous vegetation.

The control of the invasive species mentioned above is strongly recommended at all colonies of the grass-leaved rush.



Figure 16. Grass-leaved rush (*Juncus biflorus*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

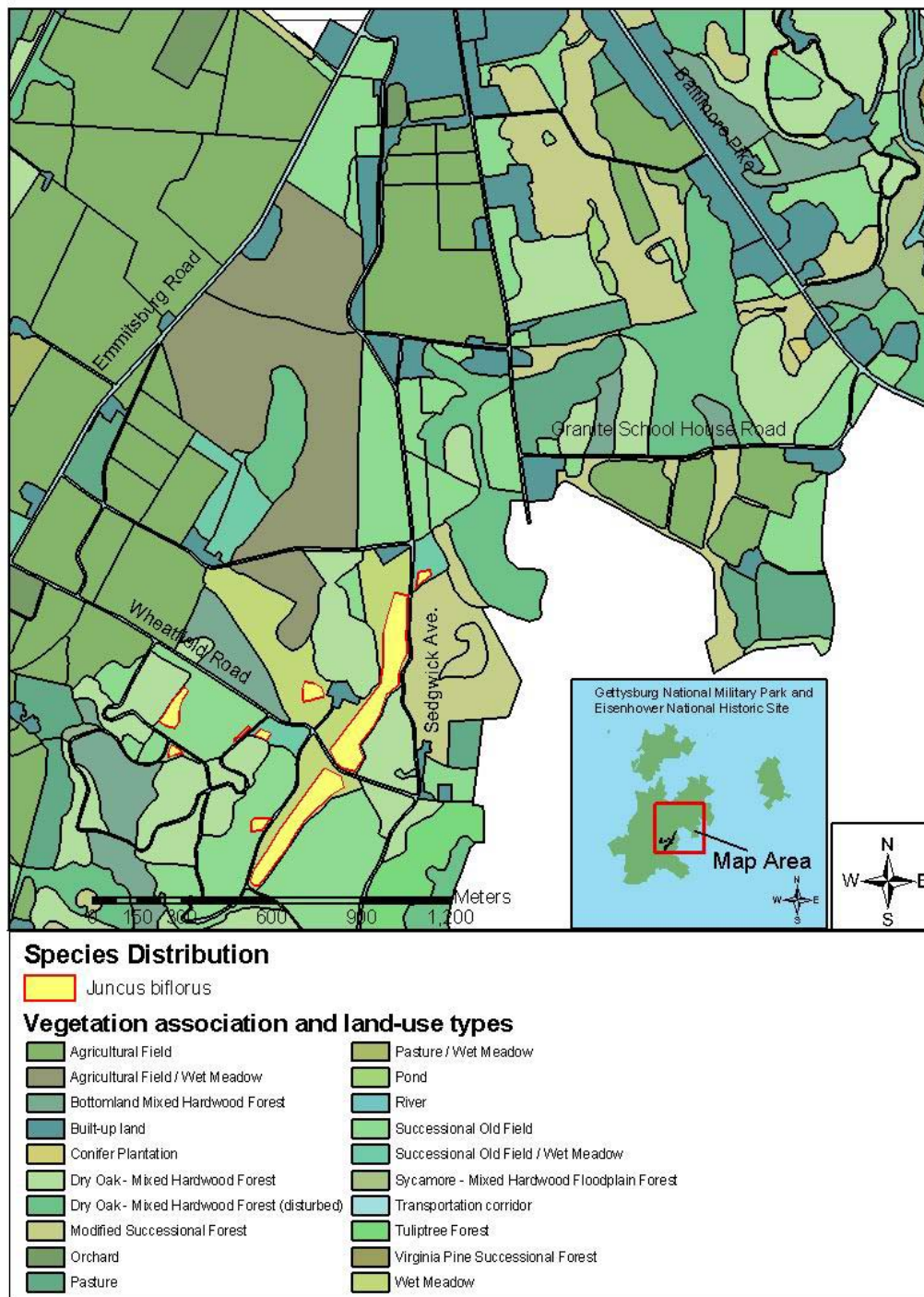


Figure 17. Species distribution of grass-leaved rush (*Juncus biflorus*).

Short-fruited rush; whiteroot rush (*Juncus brachycarpus*; Juncaceae) PABS Endangered; G4G5 S1

The short-fruited rush, a member of the rush family, is characterized by its colonial growth habit with stems growing to about three feet in height, by the narrow, grass-like leaves, and by the terminal clusters of small, bur-like, capsule-like fruits that are most prominent in summer and early fall (Figure 18).

The species grows in permanently or seasonally damp or wet, open places, and seems to have an affinity for diabase-derived soil and certain types of soil disturbance. The short-fruited rush often grows in association with another species of special concern, the grass-leaved rush (*Juncus biflorus*). Both of these rush species appear to be somewhat short-lived, successional species, and individual plants may not persist for more than a few years even under optimal conditions.

The short-fruited rush is a wide-ranging species of eastern North America. In Pennsylvania, it is somewhat of a southerly species, with the few current records known to PNHP being restricted to the southcentral counties of Adams, Franklin and York (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the short-fruited rush is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of New Jersey, New York and West Virginia. In Pennsylvania, the species currently has an Endangered status, as it has been documented by PNHP at only three occurrences; however, the successional nature of the species and its ability to colonize areas that have been disturbed by certain types human activity have led some botanists to question this high-ranking status (NatureServe 2006; PNHP 2006).

The short-fruited rush was first documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site in 1987 in the Sedgwick Avenue Meadow, located north of Wheatfield Road and west of Sedgwick Avenue. This occurrence was updated by PNHP in 1994. During the surveys of 2004 and 2005, this original colony was confirmed, and additional colonies were found in The Wheatfield and other parts of the Plum Run Valley (Figure 19). Several hundred fruiting stems were observed in total at the various colonies, the largest being at Sedgwick Avenue Meadow, making this occurrence of short-fruited rush the largest and most viable occurrence known to PNHP in the state (PNHP 2006).

The habitat was similar at all of the colonies, consisting of grassland or meadow that received abundant sunlight, had a seasonally or permanently wet substrate, and predominantly herbaceous vegetation. The vegetation associations at the short-fruited rush colonies were classified as Successional Old Field, Wet Meadow, and Successional Old Field/Wet Meadow (Perles et al. 2006).

A major threat to the colonies of this species - succession toward a habitat more dominated by woody plant species – has been greatly lowered by the annual mowing schedule and the spot-herbiciding/mechanical control of woody plants. There remains the problem of controlling invasive, exotic species such as stilt grass (*Microstegium vimineum*), small carpgrass (*Arthraxon*

hispidus), and to a lesser extent the weedy native reed canary grass (*Phalaris arundinacea*), which constitute an increasing threat to these grassland-type habitats.

The occurrence of the short-fruited rush did not have any threats from deer browsing or impact from tourists.

This species would appear to be a beneficiary of the “if the habitat is there, they will come” strategy of management discussed on pages 15-16. As a result, the general practice of mowing the open grassland and meadow habitats in Gettysburg National Military Park and Eisenhower National Historic Site in late summer or early fall after the main tourist season, and augmented in spring and summer by the control of woody plants that resist the mowing, has appeared to be very beneficial for the short-fruited rush and its habitat. It is recommended that this management activity be continued, with the suggestion that the mowing be done several weeks later in the year (typically late October or early November), after the first heavy frost or first freeze has killed the herbaceous vegetation.

The control of the invasive species mentioned above is strongly recommended at all colonies of the short-fruited rush.



Figure 18. Short-fruited rush (*Juncus brachycarpus*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

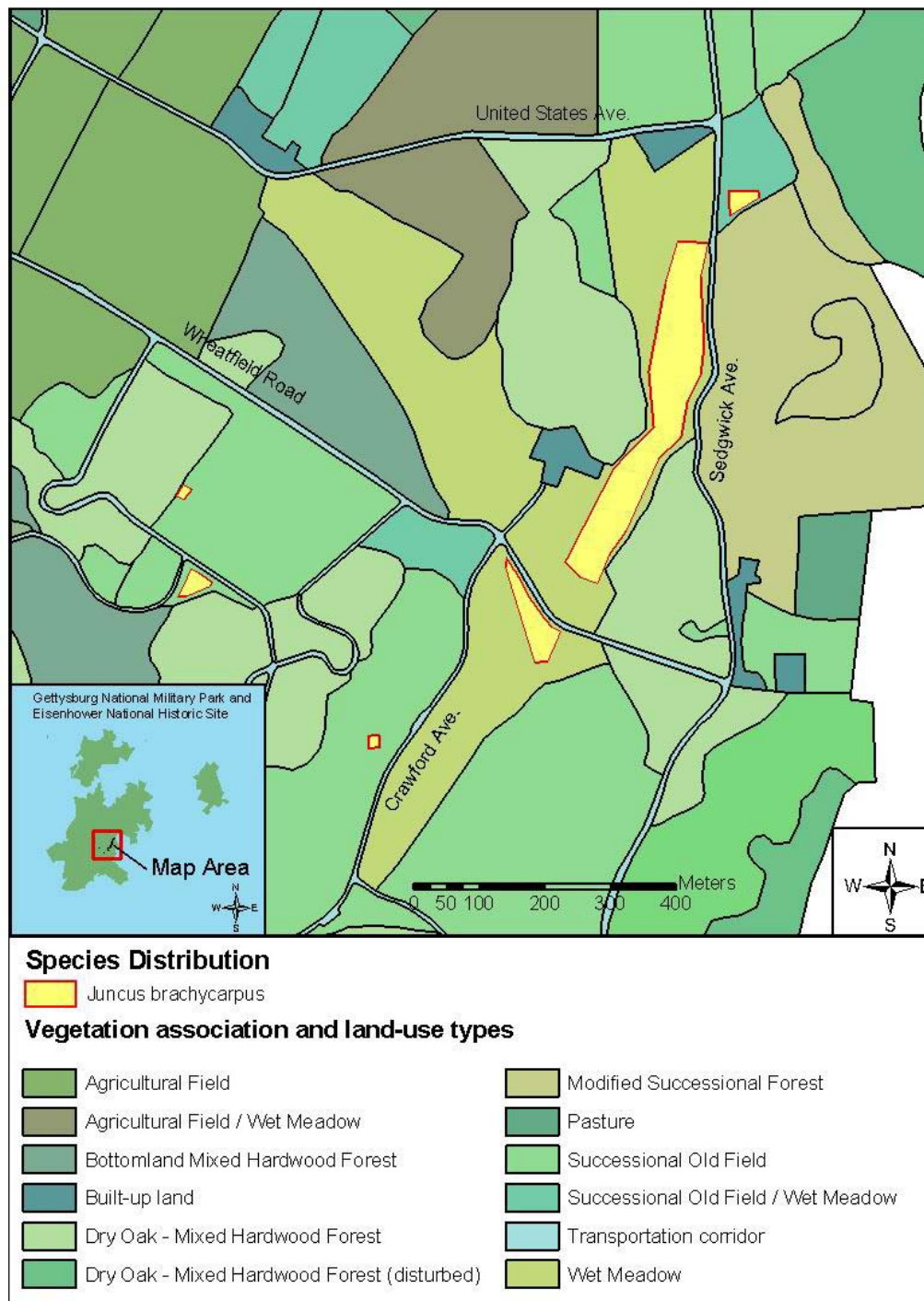


Figure 19. Species distribution of short-fruited rush (*Juncus brachycarpus*).

Hoary puccoon (*Lithospermum canescens*; Boraginaceae) PABS Undetermined; G5 S2

The hoary puccoon, a member of the borage family, is characterized by a hairy stem to about one foot in height, by the alternate, entire and hairy leaves, and by the yellow to orange, five-lobed flowers that appear in a terminal cluster in May (Figure 20).

The species grows on dry, rocky slopes, open woods, and barrens, particularly on limestone and diabase substrates.

The hoary puccoon is a wide-ranging species of eastern North America. In Pennsylvania, the historical records are mostly in the southern half of the state, particularly in the southcentral counties (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the hoary puccoon is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Delaware, New Jersey, New York and West Virginia. In Pennsylvania, the species currently has an Undetermined status, which means that although the species appears to be deserving of being a species of special concern, more information is required before a more definitive status can be assigned. At present, about ten extant occurrences have documented by PNHP in the state, but much additional work is needed (NatureServe 2006; PNHP 2006).

The hoary puccoon had not been documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site prior to 2004. In May 2004, approximately three dozen individuals were discovered in a small opening, covering about eighty feet by forty feet, just west of Pardee Field (Figure 21).

Except for the presence of scattered trees, this opening had a resemblance to the upper slope on the east side of nearby Pardee Field, which supports species of special concern such as the hoary frostweed, Heller's panic grass, and pencilflower, in having a well-drained, thin soil (occasionally with outcroppings of diabase bedrock) and relatively low-growing herbaceous and graminoid plants. The vegetation association at the hoary puccoon occurrence has been classified as Modified Successional Forest (Perles et al. 2006).

Various exotic species were present at this occurrence, but did not appear to represent an imminent threat. Unlike the successional grassland habitats that occur on seasonally or permanently damp/wet soils (e.g, wet meadows), the successional grassland habitats that occur on very well-drained soils appeared to have a lower threat from exotic species.

The occurrence of the hoary puccoon did not have any threats from deer browsing or impacts from tourists.

The small colony of hoary puccoon appeared to be relatively secure for the present because of the slow pace of succession on the very thin soil, but may eventually require some control – chemical or mechanical - of the competing vegetation, particularly shrubs.



Figure 20. Hoary puccoon (*Lithospermum canescens*). Photograph by Greg Podniesinski; taken in Gettysburg National Military Park.

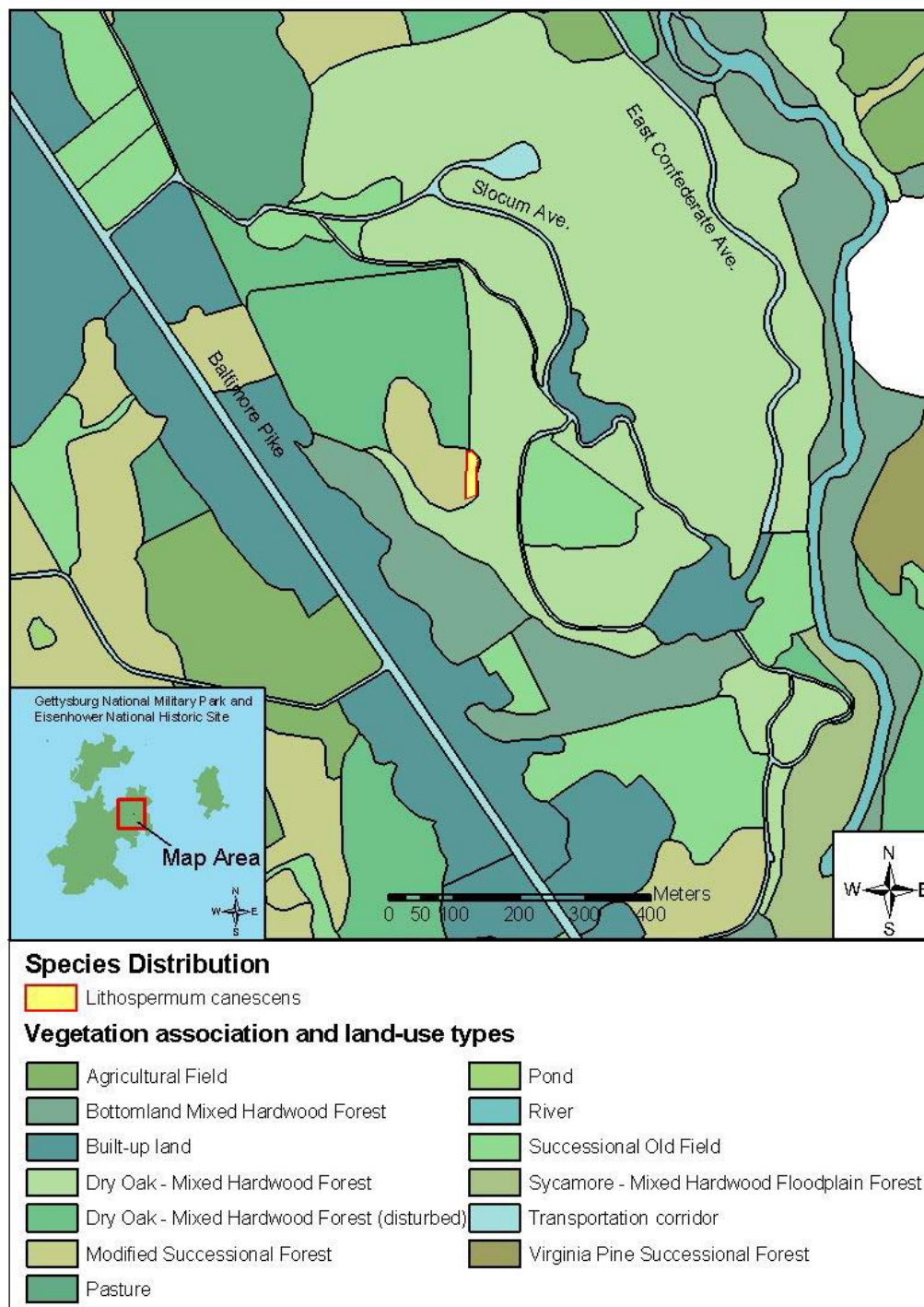


Figure 21. Species distribution of hoary puccoon (*Lithospermum canescens*).

Heller's panic grass; Scribner's rosette grass (*Panicum oligosanthos*; Poaceae) PABS
Undetermined; G5 S3

Heller's panic grass, a member of the grass family, is characterized by its hairy stems to about two feet in height, by its hairy leaves, and by the terminal clusters of small, rounded, prominently-veined spikelets that are most evident in June and July, but can be separated with certainty from other species of the genus *Panicum* – several of which occur in Gettysburg National Military Park and Eisenhower National Historic Site - only by more microscopic, technical characters (Figure 22).

The species grows in dry, open places, such as old fields, clearings, dry slopes and banks, and barrens, particularly on limestone and diabase substrates.

Heller's panic grass is a very wide ranging species of North America. In Pennsylvania, the historical records occur mostly in the eastern half of the state, particularly along the Delaware River counties (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the Heller's panic grass is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania. In Pennsylvania, the species currently has an Undetermined status, which means that although the species appears to be deserving of being a species of special concern, more information is required before a more definitive status can be assigned. At present, only a few extant occurrences have documented by PNHP in the state, but more are expected as additional field work is conducted (NatureServe 2006; PNHP 2006).

Heller's panic grass was first documented by PNHP in 1991 in Gettysburg National Military Park and Eisenhower National Historic Site on the upper slope on the east side of Pardee Field. This colony was updated in 1994, 1996, and again in 2004, and seemed to maintain a relatively uniform population of several hundred stems. In 2004 and 2005, additional colonies were observed south of McMillan Woods on Seminary Ridge, on the west side of Crawford Avenue, and in The Wheatfield (Figure 23). The latter colony contained a few hundred stems, while the former two had less than one hundred stems.

The habitat for this species at the various colonies consisted of sunny fields, characterized by well-drained, often thin soil and relatively low-growing herbaceous and graminoid plants. All of the colonies appeared to receive an annual mowing in late summer. The vegetation associations at the colonies were classified as Agricultural Field (the field south of McMillan Woods) and Successional Old Field (Perles et al. 2006).

Additional colonies of Heller's panic grass are very likely to be found in Gettysburg National Military Park and Eisenhower National Historic Site.

The main threat to this species appeared to be the establishment and spread of woody plants, primarily native species, that were not controlled by the annual mowing.

Unlike the successional grassland habitats that occur on seasonally or permanently wet soils (e.g., wet meadows), the successional grassland habitats that occur on well-drained soils, such as those occupied by Heller's panic grass, appeared to have a lower threat from exotic species.

The colonies of Heller's panic grass did not have any threats from deer browsing or impacts from tourists.

This species would appear to be a beneficiary of the "if the habitat is there, they will come" strategy of management discussed on pages 15-16. As a result, the current management of the grassland-type habitats in Gettysburg National Military Park and Eisenhower National Historic Site, consisting of mowing in the late summer after the peak of the tourist season, and augmented in spring and summer by the spot-herbiciding/mechanical control of woody plants that resist the mowing, would appear to be very effective in maintaining the colonies of Heller's panic grass, as well as the surrounding vegetation association. It is recommended that the annual mowing schedule and the control of woody plants be continued, with the suggestion that the mowing be postponed until after the first killing frost of the autumn (typically late October or early November).



Figure 22. Heller's panic grass (*Panicum oligosanthes*). Photograph by John Kunsman; specimen collected from Gettysburg National Military Park.

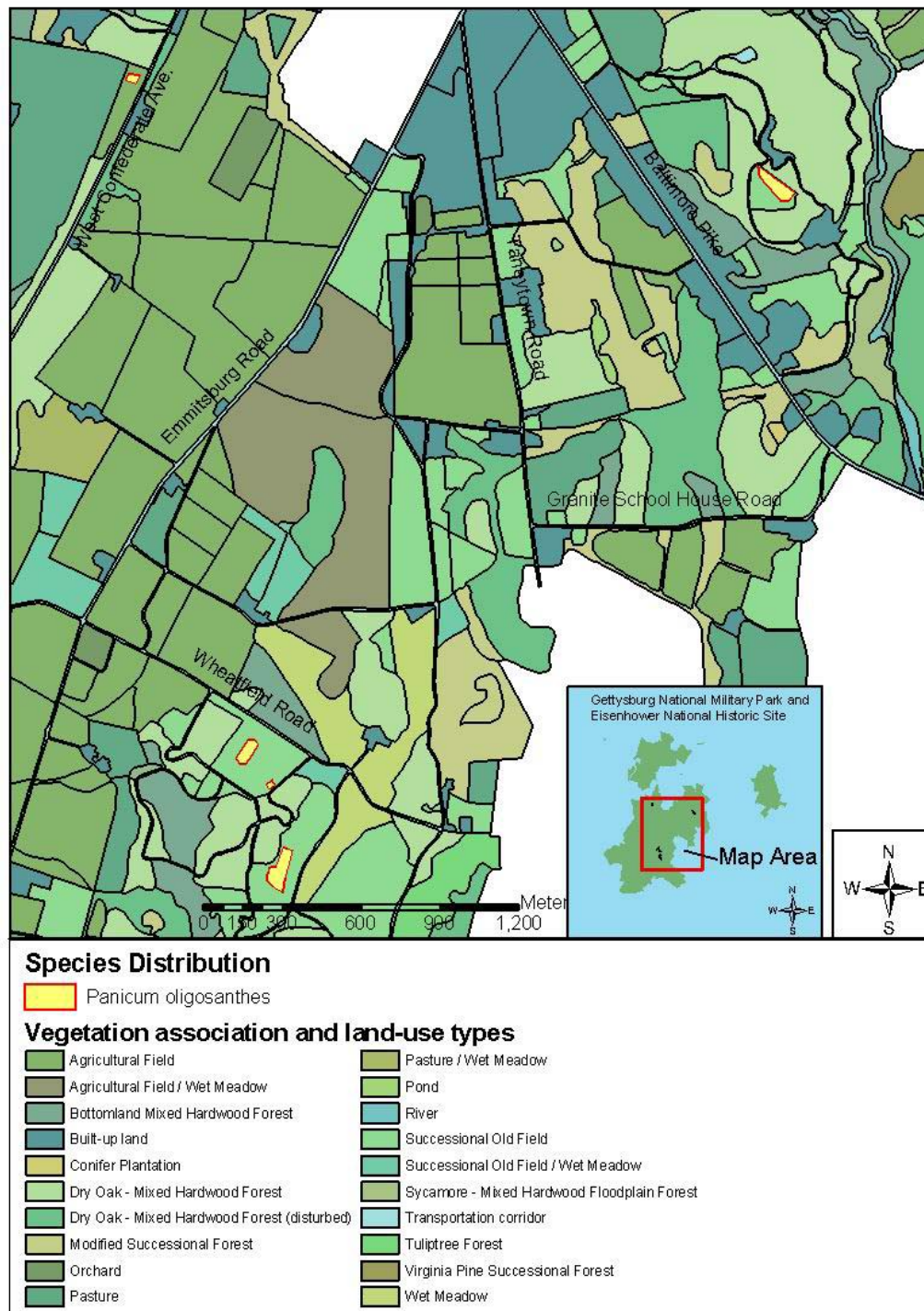


Figure 23. Species distribution of Heller's panic grass (*Panicum oligosanthes*).

Smooth beardtongue; eastern smooth beardtongue (*Penstemon laevigatus*; Scrophulariaceae)
PABS Undetermined; G5 S3

The smooth beardtongue, a member of the figwort family, is characterized by a stem to three feet high, by the oppositely arranged and lance-ovate shaped leaves that mostly lack a leaf stalk, and by the very pale colored flowers – typically bluish or violet - that are grouped in a terminal branching cluster and appear in June and July (Figure 24).

The species usually grows in open, sunny places, such as meadows, fields, and successional habitats, less frequently in open forests, with the substrate varying from well drained to seasonally moist or damp. It appears to be a short-lived, successional species, somewhat unpredictable in its appearance and disappearance from a given location, and individual plants may not persist at a given location for more than a few years even under optimal conditions.

The tall white beardtongue (*Penstemon digitalis*), a more common and widespread species in Gettysburg National Military Park and Eisenhower National Historic Site, has slightly larger, more-or-less pure white flowers, but otherwise has a very similar morphology and habitat as the smooth beardtongue.

The smooth beardtongue has a wide range in eastern North America. In Pennsylvania, it is more-or-less a southerly species, having been documented in many parts of the state, with most of the historical records being in the western counties (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the smooth beardtongue is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of New Jersey, New York, Maryland, Ohio, and West Virginia. In Pennsylvania, the species currently has an Undetermined status, which means that although the species appears to be deserving of being a species of special concern, more information is required before a more definitive status can be assigned. At present, only a few extant occurrences have been documented by PNHP in the state, but field inventories for this species are in the early stages and much additional work remains to be done (NatureServe 2006; PNHP 2006).

The smooth beardtongue was first documented by PNHP in 1995 at the former Welcome Traveler campground. The plants at this colony, numbering about thirty, were confirmed as still extant in 2004. Several additional colonies of this species were discovered in 2004 and 2005 in the Plum Run Valley, particularly in the grasslands and meadows between United States Avenue and Devils Den (Figure 25).

Approximately two hundred fertile stems were observed in total at the various colonies, making this occurrence in Gettysburg National Military Park and Eisenhower National Historic Site one of the larger occurrences currently known to PNHP in the state (PNHP 2006).

This plant appeared to be chiefly a grassland-type species, particularly where the substrate was permanently or seasonally damp or even a bit wet. The colonies were found in the Successional

Old Field, Wet Meadow, and Successional Old Field/Wet Meadow vegetation associations (Perles et al. 2006).

A major threat to the colonies of this species - succession toward a habitat more dominated by woody plant species – has been greatly lowered by the annual mowing schedule and the spot-herbiciding/mechanical control of woody plants. There remains the problem of controlling invasive, exotic species such as stilt grass (*Microstegium vimineum*), small carpgrass (*Arthraxon hispidus*), and to a lesser extent the weedy native reed canary grass (*Phalaris arundinacea*), which constitute an increasing threat to these grassland-type habitats.

The colonies of the smooth beardtongue did not have any threats from deer browsing or impacts from tourists.

It should be noted that even under the best of management, individual plants of this species might persist for only a few years because of its generally short-lived, successional nature.

This species would appear to be a beneficiary of the “if the habitat is there, they will come” strategy of management discussed on pages 15-16. As a result, the current management of the grassland-type habitats in Gettysburg National Military Park and Eisenhower National Historic Site, consisting of mowing in the late summer after the peak of the tourist season, and augmented in spring and summer by the control of woody plants that resist the mowing, would appear to be very effective in maintaining the colonies of the smooth beardtongue, as well as the surrounding vegetation association. It is recommended that the annual mowing schedule and the woody plant control be continued, with the suggestion that the mowing be postponed until after the first killing frost of the autumn (typically late October or early November).

The control of the invasive species mentioned above is strongly recommended at the colonies of smooth beardtongue.



Figure 24. Smooth beardtongue (*Penstemon laevigatus*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

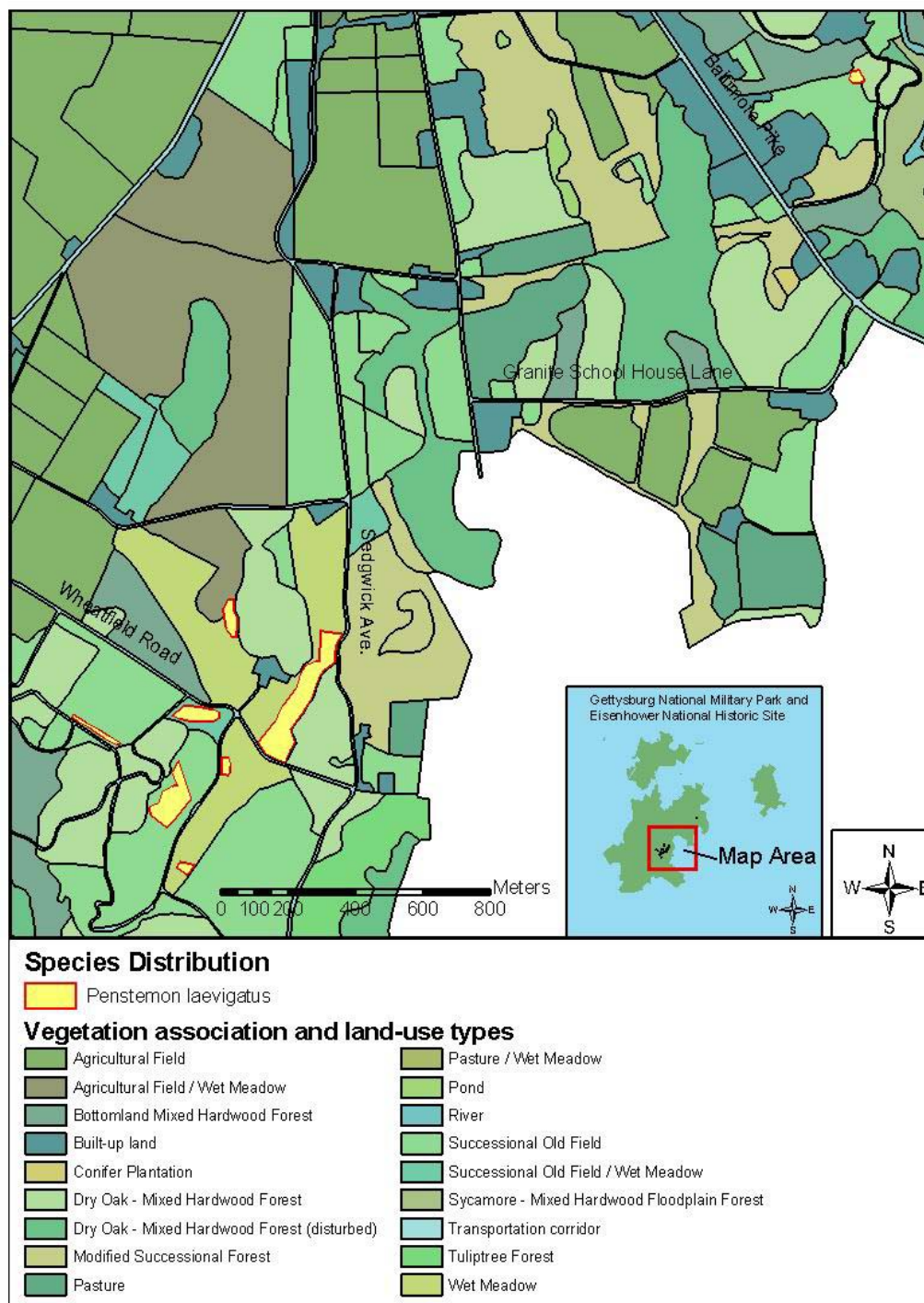


Figure 25. Species distribution of smooth beardtongue (*Penstemon laevis*).

Downy phlox (*Phlox pilosa*; Polemoniaceae) PABS Endangered; G5 S1S2

The downy phlox, a member of the phlox family, is characterized by a slender, hairy stem to about one and one-half feet in height, by the oppositely-arranged, hairy, and very narrow and sharp-pointed leaves, and by the five-lobed, reddish-purple flowers that appear in May (Figure 26).

The species grows in meadows, fields, successional habitats, and sometimes in open forests, with the substrate varying from well drained to permanently to seasonally damp. It seems to have an affinity for diabase-derived soil in southeastern Pennsylvania. The downy phlox appears to be a short-lived, successional species, somewhat unpredictable in its appearance and disappearance from a given location, and individual plants may not persist at a given location for more than a few years even under optimal conditions.

The downy phlox has a wide distribution in the eastern half of eastern North America.

In Pennsylvania, it is somewhat of southerly species that has been documented mostly in the southeastern counties (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the downy phlox is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Delaware, Maryland, and New York.

In Pennsylvania, the species currently has an Endangered status, as it has been only documented by PNHP at a few occurrences. The species is inconspicuous when not in flower and successional in its ecological requirements, and could be more frequent than the state rarity status of Endangered would suggest (NatureServe 2006; PNHP 2006).

The downy phlox had not been documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site prior to 2005, although the species was a possibility to be present because of the habitat available and the occurrence of the species elsewhere in Adams County (Table 2). In June 2005, three flowering stems were found at the southern end of The Wheatfield (Figure 27).

The species was growing with a variety of other graminoids and herbaceous plants in an open, damp/wet meadow, but near the interface with adjacent forest. The meadow appeared to receive an annual mowing. This site was classified as the Dry Oak-Mixed Hardwood Forest and Successional Old Field vegetation associations (Perles et al. 2006).

The downy phlox may be present at other grassland-type habitats in Gettysburg National Military Park and Eisenhower National Historic Site.

A major threat to this species - succession toward a habitat more dominated by woody plant species – has been greatly lowered by the annual mowing schedule and the spot-herbiciding/mechanical control of woody plants. There remains the problem of controlling invasive, exotic species such as stilt grass (*Microstegium vimineum*), small carpgrass (*Arthraxon hispidus*), and to a lesser extent the weedy native reed canary grass (*Phalaris arundinacea*), which constitute an increasing threat to these grassland-type habitats.

The occurrence did not have any threats from deer browsing or impacts from tourists.

It should be noted that even under the best of management, individual plants of this species might persist for only a few years because of its generally short-lived, successional nature.

This species would appear to be a beneficiary of the “if the habitat is there, they will come” strategy of management discussed on pages 15-16. As a result, the current management of the grassland-type habitats in Gettysburg National Military Park and Eisenhower National Historic Site, consisting of mowing in the late summer after the peak of the tourist season, and augmented in spring and summer by the control of woody plants that resist the mowing, would appear to be beneficial in attempting to maintain the colony of the downy phlox, as well as the surrounding vegetation association. It is recommended that the annual mowing schedule and the woody plant control be continued, with the suggestion that the mowing be postponed until after the first killing frost of the autumn (typically late October or early November).

The control of the invasive species mentioned above is very strongly recommended.



Figure 26. Downy phlox (*Phlox pilosa*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

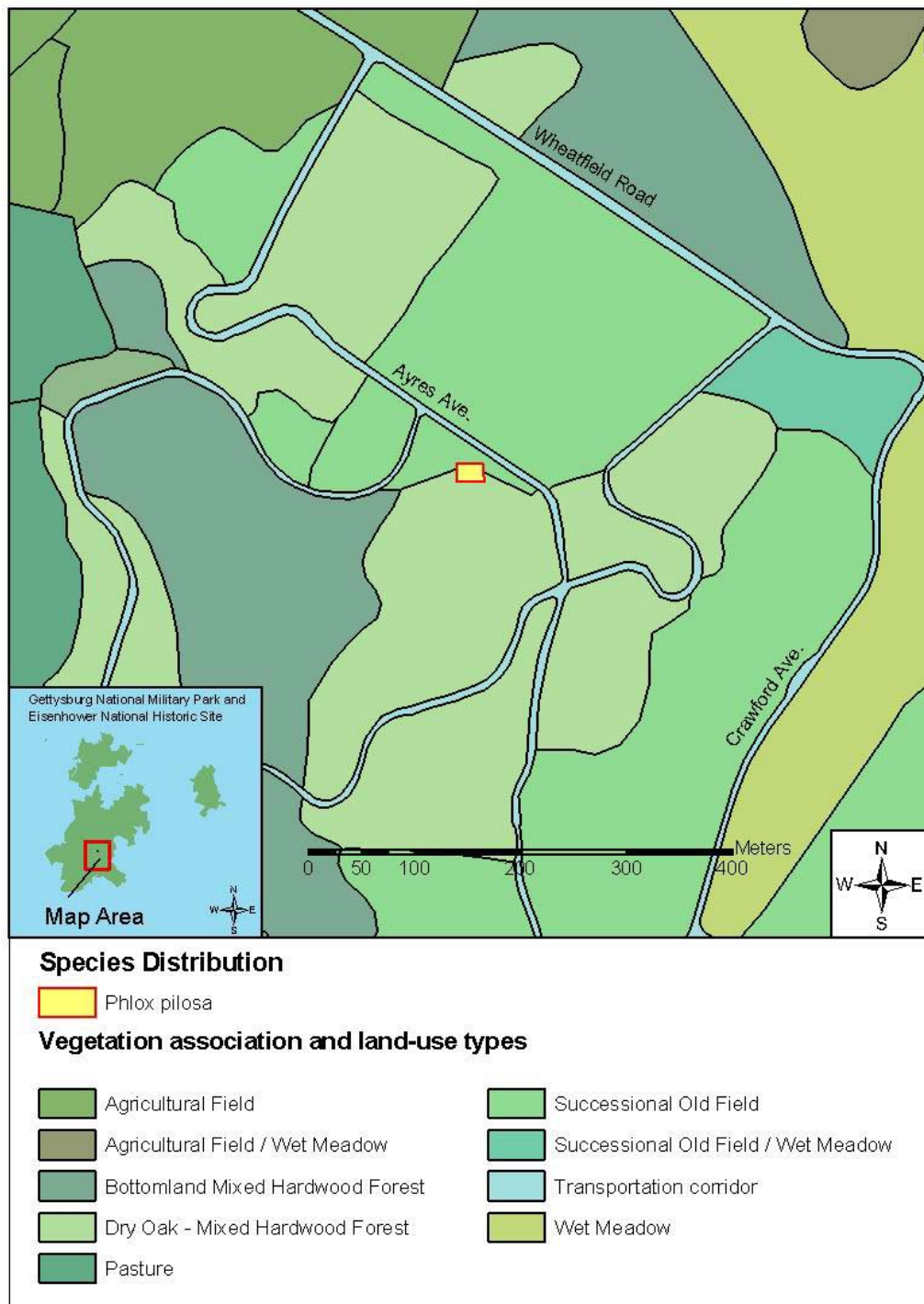


Figure 27. Species distribution of downy phlox (*Phlox pilosa*).

Lion's-foot; cankerweed (*Prenanthes serpentaria*; Asteraceae) PABS Undetermined; G5 S3

The lion's-foot, a member of the aster family, is characterized by a herbaceous stem to three feet in height, by the alternately arranged and variably-lobed leaves, and by the small, nodding flower heads grouped in a terminal cluster that bloom in late summer and fall. The plant tends to be most often encountered in the vegetative condition, consisting of a basal rosette of variously-lobed leaves, than encountered in the taller, fertile condition that has an erect stem. It is unclear if this infrequency of fertile stems is characteristic of the species or if it is the result of environmental factors (Figure 28).

The species grows in well-drained forests and forest borders. It appears to be a short-lived species, somewhat unpredictable in its appearance and disappearance from a given location, and may not persist at a given location for more than a few years even under optimal conditions.

The lion's-foot has a distribution primarily in the Atlantic coastal states in eastern North America. In Pennsylvania, it can be considered a southerly species, with documented records being in the southcentral and southeastern counties (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the lion's-foot is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring state of Delaware. In Pennsylvania, the species currently has an Undetermined status, which means that although the species appears to be deserving of being a species of special concern, more information is required before a more definitive status can be assigned. At present, only a few extant occurrences have been documented by PNHP in the state, but much additional field inventory remains to be done. As mentioned above, the species seems to produce flowering stems relatively infrequently, and as a result may be under-reported by botanists (NatureServe 2006; PNHP 2006).

This species was not documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site prior to 2004. The field surveys of 2004 and 2005 resulted in observing numerous colonies of the species, especially in various woodlots on Seminary Ridge (Figure 29). The species was not observed in forests at Big Round Top, Little Round Top, and Culp's Hill, and may have been overlooked, since suitable habitat appeared to be present. A total of approximately three hundred plants – all basal rosettes except for about ten fertile stems – were observed in total at the various colonies. At present, the Seminary Ridge colonies and the East Cavalry Field colony of the species are being considered as two separate occurrences, at least until colonies are found in the intervening area.

The lion's-foot appeared to be most frequent in open, well-drained forests that received relatively high amounts of light and that had a paucity of other herbaceous species on the forest floor. The vegetation association at all of the colonies of this species was classified as Dry Oak-Mixed Hardwood Forest (Perles et al. 2006).

The colonies of lion's-foot did not appear to be facing any imminent threats, although exotic species were inevitably present in the surrounding forest, and the lion's-foot appeared to be most

frequent where competing vegetation was relatively sparse. The rosettes of leaves that are characteristic of the species appeared to be much more frequent early in the growing season than later in the growing season, which could suggest browsing by deer; however, leaf senescence late in the growing season by rosette-forming species has been observed in other species and may not be at all related to deer.

The lion's-foot, a forest plant, appeared to have very minimal management requirements. The primary recommendation would be to retain the forest cover at the colonies, as long as the presence of the forest is compatible with the NPS goal of simulating the 1863 appearance of the area. Although the short term survival of the lion's-foot did not appear to be threatened by exotic species, these species were present at the various colonies, and control of the exotics, as time and budget permit, would be beneficial.

It should be noted that even under the best of management, this species might persist in a given area for only a few years because of its generally short-lived nature.



Figure 28. Lion's-foot (*Prenanthes serpentina*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

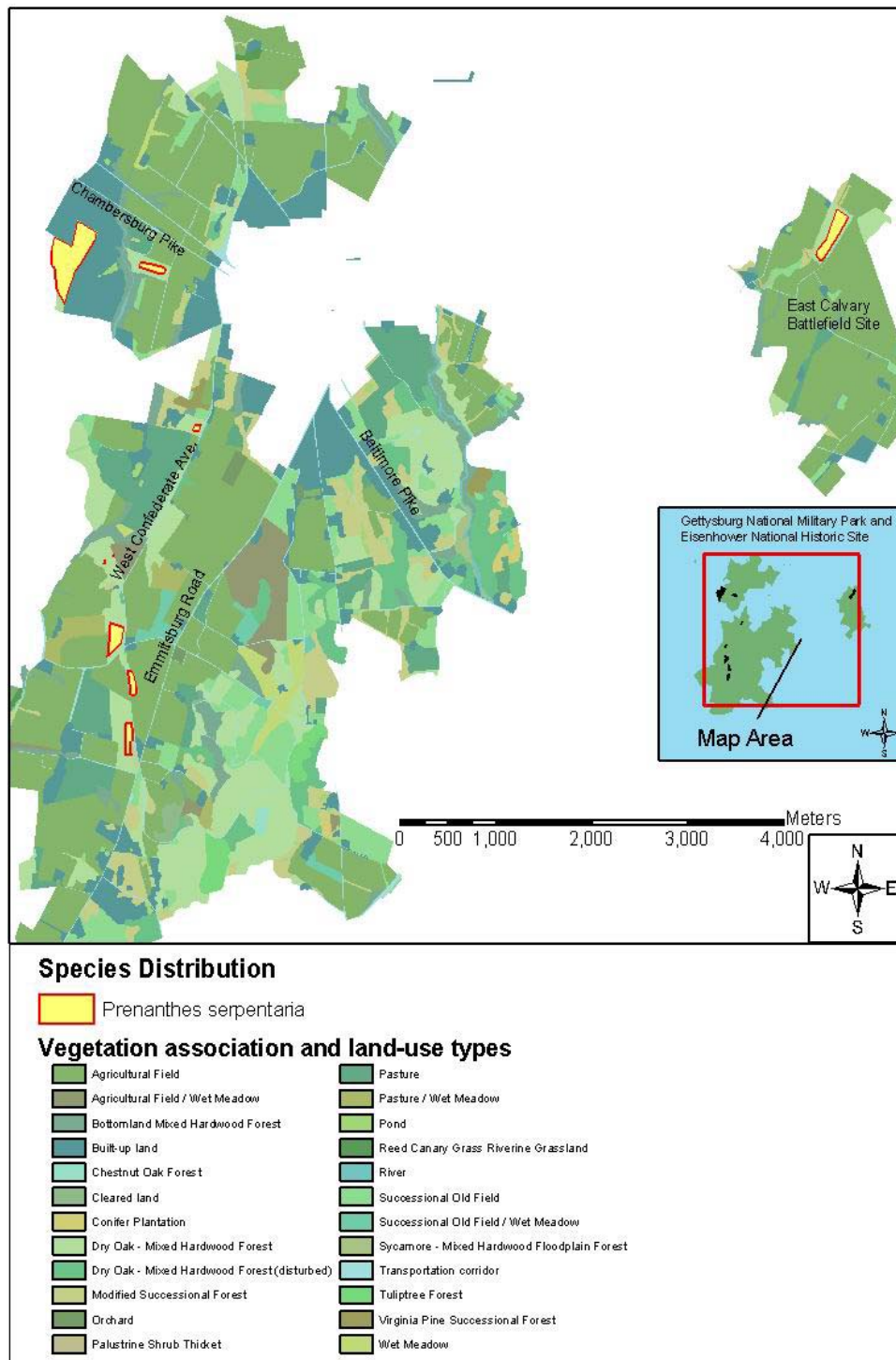


Figure 29. Species distribution of lion's-foot (*Prenanthes serpentina*).

Shumard's oak (*Quercus shumardii*; Fagaceae) PABS Endangered; G5 S1

Shumard's oak, a member of the beech family, is characterized by its potentially large size (to one hundred feet or more in height), by the alternate, deciduous, deeply seven to nine lobed and bristle-tipped leaves, by the dull gray or brown colored and usually hairless winter buds, and by the relatively large acorns. The winter buds provide the best means of distinguishing this species from similar oak species as pin oak (*Quercus palustris*) and northern red oak (*Quercus rubra*) (Figure 30).

The species grows on streambanks, lower slopes and in bottomlands, particularly in rich, moist soil derived from limestone and diabase. This tree appears to be very intolerant of shade, and as a result seedlings and saplings usually are found in well-developed forest openings, forest borders, or in clearings.

Shumard's oak has a wide ranging distribution in eastern North America and is particularly frequent in the southcentral United States and lower Mississippi River basin.

In Pennsylvania, it is a southerly species, with the documented records currently restricted to a few counties bordering the state of Maryland (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although Shumard's oak is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Maryland, New York, and West Virginia. It has not been documented in Delaware and New Jersey. In Pennsylvania, Shumard's oak currently has an Endangered status, but several new occurrences have been documented on public land in recent years, and overall the species has proven to be more frequent than historical records indicated. The current status of Endangered may be amended to Threatened in the near future (NatureServe 2006; PNHP 2006).

Shumard's oak had not been documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site prior to 2004, although its presence was a possibility because of its occurrence elsewhere in Adams County, as well as the bordering counties of Franklin and York (Table 2). In 2004, approximately twenty trees were found along Plum Run and the lower west slope of Big Round Top near Snyder Farm, and in 2005 approximately ten trees were found in the more northern part of the Plum Run watershed, more specifically in the woodlot between Wheatfield Road and US Avenue (Figure 31).

Shumard's oak was growing with mixed hardwoods, particularly other species of oaks, in diabase-derived soil. The vegetation associations at the two colonies consisted mainly of Dry Oak-Mixed Hardwood Forest, but at Snyder Farm also included Pasture/Wet Meadow (Perles et al. 2006).

Although the approximately thirty trees cited above seemed to represent "pure" Shumard's oak, other trees were observed at both colonies that appeared to show some mixed characteristics of Shumard's oak and northern red oak (*Quercus rubra*), which suggested that the trees might be of

hybrid origin. These trees could not be identified with certainty, and will require more field investigations in order to resolve this question.

The larger specimens of Shumard's oak observed in Gettysburg National Military Park and Eisenhower National Historic Site appeared to compete successfully with other trees in the forest. The seedlings, saplings and young trees of Shumard's oak, because of its intolerance to shade, were found in more open conditions such as successional forests, thickets, and along forest borders. The requirement of these habitats by younger individuals of Shumard's oak could make them more vulnerable to competition from exotic species or browsing by deer.

It is recommended that the forest tracts that contain mature Shumard's oak be maintained as forest, as long as the presence of forest is consistent with the goal on maintaining the area in the 1863 appearance. Young specimens of Shumard's oak, if growing in locations where forest is prescribed, should be marked and given protection, if needed, from exotic species competition and browsing by deer.



Figure 30. Shumard's oak (*Quercus shumardii*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

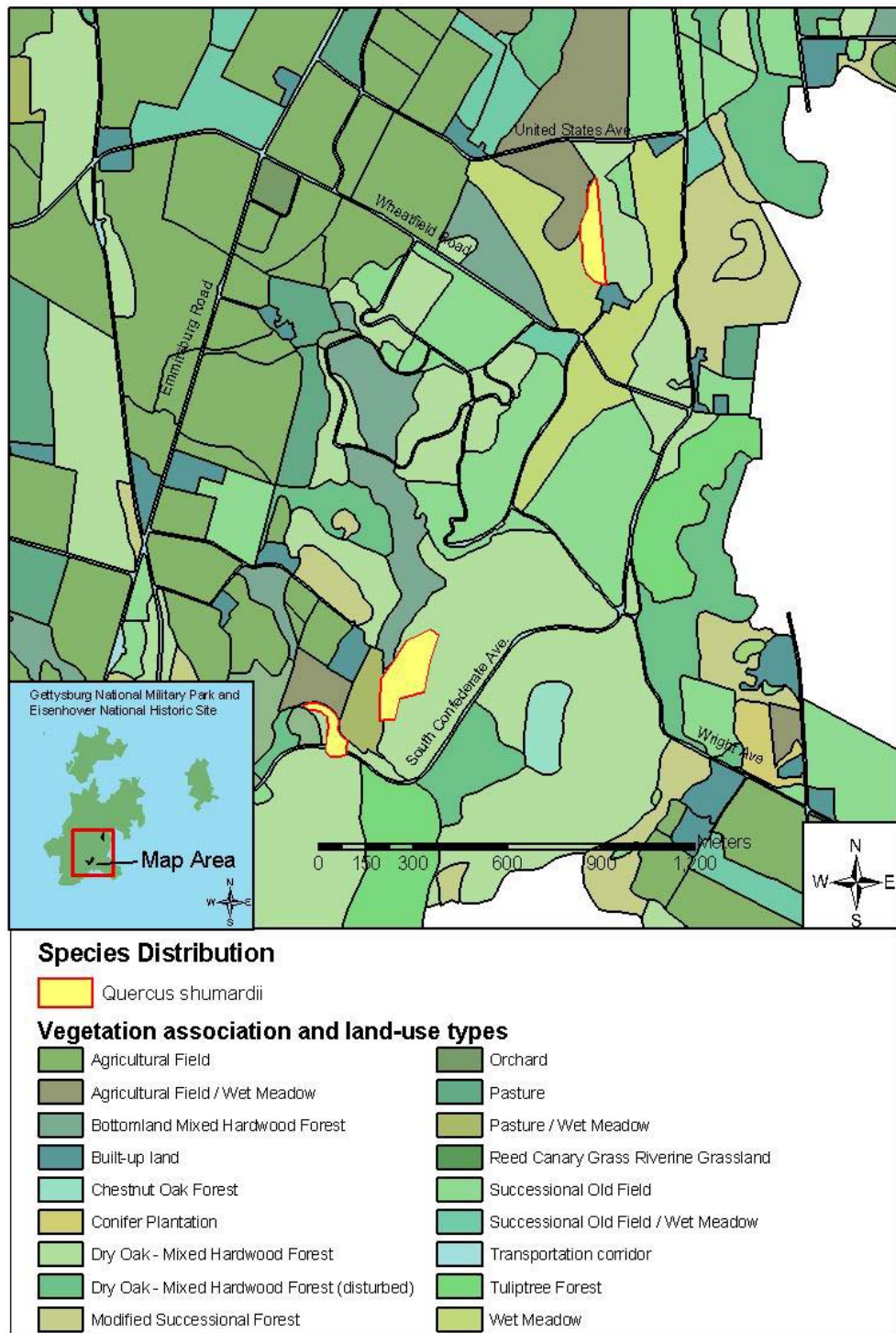


Figure 31. Species distribution of Shumard's oak (*Quercus shumardii*).

Low spearwort (*Ranunculus pusillus*; Ranunculaceae) PABS Endangered; G5 S1

The low spearwort, a member of the buttercup family, is characterized by smooth, slender stems that average about one foot in height, by the alternate and lance-ovate leaves with well-defined leaf stalks, by the very tiny flowers with one to three (to five) yellow petals that appear in May and June, and tiny nutlet-like fruits. The plant is relatively inconspicuous even when blooming (Figure 32).

The species grows in wet ground, usually in open places, especially where water tends to form small pools or puddles either permanently or seasonally. It appears to be a short-lived species, and individual plants may not persist at a given location for more than a few years even under optimal conditions.

The low spearwort has a distribution in eastern North America. In Pennsylvania, it is considered a southerly species and has been documented in scattered places in the southern half of the state (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the low spearwort is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Delaware, New York, Ohio, and West Virginia. In Pennsylvania, the species currently has an Endangered status, as it has been documented by PNHP only at a few occurrences; however, the species is very inconspicuous, appears to thrive in at least some types of human-created habitats, such as infrequently-grazed wet meadows, and may not be of as great a conservation concern as currently believed. More field work is needed to get a better idea of the habitat requirements of this species and its relative frequency (NatureServe 2006; PNHP 2006).

The low spearwort had not been documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site prior to 2005. In 2005, approximately twenty-two plants of the species were found in the wet pasture/meadow located south of Slyder Farm (Figure 33).

This species grew in sunny, open, wet meadow-like habitat, associated with a diverse group of graminoid and herbaceous species. Most of the plants of low spearwort were found along natural or human-enhanced drainageways where water tended to form small pools or to deposit small amounts of sediment in times of wet weather. The vegetation association at the occurrence was classified as Agricultural Land/Wet Meadow and Pasture/Wet Meadow (Perles et al. 2006).

The low spearwort may be present at other locations in Gettysburg National Military Park and Eisenhower National Historic Site, particularly in the wetter grasslands located between United States Avenue and Devils Den.

A major threat to this species - succession toward a habitat more dominated by woody plant species – has been greatly lowered by the annual mowing schedule and the spot-treatment/mechanical control of woody plants, and apparently by occasional grazing by livestock. There remains the problem of controlling invasive, exotic species such as stilt grass (*Microstegium vimineum*), small carpgrass (*Arthraxon hispidus*), and to a lesser extent the weedy

native reed canary grass (*Phalaris arundinacea*), which constitute an increasing threat to these grassland-type habitats.

The occurrence did not have any threats from deer browsing or impacts from tourists.

It should be noted that even under the best of management, individual plants of this species might persist for only a few years because of its generally short-lived, successional nature.

This species would appear to be a beneficiary of the “if the habitat is there, they will come” strategy of management discussed on pages 15-16. As a result, the current management of the grassland-type habitats in Gettysburg National Military Park and Eisenhower National Historic Site, consisting of mowing in the late summer after the peak of the tourist season, and augmented in spring and summer by the control of woody plants that resist the mowing, would appear to be very effective in maintaining the occurrence of the low spearwort, as well as the surrounding vegetation association. It is recommended that the annual mowing schedule and woody plant control be continued, with the suggestion that the mowing be postponed until after the first killing frost of the autumn (typically late October or early November). Low intensity grazing of the pasture/meadow type habitat would also be beneficial.

The control of the invasive species mentioned above is strongly recommended.



Figure 32. Low spearwort (*Ranunculus pusillus*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

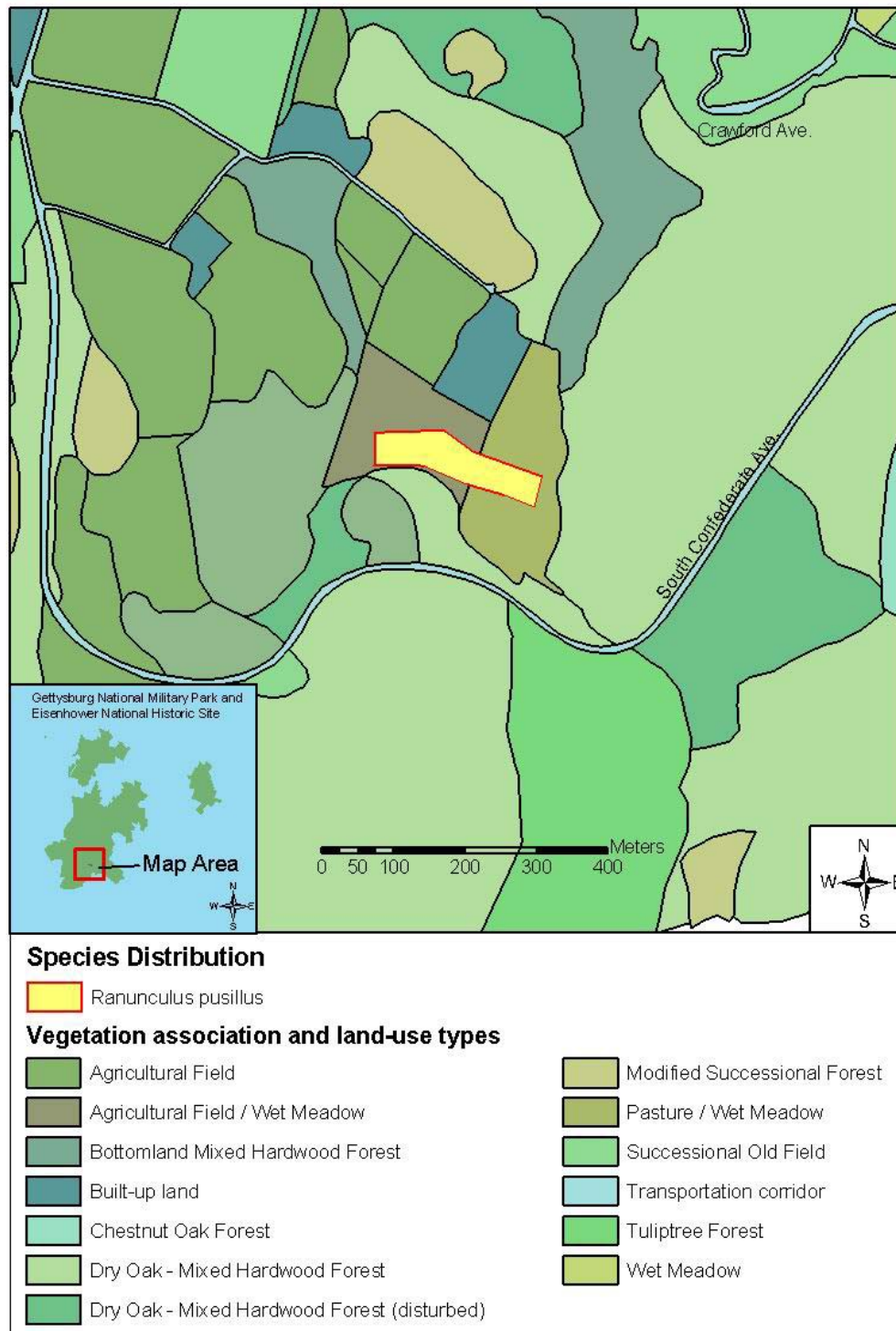


Figure 33. Species distribution of low spearwort (*Ranunculus pusillus*).

Missouri gooseberry (*Ribes missouriense*; Grossulariaceae) PABS Endangered; G5 S1

The Missouri gooseberry, a shrub of the gooseberry family, is characterized by its sharply prickly, woody stems that grow to about six feet high, by the alternately-arranged, deciduous, and maple-shaped leaves, by the white flowers with long slender petals that appear in late April and early May, and by the berry-like fruit (figure 34).

The species grows in forests and forest borders, successional areas, fencerows, and sometimes in more open habitats.

The Missouri gooseberry has a distribution primarily in midwestern North America, but also has been recorded in some mid-Atlantic states. In Pennsylvania, the species occurs in the eastern part of its range and has been documented in a few counties in the central and southcentral part of the state (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the Missouri gooseberry is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of New Jersey, Ohio, and West Virginia. It has not been documented in Delaware and New York. In Pennsylvania, the species currently has an Endangered status, as it has been documented by PNHP at only a few occurrences (NatureServe 2006; PNHP 2006).

The Missouri gooseberry was first documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site in 1991 in the woodlot along Country Club Lane. Subsequent surveys by PNHP during the next ten years, and also in 2004 and 2005, greatly increased the known distribution of the species throughout much of the remainder of the Gettysburg National Military Park and Eisenhower National Historic Site, including a more isolated colony in the East Cavalry Field area (Figure 35).

A conservative estimate of several hundred individuals of Missouri gooseberry was seen in 2004 and 2005, with some of the larger concentrations being observed on the lower east slope of Culp's Hill, the Pitzer Woods area on Seminary Ridge, and Oak Ridge near the Peace Memorial. Based on fifteen years of observation of the species by PNHP, the species has proven to be persistent at a given location and an effective competitor. The occurrence of Missouri gooseberry in Gettysburg National Military Park and Eisenhower National Historic Site represents the largest and most viable occurrence of the species known to PNHP in the state (PNHP 2006).

The species was found primarily in forested and forest border habitats, in both well-drained and moist soils. Most of the colonies occurred in the Dry Oak-Mixed Hardwood Forest vegetation association, but the species was also noticed in the Mixed Bottomland Hardwood Forest and Modified Successional Forest vegetation associations (Perles et al. 2006).

The species will undoubtedly be found in additional areas of the Gettysburg National Military Park and Eisenhower National Historic Site.

The Missouri gooseberry did not appear to have any imminent threats. It appeared to be successful in reproducing and dispersing itself and competing with associated species.

Prior to managing white-tailed deer populations in the parks some plant species inhabiting forested tracts in Gettysburg National Military Park and Eisenhower National Historic Site may have been impacted negatively by the large deer population. In comparison, the Missouri gooseberry may have had a competitive advantage and been spared to some extent because its prickly stems made it less attractive for browsing. If this hypothesis has some truth, a lower deer population might increase the competition for the gooseberry from other plants that are no longer being browsed as intensively.

The Missouri gooseberry, because of its relative abundance, appears to require very minimal management in Gettysburg National Military Park and Eisenhower National Historic Site. As long as tracts of forest are retained and exotic species are kept under reasonable control, the gooseberry should continue to thrive.



Figure 34. Missouri gooseberry (*Ribes missouriense*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

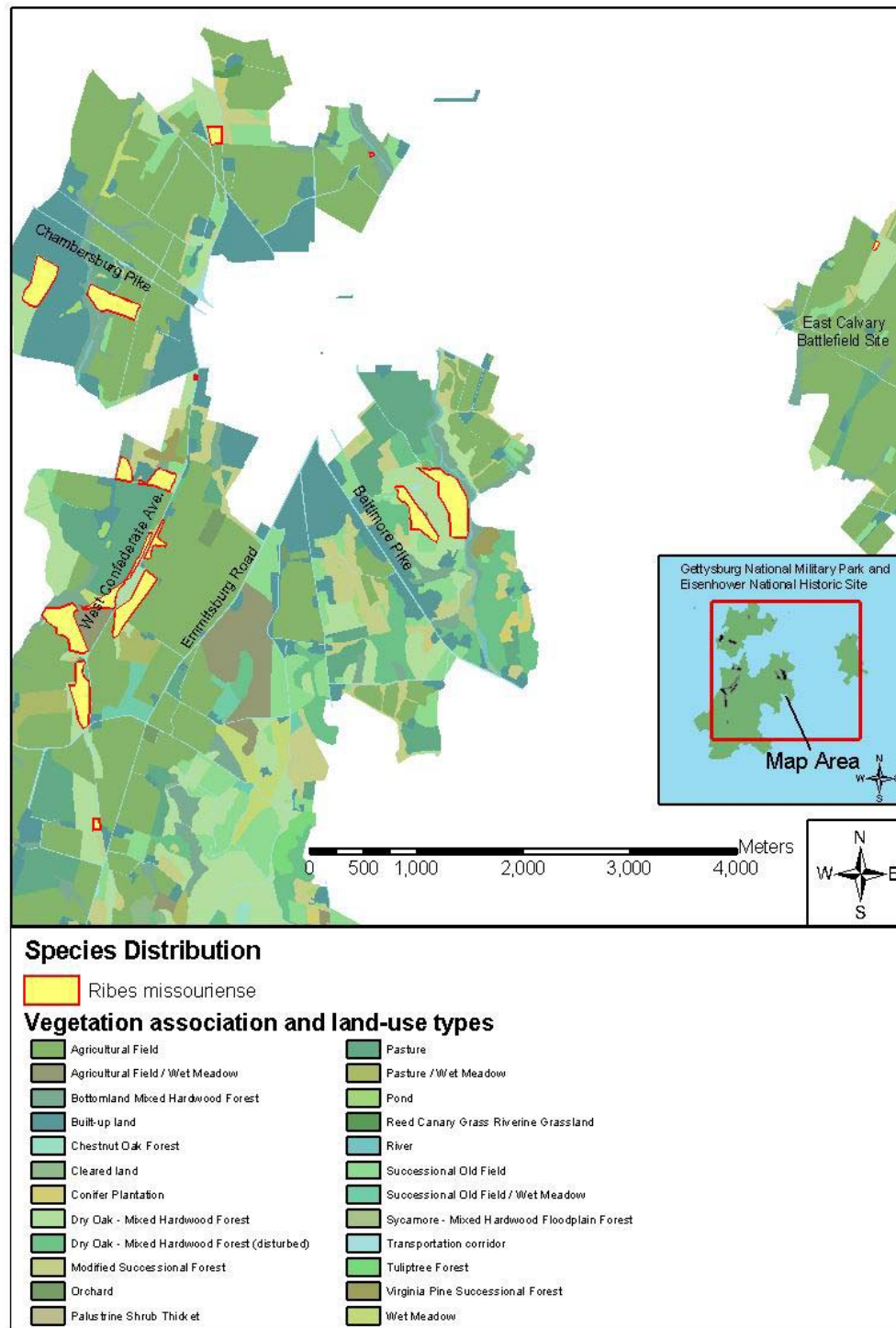


Figure 35. Species distribution of Missouri gooseberry (*Ribes missouriense*).

Eastern coneflower; orange coneflower (*Rudbeckia fulgida*; Asteraceae) PABS Undetermined; G5 S3

The eastern coneflower, a perennial member of the aster family, is characterized by its hairy stem to about three feet in height, by alternate, toothed or untoothed leaves that tend to decrease in size going up the stem and often lack a leaf stalk, and by flower heads with a dark brown center and orange to yellow ray flowers that appear in summer and fall. The species belongs to a group of plants commonly called “blackeyed Susan.” Two additional species of this group, *Rudbeckia hirta* and *Rudbeckia triloba*, resemble the eastern coneflower and must be distinguished carefully (figure 36).

The eastern coneflower typically grows in meadows, fields, and successional areas, much less frequently in open woods, especially where the substrate is at least seasonally damp. In southeastern Pennsylvania, this species seems to have an affinity for diabase-derived soils. The plant appears to be somewhat of a short-lived, successional species, rather unpredictable in its appearance and disappearance at a given location, and individual plants may not persist for more than a few years even under optimal conditions.

The eastern coneflower is a wide-ranging and taxonomically complex species of eastern North America. In Pennsylvania, it is somewhat of a southerly species that has a historical range in the southern half of the state, particularly in the counties of the Piedmont and Great Valley (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the eastern coneflower is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Delaware, Maryland, New Jersey and West Virginia. In Pennsylvania, the species currently has an Undetermined status. Field investigations of this species are still in an early stage, which makes it difficult to assign a more definitive conservation status – if a conservation status proves to be justified at all (Nature Serve 2006; PNDI 2006).

This species was not documented by PNHP in Gettysburg National Military Park and Eisenhower National Historic Site prior to 2004. In 2004 and 2005, the species was found at several colonies, particularly in the grassland-type habitats in the Plum Run watershed (Figure 37).

Approximately two hundred flowering plants were observed at the various colonies in total, although the number of individuals may be higher because of the difficulty in identifying plants that are only in the vegetative condition.

The habitat for the plant consisted of various types of open ground, such as wet meadows and old fields, where the substrate remained permanently or at least seasonally damp, but not excessively wet. The associated species were made up generally of various graminoids and herbaceous species. The vegetation associations at the various colonies of eastern coneflower included Wet Meadow, Successional Old Field, Pasture/Wet Meadow, Modified Successional Forest, and Agricultural Field/Wet Meadow (Perles et al. 2006).

A major threat to this species and its typically grassland-type habitat - succession toward a habitat more dominated by woody plant species – has been greatly lowered by the annual mowing schedule and the herbicide/mechanical treatment of woody plants. There remains the problem of controlling invasive, exotic species such as stilt grass (*Microstegium vimineum*), small carpgrass (*Arthraxon hispidus*), and to a lesser extent the weedy native reed canary grass (*Phalaris arundinacea*), which constitute an increasing threat to these habitats.

The occurrence did not have any threats from deer browsing or impacts from tourists.

It should be noted that even under the best of management, individual plants of this species might persist for only a few years because of its generally short-lived, successional nature.

This species would appear to be a beneficiary of the “if the habitat is there, they will come” strategy of management discussed on pages 15-16. As a result, the current management of the grassland-type habitats in Gettysburg National Military Park and Eisenhower National Historic Site, consisting of mowing in the late summer after the peak of the tourist season, and augmented in spring and summer by the herbicide/mechanical control of woody plants that resist the mowing, would appear to be very effective in maintaining the colonies of the eastern coneflower, as well as the surrounding vegetation association. It is recommended that the annual mowing schedule and the control of woody plants be continued, with the suggestion that the mowing be postponed until after the first killing frost of the autumn (typically late October or early November).

The control of the invasive species mentioned above is strongly recommended in the grassland-type habitat utilized by this species.



Figure 36. Eastern coneflower (*Rudbeckia fulgida*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

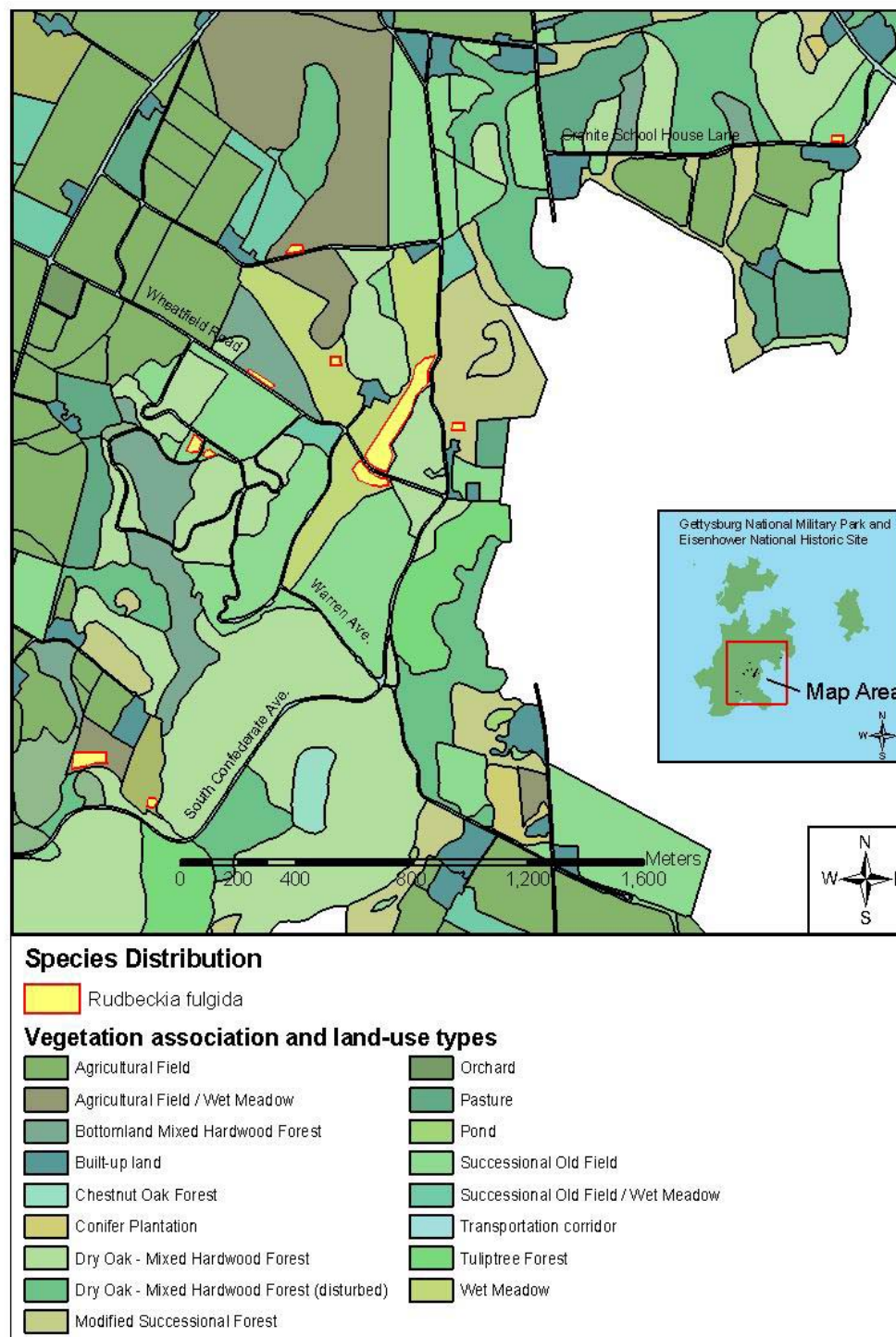


Figure 37. Species distribution of eastern coneflower (*Rudbeckia fulgida*).

Pencilflower; sidebeak pencilflower (*Stylosanthes biflora*; Fabaceae) PABS Endangered; G5 S2

The pencilflower, a member of the legume family, is characterized by a wiry stem that grows to about one foot in height, by alternate leaves that have very short leaf stalks and are divided into three leaflets, by the orange-yellow flowers that occur in small clusters and appear in summer, and by the small, pod-like fruits (Figure 38).

The species grows in dry, usually open, places, such as rock outcrops, exposed banks, sunny slopes, and open forests, where the soil is generally thin and subject to dryness.

The pencilflower has a wide ranging distribution in eastern North America. In Pennsylvania, it is considered somewhat of a southerly species, with the historical records mostly occurring in the southern and southeastern counties (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the pencilflower is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of New Jersey and New York. In Pennsylvania, the pencilflower currently has an Endangered status, as the species has been documented by PNHP at only a few locations (NatureServe 2006; PNHP 2006).

The possibility remains that the species may be more frequent than the current records would indicate, since it is an inconspicuous species, often grows in places that may not be easily accessible, and is known historically from a number of locations in the state.

The pencilflower had been first documented by PNHP in 1991 in Gettysburg National Military Park and Eisenhower National Historic Site at Pardee Field. The species was confirmed again at this location in 1994, 1996, and 2004, and consistently maintained a population of over one thousand stems. Also in 2004, an additional colony of several dozen stems was found in a small opening a short distance to the west of Pardee Field and bordering private land (Figure 39). The occurrence of pencilflower in Gettysburg National Military Park and Eisenhower National Historic Site represents by far the largest and most viable extant occurrence of the species known to PNHP in the state (PNHP 2006).

The habitat at both colonies of this species consisted of dry, open to relatively open conditions, characterized by a thin soil (occasionally with outcroppings of diabase bedrock) and relatively low-growing herbaceous and graminoid plants. The Pardee Field colony appeared to receive an annual mowing in late summer. The vegetation associations at the two colonies have been classified as Successional Old Field at the colony at Pardee Field and Modified Successional Forest at the colony west of Pardee Field (Perles et al. 2006).

The main threat to the two colonies of this species, particularly at Pardee Field, appeared to be the establishment and spread of woody plants, primarily native species, that would eventually, without management, begin to dominate the area. The pencilflower can thrive in successional or relatively open woodlands, such as currently at the small colony to the west of Pardee Field, but would become vulnerable as shade increased.

Various exotic species are present at both colonies, but do not appear to be an imminent threat. Unlike the successional grassland habitats that occur on seasonally or permanently damp/wet soils (e.g, wet meadows), the successional grassland habitats that occur on very well-drained soils, such as Pardee Field, appeared to have a lower threat from exotic species.

The occurrence of the pencilflower did not have any threats from deer browsing or impacts from tourists.

The current management of Pardee Field, consisting of mowing in the late summer after the peak of the tourist season, and augmented in spring and summer by the spot-herbiciding/mechanical control of woody plants that resist the mowing, has appeared to have been very effective in maintaining the occurrence of pencilflower, as well as the surrounding vegetation association, for many years. It is recommended that the annual mowing schedule and the woody plant control be continued, with the suggestion that the mowing be postponed until after the first killing frost of the autumn (typically late October or early November).

The small colony of pencilflower that is located west of Pardee Field appeared to be relatively secure for the present because of the slow pace of succession on the very thin soil, but may eventually require herbicidal or mechanical control of the competing vegetation, particularly the shrubby vegetation.





Figure 38. Pencilflower (*Stylosanthes biflora*). Photos by William Gleason; taken in Gettysburg National Military Park.

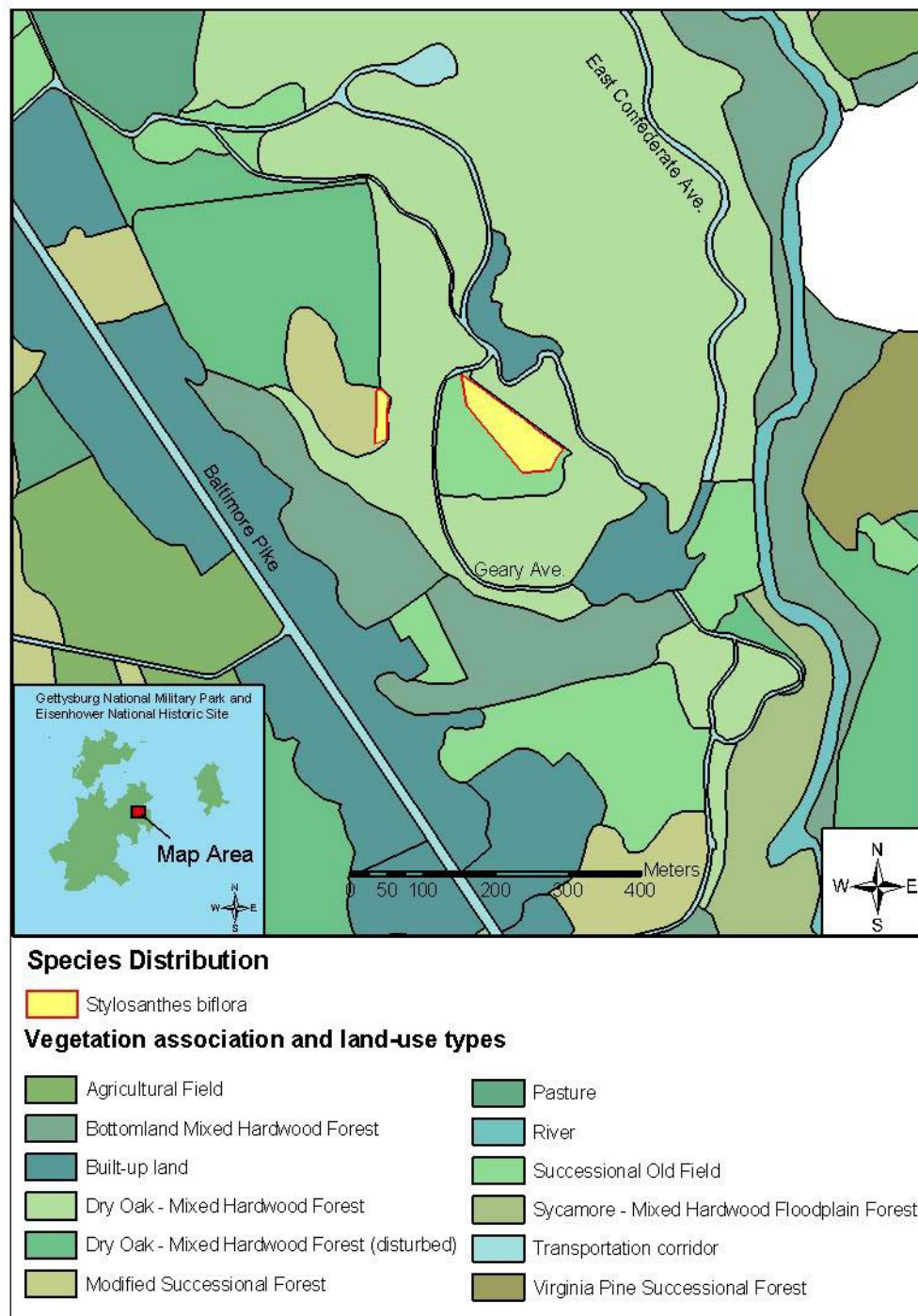


Figure 39. Species distribution of pencilflower (*Stylosanthes biflora*).

Cranefly orchid; crippled crane (*Tipularia discolor*; Orchidaceae) PABS Rare; G4G5 S3

The crane orchid, a member of the orchid family, is characterized by the presence of an elliptical or ovate shaped, over-wintering leaf (one leaf is not always equivalent to one individual plant) that often has a purplish undersurface, and by an erect, leafless stem that grows to about one foot in height that produces greenish-yellow flowers that appear in August (Figure 40).

The species grows in dryish to moist forests, particularly those with a mixed hardwood canopy. It appears to be able to thrive in forests that are in less than pristine condition.

The crane orchid has a wide ranging distribution in eastern North America. In Pennsylvania, it is considered somewhat of a southerly species, with the historical records mostly occurring in the southeastern counties (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the crane orchid is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of New Jersey and New York. In Pennsylvania, the crane orchid currently has a Rare status, as the species has been documented by PNHP at several dozen extant occurrences, and although the populations tend to be relatively small, it appears frequent enough and well protected enough not to qualify for an Endangered or Threatened status (NatureServe 2006; PNHP 2006).

The crane orchid had been first documented by PNHP in 1992 in Gettysburg National Military Park and Eisenhower National Historic Site, when a single flowering stem was seen in the woodlot on the west side of Country Club Lane (Figure 41). The occurrence was not revisited until the beginning of the current project in 2004. Surveys conducted during 2004 and 2005 were unsuccessful in locating the species at this location, although much suitable habitat remained. The species could no longer be present here, but may also have been overlooked because of its inconspicuous aspect in both leaf or flower, or because of the frequently unpredictable nature of orchids in alternately appearing and disappearing from a given location.

The habitat at the Country Club Lane occurrence consisted of open, well-drained, mixed hardwood forest, and was classified as the Dry Oak-Mixed Hardwood Forest vegetation association (Perles et al. 2006).

It would be not at all surprising to discover this species elsewhere in Gettysburg National Military Park and Eisenhower National Historic Site, particularly in forested areas such as Big Round Top, Little Round Top, and Culps Hill.

As with other species of special concern that are forest species in Gettysburg National Military Park and Eisenhower National Historic Site, potential threats to this species – should the species be rediscovered – include removal of the forest cover, competition from exotic species, and deer browsing. In the latter case, the browsing of flowering stems has been observed by PNHP staff at other occurrences of this species in eastern Pennsylvania.

The crane orchid – should it be rediscovered in Gettysburg National Military Park and Eisenhower National Historic Site – would appear to require very minimal management activity.

Since the species is a forest plant, maintaining the forest cover would be the main requirement. Control of exotic species and possibly some protection (e.g., a small fence) from browsing by deer might be necessary.



Figure 40. Crane fly orchid (*Tipularia discolor*). Photograph by John Kunsman; taken in York County, PA.

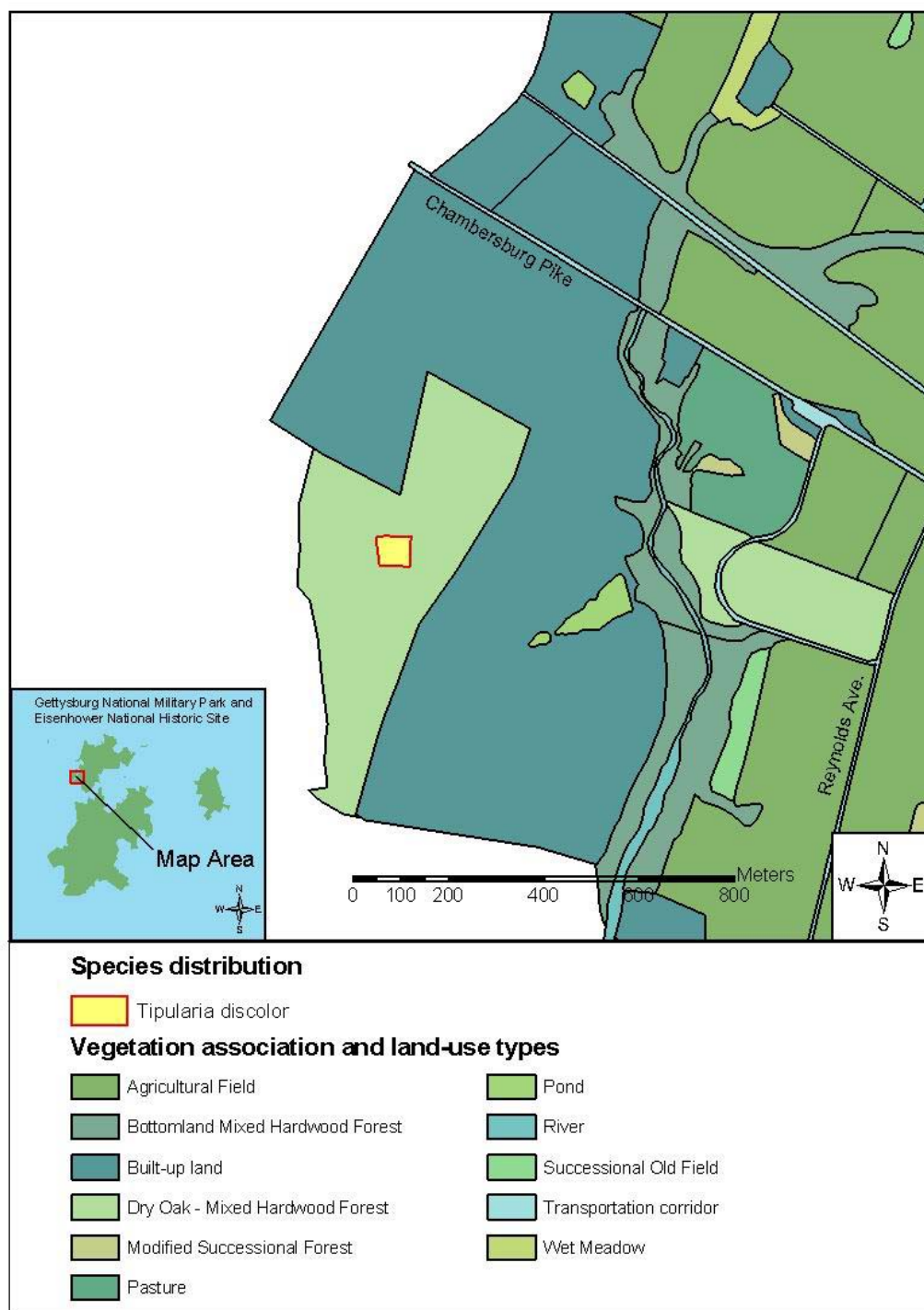


Figure 41. Species distribution of crane fly orchid (*Tipularia discolor*).

Horse-gentian; yellowfruit horse-gentian (*Triosteum angustifolium*; Caprifoliaceae) PABS
Endangered; G5 S1

The horse-gentian, a herbaceous member of the honeysuckle family, is characterized by a hairy stem to about two feet in height, by the entire, opposite, and untoothed leaves that are narrowly elliptical in shape and lack a leaf stalk, by the small, yellowish, axillary flowers that appear in late April or May, and by the orangish-red, berry-like fruit (Figure 42).

The species grows in a variety of habitats, including various types of openings and fields, forest borders, and open forests, particularly on shale, limestone, and diabase substrates.

It appears to be somewhat of a short-lived, successional species, rather unpredictable in its appearance and disappearance from a given location, and may not persist at a given location for more than a few years even under optimal conditions.

The horse-gentian has a wide distribution in eastern North America. In Pennsylvania, it can be considered a southerly species, with most of the historical records being known from the southern half of the state, particularly the southeastern counties (NatureServe 2006; PNHP 2006; Rhoads & Klein 1993).

Although the horse-gentian is not considered to be of conservation concern on a global basis and does not have a federal rarity status, it is listed as a species of special concern in Pennsylvania as well as the neighboring states of Delaware, Maryland, New Jersey, New York, and West Virginia. In Pennsylvania, the horse-gentian has an Endangered status, as the species has been documented by PNHP at only a few extant occurrences; however, there is some debate among botanists whether this status is excessive and that perhaps a lower status such as Threatened or Rare might be more appropriate. The plant is relatively inconspicuous in appearance, may be confused with other more frequent species of the genus *Triosteum*, and seems to be a successional plant that inhabits a variety of habitats, and thus could be more frequent than currently believed. More field work is required to resolve this debate (NatureServe 2006; PNHP 2006).

The horse-gentian was first documented by PNHP in 1996 at the former Welcome Traveler campground, and consisted of only a single plant with two, somewhat depauperate, vegetative stems. The habitat was of the successional old field type, with the associated vegetation being relatively low-growing herbaceous and graminoid species. In 2004, the horse-gentian could not be found at Welcome Traveler, possibly due to the fact that the vegetation was much higher and denser than in 1996.

On the positive side, a previously-undocumented occurrence of thirty plants of horse-gentian was found in 2005 in the forest located adjacent to the Observation Tower on the east side of West Confederate Avenue on Seminary Ridge (Figure 43). This population occurred over an approximate fifty feet by twenty feet area. This colony appeared quite healthy, with most of the plants flowering.

The forest at this occurrence consisted of mixed hardwoods, with a number of suppressed red-cedars (*Juniperus virginiana*), and featured a well-drained soil and a relatively open aspect. The

forest was classified as the Dry Oak-Mixed Hardwood Forest vegetation association (Perles et al. 2006).

Given the variety of habitats utilized by this species throughout its range and its seeming preference for diabase-derived soil, additional locations for the species might be expected in Gettysburg National Military Park and Eisenhower National Historic Site.

The occurrence of the horse-gentian at the Observation Tower did not appear to have any imminent threats. There was no evidence that tourists enter the forest in any numbers, which might lead to the problem of trampling or causing disturbance that could promote the growth of exotic species. Various species of exotic plants were present in the forest, but were relatively infrequent and did not appear to pose an immediate threat.

The horse-gentian did not show any signs of being browsed by deer, although browsing of this species has been observed by PNHP staff at another occurrence in eastern Pennsylvania.

It should be noted that even under the best of management, this species might persist in a given area for only a few years because of its generally short-lived, successional nature.

It is recommended that the forest at the Observation Tower occurrence be retained as forest, provided the existence of this woodlot is consistent with the goal of keeping the area in its 1863 appearance. Currently, most of this forest has a relatively open aspect, and retaining this open appearance would undoubtedly be positive for the horse-gentian. Although exotic plant species were not an immediate threat here, control of these species in the woodlot, if time and budget allow, would probably also increase the viability of the occurrence.

Since the horse-gentian may also inhabit grassland and successional areas, it would appear to be a beneficiary of the “if the habitat is there, they will come” strategy of management discussed on pages 15-16.



Figure 42. Horse-gentian (*Triosteum angustifolium*). Photograph by John Kunsman; taken in Gettysburg National Military Park.

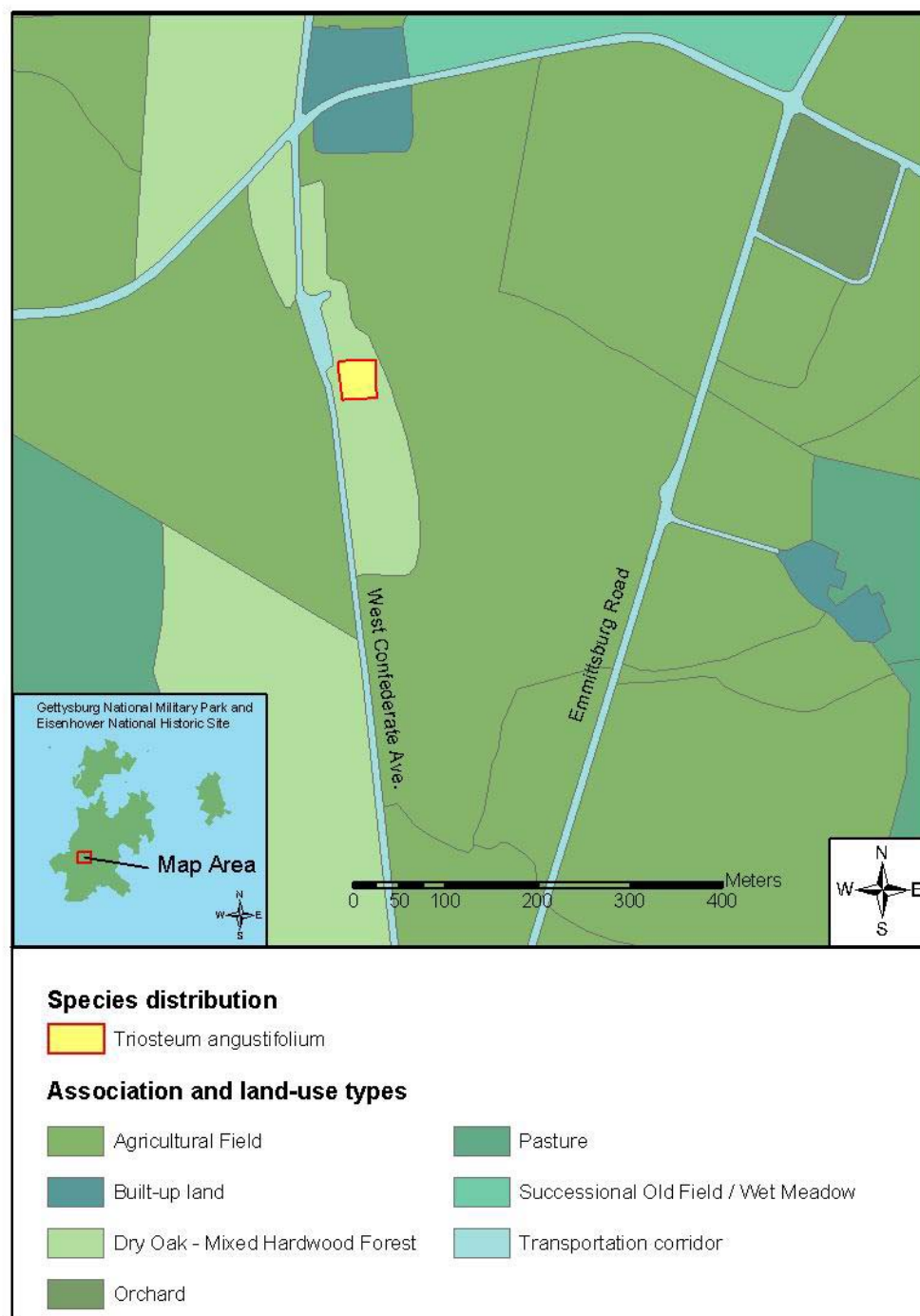


Figure 43. Species distribution of horse-gentian (*Triosteum angustifolium*).

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Appendix A. Federal and state rarity statuses and global and state ranks.

FEDERAL STATUSES

(Legislative Authority: The Endangered Species Act of 1973)

Endangered – a species in danger of extinction throughout all or a significant portion of its range.

Threatened – a species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

DCNR STATE RARITY STATUSES

(Legislative Authority: Title 25, Chapter 82, Conservation of Native Wild Plants, amended June 18, 1993, Pennsylvania Department of Environmental Resources)

The state rarity statuses and state element ranks can be dynamic and may be amended as new data become available as the result of continuing field surveys and research.

- PE - Pennsylvania Endangered - Plant species which are in danger of extinction throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained or if the species is greatly exploited by man. This classification shall also include any populations of plant species that have been classified as Pennsylvania Extirpated, but which subsequently are found to exist in this Commonwealth.
- PT - Pennsylvania Threatened - Plant species which may become endangered throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained to prevent further decline in this Commonwealth, or if the species is greatly exploited by man.
- PR - Pennsylvania Rare - Plant species which are uncommon within this Commonwealth. All species of native wild plants classified as Disjunct, Endemic, Limit of Range and Restricted are included within the Pennsylvania Rare classification.
- PX - Pennsylvania Extirpated - Plant species believed by the Department to be extinct within this Commonwealth. These plant species may or may not be in existence outside this Commonwealth. If plant species classified as Pennsylvania Extirpated are found to exist, the species automatically will be considered to be classified as Pennsylvania Endangered.
- PV - Pennsylvania Vulnerable - Plant species which are in danger of population decline within Pennsylvania because of their beauty, economic value, use as a cultivar, or other factors which indicate that persons may seek to remove these species from their native habitats.
- TU - Tentatively Undetermined - Plant species which are believed to be in danger of population decline, but which cannot presently be included within another classification

due to taxonomic uncertainties, limited evidence within historical records, or insufficient data.

- N - None - Plant species which are believed to be endangered, rare, or threatened, but which are being considered by the required regulatory review processes for future listing.

NatureServe GLOBAL ELEMENT RANKS

- G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
- G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
- G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.
- G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- GH = Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered (e.g., Bachman's Warbler).
- GU = Possibly in peril range wide but status uncertain; need more information.
- GX = Believed to be extinct throughout its range (e.g., Passenger Pigeon) with virtually no likelihood that it will be rediscovered.

NatureServe STATE ELEMENT RANKS

- S1 = Critically imperiled in state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.

- S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.
- S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences).
- S4 = Apparently secure in state, with many occurrences.
- S5 = Demonstrably secure in state and essentially ineradicable under present conditions.
- SA = Accidental in state, including species which only sporadically breed in the state.
- SE = An exotic established in state; may be native elsewhere in North America (e.g., house finch).
- SH = Of historical occurrence in the state with the expectation that it may be rediscovered.
- SN = Regularly occurring, usually migratory and typically non-breeding species for which no significant or effective habitat conservation measures can be taken in the state.
- SR = Reported from the state, but without persuasive documentation which would provide a basis for either accepting or rejecting (e.g., misidentified specimen) the report.
- SRF = Reported falsely (in error) from the state but this error persisting in the literature.
- SU = Possibly in peril in state but status uncertain; need more information.
- SX = Apparently extirpated from the state.

Note: A "T" appearing in either the G Rank or S Rank indicates that the intraspecific taxa is being ranked differently than the species. A "Q" in the rank indicates that there is taxonomic uncertainty about a taxa being ranked (i.e., taxa is being accepted as a full species or natural community in this list but may be treated as a variety or form by others). A "?" after a "G" or "S" indicates that the rank is uncertain at this time.

Appendix B. Vegetation associations in Gettysburg National Military Park and Eisenhower National Historic Site (adapted from Perles et al. 2006).

Agricultural Field

When these fields are planted to grasses, they are often near monocultures of one of following species: timothy (*Phleum pratense*), meadow ryegrass (*Lolium pratense*), or wheat (*Triticum aestivum*). Other common associates include wild garlic (*Allium vineale*), garden yellow rocket (*Barbarea vulgaris*), redtop (*Agrostis gigantea*), red clover (*Trifolium pratense*), white clover (*Trifolium repens*), quackgrass (*Elymus repens*), red fescue (*Festuca rubra*), orchard grass (*Dactylis glomerata*), Canada bluegrass (*Poa compressa*), common dandelion (*Taraxacum officinale*), sweet vernal grass (*Anthoxanthum odoratum*), narrowleaf plantain (*Plantago lanceolata*), spreading dogbane (*Apocynum androsaemifolium*), and Kentucky bluegrass (*Poa pratensis*). Fallow fields usually contain a mixture of species that colonize bare soil, such as prairie fleabane (*Erigeron strigosus*), mouse-ear cress (*Arabidopsis thaliana*), common mouse-ear chickweed (*Cerastium fontanum*), bristleglass (*Setaria* spp.), and other annual weeds. The invasive species Canadian thistle (*Cirsium arvense*) can be abundant in the fallow fields and present in the planted fields. Woody plants and vines are generally absent from these fields. These fields may contain inclusions of wet meadow vegetation along the linear drainages and swales that run through the fields.

Agricultural Field/Wet Meadow

A blend of the Agricultural Field and Wet Meadow vegetation associations.

Bottomland Mixed Hardwood Forest

Due to the small fragmented nature of the stands and their disturbance history, the canopy composition can be extremely variable. The canopy can be dominated by one or more of the following species: green ash (*Fraxinus pennsylvanica*), pin oak (*Quercus palustris*), swamp white oak (*Quercus bicolor*), black walnut (*Juglans nigra*), or shagbark hickory (*Carya ovata*). A wide range of associates can be found in the canopy and subcanopy, such as: red maple (*Acer rubrum*), American elm (*Ulmus americana*), eastern redbud (*Cercis canadensis*), box-elder (*Acer negundo*), eastern red-cedar (*Juniperus virginiana*), Shumard's oak (*Quercus shumardii*), black cherry (*Prunus serotina*), silver maple (*Acer saccharinum*), sweet cherry (*Prunus avium*), and tuliptree (*Liriodendron tulipifera*). The canopy varies from open woodland to closed canopy (25-80% cover) and extends 20-30 m in height. Subcanopy trees usually range from 10-15 m in height and cover 15-70% of the stand. Northern spicebush (*Lindera benzoin*), along with the invasive plants multiflora rose (*Rosa multiflora*), autumn-olive (*Elaeagnus umbellata*), Morrow's honeysuckle (*Lonicera morrowii*), and European privet (*Ligustrum vulgare*) compose the tall-shrub layer that covers 20-60% of the stand. Common short shrubs are Japanese barberry (*Berberis thunbergii*), wineberry (*Rubus phoenicolasius*), black raspberry (*Rubus occidentalis*), northern dewberry (*Rubus flagellaris*), Allegheny blackberry (*Rubus allegheniensis*), and seedlings of the canopy and subcanopy species. The herbaceous layer is typically moderately dense to dense (50-99% cover) and contains jewelweed (*Impatiens capensis*), mannagrass (*Glyceria* sp.), spring avens (*Geum vernum*), Jack-in-the-pulpit (*Arisaema triphyllum*), broadleaf enchanter's-nightshade (*Circaea lutetiana* ssp. *canadensis*), eastern star sedge (*Carex radiata*), common yellow wood sorrel (*Oxalis stricta*), eastern narrowleaf sedge (*Carex amphibola*), rough

bluegrass (*Poa trivialis*), Canadian wild ginger (*Asarum canadense*), wild garlic (*Allium vineale*), marsh blue violet (*Viola cucullata*), false nettle (*Boehmeria cylindrica*), and sensitive fern (*Onoclea sensibilis*). The invasive species Japanese stiltgrass (*Microstegium vimineum*), Japanese honeysuckle (*Lonicera japonica*), creeping jenny (*Lysimachia nummularia*), and garlic mustard (*Alliaria petiolata*) can be abundant in the herbaceous layer. Vines such as poison-ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), frost grape (*Vitis vulpina*), and common moonseed (*Menispermum canadense*) are typical and cover 10-60% of the stand.

Chestnut Oak Forest

The closed canopy is dominated by chestnut oak (*Quercus prinus*) with associates of black oak (*Quercus velutina*), scarlet oak (*Quercus coccinea*), and/or white oak (*Quercus alba*). Other canopy and subcanopy tree species include mockernut hickory (*Carya alba*), pignut hickory (*Carya glabra*), red hickory (*Carya ovalis*), common serviceberry (*Amelanchier arborea*), sassafras (*Sassafras albidum*), blackgum (*Nyssa sylvatica*), black cherry (*Prunus serotina*), and red maple (*Acer rubrum*). Canopy trees tend to extend 25-30 m in height, while subcanopy trees are typically 10-15 m in height. A sparse tall-shrub layer contains eastern redbud (*Cercis canadensis*), white ash (*Fraxinus americana*), and species from the canopy. The short-shrub layer contains mostly ericaceous species, predominantly Blue Ridge blueberry (*Vaccinium pallidum*), with occasional mountain laurel (*Kalmia latifolia*), northern lowbush blueberry (*Vaccinium angustifolium*), deerberry (*Vaccinium stamineum*), and black huckleberry (*Gaylussacia baccata*). Mapleleaf viburnum (*Viburnum acerifolium*) is another prominent short shrub, along with northern dewberry (*Rubus flagellaris*) and seedlings of canopy trees. Owing largely to the thick, resistant oak/ericad leaf litter, the herbaceous layer is generally sparse. Common constituents include white snakeroot (*Ageratina altissima* var. *altissima*), wreath goldenrod (*Solidago caesia*), Solomon's-seal (*Polygonatum biflorum*), feathery false lily-of-the-valley (*Maianthemum racemosum* ssp. *racemosum*), and whitetinge sedge (*Carex albicans*). Virginia creeper (*Parthenocissus quinquefolia*) may be an abundant vine in this forest type.

Dry Oak Mixed-Hardwood Forest

The canopy is dominated by white oak (*Quercus alba*) and/or northern red oak (*Quercus rubra*), with associates pignut hickory (*Carya glabra*), black oak (*Quercus velutina*), white ash (*Fraxinus americana*), mockernut hickory (*Carya alba*), and shagbark hickory (*Carya ovata*). Disturbed stands of this forest type can also have tuliptree (*Liriodendron tulipifera*) as a codominant. Eastern white pine (*Pinus strobus*) can be an occasional canopy associate. Canopy trees usually extend from 20-35 m in height and cover 60-90% of the area. In stands where clearing has occurred, the canopy will be more open, resembling a woodland. The subcanopy reaches from 5-20 m in height and can cover 25-50% of the area. Typical subcanopy trees include red maple (*Acer rubrum*), shagbark hickory (*Carya ovata*), pignut hickory, sweet cherry (*Prunus avium*), black cherry (*Prunus serotina*), American elm (*Ulmus americana*), sassafras (*Sassafras albidum*), and blackgum (*Nyssa sylvatica*). Dead or declining subcanopy eastern redcedar (*Juniperus virginiana*) are common in disturbed stands. The tall-shrub layer can be sparse (5-20% cover) or dense (40-60% cover) and contains flowering dogwood (*Cornus florida*), blackhaw (*Viburnum prunifolium*), spicebush (*Lindera benzoin*), American witch-hazel (*Hamamelis virginiana*), and species from the canopy and subcanopy. White ash seedlings, spicebush, northern dewberry (*Rubus flagellaris*), eastern redbud (*Cercis canadensis*), and

mapleleaf viburnum (*Viburnum acerifolium*) are common species in the short-shrub layer that covers 10-50% of the area. The invasive species multiflora rose (*Rosa multiflora*) and Japanese barberry (*Berberis thunbergii*) can also be abundant in the short-shrub layer in disturbed examples of this type. The herbaceous layer is generally sparse and covers approximately 30% of the area, although the percent cover of the herbaceous layer can vary from 15-90%. Common constituents include broadleaf enchanter's-nightshade (*Circaea lutetiana* ssp. *canadensis*), jewelweed (*Impatiens capensis*), licorice bedstraw (*Galium circaezans*), Jack-in-the-pulpit (*Arisaema triphyllum*), rue anemone (*Thalictrum thalictroides*), Virginia springbeauty (*Claytonia virginica*), feathery false lily-of-the-valley (*Maianthemum racemosum* ssp. *racemosum*), Solomon's-seal (*Polygonatum biflorum*), naked-flower tick-trefoil (*Desmodium nudiflorum*), lopseed (*Phryma leptostachya*), and upland boneset (*Eupatorium sessilifolium*). Virginia creeper (*Parthenocissus quinquefolia*) is a typical vine. The invasive species Japanese honeysuckle (*Lonicera japonica*), garlic mustard (*Alliaria petiolata*), Japanese stiltgrass (*Microstegium vimineum*), and oriental lady's-thumb (*Polygonum caespitosum*) may be abundant in this forest type.

Modified Successional Forest

This association is variable both in vegetation structure and species composition. Land-use history as well as past and current management greatly affect the composition of each forest stand. In general, the canopy and subcanopy are dominated by early-successional and weedy species, often with small diameters at breast height (<15 cm). Eastern red-cedar (*Juniperus virginiana*) is often abundant in the subcanopy, although these trees may experience decline as they are shaded by canopy trees. Common canopy and subcanopy trees include white ash (*Fraxinus americana*), black cherry (*Prunus serotina*), black walnut (*Juglans nigra*), black locust (*Robinia pseudoacacia*), eastern redbud (*Cercis canadensis*), sassafras (*Sassafras albidum*), American elm (*Ulmus americana*), red maple (*Acer rubrum*), honey locust (*Gleditsia triacanthos*), white pine (*Pinus strobus*), quaking aspen (*Populus tremuloides*), catalpa (*Catalpa speciosa*), and several oak species (*Quercus rubra*, *Quercus velutina*, *Quercus palustris*). Canopy trees typically extend 20-30 m in height and cover 30-70% of the stand. Subcanopy trees usually range from 5-15 m in height and cover 20-80% of the stand. Blackhaw (*Viburnum prunifolium*), northern spicebush (*Lindera benzoin*), eastern redbud, and flowering dogwood (*Cornus florida*) make up the tall-shrub layer (20-50% cover). The short-shrub layer (20-50% cover) is composed of black raspberry (*Rubus occidentalis*), Allegheny blackberry (*Rubus allegheniensis*), northern dewberry (*Rubus flagellaris*), and seedlings of the canopy trees. The herbaceous layer (20-80% cover) is composed of jewelweed (*Impatiens capensis*), eastern narrowleaf sedge (*Carex amphibola*), wild garlic (*Allium vineale*), broadleaf enchanter's-nightshade (*Circaea lutetiana* ssp. *canadensis*), sweet vernal grass (*Anthoxanthum odoratum*), eastern star sedge (*Carex radiata*), common yellow wood sorrel (*Oxalis stricta*), white snakeroot (*Ageratina altissima* var. *altissima*), Jack-in-the-pulpit (*Arisaema triphyllum*), licorice bedstraw (*Galium circaezans*), Indian strawberry (*Duchesnea indica*), and common selfheal (*Prunella vulgaris*). Invasive species are abundant in the tall-shrub, short-shrub and herbaceous layers of this forest type. The most common invasives include Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), garlic mustard (*Alliaria petiolata*), European privet (*Ligustrum vulgare*), Morrow's honeysuckle (*Lonicera morrowii*), and wineberry (*Rubus phoenicolasius*). Vines can be sparse or abundant (10-70% cover), with such common species as Virginia creeper (*Parthenocissus quinquefolia*), grape (*Vitis* spp.), and poison-ivy (*Toxicodendron radicans*).

Pasture

The vegetation in these fields is often heavily browsed. The species composition is variable, although most species are annual weeds or adapted to colonizing bare soil. Common species include meadow ryegrass (*Lolium pratense*), Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), white clover (*Trifolium repens*), red clover (*Trifolium pratense*), annual ragweed (*Ambrosia artemisiifolia*), sweet vernal grass (*Anthoxanthum odoratum*), and path rush (*Juncus tenuis*). Other associates include prairie fleabane (*Erigeron strigosus*), Queen Anne's-lace (*Daucus carota*), narrowleaf plantain (*Plantago lanceolata*), common dandelion (*Taraxacum officinale*), and orchard grass (*Dactylis glomerata*). Widely scattered trees may be present in the pastures or line the edges of the field. Possible species include eastern red-cedar (*Juniperus virginiana*), cherry (*Prunus* spp.), white ash (*Fraxinus americana*), black walnut (*Juglans nigra*), black locust (*Robinia pseudoacacia*), eastern redbud (*Cercis canadensis*), sassafras (*Sassafras albidum*), American elm (*Ulmus americana*), red maple (*Acer rubrum*), honey locust (*Gleditsia triacanthos*), and oaks (*Quercus* spp.).

Pasture/Wet Meadow

A blend of the Pasture and Wet Meadow vegetation associations.

Successional Old Field

These successional fields are typically dominated by a diverse mix of grasses and forbs with woody species establishing intermittently throughout the fields. Shrubs and saplings can be absent or cover up to 80% of the field. The most common tall shrub is eastern red-cedar (*Juniperus virginiana*), with sweet cherry (*Prunus avium*) and white ash (*Fraxinus americana*) as other common woody plants. Short shrubs can cover 5-40% of the field. Common short shrubs include Allegheny blackberry (*Rubus allegheniensis*), smooth sumac (*Rhus glabra*), eastern red-cedar, eastern redbud (*Cercis canadensis*), and northern dewberry (*Rubus flagellaris*). In areas of the field without dense shrubs, the herbaceous layer is typically dense (60-95% cover) and contains a diverse mix of grasses and forbs. The most common species include sweet vernal grass (*Anthoxanthum odoratum*), red fescue (*Festuca rubra*), meadow ryegrass (*Lolium pratense*), early goldenrod (*Solidago juncea*), wrinkleleaf goldenrod (*Solidago rugosa*), narrowleaf mountainmint (*Pycnanthemum tenuifolium*), American burnweed (*Erechtites hieraciifolia*), common yellow wood sorrel (*Oxalis stricta*), fuzzy sedge (*Carex hirsutella*), yellow Indiangrass (*Sorghastrum nutans*), St. John's-wort (*Hypericum punctatum*, *Hypericum perforatum*), garden yellow rocket (*Barbarea vulgaris*), Queen Anne's-lace (*Daucus carota*), panicked-leaf tick-trefoil (*Desmodium paniculatum*), wild garlic (*Allium vineale*), flat-top goldentop (*Euthamia graminifolia*), Virginia strawberry (*Fragaria virginiana*), and wild mint (*Mentha arvensis*). Invasive species can be abundant in the tall-shrub, short-shrub and herbaceous layers, including Japanese honeysuckle (*Lonicera japonica*), Morrow's honeysuckle (*Lonicera morrowii*), multiflora rose (*Rosa multiflora*), and autumn-olive (*Elaeagnus umbellata*). Vines such as poison-ivy (*Toxicodendron radicans*) and grape (*Vitis* spp.) are typical and can cover 0-40% of the stand.

Successional Old Field/Wet Meadow

A blend of the Successional Old Field and Wet Meadow vegetation associations.

Sycamore-Mixed Hardwood Floodplain Forest

The canopy is typically dominated by sycamore (*Platanus occidentalis*), with associates black walnut (*Juglans nigra*), bitternut hickory (*Carya cordiformis*), silver maple (*Acer saccharinum*), shagbark hickory (*Carya ovata*), box-elder (*Acer negundo*), and shellbark hickory (*Carya laciniosa*). The subcanopy is composed of American elm (*Ulmus americana*), box-elder, silver maple, and green ash (*Fraxinus pennsylvanica*). The closed canopy extends 25-35 m in height, while subcanopy trees usually range from 5-15 m in height and cover 30-60% of the stand. The tall- and short-shrub layers are sparse, usually composed of saplings and seedlings of canopy and subcanopy trees, as well as other weedy hardwood species. The herbaceous layer is typically dense (about 90% cover) and contains false mermaidweed (*Floerkea proserpinacoides*), jewelweed (*Impatiens capensis*), broadleaf enchanter's-nightshade (*Circaea lutetiana ssp. canadensis*), Canadian wild ginger (*Asarum canadense*), green dragon (*Arisaema dracontium*), spreading sedge (*Carex laxiculmis*), and Solomon's-seal (*Polygonatum biflorum*). Invasive species are abundant in the herbaceous layer, including garlic mustard (*Alliaria petiolata*), Japanese stiltgrass (*Microstegium vimineum*), Japanese honeysuckle (*Lonicera japonica*), oriental lady's-thumb (*Polygonum caespitosum*), and Asiatic tearthumb (*Polygonum perfoliatum*). Vines such as poison-ivy (*Toxicodendron radicans*) and Virginia creeper (*Parthenocissus quinquefolia*) are typical and cover 5-20% of the stand.

Tuliptree Forest

Tuliptree (*Liriodendron tulipifera*) is dominant in the canopy and subcanopy, covering greater than 50% of the forest canopy. Common canopy associates include oaks (*Quercus velutina*, *Quercus rubra*, *Quercus alba*, *Quercus prinus*) and mockernut hickory (*Carya alba*), while subcanopy associates are white ash (*Fraxinus americana*) and red maple (*Acer rubrum*). Canopy trees usually range in height from 30-35 m, and subcanopy trees reach 10-25 m in height. Northern spicebush (*Lindera benzoin*) is typically dominant in the tall- and short-shrub layers, which can be sparse to moderately dense (20-60% cover). Other common shrubs include blackhaw (*Viburnum prunifolium*), witch-hazel (*Hamamelis virginiana*), and seedlings and saplings of the canopy trees. The invasive species multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*), and wineberry (*Rubus phoenicolasius*) can also be abundant in the short-shrub layer. The herbaceous layer is composed of broadleaf enchanter's-nightshade (*Circaea lutetiana ssp. canadensis*), Jack-in-the-pulpit (*Arisaema triphyllum*), wild comfrey (*Cynoglossum virginianum*), licorice bedstraw (*Galium circaezans*), jewelweed (*Impatiens capensis*), perfoliate bellwort (*Uvularia perfoliata*), and downy yellow violet (*Viola pubescens*). Virginia creeper (*Parthenocissus quinquefolia*) is often present as a vine. The invasive species Japanese honeysuckle (*Lonicera japonica*), garlic mustard (*Alliaria petiolata*), Japanese stiltgrass (*Microstegium vimineum*), and oriental lady's-thumb (*Polygonum caespitosum*) may be abundant in this forest type.

Wet Meadow

This association is dominated by a diverse mix of hydrophilic graminoids, predominantly sedges (*Carex* spp.). Common sedges include broom sedge (*Carex scoparia*), fox sedge (*Carex vulpinoidea*), yellowfruit sedge (*Carex annectens*), Bush's sedge (*Carex bushii*), owlfruit sedge (*Carex stipata*), squarrose sedge (*Carex squarrosa*), shallow sedge (*Carex lurida*), blunt broom sedge (*Carex tribuloides*), tussock sedge (*Carex stricta*), and woolly sedge (*Carex pellita*). The graminoid and herbaceous vegetation is typically dense (>90% cover). Other common species

are common rush (*Juncus effusus*), path rush (*Juncus tenuis*), reed canary grass (*Phalaris arundinacea*), rough bluegrass (*Poa trivialis*), rice cutgrass (*Leersia oryzoides*), green bulrush (*Scirpus atrovirens*), Indian hemp (*Apocynum cannabinum*), meadow ryegrass (*Lolium pratense*), red fescue (*Festuca rubra*), arrowleaf tearthumb (*Polygonum sagittatum*), harvestlice (*Agrimonia parviflora*), bluntleaf bedstraw (*Galium obtusum*), woolgrass (*Scirpus cyperinus*), jewelweed (*Impatiens capensis*), fowl mannagrass (*Glyceria striata*), and many others. Short shrubs can be scattered throughout the wet meadow vegetation, including swamp rose (*Rosa palustris*), common elderberry (*Sambucus nigra ssp. canadensis*), willows (*Salix* spp.), and tree seedlings such as pin oak (*Quercus palustris*), swamp white oak (*Quercus bicolor*), red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), and American elm (*Ulmus americana*). The invasive species creeping jenny (*Lysimachia nummularia*) and multiflora rose (*Rosa multiflora*) are frequent associates in this vegetation type.

Appendix C. Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Family	Scientific Name	Common Name
Aceraceae	<i>Acer campestre</i>	hedge maple
Aceraceae	<i>Acer negundo</i>	boxelder
Aceraceae	<i>Acer platanoides</i>	Norway maple
Aceraceae	<i>Acer rubrum</i>	red maple
Aceraceae	<i>Acer saccharinum</i>	silver maple
Aceraceae	<i>Acer saccharum</i>	sugar maple
Acoraceae	<i>Acorus calamus</i>	Calamus
Agavaceae	<i>Yucca</i> sp.	Yucca
Alismataceae	<i>Alisma subcordatum</i>	American water plantain
Anacardiaceae	<i>Rhus copallinum</i>	flameleaf sumac
Anacardiaceae	<i>Rhus glabra</i>	smooth sumac
Anacardiaceae	<i>Toxicodendron radicans</i>	eastern poison ivy
Annonaceae	<i>Asimina triloba</i>	Pawpaw
Apiaceae	<i>Cicuta maculata</i>	spotted water hemlock
Apiaceae	<i>Conium maculatum</i>	poison hemlock
Apiaceae	<i>Cryptotaenia canadensis</i>	Canadian honewort
Apiaceae	<i>Daucus carota</i>	Queen Anne's lace
Apiaceae	<i>Osmorhiza longistylis</i>	longstyle sweetroot
Apiaceae	<i>Sanicula canadensis</i>	Canadian blacksnakeroot
Apiaceae	<i>Sanicula odorata</i>	clustered blacksnakeroot
Apiaceae	<i>Thaspium barbinode</i>	hairyjoint meadowparsnip
Apiaceae	<i>Zizia aptera</i>	Meadow zizia
Apiaceae	<i>Zizia aurea</i>	golden zizia
Apocynaceae	<i>Apocynum cannabinum</i>	Indianhemp
Apocynaceae	<i>Vinca minor</i>	Common periwinkle
Aquifoliaceae	<i>Ilex verticillata</i>	Common winterberry
Araceae	<i>Arisaema dracontium</i>	green dragon
Araceae	<i>Arisaema triphyllum</i>	Jack in the pulpit
Araceae	<i>Symplocarpus foetidus</i>	skunk cabbage
Araliaceae	<i>Hedera helix</i>	English ivy
Aristolochiaceae	<i>Aristolochia serpentaria</i>	Virginia snakeroot
Aristolochiaceae	<i>Asarum canadense</i>	Canadian wildginger
Asclepiadaceae	<i>Asclepias incarnata</i>	swamp milkweed
Asclepiadaceae	<i>Asclepias purpurascens</i>	purple milkweed
Asclepiadaceae	<i>Asclepias quadrifolia</i>	fourleaf milkweed
Asclepiadaceae	<i>Asclepias syriaca</i>	Common milkweed
Asclepiadaceae	<i>Asclepias tuberosa</i>	Butterfly milkweed
Asclepiadaceae	<i>Asclepias viridiflora</i>	green comet milkweed
Aspleniaceae	<i>Asplenium platyneuron</i>	ebony spleenwort
Asteraceae	<i>Achillea millefolium</i>	Common yarrow
Asteraceae	<i>Ageratina altissima</i> var. <i>altissima</i>	white snakeroot

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Asteraceae	<i>Ambrosia artemisiifolia</i>	annual ragweed
Asteraceae	<i>Ambrosia trifida</i>	great ragweed
Asteraceae	<i>Antennaria howellii</i>	Howell's pussytoes
Asteraceae	<i>Antennaria neglecta</i>	field pussytoes
Asteraceae	<i>Antennaria parlinii</i>	Parlin's pussytoes
Asteraceae	<i>Antennaria plantaginifolia</i>	woman's tobacco
Asteraceae	<i>Arctium minus</i>	lesser burdock
Asteraceae	<i>Artemisia annua</i>	sweet sagewort
Asteraceae	<i>Bidens cernua</i>	Nodding beggartick
Asteraceae	<i>Bidens frondosa</i>	devil's beggartick
Asteraceae	<i>Bidens tripartita</i>	threelobe beggarticks
Asteraceae	<i>Centaurea biebersteinii</i>	spotted knapweed
Asteraceae	<i>Cichorium intybus</i>	Chicory
Asteraceae	<i>Cirsium arvense</i>	Canada thistle
Asteraceae	<i>Cirsium discolor</i>	field thistle
Asteraceae	<i>Cirsium pumilum</i>	pasture thistle
Asteraceae	<i>Cirsium vulgare</i>	bull thistle
Asteraceae	<i>Conyza canadensis</i>	Canadian horseweed
Asteraceae	<i>Eclipta prostrata</i>	false daisy
Asteraceae	<i>Erechtites hieraciifolia</i>	American burnweed
Asteraceae	<i>Erigeron annuus</i>	eastern daisy fleabane
Asteraceae	<i>Erigeron philadelphicus</i>	Philadelphia fleabane
Asteraceae	<i>Erigeron pulchellus</i>	robin's plantain
Asteraceae	<i>Erigeron strigosus</i>	prairie fleabane
Asteraceae	<i>Eupatorium fistulosum</i>	trumpetweed
Asteraceae	<i>Eupatorium perfoliatum</i>	Common boneset
Asteraceae	<i>Eupatorium purpureum</i>	sweetscented joeypyeweed
Asteraceae	<i>Eurybia divaricata</i>	white wood aster
Asteraceae	<i>Eurybia macrophylla</i>	bigleaf aster
Asteraceae	<i>Euthamia graminifolia</i>	flat-top goldentop
Asteraceae	<i>Helenium autumnale</i>	Common sneezeweed
Asteraceae	<i>Helianthus divaricatus</i>	woodland sunflower
Asteraceae	<i>Heliopsis helianthoides</i>	smooth oxeye
Asteraceae	<i>Hieracium caespitosum</i>	Meadow hawkweed
Asteraceae	<i>Hieracium venosum</i>	rattlesnakeweed
Asteraceae	<i>Krigia virginica</i>	Virginia dwarf dandelion
Asteraceae	<i>Leucanthemum vulgare</i>	oxeye daisy
Asteraceae	<i>Packera aurea</i>	golden ragwort
Asteraceae	<i>Packera paupercula</i>	balsam groundsel
Asteraceae	<i>Prenanthes altissima</i>	tall rattlesnakeroot
Asteraceae	<i>Prenanthes serpentina</i>	lion's-foot; cankerweed
Asteraceae	<i>Pseudognaphalium obtusifolium</i> ssp. <i>obtusifolium</i>	rabbittobacco
Asteraceae	<i>Rudbeckia fulgida</i>	eastern coneflower; orange coneflower

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Asteraceae	<i>Rudbeckia hirta</i>	blackeyed Susan
Asteraceae	<i>Rudbeckia laciniata</i>	cutleaf coneflower
Asteraceae	<i>Rudbeckia triloba</i>	browneyed Susan
Asteraceae	<i>Silphium trifoliatum</i>	whorled rosinweed
Asteraceae	<i>Solidago bicolor</i>	white goldenrod
Asteraceae	<i>Solidago caesia</i>	wreath goldenrod
Asteraceae	<i>Solidago</i> <i>anadensis</i> var. <i>scabra</i>	Canada goldenrod
Asteraceae	<i>Solidago gigantea</i>	giant goldenrod
Asteraceae	<i>Solidago juncea</i>	early goldenrod
Asteraceae	<i>Solidago nemoralis</i>	gray goldenrod
Asteraceae	<i>Solidago rugosa</i>	wrinkleleaf goldenrod
Asteraceae	<i>Solidago ulmifolia</i>	elmleaf goldenrod
Asteraceae	<i>Sonchus asper</i>	spiny sowthistle
Asteraceae	<i>Symphotrichum lanceolatum</i> ssp. <i>Lanceolatum</i> var. <i>lanceolatum</i>	white panicle aster
Asteraceae	<i>Symphotrichum lateriflorum</i> var. <i>lateriflorum</i>	calico aster
Asteraceae	<i>Symphotrichum patens</i> var. <i>patens</i>	late purple aster
Asteraceae	<i>Symphotrichum pilosum</i> var. <i>pilosum</i>	hairy white oldfield aster
Asteraceae	<i>Symphotrichum prenanthoides</i>	crookedstem aster
Asteraceae	<i>Symphotrichum undulatum</i>	waxy leaf aster
Asteraceae	<i>Taraxacum officinale</i>	common dandelion
Asteraceae	<i>Verbesina alternifolia</i>	wingstem
Asteraceae	<i>Vernonia noveboracensis</i>	New York ironweed
Asteraceae	<i>Xanthium strumarium</i>	rough cocklebur
Balsaminaceae	<i>Impatiens capensis</i>	jewelweed
Berberidaceae	<i>Berberis thunbergii</i>	Japanese barberry
Berberidaceae	<i>Podophyllum peltatum</i>	mayapple
Betulaceae	<i>Alnus glutinosa</i>	European alder
Betulaceae	<i>Carpinus caroliniana</i>	American hornbeam
Betulaceae	<i>Corylus americana</i>	American hazelnut
Betulaceae	<i>Ostrya virginiana</i>	hophornbeam
Bignoniaceae	<i>Campsis radicans</i>	trumpet creeper
Bignoniaceae	<i>Catalpa speciosa</i>	northern catalpa
Boraginaceae	<i>Cynoglossum virginianum</i>	wild comfrey
Boraginaceae	<i>Echium vulgare</i>	common vipersbugloss
Boraginaceae	<i>Hackelia virginiana</i>	beggarslice
Boraginaceae	<i>Lithospermum canescens</i>	hoary puccoon
Boraginaceae	<i>Myosotis laxa</i>	bay forget-me-not
Boraginaceae	<i>Myosotis verna</i>	spring forget-me-not
Brassicaceae	<i>Alliaria petiolata</i>	garlic mustard
Brassicaceae	<i>Arabis canadensis</i>	sicklepod
Brassicaceae	<i>Barbarea vulgaris</i>	garden yellowrocket

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Brassicaceae	<i>Capsella bursa-pastoris</i>	shepherd's purse
Brassicaceae	<i>Cardamine bulbosa</i>	bulbous bittercress
Brassicaceae	<i>Cardamine concatenata</i>	cutleaf toothwort
Brassicaceae	<i>Cardamine hirsuta</i>	hairy bittercress
Brassicaceae	<i>Cardamine parviflora</i>	sand bittercress
Brassicaceae	<i>Hesperis matronalis</i>	dames rocket
Brassicaceae	<i>Rorippa nasturtium-aquaticum</i>	watercress
Callitrichaceae	<i>Callitriche heterophylla</i>	twoheaded water-starwort
Callitrichaceae	<i>Callitriche terrestris</i>	terrestrial water-starwort
Campanulaceae	<i>Lobelia cardinalis</i>	cardinalflower
Campanulaceae	<i>Lobelia inflata</i>	Indian-tobacco
Campanulaceae	<i>Lobelia siphilitica</i>	great blue lobelia
Campanulaceae	<i>Lobelia spicata</i>	palespike lobelia
Campanulaceae	<i>Triodanis perfoliata</i>	clasping Venus' looking-glass
Caprifoliaceae	<i>Lonicera japonica</i>	Japanese honeysuckle
Caprifoliaceae	<i>Lonicera maackii</i>	Amur honeysuckle
Caprifoliaceae	<i>Lonicera morrowii</i>	Morrow's honeysuckle
Caprifoliaceae	<i>Lonicera</i> sp.	Honeysuckle
Caprifoliaceae	<i>Sambucus nigra</i> ssp. <i>Canadensis</i>	common elderberry
Caprifoliaceae	<i>Symphoricarpos orbiculatus</i>	coralberry
Caprifoliaceae	<i>Triosteum angustifolium</i>	horse-gentian; yellowfruit horse-gentian
Caprifoliaceae	<i>Viburnum acerifolium</i>	mapleleaf viburnum
Caprifoliaceae	<i>Viburnum dentatum</i> var. <i>lucidum</i>	southern arrowwood
Caprifoliaceae	<i>Viburnum prunifolium</i>	blackhaw
Caprifoliaceae	<i>Viburnum</i> sp.	Viburnum
Caryophyllaceae	<i>Arenaria serpyllifolia</i>	thymeleaf sandwort
Caryophyllaceae	<i>Cerastium arvense</i>	field chickweed
Caryophyllaceae	<i>Cerastium fontanum</i>	common mouse-ear chickweed
Caryophyllaceae	<i>Dianthus armeria</i>	Deptford pink
Caryophyllaceae	<i>Myosoton aquaticum</i>	giantchickweed
Caryophyllaceae	<i>Paronychia canadensis</i>	smooth forked nailwort
Caryophyllaceae	<i>Silene caroliniana</i>	sticky catchfly
Caryophyllaceae	<i>Silene stellata</i>	widowsfrill
Caryophyllaceae	<i>Stellaria graminea</i>	grasslike starwort
Caryophyllaceae	<i>Stellaria longifolia</i>	longleaf starwort
Caryophyllaceae	<i>Stellaria media</i>	common chickweed
Celastraceae	<i>Celastrus orbiculata</i>	Asian bittersweet
Celastraceae	<i>Euonymus alata</i>	winged burning bush
Celastraceae	<i>Euonymus americana</i>	strawberry bush
Celastraceae	<i>Euonymus atropurpurea</i>	eastern wahoo
Cistaceae	<i>Helianthemum bicknellii</i>	hoary frostweed; Bicknell's hoary rockrose
Cistaceae	<i>Lechea</i> sp.	Pinweed
Clusiaceae	<i>Hypericum mutilum</i>	dwarf St. Johnswort

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Clusiaceae	<i>Hypericum perforatum</i>	common St. Johnswort
Clusiaceae	<i>Hypericum prolificum</i>	shrubby St. Johnswort
Clusiaceae	<i>Hypericum punctatum</i>	spotted St. Johnswort
Commelinaceae	<i>Commelina communis</i>	Asiatic dayflower
Commelinaceae	<i>Tradescantia virginiana</i>	Virginia spiderwort
Convolvulaceae	<i>Calystegia sepium</i>	hedge false bindweed
Convolvulaceae	<i>Ipomoea pandurata</i>	man of the earth
Cornaceae	<i>Cornus amomum</i>	silky dogwood
Cornaceae	<i>Cornus florida</i>	flowering dogwood
Cornaceae	<i>Cornus racemosa</i>	gray dogwood
Crassulaceae	<i>Penthorum sedoides</i>	ditch stonecrop
Crassulaceae	<i>Sedum sarmentosum</i>	stringy stonecrop
Cucurbitaceae	<i>Sicyos angulatus</i>	oneseed burr cucumber
Cupressaceae	<i>Juniperus virginiana</i>	eastern redcedar
Cuscutaceae	<i>Cuscuta gronovii</i>	scaldweed
Cyperaceae	<i>Carex aggregata</i>	glomerate sedge
Cyperaceae	<i>Carex albicans</i>	whitening sedge
Cyperaceae	<i>Carex amphibola</i>	eastern narrowleaf sedge
Cyperaceae	<i>Carex annectens</i>	yellowfruit sedge
Cyperaceae	<i>Carex blanda</i>	eastern woodland sedge
Cyperaceae	<i>Carex bromoides</i>	bromelike sedge
Cyperaceae	<i>Carex bushii</i>	Bush's sedge
Cyperaceae	<i>Carex buxbaumii</i>	brown sedge; Buxbaum's sedge
Cyperaceae	<i>Carex cephalophora</i>	oval-leaf sedge
Cyperaceae	<i>Carex conjuncta</i>	soft fox sedge
Cyperaceae	<i>Carex conoidea</i>	openfield sedge
Cyperaceae	<i>Carex crinita</i>	fringed sedge
Cyperaceae	<i>Carex digitalis</i>	slender woodland sedge
Cyperaceae	<i>Carex festucacea</i>	fescue sedge
Cyperaceae	<i>Carex frankii</i>	Frank's sedge
Cyperaceae	<i>Carex glaucoidea</i>	blue sedge
Cyperaceae	<i>Carex granularis</i>	limestone meadow sedge
Cyperaceae	<i>Carex grayi</i>	Gray's sedge
Cyperaceae	<i>Carex grisea</i>	eastern narrowleaf sedge
Cyperaceae	<i>Carex hirsutella</i>	fuzzy wuzzy sedge
Cyperaceae	<i>Carex laxiculmis</i>	spreading sedge
Cyperaceae	<i>Carex laxiflora</i>	broad looseflower sedge
Cyperaceae	<i>Carex lupulina</i>	hop sedge
Cyperaceae	<i>Carex lurida</i>	shallow sedge
Cyperaceae	<i>Carex normalis</i>	greater straw sedge
Cyperaceae	<i>Carex pellita</i>	woolly sedge
Cyperaceae	<i>Carex pensylvanica</i>	Pennsylvania sedge
Cyperaceae	<i>Carex prasina</i>	drooping sedge
Cyperaceae	<i>Carex radiata</i>	eastern star sedge

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Cyperaceae	<i>Carex rosea</i>	rosy sedge
Cyperaceae	<i>Carex scoparia</i>	broom sedge
Cyperaceae	<i>Carex scoparia</i>	broom sedge
Cyperaceae	<i>Carex shortiana</i>	Short's sedge
Cyperaceae	<i>Carex squarrosa</i>	squarrose sedge
Cyperaceae	<i>Carex stipata</i>	owlfruit sedge
Cyperaceae	<i>Carex stricta</i>	upright sedge
Cyperaceae	<i>Carex swanii</i>	Swan's sedge
Cyperaceae	<i>Carex tetanica</i>	rigid sedge
Cyperaceae	<i>Carex tribuloides</i>	blunt broom sedge
Cyperaceae	<i>Carex umbellata</i>	parasol sedge
Cyperaceae	<i>Carex vulpinoidea</i>	fox sedge
Cyperaceae	<i>Carex willdenowii</i>	Willdenow's sedge
Cyperaceae	<i>Cyperus echinatus</i>	globe flatsedge
Cyperaceae	<i>Cyperus strigosus</i>	strawcolored flatsedge
Cyperaceae	<i>Eleocharis obtusa</i>	blunt spikerush
Cyperaceae	<i>Eleocharis palustris</i>	common spikerush
Cyperaceae	<i>Eleocharis tenuis</i>	slender spikerush
Cyperaceae	<i>Schoenoplectus tabernaemontani</i>	softstem bulrush
Cyperaceae	<i>Scirpus atrovirens</i>	green bulrush
Cyperaceae	<i>Scirpus cyperinus</i>	woolgrass
Cyperaceae	<i>Scirpus georgianus</i>	Georgia bulrush
Cyperaceae	<i>Scirpus pendulus</i>	rufous bulrush
Cyperaceae	<i>Scirpus polyphyllus</i>	leafy bulrush
Cyperaceae	<i>Trichophorum planifolium</i>	bashful bulrush
Dennstaedtiaceae	<i>Dennstaedtia punctilobula</i>	eastern hayscented fern
Dennstaedtiaceae	<i>Pteridium aquilinum</i>	western brackenfern
Dioscoreaceae	<i>Dioscorea quaternata</i>	fourleaf yam
Dioscoreaceae	<i>Dioscorea villosa</i>	wild yam
Dipsacaceae	<i>Dipsacus fullonum</i> ssp. <i>Sylvestris</i>	Fuller's teasel
Dryopteridaceae	<i>Dryopteris carthusiana</i>	spinulose woodfern
Dryopteridaceae	<i>Dryopteris intermedia</i>	intermediate woodfern
Dryopteridaceae	<i>Dryopteris marginalis</i>	marginal woodfern
Dryopteridaceae	<i>Onoclea sensibilis</i>	sensitive fern
Dryopteridaceae	<i>Polystichum acrostichoides</i>	Christmas fern
Dryopteridaceae	<i>Woodsia obtusa</i>	bluntlobe cliff fern
Ebenaceae	<i>Diospyros virginiana</i>	common persimmon
Elaeagnaceae	<i>Elaeagnus umbellata</i>	autumn olive
Equisetaceae	<i>Equisetum arvense</i>	field horsetail
Ericaceae	<i>Vaccinium pallidum</i>	Blue Ridge blueberry
Ericaceae	<i>Vaccinium stamineum</i>	deerberry
Euphorbiaceae	<i>Acalypha rhomboidea</i>	Virginia threeseed mercury
Euphorbiaceae	<i>Euphorbia corollata</i>	flowering spurge
Fabaceae	<i>Amphicarpaea bracteata</i>	American hogpeanut

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Fabaceae	<i>Baptisia tinctoria</i>	horseflyweed
Fabaceae	<i>Cercis canadensis</i>	eastern redbud
Fabaceae	<i>Desmodium glutinosum</i>	pointedleaf ticktrefoil
Fabaceae	<i>Desmodium marilandicum</i>	smooth small-leaf ticktrefoil
Fabaceae	<i>Desmodium nudiflorum</i>	nakedflower ticktrefoil
Fabaceae	<i>Desmodium paniculatum</i>	panicledleaf ticktrefoil
Fabaceae	<i>Desmodium perplexum</i>	perplexed ticktrefoil
Fabaceae	<i>Desmodium rotundifolium</i>	prostrate ticktrefoil
Fabaceae	<i>Gleditsia triacanthos</i>	honeylocust
Fabaceae	<i>Gymnocladus dioica</i>	Kentucky coffeetree
Fabaceae	<i>Kummerowia striata</i>	Japanese clover
Fabaceae	<i>Lespedeza cuneata</i>	Chinese lespedeza
Fabaceae	<i>Lespedeza procumbens</i>	trailing lespedeza
Fabaceae	<i>Lespedeza virginica</i>	slender lespedeza
Fabaceae	<i>Medicago lupulina</i>	black medick
Fabaceae	<i>Melilotus officinalis</i>	yellow sweetclover
Fabaceae	<i>Robinia pseudoacacia</i>	black locust
Fabaceae	<i>Senna hebecarpa</i>	American senna
Fabaceae	<i>Stylosanthes biflora</i>	pencilflower; sidebeak pencilflower
Fabaceae	<i>Trifolium aureum</i>	golden clover
Fabaceae	<i>Trifolium hybridum</i>	alsike clover
Fabaceae	<i>Trifolium pratense</i>	red clover
Fabaceae	<i>Trifolium repens</i>	white clover
Fagaceae	<i>Quercus alba</i>	white oak
Fagaceae	<i>Quercus bicolor</i>	swamp white oak
Fagaceae	<i>Quercus coccinea</i>	scarlet oak
Fagaceae	<i>Quercus montana</i>	chestnut oak
Fagaceae	<i>Quercus palustris</i>	pin oak
Fagaceae	<i>Quercus rubra</i>	northern red oak
Fagaceae	<i>Quercus shumardii</i>	Shumard's oak
Fagaceae	<i>Quercus stellata</i>	post oak
Fagaceae	<i>Quercus velutina</i>	black oak
Fumariaceae	<i>Corydalis flavula</i>	yellow fumewort
Gentianaceae	<i>Gentiana clausa</i>	bottle gentian
Gentianaceae	<i>Sabatia angularis</i>	rosepink
Geraniaceae	<i>Geranium maculatum</i>	spotted geranium
Grossulariaceae	<i>Ribes americanum</i>	American black currant
Grossulariaceae	<i>Ribes missouriense</i>	Missouri gooseberry
Hamamelidaceae	<i>Hamamelis virginiana</i>	American witchhazel
Hippocastanaceae	<i>Aesculus flava</i>	yellow buckeye
Hydrocharitaceae	<i>Elodea canadensis</i>	Canadian waterweed
Iridaceae	<i>Belamcanda chinensis</i>	blackberry lily
Iridaceae	<i>Hypoxis hirsuta</i>	common goldstar

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Iridaceae	<i>Iris germanica</i>	German iris
Iridaceae	<i>Sisyrinchium angustifolium</i>	narrowleaf blue-eyed grass
Iridaceae	<i>Sisyrinchium mucronatum</i>	needle-tip blue-eyed grass
Juglandaceae	<i>Carya alba</i>	mockernut hickory
Juglandaceae	<i>Carya cordiformis</i>	bitternut hickory
Juglandaceae	<i>Carya glabra</i>	pignut hickory
Juglandaceae	<i>Carya laciniosa</i>	shellbark hickory
Juglandaceae	<i>Carya ovalis</i>	red hickory
Juglandaceae	<i>Carya ovata</i>	shagbark hickory
Juglandaceae	<i>Juglans cinerea</i>	butternut
Juglandaceae	<i>Juglans nigra</i>	black walnut
Juncaceae	<i>Juncus acuminatus</i>	tapertip rush
Juncaceae	<i>Juncus biflorus</i>	grass-leaved rush; bog rush
Juncaceae	<i>Juncus brachycarpus</i>	short-fruited rush; whiteroot rush
Juncaceae	<i>Juncus effusus</i>	common rush
Juncaceae	<i>Juncus marginatus</i>	grassleaf rush
Juncaceae	<i>Juncus tenuis</i>	poverty rush
Juncaceae	<i>Luzula multiflora</i>	common woodrush
Lamiaceae	<i>Clinopodium vulgare</i>	wild basil
Lamiaceae	<i>Collinsonia canadensis</i>	richweed
Lamiaceae	<i>Cunila origanoides</i>	common dittany
Lamiaceae	<i>Glechoma hederacea</i>	ground ivy
Lamiaceae	<i>Hedeoma pulegioides</i>	American false pennyroyal
Lamiaceae	<i>Lamium purpureum</i>	purple deadnettle
Lamiaceae	<i>Leonurus cardiaca</i>	common motherwort
Lamiaceae	<i>Lycopus americanus</i>	American water horehound
Lamiaceae	<i>Lycopus uniflorus</i>	northern bugleweed
Lamiaceae	<i>Mentha ×piperita</i>	peppermint
Lamiaceae	<i>Mentha arvensis</i>	wild mint
Lamiaceae	<i>Mentha spicata</i>	spearmint
Lamiaceae	<i>Perilla frutescens</i>	beefsteakplant
Lamiaceae	<i>Prunella vulgaris</i>	common selfheal
Lamiaceae	<i>Pycnanthemum incanum</i>	hoary mountainmint
Lamiaceae	<i>Pycnanthemum tenuifolium</i>	narrowleaf mountainmint
Lamiaceae	<i>Pycnanthemum virginianum</i>	Virginia mountainmint
Lamiaceae	<i>Scutellaria elliptica</i>	hairy skullcap
Lamiaceae	<i>Scutellaria integrifolia</i>	helmet flower
Lamiaceae	<i>Scutellaria nervosa</i>	veiny skullcap
Lamiaceae	<i>Scutellaria parvula</i> var. <i>missouriensis</i>	Leonard's skullcap
Lamiaceae	<i>Stachys</i> sp.	hedgenettle
Lamiaceae	<i>Teucrium canadense</i>	Canada germander
Lauraceae	<i>Lindera benzoin</i>	northern spicebush
Lauraceae	<i>Sassafras albidum</i>	sassafras

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Lemnaceae	<i>Lemna minor</i>	common duckweed
Liliaceae	<i>Allium canadense</i>	meadow garlic
Liliaceae	<i>Allium cernuum</i>	nodding onion
Liliaceae	<i>Allium vineale</i>	wild garlic
Liliaceae	<i>Asparagus officinalis</i>	garden asparagus
Liliaceae	<i>Convallaria majalis</i>	European lily of the valley
Liliaceae	<i>Erythronium americanum</i>	dogtooth violet
Liliaceae	<i>Hamerocallis fulva</i>	orange daylily
Liliaceae	<i>Lilium superbum</i>	turk's-cap lily
Liliaceae	<i>Maianthemum racemosum</i> ssp. <i>racemosum</i>	feathery false lily of the vally
Liliaceae	<i>Maianthemum stellatum</i>	starry false lily of the vally
Liliaceae	<i>Narcissus poeticus</i>	poet's narcissus
Liliaceae	<i>Narcissus pseudonarcissus</i>	daffodil
Liliaceae	<i>Ornithogalum umbellatum</i>	star of Bethlehem
Liliaceae	<i>Polygonatum biflorum</i>	smooth Solomon's seal
Liliaceae	<i>Polygonatum biflorum</i> var. <i>commutatum</i>	smooth Solomon's seal
Liliaceae	<i>Polygonatum pubescens</i>	hairy Solomon's seal
Liliaceae	<i>Uvularia perfoliata</i>	perfoliate bellwort
Limnathaceae	<i>Floerkea proserpinacoides</i>	false mermaidweed
Linaceae	<i>Linum virginianum</i>	woodland flax
Lythraceae	<i>Cuphea viscosissima</i>	blue waxweed
Magnoliaceae	<i>Liriodendron tulipifera</i>	tuliptree
Monotropaceae	<i>Monotropa uniflora</i>	Indianpipe
Moraceae	<i>Maclura pomifera</i>	osage orange
Moraceae	<i>Morus alba</i>	white mulberry
Nymphaeaceae	<i>Nuphar lutea</i>	yellow pond-lily
Nyssaceae	<i>Nyssa sylvatica</i>	blackgum
Oleaceae	<i>Fraxinus americana</i>	white ash
Oleaceae	<i>Fraxinus nigra</i>	black ash
Oleaceae	<i>Fraxinus pennsylvanica</i>	green ash
Oleaceae	<i>Ligustrum</i> sp.	privet
Onagraceae	<i>Circaea lutetiana</i>	broadleaf enchanter's nightshade
Onagraceae	<i>Epilobium coloratum</i>	purpleleaf willowherb
Onagraceae	<i>Ludwigia palustris</i>	marsh seedbox
Onagraceae	<i>Oenothera biennis</i>	common evening-primrose
Onagraceae	<i>Oenothera fruticosa</i>	narrowleaf evening-primrose
Onagraceae	<i>Oenothera perennis</i>	little evening-primrose
Ophioglossaceae	<i>Botrychium dissectum</i>	cutleaf grapefern
Ophioglossaceae	<i>Botrychium virginianum</i>	rattlesnake fern
Ophioglossaceae	<i>Ophioglossum</i> sp.	adderstongue
Orchidaceae	<i>Aplectrum hyemale</i>	puttyroot; Adam and Eve
Orchidaceae	<i>Cypripedium pubescens</i>	yellow lady's slipper
Orchidaceae	<i>Epipactis helleborine</i>	broadleaf helleborine

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Orchidaceae	<i>Galearis spectabilis</i>	showy orchid
Orchidaceae	<i>Spiranthes lacera</i> var. <i>gracilis</i>	northern slender ladies'-tresses
Orchidaceae	<i>Tipularia discolor</i>	crane fly orchid; crippled crane fly
Oxalidaceae	<i>Oxalis stricta</i>	common yellow oxalis
Oxalidaceae	<i>Oxalis violacea</i>	violet woodsorrel
Papaveraceae	<i>Chelidonium majus</i>	celandine
Papaveraceae	<i>Sanguinaria canadensis</i>	bloodroot
Phytolaccaceae	<i>Phytolacca americana</i>	American pokeweed
Pinaceae	<i>Larix kaempferi</i>	Japanese larch
Pinaceae	<i>Pinus rigida</i>	pitch pine
Pinaceae	<i>Pinus strobus</i>	eastern white pine
Pinaceae	<i>Pinus sylvestris</i>	Scotch pine
Pinaceae	<i>Pinus virginiana</i>	Virginia pine
Pinaceae	<i>Tsuga canadensis</i>	eastern hemlock
Plantaginaceae	<i>Plantago lanceolata</i>	narrowleaf plantain
Plantaginaceae	<i>Plantago rugelii</i>	blackseed plantain
Plantaginaceae	<i>Plantago virginica</i>	Virginia plantain
Platanaceae	<i>Platanus occidentalis</i>	American sycamore
Poaceae	<i>Agrostis gigantea</i>	redtop
Poaceae	<i>Agrostis perennans</i>	upland bentgrass
Poaceae	<i>Andropogon gerardii</i>	big bluestem
Poaceae	<i>Andropogon virginicus</i>	broomsedge bluestem
Poaceae	<i>Anthoxanthum odoratum</i>	sweet vernalgrass
Poaceae	<i>Arrhenatherum elatius</i>	tall oatgrass
Poaceae	<i>Arthraxon hispidus</i>	small carpgrass
Poaceae	<i>Brachyelytrum erectum</i>	bearded shorthusk
Poaceae	<i>Bromus commutatus</i>	meadow brome
Poaceae	<i>Bromus inermis</i>	smooth brome
Poaceae	<i>Bromus japonicus</i>	Japanese brome
Poaceae	<i>Bromus kalmii</i>	Kalm's brome grass; arctic brome
Poaceae	<i>Bromus latiglumis</i>	earlyleaf brome
Poaceae	<i>Bromus pubescens</i>	hairy woodland brome
Poaceae	<i>Bromus sterilis</i>	poverty brome
Poaceae	<i>Bromus tectorum</i>	cheatgrass
Poaceae	<i>Cinna arundinacea</i>	sweet woodreed
Poaceae	<i>Dactylis glomerata</i>	orchardgrass
Poaceae	<i>Danthonia spicata</i>	poverty oatgrass
Poaceae	<i>Digitaria ischaemum</i>	smooth crabgrass
Poaceae	<i>Digitaria sanguinalis</i>	hairy crabgrass
Poaceae	<i>Echinochloa crus-galli</i>	barnyardgrass
Poaceae	<i>Elymus hystrix</i>	eastern bottlebrush grass
Poaceae	<i>Elymus repens</i>	quackgrass
Poaceae	<i>Elymus riparius</i>	riverbank wildrye
Poaceae	<i>Elymus villosus</i>	hairy wildrye

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Poaceae	<i>Elymus virginicus</i>	Virginia wildrye
Poaceae	<i>Eragrostis hypnoides</i>	teal lovegrass
Poaceae	<i>Eragrostis spectabilis</i>	purple lovegrass
Poaceae	<i>Festuca rubra</i>	red fescue
Poaceae	<i>Festuca subverticillata</i>	nodding fescue
Poaceae	<i>Glyceria septentrionalis</i>	floating mannagrass
Poaceae	<i>Glyceria striata</i>	fowl mannagrass
Poaceae	<i>Holcus lanatus</i>	common velvetgrass
Poaceae	<i>Leersia oryzoides</i>	rice cutgrass
Poaceae	<i>Leersia virginica</i>	whitegrass
Poaceae	<i>Lolium pratense</i>	meadow ryegrass
Poaceae	<i>Microstegium vimineum</i>	stilt grass; Nepalese browntop
Poaceae	<i>Muhlenbergia schreberi</i>	nimblewill
Poaceae	<i>Muhlenbergia sobolifera</i>	rock muhly
Poaceae	<i>Panicum acuminatum</i> (<i>Dichanthelium</i> in USDA)	tapered rosette grass
Poaceae	<i>Panicum anceps</i> (<i>Dichanthelium</i> in USDA)	beaked panicgrass
Poaceae	<i>Panicum boscii</i> (<i>Dichanthelium</i> in USDA)	Bosc's panicgrass
Poaceae	<i>Panicum clandestinum</i> (<i>Dichanthelium</i> in USDA)	deertongue
Poaceae	<i>Panicum commutatum</i> (<i>Dichanthelium</i> in USDA)	variable panicgrass
Poaceae	<i>Panicum depauperatum</i> (<i>Dichanthelium</i> in USDA)	starved panicgrass
Poaceae	<i>Panicum dichotomiflorum</i>	fall panicgrass
Poaceae	<i>Panicum dichotomum</i> (<i>Dichanthelium</i> in USDA)	cypress panicgrass
Poaceae	<i>Panicum gattingeri</i>	Gattinger's panicgrass
Poaceae	<i>Panicum microcarpon</i> (<i>Dichanthelium</i> in USDA)	cypress panicgrass
Poaceae	<i>Panicum oligosanthos</i> (<i>Dichanthelium</i> in USDA)	Heller's panic grass; Scribner's rosette grass
Poaceae	<i>Panicum rigidulum</i>	redtop panicgrass
Poaceae	<i>Paspalum laeve</i>	field paspalum
Poaceae	<i>Paspalum setaceum</i>	thin paspalum
Poaceae	<i>Phalaris arundinacea</i>	reed canarygrass
Poaceae	<i>Phleum pratense</i>	timothy
Poaceae	<i>Poa annua</i>	annual bluegrass
Poaceae	<i>Poa compressa</i>	Canada bluegrass
Poaceae	<i>Poa pratensis</i>	Kentucky bluegrass
Poaceae	<i>Poa trivialis</i>	rough bluegrass
Poaceae	<i>Schizachyrium scoparium</i>	little bluestem
Poaceae	<i>Setaria faberi</i>	Japanese bristlegrass

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Poaceae	<i>Setaria parviflora</i>	marsh bristlegrass
Poaceae	<i>Setaria pumila</i>	yellow bristlegrass
Poaceae	<i>Setaria viridis</i>	green bristlegrass
Poaceae	<i>Sorghastrum nutans</i>	Indiangrass
Poaceae	<i>Sphenopholis intermedia</i>	slender wedgescale
Poaceae	<i>Sphenopholis nitida</i>	shiny wedgescale
Poaceae	<i>Sporobolus vaginiflorus</i>	poverty dropseed
Poaceae	<i>Tridens flavus</i>	purpletop tridens
Poaceae	<i>Vulpia octoflora</i>	sixweeks fescue
Polemoniaceae	<i>Phlox maculata</i>	wild sweetwilliam
Polemoniaceae	<i>Phlox pilosa</i>	downy phlox
Polygonaceae	<i>Polygonum amphibium</i>	water knotweed
Polygonaceae	<i>Polygonum caespitosum</i>	oriental ladythumb
Polygonaceae	<i>Polygonum lapathifolium</i>	curlytop knotweed
Polygonaceae	<i>Polygonum perfoliatum</i>	Asiatic tearthumb
Polygonaceae	<i>Polygonum persicaria</i>	spotted ladythumb
Polygonaceae	<i>Polygonum punctatum</i>	dotted smartweed
Polygonaceae	<i>Polygonum sagittatum</i>	arrowleaf tearthumb
Polygonaceae	<i>Polygonum scandens</i>	climbing false buckwheat
Polygonaceae	<i>Polygonum virginianum</i>	jumpseed
Polygonaceae	<i>Rumex acetosella</i>	common sheep sorrel
Polygonaceae	<i>Rumex crispus</i>	curly dock
Polygonaceae	<i>Rumex obtusifolius</i>	bitter dock
Polypodiaceae	<i>Polypodium virginianum</i>	rock polypody
Portulacaceae	<i>Claytonia virginica</i>	Virginia springbeauty
Primulaceae	<i>Anagallis arvensis</i>	scarlet pimpernel
Primulaceae	<i>Lysimachia ciliata</i>	fringed loosestrife
Primulaceae	<i>Lysimachia lanceolata</i>	lanceleaf loosestrife
Primulaceae	<i>Lysimachia nummularia</i>	creeping jenny
Primulaceae	<i>Lysimachia quadrifolia</i>	whorled yellow loosestrife
Pteridaceae	<i>Adiantum pedatum</i>	northern maidenhair
Pyrolaceae	<i>Chimaphila maculata</i>	striped prince's pine
Pyrolaceae	<i>Chimaphila umbellata</i>	pipsissewa
Ranunculaceae	<i>Anemone virginiana</i>	tall thimbleweed
Ranunculaceae	<i>Clematis terniflora</i>	sweet autumn virginsbower
Ranunculaceae	<i>Clematis virginiana</i>	devil's darning needles
Ranunculaceae	<i>Hepatica nobilis</i> var. <i>obtus</i>	roundlobe hepatica
Ranunculaceae	<i>Ranunculus abortivus</i>	littleleaf buttercup
Ranunculaceae	<i>Ranunculus acris</i>	tall buttercup
Ranunculaceae	<i>Ranunculus bulbosus</i>	St. Anthony's turnip
Ranunculaceae	<i>Ranunculus hispidus</i> var. <i>caricetorum</i>	bristly buttercup
Ranunculaceae	<i>Ranunculus hispidus</i> var. <i>hispidus</i>	bristly buttercup
Ranunculaceae	<i>Ranunculus pusillus</i>	low spearwort

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Ranunculaceae	<i>Ranunculus recurvatus</i>	blisterwort
Ranunculaceae	<i>Thalictrum pubescens</i>	king of the meadow
Ranunculaceae	<i>Thalictrum revolutum</i>	waxyleaf meadow-rue
Ranunculaceae	<i>Thalictrum thalictroides</i>	rue anemone
Rhamnaceae	<i>Ceanothus americanus</i>	New Jersey tea
Rosaceae	<i>Agrimonia parviflora</i>	harvestlice
Rosaceae	<i>Agrimonia</i> sp.	agrimony
Rosaceae	<i>Amelanchier arborea</i>	common serviceberry
Rosaceae	<i>Crataegus</i> spp.	hawthorn
Rosaceae	<i>Duchesnea indica</i>	Indian strawberry
Rosaceae	<i>Fragaria virginiana</i>	Virginia strawberry
Rosaceae	<i>Geum canadense</i>	white avens
Rosaceae	<i>Geum laciniatum</i>	rough avens
Rosaceae	<i>Geum vernum</i>	spring avens
Rosaceae	<i>Physocarpus opulifolius</i>	common ninebark
Rosaceae	<i>Potentilla canadensis</i>	dwarf cinquefoil
Rosaceae	<i>Potentilla recta</i>	sulphur cinquefoil
Rosaceae	<i>Potentilla simplex</i>	common cinquefoil
Rosaceae	<i>Prunus americana</i>	American plum
Rosaceae	<i>Prunus avium</i>	sweet cherry
Rosaceae	<i>Prunus serotina</i>	black cherry
Rosaceae	<i>Prunus virginiana</i>	chokecherry
Rosaceae	<i>Rosa carolina</i>	Carolina rose
Rosaceae	<i>Rosa multiflora</i>	multiflora rose
Rosaceae	<i>Rosa palustris</i>	swamp rose
Rosaceae	<i>Rubus allegheniensis</i>	Allegheny blackberry
Rosaceae	<i>Rubus flagellaris</i>	northern dewberry
Rosaceae	<i>Rubus occidentalis</i>	black raspberry
Rosaceae	<i>Rubus phoenicolasius</i>	wine raspberry
Rubiaceae	<i>Cephalanthus occidentalis</i>	common buttonbush
Rubiaceae	<i>Galium aparine</i>	stickywilly
Rubiaceae	<i>Galium circaeans</i>	licorice bedstraw
Rubiaceae	<i>Galium concinnum</i>	shining bedstraw
Rubiaceae	<i>Galium lanceolatum</i>	lanceleaf wild licorice
Rubiaceae	<i>Galium mollugo</i>	false baby's breath
Rubiaceae	<i>Galium obtusum</i>	bluntleaf bedstraw
Rubiaceae	<i>Galium pilosum</i>	hairy bedstraw
Rubiaceae	<i>Galium tinctorium</i>	stiff marsh bedstraw
Rubiaceae	<i>Galium triflorum</i>	fragrant bedstraw
Rubiaceae	<i>Houstonia caerulea</i>	azure bluet
Rubiaceae	<i>Mitchella repens</i>	partridgeberry
Rutaceae	<i>Zanthoxylum americanum</i>	common pricklyash
Salicaceae	<i>Salix nigra</i>	black willow
Santalaceae	<i>Comandra umbellata</i>	bastard toadflax

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Saxifragaceae	<i>Heuchera pubescens</i>	downy alumroot
Saxifragaceae	<i>Saxifraga virginensis</i>	early saxifrage
Scrophulariaceae	<i>Agalinis tenuifolia</i>	slenderleaf false foxglove
Scrophulariaceae	<i>Chelone glabra</i>	white turtlehead
Scrophulariaceae	<i>Gratiola neglecta</i>	clammy hedgehyssop
Scrophulariaceae	<i>Linaria vulgaris</i>	butter and eggs
Scrophulariaceae	<i>Lindernia dubia</i>	yellowseed false pimpernel
Scrophulariaceae	<i>Mimulus alatus</i>	sharpwing monkeyflower
Scrophulariaceae	<i>Mimulus ringens</i>	Allegheny monkeyflower
Scrophulariaceae	<i>Pedicularis canadensis</i>	Canadian lousewort
Scrophulariaceae	<i>Penstemon digitalis</i>	talus slope penstemon
Scrophulariaceae	<i>Penstemon hirsutus</i>	hairy beardtongue
Scrophulariaceae	<i>Penstemon laevigatus</i>	smooth beardtongue; eastern smooth beardtongue
Scrophulariaceae	<i>Scrophularia marilandica</i>	carpenter's square
Scrophulariaceae	<i>Verbascum blattaria</i>	moth mullein
Scrophulariaceae	<i>Verbascum thapsus</i>	common mullein
Scrophulariaceae	<i>Veronica arvensis</i>	corn speedwell
Scrophulariaceae	<i>Veronica officinalis</i>	common gypsyweed
Scrophulariaceae	<i>Veronica peregrina</i>	neckweed
Selaginellaceae	<i>Selaginella apoda</i>	meadow spikemoss
Simaroubaceae	<i>Ailanthus altissima</i>	tree of heaven
Smilacaceae	<i>Smilax herbacea</i>	smooth carrionflower
Smilacaceae	<i>Smilax pulverulenta</i>	downy carrionflower
Smilacaceae	<i>Smilax rotundifolia</i>	roundleaf greenbrier
Solanaceae	<i>Solanum carolinense</i>	Carolina horsenettle
Solanaceae	<i>Solanum dulcamara</i>	climbing nightshade
Staphyleaceae	<i>Staphylea trifolia</i>	American bladdernut
Thelypteridaceae	<i>Thelypteris palustris</i>	eastern marsh fern
Tiliaceae	<i>Tilia americana</i>	American basswood
Typhaceae	<i>Typha latifolia</i>	broadleaf cattail
Ulmaceae	<i>Celtis occidentalis</i>	common hackberry
Ulmaceae	<i>Ulmus americana</i>	American elm
Ulmaceae	<i>Ulmus rubra</i>	slippery elm
Urticaceae	<i>Boehmeria cylindrica</i>	smallspike false nettle
Urticaceae	<i>Pilea pumila</i>	Canadian clearweed
Verbenaceae	<i>Phryma leptostachya</i>	American lopseed
Verbenaceae	<i>Verbena hastata</i>	swamp verbena
Verbenaceae	<i>Verbena simplex</i>	narrowleaf vervain
Verbenaceae	<i>Verbena urticifolia</i>	white vervain
Violaceae	<i>Viola conspersa</i>	American dog violet
Violaceae	<i>Viola hirsutula</i>	southern woodland violet
Violaceae	<i>Viola palmata</i>	early blue violet
Violaceae	<i>Viola pubescens</i>	downy yellow violet

Appendix C (continued). Vascular plant taxa observed during the field surveys in Gettysburg National Military Park and Eisenhower National Historic Site, 2004-2005

Violaceae	<i>Viola sagittata</i>	arrowleaf violet
Violaceae	<i>Viola sororia</i>	common blue violet
Vitaceae	<i>Parthenocissus quinquefolia</i>	Virginia creeper
Vitaceae	<i>Vitis aestivalis</i>	summer grape
Vitaceae	<i>Vitis labrusca</i>	fox grape
Vitaceae	<i>Vitis riparia</i>	riverbank grape

Appendix D. Data from labels of voucher specimens of species of special concern collected in Gettysburg National Military Park and Eisenhower National Historic Site, 1987-2005.

Species	Date	Collector	Location	Habitat	Herbarium
<i>Aplectrum hyemale</i> (Willd.) Nutt.	2005 Apr 13	Kunsman 16733	Adams County: ca 394715N x 771430W; east side of South Confederate Avenue; watershed of Plum Run; ca 3.03 air miles S by slightly SW of the center square, Gettysburg	well drained mixed forest with diabase boulders on west slope of Big Round Top; elevation ca 560 feet.	PNHP, Middletown
<i>Bromus kalmii</i> Gray	1996 Jun 24	Kunsman 13854	Adams County: former Welcome Traveler campground, ca 1.5 miles SSE of Gettysburg	successional graminoid/shrub/small tree old field with diabase substrate; elevation ca 470 feet.	Academy of Natural Sciences, Philadelphia
<i>Carex buxbaumii</i> Wahlenb.	2005 Jun 15	Kunsman 16814	Adams County: ca 394745N x 771419W; ca 2.43 air miles SSW of the center square, Gettysburg	seasonally damp meadow south of Wheatfield Road, east side of Plum Run; elevation ca 520 feet.	PNHP, Middletown
<i>Carex shortiana</i> Dewey	2005 Jun 9	Kunsman 16806	Adams County: ca 394716N x 771445W; ca 3.06 air miles SSW of the center square, Gettysburg	in wet meadow southeast of Granite Farm, watershed of Plum Run; elevation ca 480 feet.	PNHP, Middletown
<i>Carex tetanica</i> Schkuhr	2005 Jun 9	Kunsman 16805	Adams County: ca 394712N x 771450W; ca 3.16 air miles SSW of the center square, Gettysburg	with numerous graminoids in wet meadow south of Granite Farm, watershed of Plum Run; elevation ca 480 feet.	PNHP, Middletown
<i>Carex tetanica</i> Schkuhr	2005 Jun 15	Kunsman 16812	Adams County: ca 394803N x 771419W; ca 2.1 air miles SSW of the center square, Gettysburg	seasonally damp meadow between US Avenue and Wheatfield Road, watershed of Plum Run; elevation ca 530 feet.	PNHP, Middletown
<i>Helianthemum bicknellii</i> Fern.	1991 Jul 17	Kunsman 9850	Adams County: ca 1.2 miles SE of Gettysburg	dry clearing (Pardee Field) on west facing hillside; elevation ca 500 feet.	Carnegie Museum, Pittsburgh
<i>Juncus biflorus</i> Ell.	1987 Jul 25	Kunsman 8962	Adams County: ca 0.25 mile N of the summit of Little Round Top	wet little-grazed field; elevation ca 520 feet.	Academy of Natural Sciences, Philadelphia
<i>Juncus brachycarpus</i> Engelm.	1987 Jul 25	Kunsman 8963	Adams County: ca 0.25 mile N of the summit of Little Round Top	wet little-grazed field; elevation ca 520 feet.	Penn State University, University Park

Appendix D (continued). Data from labels of voucher specimens of species of special concern collected in Gettysburg National Military Park and Eisenhower National Historic Site, 1987-2005.

Species	Date	Collector	Location	Habitat	Herbarium
<i>Lithospermum canescens</i> (Michx.) Lehm.	2004 May 10	Kunsman 16499	Adams County: 394858N x 771317W; west of Pardee Field, ca 1.16 air miles SSE of the center square, Gettysburg	dry scrubby diabase "glade"; elevation ca 510 feet.	PNHP, Middletown
<i>Panicum oligosanthos</i> Schultes	2004 Jun 21	Kunsman 16577	Adams County: ca 394910N x 771452W; south of McMillen Woods and west of West Confederate Avenue, ca 1.17 air miles SW of the center square, Gettysburg	graminoid and herb dominated field with well drained diabase substrate; elevation ca 560 feet.	PNHP, Middletown
<i>Panicum oligosanthos</i> Schultes	2005 Jun 23	Kunsman 16829	Adams County: ca 394749N x 771436W; ca 2.4 air miles SSW of the center square, Gettysburg	well drained graminoid and herb dominated old field; The Wheatfield; watershed of Plum Run; elevation ca 520 feet.	PNHP, Middletown
<i>Penstemon laevigatus</i> Ait.	2001 Jul 25	Kunsman 15726	Adams County: ca 1.6 air miles SE by slightly S of the center square, Gettysburg	small opening with dense and diverse herbaceous vegetation in young redcedar and hardwood forest with rocky diabase substrate; watershed of Rock Creek; elevation ca 480 feet.	Academy of Natural Sciences, Philadelphia
<i>Prenanthes serpentaria</i> Pursh	2004 Oct 6	Kunsman 16718	Adams County: ca 395004N x 771507W; ca 1.13 air miles W by slightly NW of the center square, Gettysburg	well drained diabase hardwood forest at Reynolds Woods; watershed of Willoughby Run; elevation ca 540 feet.	Academy of Natural Sciences, Philadelphia
<i>Prenanthes serpentaria</i> Pursh	2005 May 11	Kunsman 16754	Adams County: ca 394757N x 771521W; just south of the Observation Tower, east side of West Confederate Avenue, ca 2.55 air miles SSW of the center square, Gettysburg	frequent in open hickory/oak/redcedar woods; watershed of Willoughby Run; elevation ca 580 feet.	PNHP, Middletown

Appendix D (continued). Data from labels of voucher specimens of species of special concern collected in Gettysburg National Military Park and Eisenhower National Historic Site, 1987-2005.

Species	Date	Collector	Location	Habitat	Herbarium
<i>Quercus shumardii</i> Buckley	2004 Jul 14	Kunsman 16614	Adams County: ca 394718N x 771442W; east side of Plum Run, ca 3.0 air miles SSW of the center square, Gettysburg	mixed hardwood forest at the base of the west slope of Big Round Top, with moist diabase derived soil; elevation ca 480 feet.	PNHP, Middletown
<i>Quercus shumardii</i> Buckley	2004 Oct 7	Kunsman 16722	Adams County: ca 394711N x 771452W; ca 3.2 air miles SSW of the center square, Gettysburg	with <i>Quercus bicolor</i> , at interface of woodlot and marshy field on the south side of Granite Farm; watershed of Plum Run; elevation ca 480 feet.	Academy of Natural Sciences, Philadelphia
<i>Quercus shumardii</i> Buckley	2005 Sep 22	Kunsman 16900	Adams County: ca 394802N x 771417W; ca 2.1 air miles S by slightly SW of center square, Gettysburg	mixed hardwood (mostly oak and hickory) forest; watershed of Plum Run; elevation ca 520 feet.	PNHP, Middletown
<i>Quercus shumardii</i> Buckley	2005 Sep 22	Kunsman 16901	Adams County: ca 394754N x 771416W; ca 2.26 air miles S by slightly SW of center square, Gettysburg	mixed hardwood (mostly oak and hickory) forest; watershed of Plum Run; elevation ca 520 feet.	PNHP, Middletown
<i>Ranunculus pusillus</i> Poir.	2005 Jun 9	Kunsman 16807	Adams County: ca 394711N x 771447W; south of Granite Farm, ca 3.06 air miles SSW of center square, Gettysburg	along margin of small pool in drainage ditch in wet meadow watershed of Plum Run; elevation ca 480 feet.	PNHP, Middletown
<i>Ribes missouriense</i> Nutt.	1991 May 1	Kunsman 9732	Adams County: ca 1.5 air miles WNW of Gettysburg	abundant in moist woods along Willoughby Run; elevation ca 540 feet.	Penn State University, University Park
<i>Rudbeckia fulgida</i> Aiton	2004 Jul 19	Kunsman 16621	Adams County: ca 394754N x 771408W; north side of Wheatfield Road and south side of US Avenue, ca 2.25 air miles S by very slightly SW of the center square, Gettysburg	with <i>Sorghastrum nutans</i> , <i>Agrimonia parviflora</i> , <i>Fragaria virginiana</i> , and <i>Carex bushii</i> in damo grassy meadow with diabase substrate; watershed of Plum Run; elevation ca 530 feet.	PNHP, Middletown
<i>Stylosanthes biflora</i> (L.) BSP.	1994 Jul 6	Kunsman 12178	Adams County: ca 1.2 miles SE of Gettysburg	dry clearing (Pardee Field) on west facing hillside; elevation ca 500 feet.	Academy of Natural Sciences, Philadelphia

Appendix D (continued). Data from labels of voucher specimens of species of special concern collected in Gettysburg National Military Park and Eisenhower National Historic Site, 1987-2005.

Species	Date	Collector	Location	Habitat	Herbarium
<i>Triosteum angustifolium</i> L.	2005 May 11	Kunsman 16755	Adams County: ca 394757N x 771521W; just south of the Observation Tower, east side of West Confederate Avenue, ca 2.55 air miles SSW of the center square, Gettysburg	open hickory/oak/redcedar woods; watershed of Willoughby Run; elevation ca 580 feet.	PNHP, Middletown
<i>Triosteum angustifolium</i> L.	2001 Jul 5	Kunsman 15726	Adams County: ca 1.6 air miles SE by slightly S of the center square, Gettysburg	small opening with dense and diverse herbaceous vegetation in young red cedar and hardwood forest with rocky diabase substrate; watershed of Rock Creek; elevation ca 480 feet.	Academy of Natural Sciences, Philadelphia

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