

Appendix A. Procedures used to develop a digital orthophoto mosaic for Valley Forge National Historical Park.

Color infrared, stereo pair 1:6,000 scale aerial photography of Valley Forge National Historical Park was acquired from an overflight on September 12, 1999, during leaf-on conditions, by Air Photographics, Inc. The photography was delivered to the National Park Service (NPS) and then forwarded to NC State University where the digital orthophoto mosaic was produced.

The mosaic was produced from 49 color infrared air photos scanned at 600 dpi with 24-bit color depth. The scanned images of the air photos were imported into ERDAS Imagine (.img) format where a photo block was created using USGS digital elevation models (DEMs) and a digital orthophoto quarter quadrangle (DOQQ) as reference. In preparation for this step, the USGS DEMs were resampled from 30 meters to 10 meters and mosaicked together. The photo block was manipulated until it could be triangulated with a root mean square error of less than 1 using Imagine Orthobase software. At this point, single frame orthophotos (one for each air photo) were generated within Imagine and exported to Imagine .lan format. Then the .lan files were imported into ER Mapper's native (.ers) format, and an ER Mapper algorithm was created which contains the color balancing information and the cutlines created for the final mosaic. In ER Mapper a band interleaved by line (.bil) image and header file of the final mosaic was generated, the .bil image was imported into Imagine .img format, and, finally, the .img image was compressed using MrSID software with a 20:1 compression ratio.

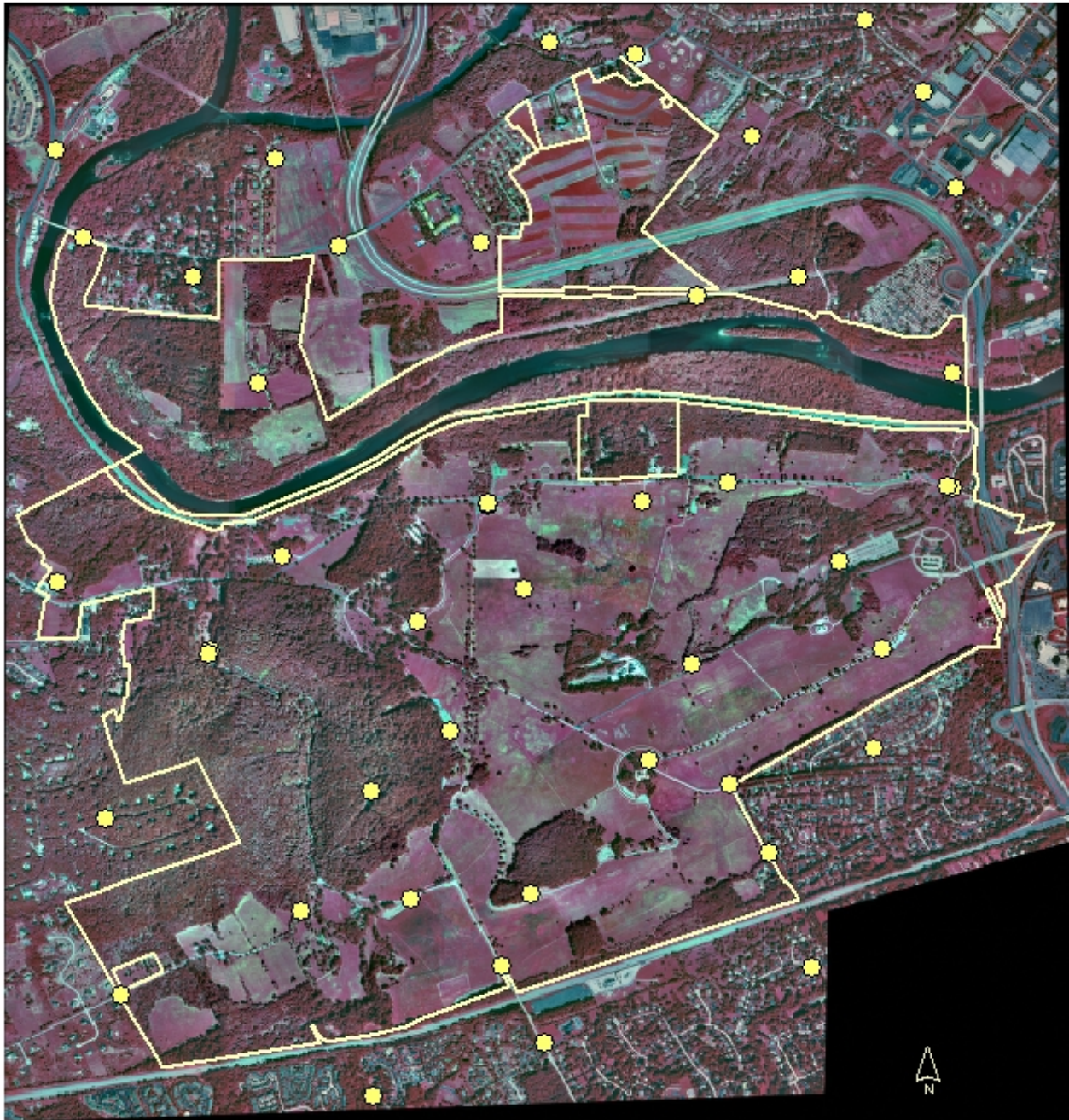
The horizontal positional accuracy of the mosaic was assessed using guidelines of the USGS/NPS Vegetation Mapping Program (ESRI, NCGIA, and TNC 1994). Well-defined positional accuracy ground control points, spaced throughout all quadrants of the mosaic, were placed on the final mosaic in ArcMap. Ground control points and zoomed-in screenshots of each point were plotted on hard copy maps with the mosaic as a background. These maps and plots were used to locate the ground control points in the field. For each plotted ground control point, field staff noted any alterations to the locations in the field, and then recorded the coordinates with a Trimble Pro XR/XRS or GeoXT. Mapped ground control points that were physically inaccessible were also noted. The field crew correctly located and collected accuracy assessment data at 50 ground control points. The coordinate data were collected with real time GPS and post processed with differential correction using Pathfinder Office software. For each point, the field-collected "true" or "reference" GPS coordinates were compared to the coordinates obtained from the mosaic viewed in ArcMap. Both pairs of coordinates for each point were entered into a spreadsheet in order to calculate horizontal accuracy (in meters). Figure A1 shows the distribution of the 50 ground control points within the park and surrounding area.

The final horizontal positional accuracy for the mosaic is 2.05 meters: 1.26 meters in the x direction which meets Class 1 National Map Accuracy Standards; and 2.84 meters in the y direction which meets Class 2 National Map Accuracy Standards (FGDC 1998b; Minnesota Governor's Council on Geographic Information and Minnesota Land Management Information Center 1999). A copy of the spreadsheet that contains the x and y coordinates for each ground control point and the root mean square error accuracy calculation formula is included in the air photo archive maintained at NCSU for the NPS Northeast Region Inventory & Monitoring Program.

A metadata record for the mosaic was prepared according to current Federal Geographic Data Committee standards (FGDC 1998a). Metadata were produced in notepad and parsed using the

USGS metadata compiler program (MP) to locate errors and omissions (USGS 2004). After all errors and omissions were corrected, MP was used to generate final TXT, HTML, and XML versions of each metadata record which are stored in the air photo archive. Key information for the Valley Forge National Historical Park mosaic is summarized in Table A1.

Figure A1. Ground control points (n=50) used to calculate horizontal positional accuracy of the Valley Forge National Historical Park mosaic².



² The park boundary shown in this figure was current at the time of field data collection in October 2000, but has since changed.

Table A1. Summary of key information for Valley Forge National Historical Park mosaic.

Title of metadata record:	Valley Forge NHP Color Photomosaic (ERDAS Imagine IMG and Mr. SID formats)
Publication date of mosaic (from metadata):	April 1, 2005
Date aerial photography was acquired:	September 12, 1999
Vendor that provided aerial photography:	Air Photographics, Inc
Scale of photography:	1:6,000
Type of photography:	Color infrared, stereo pairs, leaf-on conditions
Number of air photos delivered:	49
Archive location of air photos, camera calibration certificate, and Index to Aerial Photography:	Valley Forge NHP
Scanning specifications:	600 dpi, 24-bit color depth
Horizontal positional accuracy of mosaic:	2.05 meters: 1.26 meters in the x direction (meets Class 1 NMAS); 2.84 meters in the y direction (meets Class 2 NMAS)
Number of ground control points upon which estimated accuracy is based:	50
Method of calculating positional accuracy:	Root Mean Square Error (RMSE)
Archive location of mosaic and metadata:	North Carolina State University, Center for Earth Observation
Format(s) of archived mosaic:	img (uncompressed); MrSID (20:1 compression)

Literature Cited

- Environmental Systems Research Institute (ESRI), National Center for Geographic Information and Analysis (NCGIA), and The Nature Conservancy (TNC). November 1994. Accuracy assessment procedures, NBS/NPS Vegetation Mapping Program. Retrieved October 2001 from <http://biology.usgs.gov/npsveg/aa/aa.html>.
- Federal Geographic Data Committee. 1998a. Content standard for digital geospatial metadata (FGDC-STD-001-1998). Retrieved October 2001 from <http://www.fgdc.gov/metadata/contstan.html>
- Federal Geographic Data Committee (FGDC). 1998b. Geospatial positioning accuracy standards, Part 3: National Standard for Spatial Data Accuracy. (FGDC-STD-007.3-1998). Retrieved October 2001 from http://www.fgdc.gov/standards/status/sub1_3.html
- Minnesota Governor's Council on Geographic Information and Minnesota Land Management Information Center. October 1999. Positional accuracy handbook, using the National Standard for Spatial Data Accuracy to measure and report geographic data quality. Retrieved October 2001 from: <http://server.admin.state.mn.us/resource.html?Id=1852>.
- United States Geological Survey (USGS). 2004. Tools for creation of formal metadata, a compiler for formal metadata. Retrieved June 2004 from <http://geology.usgs.gov/tools/metadata/tools/doc/mp.html>

**Appendix B. Vegetation classification plot sampling
and accuracy assessment field forms.**

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Accuracy Assessment Form

USGS-NPS Vegetation Mapping Program

1. Plot Number _____	2. Park Code _____	3. Date _____
4. Observer(s) _____	5. Datum _____	6. Accuracy _____
7. UTM Coordinates: Easting _____, _____	Northing _____, _____, _____	
8. UTM Zone _____	9. Offset from Point: Easting _____ m	Northing _____ m
10. Topographic Description _____		
11. Elevation _____ m	12. Aspect _____	
13. Veg Assoc. at Site _____		
14. Veg Assoc 2 within 50m of Site _____		
15. Veg Assoc 3 within 50m of Site _____		
16. Major Species Present (by strata) _____		

17. Canopy Closure of Top Layer _____		
18. Rationale for Classification _____		

19. Comments _____		

Instructions for Accuracy Assessment

The basic document for accuracy assessment is “Accuracy Assessment Procedures”, developed by the Program in 1994. The document can be downloaded from the Program web site at <http://biology.usgs.gov/npsveg>. This accuracy assessment (AA) form is the result of an additional 4 years of field experience. The purpose of this form is to generate concise data to document the accuracy assessment procedure that occurred in the field and to compare it to the mapped data.

All navigation must occur with either a Y-code GPS receiver (e.g. Rockwell PLGR) or in real time differential mode if using other types of receivers. This unit allows the user to navigate to sites within a few meters of their actual locations. The AA sites will be selected using randomly located samples stratified according to the associations. Before beginning each morning, make sure the datum is set to NAD83, and that the projection system is UTM, with the proper zone. A compass is needed to estimate aspect.

The materials you should have before you begin are a 1) plots of the DOQQ's showing the polygon boundaries, but no information on polygon attributes, and the location of the AA sites with numbers, 2) AA site coordinates loaded into your GPS receiver, 3) the field key, and 4) association descriptions.

Once you have navigated to an accuracy assessment site, and the FOM (Figure of Merit) is at 1, if using a PLGR, observe the vegetation within a 50 meter radius of the site. To gauge how far 50 meters is, it is helpful to have the navigator pace 50 meters in one direction. Document what the vegetation community is at the site, and if there are more than one community present within a 50 meter radius, document those as well under Veg Assoc 2 & 3.

Specific Instructions:

1. Plot Number - self explanatory
2. Park Code - the four character code for the park (e.g. Voyageurs is VOYA, Scotts Bluff is SCBL)
3. Date - self explanatory
4. Observer(s) - self explanatory
5. Datum - the reference system for the projection, should be NAD83 (NAR on the PLGR)
6. Accuracy - the distance in meters the GPS receiver displays, if using a PLGR
7. UTM Coordinates - easting and northing in meters
8. UTM Zone - UTM zones in continental US range between 10 (126° W longitude on the Pacific Coast) and 19 (66° W longitude on the Atlantic Coast)
9. Offset from Site - if you are unable to navigate directly to a site due to terrain problems (e.g., rivers, canyons), record the distance from the site displayed on your GPS receiver, record 0 if there is no offset
 - a. Topographic Description - where you are on the terrain; on the top of a hill, in a small valley, midslope on a south facing slope, etc.
10. Elevation - above sea level in meters
11. Aspect - using a compass estimate the aspect of the whole site, record in degrees of azimuth (0-360)
12. Veg Assoc at Site - use the field key determine the association directly on the AA site
13. Veg Assoc 2 within 50 m of Site - if a second vegetation association is found within 50 meters of the site, record that association.
14. Veg Assoc 3 within 50 m of Site - if a third vegetation association is found within 50 meters of the site, record that association
15. Major Species Present (by strata) - record the major and indicator species present
16. Canopy Closure of Top Layer - estimate canopy closure of top stratum, eliminating the contribution from lower strata.
17. Rationale for Classification - record the logical procedure you used to determine the vegetation association based on indicator species, major species, structure, etc.
18. Comments - all relevant information that does not fit into the fields above. Note such things as multiple associations near the site, indications of artificial influences on the vegetation, such as grazing, logging, animal presence or use, influences of elevation, aspect, water tables, etc

**Appendix C. Key to vegetation types at Valley Forge National
Historical Park.**

KEY TO VEGETATION TYPES AT VALLEY FORGE NATIONAL HISTORICAL PARK

The vegetation key is intended to assist in the identification of association-level vegetation within Valley Forge National Historical Park. This key should be used in conjunction with local association descriptions within the main body of this report. Several of the anthropogenic types have no descriptions as they are easily distinguished or lack natural vegetation. Users of the key should have a good knowledge of the local flora within the park. Field guides including Pennsylvania flora may be helpful (e.g., Rhodes and Block 2000, Gleason and Cronquist 1991).

Notes on Use of Vegetation Key

Species included in an association name are not necessarily present in any particular plot or even within all plots of that type in the park, due to the fact that association names are based on the rangewide characteristics rather than local descriptions. For example, some of the mixed floodplain forests in the park, classified as “Riverine Floodplain Forest” (*Platanus occidentalis* – *Fraxinus pennsylvanica* Forest), are co-dominated by sycamore and contain no green ash. Association names are provided below the local name; see vegetation descriptions for full details on composition and environmental setting. Colloquial plant names are included for ease of use.

The key is broken into broad sections, easily recognizable human managed landscapes (e.g., developed land, open mowed or tall grass grasslands), silvicultural plantings (e.g., white pine plantations, ornamental groves, single species hardwood plantings), and relatively unmanaged natural and successional vegetation.

NON-FORESTED ANTHROPOGENIC, DEVELOPED, OR INTENSIVELY MANAGED LAND OR VEGETATION

1. Uplands containing park infrastructure and severely disturbed landscape, including buildings, roads and abandoned quarries.
2. Uplands surrounding or adjacent buildings and infrastructure (excluding roads), typically with regularly mowed lawns and ornamental landscaping.

Developed Land

2. Uplands associated with roads and maintained road right-of-way and abandoned quarries.
3. Uplands associated with roads and maintained road right-of-way.

Transportation Corridor

3. Uplands associated with past mining operations.

Old Quarry/Reclamation Site

1. Uplands not directly associated with park infrastructure or severely disturbed landscape. Includes current or recently fallowed agricultural land, managed grasslands and abandoned horticultural nurseries. Agricultural land, including orchards, pastures and cropland.

4. Open grassland.

5. Mowed on a regular basis, maintained as short grass.

Grassland (mowed)

Dactylis glomerata – *Rumex acetosella* Herbaceous Vegetation

5. Mowed only once or twice a year, managed as tall grass.

Grassland (tall grass)

Dactylis glomerata – *Rumex acetosella* Herbaceous Vegetation

4. Not open grassland, current or recently farmed cropland, also old abandoned horticultural nursery sites.

6. Planted row crops (typically corn), or recently fallowed agricultural land.

Cropland

6. Mass plantings of horticultural species, typically overgrown and weedy in appearance.

Old Nursery Site

FORESTED ANTHROPOGENIC STANDS, INCLUDING PLANTED FORESTS AND WOODLANDS

1. Stand dominated by planted hardwood shrubs or trees.

2. Stand associated with former horticultural nursery, canopy or shrub layer characterized by mass single species plantings, often of exotic species.

Old Nursery Site

2. Stand not associated with former horticultural nursery.

3. Stand dominated by ornamental shrubs, primarily dogwoods, in well-maintained, open grassland setting.

Planted Ornamental Tree Grove

3. Stand dominated by trees, typically catalpa or red oak.

4. Stand dominated by northern catalpa (*Catalpa speciosa*).

Northern Catalpa Planted Forest

Catalpa speciosa Planted Forest

4. Stand dominated by red oak (*Quercus rubra*).

Plantation Red Oak

Quercus rubra Planted Forest

1. Stand dominated by planted conifers or conifers mixed with hardwoods (often planted pin oaks (*Quercus palustris*)).

5. Stand a mix of planted conifers, especially white pine (*Pinus strobus*), and planted hardwoods.

Mixed White Pine – Hardwood Plantation

5. Stand dominated by planted conifers, hardwoods limited to volunteer hardwoods (not planted).

6. Stand dominated by white pine (*Pinus strobus*), often with volunteer hardwoods.

White Pine Plantation

Pinus strobus Planted Forest

6. Stand dominated by eastern hemlock (*Tsuga canadensis*) with occasional volunteer hardwoods.

Eastern Hemlock Plantation

Tsuga canadensis Planted Forest

NATURAL VEGETATION

1. Herbaceous and shrub vegetation with tree cover less than 25%.

2. Uplands, not seasonally or temporarily flooded.

3. Uplands co-dominated by grasses and over 30% cover of shrubs and vines such as multiflora rose (*Rosa multiflora*), autumn olive (*Eleagnus* sp.), Japanese honeysuckle (*Lonicera japonica*) and other weedy species.

Successional Old Field / Shrubland

(Local Type)

3. Sparsely vegetated upland talus and scree slopes, not dominated by grasses and shrubs.

Chestnut Oak – Black Birch Talus Slope

Quercus prinus – *Betula lenta* / *Parthenocissus quinquefolia* Talus Woodland

2. Seasonally or temporarily flooded or saturated.

4. Open, non-forested wetland dominated by reed canary grass (*Phalaris arundinacea*) and wetland species such as rice cut-grass (*Leersia oryzoides*) and burreed (*Sparganium* spp).

Wet Meadow

Calamagrostis canadensis – *Phalaris arundinacea* Herbaceous Vegetation

4. Wetland occurs in forested setting with partial to closed canopy, herbaceous layer dominated by skunk cabbage (*Symplocarpus foetidus*).

Skunk Cabbage Seepage Meadow
Symplocarpus foetidus Herbaceous Vegetation

1. Forest and woodlands with tree cover greater than 25 %.

5. Tuliptree (*Liriodendron tulipifera*) dominant, comprising over 40% tree cover, in even age stand with or without associate tree species.

Tuliptree - Oak Forest
Liriodendron tulipifera – *Acer rubrum* – *Quercus* spp. Forest

5. Tuliptree (*Liriodendron tulipifera*) comprising less than 40% canopy and / or sub-canopy cover.

6. Oak (*Quercus* spp.) absent or sparse; oak species comprising less than 15% tree cover.

7. Silver maple (*Acer saccharinum*), sycamore (*Platanus occidentalis*) and / or green ash (*Fraxinus pennsylvanica*) dominate the canopy and / or sub-canopy (comprising over 50% cover). Temporarily flooded or with seasonally high water table. Floodplain Forests.

8. Silver maple (*Acer saccharinum*) strongly dominant, comprising over 60% canopy cover. Mature silver maple present. Temporarily flooded.

Silver Maple Floodplain Forest
Acer saccharinum Temporarily Flooded Forest

8. Canopy cover mixed with silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*) and / or sycamore (*Platanus occidentalis*) as co-dominants. Characteristic species include box elder (*Acer negundo*), spicebush (*Lindera benzoin*), false nettle (*Boehmeria cylindrica*), stiltgrass (*Microstegium vimineum*).

Riverine Floodplain Forest
Platanus occidentalis – *Fraxinus pennsylvanica* Forest

7. Canopy and or subcanopy not dominated by silver maple (*Acer saccharinum*), sycamore (*Platanus occidentalis*) and / or green ash (*Fraxinus pennsylvanica*) (comprising less than 50% cover). Uplands.

9. Tuliptree (*Liriodendron tulipifera*) codominant, with 10 to 40% canopy cover with less than 5% of any of the following: *Quercus prinus*, *Kalmia latifolia*, *Nyssa sylvatica*, *Ulmus americana* or *Fraxinus pennsylvanica*. Common associates include *Cornus florida* and *Lindera benzoin*. *Quercus velutina* or *Quercus alba* may be present at over 5%.

Tuliptree – Oak Forest
Liriodendron tulipifera – *Acer rubrum* – *Quercus* spp. Forest

9. Tuliptree rare or absent. Canopy dominated by mixed early successional hardwoods, often with black walnut (*Juglans nigra*), white ash (*Fraxinus americana*), tree-of-heaven (*Ailanthus altissima*) and / or black locust (*Robinia pseudoacacia*) dominant or codominant. Often characterized by conspicuous vine cover in tree layer: oriental bittersweet (*Celastrus orbiculatus*), Japanese honeysuckle (*Lonicera japonica*), summer grape (*Vitis aestivalis*) and others. Wineberry (*Rubus phoenicolasius*) and garlic mustard (*Alliaria petiolata*) are also frequent.

Northeastern Modified Successional Forest

Prunus serotina - *Liriodendron tulipifera* - *Acer rubrum* - *Fraxinus americana* Forest

6. Oak dominated (oak species comprise over 50% of tree layer), chestnut oak (*Quercus prinus*), black oak (*Quercus velutina*), white oak (*Quercus alba*) and/or scarlet oak (*Quercus coccinea*) comprise over 50% of the tree cover.

Dry Oak Forest

Quercus prinus – *Quercus (rubra, velutina)* / *Vaccinium angustifolium* Forest

Appendix D. Vascular plants identified in vegetation classification and thematic accuracy assessment plots (nomenclature follows Kartesz 1994) at Valley Forge National Historical Park.

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Family	Scientific Name	Common Name
Aceraceae	<i>Acer negundo</i> L.	boxelder
Aceraceae	<i>Acer platanoides</i> L.	Norway maple
Aceraceae	<i>Acer rubrum</i> L.	red maple
Aceraceae	<i>Acer saccharinum</i> L.	silver maple
Aceraceae	<i>Acer saccharum</i> Marsh.	sugar maple
Alismataceae	<i>Alisma triviale</i> Pursh	northern water plantain
Anacardiaceae	<i>Rhus typhina</i> L.	staghorn sumac
Anacardiaceae	<i>Toxicodendron radicans</i> (L.) Kuntze	eastern poison ivy
Annonaceae	<i>Asimina triloba</i> (L.) Dunal	common pawpaw
Apiaceae	<i>Daucus carota</i> L.	Queen Anne's lace
Apiaceae	<i>Pastinaca sativa</i> L.	wild parsnip
Apiaceae	<i>Sanicula</i> L.	sanicle
Apocynaceae	<i>Apocynum cannabinum</i> L.	Indianhemp
Aquifoliaceae	<i>Ilex opaca</i> Ait.	American holly
Araceae	<i>Arisaema triphyllum</i> (L.) Schott	jack-in-the-pulpit
Araceae	<i>Symplocarpus foetidus</i> (L.) Salisb. ex Nutt.	skunk cabbage
Araliaceae	<i>Hedera helix</i> L.	English ivy
Araliaceae	<i>Panax quinquefolius</i> L.	American ginseng
Aristolochiaceae	<i>Asarum canadense</i> L.	Canadian wildginger
Asclepiadaceae	<i>Asclepias incarnata</i> L.	swamp milkweed
Asclepiadaceae	<i>Asclepias</i> L.	milkweed
Asclepiadaceae	<i>Asclepias syriaca</i> L.	common milkweed
Asteraceae	<i>Achillea millefolium</i> L.	common yarrow
Asteraceae	<i>Ambrosia artemisiifolia</i> L.	annual ragweed
Asteraceae	<i>Anaphalis margaritacea</i> (L.) Benth. & Hook. f.	western pearlyeverlasting
Asteraceae	<i>Antennaria</i> Gaertn.	pussytoes
Asteraceae	<i>Antennaria neglecta</i> Greene	field pussytoes
Asteraceae	<i>Artemisia</i> L.	sagebrush
Asteraceae	<i>Artemisia vulgaris</i> L.	common wormwood
Asteraceae	<i>Aster divaricatus</i> L.	white wood aster
Asteraceae	<i>Aster</i> L.	aster
Asteraceae	<i>Aster lateriflorus</i> (L.) Britt.	calico aster
Asteraceae	<i>Aster novae-angliae</i> L.	New England aster
Asteraceae	<i>Bidens</i> L.	beggartick
Asteraceae	<i>Cirsium discolor</i> (Muhl. ex Willd.) Spreng.	field thistle
Asteraceae	<i>Cirsium P.</i> Mill.	thistle
Asteraceae	<i>Conyza canadensis</i> (L.) Cronq.	Canadian horseweed
Asteraceae	<i>Erechtites hieraciifolia</i> (L.) Raf. Ex DC.	American burnweed
Asteraceae	<i>Erigeron</i> L.	fleabane
Asteraceae	<i>Eupatorium</i> L.	thoroughwort
Asteraceae	<i>Eupatorium rugosum</i> Houtt.	white snake-root
Asteraceae	<i>Euthamia graminifolia</i> (L.) Nutt.	flattop goldentop
Asteraceae	<i>Helenium autumnale</i> L.	common sneezeweed
Asteraceae	<i>Hieracium</i> L.	hawkweed
Asteraceae	<i>Prenanthes</i> L.	rattlesnakeroot
Asteraceae	<i>Rudbeckia hirta</i> L.	blackeyed Susan
Asteraceae	<i>Solidago canadensis</i> L.	Canada goldenrod

Appendix D. Vascular plants identified in vegetation classification and thematic accuracy assessment plots (nomenclature follows Kartesz 1994) at Valley Forge National Historical Park (continued).

Family	Scientific Name	Common Name
Asteraceae	<i>Solidago rugosa</i> P. Mill.	wrinkleleaf goldenrod
Asteraceae	<i>Tanacetum</i> L.	tansy
Asteraceae	<i>Taraxacum officinale</i> G.H. Weber ex Wiggers	common dandelion
Balsaminaceae	<i>Impatiens capensis</i> Meerb.	jewelweed
Balsaminaceae	<i>Impatiens</i> L.	touchmenot
Berberidaceae	<i>Berberis thunbergii</i> L.	Japanese barberry
Berberidaceae	<i>Podophyllum peltatum</i> L.	mayapple
Betulaceae	<i>Alnus serrulata</i> (Ait.) Willd.	hazel alder
Betulaceae	<i>Betula lenta</i> L.	sweet birch
Betulaceae	<i>Betula nigra</i> L.	river birch
Betulaceae	<i>Carpinus caroliniana</i> Walt.	American hornbeam
Betulaceae	<i>Ostrya virginiana</i> (P. Mill.) K. Koch	eastern hophornbeam
Bignoniaceae	<i>Catalpa speciosa</i> (Warder) Warder ex Engelm.	northern catalpa
Boraginaceae	<i>Hackelia virginiana</i> (L.) I.M. Johnston	beggarslice
Boraginaceae	<i>Mertensia virginica</i> (L.) Pers. Ex Link	Virginia bluebells
Brassicaceae	<i>Alliaria petiolata</i> (Bieb.) Cavara & Grande	garlic mustard
Brassicaceae	<i>Cardamine impatiens</i> L.	narrowleaf bittercress
Brassicaceae	<i>Cardamine pensylvanica</i> Muhl. Ex Willd.	Pennsylvania bittercress
Brassicaceae	<i>Cardamine pratensis</i> L.	cuckoo flower
Brassicaceae	<i>Nasturtium officinale</i> Ait. F.	water cress
Campanulaceae	<i>Lobelia spicata</i> Lam.	palespike lobelia
Caprifoliaceae	<i>Linnaea borealis</i> L.	twinflower
Caprifoliaceae	<i>Lonicera japonica</i> Thunb.	Japanese honeysuckle
Caprifoliaceae	<i>Lonicera maackii</i> (Rupr.) Herder	amur honeysuckle
Caprifoliaceae	<i>Lonicera morrowii</i> Gray	Morrow's honeysuckle
Caprifoliaceae	<i>Lonicera tatarica</i> L.	tatarian honeysuckle
Caprifoliaceae	<i>Viburnum dilatatum</i> Thunb.	linden arrowwood
Caprifoliaceae	<i>Viburnum</i> L.	viburnum
Caprifoliaceae	<i>Viburnum prunifolium</i> L.	blackhaw
Caprifoliaceae	<i>Viburnum recognitum</i> Fern.	arrow-wood
Caryophyllaceae	<i>Cerastium arvense</i> L.	field chickweed
Caryophyllaceae	<i>Cerastium fontanum</i> Baumg.	common chickweed
Caryophyllaceae	<i>Dianthus armeria</i> L.	deptford pink
Caryophyllaceae	<i>Stellaria media</i> (L.) Vill.	common chickweed
Celastraceae	<i>Celastrus orbiculatus</i> Thunb.	oriental bittersweet
Clusiaceae	<i>Hypericum perforatum</i> L.	common St. Johnswort
Commelinaceae	<i>Commelina communis</i> L.	asiatic dayflower
Convolvulaceae	<i>Calystegia sepium</i> (L.) R. Br.	hedge false bindweed
Cornaceae	<i>Cornus amomum</i> P. Mill.	silky dogwood
Cornaceae	<i>Cornus florida</i> L.	flowering dogwood
Cupressaceae	<i>Juniperus virginiana</i> L.	eastern redcedar
Cupressaceae	<i>Thuja occidentalis</i> L.	eastern arborvitae
Cuscutaceae	<i>Cuscuta</i> L.	dodder
Cyperaceae	<i>Carex annectens</i> (Bickn.) Bickn.	yellowfruit sedge
Cyperaceae	<i>Carex bushii</i> Mackenzie	Bush's sedge
Cyperaceae	<i>Carex hirsutella</i> Mackenzie	fuzzy wuzzy sedge

Appendix D. Vascular plants identified in vegetation classification and thematic accuracy assessment plots (nomenclature follows Kartesz 1994) at Valley Forge National Historical Park (continued).

Family	Scientific Name	Common Name
Cyperaceae	<i>Carex intumescens</i> Rudge	greater bladder sedge
Cyperaceae	<i>Carex</i> L.	sedge
Cyperaceae	<i>Carex lupulina</i> Muhl. ex Willd.	hop sedge
Cyperaceae	<i>Carex ovalis</i> Goodenough	sedge
Cyperaceae	<i>Carex pensylvanica</i> Lam.	Pennsylvania sedge
Cyperaceae	<i>Carex swanii</i> (Fern.) Mackenzie	swan's sedge
Cyperaceae	<i>Cyperus</i> L.	flatsedge
Cyperaceae	<i>Cyperus lupulinus</i> (Spreng.) Marcks	Great Plains flatsedge
Cyperaceae	<i>Dulichium arundinaceum</i> (L.) Britt.	threeway sedge
Cyperaceae	<i>Eleocharis acicularis</i> (L.) Roemer & J.A. Schultes	needle spikerush
Cyperaceae	<i>Scirpus</i> L.	bulrush
Dennstaedtiaceae	<i>Dennstaedtia punctilobula</i> (Michx.) T. Moore	eastern hayscented fern
Dioscoreaceae	<i>Dioscorea villosa</i> L.	wild yam
Dryopteridaceae	<i>Dryopteris carthusiana</i> (Vill.) H.P. Fuchs	spinulose woodfern
Dryopteridaceae	<i>Dryopteris intermedia</i> (Muhl. ex Willd.) Gray	intermediate woodfern
Dryopteridaceae	<i>Dryopteris marginalis</i> (L.) Gray	marginal woodfern
Dryopteridaceae	<i>Gymnocarpium dryopteris</i> (L.) Newman	western oakfern
Dryopteridaceae	<i>Onoclea sensibilis</i> L.	sensitive fern
Dryopteridaceae	<i>Polystichum acrostichoides</i> (Michx.) Schott	Christmas fern
Elaeagnaceae	<i>Elaeagnus umbellata</i> Thunb.	autumn olive
Ericaceae	<i>Gaylussacia baccata</i> (Wangenh.) K. Koch	black huckleberry
Ericaceae	<i>Kalmia latifolia</i> L.	mountain laurel
Ericaceae	<i>Rhododendron periclymenoides</i> (Michx.) Shinners	pink azalea
Ericaceae	<i>Vaccinium pallidum</i> Ait.	Blue Ridge blueberry
Ericaceae	<i>Vaccinium stamineum</i> L.	deerberry
Euphorbiaceae	<i>Acalypha</i> L.	acalypha
Fabaceae	<i>Amphicarpaea bracteata</i> (L.) Fern.	American hogpeanut
Fabaceae	<i>Cercis canadensis</i> L.	eastern redbud
Fabaceae	<i>Coronilla</i> L.	crownvetch
Fabaceae	<i>Desmodium nudiflorum</i> (L.) DC.	nakedflower ticktrefoil
Fabaceae	<i>Desmodium paniculatum</i> (L.) DC.	panicledleaf ticktrefoil
Fabaceae	<i>Gleditsia triacanthos</i> L.	honeylocust
Fabaceae	<i>Lotus corniculatus</i> L.	birdfoot deervetch
Fabaceae	<i>Medicago lupulina</i> L.	black medick
Fabaceae	<i>Robinia pseudoacacia</i> L.	black locust
Fabaceae	<i>Trifolium</i> L.	clover
Fabaceae	<i>Trifolium pratense</i> L.	red clover
Fabaceae	<i>Trifolium repens</i> L.	white clover
Fabaceae	<i>Wisteria</i> Nutt.	wisteria
Fagaceae	<i>Castanea dentata</i> (Marsh.) Borkh.	American chestnut
Fagaceae	<i>Fagus grandifolia</i> Ehrh.	American beech
Fagaceae	<i>Fagus sylvatica</i> L.	European beech
Fagaceae	<i>Quercus alba</i> L.	white oak
Fagaceae	<i>Quercus coccinea</i> Muenchh.	scarlet oak
Fagaceae	<i>Quercus palustris</i> Muenchh.	pin oak

Appendix D. Vascular plants identified in vegetation classification and thematic accuracy assessment plots (nomenclature follows Kartesz 1994) at Valley Forge National Historical Park (continued).

Family	Scientific Name	Common Name
Fagaceae	<i>Quercus prinus</i> L.	chestnut oak
Fagaceae	<i>Quercus rubra</i> L.	northern red oak
Fagaceae	<i>Quercus velutina</i> Lam.	black oak
Fumariaceae	<i>Corydalis flavula</i> (Raf.) DC.	yellow fumewort
Hamamelidaceae	<i>Hamamelis virginiana</i> L.	American witchhazel
Hamamelidaceae	<i>Liquidambar styraciflua</i> L.	sweetgum
Hippocastanaceae	<i>Aesculus</i> L.	buckeye
Juglandaceae	<i>Carya cordiformis</i> (Wangenh.) K. Koch	bitternut hickory
Juglandaceae	<i>Carya glabra</i> (P. Mill.) Sweet	pignut hickory
Juglandaceae	<i>Carya</i> Nutt.	hickory
Juglandaceae	<i>Carya ovalis</i> (Wangenh.) Sarg.	red hickory
Juglandaceae	<i>Carya ovata</i> (P. Mill.) K. Koch	shagbark hickory
Juglandaceae	<i>Juglans cinerea</i> L.	butternut
Juglandaceae	<i>Juglans nigra</i> L.	black walnut
Juncaceae	<i>Juncus canadensis</i> J. Gay ex Laharpe	Canadian rush
Juncaceae	<i>Juncus effusus</i> L.	common rush
Juncaceae	<i>Juncus tenuis</i> Willd.	poverty rush
Lamiaceae	<i>Clinopodium vulgare</i> L.	wild basil
Lamiaceae	<i>Lycopus americanus</i> Muhl. Ex W. Bart.	American waterhorehound
Lamiaceae	<i>Lycopus</i> L.	waterhorehound
Lamiaceae	<i>Mentha</i> L.	mint
Lamiaceae	<i>Prunella vulgaris</i> L.	common selfheal
Lamiaceae	<i>Pycnanthemum</i> Michx.	pycnanthemum
Lamiaceae	<i>Scutellaria</i> L.	skullcap
Lamiaceae	<i>Scutellaria lateriflora</i> L.	blue skullcap
Lamiaceae	<i>Teucrium canadense</i> L.	Canada germander
Lamiaceae	<i>Trichostema dichotomum</i> L.	forked bluecurls
Lauraceae	<i>Lindera benzoin</i> (L.) Blume	northern spicebush
Lauraceae	<i>Sassafras albidum</i> (Nutt.) Nees	sassafras
Lemnaceae	<i>Lemna</i> L.	duckweed
Liliaceae	<i>Allium vineale</i> L.	wild garlic
Liliaceae	<i>Maianthemum canadense</i> Desf.	Canada beadruby
Liliaceae	<i>Medeola virginiana</i> L.	Indian cucumberroot
Liliaceae	<i>Polygonatum pubescens</i> (Willd.) Pursh	hairy Solomon's seal
Liliaceae	<i>Uvularia perfoliata</i> L.	perfoliate bellwort
Lythraceae	<i>Lythrum salicaria</i> L.	purple loosestrife
Magnoliaceae	<i>Liriodendron tulipifera</i> L.	tuliptree
Magnoliaceae	<i>Magnolia acuminata</i> (L.) L.	cucumbertree
Monotropaceae	<i>Monotropa uniflora</i> L.	Indianpipe
Moraceae	<i>Morus alba</i> L.	white mulberry
Nymphaeaceae	<i>Nuphar</i> Sm.	pondlilly
Nyssaceae	<i>Nyssa sylvatica</i> Marsh.	blackgum
Oleaceae	<i>Fraxinus americana</i> L.	white ash
Oleaceae	<i>Fraxinus pennsylvanica</i> Marsh.	green ash
Ophioglossaceae	<i>Botrychium dissectum</i> Spreng.	cutleaf grapefern

Appendix D. Vascular plants identified in vegetation classification and thematic accuracy assessment plots (nomenclature follows Kartesz 1994) at Valley Forge National Historical Park (continued).

Family	Scientific Name	Common Name
Onagraceae	<i>Circaea lutetiana</i> L.	broadleaf enchanter's nightshade
Oleaceae	<i>Ligustrum vulgare</i> L.	European privet
Orobanchaceae	<i>Epifagus virginiana</i> (L.) W. Bart.	beechdrops
Osmundaceae	<i>Osmunda claytoniana</i> L.	interrupted fern
Oxalidaceae	<i>Oxalis</i> L.	woodsorrel
Oxalidaceae	<i>Oxalis stricta</i> L.	common yellow oxalis
Phytolaccaceae	<i>Phytolacca americana</i> L.	American pokeweed
Pinaceae	<i>Larix decidua</i> P. Mill.	European larch
Pinaceae	<i>Picea</i> A. Dietr.	spruce
Pinaceae	<i>Pinus strobus</i> L.	eastern white pine
Pinaceae	<i>Pinus sylvestris</i> L.	scotch pine
Pinaceae	<i>Tsuga canadensis</i> (L.) Carr.	eastern hemlock
Plantaginaceae	<i>Plantago lanceolata</i> L.	narrowleaf plantain
Plantaginaceae	<i>Plantago major</i> L.	common plantain
Platanaceae	<i>Platanus occidentalis</i> L.	American sycamore
Poaceae	<i>Agrostis gigantea</i> Roth	redtop
Poaceae	<i>Agrostis perennans</i> (Walt.) Tuckerman	upland bentgrass
Poaceae	<i>Agrostis stolonifera</i> L.	creeping bentgrass
Poaceae	<i>Andropogon virginicus</i> L.	broomsedge bluestem
Poaceae	<i>Anthoxanthum odoratum</i> L.	sweet vernalgrass
Poaceae	<i>Bromus commutatus</i> Schrad.	meadow brome
Poaceae	<i>Bromus japonicus</i> Thunb. Ex Murr.	Japanese brome
Poaceae	<i>Cinna arundinacea</i> L.	sweet woodreed
Poaceae	<i>Cinna latifolia</i> (Trev. Ex Goepp.) Griseb.	drooping woodreed
Poaceae	<i>Dactylis glomerata</i> L.	orchardgrass
Poaceae	<i>Digitaria sanguinalis</i> (L.) Scop.	hairy crabgrass
Poaceae	<i>Echinochloa muricata</i> (Beauv.) Fern.	rough barnyardgrass
Poaceae	<i>Elymus hystrix</i> L.	eastern bottlebrush grass
Poaceae	<i>Elymus</i> L.	wildrye
Poaceae	<i>Elymus villosus</i> Muhl. Ex Willd.	hairy wildrye
Poaceae	<i>Elytrigia repens</i> (L.) Desv. Ex B.D. Jackson	creeping quackgrass
Poaceae	<i>Eragrostis spectabilis</i> (Pursh) Steud.	purple lovegrass
Poaceae	<i>Festuca elatior</i> L. p.p.	tall fescue
Poaceae	<i>Festuca</i> L.	fescue
Poaceae	<i>Festuca obtusa</i> Biehler	nodding fescue
Poaceae	<i>Festuca rubra</i> L.	red fescue
Poaceae	<i>Glyceria</i> R. Br.	mannagrass
Poaceae	<i>Glyceria striata</i> (Lam.) A.S. Hitchc.	fowl mannagrass
Poaceae	<i>Leersia oryzoides</i> (L.) Sw.	rice cutgrass
Poaceae	<i>Microstegium vimineum</i> (Trin.) A. Camus	Japanese stiltgrass
Poaceae	<i>Panicum acuminatum</i> Sw.	panic grass
Poaceae	<i>Panicum anceps</i> Michx.	beaked panicum
Poaceae	<i>Panicum clandestinum</i> L.	deer tongue
Poaceae	<i>Panicum</i> L.	panicum
Poaceae	<i>Paspalum setaceum</i> Michx.	thin paspalum

Appendix D. Vascular plants identified in vegetation classification and thematic accuracy assessment plots (nomenclature follows Kartesz 1994) at Valley Forge National Historical Park (continued).

Family	Scientific Name	Common Name
Poaceae	<i>Phalaris arundinacea</i> L.	reed canarygrass
Poaceae	<i>Phleum pratense</i> L.	timothy
Poaceae	<i>Poa</i> L.	bluegrass
Poaceae	<i>Poa pratensis</i> L.	Kentucky bluegrass
Poaceae	<i>Setaria</i> Beauv.	bristlegrass
Poaceae	<i>Setaria faberi</i> Herrm.	Japanese bristlegrass
Poaceae	<i>Setaria geniculata</i> Beauv.	perennial foxtail
Poaceae	<i>Tridens flavus</i> (L.) A.S. Hitchc.	purpletop tridens
Polygonaceae	<i>Polygonum amphibium</i> L.	water knotweed
Polygonaceae	<i>Polygonum arifolium</i> L.	halberdleaf tearthumb
Polygonaceae	<i>Polygonum cespitosum</i> Blume	oriental ladythumb
Polygonaceae	<i>Polygonum cuspidatum</i> Sieb. & Zucc.	Japanese knotweed
Polygonaceae	<i>Polygonum hydropiperoides</i> Michx.	swamp smartweed
Polygonaceae	<i>Polygonum pensylvanicum</i> L.	Pennsylvania smartweed
Polygonaceae	<i>Polygonum perfoliatum</i> L.	asiatic tearthumb
Polygonaceae	<i>Polygonum persicaria</i> L.	spotted ladythumb
Polygonaceae	<i>Polygonum sagittatum</i> L.	arrowleaf tearthumb
Polygonaceae	<i>Polygonum virginianum</i> L.	jumpseed
Polygonaceae	<i>Rumex acetosella</i> L.	common sheep sorrel
Polygonaceae	<i>Rumex crispus</i> L.	curly dock
Polygonaceae	<i>Rumex obtusifolius</i> L.	bitter dock
Polygonaceae	<i>Rumex verticillatus</i> L.	swamp dock
Pyrolaceae	<i>Chimaphila maculata</i> (L.) Pursh	striped prince's pine
Ranunculaceae	<i>Anemone quinquefolia</i> L.	nightcaps
Ranunculaceae	<i>Hepatica americana</i> (DC.) Ker-Gawl.	liverleaf
Ranunculaceae	<i>Ranunculus ficaria</i> L.	fig buttercup
Ranunculaceae	<i>Ranunculus</i> L.	buttercup
Rosaceae	<i>Agrimonia</i> L.	agrimony
Rosaceae	<i>Amelanchier arborea</i> (Michx. F.) Fern.	common serviceberry
Rosaceae	<i>Amelanchier</i> Medik.	serviceberry
Rosaceae	<i>Crataegus</i> L.	hawthorn
Rosaceae	<i>Fragaria virginiana</i> Duchesne	Virginia strawberry
Rosaceae	<i>Geum canadense</i> Jacq.	white avens
Rosaceae	<i>Geum laciniatum</i> Murr.	rough avens
Rosaceae	<i>Malus</i> P. Mill.	apple
Rosaceae	<i>Potentilla</i> L.	cinquefoil
Rosaceae	<i>Potentilla simplex</i> Michx.	common cinquefoil
Rosaceae	<i>Prunus avium</i> (L.) L.	sweet cherry
Rosaceae	<i>Prunus serotina</i> Ehrh.	black cherry
Rosaceae	<i>Prunus virginiana</i> L.	common chokecherry
Rosaceae	<i>Pyrus coronaria</i> L.	crab apple
Rosaceae	<i>Pyrus</i> L.	pear
Rosaceae	<i>Rhodotypos scandens</i> (Thunb.) Makino	jetbead
Rosaceae	<i>Rosa multiflora</i> Thunb. Ex Murr.	multiflora rose
Rosaceae	<i>Rubus allegheniensis</i> Porter	Allegheny blackberry
Rosaceae	<i>Rubus idaeus</i> L.	American red raspberry

Appendix D. Vascular plants identified in vegetation classification and thematic accuracy assessment plots (nomenclature follows Kartesz 1994) at Valley Forge National Historical Park (continued).

Family	Scientific Name	Common Name
Rosaceae	<i>Rubus philadelphicus</i> Blanch.	Philadelphia blackberry
Rosaceae	<i>Rubus phoenicolasius</i> Maxim.	wine raspberry
Rosaceae	<i>Waldsteinia fragarioides</i> (Michx.) Tratt.	barren strawberry
Rubiaceae	<i>Cephalanthus occidentalis</i> L.	common buttonbush
Rubiaceae	<i>Galium aparine</i> L.	stickywilly
Rubiaceae	<i>Galium asprellum</i> Michx.	rough bedstraw
Rubiaceae	<i>Galium circaezans</i> Michx.	licorice bedstraw
Rubiaceae	<i>Galium concinnum</i> Torr. & Gray	shining bedstraw
Rubiaceae	<i>Galium palustre</i> L.	common marsh bedstraw
Rubiaceae	<i>Galium triflorum</i> Michx.	fragrant bedstraw
Salicaceae	<i>Populus grandidentata</i> Michx.	bigtooth aspen
Salicaceae	<i>Salix nigra</i> Marsh.	black willow
Saururaceae	<i>Saururus cernuus</i> L.	lizards tail
Saxifragaceae	<i>Tiarella cordifolia</i> L.	heartleaf foamflower
Scrophulariaceae	<i>Linaria vulgaris</i> P. Mill.	butter and eggs
Scrophulariaceae	<i>Paulownia tomentosa</i> (Thunb.) Sieb. & Zucc. ex Steud.	princesstree
Scrophulariaceae	<i>Penstemon digitalis</i> Nutt. ex Sims	beardtongue
Scrophulariaceae	<i>Verbascum thapsus</i> L.	common mullein
Simaroubaceae	<i>Ailanthus altissima</i> (P. Mill.) Swingle	tree of heaven
Smilacaceae	<i>Smilax glauca</i> Walt.	cat greenbrier
Smilacaceae	<i>Smilax rotundifolia</i> L.	roundleaf greenbrier
Solanaceae	<i>Solanum carolinense</i> L.	Carolina horsenettle
Sparganiaceae	<i>Sparganium androcladum</i> (Engelm.) Morong	branched burreed
Sparganiaceae	<i>Sparganium</i> L.	burreed
Staphyleaceae	<i>Staphylea trifolia</i> L.	American bladdernut
Taxaceae	<i>Taxus</i> L.	yew
Tiliaceae	<i>Tilia americana</i> L.	American basswood
Typhaceae	<i>Typha angustifolia</i> L.	narrowleaf cattail
Typhaceae	<i>Typha latifolia</i> L.	broadleaf cattail
Ulmaceae	<i>Celtis occidentalis</i> L.	common hackberry
Ulmaceae	<i>Ulmus americana</i> L.	American elm
Ulmaceae	<i>Ulmus rubra</i> Muhl.	slippery elm
Urticaceae	<i>Boehmeria cylindrica</i> (L.) Sw.	smallspike false nettle
Urticaceae	<i>Pilea pumila</i> (L.) Gray	Canadian clearweed
Urticaceae	<i>Urtica dioica</i> L.	stinging nettle
Urticaceae	<i>Urtica procera</i> Muhl. ex Willd.	stinging nettle
Violaceae	<i>Viola hirsutula</i> Brainerd	southern woodland violet
Violaceae	<i>Viola</i> L.	violet
Vitaceae	<i>Parthenocissus quinquefolia</i> (L.) Planch.	Virginia creeper
Vitaceae	<i>Vitis aestivalis</i> Michx.	summer grape
Vitaceae	<i>Vitis riparia</i> Michx.	riverbank grape
Vitaceae	<i>Vitis vulpina</i> L.	frost grape

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

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