

# The naturally occurring historical and extant flora of Central Park, New York City, New York 1857–2007

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DECANDIDO, R. (Hawk Mountain Sanctuary, 410 Summer Valley Road, Orwigsburg, PA 17961), NEIL CALVANESE (Central Park Conservancy, 14 East 60<sup>th</sup> Street, New York, NY 10022), R. V. ALVAREZ (Central Park Conservancy, 14 East 60<sup>th</sup> Street, New York, NY 10022), M. I. BROWN (Central Park Conservancy, Soil, Water and Ecology Lab, 830 Fifth Avenue, New York, NY 10021), and T. M. NELSON (Central Park Conservancy, Soil, Water and Ecology Lab, 830 Fifth Avenue, New York, NY 10021). The naturally occurring historical and extant flora of Central Park, New York City, New York 1857–2007. *J. Torrey Bot. Soc.* 134: 552–569. 2007—This vascular flora of Central Park, New York County, New York State is based upon field work by the authors in 2006–2007 combined with three 19<sup>th</sup> century plant lists, and specimens held at metropolitan herbaria collected from 1885–2006. Altogether, 106 families, 351 genera, and 583 species are reported. The largest family in Central Park in both the historical (1857 to 1910) and modern period (1985 to 2007) is the Asteraceae. The largest genera are *Polygonum*, *Quercus*, and *Aster*. Analyses of the ecological characteristics of the historical flora show that species indicative of riparian areas including ponds, swamps, wet meadows and woods, were formerly common in the area that was developed into Central Park. Twenty-one species would have special New York State Natural Heritage Program designations if they were extant today. In the 19<sup>th</sup> and early 20<sup>th</sup> century, native plant species (255; 74%) far exceeded non-natives (91; 26%) in Central Park. However, 70% (178) of the native plants recorded in the historical time period have been extirpated. Most extirpated native species were herbaceous plants (111; 62%), and were significantly more likely to prefer wet meadows and woods than drier habitats. By comparison, in our field work in 2006–2007 and examination of BBG and NYBG plant collections, we found 362 species, most of which were non-native plants (217; 60%). Three species we collected have special status designations in New York State: *Eclipta prostrata*, *Eupatorium serotinum*, and *Ptelea trifoliata*. We recommend the continuation of native plant restoration efforts in Central Park, with an emphasis upon re-establishing herbaceous species characteristic of meadows, open woodlands and riparian areas, as well as increasing the diversity and number of *Quercus* spp. in the forest. Combined with educational outreach that calls to attention the environmental history of Central Park, much can be done to make people aware of the significant role urban areas can play in conservation efforts.

Key words: biotic homogenization, Central Park, historical flora, New York City, restoration, urban.

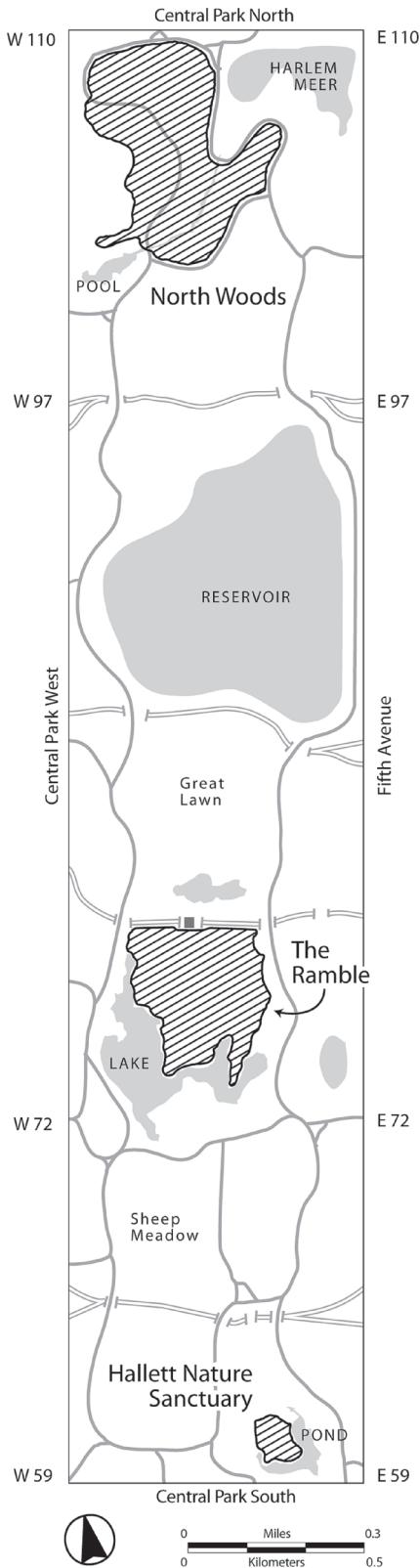
<sup>1</sup> This paper is dedicated to two distinguished New York City naturalists who have studied plants in Central Park for more than 50 years: William Schiller of the Education Department of the American Museum of Natural History, and Sarah M. Elliott, author and illustrator. We also thank these colleagues for their expertise and advice: N. Wagerik, E. Levine, D. Allen, H. Becker, N. Dicker, A.M. Greller, R. S. Lieberman, R. E. Loeb, L. Miller, S.C. Miller, R. Schutz, A. Stillman, H. H. Stillman and S. J. Wiley. M. F. Baron labeled pressed plant specimens and organized the herbarium. A. Arrowsmith designed the map.

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Central Park (Fig. 1) is one of the best known urban parks in North America. At 341.2 ha., it is the fifth largest green space in New York City (NYC). The park was established in 1853 when the land was obtained via decree by the New York State legislature. After substantial construction, landscaping, and planting, the park was opened to the public in 1858 (Richards 1861,

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Cook 1869). By 2000, it was estimated that 25 million people visit Central Park each year (The Trust for Public Land 2006).

People have a long association with Central Park. In 1853, there were approximately 1600 residents in the area that would become the park (Rosenzweig and Blackmar 1992). At that time, a community of mostly African-American citizens lived in 'Seneca Village' between present day 81<sup>st</sup> and 86<sup>th</sup> Streets near the west side. Businesses, including leather tanning works and slaughterhouses, also operated in the park. Up until 1858, it is likely that anthropogenic activities such as cutting wood for fuel, fire, and shelter maintained a diversity of habitats in the area of Central Park including open fields, swamps, meadows, and early successional woodlands. During the construction phase beginning in 1858, almost 1000 workers were hired for landscaping projects. By 1873, at least 10 million cartloads of material had been hauled through the park. Approximately four million trees, shrubs, and plants, representing more than 1000 species were planted (Barlow 1977, Graff 1985, Rosenzweig and Blackmar 1992). Today, there are about 200 workers employed by the Central Park Conservancy as gardeners and others, working directly with the park's plants and landscape.

Beginning in the mid 19<sup>th</sup> century, researchers documented the biodiversity of Central Park including its terrestrial plant species (Rawolle and Pilat 1857), fresh water flora and fauna (Gratacap and Woodward 1884), and breeding birds (Woodruff and Paine 1886). In the last 25 years, geologists have mapped the rock formations and geologic history of the park (Taterka 1987, Merguerian and Sanders 1993). Other research has assessed long-term changes in woody plant species of the park (Loeb 1993), as well as atmospheric particulates found in sediment cores extracted from the Central Park lake (Chillrud et al. 1999, Yan et al. 2005). However since the 19<sup>th</sup> century, botanists have not compiled a complete flora of the park.

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FIG. 1. Map of Central Park, New York County, New York.

Most people are unaware of the great diversity of plant species found in NYC. Sanderson and Brown (2007) mapped 54 ecological communities that once existed on Manhattan Island prior to the 18<sup>th</sup> century. As recently as the late 19<sup>th</sup> century, 30 of the 58 native orchids of New York State could be found in NYC, with 21 species occurring on Manhattan Island (Denslow 1924, DeCandido et al. 2004, Lamont 2007).

McKinney (2006) has shown that urbanization produces biotic homogenization of plant species diversity in cities and suburbs in North America and elsewhere. Uncommon and rare native plant species are often extirpated locally as urbanization increases, while on a regional scale, synanthropic (primarily non-native) plants become more widespread (see Chochołouskova and Pysek 2003, Standley 2003, Clemants and Moore 2005). This process has been especially pronounced in port cities of the northeastern United States (Clemants and Moore 2003). The establishment of gardens or other exotic plantings further augments diversity of alien species in cities (Smith et al. 2006). Also, urbanization creates barriers to migration by eliminating direct biotic corridors that native plant species can utilize to re-establish populations in city parks. As a result, despite the overall increase in alpha-level biodiversity in cities, the loss of unique native plants impoverishes urban parks and other natural areas. Urban habitats most affected have been wetlands, moist meadows and woods, with certain plant groups such as orchids and ferns having significantly high extirpation rates (Drayton and Primack 1996, Bertin 2000, DeCandido et al. 2004).

Central Park, the largest green space on Manhattan Island, presented an ideal opportunity to examine the effects of rapid urbanization upon native flora. We had two goals in our research: (1) to document extant plant species diversity of the park; and (2) to understand how the park's flora has changed through time. In addition to these goals, we had specific research questions: Were native herbaceous plants, such as wildflowers and ferns, significantly more likely to have been extirpated than native woody species? Were species of certain habitats, such as moist meadows, swamps, and mesic woodlands more likely to have been extirpated than species found in upland (dry) woods and meadows? What unique native species were

present in Central Park in the past? Are any New York State listed native plants found in the park today? By answering such questions, we could provide guidance to park managers interested in restoring native plant species diversity to natural areas of the park, and trace an environmental history of Central Park since the mid-19<sup>th</sup> century.

**Materials and Methods.** **STUDY SITE.** Central Park is located in the center of Manhattan (New York County) in the southeastern part of New York State (40° 46' 12" N, 73° 58' 1" W; Fig. 1). The park is rectangular, approximately 4.0 km long and 0.8 km wide, trending 29° NE (Taterka 1987) stretching from 59<sup>th</sup> Street (Central Park South) north to 110<sup>th</sup> Street. The original northern boundary of the park was at 106<sup>th</sup> Street in 1853, but in 1863 additional land was added up to 110<sup>th</sup> Street (Olmstead and Kimball 1928). The lowest point of the park is 4.5 m above sea level (asl) at the Harlem Meer at the northeastern section of the park. The highest point (excluding man-made structures) is 41.3 m asl atop Summit Rock near Central Park West and 83<sup>rd</sup> Street. Today, ballfields, lawns, formal gardens, paved recreational areas and roadways form the major part of the park. However, there still remain three significant natural areas managed by Central Park Conservancy staff: the North Woods and adjacent Wildflower Meadow (36.4 ha), the Ramble (14.6 ha), and Hallett Sanctuary (1.6 ha).

The topography, flora, and fauna of Central Park have been dramatically affected by landscaping construction that commenced in 1858 under the Greensward plan designed by F. L. Olmstead and C. Vaux (Richards 1861, Cook 1869). Approximately 150 km of underground drainage pipe were installed to eliminate the extensive wetlands of the area (Simpson and Hern 1981). In the southern two-thirds of the park, most of the exposed Pleistocene boulders were cleared, or moved from their original locations in order to create unobstructive vistas that would give visitors a sense of expanse (Rosenzweig and Blackmar 1992). Both a lake and a reservoir were built in the park, and four smaller ponds were added or expanded near 59<sup>th</sup> Street, 79<sup>th</sup> Street, 105<sup>th</sup> Street, and 110<sup>th</sup> Street.

The geology and soils of Central Park have a long history of investigation (see Mather 1843, Maynadier 1911, Warner and Hanna

1982, Merguerian and Sanders 1993). The park's bedrock consists of metamorphosed sedimentary rock, originally named "Manhattan Schist" by Merrill (1890), and now considered a complex of three types of schist (Merguerian and Sanders 1993). Other significant geological features in the park include Cameron's Line located south of 86<sup>th</sup> Street, as well as the Hartland Formation, primarily south of 70<sup>th</sup> Street (Taterka 1987, Merguerian and Merguerian 2004). From the Ramble south remain several glacial erratics derived from the nearby Palisades of western New Jersey (Taterka 1987, Merguerian and Merguerian 2004).

**METHODS.** From early March through late October 2006, Central Park was surveyed by one observer (R. DeCandido) three to four days per week (April through August), and one to two days per week in March, and again in September–October. Further investigations, usually one to two days per week, were made in April through August 2007. All sections of the park were monitored at least once every other week. Certain areas received more attention than others: the protected walls surrounding the reservoir, the North Woods, Ramble and Hallett Sanctuary areas, and the margins of Turtle Pond and the Harlem Meer. By comparison some sections of the park that are frequently mowed or maintained received less attention including playgrounds, lawns and the southwestern section of Central Park that was undergoing extensive renovations during our study. Voucher specimens were deposited at the Soil, Water and Ecology Lab at the North Meadow complex in Central Park. (For access to this collection, contact M. Brown (MBrown@CentralParkNYC.org). Additional voucher specimens of rare or significant plants collected (e.g., *Eclipta prostrata*, *Polygonum perfoliatum*) were deposited at the Brooklyn Botanic Garden for their New York Metropolitan Flora Project.

We focused our efforts on identifying and collecting plant species growing wild (uncultivated) in the park. We disregarded cultivated plants found in formal gardens, or other areas actively maintained by park personnel, but did collect weeds in these sites. Most of the plants we expected to find were opportunistic, so we devoted particular attention to a variety of urban habitats that were not frequently mowed including the edges of sports fields,

walkways, bases of walls and buildings, and ephemeral riparian zones. N. Wagerik, E. Levine, L. Miller, H. Stillman, and R. Lieberman, who have a long-term interest in the park's flora, helped us find and collect less common species. We also used a tree species list compiled by N. Calvanese, and a list of native species planted in the park by R. V. Alvarez et al. since 2000 (N. Calvanese, unpubl. data, R. V. Alvarez, unpubl. data, DeCandido et al. 2007).

For the historical flora of Central Park we consulted three published lists (Rawolle and Pilat 1857, Viele 1857, Gratacap 1880). Rawolle and Pilat (1857) collected in August and September 1857, and it is likely that many spring and early summer flowering plants were missed. Totals reported for Central Park for historical species occurrence in each of the three 19<sup>th</sup> century publications should be considered minimum estimates. We also searched on-line databases of the plant collections held at the Brooklyn Botanical Garden (BBG) as well as the New York Botanical Garden (NYBG). We examined the NYBG plant collection for species collected in Central Park. If we found a species at these herbaria not listed on any of the three historical lists or found in our field research in 2006–2007, we included it in this study along with its collection number. If an extirpated or extant plant species has a special state designation as determined by the Natural Heritage Program (see Young and Weldy 2006), we noted this information in the Appendix.

We did not attempt to assess the current diversity of the park's planted flora (e.g., Peet 1903) unless a species in question had escaped from cultivation. Additionally, a few (less than 5) species that were found in bloom in the park from 1995–2005 but could not be re-located in 2006–2007, are included as extirpated species. We have omitted native species from the Appendix that were planted by Central Park Conservancy staff since 1995 as part of restoration efforts, unless the species in question has also established a significant population outside of restoration sites, gardens or areas that are mostly cultivated.

To update outdated scientific names, we consulted the 5th edition of Gray's *Manual* (Gray 1880), as well as the 8th edition of the *Manual* (Fernald 1950), and Kartesz (1994). We identified plant species using Gleason and Cronquist (1991). We also consulted Mitchell

Table 1. Number of plant species found in Central Park in the 19th and early 20th centuries compared to species found from 1985 to 2007.

	Pteridophytes		Conifers		Dicots		Monocots		Total		Total All
	1857– 1910	1985– 2007	1857– 1910	1985– 2007	1857– 1910	1985– 2007	1857– 1910	1985– 2007	1857– 1910	1985– 2007	1857– 2007
Native Species	18	6	1	0	220	119	16	20	255	145	331
Non-native Species	0	0	0	0	89	191	2	26	91	217	252
Total Species	18	6	1	0	309	310	18	46	346	362	583

(1978, 1993) and Clemants (1992). Several species of Poaceae were determined by N. Dicker of the Brooklyn Botanic Garden.

From the 19th century plant lists and late 19th and early 20th century herbarium specimens, we compiled an historical database of the flora of Central Park. We classified each species as native or non-native (alien), and then compared these to a database of the extant plants we identified in Central Park in 2006–07 combined with a few additional species collected in the park since 1985 and held at BBG or NYBG. Nomenclature follows Mitchell and Tucker (1997) with minor revisions found in Mitchell (2000).

In order to understand how the park's flora and environment changed through time, we classified plants in the Appendix as woody or herbaceous according to our experience with the species in the park (see also Gleason and Cronquist 1991), as well as native or non-native to New York State (Mitchell and Tucker 1997, Mitchell 2000). We also categorized each species to one of five general habitat types: dry vs. moist (mesic) woods, dry vs. moist meadow, or wasteland.

We used chi-square tests (see Preacher 2001) with one degree of freedom to test two hypotheses: (1) there are significantly more non-native than native species found in Central Park from 1985 through 2007 than in the 19th and early 20th century; and (2) in the historical period, there were significantly more native plant species indicative of mesic habitats (moist or wet meadows and woodlands) than native species characteristic of dry (upland) meadows and woods.

**Results.** The vascular flora of Central Park (see Appendix) contains 106 families, 351 genera, and 583 species. Of the 583 species ever identified in the park, 331 (57%) are native and 252 (43%) are non-native (Table 1). In the 19th and early 20th century at least 346 species were found in Central Park. Most (255;

74%) were native species and most (221; 64%) were herbaceous plants. Native plants of Central Park in the historical period were significantly more likely to be species that preferred mesic conditions than species that preferred dry habitats ( $\chi^2 = 11.1$ ,  $P < 0.05$ ). By comparison, we found 362 species in our field work in 2006–2007 combined with research of herbarium specimens collected in Central Park since 1985. Of these, 145 are native (40%) and 217 are non-native species (60%). Overall, the proportion of native vs. non-native species in Central Park has significantly changed since the 19th century ( $\chi^2 = 81.5$ ,  $P < 0.05$ ).

New plant records for Central Park since 1985 but not present on earlier lists number 260 species. Most (167; 64%) are non-native species. By comparison, 198 (57%) of the plants listed for the park since the historical time period have been extirpated, including 179 native species (90% of extirpated species). Most of these native extirpated species (117; 65%) were herbaceous plants. Native herbaceous plants were significantly more likely to be extirpated than native woody species ( $\chi^2 = 11.4$ ,  $P < 0.05$ ). Native plants that were extirpated from the park were significantly more likely to prefer mesic meadows and woods, than dry meadows or woods ( $\chi^2 = 13.1$ ,  $P < 0.05$ ).

In Central Park in the 19th and early 20th centuries, the plant families with the greatest species richness were the Asteraceae with 30 genera and 42 species (28 native); the Rosaceae, with 11 genera and 21 species (17 native); and the Polygonaceae with 2 genera and 15 species (6 native). Together, they composed 23% of all species known from the historical time period. The largest genera were: *Polygonum* (12 species), *Quercus* (10 species), and *Aster* (6 species). For the 1985–2007 period, the families with the greatest species richness are the Asteraceae with 31 genera and 55 species (25 native); the Poaceae, with 20 genera



and 24 species (6 native); and the Rosaceae with 11 genera and 21 species (7 native). Together, they compose 28% of all extant species. The largest genera are: *Polygonum* (10 species), *Aster* (8 species), *Ranunculus* (6 species) and *Solanum* (5 species). In 2006–07, of the 339 vascular plant species for which we could determine the time of first bloom, most (132) began flowering in the month of May.

In our field work in 2006–2007, we found 10 of the 12 most invasive species in southeastern New York State (Zimmerman et al. 2006). Six of these pose significant threats to native species and restoration efforts in Central Park: *Acer platanoides*, *Alliaria petiolata*, *Polygonum cuspidatum*, *Ranunculus ficaria* var. *bulbifera*, *Robinia pseudoacacia*, and *Wisteria sinensis*.

When the 19<sup>th</sup> century Central Park plant list is analyzed, there are 21 native species (14 herbaceous) listed in the Appendix that if extant today, would have special status designations in New York State (see Young and Weldy 2006). During the course of the 2006–2007 survey, 43 (12%) of the 362 extant plant species were judged to be uncommon or rare in Central Park. Of these, 38 (88%) are herbaceous species. Three species we collected have special status designations in New York State: *Eclipta prostrata*, *Eupatorium serotinum*, and *Ptelea trifoliata*. Seventeen native species (15 herbaceous) have been reduced to a population of a few individuals (less than 10) in Central Park. These are: *Amelanchier arborea*, *Anemone virginiana* var. *virginiana*, *Aster lateriflorus* var. *lateriflorous*, *Boehmeria cylindrica*, *Cystopteris fragilis*, *Epilobium ciliatum* ssp. *ciliatum*, *Equisetum arvense*, *Lactuca biennis*, *Linaria canadensis*, *Lobelia inflata*, *Onoclea sensibilis*, *Osmorhiza longistylis*, *Ptelia trifoliata*, *Sanicula canadensis*, *Teucrium canadense* var. *canadense*, *Triodanis perfoliata* var. *perfoliata*, and *Urtica dioica* ssp. *gracilis*. Three other native herbaceous species were extirpated between 1995 and 2005: *Datura stramonium*, *Lindernia dubia* var. *dubia*, and *Monotropa uniflora*.

**Discussion.** Our research documents the vascular flora known from Central Park including 106 plant families, 351 genera, and 583 species (Table 1). In the 19<sup>th</sup> century, native plants composed 74% of the species identified in Central Park. However, substantial changes in plant species diversity occurred in the last 150 years. At least 178 native plants

have likely been extirpated. Native herbaceous species (111 extirpated; 62%) were significantly more likely to be extirpated than native woody species. By comparison, non-native plants today are much more common in Central Park than in the 19<sup>th</sup> century, accounting for 60% of all species identified from 1985–2007. Of the 165 non-native herbaceous species identified in 2006–2007, only 8 (5%) are considered rare in the park.

The loss of native plant species diversity in Central Park reflects similar changes that occurred in many other parts of NYC. Historically, Manhattan Island had significant plant species diversity: approximately 50% (704) of the native plants identified in NYC have been found in this borough (DeCandido, unpubl. data). Since the 19<sup>th</sup> century, Manhattan Island has lost 21 native orchid spp., 24 native fern spp., 24 spp. of native sedges and rushes, 37 spp. of native grasses, and at least 14 spp. of native plants found nowhere else in NYC (DeCandido, unpubl. data).

Changes in plant species diversity occurred rapidly in the new park. Soon after the first plant inventory was completed by Pilat and Rawolle (1857), landscape-level changes were made to Central Park according to the Greensward Plan designed by Olmstead and Vaux (Cook 1869, Rosenzweig and Blackmar 1992). Many of the park's wet meadows and mesic woodlands were eliminated. From 1858–1860, gardeners and landscapers systematically removed most of the herbaceous plants from the park, transplanting a few in other areas but disposing of the majority (Rosenzweig and Blackmar 1992). These landscape level changes also eliminated several native woody species in the park: *Populus grandidentata*, *Prunus virginiana*, *Quercus alba*, and *Q. velutina*. Today, plant species that prefer dry meadows, woodland edges, and upland, rocky woods dominate the flora of the park. Weedy (primarily non-native) species are now significantly more common in the park than in the 19<sup>th</sup> century. Many of the alien species collected in Central Park since 1985 are widespread throughout the city (DeCandido et al. 2004). The landscape-level changes made to Central Park beginning in 1858 reflect development that subsequently occurred throughout NYC, even affecting areas set aside as park land. This process of biotic homogenization, the loss of unique native species and the simultaneous spread of synan-

thropic non-native species, will continue to affect parks and other natural areas throughout the city. Currently, only one of NYC's five counties (Staten Island) has more extant native plant species than extirpated native ones (Robinson et al. 1994, DeCandido et al. 2004). Other studies from the northeastern United States have reported similar trends: the decline of uncommon to rare native plants, particularly herbaceous species, and a sharp increase in alien plants (see Brown 1913, Bertin 2000, Standley 2003, DeCandido 2004).

Historically, in the pre-park era, both the native plants and the habitats they composed were very different than the ones people encounter in Central Park today. Using the three 19<sup>th</sup> century plant species lists and herbarium specimens at BBG and NYBG, we describe two distinct habitats of the park as they might have appeared before construction began in 1858. We also examine plant species diversity in typical environments of Central Park today.

*Historical Era.* Human settlements were scattered through the park pre-1858, and native plant species far exceeded non-natives. Wetlands were extensive and diverse, and most native plants preferred mesic conditions rather than dry habitats (Rawolle and Pilat 1857). Species indicative of wet meadows, riparian areas, and swamps included: *Alisma subcordatum*, *Alnus serrulata*, *Andromeda glaucophylla*, *Asclepias incarnata*, *Boehmeria cylindrica*, *Cephalanthus occidentalis*, *Cornus sericea*, *Epilobium coloratum*, *Gentiana andrewsii*, *Leucothoe racemosa*, *Lysimachia terrestris*, *Mimulus alatus*, *Osmunda regalis* var. *spectabilis*, *Parietaria pensylvanica*, *Penthorum sedoides*, *Physostegia virginiana*, *Polygonum amphibium* var. *stipulaceum*, *Ranunculus ambigens*, *Rubus hispidus*, *Salix humilis* var. *humilis*, *Sambucus canadensis*, *Saururus cernuus*, *Spiranthes lacera* var. *gracilis*, and *Toxicodendron vernix*.

Species indicative of rich, mesic woodlands in the 19<sup>th</sup> century were *Acer rubrum* var. *rubrum*, *Agrimonia parviflora*, *Aralia racemosa*, *Arisaema triphyllum* ssp. *triphyllum*, *Betula nigra*, *Botrychium dissectum*, *Clethra alnifolia*, *Collinsonia canadensis*, *Cornus rugosa*, *Heliopsis helianthoides*, *Ilex laevigata*, *Lilium canadense* ssp. *canadense*, *Lonicera sempervirens*, *Lycopodium dendroideum*, *Matteuccia struthiopteris*, *Phegopteris connectilis*, *Populus heterophylla*, *Rhododendron viscosum*,

*Rosa carolina* var. *carolina*, *Salix discolor*, and *Symplocarpus foetidus*. In the woodlands, tree species diversity was high. Ten native oak species were identified in the park, including *Quercus alba*, *Q. coccinea* and *Q. stellata*. In drier areas of the uplands native wildflowers included *Aquilegia canadensis*, *Chamaecrista nictitans*, *Desmodium canadense*, *Hypericum gentianoides*, *Opuntia humifusa*, *Silene caroliniana* var. *pensylvanica*, and *Silene stellata*.

*19<sup>th</sup> century rare or significant native species.* According to current criteria developed by the Natural Heritage Program in NYS (see Young and Weldy 2006), 21 species present in Central Park in the 19<sup>th</sup> century have special status designations in the state today. These are: *Acalypha virginica* var. *virginica*, *Agrimonia parviflora*, *Betula nigra*, *Botrychium lunaria*, *Celastrus scandens*, *Crotalaria sagittalis*, *Diospyros virginiana*, *Galactia volubilis*, *Hypericum prolificum*, *Juglans cinerea*, *Lespedeza violacea*, *Mimulus alatus*, *Silene caroliniana* var. *pensylvanica*, *Polygonum careyi*, *Polygonum erectum*, *Polygonum tenue*, *Populus heterophylla*, *Ptelea trifoliata*, *Pycnanthemum clinopodioides*, *Rubus cuneifolius*, and *Salvia lyrata*. The historical status of four species recorded on the 19<sup>th</sup> century lists in Central Park is questionable: *Tilia americana* var. *heterophylla* has not been found in other parts of NYC, and herbarium records come from central NYS (see Young and Weldy 2006). *Rhododendron arborescens* is listed as reported from NYS, however no herbarium specimen is currently known from NYS (Mitchell 2000). Finally, there are two species, *Aletris aurea* and *Fuirena squarrosa* that are not known in NYS either by voucher specimens or other types of reports. These may represent errors in identification by Pilat and Rawolle (1857). However, there are two closely related species (*F. pumila* and *A. farinosa*) once collected in NYC, for which voucher specimens exist. For these four species, we have indicated the current uncertainty of their historical status in the metropolitan area in the Appendix.

*Central Park 2006.* Ongoing restoration efforts since ca. 1995 have increased native plant species diversity of the park. Current management policy seeks to re-establish extirpated habitats such as wildflower meadows, and significantly increase the diversity and number of native herbaceous plants in riparian

areas and upland woods. In the forests, *Acer platanoides* is the most difficult alien species to control. In the understorey, removal of non-native *Alliaria petiolata*, *Polygonum cuspidatum*, *Ranunculus ficaria* var. *bulbifera*, and *Wisteria chinensis* require many hours of removal effort each year. *Polygonum perfoliatum* has been a recent arrival (since ca. 1997) but has been contained. In the woodlands, restoration efforts have concentrated on widespread planting of native trees especially *Liriodendron tulipifera*, *Quercus alba*, and *Q. velutina*, as well as other tree species typical of NYC.

There are three habitats typical of Central Park today: upland woods, riparian areas including ponds and a man-made reservoir, and ruderal areas with a diverse, primarily non-native flora.

In the woodlands, native species that thrive in dry, rocky, acidic soils are common. These include: *Celtis occidentalis*, *Prunus serotina*, *Q. rubra*, and *Ulmus* spp. In richer soils two species predominate: *Liquidambar styraciflua* and *Liriodendron tulipifera*. Common forbs of the understorey include *Alliaria petiolata*, *Allium vineale*, *Aster divaricatus*, *Circaea lutetiana* ssp. *canadensis*, *Eupatorium rugosum*, *Polygonum virginianum*, and *Viola sororia*. Invasive woody species such as *Acer platanoides*, *Acer pseudoplatanus*, *Phellodendron amurense*, *Quercus cerris*, and *Robinia pseudo-acacia* are widespread and reproduce rapidly. In areas where *Q. cerris* is common along the southern edge of the reservoir, *Epipactis helleborine* thrives in large colonies of 100–200 individuals in the shade of these oaks. In the last decade, native trees such as *Fraxinus* spp. and *Ulmus americana* have declined in number due to summer drought, the urban heat-island effect, non-native tree diseases, and non-native insects. In these canopy gaps *Prunus serotina* is common, and it is likely the most abundant woody species in the park (see also Loeb 1993).

In the wetlands of the park such as riparian areas along the margin of the Harlem Meer, Lake, and Turtle Pond, restoration efforts have been negatively affected by large numbers of overwintering waterfowl, particularly Canada geese (*Branta canadensis*) and mallards (*Anas platyrhynchos*). These birds graze on tubers and emergent vegetation along the water's edge creating erosion problems and reducing habitat quality for other species.

However, certain plant species can tolerate high levels of herbivory, and have persisted in the park. These include *Bidens frondosa*, *Cephalanthus occidentalis*, *Eclipta prostrata*, *Eupatorium perfoliatum*, *Hibiscus moscheutos*, *Impatiens capensis*, *Iris pseudacorus*, *Saururus cernuus*, *Scirpus americanus*, *Typha latifolia*, and *Vernonia noveboracensis*. Along the protected rocky, sloping margin of the man-made reservoir, several herbaceous plant species are common: *Apocynum cannabinum* var. *cannabinum*, *Artemisia vulgaris*, *Asclepias syriaca*, *Chenopodium album* var. *album*, *Cirsium arvense*, *Conyza canadensis* var. *canadensis*, *Erechtites hieracifolia* var. *hieracifolia*, *Erigeron annuus*, *Eupatorium serotinum*, *Hieracium subaudum*, *Lactuca canadensis* var. *canadensis*, *Lapsana communis*, *Linaria vulgaris*, *Parthenocissus quinquefolia*, *Polygonum lapathifolium*, *Saponaria officinalis*, *Senecio vulgaris*, *Solidago canadensis* var. *scabra*, and *Verbascum thapsus*.

Central Park has a great diversity of ruderal species, including several non-native species of these families: Asteraceae, Brassicaceae, Chenopodiaceae-Amaranthaceae, and Polygonaceae. Common weed species of the park that thrive where full-sun conditions prevail include: *Amaranthus blitum*, *Cerastium fontanum*, *Chenopodium ambrosioides*, *Chenopodium pumilio*, *Matricaria discoidea*, *Mazus pumilus*, *Portulaca oleracea*, *Sagina* spp., *Senecio vulgaris*, *Sonchus oleraceus*, *Stellaria media*, and *Veronica persica*. In open areas once dominated by ruderals where restorations have begun, herbaceous meadow species are now thriving. Native herbaceous species recently planted in Central Park that have done well and have spread to other areas include: *Andropogon gerardii*, *Aster cordifolius*, *Aster novae-angliae*, *Aster novae-belgii* var. *novae-belgii*, *Erythronium americanum*, *Eupatorium perfoliatum*, *Eupatorium purpurea*, *Panicum* spp., *Schizachyrium scoparium* ssp. *scoparium*, *Silphium perfoliatum*, and *Solidago caesia*.

Central Park presents a unique opportunity to restore native meadows, woodlands, and riparian habitats in the center of a great metropolis. The restoration will depend upon coordinating the efforts of park workers, volunteers and students from nearby schools. We recommend utilizing the extirpated plants listed in the Appendix whenever possible to return unique native species to Central Park. From a broader perspective, educational



efforts should strive to make NYC residents aware of the significant diversity of plants and animals that have been found here. This biological diversity mirrors the complex cultural diversity of the people who compose NYC. Given the interest of many New Yorkers in the global environment, emphasis must also be placed upon the role local parks play in preserving regional biodiversity. The key to protecting the park's remaining biodiversity will be to make people aware at the grassroots level of species that can still be seen in the natural areas of the park, as well as the rich flora and fauna extirpated here.

**Conclusions.** The environmental history of Central Park shows that plant species diversity has significantly changed through time. Approximately 70% of the 248 native plant species identified in the park in the 19<sup>th</sup> and early 20<sup>th</sup> century have been extirpated. These extirpations disproportionately affected native herbaceous plants including wildflowers and ferns growing in riparian areas such as swamps, moist meadows, and mesic woods. Non-native plants now dominate the flora of Central Park, accounting for 60% of the species found in the park from 1985–2007. Most of these alien species are widespread throughout New York City. The substantial change in Central Park's plant species diversity mirrors the loss of native plant species on Manhattan Island since the 19<sup>th</sup> century. Two strategies can halt and possibly even reverse this marked decline of New York City's biological heritage: education and restoration.

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### Appendix

Checklist of the naturally occurring vascular flora of Central Park, New York County, New York. Nomenclature follows that of Mitchell and Tucker (1997) with minor revisions by Mitchell (2000). The following symbols have been used throughout the list: an asterisk (\*) indicates a species non-native (alien) to New York State. A plus sign (+) indicates that the species was planted in Central Park from 1995–2005 as part of a restoration initiative, and has spread to some degree into other natural areas of the park. An exclamation mark (!) preceding the scientific name indicates that the species was considered to be planted in Central Park in the 19<sup>th</sup> century, and not established in the park's natural areas at that time. Native vascular plants collected on one or more historical surveys, or as part of this study, are preceded by no symbol unless recently planted in Central Park. If a species is considered rare, uncommon, extirpated, etc., in New York State in surveys conducted by The Natural Heritage Program, its rarity designation is provided. See Young and Weldy (2006) for exact definitions of these terms.

The current status of each species observed in Central Park in 2006–2007 follows the scientific name of all native and non-native plants. *Rare*: if an herbaceous species then it was only found at one to three sites, with no more than 10 individuals present at any one site; or, present at one site with no more than 15 total plants. If a shrub or tree, it must only have been present at up to five locations, with no site having more than five individuals; or present at one site with no more than 10 individuals found at that location. *Uncommon*: if an herbaceous species then it must have been present at four to six sites with no more than 10 individuals at any one of those sites. If a shrub or tree, the species must have been present at six to 10 sites with no stand greater than five individuals; or, present at one site only with 10 to 20 individuals. A species is listed as extirpated if it was observed in Central Park for one or more years during 1995–2005, but not seen in 2006–2007, despite several attempts at re-locating it. Species that we considered common to abundant in 2006–2007 are not designated with any symbol.

For the historical period, brackets [ ] surrounding the scientific name indicate a species only listed on historical 19<sup>th</sup> century list(s). If questions arose as to the validity of an historical species, we denote these few species with a question mark (?) prior to the scientific name. Immediately following the brackets, we provide the year of the study in which the species was listed as follows: Rawolle and Pilat (1857) is referenced as 1857a; Viele (1857) is referenced as 1857b; and Gratacap (1880) is indicated by 1880. Some of the species listed as extirpated in Central Park may still be extant in New York County.

For plants collected or seen in 2006–2007, we also noted the time of the month when the species first came into bloom. “Early” indicates that the species was seen in bloom in the first 10 days of the month in question; “Mid-” indicates time of first bloom from the 11<sup>th</sup> to the 20<sup>th</sup> day of the month; and “Late” for the remaining days of the month. Collection numbers for our voucher specimens are provided in parentheses. If we found a voucher for a specimen at the herbarium of the Brooklyn Botanical Garden (BBG) or the New York Botanical Garden (NYBG), the collection number for that institution is provided.

#### LYCOPODIOPHYTA

##### LYCOPODIACEAE

- [*Huperzia lucidula* (Michx.) Trev.] – 1857a  
[*Lycopodium dendroideum* Michx.] – 1857a

#### EQUISETOPHYTA

##### SELAGINACEAE

- [*Selaginella rupestris* (L.) Spring.] – 1857a

##### EQUISETACEAE

- Equisetum arvense* L. – Rare (no specimen collected)

#### POLYPODIOPHYTA

##### OPHIOGLOSSACEAE

- [*Botrychium dissectum* Spreng.] – 1857a  
[*Botrychium lunaria* (L.) Sw.] – 1857a; NYS S1

##### OSMUNDACEAE

- [*Osmunda regalis* var. *spectabilis* (Willd.) A. Gray] – 1857a

##### PTERIDACEAE

- [*Adiantum pedatum* L.] – 1857a

##### DENNSTAEDTIACEAE

- Dennstaedtia punctiloba* (Michx.) Moore – Uncommon (446)  
[*Pteridium aquilinum* var. *latiusculum* (Desv.) Underw. Ex Heller] – 1857a

#### THELYPTERIDACEAE

- [*Phegopteris connectilis* (Michx.) Watt] – 1857a

#### ASPLENIACEAE

- Asplenium platyneuron* (L.) BSP – 1857a; (181)  
[*Asplenium trichomanes* L.] – 1857a

#### DRYOPTERIDACEAE

- [*Athyrium filix-femina* var. *asplenioides* (Michx.) Farw.] – 1857a  
*Cystopteris fragilis* (L.) Bernh. – Rare (215)  
[*Deparia acrostichoides* (Sw.) Kato] – 1857a  
[*Dryopteris carthusiana* (Vill.) Fuchs] – 1857a  
[*Dryopteris intermedia* (Muhl. Ex. Willd.) A. Gray] – 1880  
[*Matteuccia struthiopteris* (L.) Todaro] – 1857a  
*Onoclea sensibilis* L. – 1857a; 1880; Rare (330)  
*Woodsia obtusa* (Spreng.) Torrey – Uncommon (182)  
[*Polypodium virginianum* L.] – 1857a

#### PINOPHYTA

##### GINKGOACEAE

- \**Ginkgo biloba* L.– Late April (308)

##### PINACEAE

- [!*Pinus strobus* L.] – 1857a;  
[!*Tsuga canadensis* (L.) Carr.] – 1857a

##### CUPRESSACEAE

- [*Juniperus virginiana* L.] – 1857a

**MAGNOLIOPHYTA–MAGNOLIOPSIDA****MAGNOLIACEAE**

*Liriodendron tulipifera* L. – 1857a; Late April (326)

**LAURACEAE**

*Lindera benzoin* (L.) Blume – 1857a; Late March (49)

*Sassafras albidum* (Nutt.) Nees – 1857a; Late April (90)

**SAURURACEAE**

+*Saururus cernuus* L. – 1857a; Late June (156)

**RANUNCULACEAE**

[*Actaea spicata* ssp. *rubra* (Ait.) Hulten] – 1857a

*Anemone virginiana* var. *virginiana* L. – Rare; Early July (69)

[+*Aquilegia canadensis* L.] – 1857a; Early May (331)

\**Clematis terniflora* DC. – Early September (332)

[*Clematis virginiana* L.] – 1857a

[*Hepatica nobilis* var. *obtusata* (Pursh) Steyererm.] – 1857a

*Ranunculus abortivus* var. *abortivus* L. – Early May (107)

\**Ranunculus acris* L. – 1880; Late May (289)

[*Ranunculus ambigens* S. Wats.] – 1857a

\**Ranunculus bulbosus* L. – Late May (287)

\**Ranunculus ficaria* var. *bulbifera* Marsden-Jones – Late March (113)

\**Ranunculus repens* L. – Mid May (267)

\**Ranunculus sceleratus* L. – Early May (169)

[*Thalictrum pubescens* Pursh.] – 1857a

+\**Xanthorhiza simplicissima* Marsh. – Mid April (244)

**BERBERIDACEAE**

[\**Berberis vulgaris* L.] – 1857a

+*Podophyllum peltatum* L.; Mid May (333)

**MENISPERMACEAE**

[*Menispermum canadense* L.] – 1857a

**PAPAVERACEAE**

\**Chelidonium majus* L. – Late April (111)

**PLATANACEAE**

[*Platanus occidentalis* L.] – 1857a

\**Platanus x hybrida* Brot. – Early June (397)

**HAMAMELIDACEAE**

*Hamamelis virginiana* L. – 1857a; Late October

*Liquidambar styraciflua* L. – 1857a; Mid May (31)

**ULMACEAE**

*Celtis occidentalis* L. – 1857a; Late April (92)

*Ulmus americana* L. – 1857a; Late March (216)

*Ulmus glabra* Huds. – Early April (93)

\**Ulmus minor* Mill. – Early May (337)

\**Ulmus pumila* L. – Late March (338)

[*Ulmus rubra* Muhl.] – 1857a

**CANNABACEAE**

[\**Cannabis sativa* L.] – 1880

\**Humulus japonicus* L. – extirpated 2006

\**Humulus lupulus* L. – 1857a; Late June (no specimen collected)

**MORACEAE**

\**Broussonetia papyrifera* (L.) L'Hér. ex Vent. – 1857a; Late April (339)

\**Maclura pomifera* (Raf. ex Sarg.) Schneid. – Early May (340)

\**Morus alba* L. – 1857a; Early May (80)

[*Morus rubra* L.] – 1857a

**URTICACEAE**

*Boehmeria cylindrica* (L.) Sw.; 1857a – Early July; Rare

[*Parietaria pensylvanica* Muhl. Willd.] – 1857a

*Pilea pumila* (L.) A. Gray – 1857a

*Urtica dioica* ssp. *gracilis* (Ait.) Selander – Late June; Rare (146)

**JUGLANDACEAE**

*Carya cordiformis* (Wang.) Koch – 1857a; Mid May (41)

*Carya glabra* (Mill.) Sweet – Mid May (341)

[*Carya ovalis* (Wang.) Sarg.] – 1857a

[*Carya ovata* (Mill.) Koch] – 1857a

*Carya tomentosa* (Poir. ex Lam.) Nutt. – 1857a; Mid May (342)

[*Juglans cinerea* L.] – 1857a; NYS S4

[*Juglans nigra* L.] – 1857a

**MYRICACEAE**

[*Myrica pensylvanica* Loisel. Ex. Duhamel] – 1857a

**FAGACEAE**

[*Castanea dentata* (Marsh.) Borkh.] – 1857a

[*Fagus grandifolia* Ehrh.] – 1857a; Mid-April (316)

[*Quercus alba* L.] – 1857a

\**Quercus cerris* L. – Mid April (16)

[*Quercus coccinea* Muenchh.] – 1857a

[*Quercus marilandica* Muenchh.] – 1857a

[*Quercus montana* Willd.] – 1857a

[*Quercus muhlenbergii* Engelm.] – 1857a

*Quercus palustris* Muenchh. – 1857a; Late April (86)

[*Quercus prinoides* Willd.] – 1857a

*Quercus rubra* L. – 1857a; Mid April (30)

[*Quercus stellata* Wang.] – 1857a

[*Quercus velutina* Lam.] – 1857a

**BETULACEAE**

[*Alnus serrulata* (Dryand ex. Ait.) Willd.] – 1857a

[*Betula alleghaniensis* Britt.] – 1857a

*Betula lenta* L. – 1857a; Early May (343)

[*Betula nigra* L.] – 1857a; NYS S3

*Betula populifolia* Marsh. – 1857a; Late April (344)

*Carpinus caroliniana* ssp. *virginiana* (Marsh.) Furlow – 1857a; Mid May (206)

[*Corylus americana* Walt.] – 1857a

[*Corylus cornuta* Marsh.] – 1857a

*Ostrya virginiana* (Mill.) Koch; Late May (345)

**PHYTOLACCACEAE**

*Phytolacca americana* L. – 1857a; 1880; Mid June (163)

**CACTACEAE**

[*Opuntia humifusa* (Raf.) Raf.] – 1857a

**CHENOPODIACEAE**

[*Atriplex patula* L.] – 1880

\**Chenopodium album* var. *album* L. – 1857a; 1880; Early June (346)

\**Chenopodium ambrosioides* L. – 1880; Late July (355)

\**Chenopodium botrys* L. – 1880; Late July (350)

\**Chenopodium pumilio* R. Br. – Late June (347)

[*Chenopodium simplex* (Torrey) Raf.] – 1857a

[\**Chenopodium urbicum* L.] – 1880



**AMARANTHACEAE**

- [\**Amaranthus albus* L.] – 1880  
 \**Amaranthus blitum* L. – Mid May (264)  
 [\**Amaranthus caudatus* L.] – 1880  
 \**Amaranthus crispus* (Lesp. & Thev.) Terrace – Early July (35)  
 \**Amaranthus hybridus* L. – Mid June (45)  
 \**Amaranthus retroflexus* L. – 1857a; 1880; Late June (348)

**PORTULACACEAE**

- [*Claytonia virginica* L.] – 1888 (BBG #307815)  
 \**Portulaca oleracea* L. – 1857a; 1880; Mid July (74)

**MOLLUGINACEAE**

- \**Mollugo verticillata* L. – 1880; Late May (119)

**CARYOPHYLLACEAE**

- \**Cerastium fontanum* Baumg. emend Jalas – Mid May (328)  
 \**Dianthus armeria* L. – Mid June – Rare (349)  
 \**Sagina japonica* (Sw.) Ohwi – Late May (360)  
 \**Sagina procumbens* L. – Mid May (121)  
 \**Saponaria officinalis* L. – 1857a; Mid June (354)  
 [*Silene caroliniana* var. *pensylvanica* (Michx.) Fern] – 1857a; NYS S3  
 \**Silene latifolia* Poir. – Early May (122)  
 [\**Silene noctiflora* L.] – 1880  
 [*Silene stellata* (L.) Ait. F.] – 1857a  
 \**Silene vulgaris* (Moench) Garcke – 1880; Early June; Rare (175)  
 \**Spergularia rubra* (L.) J. & C. Presl; Late May (130)  
 \**Stellaria graminea* L. – Mid June; Rare (179)  
 \**Stellaria media* (L.) Vill. – 1880; Late March (237)

**POLYGONACEAE**

- \**Fagopyrum esculentum* Moench. – Mid June; Rare (173)  
 [*Polygonum amphibium* var. *stipulaceum* Coleman.] – 1857a  
 \**Polygonum arenastrum* Jord. ex Bor. – Late May (139)  
 \**Polygonum aubertii* Henry – Early June (171)  
 [\**Polygonum aviculare* L.] – 1857a  
 [*Polygonum careyi* Olney] – 1857a; NYS S1-S2  
 \**Polygonum cespitosum* var. *longisetum* (DeBruyn) Stewart – Late May (356)  
 \**Polygonum convolvulus* L. – 1857a; Mid June (159)  
 \**Polygonum cuspidatum* Sieb. & Zucc. – Early July (79)  
 [*Polygonum erectum* L.] – 1880; NYS Extirpated  
 [\**Polygonum hydropiper* L.] – 1880  
 \**Polygonum lapathifolium* L. – Early June (63)  
 [\**Polygonum orientale* L.] – 1880  
 [*Polygonum pensylvanicum* L.] – 1857a; 1880  
 \**Polygonum perfoliatum* L. – Mid July (61)  
 \**Polygonum persicaria* L. – 1880; Early July (72)  
 [*Polygonum punctatum* var. *punctatum* Ell.] – 1880  
 \**Polygonum scandens* var. *dumetorum* (L.) Gleason] – 1880  
*Polygonum setaceum* Bald. ex. Ell. – 2004 (BBG #288951)  
 [*Polygonum tenue* Michx.] – 1857a; NYS S3  
*Polygonum virginianum* L. – Early July (65)  
 \**Rumex acetosella* L. – 1880; Early May (353)  
 \**Rumex crispus* L. – 1880; Late May (364)  
 \**Rumex obtusifolius* L. – Late May (187)  
 [\**Rumex orbiculatus* A. Gray] – 1857a

**CLUSIACEAE**

- [*Hypericum ellipticum* Hooker] – 1857a  
 [*Hypericum gentianoides* (L.) BSP.] – 1857a  
 \**Hypericum perforatum* L. – 1880; Early June (258)  
 [*Hypericum prolificum* L.] – 1857a; NYS S2

**TILIACEAE**

- Tilia americana* var. *americana* L. – 1857a; Late May; Uncommon (157)  
 [? *Tilia americana* var. *heterophylla* (Vent.) Loud] – 1857a; NYS Extirpated

**MALVACEAE**

- \**Abutilon theophrasti* Medik. – 1857a; 1880; Late July; Uncommon (310)  
 [+\**Hibiscus syriacus* L.] – 1857a  
 \**Malva neglecta* Wallr. – 1857a; 1880; Early May (144)

**VIOLACEAE**

- [*Viola palmata* L.] – 1900 (BBG #338794)  
*Viola sororia* Willd. – Early April (236)

**CUCURBITACEAE**

- \**Cucurbita pepo* L. – Mid August (no specimen collected)  
 [*Sicyos angulatus* L.] – 1857a

**SALICACEAE**

- \**Populus alba* L. – Early April (207)  
 [*Populus balsamifera* L.] – 1857b  
*Populus deltoides* Bartr. ex Marsh – 1857a; Early April (362)  
 [*Populus grandidentata* Michx.] – 1857a  
 [*Populus heterophylla* L.] – 1857a; NYS S1  
 [+\**Populus nigra* L.] – 1857a  
 [*Populus tremuloides* Michx. A. & D. Love] – 1857a  
 [\**Salix alba* L.] – 1857a  
 [*Salix babylonica* L.] – 1857a  
*Salix discolor* Muhl. – Late March (no specimen collected)  
 [*Salix eriocephala* Michx.] – 1857a  
 [\**Salix fragilis* L.] – 1857a  
 [*Salix humilis* var. *tristis* (Ait.) Griggs] – 1857a  
 [*Salix lucida* Muhl.] – 1857a  
*Salix nigra* Marsh.; Mid May (2)  
 [*Salix sericea* Marsh.] – 1857a

**BRASSICACEAE**

- \**Alliaria petiolata* (Bieb.) Cav. & Grande – Mid April (228)  
 \**Arabidopsis thaliana* (L.) Heynh.; Early May (274)  
 \**Barbarea vulgaris* R. Br. ex. Ait. – Late April; Uncommon (250)  
 \**Brassica rapa* L. – 1880; Mid May (136)  
 \**Capsella bursa-pastoris* (L.) Medik. – 1880; Late March (240)  
 \**Cardamine hirsuta* L. – Late March (243)  
*Cardamine pensylvanica* Muhl. ex. Willd. – Early May (273)  
 \**Coronopus didymus* (L.) Sm. – Early June; Uncommon (176)  
 \**Erysimum cheiranthoides* L. – Mid June; Uncommon (185)  
 \**Hesperis matronalis* L. – Mid-May; Uncommon (261)  
*Lepidium virginicum* L. – 1880; Early May; Uncommon (143)  
 \**Raphanus raphanistrum* L. – Mid June (145)

- \**Rorippa palustris* ssp. *palustris* (L.) Besser – Mid June (164)  
 \**Sinapis alba* L. – Late April (148)  
 \**Sinapis arvensis* L. – Late April (367)  
 \**Sisymbrium officinale* (L.) Scop. – 1880; Late April (149)  
 \**Thlaspi arvense* L. – Early May (284)

**CLETHRACEAE**

- +*Clethra alnifolia* L. – 1857a; Mid July (78)

**ERICACEAE**

- [*Andromeda glaucophylla* Link] – 1857b  
 [*Gaylussacia frondosa* (L.) Torrey & A. Gray ex Torrey] – 1857a  
 [*Leucothoe racemosa* (L.) A. Gray] – 1857a  
 [*Lyonia ligustrina* (L.) DC.] – 1857a  
 [*Monotropa uniflora* L. – Late June; extirpated 2006  
 [?]*Rhododendron arborescens* (Pursh) Torrey] – 1857a; NYS Extirpated  
 [*Rhododendron viscosum* (L.) Torrey] – 1857a  
 [*Vaccinium angustifolium* Ait.] – 1857a  
 [*Vaccinium corymbosum* L.] – 1857a  
 [*Vaccinium pallidum* Ait.] – 1857a  
 [*Vaccinium stamineum* L.] – 1857a

**EBENACEAE**

- [*Diospyros virginiana* L.] – 1857b; NYS S2

**PRIMULACEAE**

- \**Anagallis arvensis* L. – Mid July; Rare (56)  
*Lysimachia quadrifolia* L. – Late May (19)  
 [*Lysimachia terrestris* (L.) BSP.] – 1857a

**HYDRANGEACEAE**

- \**Philadelphus coronarius* L. – Late May (132)

**CRASSULACEAE**

- [*Penthorum sedoides* L.] – 1857a; 1880  
 \**Sedum acre* L. – 1857a; Late May (203)

**SAXIFRAGACEAE**

- [*Saxifraga virginiana* Michx.] – 1903 (BBG #333239)  
 +*Tiarella cordifolia* L. – Early May (394)

**ROSACEAE**

- [*Agrimonia parviflora* Soland ex Ait.] – 1857a; NYS S3  
*Amelanchier arborea* (Michx. f.) Fern. – Mid April; Rare (365)  
*Amelanchier canadensis* (L.) Medik. – 1888 (BBG #340862)  
 [*Aronia arbutifolia* (L.) Pers.] – 1857a  
 [*Crataegus calpodendron* (Ehrh.) Medik.] – 1857a  
 [*Crataegus crusgalli* L.] – 1892 (BBG #341126)  
 \**Crataegus monogyna* Jacq. – Early May (369)  
 \**Duchesnea indica* (Andr.) Focke – Mid April (100)  
 [\**Fragaria vesca* ssp. *vesca* L.] – 1857a; 1880  
*Fragaria virginiana* Dcne. – Early May (248)  
*Geum canadense* Jacq. – 1857a; Early June (20)  
 \**Malus baccata* (L.) Borkh. – Mid April (315)  
 \**Malus hupehensis* (Pamp.) Rehder – Mid April (366)  
 \**Photinia villosa* (Thunb.) DC. – Mid May (277)  
 \**Potentilla argentea* L. – 1857a; 1880; Early May (138)  
 [*Potentilla canadensis* L.] – 1880  
 \**Potentilla norvegica* ssp. *norvegica* L. – Early May (160)  
 \**Potentilla recta* L. – Late May (124)

- Potentilla simplex* Michx. – Mid May (137)  
 [*Prunus maritima* Marsh.] – 1857a  
 \**Prunus persica* (L.) Batsch – Late April (372)  
*Prunus serotina* Ehrh. – 1857a; Early May (95)  
 [*Prunus virginiana* L.] – 1857b  
 \**Prunus x yedoensis* Matsum – Early May (370)  
 \**Rhodotypos scandens* (Thunb.) Makino – Mid April (110)  
 [*Rosa carolina* var. *carolina* L.] – 1857a  
 [\**Rosa eglanteria* L.] – 1857a  
 \**Rosa multiflora* Thunb. Ex Murr. – Late May (291)  
 [*Rosa virginiana* Mill.] – 1857a  
*Rubus allegheniensis* Porter ex Bailey – Mid May (269)  
 [*Rubus argutus* Link] – 1857a; 1880  
 [*Rubus canadensis* L.] – 1880  
 [*Rubus cuneifolius* Pursh] – 1857a; NYS Extirpated  
*Rubus flagellaris* Willd. – Early May (275)  
 [*Rubus hispidus* L.] – 1857a  
 \**Rubus laciniatus* Willd. – Early June (200)  
 [*Rubus occidentalis* L.] – 1857a  
 \**Rubus phoenicolasius* Maxim. – Late May (376)  
 [*Spiraea tomentosa* var. *tomentosa* L.] – 1857a

**FABACEAE**

- \**Albizia julibrissin* Durazz – Mid July (374)  
 [*Apios americana* Medik.] – 1857a; 1880  
 \**Cercis canadensis* L. – Late April; Uncommon (371)  
 [*Chamaecrista nictitans* (L.) Moench] – 1857a  
 \**Coronilla varia* L. – Mid June (259)  
 [*Crotalaria sagittalis* L.] – 1857a; NYS S1  
 [*Desmodium canadense* (L.) DC.] – 1857a  
 [*Desmodium paniculatum* (L.) DC] – 1857a  
 [*Galactia volubilis* (L.) Britt.] – 1857a; NYS Extirpated  
 \**Gleditsia triacanthos* L. – 1894 (BBG #174608); Mid May; Uncommon (325)  
 \**Gymnocladus dioica* (L.) Koch – Mid May; Uncommon (368)  
 [*Lespedeza capitata* Michx.] – 1857a  
 [*Lespedeza procumbens* Michx.] – 1857a  
 [*Lespedeza violacea* (L.) Pers.] – 1857a; NYS S3  
 \**Lotus corniculata* L. – Early June (168)  
 \**Medicago lupulina* L. – Mid May (178)  
 \**Melilotus alba* Desr. ex Lam. – 1880; Late July (57)  
 \**Robinia pseudo-acacia* L. – 1857a; Mid May (380)  
 [\**Robinia hispida* L.] – 1889 (BBG #205665)  
 \**Trifolium arvense* L. – Late May (288)  
 [\**Trifolium aureum* Pollich] – 1880  
 \**Trifolium pratense* L. – 1880; Mid May (174)  
 \**Trifolium repens* L. – 1880; Early May (98)  
 \**Vicia sativa* ssp. *nigra* (L.) Ehrh. – Early May (140)  
 \**Vicia tetrasperma* (L.) Schreb. – Early June (180)  
 \**Vicia villosa* ssp. *villosa* Roth – Mid June (155)  
 \**Wisteria sinensis* (Sims) Sweet – Late April (245)

**LYTHRACEAE**

- \**Lythrum salicaria* L. – Mid June (382)

**ONAGRACEAE**

- Circaea lutetiana* ssp. *canadensis* (L.) Aschers. & Magnus – Late June (190)  
*Epilobium ciliatum* ssp. *ciliatum* Raf. – Late June; Rare (226)  
 [*Epilobium coloratum* Biehl.] – 1857a  
 [*Ludwigia alternifolia* L.] – 1857a  
*Oenothera biennis* L. – 1857a; 1880; Late July (46)

\**Oenothera glazioviana* L. – Mid June (381)

#### NYSSACEAE

*Nyssa sylvatica* Marsh. – Mid May (91)

#### CORNACEAE

*Cornus alternifolia* L. f. – Mid May (290)

[*Cornus amomum* ssp. *amomum* Mill.] – 1857a

[*Cornus florida* L.] – 1857a

*Cornus foemina* ssp. *racemosa* (Lam.) J. Wilson – 1857a; Early June (378)

[*Cornus rugosa* Lam.] – 1857a

[*Cornus sericea* L.] – 1857a

#### CELASTRACEAE

\**Celastrus orbiculata* Thunb. – Mid May (384)

[*Celastrus scandens* L.] – 1857a; NYS S3

#### AQUIFOLIACEAE

[*Ilex laevigata* (Pursh) A. Gray] – 1857a

[*Ilex montana* Torrey & A. Gray ex A. Gray] – 1857a

#### EUPHORBIACEAE

*Acalypha virginica* var. *rhomboidea* (Raf.) Cooper-  
rider – Late June (18)

[*Acalypha virginica* var. *virginica* L.] – 1857a; 1880;  
NYS S2

*Chamaesyce maculata* (L.) Small – 1880; Late May  
(129)

\**Euphorbia cyparissias* L. – Late April (390)

#### RHAMNACEAE

[*Ceanothus americanus* L.] – 1857a

\**Rhamnus frangula* L. – Late May (133)

#### VITACEAE

\**Ampelopsis brevipedunculata* var. *brevipedunculata*  
(Maxim.) Trautv. – Mid June (71)

*Parthenocissus quinquefolia* (L.) Planch. ex DC –  
1857a; 1880; Mid June (193)

\**Parthenocissus tricuspidata* (Sieb. & Zucc.) Planch.  
ex DC. – Late May (123)

[*Vitis aestivalis* Michx.] – 1857a

[*Vitis labrusca* L.] – 1857a; 1857b

#### LINACEAE

\**Linum usitatissimum* L. – Mid June; Uncommon  
(184)

[*Linum virginianum* L.] – 1857a

#### POLYGALACEAE

*Polygala verticillata* var. *verticillata* L.] – 1857a

#### SAPINDACEAE

\**Koeleruteria paniculata* Laxm. – Early July (58)

#### HIPPOCASTANACEAE

\*+*Aesculus hippocastanum* L. – 1857a; Early May

#### ACERACEAE

\**Acer platanoides* L. – Early April (131)

\**Acer pseudoplatanus* L. – Mid May (34)

*Acer rubrum* var. *rubrum* L. – 1857a; Late March (32)

[*Acer saccharinum* L.] – 1857a

#### ANACARDIACEAE

+*Rhus aromatica* Ait. – Late May (386)

*Rhus copallinum* L. – 1857a; Early August (399)

[*Rhus glabra* L.] – 1857a; 1880

*Rhus hirta* (L.) Sudworth – 1857a; Late June (405)

*Toxicodendron radicans* ssp. *radicans* (L.) Kuntze –  
1857a; 1880; Late May

[*Toxicodendron vernix* (L.) Kuntze] – 1857a

#### SIMAROUBACEAE

\**Ailanthus altissima* (Mill.) Swingle – 1857a; 1880;  
Early June (393)

#### RUTACEAE

\**Phellodendron amurense* Maxim. – Mid July (411)

*Ptelea trifoliata* L. – 1857a; Late May; Rare; NYS  
S1-S2 (152)

\**Tetradium danielli* (Benn.) T.G.Hartley – Early  
May (401)

#### OXALIDACEAE

\**Oxalis corniculata* L. – Mid June; Rare (217)

*Oxalis stricta* L. – 1857a; 1880; Late April (112)

#### GERANIACEAE

\**Erodium cicutarium* (L.) L'Her. ex Ait. – Late  
April; Rare (109)

*Geranium carolinianum* var. *carolinianum* L. – 1880;  
Mid May (118)

+*Geranium maculatum* L. – Early May (102)

\**Geranium pusillum* Burm. f. – Mid May; Rare (116)

#### BALSAMINACEAE

*Impatiens capensis* Meerb. – 1857a; 1880; Mid June  
(28)

#### ARALIACEAE

\**Acanthopanax sieboldianus* L. – Late May (377)

[*Aralia racemosa* L.] – 1857a

*Aralia spinosa* L. – 1857a; Mid July (77)

\**Hedera helix* L. – Late July (402)

#### APIACEAE

+*Cryptotaenia canadensis* (L.) DC. – Late May (183)

\**Daucus carota* L. – 1857a; 1880; Mid July (52)

*Osmorhiza longistylis* (Torrey) DC. – Late May;  
Rare (170)

*Sanicula canadensis* L. – Early June; Rare (255)

#### GENTIANACEAE

[*Gentiana andrewsii* Griesb.] – 1857a

#### APOCYNACEAE

*Apocynum cannabinum* var. *cannabinum* L. – Late  
May (205)

\**Vinca minor* L. – Early April (108)

#### ASCLEPIADACEAE

+*Asclepias incarnata* var. *incarnata* L. – 1857a; Late  
June (5)

*Asclepias syriaca* L. – 1880; Early June (352)

+*Asclepias tuberosa* var. *interior* L. – 1857a; Mid June  
(21)

\**Cynanchum louiseae* Kartesz & Gandhi – Mid May  
(268)

#### SOLANACEAE

[*Datura stramonium* L.] – 1880; extirpated 2006

\**Lycium barbarum* L. – Late August (209)

\**Lycopersicon esculentum* Mill. – Late July (no  
specimen collected)

[*Physalis heterophylla* Nees] – 1867a

*Solanum carolinense* L. – Mid June (70)

\**Solanum dulcamara* L. – 1857a; Mid May (120)

\**Solanum nigrum* L. – 1880; 2003 (BBG #271638)

\**Solanum ptycanthum* Dunal – Late May (196)

\**Solanum rostratum* Dunal – Early September (409)

\**Solanum tuberosum* L. – Late September (412)

#### CONVOLVULACEAE

\**Calystegia sepium* ssp. *sepium* (L.) R. Br. – Early June (162)

\**Convolvulus arvensis* L. – 1880; Late June (223)

[\**Ipomoea purpurea* (L.) Roth] – 1880

#### CUSCUTACEAE

*Cuscuta gronovii* Willd ex Schultz – 1857a; Mid July (no specimen collected)

#### BORAGINACEAE

+*Mertensia virginica* (L.) Pers. ex Link – Late March (363)

#### VERBENACEAE

[*Verbena hastata* L.] – 1880

[*Verbena stricta* Vent.] – 1857a

*Verbena urticifolia* var. *urticifolia* L. – 1857a; 1880; Late June (13)

#### LAMIACEAE

\**Ajuga reptans* L. – Mid April (231)

[*Collinsonia canadensis* L.] – 1857a; 1880

\**Glechoma hederacea* L. – 1880; Mid April (151)

\**Lamiasstrum galeobdolan* (L.) Ehren. & Polatschek – Late April (106)

\**Lamium amplexicaule* L. – Late March (235)

\**Lamium purpureum* var. *purpureum* L. – Late March (229)

[\**Leonurus cardiaca* L. – 1857a; 1880]

[\**Lycopus europaeus* L.] – 1880

[\**Mentha canadensis* L.] – 1857a

[*Nepeta cataria* L.] – 1899 (BBG #324137)

[\**Origanum vulgare* L.] – 1857a

[*Physostegia virginiana* (L.) Benth] – 1857a

\**Prunella vulgaris* L. – 1857a; Early June (198)

[*Pycnanthemum clinopodioides* Torrey & A. Gray] – 1857a; NYS S1

[*Salvia lyrata* L.] – 1880; NYS Extirpated

[*Scutellaria galericulata* L.] – 1857a

[*Scutellaria lateriflora* L.] – 1880

*Teucrium canadense* var. *canadense* L. – Mid July; Rare (no specimen collected)

#### PLANTAGINACEAE

\**Plantago lanceolata* L. – 1857a; Late April (142)

\**Plantago major* L. – 1857a; 1880; Early June (147)

#### OLEACEAE

*Fraxinus americana* L. – 1857a; Mid May (88)

[*Fraxinus nigra* Marsh.] – 1857a

*Fraxinus pennsylvanica* Marsh. – 1857a; Mid May (412)

[+\**Ligustrum vulgare* L.] – 1857a

[+\**Syringa vulgaris* L.] – 1857a

#### SCROPHULARIACEAE

[*Agalinis tenuifolia* var. *tenuifolia* (Vahl) Raf.] – 1857a

[*Chelone glabra* L.] – 1857a

*Linaria canadensis* (L.) Dumort. – Mid May; Rare (117)

\**Linaria vulgaris* Mill. – 1857a; Late May (17)

[*Lindernia dubia* var. *dubia* (L.) Penell] – 1857a; extirpated 2006

\**Mazus pumilus* (Burm. f.) Steenis – Late May (375)

[*Mimulus alatus* Ait.] – 1857a; NYS S3

[*Mimulus ringens* L.] – 1880

+*Penstemon hirsutus* (L.) Willd. – Late May (395)

\**Verbascum blatteria* L. – 1880; Late May; Uncommon (68)

\**Verbascum thapsus* L. – 1857a; 1880; Late June (312)

\**Veronica arvensis* L. – Mid April (391)

*Veronica peregrina* ssp. *peregrina* L. – Early May (103)

\**Veronica persica* Poir. – Late March (238)

\**Veronica serpyllifolia* ssp. *serpyllifolia* L. – Late April (115)

#### BIGNONIACEAE

\**Campsis radicans* (L.) Seem. ex Bureau – Mid June (192)

[+\**Catalpa bignonioides* Walt.] – 1857a; 1880

\**Catalpa speciosa* (Warder ex Barney) Engelm. – Early June (81)

\**Paulownia tomentosa* (Thunb.) Sieb. & Zucc. ex Steud. – Late May (89)

#### CAMPANULACEAE

[\**Campanula rapunculooides* L.] – 1880

[*Lobelia cardinalis* L.] – 1857a

*Lobelia inflata* L. – Late June; Rare (225)

[*Lobelia spicata* Lam.] – 1857a

*Triodanis perfoliata* var. *perfoliata* (L.) Nieuwl. – Late May; Rare (251)

#### RUBIACEAE

*Galium aparine* L. – Late May (403)

\**Galium mollugo* L. – Late May (126)

[*Mitchella repens* L.] – 1857a

#### CAPRIFOLIACEAE

[*Diervilla lonicera* Mill.] – 1857a

\**Lonicera japonica* Thunb. – Late May (202)

\**Lonicera maackii* (Rupr.) Maxim. – Mid May (265)

[*Lonicera sempervirens* L.] – 1857a

*Sambucus canadensis* L. – 1857a; 1880; Early June (189)

[*Viburnum acerifolium* L.] – 1857a

*Viburnum dentatum* var. *lucidum* Ait. – 1857a; Late May (254)

\**Viburnum opulus* var. *opulus* L. – Mid May (253)

\**Viburnum plicatum* Thunb. – Early May (246)

*Viburnum prunifolium* L. – 1857a; Early May (14)

[+\**Viburnum rhytidophyllum* Helms.] – 1989 (BBG #287407)

#### ASTERACEAE

[\**Achillea millefolium* var. *millefolium* L.] – 1880

*Ambrosia artemisiifolia* L. – 1880; Early August (324)

*Ambrosia trifida* L. – Mid July (39)

[*Anaphalis margaritacea* (L.) Benth. & Hooker f. ex Clarke] – 1880

\**Anthemis arvensis* L. – Late June; Uncommon (224)

[\**Anthemis cotula* L.] – 1880

[\**Arctium lappa* L.] – 1857a

\**Arctium minus* (Hill) Bernh. – 1880; Mid June (25)

\**Artemisia annua* L. – Early September (404)

\**Artemisia vulgaris* L. – Late August (1)

[*Aster acuminatus* Michx.] – 1880

+*Aster cordifolius* L. – Late June (153)

*Aster divaricatus* L. – Late June (64)

*Aster ericoides* L.; 1857a; 1880; Late June (357)

+*Aster laevis* var. *laevis* L. – Late June (407)

+*Aster lanceolatus* var. *lanceolatus* Willd. – 1880; Late August (388)

*Aster lateriflorus* var. *lateriflorus* (L.) Britt. – 1880; Late May; Rare (414)



*Aster novae-angliae* L. – 1880  
 +*Aster novi-belgii* var. *novi-belgii* L. – Late June (359)  
 [*Aster paternus* Cronq.] – 1857a  
*Aster pilosus* var. *pilosus* Willd. – Early September (448; BBG #288945)  
 [*Bidens cernua* L.] – 1880  
*Bidens frondosa* L. – 1880; Late July (3)  
 \**Centaurea jacea* L. – Early August (413)  
 \**Centaurea nigra* L. – Early August (47)  
 \**Cichorium intybus* L. – 1857a; 1880; Mid June (191)  
 \**Cirsium arvense* (L.) Scop. – 1880; Early June (172)  
 \**Cirsium vulgare* (Savi) Tenore – 1880; Early June (414)  
*Conyza canadensis* var. *canadensis* (L.) Cronq. – 1880; Early July (59)  
 \**Coreopsis lanceolata* L. – Early June (383)  
*Eclipta prostrata* (L.) L. – Early June; NYS S1 (211)  
*Erechtites hieracifolia* var. *hieracifolia* (L.) Raf ex DC. – 1857a; Early August (321)  
*Erigeron annuus* (L.) Pers. – Early May (249)  
 [*Erigeron philadelphicus* L.] – 1857a  
 [*Eupatorium perfoliatum* L.] – 1857a; 1880  
 [*Eupatorium purpureum* L.] – 1857a  
*Eupatorium rugosum* Houtt. – Mid July (4)  
 \**Eupatorium serotinum* Michx. – Mid August; NYS S2 (320)  
*Euthamia graminifolia* (L.) Nutt. ex Cass. – Mid July (323)  
 [*Euthamia tenuifolia* (Pursh) Nutt.] – 1880  
 [\**Galinsoga parviflora* Cav.] – 1880  
 \**Galinsoga quadriradiata* Ruiz & Pavón – Late May (293)  
 [*Gnaphalium macounii* Greene] – 1880  
 [\**Gnaphalium uliginosum* L.] – 1857a  
 \**Helianthus annuus* L. – 1880; Late June; Uncommon (415)  
 +*Helianthus strumosus* L. – Mid July (54)  
 \**Helianthus tuberosus* L. – Mid July (38)  
 [*Heliopsis helianthoides* (L.) Sweet] – 1857a  
 \**Hieracium floribundum* Wimm. & Gräbn. – Mid June (154)  
 \**Hieracium piloselloides* Vill. – Mid May (135)  
 \**Hieracium subaudum* L. – Late June (27)  
 [*Hieracium scabrum* Michx.] – 1857a  
 \**Hypochaeris radicata* L. – Late May (416)  
 [*Inula helenium* L.] – 1857a  
*Lactuca biennis* (Moench) Fern. – Early August; Rare (76)  
*Lactuca canadensis* var. *canadensis* L. – 1857a; 1880; Early July (75)  
 [\**Lactuca sativa* L.] – 1880  
 \**Lactuca serriola* L. – 1880; Late June (408)  
 \**Lapsana communis* L. – Early July (55)  
 \**Leucanthemum vulgare* Lam. – 1880; Mid May (279)  
 \**Matricaria discoidea* DC. – Late April (270)  
 [*Mikania scandens* (L.) Willd.] – 1857a  
 [*Prenanthes altissima* L.] – 1857a  
 \**Rudbeckia hirta* var. *pulcherrima* Farw. – Late June (417)  
 +*Rudbeckia laciniata* L. – Late July (29)  
 \**Senecio vulgaris* L. – Late March (232)  
 \**Silphium perfoliatum* L. – Late June (11)  
 [*Solidago bicolor* L.] – 1857a  
 +*Solidago caesia* L. – Mid July (418)

*Solidago canadensis* var. *scabra* (Muhl.) Torrey & A. Gray – Late August (399)  
*Solidago juncea* Ait. – Late June (23)  
 [*Solidago nemoralis* Ait.] – 1880  
 [*Solidago rigida* L.] – 1857a  
*Solidago rugosa* ssp. *rugosa* var. *rugosa* Mill. – Mid-August (419)  
 +*Solidago sempervirens* var. *sempervirens* L. – Mid September (420)  
 \**Sonchus asper* (L.) Hill – Late May; Uncommon (389)  
 \**Sonchus oleraceus* L. – Late May (396)  
 [\**Tanacetum parthenium* (L.) Schultz] – 1857a  
 \**Taraxacum officinale* Weber ex Wiggers – 1880; Mid March (361)  
 +*Vernonia noveboracensis* (L.) Michx. – 1880; Mid July (421)  
 \**Xanthium strumarium* var. *strumarium* L.] – 1857a; 1880

### MAGNOLIOPHYTA–LILIOPSIDA

#### ALISMATACEAE

[*Alisma subcordatum* Raf.] – 1857a

#### ARACEAE

[*Arisaema triphyllum* ssp. *triphyllum* (L.) Schott ex Schott & Endll.] – 1857a  
 +*Symplocarpus foetidus* (L.) Salisb. Ex Nutt. – 1857a

#### LEMNACEAE

*Lemna minor* L. – 1857a; no flowering time noted (379)  
*Wolffia columbiana* Karst. – Late May (422)

#### COMMELINACEAE

\**Commelina communis* var. *ludens* (Miq.) Pennell – Late May (198)  
 \**Tradescantia virginiana* L. – Late May (194)

#### JUNCACEAE

*Juncus effusus* var. *pylpei* (LaHarpe) Fern. & Wieg. – Late May (425)

#### CYPERACEAE

*Carex annectens* (Bickn.) Bickn. – Late May (431)  
*Carex blanda* Dewey – Mid May (432)  
*Carex radiata* (Wahl.) Small – Mid May (433)  
*Carex vulpinoidea* Michx. – Late May (434)  
 \**Cyperus esculentus* var. *leptostachyus* Boeck. – Early July (385)  
 [*Cyperus strigosus* L.] – 1857a; 1880  
 [? *Fuirena squarrosa* Michx.] – 1857a  
 +*Scirpus hattorianus* Pers. – Late May (125)

#### POACEAE

\**Agrostis gigantea* Roth. – Late May (442)  
 \**Anthoxanthum odoratum* L. – Late May (300)  
 \**Bromus sterilis* L. – Early May (428)  
 \**Bromus tectorum* L. – 1903 (BBG # 325037); Mid May (433)  
 \**Dactylis glomerata* L. – Late May (305)  
 +*Danthonia compressa* Austin – Late May (424)  
 \**Digitaria sanguinalis* (L.) Scop. – 1902 (BBG #330781); Early July (73)  
 \**Echinochloa crusgalli* ssp. *crusgalli* (L.) Beauv. – Late July (434)  
 \**Eleusine indica* (L.) Gaertn. – Late August (306)  
 +*Elymus hystrix* var. *hystrix* L. – Late May (436)  
 \**Holcus lanatus* L. – Early June (302)

*Leersia virginica* Willd. – 1857a; Early September (435)

\**Lolium perenne* var. *perenne* L. – Late May (303)

\**Microstegium vimineum* (Trin.) Camus – Early September (423)

*Muhlenbergia schreberi* Gmel. – Early September (436)

[*Panicum capillare* L.] – 1857a

*Panicum clandestinum* L. – Mid June (301)

\**Panicum milaceum* L. – Late August; Rare (443)

\**Phleum pratense* ssp. *pratense* L. – Mid June (429)

\**Phragmites australis* (Cav.) Trin. ex Steud. – Early August (438)

\**Poa annua* L. – Late April (298)

\**Poa compressa* L. – Late May (440)

\**Poa pratensis* L. – Early April (299)

*Schizachyrium scoparium* ssp. *scoparium* L. – Mid September; Uncommon (439)

\**Setaria faberi* Herrm. – Late July (444)

\**Setaria pumila* (Poir.) Schultes – Early August (9)

[*Sporobolus asper* (Michx.) Kunth] – 1857a

#### TYPHACEAE

+*Typha latifolia* L. – 1857a; Mid June (445)

#### LILIACEAE

[?*Aletris aurea* Walt.] – 1857a

+*Allium tricoccum* Ait. – Early May (99)

\**Allium vineale* L. – Late June (441)

[\**Asparagus officinalis* L.] – 1857a

+*Erythronium americanum* Ker. – Early April (230)

\**Hemerocallis fulva* (L.) L. – Mid June (446)

\**Hosta ventricosa* (Salisb.) Stearn. – Late July (208)

\**Hyacinthoides nonscripta* (L.) Chouard ex Rothm. – Early May (101)

[*Lilium canadense* ssp. *canadense* L.] – 1857a

\**Ornithogalum umbellatum* L. – Mid April (233)

[*Polygonatum biflorum* (Walt.) Ell.] – 1857a

#### IRIDACEAE

\**Iris pseudacorus* L. – Mid May (283)

+*Iris versicolor* L. – Mid May (447)

*Sisyrinchium angustifolium* Mill. – Mid June (220)

#### SMILACACEAE

[*Smilax glauca* Walt.] – 1857a

[*Smilax herbacea* L.] – 1857a

*Smilax rotundifolia* L. – 1857a; 1880; Mid May (318)

#### DIOSCOREACEAE

[*Dioscorea villosa* L.] – 1857a

#### ORCHIDACEAE

\**Epipactis helleborine* (L.) Crantz – Mid June (227)

[*Goodyera pubescens* (Willd.) R. Br.] – 1857a

[*Spiranthes lacera* var. *gracilis* (Biegl.) Luer] – 1857a