

# The Spontaneous Vascular Plant Flora of New York's Central Park<sup>1</sup>

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**Abstract.** This work details the spontaneous vascular plant flora of New York City's Central Park for the period 2013 to 2017. We divided the 341-ha (843-acre) park into 36 zones and used a modified timed-meander sampling method to collect herbarium specimens and silica-dried samples (for DNA analysis) of spontaneous, naturalized plants. We collected each new species until we ceased to find any species that had not been previously encountered in any zone. We collected 1,468 specimens, representing 438 species and two subspecific taxa from 262 genera and 89 families, and a number of cultivated species not analyzed in this work. We find that 45% of the flora are native (198 species) and 54% (240 species) are nonnative. Three species are of unknown native status (<1%). The largest families are Poaceae (56 species), Asteraceae (55), Rosaceae (27), Fabaceae (20), and Polygonaceae (17). The largest genera are *Persicaria* (8 species), *Carex* (7), *Acer* (7), *Cyperus* (6), *Rubus* (6), and *Eragrostis* (6). Seven species are ranked as rare, threatened, or endangered by New York Natural Heritage Program. Thirty-six species are listed as prohibited or regulated invasive species by New York State. Four species new for New York State were collected in Central Park during this study. We documented 76 additional species since the last inventory of 2007. The percentage of native species has increased by 5% since 2007. The data suggest that management efforts focused on controlling invasive species and planting and supporting native species have been effective. The spontaneous, naturalized flora is

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listed in Appendix I. Spontaneous plants that appear once or sporadically but do not persist without repeated introduction are listed as waifs in Appendix II. The species are listed with scientific and common name, native status in New York State, coefficient of conservatism, New York Natural Heritage Program rarity ranking (S1–S5), observed frequency in Central Park (rare, infrequent, and frequent), and observed species fecundity for Central Park (decreasing, stable, or increasing). All species reported are vouchered by herbarium specimens and silica-dried tissue samples at the New York Botanical Garden.

Key words: conservation, invasive species, native plants, New York City, urban flora

Central Park is probably the most famous urban park in the world. It was designated a National Historic Landmark in 1963 and is tentatively listed as a UNESCO World Heritage site (UNESCO 2018). It lies in the middle of Manhattan Island in the center of the New York Metropolitan Area, the tenth largest megacity in the world and the largest urban area in land cover (Demographia 2018). It was widely reported that in 2014, more than half the world's population lived in cities (Sengupta 2014) and the number is projected to rise. Which wild plants and animals that are able to coexist with such intense urbanization and the dynamics of their survival are globally important issues. The subject of this study, the wild flora of Central Park, seeks to contribute baseline inventory data to help us understand the dynamics of spontaneous urban floras so they can be managed sustainably.

While New York City may be the iconic urban area—the concrete jungle—actually forty percent of New York City's land area (783 km<sup>2</sup>) is “green” or managed as open space such as parks, cemeteries, campuses, private yards, and golf courses (Pregitzer *et al.* 2018). A significant portion of this is managed as natural areas by the New York City Department of Parks and Recreation as well as municipal, state, and federal authorities, often in partnership with conservancies, friends groups, and similar organizations. The health and sustainability of these natural areas and the species they support are important barometers of the health of our environment and also reflect our values and priorities as a society.

Prior to the beginning of park construction in 1857, the area of Central Park was rural or suburban land at the edge of a burgeoning city, with homes for 1,600 inhabitants, businesses, churches, schools, and farms (Miller 2003, 2009). Two principal documents chronicle the species present at the time the park was constructed (Rawolle and Pilat 1857, Viele 1857), followed a few years later by an inventory of the planted and spontaneous plants (Demcker 1873). When compared to the modern spontaneous flora, these

historical accounts show an overall change indicating the loss of many native species and a substantial increase in nonnative species. Over 50% of the species listed in these historical documents have been extirpated, and the majority of these were native species (DeCandido *et al.* 2007). Two entire families were lost, only to be replaced with nonnatives of the same family (Orchidaceae and Dioscoreaceae). Only one spontaneous orchid was found in our survey—the nonnative *Epipactis helleborine*. The native *Dioscorea villosa* has not been seen in the park since 1857, but the nonnative *Dioscorea polystachya* is spreading.

While often described as a barren wasteland, the area that would become Central Park contained significant woodlands, swamps, and wetlands. The park's first chief engineer, Egbert Viele, reported that there were 9,000 *Acer saccharinum* L. trees and 12,000 *Alnus serrulata* (Aiton) Willd. shrubs growing in the park (Viele 1857). Through much of the 19th and 20th centuries, marshes, swamps, creeks and other wetlands were seen as a nuisance preventing development and contributing to disease. In Central Park, all of the creeks and swamps and most of the seeps and springs were diverted into pipes and combined with the city's growing waste water system (Rosenzweig and Blackmar 1992). The major streams were reconfigured into open waterbodies to provide “picturesque” landscape elements. While much of the park was constructed, there remain elements of the pre-existing topography, vegetation, and hydrology. Many of the natural rock outcrops throughout the park were left intact as part of the design. The north end of the park, from 106th Street to 110th Street, was acquired and added after construction had begun. The area included high bluffs, large rock outcrops, a salt marsh, and young forest. The rugged landscape became a welcome addition to the park and was left largely as it was (Rosenzweig and Blackmar 1992). Elsewhere, the park has retained areas where spontaneous native and nonnative species have flourished. In some cases

this was intentional—in woodlands, for example, or edges of open lawn. In others cases it was unintentional—corners and edges not easily mown, rock outcrops, transverse roads, waterbody islands are all areas where spontaneous vegetation flourishes.

Marianne Cramer summarizes how these areas have been managed and the challenges and conflicts addressed since the park was created (Cramer 1993). In her work, she describes how the Central Park Conservancy (Conservancy), founded in 1980 by Elizabeth Barlow Rogers, assumed day-to-day management of the park, and began to reclaim the “nature” in Olmsted and Vaux’s “naturalistic” design. At the time, the park was severely degraded. Heavy use and neglect had diminished the native biodiversity and favored invasive species (Barlow Rogers 2018). Degraded landscapes, depauperate of native species too often evolve toward an uninspiring and unhealthy monotony of a very few hardy, mostly introduced species. Reversing this trend took tremendous effort and the wisdom to recognize that reliable data were necessary to make informed management decisions and the most efficient allocation of resources (Barlow Rogers 1987).

A significant research impediment with the historic lists prior to 2007 is that no set of contemporaneous herbarium specimens referable to the works have been located that permit verification of the species reported. This is the case for lists of animals and fungi as well. There are privately produced checklists and inventories of birds, fungi, and insects, but as with plants, surprisingly few vouchered biological inventories of Central Park have been published. Despite the lack of vouchers, these inventories are useful in suggesting biological change over time. The late Gary Lincoff cataloged fungi in the park for 40 years and kept a fungal list on social media.

To inform sound landscape management, the Central Park Conservancy sponsored the first inventory of the spontaneous flora that was vouchered by herbarium specimens and thus was verifiable. The work was led by Dr. Robert DeCandido and published in 2007 (DeCandido *et al.* 2007). The authors surveyed the entire park for one year, attempting to collect a specimen of every spontaneous species. The specimens were generally well prepared, labeled, and mounted. They were stored in a metal herbarium cabinet in the Conservancy’s Soil and Water Lab and curated by

Tina Nelson, the Soil, Water and Ecology Laboratory Coordinator. The collection contained approximately 422 mounted and 14 unmounted sheets. In 2015, the specimens were generously donated by the Conservancy to the William and Lynda Steere Herbarium at the New York Botanical Garden (NYBG), where they have been databased, imaged, added to the general collection, and made available online. The published 2007 inventory consisted of 362 putative native and naturalized species. This is the number we used for analysis and comparison.

The present study was begun in the summer of 2013 by the authors (D.A., R.A., and K.C.) who coordinated the plant section of the 2013 Macaulay Honors College BioBlitz of Central Park. A BioBlitz is a 24-hour event during which experts and volunteers catalog as many species as possible in a designated area. These events are meant to document flora and fauna and increase public awareness of local biodiversity. During the initial scouting for the BioBlitz, several spontaneous plants were discovered that were not reported in the 2007 inventory, including *Plantago rugelii*, *Viburnum sieboldii*, *Persicaria extremiorientalis*, and others. A new survey of the spontaneous flora seemed warranted by the number of novelties observed during the brief period of the BioBlitz. With financial and logistical support from the NYBG and the Conservancy, and permission to collect specimens granted by the New York City Department of Parks and Recreation, the Central Park Flora Project began in the fall of 2013. The project was designed to conclude four years later in 2017, 10 years after the previous inventory.

**Materials and Methods.** The focus of this study is the spontaneous vascular plant flora of Central Park, New York County, New York. The 341-ha (843-acre) study area is bounded by the rectangle formed by 59th Street on the south, 110th Street on the north, Fifth Avenue on the east and Eighth Avenue (Central Park West) on the west (Fig. 1). The park is uniformly enclosed by a stone perimeter wall with numerous entrances of various sizes. For this study we include all the area inside the wall and the inside of the wall itself. We did not include the exterior surface of the wall nor the sidewalk or tree pits outside of it. We did include the area of the four transverse roads inside of the park perimeter. Elevation in Central Park ranges

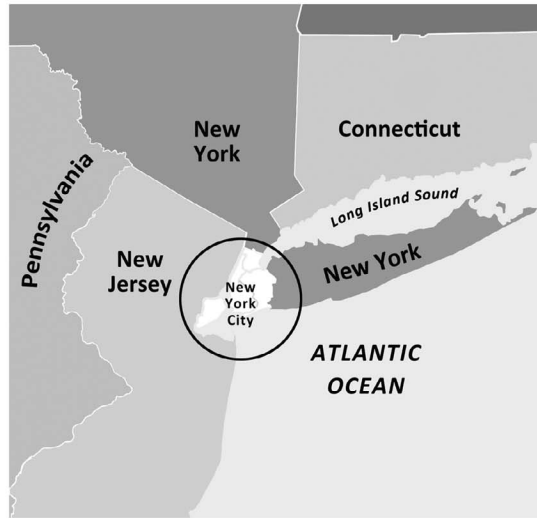
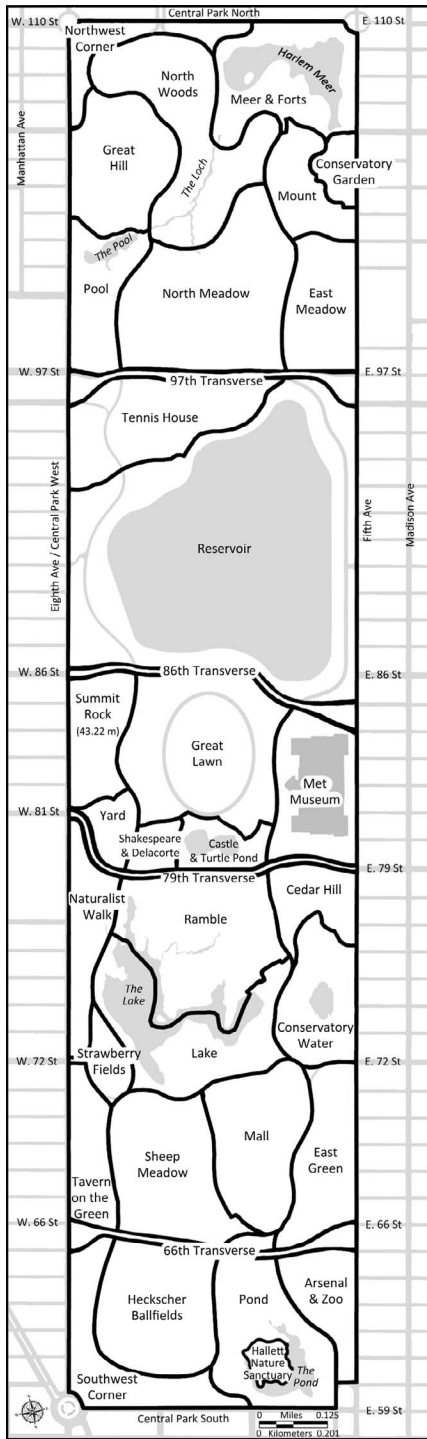


FIG. 1. Central Park in local and regional context. Map of Central Park showing the thirty-six zones used in this study (left). Map of New York City's five boroughs showing location of Central Park (top). Map of New York City and surrounding states (above).



from approximately 5 m above sea level at the Harlem Meer to 44 m at Summit Rock (Fig. 1).

We divided the park into 36 zones to facilitate data collection, analysis, and discussion. In defining the zones, we tried to maintain some ecological and physiographic cohesion within each zone and intended them to be intuitive to a visitor reasonably familiar with the park and its geographical features. We also attempted to follow the zone management system used by the Conservancy. Every specimen collected was assigned to a particular zone and reported on the specimen labels.

We used a modified timed-meander sampling method (Nkoa *et al.* 2013) during the roughly four years of collecting. We assume this is the same method used by DeCandido *et al.* (2007), but in their case, the time interval was one year and in ours it was four. We traversed each of the 36 zones several times in different seasons, looking for species not previously encountered. When no new species were found in a zone after repeated visits, we focused our efforts elsewhere. From August 17, 2013 to September 16, 2017, we visited the park 139 times and collected a total of 1,468 specimens, the majority being spontaneous plants, but including some cultivated plants (not analyzed) and waifs (see Appendix II). After the second year, we identified blank spots on our collecting map and visited them, often finding interesting things (see Results and Discussion). By the end of the study, no new species were found in any zone.

Every specimen is databased, imaged, and accessioned in the Herbarium at NYBG. Every specimen has a silica-dried tissue sample in the NYBG DNA bank. All specimen data and images are accessible online through various data portals such as the NYBG's CV Starr Virtual Herbarium, SEINET, and GBIF.

We define spontaneous as any free-living *individual plant* not intentionally planted in Central Park by humans (note italics). The plant could be annual or perennial, native or introduced. To be considered a part of the indigenous or naturalized flora for this study, a species must be represented by at least one spontaneous population growing somewhere in the park. Generally, a population consists of more than one individual; however, some perennial species such as trees may be spontaneous, but only known from one individual.

A spontaneous annual plant that occurs once and disappears, or that may persist but does not reproduce on its own, disappears and only occurs again if re-introduced is considered by us as a waif. To assess the status of a waif or naturalized species we consider the species' history in the park, its reproductive and dispersal dynamics, and its context in the region.

The flora in Appendix I is arranged by major groups (ferns, gymnosperms, angiosperms: monocots and dicots) with families, genera, and species arranged alphabetically within each group. Fern taxonomy follows Moran (2017). Angiosperm taxonomy follows the classification of the Angiosperm Phylogeny Group (APG IV 2016). Author abbreviations follow Brummitt and Powell (1992). Species concepts follow Werier (2017), largely as described in Flora of North America (FNA 1993+) and Gleason and Cronquist (1991), and recent revisions. We endeavored to use common names as they are spoken and written currently by individuals referring to plants of New York City. For those plants without names in common usage or where there are multiple names used, we chose a name from among those used in the New York Flora Atlas (Weldy *et al.* 2019), the USDA Plants Database (USDA, NRCS 2019), Gleason and Cronquist (1991), other sources.

Nativity status (native or introduced), coefficients of conservatism, and state rarity ranking (S1–S5) follow the *Catalogue of the Vascular Plants of New York State* (Werier 2017), the New York Flora Atlas online (Weldy *et al.* 2019), and the New York Rare Plant Status Lists (Young 2017).

We report the species' abundance in Central Park as rare (1 population or individual), infrequent (2–5 populations), and frequent (> 5 populations). The trajectory designation is a measure of the species' fecundity *in situ*, reported as either decreasing, stable, or increasing. We cannot predict how the park will be managed in the future and we cannot predict the climate or other environmental variables, so trajectory is measured on the basis of what we observed during 2013–2017 period, augmented by our knowledge of the species behavior elsewhere in the region. In addition, we took into consideration the observations and knowledge of current and former Conservancy staff members, several of whom have worked in the park for many years. Invasive species are aggressive by definition and if left

Table 1. The number of species (excluding subspecific taxa) reported by DeCandido *et al.* (2007) and this paper, Atha *et al.* (2020).

	Native	Introduced	Total
2007	145 (40%)	217 (60%)	362
2017	198 (45%)	240 (55%)	438
Change	+53	+23	+76

alone, their populations would increase in size and density. In many cases the most aggressive invaders are actively managed and seasonally removed to the extent possible. Nevertheless, we classify most of these invasives as “increasing” because they would be if left alone, but may be reduced by management.

**Results.** The spontaneous flora consists of 438 species and 2 subspecific taxa from 262 genera and 89 families. We documented 76 additional species since the inventory of 2007. The largest families are Poaceae (56 species), Asteraceae (55), Rosaceae (27), Fabaceae (20), and Polygonaceae (17). The largest genera are *Persicaria* (8 species), *Carex* (7), *Acer* (7), *Cyperus* (6), *Rubus* (6), and *Eragrostis* (6). Seven species are ranked as rare, threatened, or endangered by New York Natural Heritage Program: Rare (S3): *Panicum amarum* subsp. *amarum*; Threatened (S2): *Viburnum dentatum* var. *venosum*, *Carex glaucoidea*; and Endangered (S1): *Acalypha virginica*, *Quercus phellos*, *Gymnocladus dioicus*, *Fraxinus profunda*. The native Ashes *Fraxinus americana*, *Fraxinus pennsylvanica*, and *Fraxinus profunda* are all ranked as Critically Endangered globally (Barstow *et al.* 2018). Thirty-six species are listed as prohibited or regulated invasive species by New York State (NYS DEC, DAM 2014). Four New York State records were collected in Central Park during this study and published separately: *Gamochaeta pensylvanica*, *Rumex cristatus*, *Stellaria pallida*, and *Sagina apetala* (Atha *et al.* 2016; Atha 2018; Atha *et al.* 2018a; Atha *et al.* 2018b).

As of 2017, native species comprise 45% of the flora. That is an increase of 5% since 2007. The comparison of native and introduced species documented in this and the previous study are summarized in Table 1.

The coefficient of conservatism (CoC) can be used to assess a species’ habitat specificity and tolerance of disturbance (Bried *et al.* 2012). Of the native species, approximately 60% (118 species) are ruderal species with a CoC value of < 5,

meaning that they occur in disturbed sites ranging from the most disturbed (CoC 0) to less disturbed (CoC 4). The remaining 40% (79 species) are native with CoC values of 5 or greater and show some fidelity to a particular habitat with little disturbance. All of the rare, threatened, and endangered species are in the latter category.

**Discussion.** In this study we documented 76 more species than were documented in 2007. As summarized in Table 1, the number of introduced species increased from 217 in 2007 to 240 in 2017 (a 10.6% increase), but the native flora increased more, from 145 in 2007 to 198 in 2017 (a 36% increase). These increases are partially due to a greater collecting time interval and intensity that documented species likely present in 2007 but were then undetected. For example, *Sagina apetala*, a state record that is hard to distinguish from other *Sagina* species; *Viburnum sieboldii*, an introduced ornamental shrub that may not have been recognized as spontaneous, but has become an emerging invasive; *Potamogeton foliosus* subsp. *foliosus*, a submerged aquatic species that is easily overlooked; and *Amelanchier sanguinea*, a Shadbush species that has never been reported for Manhattan, was found in only one location in the North Woods of Central Park. The longer collection time (four years vs. one year) also allowed us to find rare species that might have been considered locally extirpated, such as *Monotropa uniflora*. Species that have naturalized from cultivation also contributed to the increase, such as *Mertensia virginica* and *Acer palmatum*.

There are 31 native species that are only known from one wild population in Central Park (defined here as rare). Almost half have a CoC value of 5 or greater. All are listed as stable or decreasing. Four of the 10 spontaneous fern species are in this group. Species that are known from only one site in Central Park are extremely vulnerable to extirpation. A severe weather event or disturbance could eliminate the species from the park and because the park is surrounded by dense urban development on all sides and is on an island, the chances of unassisted recolonization is very low, even for ferns which are dispersed by wind. The only known wild population of *Dryopteris marginalis* occurs in the northern section of the park, but Conservancy staff have planted and cultivated the species elsewhere. This species is available in the nursery trade, but that is not true for all species.

Other species such as *Amelanchier sanguinea* are also known from only one population and should be protected and increased if possible.

Inventories such as these are also useful in verifying the identity of planted specimens that may become naturalized. Occasionally, nurseries make errors in identifying and labeling species. We found several examples of this: *Dryopteris goldiana* labeled as *D. marginalis* and *Viola striata* labeled as *V. blanda*. These examples do not pose serious problems in the landscape since both are native. But *Parthenocissus quinquefolia* labeled as *P. inserta* may be a problem because although these look similar, *P. inserta* will not climb trees or trellises, a characteristic which may be desired. Most importantly, errors such as *Alnus glutinosa* sold as *A. incana* is a serious problem because *A. glutinosa* is introduced, spreads rapidly, and is difficult to eradicate once established.

Considerable attention and allocation of resources by the Conservancy (with the help of many volunteers) has decreased the abundance and density of invasive species in Central Park. Large areas, particularly the Ramble, were once dominated by *Reynoutria japonica* and the canopy of the North Woods was once dominated by *Acer platanoides*. These species are still found in Central Park, but their numbers and harmful ecological consequences have been greatly reduced. *Humulus japonicus* was declared extirpated by DeCandido *et al.* (2007). This highly invasive annual vine has been increasing greatly in New York City in the last several years and is once again present in Central Park. We list the species as frequent and increasing. Perhaps it can be eliminated again. While no New York State prohibited or regulated invasive species has been eliminated since 2007, it is hoped that some invasives will be eliminated by the time of the next inventory.

Early detection of new invasive species and rapid response with control measures (EDRR) is the most efficient and effective means of controlling invasives and protecting the health, beauty, and ecological integrity of landscapes. Species should be identified as soon as they appear and eliminated before they have time to cover large areas and increase vigor from repeated genetic mixing. Trained botanists, community scientists and other knowledgeable persons should alert management staff as soon as a new potential invasive is detected. One invasive that could

become a large problem in New York City is *Sorghum halapense*. We found a large patch of *S. halapense* behind the stage at the Delacorte Theater and promptly alerted management staff. This species has cost many millions of dollars and lost productivity in the southern states, particularly in the agricultural sector. While New York City is not agricultural, *S. halapense* is extremely aggressive and difficult to control once established. It is vital that New York City take seriously the threat from this species (and others like it) and provide aggressive steps to eradicate it wherever it occurs, as was done in Central Park. *Fatoua villosa* is an annual species that appears to be spreading rapidly throughout New York City (including Central Park) and should be managed aggressively before it becomes unmanageable.

As described in the Materials and Methods section, waifs (listed in Appendix II) are usually introduced plants that appear spontaneously, but do not persist in the same place and do not form reproducing and spreading populations. Most spread anthropogenically, often inadvertently, but occasionally deliberately as ornamentals or food plants. One of the most common inadvertent anthropogenic vectors for the spread of waifs is the broadcast of bird seed. A cursory analysis of the waif list in Appendix II shows that many are components of bird seed and are not naturally found in New York. Examples of these include *Panicum miliaceum* subsp. *miliaceum*, *Sorghum bicolor* subsp. *bicolor*, *Phleum canariense* and *Amaranthus cruentus*. Common food plants may also be spread by humans or other animals. Every year during the warmer months we observed numerous occurrences of *Solanum lycopersicum* plants scattered throughout the park. The plants often reach flowering and sometimes fruiting stage, but they never seem to reappear in the same place the following season. The introduction of commercial nursery plants carrying ancillary novel plant species in the soil is another common vector for waifs, invasives, and occasionally native species. For example, we found a few plants of *Erigenia bulbosa* in one recently planted area. The species is native to western New York and Pennsylvania, but not New York City and likely came in with nursery material. Some of the waifs could have become very troublesome invasives, but we alerted the management staff to the nature and location of these infestations. The tropical *Pistia stratiotes* is a good example. Overwintering

populations of this extremely fast-growing aquatic invasive have been moving north in North America concurrent with a warming climate. We found it in the pool at 103rd Street two years in a row beginning in 2014, each time alerting the management, who removed it. The species was not observed in 2016, 2017, or 2018. We do not know whether the plant overwintered from 2014 to 2015 or was reintroduced. Another extremely worrying potentially invasive plant we listed as a waif is *Impatiens balfourii*. There was a spontaneous population of about a dozen plants in the moist, shady woods of the Ramble in 2016. Conservancy gardeners removed it and it has not been seen since. This species could have expanded its range and displaced the native *Impatiens capensis* and *I. pallida* and other shade tolerant herbaceous perennials. As yet, neither *Pistia stratiotes* nor *Impatiens balfourii* are known to occur elsewhere in New York State (Werier 2017), demonstrating the value of EDRR.

In recent years, the Central Park Conservancy has planted an increasing number of native species, experimenting with a variety of native species for different habitats. Over time some of these have become naturalized, sometimes for the first time, such as the *Mertensia virginica* and sometimes augmenting existing populations that may have occurred in low numbers such as *Lindera benzoin*. The native species, *Mertensia virginica*, is a Central Park success story. There are numerous populations of this species that have spread beyond initial plantings to form dense stands in moist, shady sites. Based on the evidence, it appears that they have become established and are self-sustaining. *Podophyllum peltatum* is another example. We observed that the plants are now abundant and widespread in the park. *Podophyllum peltatum* is an ideal species for Central Park because it can tolerate diverse soil and light conditions, and because it spreads by rhizomes, it can rebound after some disturbance. However, not all reintroductions have been successful. There are many native species that were introduced but did not succeed. *Symphiotrichum novae-angliae* and *S. novi-belgii* were both tried numerous times in what seemed to be proper environments. Neither did well and the populations declined and disappeared over time. The native orchid *Goodyera pubescens* is another reintroduced species that struggled and soon disappeared.

The ongoing effort to plant native species and the success of past efforts to restore native plant populations by the Conservancy should be strongly supported and encouraged. Based on years of collective observation of insects and birds in Central Park, native plants are preferred by resident and visiting fauna. Some introduced ornamental plants may be preferred horticulturally because they are considered pest free, meaning that insects, fungi, and other herbivores do not exploit them as food or shelter. This is supported by a recent study showing that native plants have significantly greater leaf herbivory rates than introduced invasive species (Bodawatta *et al.* 2019). A 1999 study showed that 96% of North American terrestrial birds rely on insects to feed their young (Tallamy 2007), but if the plants preferred by insects (native) are not there, the birds will suffer. In Central Park, bees, wasps, and flies are among the most prodigious pollinators and help sustain the local flora. Thus, the regions of Central Park supporting spontaneous plant growth, especially of native species, help sustain the insects and birds. If we seek to manage and grow our urban green spaces as diverse and healthy ecosystems for the benefit of wildlife, we must aim for the restoration and continued management of diverse and healthy native plant palettes.

A change in the culture of park users and park managers has been an important factor in the restoration of native plant communities. Appreciating plants that people traditionally see as weeds may be a vital factor in ecosystem restoration. For example, *Phytolacca americana*, *Asclepias syriaca*, *Persicaria virginiana*, and *Ageratina altissima* were regularly pulled up as weeds anywhere they were found. They are now left in natural areas and they provide important forage for migrating birds and other wildlife.

Habitats such as roadsides, woodland edges, and rock outcrops harbor numerous ruderal (CoC value < 5) native species that rely on minor disturbances and suppression of woody species. These habitats are particularly abundant in the park and help to define the naturalistic character of the landscape (Barlow Rogers 1987). They are important for maintaining meadow and edge species, such as many of the *Symphiotrichum* spp., *Solidago* spp., *Rhus* spp., *Rubus* spp., *Sambucus nigra* subsp. *canadensis*, *Populus deltoides*, *Sassafras albidum*, and many others.



Vernal pools, marshes, and other wetlands are important habitats for native plants and wildlife. Over the course of the last two centuries, the fear of disease and development pressures drove our predecessors in New York City to drain these areas and to use them as garbage dumps and building sites to the point where they are now rare and almost nonexistent in Manhattan (Steinberg 2014). Freshwater marshes that were not completely filled in were diverted into pipes or channelized into concrete canals, destroying their ecological integrity and function. Until 1949, a small but significant (for the island of Manhattan) freshwater marsh existed in the southeast corner of Central Park at the north end of the Pond. The marsh was formerly part of a much larger wetlands system formed by DeVoor's Mill Stream that was substantially altered by the construction of the park in 1857 and development of the city beyond. The small marsh that remained after 1857 was filled and covered by an ice skating rink in 1949. In 1966, the last remaining marsh in Central Park connecting Montagne's Rivulet (the Loch) and the Harlem Meer at the north end of the park was similarly filled in and covered by an ice skating rink. No inventories of these areas are available from before these developments, but it can be assumed that a number of wetland species were lost. Some wetland species persist today or appear ephemerally, such as the small population of *Lindernia dubia*, a native species with a CoC value of 6, that we documented growing in a small muddy area between the Wollman rink and Gapstow Bridge, most likely a refugee of the former wetland that existed where the ice rink is. We support the Conservancy's effort to daylight the waterway connecting the Loch and the Harlem Meer, currently diverted into a pipe under the Lasker Rink. If this project proceeds, we hope the water will be slowed and widened as it meanders northward toward the Meer, creating (or recreating) what may be the only naturally occurring, ecologically functional freshwater emergent marsh (Edinger *et al.* 2016) on the island of Manhattan.

**Conclusions.** This study, and its 2007 predecessor, have established baseline data on the spontaneous flora of Central Park. Considering that the first vouchered inventory of Central Park's spontaneous flora did not occur until 150 years after the park was established, a once-decadal survey of the plants seems luxurious, but the

results presented here, detailing the changes in just 10 years, argues for their high value and continued importance. We hope others will follow suit, though future studies may not take the same form, as herbarium collections are expensive to collect and maintain. Other forms, such as digital photograph collections will augment and substitute for physical collections, especially of common, weedy species that are well documented.

Landscape management is a complex business involving many elements, living and non, but inarguably, the most important element is the flora. Plants are living organisms responding to untold influences beyond the control of even the most skilled and well-funded managers. Often, the results of management interventions are not known until the plants have time to "settle in." The palette of available plant material for display and restoration is constantly changing and not every planting will succeed. In addition, wild plants are constantly being introduced by humans, animals, and natural dispersal, creating an ever-changing and highly dynamic flora that must be constantly monitored if it is to be sustainably managed.

As demonstrated during this study, early detection of invasive and potentially invasive plants and their prompt removal while populations are small is essential to maintaining a sustainable landscape.

Our findings show that even in a park with 40 million visits per year, alpha diversity can be maintained and even increased when native species are planted, encouraged, and allowed the flexibility to move dynamically, thereby allowing the landscape to respond to natural as well as anthropogenic change.

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## Appendix 1

Checklist of the spontaneous vascular plants of Central Park. Waifs appear in Appendix 2. The list is arranged alphabetically by family and species within three groups: ferns and allies, gymnosperm, and flowering plants. The latter category includes both monocots and dicots together to assist those not familiar with plant systematics to find a family and species easily. It is a bit unfortunate that related families do not appear together, such as the Fagaceae and Juglandaceae and Poaceae and Cyperaceae (oaks and hickories and grasses and sedges), but that is the nature of compromise. All species reported here were documented between 2013 and 2017, inclusive. Native status and coefficient of conservatism (CoC) are from the New York Flora Atlas (Weldy *et al.* 2019) and Catalogue of the Vascular Plants of New York State (Werier 2017). Rarity rankings in New York State (S1–S5) are from the New York Rare Plant Status List (Young 2017). Introduced species are not ranked at the state level. These values are followed by abundance in Central Park as observed by us during the four-year period from 2014 to 2017 (inclusive): rare (1 population or individual); infrequent (2–5 populations); and frequent (> 5 populations). Frequency is assessed as either decreasing, stable, or increasing. All voucher specimens are at the New York Botanical Garden (NY). Collection numbers 13000–16000 were assigned to D. Atha and co-collectors and collection numbers between 201300–201700 were assigned to R. Alvarez and co-collectors. All other collection numbers are indicated with collector name.

## FERNS

**Aspleniaceae**

*Asplenium platyneuron* (L.) Britton, Sterns & Poggenb. – Ebony Spleenwort. Native, CoC 5, S5; frequent, increasing. 13959, 14652, 201605.

**Dennstaedtiaceae**

*Dennstaedtia punctilobula* (Michx.) T. Moore – Hay-Scented Fern. Native, CoC 4, S5; infrequent, stable. 14556, 14657, 15011.

**Dryopteridaceae**

*Dryopteris carthusiana* (Vill.) H.P. Fuchs – Spinulose Wood Fern. Native, CoC 6, S5; rare, stable? 14557.

*Dryopteris intermedia* (Muhl. ex Willd.) A. Gray – Evergreen Wood Fern. Native, CoC 5, S5; (also cultivated), rare, stable. 13966, 14661.

*Dryopteris marginalis* (L.) A. Gray – Marginal Wood Fern. Native, CoC 6, S5; rare, stable. 14244, 14660.

*Polystichum acrostichoides* (Michx.) Schott – Christmas Fern. Native, CoC 6, S5; rare, stable. 14540, 14981.

**Onocleaceae**

*Onoclea sensibilis* L. – Sensitive Fern. Native, CoC 2, S5; frequent, increasing. 14333, 14382.

**Ophioglossaceae**

*Sceptridium dissectum* (Spreng.) Lyon [*Botrychium dissectum*] – Dissected Grapefern. Native, CoC 3, S5; rare, stable. 14966.

**Thelypteridaceae**

*Thelypteris noveboracensis* (L.) Nieuwl. – New York Fern. Native, CoC 4, S5; rare, stable. 15205.

**Woodsiaceae**

*Woodsia obtusa* (Spreng.) Torr. – Blunt-Lobed Woodsia. Native, CoC 7, S5; frequent, increasing. 13960, 13961, 14653, 14659.

## GYMNOSPERM

**Taxaceae**

*Taxus cuspidata* Siebold & Zucc. – Japanese Yew. Introduced; infrequent, increasing. 14165, 14685, 15713.

## FLOWERING PLANTS

**Adoxaceae**

*Sambucus nigra* L. subsp. *canadensis* (L.) Bolli – Common Elderberry. Native, CoC 4, S5; frequent, increasing. 14530, 14601, 15690.

*Viburnum dentatum* L. var. *lucidum* Aiton – Smooth Arrowwood. Native; frequent, increasing. 14048, 15076, 15454.

*Viburnum dentatum* L. var. *venosum* (Britton) Gleason – Southern Arrowwood. Native, Threatened, CoC 7, S2; infrequent, stable. 14047, 15482.

*Viburnum prunifolium* L. – Blackhaw. Native, CoC 4, S4; frequent, increasing. 14131, 14180, 14198, 14390, 14461, 15427.

*Viburnum sieboldii* Miq. – Siebold's Viburnum. Introduced; frequent, increasing. 15077, 15098, 15409, 15647.

**Altingiaceae**

*Liquidambar styraciflua* L. – American Sweetgum. Native, CoC 6, S5; frequent, increasing. 14112, 15907.

**Amaranthaceae**

*Amaranthus albus* L. – Tumbleweed Amaranth. Introduced; frequent, increasing. 14682.

*Amaranthus blitum* L. – Notch-Leaved Amaranth. Introduced; frequent, increasing. 13971, 14684, 14827.

*Amaranthus hybridus* L. – Smooth Amaranth. Native, CoC 0, S?; infrequent, increasing. 14928.

*Amaranthus powellii* S. Watson – Powell's Amaranth. Introduced; frequent, increasing. 15369, 15656.

*Amaranthus retroflexus* L. – Redroot Amaranth. Native, CoC 0, S5; infrequent, increasing. 14858.

*Atriplex patula* L. – Spear Orach. Introduced; rare, decreasing. 15265, 15265.

*Chenopodium album* L. – Lambsquarters. Introduced; frequent, increasing. 14170, 14561.

*Dysphania ambrosioides* (L.) Mosyakin & Clemants – Mexican Tea, Epazote. Introduced; frequent, increasing. 14083.

*Dysphania pumilio* (R. Br.) Mosyakin & Clemants – Clammy Goosefoot. Introduced; frequent, increasing. 13976, 14120, 14681.

**Amaryllidaceae**

*Allium vineale* L. – Field Garlic. Introduced; frequent, increasing. 14231, 14351, 14563.

**Anacardiaceae**

*Rhus copallinum* L. var. *latifolia* – Common Winged Sumac. Native, CoC 7, S5; frequent, increasing. 14197, 201481.

*Rhus glabra* L. – Smooth Sumac. Native, CoC 3, S5; frequent, increasing. 14736.

*Rhus typhina* L. – Staghorn Sumac. Native, CoC 1, S5; frequent, increasing. 14726, 15627.

*Toxicodendron radicans* (L.) Kuntze ssp. *radicans* – Eastern Poison Ivy. Native, CoC 3, S5; frequent, increasing. 14476, 14518.

**Apiaceae**

*Aegopodium podagraria* L. – Goutweed. Introduced; frequent, increasing. 14590, 14635, 201440.

*Conium maculatum* L. – Poison Hemlock. Introduced; infrequent, increasing. 15117, 201462.

*Cryptotaenia canadensis* (L.) DC. – Honewort. Native, CoC 6, S5; frequent, increasing. 14591, 15180.

*Daucus carota* L. – Wild Carrot. Introduced; frequent, increasing. 15160.

*Osmorhiza claytonii* (Michx.) C.B. Clarke – Hairy Sweet Cicely. Native, CoC 7, S5; frequent, increasing. 15065.

*Sanicula canadensis* L. var. *canadensis* – Common Canada Snakeroot. Native, CoC 7, S5; infrequent, stable. 15177.

**Apocynaceae**

*Apocynum cannabinum* L. – Indian Hemp. Native, CoC 2, S5; frequent, increasing. 14698.

*Asclepias incarnata* L. – Eastern Swamp Milkweed. Native, CoC 4, S3?; infrequent, stable. 15678, 201476.

*Asclepias syriaca* L. – Common Milkweed. Native, CoC 0, S5; frequent, increasing. 14190, 14632.

*Cynanchum laeve* (Michx.) Pers. – Honeyvine. Native; rare, stable. 15209.

*Cynanchum louiseae* Kartesz & Gandhi – Black Swallowwort. Introduced; rare, increasing. 15162.

*Vinca minor* L. – Common Periwinkle. Introduced; frequent, increasing. 14323.

**Araceae**

*Lemna minor* L. – Common Duckweed. Native, CoC 2, S5; frequent, increasing. 14507.

*Peltandra virginica* (L.) Raf. ex Schott – Green Arrow Arum, Tuckahoe. Native, CoC 6, S5; infrequent, stable. 14574.

*Spirodela polyrrhiza* (L.) Schleid. – Greater Duckweed. Native, CoC 3, S5; infrequent, stable. 14506.

*Wolffia brasiliensis* Wedd. – Brazilian Duckweed. Native, CoC 2, S4; rare, stable. 15208.

**Araliaceae**

*Aralia elata* (Miq.) Seem. – Japanese Angelica Tree. Introduced, prohibited; frequent, increasing. 14033, 15705.

*Hedera helix* L. – English Ivy. Introduced; frequent, increasing. 14130, 14195.

**Asparagaceae**

*Ornithogalum umbellatum* L. – Common Star-Of-Bethlehem. Introduced; frequent, increasing. 14292, 15431.

**Asteraceae**

*Ageratina altissima* (L.) R.M. King & H. Rob. – White Snakeroot. Native, CoC 4, S5; frequent, increasing. 13970, 14039, 15385, 15707.

*Ambrosia artemisiifolia* L. – Common Ragweed. Native, CoC 0, S5; frequent, increasing. 14169.

*Ambrosia trifida* L. – Giant Ragweed. Native, CoC 3, S4; frequent, increasing. 201472.

*Anthemis arvensis* L. – Corn Chamomile. Introduced; rare, stable. 15449, 15487.

*Arctium minus* (Hill) Bernh. – Lesser Burdock. Introduced; frequent, increasing. 14870, 15712.

*Artemisia annua* L. – Sweet Annie. Introduced; frequent, increasing. 14093, 15869.

*Artemisia vulgaris* L. – Mugwort. Introduced, prohibited; frequent, increasing. 14167, 14202.

*Baccharis halimifolia* L. – Groundsel Tree. Native, CoC 7, S5; infrequent, increasing. 14196, 14216, 15615.



- Bidens connata* Muhl. ex Willd. – Purple-Stemmed Beggarticks. Native, CoC 4, S5; rare, stable. 15853.
- Bidens frondosa* L. – Devil's Beggarticks. Native, CoC 2, S5; frequent, increasing. 13978, 13980, 13981, 13982, 13999, 14045, 14086, 15850.
- Centaurea nigra* L. – Black Knapweed. Introduced; frequent, increasing. 15833.
- Centaurea stoebe* L. – Spotted Knapweed. Introduced, prohibited; frequent, increasing. 201477.
- Cichorium intybus* L. – Chicory. Introduced; frequent, increasing. 14727.
- Cirsium arvense* (L.) Scop. – Canada Thistle. Introduced, prohibited; frequent, increasing. 14568, 15437, 15694.
- Cirsium vulgare* (Savi) Ten. – Bull Thistle. Introduced; frequent, increasing. 15157.
- Coreopsis lanceolata* L. – Lance-leaved Coreopsis. Introduced; rare, increasing. 14748.
- Eclipta prostrata* (L.) L. – False Daisy. Unknown?, CoC 1, S?; frequent, increasing. 13979.
- Erechtites hieraciifolius* (L.) Raf. ex DC. – Fireweed. Native, CoC 3, S5; frequent, increasing. 14051.
- Erigeron annuus* (L.) Pers. – Annual Daisy Fleabane. Native, CoC 0, S5; frequent, increasing. 14555, 201443.
- Erigeron canadensis* L. – Common Horseweed. Native, CoC 0, S5; frequent, increasing. 14104.
- Eupatorium serotinum* Michx. – Late Thoroughwort. Native, CoC 1, S?; frequent, increasing. 14040.
- Eurybia divaricata* (L.) G.L. Nesom – White Wood Aster. Native, CoC 6, S5; frequent, increasing. 14038, 14142.
- Euthamia graminifolia* (L.) Nutt. – Common Flat-Topped Goldenrod. Native, CoC 1, S5; rare, stable. 201467.
- Galinsoga parviflora* Cav. – Lesser Quickweed. Introduced; rare, stable. 14559.
- Galinsoga quadriradiata* Ruiz & Pav. – Common Quickweed. Introduced; frequent, increasing. 14091, 14490, 14527, 14558, 14854, 14916, 201607, 201608, 201609.
- Gamochaeta pensylvanica* (Willd.) Cabrera – Pennsylvania Cudweed. Introduced; rare, decreasing. 15390.
- Hieracium kalmii* L. – Canada Hawkweed. Native, CoC 5, S4; infrequent, increasing. 14720, 15176.
- Hypochaeris radicata* L. – Hairy Cat's-Ear. Introduced; infrequent, increasing. 15667.
- Lactuca canadensis* L. – Tall Lettuce. Native, CoC 1, S5; infrequent, increasing. 14725, 201456.
- Lactuca serriola* L. – Prickly Lettuce. Introduced; frequent, increasing. 15797.
- Lapsana communis* L. – Nipplewort. Introduced; infrequent, increasing. 14850.
- Leucanthemum vulgare* Lam. – Oxeye Daisy. Introduced; rare, increasing. 15131.
- Matricaria discoidea* DC. – Pineapple-Weed. Introduced; infrequent, increasing. 14524.
- Pilosella caespitosa* (Dumort.) P.D. Sell. & C. West – Meadow Hawkweed. Introduced; rare, increasing. 14747.
- Rudbeckia laciniata* L. var. *laciniata* – Green-Headed Coneflower. Native, CoC 5, S5; infrequent, increasing. 14185, 15714.
- Senecio vulgaris* L. – Common Groundsel. Introduced; frequent, increasing. 14096, 14255, 14486.
- Silphium perfoliatum* L. – Cup Plant. Introduced, prohibited; frequent, increasing. 14184.
- Solidago altissima* L. ssp. *altissima* – Tall Goldenrod. Native, CoC 1, S5; frequent, increasing. 14053, 15358.
- Solidago caesia* L. var. *caesia* – Blue-Stemmed Goldenrod. Native, CoC 6, S5; frequent, increasing. 15356.
- Solidago juncea* Aiton – Early Goldenrod. Native, CoC 3, S5; infrequent, increasing. 15782.
- Solidago rugosa* Mill. var. *rugosa* – Wrinkleleaf Goldenrod. Native, CoC 1, S5; frequent, increasing. 14143.
- Solidago sempervirens* L. – Seaside Goldenrod. Native, CoC 4, S4; rare, stable. 201612.
- Sonchus asper* (L.) Hill – Prickly Sowthistle. Introduced; frequent, stable. 14094, 14500, 14620, 201453, 201460.
- Sonchus oleraceus* L. – Common Sow-Thistle. Introduced; frequent, stable. 14831.
- Symphotrichum cordifolium* (L.) G.L. Nesom – Common Blue Wood Aster. Native, CoC 4, S5; frequent, increasing. 14156, 14205, 15748.
- Symphotrichum laeve* (L.) Á. Löve & D. Löve – Smooth Aster. Native, CoC 2, S5; infrequent, stable? 14912.
- Symphotrichum lanceolatum* (Willd.) G.L. Nesom var. *lanceolatum* – Lance-Leaved-Aster. Native, CoC 1, S5; frequent, increasing. 14082, 14145, 14182, 14187, 14217, 14948, 15340, 15341, 15353, 15370, 15904, 201606.
- Symphotrichum pilosum* (Willd.) G.L. Nesom var. *pilosum* – Frostweed Aster. Native, CoC 0, S5; Infrequent, stable. 15371.
- Symphotrichum puniceum* (L.) Á. Löve & D. Löve var. *puniceum* – Purple-Stemmed-Aster. Native, CoC 4, S5; infrequent, stable. 15858.
- Taraxacum officinale* F.H. Wigg. – Common Dandelion. Introduced; frequent, increasing. 14251, 14264, 14343, 14356.

- Tragopogon dubius* Scop. – Yellow Salsify. Introduced; rare, stable? 15695.
- Tussilago farfara* L. – Colt's-Foot. Introduced; rare, stable. 14289.
- Verbesina alternifolia* (L.) Britton ex Kearney – Wingstem. Unknown; CoC 1, S?; rare, stable. 14947.
- Xanthium strumarium* L. – Canada Cocklebur. Native, CoC 1, S5; infrequent, increasing. 14896, 14922.
- Balsaminaceae**
- Impatiens capensis* Meerb. – Spotted Jewelweed. Native, CoC 3, S5; frequent, increasing. 14201, 14650, 15384.
- Impatiens pallida* Nutt. – Pale Jewelweed. Native, CoC 3, S4; infrequent, increasing. 15147.
- Berberidaceae**
- Podophyllum peltatum* L. – Mayapple. Native, CoC 5, S5; frequent, increasing. 14393.
- Betulaceae**
- Betula lenta* L. – Sweet Birch. Native, CoC 6, S5; infrequent, stable. 14146, 15382.
- Betula populifolia* Marshall – Gray Birch. Native, CoC 5, S5; rare, stable. 15851.
- Bignoniaceae**
- Catalpa bignonioides* Walter – Southern Catalpa. Introduced; frequent, increasing. 15779, 15840.
- Boraginaceae**
- Mertensia virginica* (L.) Pers. ex Link – Virginia Bluebells. Native, CoC 7, S4; frequent, increasing. 14346.
- Brassicaceae**
- Alliaria petiolata* (M. Bieb.) Cavara & Grande – Garlic Mustard. Introduced, prohibited; frequent, increasing. 14296, 14339, 14451.
- Arabidopsis thaliana* (L.) Heynh. – Mouse-Ear Cress. Introduced; frequent, increasing. 14991, 14996.
- Barbarea vulgaris* W.T. Aiton – Yellow Rocket. Introduced; infrequent, increasing. 14474.
- Brassica juncea* (L.) Czern. – Brown Mustard. Introduced; frequent, increasing. 14613, 14710, 14990, 15096.
- Brassica rapa* L. – Field Mustard. Introduced; infrequent, stable. 201618.
- Capsella bursa-pastoris* (L.) Medik. – Shepherd's Purse. Introduced; frequent, increasing. 14252, 14263, 14338, 14377, 201413.
- Cardamine concatenata* (Michx.) O. Schwarz – Cut-Leaved Toothwort. Native, CoC 6, S5; rare, decreasing. 15061.
- Cardamine flexuosa* With. – Wavy Bittercress. Introduced; frequent, increasing. 14100, 14380, 15388, 15868, 201414.
- Cardamine hirsuta* L. – Hairy Bittercress. Introduced; frequent, increasing. 14260, 14314, 14962, 14964, 14973.
- Draba verna* L. – Spring Whitlowgrass. Introduced; frequent, increasing. 14309, 14968, 14995.
- Erucastrum gallicum* (Willd.) O.E. Schulz – French Rocket. Introduced; rare, stable. 15651.
- Lepidium virginicum* L. ssp. *virginicum* – Wild Pepperweed. Native, CoC 0, S5; frequent, stable. 14479, 14481.
- Rorippa palustris* (L.) Besser ssp. *palustris* – Marsh Yellowcress. Native, CoC 3, S4; frequent, stable. 14826, 15439.
- Rorippa sylvestris* (L.) Besser – Creeping Yellow Cress. Introduced; rare, stable. 14528.
- Sisymbrium officinale* (L.) Scop. – Common Hedge Mustard. Introduced; frequent, increasing. 14495, 14729.
- Thlaspi arvense* L. – Field Pennycress. Introduced; frequent, increasing. 14253, 14315, 201450.
- Campanulaceae**
- Lobelia inflata* L. – Indian Tobacco. Native, CoC 1, S5; infrequent, increasing. 15723.
- Triodanis perfoliata* (L.) Nieuwl. – Claspng Venus's Looking Glass. Native, CoC 7, S5; frequent, increasing. 14643.
- Cannabaceae**
- Celtis occidentalis* L. – Northern Hackberry. Native, CoC 7, S4; frequent, increasing. 13986, 14101, 14325, 14362, 14898, 201444.
- Celtis sinensis* Pers. – Chinese Hackberry. Introduced; infrequent, increasing. 14899.
- Humulus japonicus* Siebold & Zucc. – Japanese Hops. Introduced, prohibited; frequent, increasing. 15342, 15343.
- Caprifoliaceae**
- Lonicera japonica* Thunb. – Japanese Honeysuckle. Introduced, prohibited; frequent, increasing. 14543, 14629.
- Lonicera maackii* (Rupr.) Maxim. – Amur Honeysuckle. Introduced, prohibited; infrequent, increasing. 14214, 14494, 15715, 15756.
- Caryophyllaceae**
- Cerastium fontanum* Baumg. subsp. *vulgare* (Hartm.) Greuter & Burdet – Big Chickweed. Introduced; frequent, increasing. 14998.
- Dianthus armeria* L. – Deptford Pink. Introduced; rare, stable. 15126, 15130.
- Sagina apetala* Ard. – Annual Pearlwort. Introduced; rare, decreasing. 15923.
- Sagina japonica* (Sw.) Ohwi – Japanese Pearlwort. Introduced; frequent, increasing. 15178, 201439.
- Sagina procumbens* L. – Matted Pearlwort. Introduced; frequent, increasing. 14504.

*Scleranthus annuus* L. – German Knotgrass.

Introduced; frequent, increasing. 14669, 201465.

*Silene latifolia* Poir. – White Campion. Introduced;

frequent, increasing. 14670.

*Silene vulgaris* (Moench) Garcke – Bladder Campion.

Introduced; frequent, stable. 14753.

*Spergularia rubra* (L.) J. Presl & C. Presl – Purple

Sandspurry. Introduced; rare, stable. 15665.

*Stellaria graminea* L. – Grass-Leaved Stitchwort.

Introduced; rare, stable. 15721.

*Stellaria media* (L.) Vill. – Common Chickweed.

Introduced; frequent, increasing. 14257, 14266,

14372, 14373, 14454, 14997.

*Stellaria pallida* (Dumort.) Crépin – Lesser

Chickweed. Introduced; frequent, increasing.

14365, 14999.

#### **Celastraceae**

*Celastrus orbiculatus* Thunb. – Asian Bittersweet.

Introduced, prohibited; frequent, increasing.

15381.

*Euonymus alatus* (Thunb.) Siebold – Winged

Euonymus, Burning-Bush. Introduced,

regulated; infrequent, stable. 14147.

*Euonymus fortunei* (Turcz.) Hand.-Mazz. – Winter

Creper. Introduced; frequent, increasing.

14042, 14243, 201615.

#### **Colchicaceae**

*Uvularia sessilifolia* L. – Sessile-Leaved Bellwort.

Native, CoC 6, S5; rare, stable. 15408.

#### **Commelinaceae**

*Commelina communis* L. – Asiatic Dayflower.

Introduced; frequent, increasing. 14078, 14496,

14598.

*Tradescantia ohiensis* Raf. – Ohio Spiderwort.

Introduced; rare, decreasing. 14625, 14667.

#### **Convolvulaceae**

*Calystegia sepium* (L.) R. Br. – Hedge Bindweed.

Native, CoC 0, S?; frequent, increasing. 14610.

*Convolvulus arvensis* L. – Field Bindweed.

Introduced; infrequent, increasing. 15634.

*Cuscuta gronovii* Willd. ex Roem. & Schult. –

Common Dodder. Native, CoC 4, S5;

infrequent, increasing. 15192, 201602, 201603.

*Ipomoea hederacea* Jacq. – Ivy-Leaved Morning

Glory. Introduced; rare, stable. 15790.

*Ipomoea hederifolia* L. – Scarlet Morning Glory.

Introduced; rare, stable. 15348.

*Ipomoea lacunosa* L. – White Morning Glory.

Introduced; rare, increasing. 15992.

*Ipomoea purpurea* (L.) Roth – Common Morning

Glory. Introduced; frequent, increasing. 14737,

14861, 14930.

#### **Crassulaceae**

*Sedum sarmentosum* Bunge – Stringy Stoncrop.

Introduced; infrequent, increasing. 14945.

*Sedum ternatum* Michx. – Woodland Stoncrop.

Introduced; infrequent, increasing. 14293.

#### **Cyperaceae**

*Carex blanda* Dewey – Eastern Woodland Sedge.

Native, CoC 4, S5; infrequent, increasing.

14472, 14567, 201416.

*Carex cephalophora* Muhl. ex Willd. – Oval-Headed

Sedge. Native, CoC 5, S5; frequent, increasing.

15149, 15481, 15620, 201411.

*Carex glaucoidea* Tuck. ex Olney – Blue Sedge. Native,

Threatened, CoC 6, S2S3; rare, stable. 15485.

*Carex muehlenbergii* Schkuhr ex Willd. –

Muhlenberg's Sedge. Native; CoC 7, S3–S5;

rare, stable. 15468.

*Carex radiata* (Wahlenb.) Small – Star Sedge. Native,

CoC 7, S5; infrequent, stable. 14592, 15483,

201425, 201428.

*Carex swanii* (Fernald) Mack. – Swan's Sedge.

Native, CoC 7, S5; frequent, increasing.

14458, 14596, 15474, 15480, 15609.

*Carex vulpinoidea* Michx. – Fox Sedge. Native, CoC

2, S5; frequent, increasing. 14575, 14576,

15435, 15476.

*Cyperus engelmannii* Steud. – Engelmann's Flat

Sedge. Native, CoC 9, S?; infrequent, stable.

14923.

*Cyperus esculentus* L. – Common Yellow Nutsedge.

Native, CoC 1, S?; frequent, stable. 14862.

*Cyperus iria* L. – Rice-Field Flat Sedge. Introduced;

infrequent, increasing. 13993, 14097, 14941.

*Cyperus lupulinus* (Spreng.) Marcks *spp. macilentus*

(Fernald) Marcks – Eastern Flat Sedge. Native,

CoC 4, S5; rare, stable. 15608.

*Cyperus microiria* Steud. – Asian Flat Sedge.

Introduced; infrequent, increasing. 13972,

15183, 15778.

*Cyperus strigosus* L. – False Yellow Nutsedge.

Native, CoC 3, S5; infrequent, stable. 14645,

14647, 14940.

#### **Dioscoreaceae**

*Dioscorea polystachya* Turcz. – Chinese Yam.

Introduced, prohibited; rare, increasing. 201617.

#### **Elaeagnaceae**

*Elaeagnus umbellata* Thunb. – Autumn Olive.

Introduced, prohibited; infrequent, increasing.

14392, 15870.

#### **Ericaceae**

*Chimaphila maculata* (L.) Pursh – Spotted Wintergreen.

Native, CoC 7, S4; rare, stable. 15674.

*Monotropa uniflora* L. – Indian Pipe. Native, CoC 7,

S5; infrequent, stable. 15675.

#### **Euphorbiaceae**

*Acalypha australis* L. – Asian Three-Seeded-

Mercury, Asian Copperleaf. Introduced;

frequent, increasing. 14751, 14883.

- Acalypha rhomboidea* Raf. – Common Three-Seeded Mercury. Native, CoC 0, S5; frequent, increasing. 14177, 14628, 14721, 201483.
- Acalypha virginica* L. – Virginia Copperleaf. Native, CoC 10, S1; infrequent, stable. 1.
- Euphorbia cyparissias* L. – Cypress Spurge. Introduced, prohibited; infrequent, stable. 201501.
- Euphorbia maculata* L. – Spotted Spurge. Native, CoC 0, S5; frequent, increasing. 14178, 14505, 14884, 14901.
- Euphorbia nutans* Lag. – Upright Spurge. Native, CoC 0, S5; infrequent, stable. 15718, 15903.
- Fabaceae**
- Albizia julibrissin* Durazz. – Silktree. Introduced; rare, increasing. 14136.
- Apios americana* Medik. – Groundnut. Native, CoC 5, S5; rare, stable. 15359.
- Chamaecrista fasciculata* (Michx.) Greene – Partridge Pea. Native, CoC 1, S3S4; infrequent, increasing. 14089, 14092.
- Gleditsia triacanthos* L. – Honeylocust. Introduced; frequent, increasing. 14467, 15054.
- Gymnocladus dioica* (L.) K. Koch – Kentucky Coffee Tree. Native, Endangered, CoC 5, S?; infrequent, increasing. 14107.
- Lotus corniculatus* L. – Common Bird's-Foot Trefoil. Introduced; frequent, increasing. 14863.
- Medicago lupulina* L. – Black Medic. Introduced; frequent, increasing. 14594, 14714, 15128, 15375.
- Melilotus albus* Medik. – White Sweet Clover. Introduced; infrequent, stable. 14750.
- Melilotus officinalis* (L.) Lam. – Yellow Sweet Clover. Introduced; frequent, increasing. 15445.
- Robinia pseudoacacia* L. – Black Locust. Introduced, regulated; frequent, increasing. 14028, 201417.
- Securigera varia* (L.) Lassen – Crown Vetch. Introduced; infrequent, increasing. 14706.
- Styphnolobium japonicum* (L.) Schott – Pagoda Tree – Introduced; frequent, increasing. 15014.
- Trifolium arvense* L. – Rabbitfoot Clover – Introduced; frequent, increasing. 14677.
- Trifolium hybridum* L. – Alsike Clover – Introduced; frequent, increasing. 15442, 15655.
- Trifolium pratense* L. – Red Clover – Introduced; frequent, increasing. 15441, 201442.
- Trifolium repens* L. – White Clover – Introduced; frequent, increasing. 15444, 15664, 201432.
- Vicia cracca* L. – Tufted Vetch. Introduced; infrequent, stable. 15361, 15450.
- Vicia sativa* L. ssp. *sativa* – Common Vetch. Introduced; infrequent, stable. 15447.
- Vicia villosa* Roth ssp. *villosa* – Hairy Vetch. Introduced; infrequent, stable. 15446.
- Wisteria sinensis* (Sims) Sweet – Chinese Wisteria. Introduced; frequent, increasing. 14220, 14221, 15069, 15616, 201418.
- Fagaceae**
- Castanea dentata* (Marshall) Borkh. – American Chestnut. Native, CoC 6, S4; rare, decreasing. 14888.
- Quercus alba* L. – White Oak. Native, CoC 7, S5; infrequent, decreasing. 15638.
- Quercus cerris* L. – Turkey Oak. Introduced; frequent, increasing. 14179, 14213, 15621, 15781.
- Quercus palustris* Münchh. – Pin Oak. Native, CoC 7, S4; frequent, increasing. 13987, 14134.
- Quercus phellos* L. – Willow Oak. Native, Endangered, CoC 8, S1; frequent, increasing. 13998, 14137, 15053.
- Quercus rubra* L. – Northern Red Oak. Native, CoC 7, S5; frequent, increasing. 14986, 15100, 201482.
- Geraniaceae**
- Erodium cicutarium* (L.) L'Hér. ex Aiton – Common Storkbill. Introduced; frequent, increasing. 14566, 15402.
- Geranium carolinianum* L. – Carolina Cranesbill. Native, CoC 4, S5; frequent, increasing. 14487, 15443.
- Hypericaceae**
- Hypericum perforatum* L. – Common St. John's-Wort. Introduced; infrequent, increasing. 14624, 14678, 15873.
- Iridaceae**
- Iris pseudacorus* L. – Yellow Iris. Introduced, prohibited; infrequent, increasing. 14509.
- Sisyrinchium angustifolium* Mill. – Narrow-Leaved Blue-Eyed Grass. Native, CoC 1, S5; rare, stable. 15679.
- Juglandaceae**
- Carya cordiformis* (Wangenh.) K. Koch – Bitternut Hickory. Native, CoC 7, S5; frequent, increasing. 15750.
- Carya glabra* (Mill.) Sweet – Pignut Hickory. Native, CoC 7, S5; infrequent, stable. 15746.
- Carya ovata* (Mill.) K. Koch – Shagbark Hickory. Native, CoC 7, S5; infrequent, decreasing. 15637.
- Juglans nigra* L. – Black Walnut. Native, CoC 5, S5; frequent, increasing. 15158, 15761.
- Juncaceae**
- Juncus pylaei* Laharpe – Pylae's Rush. Native, CoC 3, S5; infrequent, increasing. 14587.
- Juncus tenuis* Willd. – Path Rush. Native, CoC 0, S5; frequent, increasing. 14032, 14526, 14733, 14734, 15639, 201434.



**Lamiaceae**

*Ajuga reptans* L. – Carpet Bugle. Introduced; rare, stable. 15407.

*Callicarpa dichotoma* (Lour.) K. Koch – Purple Beautyberry. Introduced; infrequent, increasing. *M. Gunderson 1.*

*Glechoma hederacea* L. – Ground-Ivy. Introduced; frequent, increasing. 14330, 14354, 15008, 201438.

*Lamium amplexicaule* L. – Henbit. Introduced; frequent, increasing. 14259, 14298.

*Lamium hybridum* Vill. – Cut-Leaved Dead-Nettle. Introduced; rare, stable. 14381.

*Lamium purpureum* L. – Purple Dead-Nettle. Introduced; frequent, increasing. 14240, 14254, 14371, 201405.

*Leonurus cardiaca* L. – Motherwort. Introduced; rare, stable. 14627.

*Lycopus americanus* Muhl. ex W.P.C. Barton – American Bugleweed. Native, CoC 4, S5; rare, stable. 15684, 15788.

*Melissa officinalis* L. – Garden Balm. Introduced; frequent, increasing. 14206, 14662, 15197.

*Nepeta cataria* L. – Common Catnip. Introduced; rare, stable. 15724.

*Perilla frutescens* (L.) Britton – Beefsteak Plant. Introduced; frequent, increasing. 14565.

*Prunella vulgaris* L. – Common Selfheal. Introduced; frequent, increasing. 14644, 15631.

*Teucrium canadense* L. – American Germander. Native, CoC 4, S5; rare, stable. 14749.

**Lauraceae**

*Lindera benzoin* (L.) Blume – Spicebush. Native, CoC 6, S5; frequent, increasing. 14160, 14290, 14327, 15103.

*Sassafras albidum* (Nutt.) Nees – Sassafras. Native, CoC 4, S5; frequent, increasing. 14311, 14383.

**Liliaceae**

*Erythronium americanum* Ker Gawl. – Yellow Trout Lily. Native, CoC 5, S5; frequent, increasing. 14291, 201406.

**Linaceae**

*Linum usitatissimum* L. – Cultivated Flax. Introduced; rare, stable. 15118.

**Linderniaceae**

*Lindernia dubia* (L.) Pennell var. *anagallidea* (Michx.) Cooperr. – Long-Stalked False Pimpernel. Native, CoC 10, S5; rare, decreasing. 14942, 15372.

**Lythraceae**

*Lythrum salicaria* L. – Purple Loosestrife. Introduced, prohibited; frequent, increasing. 14646.

**Magnoliaceae**

*Liriodendron tulipifera* L. – Tulip Tree. Native, CoC 6, S5; frequent, increasing. 14829, 15787.

**Malvaceae**

*Abutilon theophrasti* Medik. – Velvetleaf. Introduced; infrequent, increasing. 14931, 15187.

*Hibiscus moscheutos* L. – Swamp Rose Mallow. Native, CoC 7, S4; infrequent, increasing. 15717.

*Malva neglecta* Wallr. – Common Mallow. Introduced; frequent, increasing. 13977, 14378, 14499.

**Mazaceae**

*Mazus pumilus* (Burm. f.) Steenis – Japanese Mazus. Introduced; frequent, increasing. 14099, 14503.

**Molluginaceae**

*Mollugo verticillata* L. – Carpetweed. Introduced; frequent, increasing. 14175, 14626.

**Moraceae**

*Fatoua villosa* (Thunb.) Nakai – Mulberry Weed. Introduced; frequent, increasing. 14853, 14881, 14882, 15362, 15852.

*Morus alba* L. – White Mulberry. Introduced; frequent, increasing. 201426.

**Nyssaceae**

*Nyssa sylvatica* Marshall – Black Tupelo. Native, CoC 7, S5; infrequent, increasing. 14893, 15429.

**Oleaceae**

*Fraxinus americana* L. – White Ash. Native, CoC 3, S5; frequent, increasing. 14125, 14929, 15050, 15074, 15190, 15666.

*Fraxinus excelsior* L. – European Ash. Introduced; infrequent, increasing. 15168, 15193, 15380.

*Fraxinus pennsylvanica* Marshall – Green Ash. Native, CoC 4, S5; frequent, increasing. 14055, 14728, 14823, 15064, 15097, 15110, 15165, 15165, 15166, 15167, 15169, 15344, 15669, 15926.

*Fraxinus profunda* (Bush) Bush – Pumpkin Ash. Native; infrequent, increasing. 15645, 15670, 15671, 15672, 15792.

*Ligustrum obtusifolium* Siebold & Zucc. – Border Privet. Introduced, prohibited; frequent, increasing. 14173, 15095.

**Onagraceae**

*Circaea canadensis* (L.) Hill – Broadleaf Enchanter's Nightshade. Native, CoC 5, S5; frequent, increasing. 14560, 15116, 15119.

*Epilobium ciliatum* Raf. – Fringed Willow Herb. Native, CoC 3, S5; infrequent, stable. 14707.

*Epilobium coloratum* Biehler – Cinnamon Willowherb. Native, CoC 2, S5; infrequent, stable. 14943.

- Ludwigia palustris* (L.) Elliott – Water Purslane.  
Native, CoC 4, S5; rare, stable. 14914, 15365.  
*Oenothera biennis* L. – Common Evening Primrose.  
Native, CoC 1, S5; frequent, increasing. 14158,  
14158, 14743.

**Orchidaceae**

- Epipactis helleborine* (L.) Crantz – Broadleaved  
Helleborine. Introduced; frequent, increasing.  
14630, 14694, 14702, 15628, 15646, 15708.

**Oxalidaceae**

- Oxalis corniculata* L. – Creeping Yellow Woodsorrel.  
Introduced; frequent, increasing. 14480.  
*Oxalis dillenii* Jacq. – Slender Yellow Woodsorrel.  
Native, CoC 0, S5; frequent, increasing. 14098,  
14344, 14447, 14488, 201412.  
*Oxalis stricta* L. – Common Yellow Woodsorrel.  
Native, CoC 0, S5; frequent, increasing. 14345,  
14448.

**Papaveraceae**

- Chelidonium majus* L. – Greater Celandine.  
Introduced; infrequent, increasing. 14484.

**Paulowniaceae**

- Paulownia tomentosa* (Thunb.) Sieb. & Zucc. ex  
Steud. – Princess-Tree, Empress-Tree.  
Introduced; frequent, increasing. 201455,  
201610.

**Phytolaccaceae**

- Phytolacca americana* L. var. *americana* –  
Pokeweed. Native, CoC 0, S5; frequent,  
increasing. 14081, 15619, 15689.

**Plantaginaceae**

- Linaria vulgaris* Mill. – Common Toadflax.  
Introduced; frequent, increasing. 14724.  
*Plantago lanceolata* L. – English Plantain.  
Introduced; frequent, increasing. 14215, 14456.  
*Plantago major* L. – Common Plantain. Introduced;  
frequent, increasing. 14708, 15281.  
*Plantago rugelii* Decne. – American Plantain. Native,  
CoC 0, S5; frequent, increasing. 13984, 13989,  
14709.  
*Veronica arvensis* L. – Corn Speedwell. Introduced;  
frequent, increasing. 14366, 14367, 14482,  
14993, 14994, 15010.  
*Veronica hederifolia* L. – Ivy-Leaved Speedwell.  
Introduced; frequent, increasing. 14261, 14347,  
14970, 14971, 15051, 15405, 201407.  
*Veronica peregrina* L. ssp. *peregrina* – Purslane  
Speedwell. Native, CoC 0, S5; frequent,  
increasing. 14341, 14364, 15352, 201415.  
*Veronica persica* Poir. – Persian Speedwell.  
Introduced; frequent, increasing. 14269, 14363,  
14483.  
*Veronica serpyllifolia* L. ssp. *serpyllifolia* – Common  
Thyme-Leaved Speedwell. Introduced;  
infrequent, stable. 15009, 15282.

**Platanaceae**

- Platanus occidentalis* L. – Eastern Sycamore. Native,  
CoC 6, S5; infrequent, increasing. 14455.

**Poaceae**

- Agrostis capillaris* L. – Rhode Island Bent.  
Introduced; frequent, increasing. 14655, 15133.  
*Agrostis gigantea* Roth – Redtop. Introduced;  
infrequent, stable. 14656.  
*Agrostis perennans* (Walter) Tuck. – Autumn Bent.  
Native, CoC 4, S5; frequent, increasing. 13956,  
14036, 14144, 15132, 15203, 15354, 201468.  
*Agrostis stolonifera* L. – Creeping Bent. Introduced;  
infrequent, stable. 15175.  
*Anthoxanthum odoratum* L. – Sweet Vernal Grass.  
Introduced; frequent, increasing. 14676.  
*Bromus inermis* Leyss. – Smooth Brome. Introduced;  
frequent, increasing. 15440, 15448.  
*Bromus sterilis* L. – Barren Brome. Introduced;  
infrequent, stable. 15654.  
*Bromus tectorum* L. – Cheatgrass. Introduced;  
frequent, increasing. 14485, 15422, 201459.  
*Calamagrostis canadensis* (Michx.) P. Beauv. –  
Canada Bluejoint Grass. Native, CoC 7, S5;  
infrequent, increasing. 14615.  
*Chasmanthium latifolium* (Michx.) Yates – Inland Sea  
Oats. Unknown; frequent, increasing. 14119,  
14593.  
*Cynodon dactylon* (L.) Pers. – Bermuda Grass.  
Introduced; infrequent, increasing. 15786.  
*Dactylis glomerata* L. – Orchard Grass. Introduced;  
frequent, increasing. 15070, 201433.  
*Danthonia compressa* Austin – Northern Oat Grass.  
Native, CoC 6, S5; frequent, increasing. 14535,  
14654, 15145, 15612.  
*Dichanthelium clandestinum* (L.) Gould –  
Deertongue Rosette Grass. Native, CoC 4, S5;  
frequent, increasing. 14030, 14059, 14462,  
14532, 14595, 15153.  
*Dichanthelium lanuginosum* (Elliott) Gould –  
Slender-Stemmed Rosette Grass. Native, CoC  
4, S5; frequent, increasing. 14035, 14463,  
14464, 14533, 14578, 14579, 14689, 14739,  
15475, 15617.  
*Dichanthelium lindheimeri* (Nash) Gould –  
Lindheimer's Rosette Grass. Native, CoC 8,  
SNR; frequent, increasing. 14697.  
*Digitaria ciliaris* (Retz.) Koel. – Southern Crabgrass.  
Introduced; frequent, increasing. 15349.  
*Digitaria ischaemum* (Schreb.) Muhl. – Smooth  
Crabgrass. Introduced; frequent, increasing.  
14087, 14168, 15350, 15357.  
*Digitaria sanguinalis* (L.) Scop. – Northern  
Crabgrass. Introduced; frequent, increasing.  
13988, 14037, 14849, 15373, 15769.

- Echinochloa crus-galli* (L.) P. Beauv. – Eurasian Barnyard Grass. Introduced; frequent, increasing. 13994, 14712, 14938.
- Eleusine indica* (L.) Gaertn. – Goosegrass. Introduced; frequent, increasing. 14090.
- Elymus canadensis* L. – Canada Wild Rye. Native, CoC 6, S5; frequent, increasing. 14103, 15156.
- Elymus hystrix* L. – Bottlebrush Grass. Native, CoC 6, S5; (also cultivated), frequent, increasing. 14531, 14614, 15150.
- Eragrostis capillaris* (L.) Nees – Tiny Lovegrass. Native, CoC 2, S5; infrequent, stable. 14176, 15838.
- Eragrostis cilianensis* (All.) Vignolo ex Janch. – Stink Lovegrass. Introduced; frequent, increasing. 14738.
- Eragrostis minor* Host – Little Lovegrass. Introduced; infrequent, increasing. 15181.
- Eragrostis pectinacea* (Michx.) Nees – Tufted Lovegrass. Native, CoC 0, S5; infrequent, increasing. 15722, 15794.
- Eragrostis pilosa* (L.) P. Beauv. – India Lovegrass. Introduced; infrequent, stable. 14741.
- Eragrostis spectabilis* (Pursh) Steud. – Purple Lovegrass. Native, CoC 3, S5; infrequent, increasing. 14855.
- Festuca myuros* L. – Foxtail Fescue. Introduced; infrequent, stable. 14478, 14501, 14673, 15120, 15486.
- Festuca rubra* L. – Red Fescue. Native/Introduced; frequent, stable. 15099, 15134, 15135, 15477.
- Hordeum jubatum* L. – Foxtail Barley. Introduced; frequent, increasing. 15636.
- Hordeum murinum* L. subsp. *leporinum* (Link) Arcang. – False Barley. Introduced; frequent, increasing. 14497, 14672.
- Leersia oryzoides* (L.) Sw. – Rice Cutgrass. Native, CoC 4, S5; rare, stable. 15854; 200451, 200452.
- Leersia virginica* Willd. – White Cutgrass. Native, CoC 5, S5; frequent, increasing. 14031, 14046, 14057, 14869.
- Lolium perenne* L. ssp. *perenne* – Perennial Ryegrass. Introduced; frequent, increasing. 201458, 201461.
- Microstegium vimineum* (Trin.) A. Camus – Japanese Stiltgrass. Introduced, prohibited; infrequent, stable. 15202.
- Muhlenbergia schreberi* J.F. Gmel. – Nimbalewell. Native, CoC 0, S5; frequent, increasing. 14080, 14880, 15791, 15938.
- Panicum amarum* Elliott ssp. *amarulum* (Hitchc. & Chase) Freckmann & Lelong – Tall Dune Panic Grass. Introduced; rare, stable. 15704.
- Panicum amarum* Elliott ssp. *amarum* – Dune Panic Grass. Native, Rare, CoC 8, S3; infrequent, stable. 15749.
- Panicum dichotomiflorum* Michx. ssp. *dichotomiflorum* – Smooth Panic Grass. Native, CoC 1, S5; frequent, increasing. 14879, 14924, 15836.
- Panicum virgatum* L. – Switchgrass. Native, CoC 4, S5; frequent, increasing. 14058, 14742, 15254.
- Phleum pratense* L. – Timothy. Introduced; infrequent, stable. 14680.
- Phragmites australis* (Cav.) Trin. ex Steud. subsp. *australis* – Common Reed. Introduced, prohibited; frequent, increasing. 14872, 15345.
- Poa annua* L. – Annual Bluegrass. Introduced; frequent, increasing. 14258, 14317, 14340, 14352, 14974, 15410, 201457.
- Poa nemoralis* L. – Woodland Bluegrass. Introduced; frequent, increasing. 14469, 14548, 14606, 14730, 15626.
- Poa pratensis* L. – Kentucky Bluegrass. Introduced; frequent, increasing. 14445, 15049, 15052, 15082.
- Poa trivialis* L. – Rough-Sheathed Bluegrass. Introduced; frequent, increasing. 14446, 14477, 14491, 14511, 15101, 201441.
- Schedonorus arundinaceus* (Schreb.) Dumort. – Tall Ryegrass. Introduced; frequent, increasing. 14449, 14489, 14597, 201436.
- Schedonorus pratensis* (Huds.) P. Beauv. – Meadow Ryegrass. Introduced; frequent, increasing. 15257.
- Schizachyrium scoparium* (Michx.) Nash – Little Bluestem. Native, CoC 4, S5; infrequent, stable. 15256, 15862.
- Setaria faberi* R.A.W. Herrm. – Giant Foxtail. Introduced; frequent, increasing. 13992, 14084, 15186, 15186.
- Setaria pumila* (Poir.) Roem. & Schult. ssp. *pumila* – Yellow Foxtail. Introduced; frequent, increasing. 15770.
- Setaria viridis* (L.) P. Beauv. var. *viridis* – Green Foxtail. Introduced; frequent, increasing. 14121.
- Sorghum halepense* (L.) Pers. – Johnson Grass. Introduced; rare, increasing. 15652.
- Tridens flavus* (L.) Hitchc. var. *flavus* – Purpletop Tridens. Native, CoC 0, S5; infrequent, stable. 15783, 15837.

#### Polygonaceae

- Fallopia convolvulus* (L.) Á. Löve – Black Bindweed. Introduced; frequent, increasing. 14691, 14693.
- Fallopia scandens* (L.) Holub – Climbing False Buckwheat. Native, CoC 6, S5; infrequent, stable. 15195.

*Persicaria extremiorientalis* (Vorosch.) Tzvelev – Far-Eastern Smartweed. Introduced; frequent, increasing. 13973, 14106, 14688, 14859, 15700.

*Persicaria lapathifolia* (L.) Delarbre – Pale Smartweed. Native, CoC 1, S?; frequent, increasing. 13975, 14860.

*Persicaria longiseta* (Bruijn) Kitag. – Low Smartweed. Introduced; frequent, increasing. 14062, 14171, 14172, 14852, 15383, 15386.

*Persicaria maculosa* Gray – Lady's Thumb. Introduced; frequent, increasing. 14825, 14851, 15910.

*Persicaria minor* (Huds.) Opiz – Small Water Pepper. Native; infrequent, increasing. 15855.

*Persicaria pensylvanica* (L.) M. Gómez – Pennsylvania Smartweed. Native, CoC 2, S5; infrequent, increasing. 13974, 15200.

*Persicaria perfoliata* (L.) H. Gross – Mile-A-Minute Weed. Introduced, prohibited; frequent, increasing. 14612, 14665, 14911, 15709.

*Persicaria virginiana* (L.) Gaertn. – Virginia Jumpseed. Native, CoC 5, S5; frequent, increasing. 14115, 15285.

*Polygonum aviculare* L. – Common Knotweed. Introduced; frequent, increasing. 13990, 14683, 15260, 15264, 15392, 15393, 15394, 15438, 15614, 15663.

*Reynoutria japonica* Houtt. – Japanese Knotweed. Introduced; frequent, increasing. 14857, 15846, 15847.

*Reynoutria sachalinensis* (F. Schmidt) Nakai – Giant Knotweed. Introduced, prohibited; rare, stable. 14368.

*Rumex acetosella* L. – Sheep Sorrel. Introduced; frequent, increasing. 14577, 201604.

*Rumex crispus* L. – Curly Dock. Introduced; frequent, increasing. 201435.

*Rumex cristatus* DC. – Greek Dock. Introduced; rare, increasing. 14686.

*Rumex obtusifolius* L. – Broadleaved Dock. Introduced; frequent, increasing. 14564.

#### Portulacaceae

*Portulaca oleracea* L. – Purslane. Introduced; frequent, increasing. 14619, 15263.

#### Potamogetonaceae

*Potamogeton crispus* L. – Curly Pondweed. Introduced, prohibited; infrequent, increasing. 14379, 15094.

*Potamogeton foliosus* Raf. ssp. *foliosus* – Leafy Pondweed. Native, CoC 2, S5; infrequent, stable. 14913, 15287, 15902.

#### Primulaceae

*Lysimachia arvensis* (L.) U. Manns & Anderb. – Scarlet Pimpernel. Introduced; rare, stable. 15871.

#### Ranunculaceae

*Clematis terniflora* DC. – Autumn Clematis, Sweet Autumn Virginsbower. Introduced, regulated; frequent, increasing. 15206, 15389.

*Ficaria verna* Huds. – Lesser Celandine. Introduced, prohibited; frequent, increasing. 14250, 14350, 201404.

*Ranunculus abortivus* L. – Small-Flowered Buttercup. Native, CoC 6, S5; frequent, increasing. 14512, 14939, 15019, 15653.

*Ranunculus acris* L. – Tall Buttercup. Introduced; frequent, increasing. 14297.

*Ranunculus bulbosus* L. – Bulbous Buttercup. Introduced; frequent, increasing. 15436.

*Ranunculus repens* L. – Creeping Buttercup. Introduced; frequent, increasing. 14572, 15456.

#### Rhamnaceae

*Frangula alnus* Mill. – Glossy Buckthorn. Introduced, prohibited; infrequent, increasing. 14116, 14539, 15685, 201429.

*Rhamnus cathartica* L. – European Buckthorn. Introduced, prohibited; infrequent, increasing. 13958, 14157.

#### Rosaceae

*Amelanchier laevis* Wiegand – Smooth Shadbush. Native, CoC 4, S5; rare, stable. 14303, 14466, 14517.

*Amelanchier sanguinea* (Pursh) DC. – Roundleaf Shadbush. Native, CoC 7, S5; rare, stable. 14374, 14514.

*Crataegus crus-galli* L. var. *crus-galli* – Cockspur Hawthorn. Native, CoC 2, S5; infrequent, stable. 14699.

*Crataegus monogyna* Jacq. – One-Seeded Hawthorn. Introduced; rare, stable. 13962.

*Crataegus phaenopyrum* Borkh. – Washington-Thorn. Introduced; rare, increasing. 14161, 14162.

*Crataegus pruinosa* (H.L. Wendl.) K. Koch – Frosted Hawthorn. Native, CoC 2, S4; infrequent, increasing. 15458, 15463, 15901, 201454.

*Geum canadense* Jacq. – White Avens. Native, CoC 5, S5; frequent, increasing. 14562, 15711, 15753.

*Malus hupehensis* (Pamp.) Rehder – Chinese Crabapple. Introduced; frequent, increasing. 14306, 14307, 14349, 14369, 14675, 15015, 15047, 15071, 15109, 15453, 15662, 15755.

*Malus pumila* Mill. – Apple. Introduced; infrequent, increasing. 15048.

*Malus toringo* (Siebold) Siebold ex de Vriese – Toringo Crabapple. Introduced; frequent, increasing. 15376, 15461, 15629, 15630, 15648, 15692, 15758.



*Photinia villosa* (Thunb.) DC. – Christmasberry. Introduced; frequent, increasing. 13964, 14135, 15419, 15462.

*Potentilla argentea* L. – Silvery Cinquefoil. Introduced; infrequent, stable. 15283.

*Potentilla indica* (Andrews) Th. Wolf – Indian Strawberry. Introduced; frequent, increasing. 14326, 14361, 14460, 201421.

*Potentilla norvegica* L. – Rough Cinquefoil. Native, CoC 0, S?; frequent, stable. 14513, 14671.

*Potentilla recta* L. – Sulphur Cinquefoil. Introduced; infrequent, stable. 15478.

*Potentilla simplex* Michx. – Common Cinquefoil. Native, CoC 0, S5; frequent, increasing. 15355.

*Prunus serotina* Ehrh. – Black Cherry. Native, CoC 4, S5; frequent, increasing. 14468, 14731, 201409.

*Prunus virginiana* L. – Chokecherry. Native, CoC 3, S5; infrequent, increasing. 14305, 14982, 14985, 15421.

*Prunus* × *yedoensis* Matsum – Yoshino Cherry. Introduced; infrequent, increasing. 15688, 15716.

*Pyrus calleryana* Decne. – Callery Pear. Introduced; frequent, increasing. 14133, 14287, 14342, 14360, 14984, 15016, 15754.

*Rosa multiflora* Thunb. Multiflora Rose. Introduced, prohibited; frequent, increasing. 14218, 14444.

*Rubus allegheniensis* Porter – Common Blackberry. Native, CoC 3, S5; frequent, stable. 14538.

*Rubus flagellaris* Willd. – Northern Dewberry. Native, CoC 1, S5; frequent, increasing. 14470, 14735, 15072.

*Rubus laciniatus* Willd. – Cut-Leaved Blackberry. Introduced; frequent, increasing. 14029, 14537.

*Rubus occidentalis* L. – Black Raspberry. Native, CoC 3, S5; frequent, increasing. 14079, 14163.

*Rubus pensilvanicus* Poir. – Pennsylvania Blackberry. Native, CoC 3, S5; frequent, increasing. 14061, 14695, 15073, 15114, 201410, 201430, 201431.

*Rubus phoenicolasius* Maxim. – Wineberry. Introduced, prohibited; frequent, increasing. 14164, 14585.

#### Rubiaceae

*Galium album* L. – Hedge Bedstraw. Introduced; frequent, increasing. 14502, 14705, 201503.

*Galium aparine* L. – Catchweed Bedstraw. Native, CoC 0, S5; frequent, increasing. 14498, 201502.

#### Salicaceae

*Populus deltoides* W. Bartram ex Marshall – Eastern Cottonwood. Native; infrequent, increasing. 15194, 15467.

*Salix cinerea* L. – Introduced, prohibited; infrequent, increasing. 15452.

*Salix nigra* Marshall – Black Willow. Native, CoC 5, S5; infrequent, decreasing. 14978.

#### Sapindaceae

*Acer negundo* L. var. *negundo* – Boxelder Maple. Native, CoC 1, S5; infrequent, stable. 14313.

*Acer palmatum* Thunb. – Japanese Maple. Introduced; infrequent, increasing. 14188, 14717.

*Acer platanoides* L. – Norway Maple. Introduced, regulated; frequent, increasing. 14281, 14376, 14492.

*Acer pseudoplatanus* L. – Sycamore Maple. Introduced, prohibited; frequent, increasing. 14718.

*Acer rubrum* L. var. *rubrum* – Red Maple. Native, CoC 4, S5; frequent, increasing. 14141, 14241, 15078, 15415.

*Acer saccharinum* L. – Silver Maple. Native, CoC 6, S5; rare, stable. 14357.

*Acer saccharum* Marshall – Sugar Maple. Native, CoC 7, S5; infrequent, increasing. 13991, 14052, 14140, 15613.

*Koelreuteria paniculata* Laxm. – Goldenrain Tree. Introduced; infrequent, increasing. 14199, 14641, 15017, 15018.

#### Saururaceae

*Saururus cernuus* L. – Lizard's Tail. Native, CoC 6, S5; frequent, increasing. 14573, 15650.

#### Scrophulariaceae

*Verbascum blattaria* L. – Moth Mullein. Introduced; infrequent, increasing. 14525.

*Verbascum thapsus* L. – Common Mullein. Introduced; infrequent, increasing. 14159.

#### Simaroubaceae

*Ailanthus altissima* (Mill.) Swingle – Tree-Of-Heaven. Introduced; frequent, increasing. 14123.

#### Smilacaceae

*Smilax glauca* Walter – White-Leaved Greenbrier. Native, CoC 6, S5; infrequent, stable. 14126, 15378.

*Smilax rotundifolia* L. – Common Greenbrier. Native, CoC 4, S5; frequent, increasing. 14181, 14516, 15379.

#### Solanaceae

*Datura stramonium* L. – Jimsonweed. Introduced; frequent, increasing. 201601.

*Lycium barbarum* L. – Matrimony Vine. Introduced; frequent, increasing. 14174, 15391, 15832, 15832, 15848.

*Physalis heterophylla* Nees – Clammy Groundcherry. Native, CoC 0, S5; rare, stable. 15908.

*Solanum carolinense* L. var. *carolinense* – Horsenettle. Native, CoC 0, S5; frequent, stable. 14580, 15632.

*Solanum dulcamara* L. – Bittersweet Nightshade. Introduced; frequent, increasing. 14194, 14471, 15618, 15691, 201437.

*Solanum nigrum* L. – Black Nightshade. Introduced; frequent, stable. 14060, 15261, 15262.

*Solanum ptycanthum* Dunal – Eastern Black Nightshade. Native, CoC 0, S5; frequent, increasing. 14687.

*Solanum rostratum* Dunal – Buffalo Bur. Introduced; rare, stable? 15184.

### **Typhaceae**

*Typha angustifolia* L. – Narrowleaf Cattail. Native, CoC 1, S5; infrequent, increasing. 14589, 14648, 15856.

### **Ulmaceae**

*Ulmus americana* L. – American Elm. Native, CoC 4, S5; frequent, increasing. 13957, 14283, 14348, 14987, 15004, 15005.

*Ulmus glabra* Huds. – Wych Elm. Introduced; frequent, increasing. 14301, 14304, 14308, 14310, 14391, 15007.

*Ulmus pumila* L. – Siberian Elm. Introduced; frequent, increasing. 14111.

*Ulmus rubra* Muhl. – Slippery Elm. Native, CoC 8, S5; infrequent, stable. 14475.

### **Urticaceae**

*Boehmeria cylindrica* (L.) Sw. – False Nettle. Native, CoC 7, S5; infrequent, increasing. 15138, 201469.

*Laportea canadensis* (L.) Gaudich. – Wood Nettle. Native, CoC 8, S5; rare, stable. 14828.

*Parietaria pensylvanica* Muhl. ex Willd. – Pennsylvania Pellitory. Native, CoC 2, S5; frequent, increasing. 13967, 14294, 14493.

*Pilea pumila* (L.) A. Gray – Green-Fruited Clearweed. Native, CoC 2, S5; infrequent, increasing. 14891.

### **Verbenaceae**

*Verbena hastata* L. – Blue Vervain. Native, CoC 3, S5; rare, stable. 15835.

*Verbena urticifolia* L. – White Vervain. Native, CoC 2, S5; frequent, increasing. 14186, 14208.

### **Violaceae**

*Viola canadensis* L. – Canadian White Violet. Native; infrequent, increasing. 14399, 15924.

*Viola pubescens* Aiton var. *scabriuscula* Torr. & A. Gray – Smooth Yellow Violet. Native, CoC 7, SNR; infrequent, increasing. 14270, 15107.

*Viola sororia* Willd. – Common Blue Violet. Native, CoC 3, S5; frequent, increasing. 14114, 14256, 14282, 14337, 14355, 14370, 14450, 15000, 15001, 15060, 15411, 15412, 15413, 15414.

*Viola sororia* Willd. forma *priceana* (Pollard) Cooperr. – Confederate Violet. Native; frequent, increasing. 14262, 14288, 14295, 14300, 14316, 14353.

*Viola striata* Aiton – Striped Cream Violet. Native; frequent, increasing. 14396, 14534, 15111, 15387, 15396, 201423.

### **Vitaceae**

*Ampelopsis glandulosa* (Wall.) Momiy. – Porcelain-Berry. Introduced, prohibited; frequent, increasing. 14044, 14536; 200453, 200454.

*Parthenocissus inserta* (A. Kern.) Fritsch – Thicket Creeper. Native, CoC 2, S5; infrequent, increasing. 15063, 15199.

*Parthenocissus quinquefolia* (L.) Planch. – Virginia Creeper. Native, CoC 4, S5; frequent, increasing. 14611, 15068.

*Parthenocissus tricuspidata* (Siebold & Zucc.) Planch. – Japanese Creeper. Introduced; frequent, increasing. 14138, 14200, 14690, 15280.

*Vitis aestivalis* L. – Summer Grape. Native, CoC 4, S5; rare, stable. 201449.

*Vitis labrusca* L. – Fox Grape. Native, CoC 6, S5; rare, stable. 15196.

## **Appendix 2**

The following are plants ranked by us as waifs. These are mostly introduced plants that occur sporadically, but do not establish self-sustaining populations (see Materials and Methods for more complete definition). These values are followed by abundance in Central Park as observed by us during the five-year period from 2013 to 2017 (inclusive): rare (1 population or individual); infrequent (2–5 populations); and frequent (> 5 populations). Frequency is assessed as either decreasing, stable, or increasing. All voucher specimens are at the New York Botanical Garden (NY). Collection numbers 13000–16000 are assigned to D. Atha and co-collectors and collection numbers between 201300–201700 are assigned to R. Alvarez and co-collectors.

## FERNS

**Athyriaceae**

*Athyrium niponicum* (Mett.) Hance var. *pictum* (Maxwell) Fraser-Jenk. – Japanese Painted Fern. Introduced; rare, stable. 14856.

## FLOWERING PLANTS

**Amaranthaceae**

*Amaranthus cruentus* L. – Blood Amaranth. Introduced; rare, stable. 14886, 15185.

*Amaranthus hypochondriacus* L. – Prince's-Feather. Introduced; rare, stable. 15793.

**Amaryllidaceae**

*Allium proliferum* (Moench) Schrad. ex Willd. – Walking Onion. Introduced; rare, decreasing. 14465.

**Apiaceae**

*Erigenia bulbosa* (Michx.) Nutt. – Harbinger-Of-Spring. Native; rare, decreasing. 14248.

**Apocynaceae**

*Asclepias curassavica* L. – Tropical Milkweed. Introduced; rare, decreasing. 15860.

*Asclepias purpurascens* L. – Purple Milkweed. Native, Threatened, CoC 2, S2S3; rare, decreasing. 15136.

**Araceae**

*Pistia stratiotes* L. – Water Lettuce. Introduced; rare, decreasing. 14864, 14868, 14910, 15121.

**Asteraceae**

*Bidens aristosa* (Michx.) Britton – Midwestern Beggarticks. Introduced; rare, decreasing. 15839.

*Helianthus annuus* L. – Common Sunflower. Introduced; infrequent, stable. 15159.

*Onopordum acanthium* L. – Scotch Thistle. Introduced; rare, decreasing. 15188.

**Balsaminaceae**

*Impatiens balfourii* Hook. f. – Kashmir Impatiens. Introduced; rare, decreasing. 15174.

**Bignoniaceae**

*Bignonia capreolata* L. – Cross Vine. Introduced; rare, stable. 15173.

**Boraginaceae**

*Cynoglossum amabile* Stapf & J.R.Drumm. – Chinese Forget-Me-Not. Introduced; rare, decreasing. 15720.

**Cucurbitaceae**

*Cucumis melo* L. – Muskmelon. Introduced; rare, decreasing. 14723.

*Cucurbita ficifolia* Bouché – Figleaf Gourd. Introduced; rare, decreasing. 14935.

*Cucurbita moschata* Duchesne ex Poir. – Pumpkin. Introduced; rare, decreasing. 15189, 15747.

**Cyperaceae**

*Cyperus brevifolioides* Thieret & Delahouss. – Asian Green-Headed Sedge. Introduced; rare, stable. 14900.

**Euphorbiaceae**

*Phyllanthus urinaria* L. – Chamber Bitter. Introduced; rare, decreasing. 201613.

**Fabaceae**

*Chamaecrista nictitans* (L.) Moench – Sensitive Pea. Native, CoC 1, S4S5; rare, decreasing. 14085.

*Trifolium incarnatum* L. – Crimson Clover. Introduced; rare, decreasing. 15668.

*Vigna unguiculata* (L.) Walp. – Blackeyed Pea. Introduced; rare, decreasing. 14926.

**Lamiaceae**

*Mentha spicata* L. – Spearmint. Introduced; rare, decreasing. 14692.

**Malvaceae**

*Abelmoschus manihot* (L.) Medik – Aibika. Introduced; rare, decreasing. 15795.

*Malva sylvestris* L. – Common Mallow. Introduced; rare, decreasing. 14915.

**Poaceae**

*Leptochloa panicea* (Retz.) Ohwi *brachiata* (Steud.) N. Snow – Mucronate Sprangeltop. Introduced; rare, decreasing. 15351.

*Leymus arenarius* (L.) Hochst. – European Dune Grass. Introduced; rare, decreasing. 15473.

*Panicum miliaceum* L. ssp. *miliaceum* – Proso Millet. Introduced; infrequent, stable. 14740, 15198.

*Phalaris canariensis* L. – Annual Canary Grass. Introduced; rare, decreasing. 15146.

*Sorghum bicolor* (L.) Moench ssp. *bicolor* – Sorghum. Introduced; frequent, stable. 14640, 14871

*Tridens strictus* (Nutt.) Nash – Longspike Tridens. Introduced; rare, decreasing. 15364.

*Triticum aestivum* L. – Wheat. Introduced; rare, decreasing. 14581.

*Zea mays* L. ssp. *mays* – Corn. Introduced; rare, decreasing. 15798.

**Rosaceae**

*Prunus persica* (L.) Batsch – Peach. Introduced; infrequent, stable. 15012, 15400.

**Solanaceae**

*Solanum lycopersicum* L. – Tomato. Introduced; frequent, stable. 14095, 14937.