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# The North American species of the non-native flora of the Kyiv urban area (Ukraine): a checklist and analysis

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**Abstract:** This paper presents an annotated checklist of the North American species established in the flora of the Kyiv urban area (KUA). For each taxon, the following data are provided: distribution in the area, degree of naturalization, period of immigration, mode of immigration and ecological characteristics. The group of the North American neophytes consists of 114 species belonging to 71 genera and 36 families and 23 cultivated species and of problematic taxonomic status. Among them prevail ergasiophytes (26%), ergasiophygophytes (22%) and ephemerophytes (19%). The majority of neophytes (47%) have spread over all types of ecotopes. Among them 12 species are invasive alien plants in the KUA.

*Key words:* urban flora, naturalization of North American species, invasive plants, Kyiv

## 1. Introduction

Alien flora of Ukraine consists of ca. 830 alien spontaneous species (ca. 14% of the total flora of Ukraine) (Protopopova *et al*. 2002). Alien taxa of North American origin are considered the second largest geographical group among alien plants occurring in Ukraine. Most of them invade natural plant communities and displace native species. North American plants were recognized as a model group in developing a national strategy on alien invasive species (Mosyakin 2006). Most of invasive alien plants recognized as highly invasive in Ukraine is also highly invasive in the Kyiv urban area (KUA). So, the present estimation of the invasion ability of North American alien species is of high importance.

The Kyiv City Agglomeration – the capital of Ukraine, comprising the city of Kyiv and several satellite towns and smaller settlements, is located on both banks of the Dnipro River. The area of Kyiv within its official administrative borders covers 824 km$^2$. The KUA is situated at the border of the forest and forest-steppe physiographic and vegetation zones. Seminatural and human-made habitats are well represented in the KUA, and the region's altered or disturbed plant communities are formed mostly by synanthropic plant species. In the 18$^{th}$ century, Kyiv began to develop as an industrial city. Continued development resulted in the formation of a large urbanized area with a dramatically transformed flora and vegetation.

The aim of the present study is to investigate the role of North American species in the formation of alien fraction of the synanthropic flora of the KUA.

## 2. Materials and methods

In the course of preparing the checklist of the North American species established in the KUA we have also referred to botanical literature (among others: Bortnyak 1978a, 1978b; Bortnyak *et al*. 1992; Kotov 1979; Mosyakin 1990, 1991a, 1991b, 1995, 1996; Protopopova 1973, 1991; Mosyakin & Yavorska 2002;), herbarium collections (mainly the collection of the National Herbarium of Ukraine) and data from our recent field studies, in particular, the collections and observations by Mosyakin (1985-2002) and Yavorska (1998-2008). During the field work, the distribution data of individual species were recorded.

The nomenclature mainly follows the Checklist of vascular plants of Ukraine (Mosyakin & Fedoronchuk 1999), while the terminology on synanthropic floras and alien plants follows that used in European publications. For the checklist, the following categories were used:

(1) degree of naturalization: neoindigenophytes, epekophytes and ephemerophytes (Pyšek *et al.* 2004); (2) time of immigration to the KUA: kenophytes – plants that immigrated between the 16th century and the end of the 19th century, eukenophytes-A – plants that immigratedin the first half of the 20th century, eukenophytes-B – plants that immigrated after the World War II up to the end of the 1980s, eukenophytes-C – plants that immigrated during the last 20 years (Yavorska 2002); (3) mode of immigration to the KUA: hemerophytes and xenophytes (Pyšek *et al.* 2004); (4) distribution of species: eu-urbanophils – spread only in intensively exploited lawns, in waste land and along railways and roadsides, hemi-urbanophils – occur in all types of urban zones, urbanoneutral plants – found both in urban and suburban zones (Gubar 2008); (5) type of biotope: gardens, flower-beds and parks, ruderal and waste land, along major highways and railroads, especially, near major terminal and transit stations, (semi)natural habitats; (6) ecological spectrum of species: heliophytes, helio- scyophytes, scyo-heliophytes, xerophytes, xeromesophytes, mesoxerophytes, mesophytes and hydrophytes.

## 3. Results and discussion

Nowadays, the synanthropic flora of the Kyiv Urban Area is relatively rich and diversified in alien species (Mosyakin & Yavorska 2002). The total alien flora of the KUA consists of 598 species belonging to 313 genera and 73 families. The modern alien flora comprises species that have already become established and were confirmed for the area in 1998-2008; it contains 363 species of 203 genera and 63 families.

In the formation of the total alien flora of the KUA, the leading role is played by species native to Ancient Mediterranean (including 27% of Mediterranean and 4% of Irano-Turanian origin) and North American (23%) floristic regions (Table 1). All North American alien species are neophytes. The species introduced during the 20th century are mainly eukenophytes (76.3%) which are over three times more numerous than kenophytes (23.7%), i.e. species that were introduced by the end of the 19th century (Fig. 1). This increasing dynamics concerns only North American alien species.

**Table 1.** Origin of the alien species of the KUA (two largest groups highlighted in bold)

| Groups by origin | No. of species | % |
|---|---|---|
| **Mediterranean** | **162** | **27** |
| Mediterranean-irano-turanian | 120 | 20 |
| Irano-turanian | 24 | 4 |
| West European | 30 | 5 |
| Asian | 95 | 16 |
| **North American** | **137** | **23** |
| South and Central American | 12 | 2 |
| Unknown origin | 18 | 3 |
| Total | 598 | 100 |

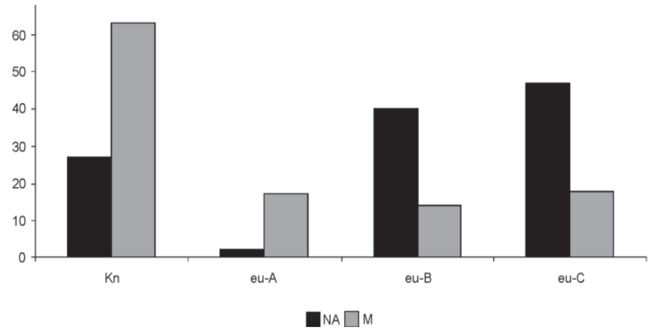


**Fig. 1.** The participation of the North American and Mediterranean kenophyte species in the alien flora of the KUA
Explantions: NA – North American species, M – Mediterranean species; Kn – kenophytes, eu-A – eukenophytes-A, eu-B – eukenophytes-B, eu-C – eukenophytes-C

In terms of the mode of immigration, hemerophytes dominate among kenophytes (62%) and eukenophytes-B (46.5%), though some of xeno-kenophytes (unintentionally introduced kenophytes) have become completely naturalized, especially in vulnerable and already severely disturbed habitats of the KUA (among others: *Amaranthus retroflexus*, *Conyza canadensis*, *Lepidium densiflorum*, *Oenothera biennis* and *Phalacroloma annua*). In the 20th century, the initial expansion (penetration into the territory) of North American species concentrated along railroads, especially near major terminal and transit stations, occasionally along major highways (Appendix). About 47% of new records of alien plants (eukenophytes-C) are restricted to these areas, especially it concerns the representatives of Poaceae (*Beckmannia syzigachne*, *Cenchrus longispinus*, *Ceratochloa carinata*, *Echinochloa microstachya*, *E. wiegandii*, *Hordeum jubatum* and species of genus *Panicum*) and *Chenopodiaceae* (*Chenopodium berlandieri* and *Ch. pratericola*).

Our analysis of species that become established and were confirmed for the area in 1998-2008 demonstrated that the group of North American plants as well as species from the Mediterranean region play the leading role in forming the modern alien flora of the KUA (Fig. 1). At present, a decrease in the proportion of hemi-urbanophil plants (47%) and an increase in the wide-spread alien species (25%) has been observed. It results from geographical conditions and diversity of synanthropic and also many seminatural habitats within the city area. The greatest number of alien species is concentrated in the places of their cultivation – gardens, flower-beds, parks and along railroads and highways. Thus, plants of open habitats (heliophytes) prevail among them (61%). New taxa that entered the alien fraction in the second half of the 20th century are represented mostly by xerophytes (35%), xeromesophytes (58%) and mesoxerophytes (0.4%), which reflects the xerophytic character of the flora. Thus, we observe that the flora of the Kyiv region is becoming much like floras of other areas in spite of human efforts to keep only native vegetation.

The stable component of the modern nonnative flora of the KUA is formed by 198 species of 147 genera and 51 families and includes only effectively naturalized species (ergasiolipophytes, neoindigenophytes and epekophytes). In the structure of the established element of the flora the highest proportion of species belongs to the group of North American plants – 23% as compared to the Mediterranean (16%) and Irano-Turanian (18%) taxa. It has been observed that in the studied group of alien plants the percentage of species introduced by the end of the 19th century (23.7%) is roughly equal to that of eukenophytes-B (26%), which arrived after the World War II and up to the end of the 1980s. Recently, about 60 new North American species have been found in the KUA, including *Ambrosia trifida,* species of genus *Amaranthus, Chenopodium, Ceratochloa carinata, Euphorbia dentata, Oenothera laciniata, Rumex triangulivalvis* and *Salvia reflexa* and at least 12 of them have been recognized as invasive plants, particularly: *Ambrosia artemisiifolia, Amorpha fruticosa, Bidens frondosa, Echinocystis lobata, Grindelia squarrosa* and *Padus serotina*. So, it shows that North American species are able to effectively naturalize and spread over practically the whole territory of the KUA in short time. In terms of the mode of immigration, hemerophytes dominate (67%). The fact that the stable component of adventives in the flora of the KUA is represented mostly by widespread plants which escaped from cultivation supports the idea that the KUA is the center of establishment and dispersal of non-native species from North America.

Our analysis of North American plants by their degree of naturalization has shown that ephemerophytes (19%), epekophytes (14%), ergasiophytes (26%) and ergasiophygophytes (22%) clearly prevail. Less numerous (19%) are species representing ergasiolipophytes and neoindigenophytes. Interestingly, the proportion of epekophytes of North American origin (14%) is lower than epekophytes from the Mediterranean region (37%). North American plants are most numerous in the group of species that successfully naturalized in the 20th century (36% of all eukenophytes while only 16% in the case of Mediterranean species). As a result, alien species differ in their impact on the structure of plant communities. The Mediterranean alien species are not such invasive as North-American epekophytes, which become more and more expansive from year to year. Among them, 12 species are invasive alien plants in the KUA. So, the North American species constitute the important component of invasive species of the alien flora of the KUA (about 80%). Thus, dynamic changes in the flora of the KUA comprise several equally important processes, among which one of the most important is the naturalization of alien plants with various immigration histories. Hemerophytes are a dominant group in terms of the mode of immigration. The establishment of invasive exotic plant species in natural habitats usually reduces the level of local biodiversity. Such processes have been actively proceeding in the Kyiv Urban Areas. As an example, there are well documented historical records of the escape of species from cultivation, including, among others: *Iva xanthiifolia*, *Asclepias syriaca*, *Solidago canadensis* and *Echinocystis lobata*. We think that the research focus in studies of alien plants should be now partially shifted to cultivated and escapee plants, since at present that group is gaining more and more importance in the process of "enrichment" of the alien fraction.

The problem of genesis of urban flora became a matter of great ecological and economic importance over the whole world. The obtained data testify to instability in the present nonnative component of the KUA's flora as it goes through an intensive period of formation. According to our floristic studies, the North American species played the important role in the development and modern transformation of the area, especially in shaping its alien flora.

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**Appendix 1.** Checklist of the North American species in the non-native flora of the KUA

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Aceraceae** | | | | | | | | | | |
| *Acer negundo* L. | ELp | eu-A | Hmr | N | + | + | + | + | hs | xm |
| *Acer saccharinum* L. | EPhg? ELp | eu-B | Hmr | N | + | | | + | hs | xm |
| **Amaranthaceae** | | | | | | | | | | |
| *Amaranthus albus* L. | Epo | eu-A | Xen | F | | | + | | h | x |
| *Amaranthus blitoides* S. Watson | Epo | eu-B | Xen | F | | | + | | h | x |
| *Amaranthus hypochondriacus* L. | ErPh | eu-C | Hmr | G | | | + | | h | x |
| *Amaranthus palmeri* S. Watson | Eph | eu-C | Xen | F | | | + | | h | x |
| *Amaranthus retroflexus* L. | Epo | Kn | Xen | G | + | + | + | + | hs | xm |
| *Amaranthus rudis* Sauer | Eph | eu-C | Xen | F | | | + | | h | x |
| *Amaranthus tuberculatus* (Moq.) Sauer | Eph | eu-C | Xen | F | | | + | | h | x |
| **Anacardiaceae** | | | | | | | | | | |
| *Toxicodendron radicans* (L.) O. Kuntze | ErPh | eu-C | Hmr | N | + | | | | hs | xm |
| **Asclepiadaceae** | | | | | | | | | | |
| *Asclepias syriaca* L. | ELp | Kn | Hmr | G | | + | + | + | hs | xm |
| **Asteraceae** | | | | | | | | | | |
| *Ambrosia artemisiifolia* L. | Epo? NnD | eu-B | Xen | G | + | + | + | + | hs | x |
| *Ambrosia trifida* L. | Eph | eu-C | Xen | F | | | + | | h | x |
| *Bidens connata* Muehl. ex Willd. | NnD | eu-C | Xen | G | | | + | + | hs | xm |
| *Bidens frondosa* L. | NnD | eu-B | Xen | G | | | + | + | hs | xm |
| *Conyza canadensis* (L.) Cronq. | NnD | Kn | Xen | G | + | + | + | + | hs | xm |
| *Coreopsis grandiflora* Hogg ex Sweet | EPhg | eu-C | Hmr | G | + | | | | h | xm |
| *Coreopsis lanceolata* L. | EPhg | eu-C | Hmr | G | + | | | | h | xm |
| *Coreopsis tinctoria* Nutt. | EPhg | eu-C | Hmr | G | + | | | | h | xm |
| *Grindelia squarrosa* (Pursh) Dunal. | Epo | eu-B | Xen | F | + | + | + | | h | x |
| *Helianthus annuus* L. | ErPh | Kn | Hmr | G | + | + | + | | h | xm |
| *Helianthus decapetalus* L. | EPhg | eu-C | Hmr | G | | + | + | | h | xm |
| *Helianthus ×laetiflorus* Pers. | EPhg | eu-C | Hmr | G | + | + | + | + | h | xm |
| *Helianthus rigidus* (Cass.) Desf. | ErPh | eu-C | Hmr | G | | + | + | | h | xm |
| *Helianthus subcanescens* (A. Gray) E. E. Wats. | EPhg | eu-C | Hmr | G | | | + | + | h | xm |
| *Helianthus tuberosus* L. | EPhg? ELp | Kn | Hmr | N | + | | | | | |
| *Heliopsis scabra* Dunal | ErPh | eu-B | Hmr | G | + | | | | h | xm |
| *Iva xanthiifolia* Nutt. | ELp | Kn | Hmr | N | + | + | + | + | h | xm |
| *Lepidotheca suaveolens* (Pursh) Nutt. | Epo | Kn | Xen | N | + | + | + | + | h | xm |
| *Phalacroloma annuum* (L.) Dumort. | Epo | Kn | Xen | N | + | + | + | + | h | xm |
| *Phalacroloma septentrionale* (Fernald & Wiegand) Tzvelev | Epo | eu-B | Xen | N | + | + | + | + | h | xm |
| *Rudbeckia hirta* L. | EPhg | Kn | Hmr | G | + | | | | h | xm |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Rudbeckia laciniata* L. | EPhg | Kn | Hmr | G | + | | | | h | xm |
| *Silphium perfoliatum* L. | ErPh | eu-C | Hmr | G | + | | | | hs | xm |
| *Solidago canadensis* L. | ELp | Kn | Hmr | N | + | + | + | + | h | xm |
| *Solidago serotinoides* A. Love & D. Love | EPhg? ELp | eu-B | Hmr | N | + | | + | + | h | xm |
| *Symphyotrichum lanceolatum* (Willd.) Nesom | EPhg | eu-B | Hmr | G | + | | | | h | xm |
| *Symphyotrichum novae-angliae* (L.) Nesom | EPhg | Kn | Hmr | G | + | | | | h | xm |
| *Symphyotrichum novi-belgii* (L.) Nesom | EPhg | Kn | Hmr | G | + | | | | h | xm |
| *Symphyotrichum ×salignum* (Willd.) Nesom | EPhg | Kn | Hmr | G | + | | | | h | xm |
| **Berberidaceae** | | | | | | | | | | |
| *Mahonia aquifolium* (Pursh) Nutt. | EPhg | eu-B | Hmr | N | + | | | + | sh | xm |
| **Brassicaceae** | | | | | | | | | | |
| *Lepidium densiflorum* Schrad. | Epo | Kn | Xen | G | | + | + | | h | x |
| **Caesalpiniceae** | | | | | | | | | | |
| *Gleditsia triacanthos* L. | EPhg | Kn | Hmr | N | + | | | | hs | xm |
| **Caprifoliaceae** | | | | | | | | | | |
| *Symphoricarpus albus* (L.) S. F. Blake s.l. | EPhg | eu-B | Hmr | G | + | | | | hs | xm |
| **Chenopodiaceae** | | | | | | | | | | |
| *Chenopodium berlandieri* Moq. subsp. *zschackei* (J. Murr) Zobel | Eph | eu-C | Xen | F | | | + | | h | x |
| *Chenopodium capitatum* (L.) Ambrosi | | | | | | | + | | | |
| *Chenopodium glaucophyllum* Aellen | Eph | eu-C | Xen | F | | | + | | h | x |
| *Chenopodium missouriense* Aellen | Eph | eu-C | Xen | F | | | + | | h | x |
| *Chenopodium pratericola* Rydb. | Eph | eu-C | Xen | F | | | + | | h | x |
| *Corispermum pallasii* Steven | Epo | eu-C | Xen | F | | | + | | h | x |
| **Commelinaceae** | | | | | | | | | | |
| *Tradescantia virginiana* L. | EPhg | eu-C | Hmr | G | + | | | | sh | mx |
| **Convolvulaceae** | | | | | | | | | | |
| *Calystegia spectabilis* (Brummitt) Tzvelev | ErPh | eu-C | Hmr | G | + | | | | h | xm |
| **Cucurbitaceae** | | | | | | | | | | |
| *Citrulus lanatus* (Thunb.) Matsum. & Nakai | ErPh | Kn | Hmr | G | | + | | | h | xm |
| *Cucurbita pepo* L. | ErPh | Kn | Hmr | G | | + | | | h | xm |
| *Echinocystis lobata* (Michx.) Torr. & A. Gray | ELp | eu-B | Hmr | N | + | + | | + | hs | xm |
| *Sicyos angulata* L. | ELp | Kn | Hmr | G | | + | | | hs | xm |
| **Cuscutaceae** | | | | | | | | | | |
| *Cuscuta campestris* Yuncker | Epo | eu-B | Xen | F | | + | + | | h | x |
| *Cuscuta gronovii* Willd. ex Roem. & Schult. | Eph | eu-B | Xen | F | | + | + | | h | x |
| **Euphorbiaceae** | | | | | | | | | | |
| *Euphorbia dentata* Michx. | Epo | eu-C | Xen | F | | | + | | h | x |
| *Euphorbia marginata* Pursh | EPhg | eu-C | Hmr | G | + | | | | h | xm |
| **Fabaceae** | | | | | | | | | | |
| *Amorpha fruticosa* L. | ELp | eu-B | Hmr | N | + | + | | + | h | xm |
| *Lupinus polyphyllus* Lindl. | EPhg? ELp | eu-C | Hmr | G | + | + | | + | hs | xm |
| *Robinia pseudoacacia* L. | ELp | eu-A | Hmr | N | + | + | | + | h | xm |
| *Robinia viscosa* Vent. | EPhg? ELp | eu-C | Hmr | G | + | | | | h | xm |
| **Fagaceae** | | | | | | | | | | |
| *Quercus palustris* Moench | EPhg | eu-C | Hmr | N | + | | | | h | xm |
| *Quercus rubra* L. (*O. borealis* Michx.) | EPhg? ELp | eu-B | Hmr | N | + | | | + | h | xm |
| **Hydrocharitaceae** | | | | | | | | | | |
| *Elodea canadensis* Michx. | NnD | Kn | Xen | N | | | | + | hs | hd |
| **Hydrophyllaceae** | | | | | | | | | | |
| *Phacelia tanacetifolia* Benth. | ErPh | Kn | Hmr | G | + | | | | hs | xm |
| **Iridaceae** | | | | | | | | | | |
| *Sisyrinchium septentrionale* Bicknell | ErPh | Kn | Hmr | G | + | | | + | sh | mx |
| **Junaceae** | | | | | | | | | | |
| *Juncus tenuis* Willd. | NnD | Kn | Xen | N | | + | | + | hs | m |
| **Lamiaceae** | | | | | | | | | | |
| *Salvia reflexa* Hornem. | Eph | eu-C | Xen | F | + | + | | | h | x |
| **Nyctaginaceae** | | | | | | | | | | |
| *Mirabilis jalapa* L. | ErPh | eu-C | Hmr | G | + | + | + | + | hs | xm |
| *Oxybaphus nyctagineus* (Michx.) Sweet | Epo | Kn | Xen | G | + | + | + | | h | x |
| **Oleaceae** | | | | | | | | | | |
| *Fraxinus lanceolata* Borkh. | ErPh | eu-B | Hmr | N | + | | | | hs | xm |
| *Fraxinus pennsylvanica* Marshall | ErPh | eu-B | Hmr | N | + | | | | hs | xm |
| **Onagraceae** | | | | | | | | | | |
| *Epilobium ciliatum* Raf. s.l. (= *E. adenocaulon* Hausskn.) | NnD | eu-B | Xen | N | | | | + | sh | m |
| *Epilobium pseudorubescens* A. K. Skvortsov | Eph | eu-C | Xen | N | | | | + | sh | m |
| *Oenothera biennis* L. | Epo | Kn | Xen | G | | + | | + | h | xm |
| *Oenothera laciniata* Hill | Eph | eu-C | Xen | N | | + | + | + | h | xm |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Oenothera oakesiana* (A. Gray) Robbins ex S. Watson & Coult. | Eph | Kn | Xen | G | | | | | h | x |
| *Oenothera villosa* Thunb. s.l. | EPhg | eu-B | Hmr | N | | + | + | + | h | xm |
| **Oxalidaceae** | | | | | | | | | | |
| *Xanthoxalis dillenii* (Jacq.) Holub | Epo | eu-B | Xen | G | + | + | | + | sh | mx |
| *Xanthoxalis stricta* (L.) Small | NnD | Kn | Xen | G | + | + | + | + | hs | mx |
| **Phytolaccaceae** | | | | | | | | | | |
| *Phytolacca americana* L. | ErPh | eu-B | Hmr | G | + | | | | hs | xm |
| **Poaceae** | | | | | | | | | | |
| *Beckmannia syzigachne* (Steud.) Fernald | Eph | eu-C | Xen | G | | | + | | h | x |
| *Cenchrus longispinus* (Hack.) Fernald | Epo | eu-C | Xen | F | | + | + | | h | x |
| *Ceratochloa carinata* (Hook. & Arn.) Tutin | Eph | eu-C | Xen | F | | | + | | h | x |
| *Echinochloa microstachya* (Wiegand) Rydb. | Eph | eu-C | Xen | F | | | + | | h | x |
| *Echinochloa wiegandii* (Fassett) McNeill & Dore | Eph | eu-C | Xen | F | | | + | | h | x |
| *Elymus trachycaulus* (Link) Gould & Schinners | Eph | eu-C | Xen | F | | | + | | h | x |
| *Eragrostis pectinacea* (Michx.) Nees | Epo | eu-C | Xen | F | | | + | | h | x |
| *Hordeum jubatum* L. | Eph | eu-C | Xen | F | | | + | | h | x |
| *Panicum barbipulvinatum* Nash | Eph | eu-C | Xen | F | | | + | | h | x |
| *Panicum capillare* L. | Eph | eu-C | Xen | F | | | + | | h | x |
| *Panicum dichotomiflorum* Michx. | Eph | eu-C | Xen | F | | | + | | h | x |
| *Puccinellia nuttalliana* (Schult.) A. S. Hitchc. | Eph | eu-C | Xen | F | | | + | | h | x |
| **Polemoniaceae** | | | | | | | | | | |
| *Phlox paniculata* L. | ErPh | eu-B | Hmr | G | + | | | | hs | xm |
| *Phlox subulata* L. | ErPh | eu-B | Hmr | G | + | | | | hs | xm |
| **Polygonaceae** | | | | | | | | | | |
| *Polygonum ramosissimum* Michx. | Eph | eu-C | Xen | F | | | + | | h | x |
| *Rumex triangulivalvis* (Danser) Rech.f. | Epo | eu-C | Xen | F | | | + | | h | x |
| **Rosaceae** | | | | | | | | | | |
| *Aronia melanocarpa* (Michx.) Elliot | ErPh | eu-C | Hmr | G | + | | | | hs | xm |
| *Padus serotina* (Ehrh.) Ag. | ELp | eu-B | Hmr | N | + | | | + | hs | xm |
| *Physocarpus opulifolius* (L.) Maxim. | EPhg | eu-B | Hmr | G | + | | | | hs | xm |
| *Prunus besseyi* Bailey | ErPh | eu-B | Hmr | G | + | | | | hs | xm |
| *Prunus pensylvanica* L. | ErPh | eu-B | Hmr | G | + | | | | hs | xm |
| *Prunus virginiana* Mill. | ErPh | eu-C | Hmr | G | + | | | | hs | xm |
| *Spiraea douglasii* Hook. s.l. | EPhg | eu-C | Hmr | N | + | | | + | h | x |
| **Rutaceae** | | | | | | | | | | |
| *Ptelea trifoliata* L. | EPhg | eu-B | Hmr | G | + | | | + | hs | xm |
| **Salicaceae** | | | | | | | | | | |
| *Populus balsamifera* L. | EPhg | eu-C | Hmr | G | + | | | | hs | xm |
| *Populus deltoides* Marsh. | EPhg | eu-C | Hmr | G | + | | | | hs | xm |
| **Scrophulariaceae** | | | | | | | | | | |
| *Veronica peregrina* L. | Epo | eu-C | Xen | G | | + | | | h | x |
| **Solanaceae** | | | | | | | | | | |
| *Solanum carolinense* L. | Eph | eu-C | Xen | F | | | + | | h | x |
| **Vitaceae** | | | | | | | | | | |
| *Parthenocissus inserta* (A. Kern.) Fritsch | EPhg? ELp | eu-B | Hmr | N | + | + | | + | sh | xm |
| *Parthenocissus quinquefolia* (L.) Planch. | EPhg? ELp | eu-B | Hmr | N | + | + | | + | sh | xm |

Explanations: 1 – families and species, 2 – degree of naturalization, 3 – period of immigration, 4 – mode of immigration, 5 – distribution, 6 – gardens, parks and flower beds, 7 – ruderal and waste land, 8 – along railways, especially near major terminal and transit stations, and major highways, 9 – (semi)natural habitats, 10 – light requirements, 11 – water requirements; NnD – neoindigenophytes, Epo – epekophytes, Eph – ephemerophytes, Kn – kenophytes, eu-A – eukenophytes-A, eu-B – eukenophytes-B, eu-C – eukenophytes-C, Hmr – hemerophytes, Xen – xenophytes, F – eu-urbanophils, G – hemi-urbanophils, N – urbanoneutral species, h – heliophytes, hs – helio-scyophytes, sh – scyo-heliophytes, x – xerophytes, xm – xeromesophytes, mx – mesoxerophytes, m – mesophytes, hd – hydrophytes