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RESEARCH ARTICLE

## Flora of the phytogeographical plot “Central Asia” in the M.M. Gryshko National Botanical Garden of the National Academy of Sciences of Ukraine

 Oleksandr Shynder \*,  Julia Negrash

M.M. Gryshko National Botanical Garden, National Academy of Sciences of Ukraine, Tymiryazevska str. 1, 01014 Kyiv, Ukraine;  
\* shinderoleksandr@gmail.com

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### Abstract

For the first time, a complete inventory and analysis of the taxonomic composition of the flora of the phytogeographic plot “Central Asia” in the M.M. Gryshko National Botanical Garden of the NAS of Ukraine were conducted. The plot “Central Asia” was established in 1953 for the directed introduction and naturalization of plants from Central Asia. Over 1,000 plant species have been tested here during all this time, which indicates a large amount of experimental work. The structure of the flora on the study plot has certain features of the flora of Central Asia. According to the inventory results, 308 valid taxa (species and subspecies) of higher vascular plants from 168 genera and 66 families have been recorded on the plot. Of these, 183 taxa belong to the natural flora of Central Asia. The structure of the flora of plants on the study plot has certain features of the flora of Central Asia. However, in the conditions of Kyiv, the plants of Central Asian flora requiring more temperate habitats (e.g., plants originated from northern steppes, valley and lowland forests) have taken root best. The geographical structure of the flora of the plot is dominated by ergasiophytes with Central Asian (25.0%), Eurasian and Paleoarctic (together 34.2%), and sub-Mediterranean (10.9%) types of ranges. From this number, 42 species of ergasiophytes are endemic to Central Asia. The biomorphological structure of the flora of the plot is dominated by perennials (47.3%), and the share of woody plants is 26.4%. According to Raunkiaer’s classification of life forms, hemicryptophytes (28.4%), phanerophytes and cryptophytes (25.1% each) predominate on the plot. In the conditions of Kyiv, phanerophytes from mountainous regions appeared to be the most resistant plants. While among ergasiophytes of Central Asian origin, plants growing in forests, steppes, shrubs, and edges appeared the most represented. Among the ergasiophytes growing on the plot “Central Asia”, 24 species are listed in the red books of Central Asian countries. Currently, there are some problems related to the state of phytocoenoses on the phytogeographical plot “Central Asia” and its flora in general (e.g., death of many ergasiophytes of Central Asian origin due to inconsistency of climatic conditions, expansion of invasive organisms, growing anthropogenic load, etc.) However, thanks to the large-scale introductory work, the collection of plants on the plot has a unique composition and remains one of the most attractive decorations of the M.M. Gryshko National Botanical Garden.

**Keywords:** introduction, native plants, flora structure, rare species, alien species

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**Authors’ contributions:** Both authors set tasks, conducted field investigations and identified plant samples. Both authors wrote the manuscript.

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## Introduction

One of the main tasks of the M.M. Gryshko National Botanical Garden of the NAS of Ukraine (NBG) in Kyiv was the reproduction of landscapes and vegetation of various regions of the temperate zone of Eurasia. Currently, over 40% of the territory of the NBG is occupied by phytogeographical plots with artificial phytocoenoses, i.e., “Steppes of Ukraine”, “Carpathians”, “Forests of plain Ukraine”, “Crimea”, “Caucasus”, “Altai and Western Siberia”, “Far East”, and “Central Asia”. Among the expositions, the phytogeographical plots received principal attention and became an important scientific and landscape part of the NBG. Plants were introduced from the respective regions and planted following special protocols. The founder of the NBG, member of the Academy of Sciences of UkrSSR, prof. Mykola Gryshko also paid particular attention to the phytogeographical plots. Unlike other plantations, phytogeographical plots are not simply representing certain plant groups but emulate the native phytocoenoses and entire ecosystems. In such plantations, many rare plants, introduced from different world regions, have successfully acclimatized and formed local introductory populations that are valuable objects requiring protection (Kharkevych, 1972; Meshkova et al., 1990; Bulakh & Didenko, 1999; Grytsenko, 2002; Zaimenko et al., 2018).

The collection of the alien introduced plants at the NBG needs constant monitoring as a basis for the purposeful introduction of plants and their acclimatization (Bulakh, 2010). Information on the taxonomic composition of ergasiophytes' collections emphasizes the importance and scope of research work in the botanical gardens and dendrological parks. At the NBG, an inventory of plants on the collection plots is conducted every five years. However, in some plantations, such as artificial phytocoenoses of phytogeographical plots, taxonomic inventory is a rather complicated procedure because many occurring ergasiophytes are not native to the flora of Ukraine and are not listed in the standard reference books and identification keys. Among the phytogeographical plots of the NBG, the recent inventory was conducted on the plot “Caucasus” (Shynder, 2015; Didenko & Shynder, 2020) and some other plots, which significantly

clarified their taxonomic composition. So far, information on the taxonomic composition of plants on the phytogeographical plot “Central Asia” has remained incomplete. Therefore, the investigation aimed to conduct a complete inventory of the taxonomic composition of ergasiophytes of Central Asian origin on the phytogeographical plot “Central Asia” of the NBG, as well as all other species of flora, and to explore their structure.

## Material and methods

### General methodology

The research was conducted in 2016–2021. To determine plants, we used special reference books on the taxonomic diversity of the flora of Central Asia and adjacent regions (Pavlov, 1956–1966; Vvedenskiy, 1968–1987; Kamelin, 1993–2015; Ishmuratova et al., 2017) and some special monographic works (Vvedenskiy, 1935; Rusanov, 1949; Kononov & Moljkova, 1974; Baum, 1978; Grudzinskaya, 1979; Tkachenko, 1986; Tzvelev, 1993). To identify live plants from the plot, they were compared with original specimens from the NBG herbarium (KWAH) that were collected directly in Central Asia in 1950–1980. Inventory lists of planted plants, taking into account their particular inaccuracy, were also used as reference material (Sikura, 1970). The investigation used information obtained earlier during the inventory of the collection of living plants on the phytogeographical plot “Caucasus” and wild flora of the NBG (Shynder, 2015, 2019a, b, c). Some plants from the plot were herbarized, and their specimens were transferred to the KWAH herbarium.

The nomenclature of taxa is given following POWO (2022), with minor clarifications for little-studied taxa according to GBIF (2022) (Appendix A). The results of the research are partially presented in the datasets “Biota of the “Central Asia” plot in M.M. Gryshko National Botanical Garden” (<https://www.inaturalist.org/projects/biota-of-the-central-asia-plot-in-m-m-gryshko-national-botanical-garden>) and “Flora of the M.M. Gryshko National Botanical Garden” (<https://www.inaturalist.org/projects/flora-of-m-m-gryshko-national-botanical-garden>).

To study the structure of the flora, some basic classifications of plants were applied.

The following main groups were identified by origin (Thellung, 1922; Pyšek et al., 2004). (1) native plants – plants growing naturally at the NBG, particularly on the plot “Central Asia”. (2) ergasiophytes – alien plants that are cultivated. (3) ergasiophygophytes – plants that were previously specially introduced (mainly to the NBG or to Ukraine, in general), and then escaped beyond the places of cultivation and became a spontaneous element of the flora. (4) xenophytes – alien plants (usually weeds) that have invaded the flora on their own.

Depending on the value of individual plant species as a collection unit, we have identified four groups of plants on the site. (1) ergasiophytes – purposefully introduced from Central Asia. These plants are the most valuable because they are direct objects of the introduction experiment. Plants from this group represent a gene pool of the Central Asian flora. (2) taxa, which occur in Central Asia but were not specially introduced from this region to the plot. These are native plants, some xenophytes and ergasiophytes. Since they formally make a part of the flora of Central Asia, it is also advisable to include them in the collection, but not to use them as a gene pool of Central Asian origin. (3) native plants that are not a part of the Central Asian flora. These are background species forming the spontaneous flora of the NBG. They grow successfully in artificial phytocoenoses together with Central Asian plants, filling certain ecological niches but do not belong to the collection fund. Although there are no strict rules to include such plants in the inventory lists of the NBG, many curators mentioned them in their collection lists. (4) alien plants that are not a part of the natural flora of Central Asia and are not native plants of the NBG. This group includes various xenophytes, ergasiophytes, and ergasiophygophytes, including weeds and invasive plant species.

Geographical analysis was carried out following the principles of botanical-geographical classification of plant ranges (Walter & Straka, 1970; Kleopov, 1990). For biomorphological analysis, the classification of life forms of Clements (1920) with updates (Sokolov & Svyazeva, 1965; Sikura, 1985; Kuznetsov et al., 2013) and classification of ecobiomorphs of Raunkiær (1934) were applied. The classification of habitats follows Baranovski et al. (2018). A complete list of

identified flora elements (life forms, range types and habitats, etc.) is provided in Appendix A.

Rusanov (1950) described two main methods of directed introduction of plants: ‘genera complexes’ and ‘geobotanical edificators’. Later these methods were supplemented by many other researchers (Sikura, 1985; Bulakh, 1994; Kokhno & Kurdyuk, 1994). Genera complexes imply the creation of a collection of a certain genus with the most whole possible introduction of plants from different global regions. For the “genera complexes”, the availability of planting material is the most important. The method of “geobotanical edificators” implies the introduction of plants that play the role of edificators in certain groups and are the most promising for the targeted introduction. It is hypothesized that such plants are potentially more hardy and stable in *ex situ* conditions (Rusanov, 1950).

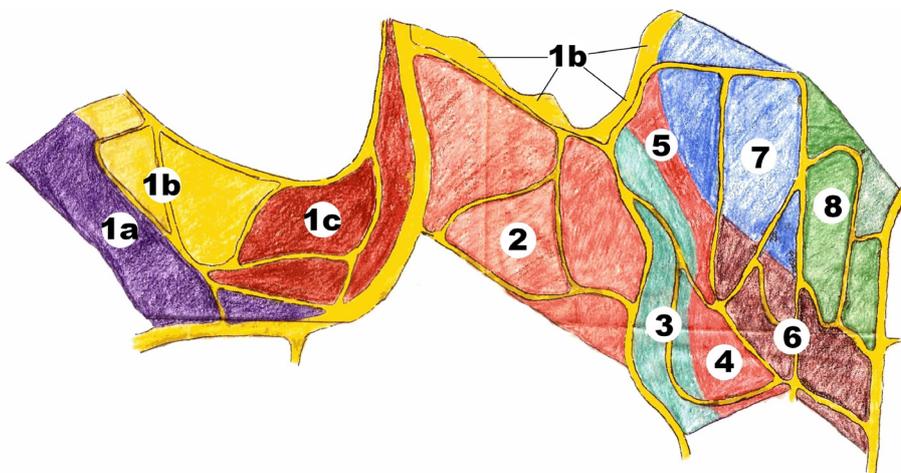
The term “introductory population” was initially applied in forestry (Logginov, 1980), but is now widely used for research work (Bulakh & Didenko, 1999; Grytsenko, 2002; Shynder et al., 2014; Shumyk, 2016). The peculiarity of “introductory populations” on phytogeographical plots of the NBG is that naturalized plants in artificial phytocoenoses can reproduce and, therefore, acquire the characteristics of natural populations (i.e., have complete age structure and homeostasis). Such populations of ergasiophytes, in which self-reproduction takes place, we called “full-fledged introductory populations”. In other cases, under “introductory populations” we mean simple plantations.

### Study area

The NBG is located in the central part of Kyiv, on the hills of the high right bank of the Dnipro River (Fig. 1). The plot “Central Asia” is located in the western part of the NBG and scattered on several slopes of different exposures (mostly southwestern slopes), between which there is a ravine. The soils of the plot are dark gray, podzolic, on the loess. A small area in the central lower part of the plot consists of sands. Also, on several slopes, there are small outcrops of loess. Initially, the plot “Central Asia” has an area of ca. 3.5 ha. In 2021, its modern contour that is determined by 43 corner points (Appendix B) was established,



**Figure 1.** Location of the phytogeographical plot “Central Asia” within the NBG outlines (A) and its sectional subdivision (B). Sections: 1 – Kopetdag; 2 – vegetation of sands; 3 – floodplain forests (tugai); 4 – apple and hawthorn forest; 5 – spruce forest; 6 – mountain meadows; 7 – deciduous forest.



**Figure 2.** The original project of the phytogeographical plot “Central Asia” (Sikura, 1970). Sections: 1 – Kopetdag plant belts; 2 – vegetation of sands; 3 – walnut forest; 4 – floodplain forests (tugai); 5 – apple and hawthorn forest; 6 – juniper forest; 7 – spruce forest; 8 – mountain meadows.

and the area of the plot within the current boundaries was recalculated for 3.14 ha.

The relief of the plot quite successfully reproduces the main landscapes of Central Asia, namely the forests and sparse forests of the middle mountain belt and river valleys. The main feature of the Central Asian mountain systems is a well-defined zonation in the location of plants. The general characteristics of the vegetation of Central Asia were taken into account when creating the plot (Fig. 2), so it belongs to the type of “phytogeographical” plots. The creation of phytogeographical plots requires not only gathering the collection of species of a certain region but also the reproduction of phytocoenoses and biosystems of this region. Phytogeographical plots are rare in botanical gardens because their creation is highly time-consuming and expensive.

Ergasiophytes of the NBG originated from Central Asia. This is the historical and geographical region of Eurasia extending from the Caspian Sea in the west to China and Mongolia in the east (Fig. C1). Currently, Central Asia is considered within the administrative boundaries of five countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan (The Editors of *Encyclopaedia Britannica*, 2018). However, during the USSR times, Kazakhstan was often not included in Central Asia, or only its southern regions were considered so (Kharkevych, 1972; Vvedenskiy, 1968–1987; Kamelin, 1993–2015). Therefore, during the creation of the plot “Central Asia”, the plants were introduced from Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, and only from the south-eastern part of Kazakhstan (Sikura, 1985).

Central Asia is primarily a region of deserts and semi-deserts. However, in its south, there are located three major mountain systems: Kopetdag, Pamir-Alai, and Tian Shan, which have a characteristic vertical distribution of vegetation. Other types of landscapes, such as floodplain forests (tugai), are much less common in Central Asia.

The climate of Central Asia is dry and very continental. The northern part of this geographical region (including the Tian Shan) belongs to the temperate climate zone, and the southern part (in particular, Kopetdag and Pamir-Alai) – to the subtropical climate zone (The Editors of *Encyclopaedia Britannica*,

2018). In 1968, only ca. 8,000 species were estimated. However, according to the latest data, the flora of Central Asia includes 9,341 species from 1,300 genera and 161 families (Vvedenskiy, 1968–1987; Kamelin, 1993–2015).

The climatic temperate-continental conditions of Kyiv are very different from the typical arid and continental climate of Central Asia. Many plants of the Central Asian flora simply cannot take root in Kyiv or become short-lived. Therefore, one of the tasks of the phytogeographical plot “Central Asia” was to test the stability of plants from the flora of the Central Asian region. In the last decade, due to global warming, the climate of the central regions of Ukraine changed toward aridification (Osadchy et al., 2010; Boychenko et al., 2016) and became more suitable for ergasiophytes from warm regions of Central Asia.

### Historical overview

Formally, the NBG was founded in 1935. But at that time, in the territory allocated for creating the botanical garden, there were two settlements in the suburbs of Kyiv, with a population of about 2,000 inhabitants. Therefore, preparatory and design work lasted for many years, was interrupted in 1941–1944 by WWII, and continued after the war (Chuvikina, 2016). According to the project of first curators M.M. Prakhov and I.V. Trotsenko, the phytogeographical plot “Central Asia” was founded in 1953. At that time, many artificially planted trees and shrubs were growing on the plot, combining native species and ergasiophytes of American and Western European origin. Some of them were kept during the creation of the plot, and these alien plants still grow on this territory.

The main planting material was collected during expeditions to the Central Asian republics of the former USSR (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan). These expeditions were organized by the curators of the phytogeographical plot “Central Asia”: M.M. Prakhov (1953, 1954), I.V. Trotsenko (1955–1958), J.J. Sikura (1961–1962, 1965, 1973, 1982) and P.Y. Bulakh (1982–1983) (Kharkevych, 1972; Sikura, 1975, 1982; Bulakh, 1994). As a result of expeditions, ca. 1,000 species from 312 genera and 67 families of Central Asian flora were introduced to the

plot (Sikura, 1982, 1985). This accentuates the large scale of this introductory experiment. Ergasiophytes were planted according to the general plan in different plot sections, which simulated individual phytocoenoses and plant belts of the Central Asian region. During the first 20 years, the main phytocoenoses, which proved to be stable in the conditions of Kyiv, were finally established (Fig. 2) (Sikura, 1970). Since then, individual plantations have been adjusted, and new plants have been planted. According to the 1969 inventory, only 241 ergasiophytes from 87 genera and 40 families grew on the plot “Central Asia” (Kharkevych, 1972). However, in 1982, the collection of the plot “Central Asia” already comprised 621 plant species, 414 of which were recommended for a more comprehensive introduction (Sikura, 1982). As of 1985, 1,029 collection specimens of Central Asian plants were introduced and studied (Sikura, 1985).

Ergasiophytes of Central Asian origin have been the subject of special attention at the NBG. The most valuable and resilient plants have been transplanted to other plots of the NBG or transferred to other scientific institutions for further introduction and acclimatization. In the 1950s, M.M. Prakhov studied some species of the genera *Eremurus* M. Bieb. and *Tulipa* L. in the plantations of the “Central Asia” plot (Kharkevych, 1972). In the 1960s and 1980s, J.J. Sikura conducted comprehensive acclimatization observations on many ergasiophytes in the primary culture and their natural environment (Zemkova & Sikura, 1980; Sikura, 1982, 1985; Shisha et al., 2008). In particular, Sikura transplanted 353 endemic taxa to the NBG (Sikura, 1985). In 1989–2010, P.Y. Bulakh conducted a comprehensive study of *Allium* L. species on the plot and in nature (Bulakh, 1994, 2010; Bulakh & Popil, 2010). On the example of introductory populations of ergasiophytes from Central Asia and the Caucasus, together with S.Y. Didenko he described the phenomenon of plant quasi-senility (Bulakh & Didenko, 1999).

The acclimatization of different species from Central Asia at the NBG was often unsuccessful due to inconsistent climatic conditions. Many sown or planted plants did not take root or were damaged during severe winters. Some successfully acclimatized ergasiophytes did not withstand competition and were displaced from the plantations by

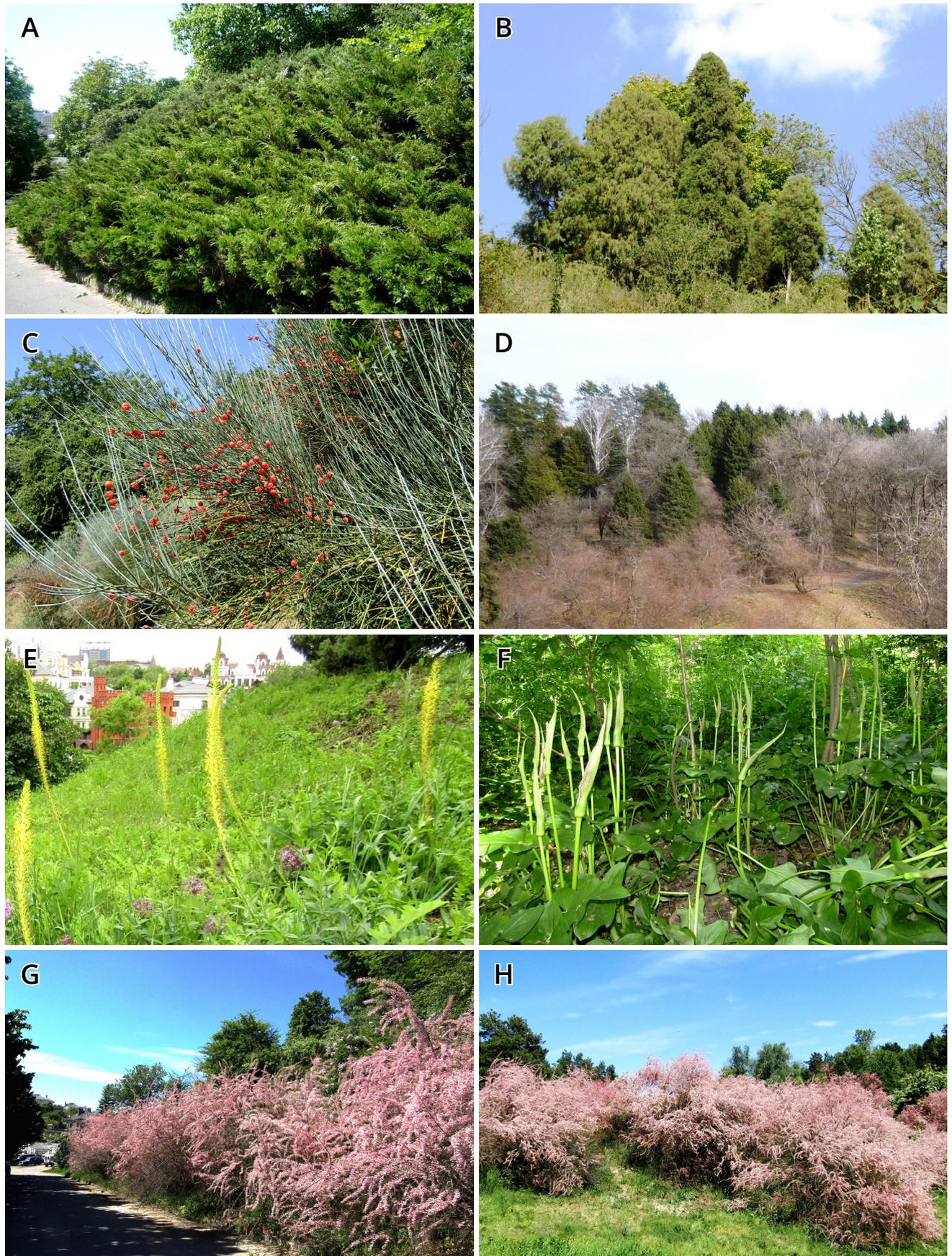
more invasively active alien plants. In the last 30 years, several artificial phytocoenoses (mountain meadows, pistachio woodland) have fallen into disrepair and disappeared. The number of thermophilic plants that did not survive severe winters in 1970–2010. Some 50–60-year-old tree plantations have reached the climax and begun to dry up. Recently, many alien (including invasive) plant species have become widespread. All these negative factors determine the need for reconstructing artificial phytocoenoses of the plot “Central Asia” and a comprehensive inventory of its vegetation.

At the same time, some sections and artificial phytocoenoses on the “Central Asia” plot are successfully preserved to our days, i.e., Kopetdag plant belts, including juniper forest, high-grass meadows and Kopetdag shibljak (Fig. 3 A, C), tamarisk plantings in sands (Fig. 3 E, F), tugai (Fig. 3 D), apple-hawthorn forest, spruce forest (Fig. 3 B), and some other. These plantations now define the overall appearance of the plot but also require maintenance and enrichment measures. Thanks to the successful planning of plantations during their creation, the artificial phytocoenoses that remained in the plantations of the plot “Central Asia” even today well reproduce the zonal location of plant belts in the mountainous regions of Central Asia (Meshkova et al., 1990).

The low-lying areas of the plot represent the vegetation of desert shrub phytocoenoses (where several species of tamarisk are represented) and the vegetation of tugai (where the stand is formed by *Populus* L., *Salix* L., and *Ulmus* L. species).

On the eastern slope of the plot, mountain belts of apple-hawthorn and walnut forests gather species from *Acer* L., *Crataegus* L., *Juglans* L., *Malus* Mill., and *Prunus* L. genera, and a coniferous belt with *Picea schrenkiana* Fisch. & C.A. Mey. is modeled. At the top of this slope, it was planned to create a belt of juniper shrubs with *Juniperus sabina* L. and mountain meadows, but most of the planted here ergasiophytes appeared unstable.

The Kopetdag vegetation is quite diverse in the western part of the plot. Here are located juniper forests formed by *Juniperus excelsa* M. Bieb. subsp. *polycarpos* (C. Koch) Takht., and *J. sabina*. Here is also mountain vegetation of crooked forest formed by *Celtis caucasica*



**Figure 3.** Artificial phytocoenoses of the "Central Asia" plot: **A** – juniper slope of Kopetdag plantations; **B** – fragment with *Juniperus seravschanica*; **C** – *Ephedra equisetina* in Kopetdag plantations; **D** – spruce belt with *Picea schrenkiana*; **E** – *Allium christophii* and *Eremurus fuscus* in the tall-grass meadow of Kopetdag plantations; **F** – *Arum korolkowii* in tugai; **G, H** – alley and tamarisk plantations.

**Table 1.** The general structure of the flora of the phytogeographical plot “Central Asia” (number of species and infraspecific taxa).

Higher taxa	Central Asian flora (collection fund)			Alien flora			Total
	Plants introduced from Central Asia	Other categories	Native flora	Plants introduced but not from Central Asia	Xenophytes	Escaped plants	
Gymnosperms	4			2		1	7
Pinopsida	3			2		1	6
Gnetopsida	1						1
Angiosperms	66	113	43	18	18	43	301
Monocots	24	18	7	4	2	10	65
Eudicots	42	95	36	16	16	31	233
Total	70	113	43	22	18	42	308

Willd., *Cornus sanguinea* L. subsp. *australis* (C.A. Mey.) Jáv., *Ephedra equisetina* Bunge, *Lonicera tatarica* L., *Rosa spinosissima* L., *Prunus sogdiana* Vassilcz., *Crategus* spp., etc.

Open sites at the top of the slope are occupied by tall-grass mountain meadows with *Allium*, *Eremurus*, and *Rumex* L. species participation.

At Kopetdag and in the tugai vegetation, various geophytes, which formed quite stable introductory populations, are represented. Among them are *Arum korolkowii* Regel, *Fritillaria sewerzowii* Regel, *Eremurus fuscus* (O. Fedtsch.) Vved., and some species of *Allium*, *Tulipa*, and *Muscari* genera. Most of these species are highly decorative.

## Results and discussion

### Taxonomic diversity and structure of flora

According to the study results, 308 valid taxa of higher vascular plants from 168 genera of 66 families have been recorded within the plot “Central Asia” (Table 1). Within this number, only 70 taxa have Central Asian origin. For 113 plant taxa, the introduction from Central Asia has not been confirmed despite their natural ranges cover this region. Therefore, we include in the collection fund of the flora of Central Asia 183 taxa that grow in plantations on the plot “Central Asia”. Other 42 taxa of native plants and 80 taxa of alien plants were identified on the plot. These 122 taxa were not listed in the collection fund of “Central Asia” plot. Nevertheless, we included them in the

analysis because these taxa are also an integral part of the plot ecosystems.

During the inventory of the flora of the plot “Central Asia”, a lot of work was done to determine taxa of some difficult genera complexes (i.e., *Acer*, *Allium*, *Crataegus*, *Tamarix*, and *Tulipa*) (Negrash & Shynder, 2021). The existing inventory lists of these taxa were often inaccurate with many errors, and due to the disappearance of many plants, these records required verification. The obtained information is of great importance for clarifying the collection composition of living plants of the NBG (Shynder, 2019a, b, c).

Compared to other phytogeographical plots of the NBG, the Central Asian flora has an average level of species richness. For example, 350 taxa from 406 totally grown in the plot “Caucasus” are part of the collection fund. In all territories of the plot “Forests of the plain part of Ukraine”, 307 species are listed in the collection fund. 183 species from the plot “Carpathians” and 249 species from the plot “Crimea” are included in the respective collection funds. In the plot “Altai and Western Siberia”, 90 species are introduced from the Altai. In the plot “Far East” 130 species belong to the collection fund (Shynder, 2015; Didenko & Shynder, 2020). However, climatic conditions of Central Asia are also the most different from the conditions of the city of Kyiv, which also explains its relatively low representativeness. Today, the plot “Central Asia” has an average level of diversity in the collection flora. Therefore, it is advisable to

continue the purposeful introduction of new plants.

Among the leading families of the flora of the phytogeographical plot “Central Asia” (Table 2), almost the same systematic groups are represented as in the native flora of Central Asia with some deviations only. For example, in the native flora of Central Asia, the leading families are: Asteraceae (18.2% of the total number of species in the flora), Fabaceae (13.4%), Lamiaceae (6.0%), Poaceae (5.8%), Apiaceae (5.1%), Brassicaceae (4.7%), Liliaceae (4.3%), Chenopodiaceae (3.7%) (Malyshev, 1972). Large areas of Central Asia are covered with dry steppes, deserts, and salt marshes. The plants adapted to such habitats comprise the main part of the flora in Central Asia. However, only Central Asian plants that require more temperate habitats (northern steppes, lowland forests, etc.) root well in the conditions of Kyiv. Several decades of acclimatization experiments showed that many desert and steppe plants from Central Asia (e.g., certain representatives of Fabaceae, Lamiaceae, Apiaceae, Chenopodiaceae, etc.) could also be successfully grown in the NBG (Kharkevych, 1972; Sikura, 1982) but their introduction requires unreasonably high expenses. Moreover, due to inconsistencies and lack of consorts, many such plants lose the ability to reproduce. Therefore, it is advisable to continue the introduction into artificial phytocoenoses of the plot only plant species from the temperate-continental areas of Central Asia.

The participation of species with different types of geographical ranges is an important indicator of any flora (Walter & Straka, 1970; Didukh, 2007). We analyzed the geographical features of all plants that were found during the inventory of the plot “Central Asia” (Table 3). Notably, among ergasiophytes introduced from Central Asia to the plot, the majority (59.2%) have the Central Asian type of distribution. Among these plants are many narrow endemics (e.g., *Cotoneaster neoantoninae* A.N. Vassiljeva, *Crataegus dsungarica* Zabel ex Lange, *Fritillaria sewerzowii* Regel, *Malus sieversii* (Ledeb.) Roem. var. *kirghisorum* (Al. Fed. & Fed.) Ponomar., *Puschkinia hyacinthoides* Baker). These plants are the most valuable and are of great importance among other collections of plants of the NBG.

**Table 2.** Leading families of the flora of the phytogeographical plot “Central Asia”.

Family	Number of species and infraspecific taxa	
	Entire flora	Collection fund
Rosaceae	34	26
Asteraceae	21	10
Poaceae	16	15
Amaryllidaceae	15	12
Liliaceae	14	10
Fabaceae	12	8
Asparagaceae	10	2
Polygonaceae	10	10

In the flora of Central Asia, there are taxa with different types of ranges, but most of them have Central Asian, sub-Mediterranean, and broad Eurasian ranges. In addition, native and alien species of plants grow on the plot, among which various types of ranges are represented. Considering the total number of taxa on the plot, plants with the Central Asian type of range make up 25.0% of the collection fund but represent only 15.1% of the entire Central Asian flora. Apparently, this share is currently low due to the constant extinction of poorly acclimatized Central Asian plants. This indicator should be increased, and the most perspective plants for a new introduction are endemic taxa of Central Asia.

We have identified the natural habitats of ergasiophytes of Central Asian origin (Appendix A). Among them, on the plot there is currently the largest number of plants that were transplanted from the mountainous regions of Central Asia (primarily the Kopetdag and Western Tian Shan). Plants from the lower and middle mountain belts turned out to be the most successful in their introduction to Kyiv’s climatic conditions. This partly confirms the importance of applying the method of climatic analogs during the scientifically directed introduction of plants.

The biomorphological structure of the flora reflects its formation in accordance with the regional ecological and climatic conditions of the environment. The distribution of life forms in the sharply continental conditions of Central Asia is very peculiar. In the 1960s, about 1,330 woody plant species (near 17% of

**Table 3.** Geographical structure of the flora on the phytogeographical plot “Central Asia” (distribution of species and infraspecific taxa).

Type of the geographic range	Entire flora		Collection fund		Ergasiophytes from Central Asia	
	number of taxa	%	number of taxa	%	number of taxa	%
American	22	7.5	-	-	-	-
Asian (excluding Central Asian)	18	5.5	7	4.3	2	4.2
Central Asian	46	14.9	46	25	42	59.2
Sub-Mediterranean – Central Asian	9	2.9	9	4.9	2	2.8
Boreal	1	0.3	-	-	-	-
Caucasian	6	1.9	-	-	-	-
Cosmopolitan	4	1.3	4	2.2	-	-
Cultigenic origin	7	2.3	1	0.5	-	-
European	20	6.5	1	0.5	-	-
Euro-Caucasian	6	1.9	2	1.1	-	-
Euro-sub-Mediterranean	36	11.7	15	8.2	4	5.6
Eurasian	45	14.6	39	21.2	9	12.7
Eurasian desert	3	1.0	3	1.6	3	4.2
Eurasian forest-steppe	2	0.6	2	1.1	-	-
Eurasian steppe	6	1.9	3	1.6	2	2.8
Far Eastern	2	0.6	-	-	-	-
Holarctical	7	2.3	7	3.8	1	1.4
Sub-Mediterranean	42	13.6	20	10.9	4	5.6
Paleoarctical	26	8.4	24	13.0	1	1.4
Total	305	100.0	183	100.0	70	100.0

the total flora) were identified for the flora of Central Asia (Sokolov & Svyazeva, 1965). This share of woody plants is much higher than in the native floras of temperate regions of Europe, where it is within a range of 10–13% (Novosad, 2005–2007; Lukash, 2009; Moisienko, 2011; Kolomiychuk, 2020). The flora of Central Asia is significantly dominated by shrubs (about 41.1%) and subshrubs (about 30.4%), but few trees (about 17.6%), small shrubs (about 10.0%), and lianas (<1%) are represented here (Sokolov & Svyazeva, 1965). Such a combination of different types of woody plants, with a high proportion of shrubs, is a peculiarity of Central Asian vegetation. The uniqueness of this flora is emphasized by its high endemism. For example, 60.2% of woody plants are endemic,

which is probably the highest rate among the temperate zones of the Holarctic.

Biomorphological structure of the flora of the plot “Central Asia” (Table 4) also has a high proportion of woody plants, but trees predominate significantly over shrubs. The vegetation cover of the Forest-Steppe and other temperate regions of Europe has a similar structure (Shynder, 2019a, b, c; Lukash, 2009). It should be noted that almost all biormorphs were transplanted here in the first years of the creation of plantations of the plot “Central Asia”. For example, according to Sikura (1985), in the first 30 years on the plot “Central Asia” acclimatization was successful in 88% of taxa of woody plants, 71.5% of shrubs, 50% of subshrubs, 82% of perennials, and 98% of annuals. However, the current inventory

**Table 4.** Biomorphological structure of flora on the phytogeographical plot “Central Asia” (distribution of species and infraspecific taxa) according to Clements (1920) and Kuznetsov et al. (2013).

Life forms (vegetation forms)	Entire flora		Collection fund		Ergasiophytes from Central Asia	
	number of taxa	%	number of taxa	%	number of taxa	%
Trees	52	16.9	30	16.3	25	35.2
Shrubs	30	9.7	14	7.6	11	15.5
Subshrubs	7	2.3	4	2.2	3	4.2
Lianas	6	1.9	-	-	-	-
Perennials	137	44.5	86	47.3	31	45.1
Biennials	19	6.2	12	6.5	-	-
Annuals	57	18.5	37	20.1	-	-
Total	308	100.0	183	100.0	70	100.0

**Table 5.** Biomorphological structure of flora on the phytogeographical plot “Central Asia” (distribution of species and infraspecific taxa) according to Raunkiaer (1934).

Life forms (ecobiomorphs)	Entire flora		Collection fund		Ergasiophytes from Central Asia	
	number of taxa	%	number of taxa	%	number of taxa	%
Phanerophytes	93	30.2	46	25.1	37	52.9
Chamaephytes	5	1.6	4	2.2	2	2.9
Hemicryptophytes	81	26.3	52	28.4	6	8.6
Cryptophytes	79	25.6	46	25.1	25	35.7
Therophytes	50	16.2	35	19.1	-	-
Total	308	100.0	183	100.0	70	100.0

shows that in the phytocoenoses of the NBG, trees and perennial herbaceous ergasiophytes of Central Asian origin were capable for long-term growth and formation of self-sustaining populations. Annuals were not able to form long-lived populations without artificial seeding.

The distribution of ergasiophytes on the plot “Central Asia” according to Raunkiaer’s (1934) classification is similar (Table 5). The share of phanerophytes is high. Among ergasiophytes transplanted from Central Asia, more than half are phanerophytes. Thus, in Kyiv conditions, phanerophytes from Central Asia mountainous regions proved to be the most stable.

In our opinion, to improve the native structure of the flora of the plot “Central Asia”, the directed introduction of shrubs is required. Perennials are another

biomorphological group that is most promising for increase. At the same time, the trees occupy pretty large areas on the plot, so the introduction of new trees here is not justified from a scientific point of view. It should be noted that among the ergasiophytes of Central Asian origin, there are no annuals (therophytes) and not a single liana from the flora of Central Asia left on the plot. Since annuals occupy a prominent place in the native flora of Central Asia, at least a few resistant species with decorative qualities are promising for the targeted introduction. At the same time, the life form of tree lianas is not typical for Central Asia, and there are only a few such species of *Atragene* and *Clematis* (Sokolov & Svyazeva, 1965). Given that these plants (e.g., *Clematis orientalis* L.) are highly ornamental and their introduction is well appropriated.

**Table 6.** Ecological and coenotic structure of the flora on the phytogeographical plot “Central Asia” (distribution of species and infraspecific taxa).

Life forms (vegetation-forms)	Entire flora		Collection fund		Ergasiophytes from Central Asia	
	number of taxa	%	number of taxa	%	number of taxa	%
Clay	2	0.6	2	1.1	1	1.4
Forests	75	24.4	38	20.7	17	23.9
Shrubs and edges	67	21.8	47	25.5	26	36.6
Meadows	46	14.9	25	13.6	8	11.3
Sands	3	1.0	3	1.6	-	-
Steppes	28	9.1	21	12.0	14	21.1
Stony	2	0.6	2	1.1	2	2.8
Synanthropic	84	27.3	44	23.9	2	2.8
Wetlands	1	0.3	1	0.5	-	-
Total	308	100.0	183	100.0	70	100.0

The distribution of plants on the plot “Central Asia” by habitat type (Table 6) in general is quite typical for the ecosystems of the NBG. Among ergasiophytes of Central Asian origin, the most represented are plants of forests, steppes, shrubs, and edges. However, typical Central Asian plants growing in a variety of clay, sandy and stony semi-deserts and deserts, saline habitats, and alpine meadows are undoubtedly unstable in the NBG. In the future, in the phytogeographical plot “Central Asia”, the use of the method of geobotanical edificators (Rusanov, 1950) is promising. That is, the directed introduction of a small number of ergasiophytes, which dominate in the extreme habitats of Central Asia, is promising. Nevertheless, the edificators themselves (e.g., *Ammodendron bifolium* (Pall.) Yakovlev, *Artemisia* spp., *Ferula* spp., *Haloxylon ammodendron* (C.A. Mey.) Bunge ex Fenzl, *Leymus racemosus* (Lam.) Tzvelev, *Prangos pabularia* Lindl., *Saccharum spontaneum* L., and *Salvia* spp.) can be quite resistant and affordable for cultivation.

### Genera complexes

The genera complexes of ergasiophytes, represented only on some plots, including the collection of plants from the plot “Central Asia” are valuable heritage of the NBG (Sikura, 1985; Kokhno & Kurdyuk, 1994). To date, only a small number of taxa from those introduced during the Soviet era have remained in the

NBG plantations. Thus, in the 1960–1980’s, 19 *Crataegus* species and 24 *Eremurus* species grew on the plot “Central Asia” (Sikura, 1969; Ostashevsky, 1988). During this period, 56 species of the genus *Allium* were tested, most of which were successfully rooted (Bulakh, 1994). Similar diversity was observed in ergasiophytes from other genera. However, the number of ergasiophytes on the plot has decreased significantly, so only a few genera complexes with four or more ergasiophytes are represented here today (Appendix A). Native and alien taxa for Central Asian flora are not considered.

The genus *Acer* is represented on the plot by four ergasiophytes of Central Asian origin: *A. monspessulanum* L. subsp. *turcomanicum* (Pojark.) A.E. Murray, *A. pentapomicum* Stewart ex Brand, *A. platanoides* L. subsp. *turkestanicum* (Pax) P.C. de Jong and *A. tataricum* L. subsp. *semenovii* (Regel & Herder) A.E. Murray, and three species of different origin. Species of the genus *Acer* play the role of assectators, and the alien *A. negundo* L. and native *A. platanoides* subsp. *platanoides* significantly litter the plantations.

The genus *Allium* is the largest represented in the flora of the plot. Currently, there are 12 ergasiophytes of Central Asian origin and one alien invasive species, *A. tuberosum* Rottler ex Spreng. (Fig. C2). Most species of the genus are ornamental plants. Especially effective are their groups, such as *A. altissimum* Regel, *A. caeruleum* Pall., *A. nutans* L.,

*A. rosenbachianum* Regel. The use of these plants as ornamental crops in Ukraine began with the mass introduction of species of the genus *Allium* to the plot “Central Asia” (Sikura, 1970; Bulakh, 1994). The possibility of expanding the collection of *Allium* species from Central Asian flora is very large. There are almost 200 species of *Allium* in the native flora of Central Asia. Many of them are promising ornamental plants. Some *Allium* species are used as vegetable crops. Their targeted introduction is now one of the ways to improve the flora of the plot. It should be noted that *Allium* species in Kyiv conditions can naturalize and in the artificial phytocoenoses can form full-fledged introductory populations.

The genus *Crataegus* is represented on the plot by many species, among which five Central Asian ergasiophytes and four taxa of other origin have been identified so far (Fig. C3). This genus is a diverse taxonomic group challenging to identify. Hawthorns are wild fruit plants, but in the collection, only *C. dsungarica* has medium-sized fruits and is of great practical value. On the plot, hawthorns grow mainly in the sections of hawthorn-apple forest, Kopetdag, and sand vegetation and play a significant role in artificial phytocoenoses. After the general inventory, it is important to continue to study the taxonomic diversity of the genus *Crataegus* on the plot to restore information about previously introduced species. In the future, new species may be identified in the plantations of the plot, because in the Soviet era, 19 species were introduced here (Ostashevsky, 1988).

The genus *Tamarix* is represented by five specimens, which we have currently identified as four species: *T. aralensis* Bunge, *T. hohenackeri* Bunge, *T. ramosissima* Leber. (there are two forms or hybrids of this species), and *T. szovitsiana* Bunge (Fig. C4). These plants represent the vegetation of sands. *Tamarix szovitsiana* is the earliest flowering and is highly decorative. Another species, *T. hohenackeri* is also highly decorative but blooms later. Other tamarisks are represented by less decorative forms. In general, the experience of growing these beautiful plants confirms their versatile value and stability in culture (Rusanov, 1944). Given the high attractiveness of *T. hohenackeri* and *T. szovitsiana* in the the plot plantations, the cultivation of new ornamental species of

the genus *Tamarix* of Central Asian flora is promising.

The genus *Tulipa* in the collection includes seven ergasiophytes of Central Asian origin, as well as *T. sprengeri* Baker from Asia Minor (Fig. C5). Tulips are among the most ornamental plants on the plot “Central Asia”, although their introductory populations are small and often hidden in the depths of plantations. In most cases, introduced tulips reproduce vegetatively and form clones ranging in size from several shoots (*T. undulatifolia* Boiss. var. *icheliana* (Hoog) Wilford) to many square meters (*T. kaufmanniana* Regel and *T. praestans* H.B. May). The value of tulips in artificial phytocoenoses of the studied plot is extremely high, because the world center of biodiversity of this genus is represented in Central Asia. In Soviet times, many species of tulips were introduced to the plot, but the exact number is unknown. However, a small part of them remains to date. Therefore, the targeted introduction of new species of Central Asian tulips and the creation of their introductory populations on the phytogeographical plot “Central Asia” is one of the most important tasks.

### Rare species

Among the main tasks of the phytogeographical plots is the conservation of rare plants. Among the ergasiophytes that grow in plantations on phytogeographical plot “Central Asia”, there are two species of the IUCN Red List (IUCN, 2022) with critical categories of a rarity – *Malus niedzwetzkyana* Dieck and *M. sieversii*. Besides this, there are 24 rare plants listed in different red books of Central Asian countries. In particular, the Red Book of Kazakhstan (Baitulin, 2014) includes *Juniperus seravschanica*, *Picea schrenkiana*, *Allium aflatunense* B. Fedtsch, *Tulipa kaufmanniana*, *T. suaveolens* Roth, *T. undulatifolia* Boiss. var. *icheliana* (Hoog) Wilford, *T. urumiensis* Stapf, *Arum korolkowii* Regel, *Celtis caucasica* Hohen. ex Planch., *Lonicera tatarica* L., *L. tatarica* var. *micrantha* Trautv., *Silene coronaria* (L.) Clairv., *Fraxinus sogdiana* Bunge, *Crataegus ambigua* C.A. Mey. ex A.K. Becker, *Malus niedzwetzkyana*, *M. sieversii*, *M. sieversii* var. *kirghisorum*, and *Prunus armeniaca* L. The Red Book of Uzbekistan (Khassanov, 2016) includes *Allium aflatunense*, *Eremurus fuscus*,

*Tulipa bifloriformis* Vved., *T. kaufmanniana*, and *T. undulatifolia* var. *melchiana*. The Red Book of Tajikistan (Rahimi et al., 2017) includes *Allium rosenbachianum*, *A. stipitatum*, *T. bifloriformis*, *T. kaufmanniana*, *T. praestans*, and *T. undulatifolia* var. *melchiana*. The Red Book of Turkmenistan (Annabayramov, 2011) includes *Juglans regia* L., *Malus sieversii*, and *M. sieversii* var. *kirghisorum*. The Red Book of Kyrgyzstan (Shukurov, 2006) includes *M. niedzwetzkyana*, *M. sieversii*, *M. sieversii* var. *kirghisorum*, and *Tulipa kaufmanniana*.

In general, ergasiophytes in the plot “Central Asia” are of great zoological importance. Many rare plants on the plot are represented in the form of introductory and full-fledged introductory populations. Their survey will be the subject of a separate study.

### Phytocoenoses and ecosystems

The vegetation on the plot “Central Asia” is now heterogeneous and generally corresponds to the initial plans (Sikura, 1970). However, due to the relatively small number of ergasiophytes of Central Asian origin, artificial phytocoenoses are not formed and mostly do not have a complete natural coenotic structure. Creating the plot, its first curators realized that it is impossible to reproduce the full vegetation of the plains and mountains of Central Asia in Kyiv. Therefore, it was important to create a layer of edificators of a certain phytocoenosis, plant a shrub layer (if possible), and a large number of geophytes and other assectators (Sikura, 1970).

The plant belts of the Kopetdag are most fully represented on the phytogeographical plot “Central Asia”. Sections of “Kopetdag” occupy the entire western part of the plot and are distributed on the principle of vertical zonation of the mountains (Figs. 2 & 3). Among the edificators in artificial phytocoenoses, the following trees of mountain forests are represented here: *Crataegus* spp., *Celtis caucasica*, *Elaeagnus angustifolia* L., *Prunus armeniaca*, *P. cerasifera* Ehrh., *P. mahaleb* L., *P. sogdiana*, and *Juglans regia*. They are complemented by shrubs *Caragana halodendron* (Pall.) Dum. Cours., *Cotoneaster neoantoninae*, *Ephedra equisetina*, *Lonicera tatarica*, and *Rosa spinosissima*. On the southern slope of this section, juniper (archa) shrublands with *Juniperus seravschanica* are

formed, and the eastern slope is covered by the monodominant group of *J. sabina* (Fig. 3 A). In some meadows of the Kopetdag, tall herbaceous vegetation with edificators *Eremurus fuscus*, *Rumex pamiricus* Rech., *R. tianschanicus* Losinsk. and *Rubia tinctorum* L. has formed. In different parts of the “Kopetdag”, there are perennial assectators of phytocoenoses *Alcea nudiflora* (Lindl.) Boiss., *Allium* spp., *Fritillaria sewerzowii*, *Muscari neglectum* Guss. ex Ten., *Silene coronaria*, and *Tulipa* spp. (Figs. 3 C, C2 A–N, C5 A–H, C6). Many of these plants are endemics of Central Asia. Most of these species are represented on the plot in the form of introductory populations.

The vegetation of the sands is represented by tamarisk plantations, while other ergasiophytes-psamophytes have not survived to this day. Therefore, the sandy vegetation section needs future reconstruction and the introduction of new ergasiophytes from Central Asia.

On the eastern side of the plot, its lower part is occupied by a large section of tugai. It occupies areas where it was planned to create walnut and juniper forests (Fig. 2). For various reasons (probably due to the low quality of the soil, which did not meet the needs of these plants) the walnut and juniper forests were not created. The vegetation of the tugai section is currently represented by *Ulmus minor* Mill. stands with *Acer* spp., *Fraxinus sogdiana*, *Juglans regia*, and *Salix alba* L. In the shrub layer, there are mainly ergasiophytes originated out of Central Asia. Valuable introductory populations of *Arum korolkowii*, *Fritillaria sewerzowii*, *Tulipa kaufmanniana*, and *T. praestans* are represented in the herbaceous cover of tugai (Figs. 3 D & C6 E–G). To date, the section of tugai needs significant additions of new ergasiophytes, especially shrubs and perennials.

Above the section of tugai there are sections of apple-hawthorn and spruce forests, which imitate the zonal location of the vegetation of the Tien Shan. This compositional solution based on the terrain of the plot proved to be an excellent example of high-quality landscape design (Fig. 3 B). Currently, the apple-hawthorn forest is represented by a plantation of edificators *Crataegus* spp., *Malus sieversii* and *M. sieversii* var. *kirghisorum*, with the participation of

*M. niedzwetzkyana* and some *Acer* species. Unfortunately, hawthorn and apple trees have reached an extreme age and dying. Therefore, this section needs to be reconstructed shortly.

The spruce forest is represented by a monodominant *Picea schrenkiana* plantation with small admixtures of deciduous trees. This plantation of the park type looks quite stable. Shrubs and herbaceous plants of Central Asian flora are absent here. But there are signs of habitat transformation under the canopy of spruces. For example, *Geastrum* sp. fungus (<https://www.inaturalist.org/observations/95143077>) indicating the formation of a coniferous forest ecosystem, was recently discovered here. In the future, this can be used to introduce some Central Asian plants whose habitats are associated with coniferous forests.

In the past, considerable resources were spent on the formation of vegetation of mountain meadows, but now only the introductory population of *Rosa webbiana* Wall. has survived. Therefore, this section needs a radical reconstruction.

A sparse plantation of deciduous trees (e.g., *Acer platanoides*, *Ulmus pumila* L., etc.) has been preserved along the perimeter of the phytogeographical plot. This plantation does not play a scientific and landscape-expositional role today and, therefore, also requires reconstruction.

### Problems and development prospects

The stability of artificial phytocoenoses on phytogeographical plots is very vulnerable and related to their experimental prospects. The rapid or gradual death of ergasiophytes due to soil and climatic conditions inconsistency, low naturalization, and other accidents happen. Since the “Central Asia” plot was created, several sections (e.g., mountain meadows and walnut forest) within its boundaries disappeared. In stable artificial phytocoenoses that have been formed, many ergasiophytes that failed to acclimatize or reproduce have died. It should be noted that similar phenomena are observed on other phytogeographical plots of the NBG, where artificial phytocoenoses exist out of their natural preferences, for example, in the plot “Caucasus” (Shynder, 2015).

The purposeful introduction of plants often remains complicated in predicting the success so far (Bulakh, 1999). This is especially true for plants being introduced for the first time. However, the gradual extinction of the introduced plants should not be considered an exclusively negative result because it provides valuable information for further experiments. In particular, due to the persistent directed introduction on the plot “Central Asia”, exceptionally useful information was obtained. It was found that the most stable phytocoenoses are that do not require special additional resource-intensive measures for their cultivation in Kyiv: many types of forests and shrub phytocoenoses, tamarisk thickets, and mountain meadows of Kopetdag. Thus, the main task for the future is to continue the directed introduction in these artificial phytocoenoses. It is important to note that due to global warming (Boychenko et al., 2016), there are favorable conditions for the successful cultivation of ergasiophytes from Central Asia.

The problem of interaction of visitors with plantations is common in the botanical gardens and arboretums. Scientific collections of phytogeographical plots of the NBG, including introductory populations of rare and ornamental plants and experimental plantings of new ergasiophytes, are open to visitors. In this regard, some plants are being stolen from the plots. After a mass visit to the NBG during the growing season, much garbage remains on the plots. Some ergasiophytes die and disappear due to such pollution and trampling. However, there are prospects that with the development of society, its attitude to nature and green planting will be with greater respect and understanding.

The number of stray dogs, which are cared for in Kyiv by volunteers has increased in recent years. The plot “Central Asia” has long been a favorite habitat for several dogs, and they did not influence the ecosystem of the plot (Fig. C7 A). However, recently, the number of dogs has increased dramatically, negatively affecting the plantation of the plot and the overall visitors and personnel safety. Another negative zoological aspect is an extremely high presence of ticks carrying pathogens. One reason for the large number of ticks is the uncontrolled breeding of dogs in the last decade. Therefore, the prospects

for developing the phytogeographical plot “Central Asia” are associated with reducing the impact of synanthropic and harmful fauna.

An urgent problem is phytopollution of the territory by invasive plants (Jebb, 2018; Protopopova & Shevera, 2019; Pyšek et al., 2020). Thus, among 44 invasive and harmful plant species that are registered in the NBG (Shynder et al., 2021), the following species are noted on the plot “Central Asia” (highly active species are underlined): *Acer negundo*, *Ambrosia artemisiifolia* L., *Asclepias syriaca* L., *Berberis aquifolium* Pursh, *Celtis occidentalis* L., *Clematis vitalba* L., *Conium maculatum* L., *Cornus sanguinea* subsp. *australis*, *Corydalis caucasica* DC., *Fraxinus pennsylvanica* Marshall, *Heracleum sosnowskyi* Manden., *Impatiens parviflora* DC., *Lonicera caprifolium* L., *L. ruprechtiana* Regel, *Lycium barbarum* L., *Morus alba* L., *Parthenocissus vitacea* (Knerr) Hitchc., *Robinia pseudoacacia* L., *Rumex patientia* L., *Solidago canadensis* L., *Symphytum asperum* Lepech., *Tilia × europaea* L., *Ulmus pumila*, *Vitis amurensis* Rupr., and *V. riparia* Michx. (Fig. C7 B–E). During the care of the plot, a constant struggle is carried out with these plants.

In the NBG, the naturalization of ergasiophytes and their escape beyond the places of cultivation continues. In addition to invasive plants, less active ergasiophytes spread to the plot “Central Asia” from neighboring plots (i.e., plots “Caucasus”, “Rare Species of Ukrainian Flora”, and “Lianas”). For example, the following plants escaped from the plot “Caucasus” and formed spontaneous populations there: *Arum elongatum* Steven (Fig. C7 F), *A. maculatum* L., *Corydalis caucasica*, *Heracleum sosnowskyi*, and *Nepeta grandiflora* M. Bieb. Some plants, such as *Galanthus woronowii* Losinsk., *Staphylea pinnata* L., *Taxus baccata* L. (Fig. C7 G–H) are represented there by single individuals or clones and did not form a spontaneous population. *Ornithogalum boucheanum* (Kunth) Asch., *O. fimbriatum* Willd., *O. orthophyllum* Ten. subsp. *kochii* (Parl.) C. Zahariadi and *Melica altissima* L. spontaneously invaded the artificial phytocoenoses of the plot “Central Asia” from the plot “Rare Species of Ukrainian Flora”. *Clematis vitalba*, *Hedera helix* L., *Lonicera caprifolium*, *Parthenocissus vitacea*, and *Vitis riparia* invaded this plot from the plot “Lianas”. It should be noted that woody

lianas are the most highly invasive plants in the NBG in general (Shynder et al., 2021).

Among ergasiophytes of Central Asian origin, invasive plants are practically absent in the spontaneous flora of the NBG (Shynder, 2019b). However, an adult specimen of *Ulmus pumila* on the eastern edge of the plot “Central Asia” poses a certain danger. It is advisable to destroy this tree during the reconstruction of the plot plantations. Some ergasiophytes of the plot “Central Asia” (e.g., *Prunus* spp., *Rumex pamiricus*) show a particular invasive ability. Nevertheless, the phytogeographical plot “Central Asia” is not the main center of invasive plants spreading in the NBG.

## Conclusions

Thus, the modern structure of the flora of the phytogeographical plot “Central Asia” in the M.M. Gryshko National Botanical Garden was formed as a result of labor-intensive scientific and experimental work on the directed introduction of plants from Central Asia. During the entire period of the plot’s existence, over 1,000 plant species have been tested on it, but only 70 species of ergasiophytes have survived to date. The main reason for the mass loss of introduced plants is the significant difference in climatic conditions between Kyiv and most regions of Central Asia.

It was found that 308 species and subspecies of vascular plants grow in the plantations on the plot “Central Asia”, of which 60% are plants of the Central Asian flora. Among peculiarities while keeping a collection of living plants on the phytogeographical plot “Central Asia” is that alien ergasiophytes grow here as part of artificially formed phytocoenoses that model certain regions of Central Asia. Some ergasiophytes are naturalized and formed introductory populations. On the plot, Central Asian (25.0%), Eurasian (21.2%), Palearctic (13.0%), and sub-Mediterranean (10.9%) types of ranges predominate among the plants of Central Asian flora. Among them, the largest number belongs to hemicryptophytes (28.4%). However, there are quite a lot of phanerophytes (25.1%), cryptophytes (25.1%), and therophytes (19.1%). Concerning the habitat conditions among the Central Asian plants, plants of

shrub thickets and edges (25.5%) and forest species (20.7%) predominate. In general, among the introduced plants, those growing in the temperate continental regions of Central Asia are the best adapted to the conditions of the NBG.

One of the most valuable features of the flora of the phytogeographical plot "Central Asia" is the species complexes of *Acer*, *Allium*, *Crataegus*, *Tamarix*, and *Tulipa* genera. Further introduction of species of these genera is promising. Among the present plot's diversity, 24 species of ergasiophytes are listed in the red books of Central Asian countries. Thus, the phytogeographical plot "Central Asia" is an important center of species diversity of introduced plants of Central Asian flora and plays a significant role in the conservation of many plant species, including rare, endemic, and relict ones.

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**Appendix A.** Checklist of the flora of the phytogeographical plot “Central Asia” (M.M. Gryshko National Botanical Garden of the National Academy of Sciences of Ukraine, Kyiv, Ukraine).

**Applied abbreviations**

FCA – Native flora of the Central Asia region

*The origin of plants (immigration groups):*

Native – native plant species;

Erg. CA – ergasiophyte, specially introduced from Central Asia (for such taxa their inventory number is marked);

Erg. non CA – ergasiophyte was not introduced from Central Asia;

Escaped – escaped plant (ergasiophygophyte);

N. r. – native range:

Am – American

Anat – Anatolian

As – Asian

Bor – Boreal

Cauc – Caucasian

Cosm – cosmopolitan

EuAs – Eurasian

EuAs-des. – Eurasian desert

EuAs-for.-step. – Eurasian forest-steppe

EuAs-step. – Eurasian steppe

Eu-subMed – Euro-sub-Mediterranean

FE – Far Eastern

Him – Himalayan

Hol – Holarctical

Med – Mediterranean (in a broad sense – sub-Mediterranean)

PARct – Paleoarctical

C – central

E – east

N – north

S – south

W – west

Cultig. – cultigenic origin

(Y) – the taxon is present in the natural flora of Central Asia

(N) – the taxon is absent in the natural flora of Central Asia

L. f. – plant life-form

Hab. – habitat

Intr. – introduction (for plants, specially those introduced from Central Asia, the year and original locality are indicated in case if such information is preserved)

**GYMNOSPERMS. PINOPIIDA**

**CUPRESSACEAE**

1. *Juniperus sabina* L.: Erg. CA, N113-00050. – N. r.: subMed (Y). – L. f.: Subhrub; Chamaephyte. – Hab.: Shrubs and edges. – Intr.: 1958, Kazakhstan, Trans-Ili Alatau

<https://www.inaturalist.org/observations/101875701>

2. *Juniperus seravschanica* Kom. Erg. CA, N113-00052. – N. r.: AsCW (Y). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges. – Intr.: 1953, Tajikistan, Gissar Range; 1958, Kyrgyzstan, Kyrgyz Ala-Too Range

<https://www.inaturalist.org/observations/101874169>

3. *Platycladus orientalis* (L.) Franco: Erg. non CA. – N. r.: AsSE (N). – L. f.: Tree; Phanerophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/95178062>

4. *Thuja occidentalis* L.: Erg. non CA. – N. r.: AmN (N). – L. f.: Tree; Phanerophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/95178061>

**PINACEAE**

5. *Picea schrenkiana* Fisch. et Mey.: Erg. CA, N113-00063. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests. – Intr.: 1958, Kazakhstan, Trans-Ili Alatau

<https://www.inaturalist.org/observations/101874161>

<https://www.inaturalist.org/observations/95180105>

**TAXACEAE**

6. *Taxus baccata* L.: Escaped (from the plot “Caucasus”). – N. r.: EuW-subMed (N). – L. f.: Tree; Phanerophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/102075373>

GYMNOSPERMS. GNETOPSIDA

EPHEDRACEAE

7. *Ephedra equisetina* Bunge: Erg. CA, N113-00039. – N. r.: EuAs-des (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Clay. – Intr.: 1961, Turkmenistan, Kopet Dag, Chuli settlement

<https://www.inaturalist.org/observations/102012803>

ANGIOSPERMS. MONOCOTS

AMARYLLIDACEAE

8. *Allium aflatunense* B. Fedtsch: Erg. CA, N113-0007. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows. – Intr.: 1961, Tajikistan, Gissar Range

9. *Allium altissimum* Regel: Erg. CA, N113-00006. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/101876890>

<https://www.inaturalist.org/observations/101876897>

10. *Allium caeruleum* Pall.: Erg. CA, N113-00011. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges. – Intr.: 1961, Kazakhstan, Talgar Gorge. – **Note.** The typical form (*var. caeruleum*) and live-bearing form (*var. bulbiferum* (Schrenk ex Fisch. & C.A. Mey.) Ledeb.) are presented on the plot "Central Asia". Typical plants of *A. caeruleum*, without bulbs in the inflorescence we initially considered another species – *Allium caesium* Schrenk, but long-term observations have shown that these two forms are one species, and they often grow side by side, even in clonal offspring of one mother plant. Therefore, *var. bulbiferum* has no systematic significance and is an ecological morphotype. As for the real *A. caesium*, in soviet times this species was indeed part of the collection (Bulakh, 1994; Kokhno, 1997), but it has not survived to date.

<https://www.inaturalist.org/observations/102075382>

<https://www.inaturalist.org/observations/103971497>

11. *Allium cristophii* Trautv.: Erg. CA, N113-00010. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows. – Intr.: 1961, Turkmenistan, Kopet Dag, border checkpoint Chaek

<https://www.inaturalist.org/observations/101875718>

12. *Allium decipiens* Fisch. ex Schult. & Schult.f.: Erg. CA?, N113-00108. – N. r.: EuAs-step (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes

<https://www.inaturalist.org/observations/101875714>

13. *Allium fetisowii* Regel: Erg. CA, N113-00109. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

<https://www.inaturalist.org/observations/101872701>

14. *Allium nutans* L.: Erg. CA, N113-00110. – N. r.: EuAsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/102076550>

15. *Allium rosenbachianum* Regel: Erg. CA, N113-00111. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

<https://www.inaturalist.org/observations/101872702>

16. *Allium schoenoprasum* L.: Erg. CA, N113-00015. – N. r.: Hol (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Synanthropic. – Intr.: 1961, Kazakhstan, Dzungarian Alatau

17. *Allium stipitatum* Regel: Erg. CA, N113-00112. – N. r.: AsCW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

<https://www.inaturalist.org/observations/101872698>

<https://www.inaturalist.org/observations/101875707>

18. *Allium strictum* Schrad.: Erg. CA, N113-00016. – N. r.: EuAsW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes. – Intr.: 1961, Kazakhstan, Dzungarian Alatau

19. *Allium tuberosum* Rottler ex Spreng.: Escaped (from flower beds). – N. r.: AsSE (N). – L. f.: Perennial; Cryptophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/102076552>

<https://www.inaturalist.org/observations/97625978>

20. *Allium turkestanicum* Regel: Erg. CA. – N.r.: AsC (Y). – L.f.: Perennial; Cryptophyte. – Hab.: Meadows. – Intr.: 2019, Canada, Edmonton

21. *Galanthus lagodechianus* Kem.-Nath. (= *G. cabardensis* Koss): Escaped (from the plot "Caucasus"). – N. r.: Cauc (N). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101869612>

22. *Galanthus woronowii* Losinsk.: Escaped (from the plot "Caucasus"). – N. r.: Cauc (N). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101882603>

<https://www.inaturalist.org/observations/101869614>

ARACEAE

23. *Arum orientale* M. Bieb. subsp. *orientale* (= *Arum elongatum* Steven): Escaped (from the plot "Caucasus"). – N. r.: subMedE (N). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101875709>

<https://www.inaturalist.org/observations/101757163>

24. *Arum korolkowii* Regel: Erg. CA, N113-00021. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Forests. – Intr.: 1961, Turkmenistan, Kopet Dag, border checkpoint Chaek

<https://www.inaturalist.org/observations/101872860>

25. *Arum maculatum* L.: Escaped (from the plot «Caucasus»). – N. r.: EuW-subMed (N). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101876891>  
<https://www.inaturalist.org/observations/101757164>

#### ASPARAGACEAE

26. *Asparagus officinalis* L.: Native. – N. r.: PARctW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

<https://www.inaturalist.org/observations/101874167>

27. *Muscari armeniacum* H.J. Veitch: Escaped (from the plot “Caucasus”). – N. r.: subMedE (N). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes

<https://www.inaturalist.org/observations/101873444>  
<https://www.inaturalist.org/observations/101870537>

28. *Muscari neglectum* Guss. ex Ten.: Erg. CA, N113-00215. – N. r.: Eu-subMed (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes

<https://www.inaturalist.org/observations/101873443>  
<https://www.inaturalist.org/observations/101876889>

29. *Ornithogalum boucheanum* (Kunth) Asch.: Escaped (from the plot “Rare Species of Ukrainian Flora”). – N. r.: EuAs-step (N). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

<https://www.inaturalist.org/observations/101757225>

30. *Ornithogalum fimbriatum* Willd.: Escaped (from the plot “Rare Species of Ukrainian Flora”). – N. r.: subMedE (N). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes

31. *Ornithogalum orthophyllum* Ten. subsp. *kochii* (Parl.) C. Zahariadi: Escaped (from the plot “Rare Species of Ukrainian Flora”). – N. r.: subMed (N). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes

<https://www.inaturalist.org/observations/101875705>

32. *Polygonatum latifolium* (Jacq.) Desf.: Escaped (from the plot “Caucasus”). – N. r.: EuC (N). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101872694>  
<https://www.inaturalist.org/observations/101876896>

33. *Polygonatum multiflorum* (L.) All.: Native. – N. r.: Eu-subMed (N). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

34. *Puschkinia scilloides* Adams (= *Puschkinia hyacinthoides* Baker): Erg. non CA. – N. r.: subMedE (N). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

<https://www.inaturalist.org/observations/101867985>

35. *Scilla bifolia* L.: Native. – N. r.: EuC (N). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

#### ASPHODELIACEAE

36. *Eremurus fuscus* (O. Fedtsch.) Vved.: Erg. CA, N113-00040. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes. – Intr.: 1961, Kazakhstan, Dzungarian Alatau

<https://www.inaturalist.org/observations/91376284>

37. *Hemerocallis fulva* (L.) L.: Erg. non CA (ergasiolypophyte). – N. r.: AsSE (N). – L. f.: Perennial; Cryptophyte. – Hab.: Synanthropic

#### CYPERACEAE

38. *Carex leporina* L.: Native. – N. r.: PARct (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows

39. *Carex hirta* L.: Native. – N. r.: Eu-subMed (N). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

40. *Carex praecox* Schreb.: Native. – N. r.: EuAs (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes

41. *Carex spicata* Huds.: Native. – N. r.: Eu-subMed (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows

#### IRIDACEAE

42. *Iris halophila* Pall.: Erg. CA, N113-00047. – N. r.: EuAsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes. – Intr.: 1962, Kazakhstan, Almaty region

#### LILIACEAE

43. *Fritillaria sewerzowii* Regel (= *Korolkowia sewerzowii* Regel): Erg. CA, N113-00053. – N. r.: EuAsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Forests. – Intr.: 1961, Western Tian Shan, Qurama Mountains

<https://www.inaturalist.org/observations/101870538>  
<https://www.inaturalist.org/observations/95859276>  
<https://www.inaturalist.org/observations/91557330>

44. *Gagea fragifera* (Vill.) Ehr. Bayer & G. López (= *G. erubescens* (Besser) Schult. & Schult. f.): Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/101870541>

45. *Gagea lutea* (L.) Ker Gawl.: Native. – N. r.: EuAs (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Forests
46. *Gagea minima* (L.) Ker Gawl.: Native. – N. r.: Eu (N). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges
47. *Gagea transversalis* Steven (= *G. paczoskii* (Zapał.) Grossh.): Native. – N. r.: EuE (N). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes  
<https://www.inaturalist.org/observations/101875697>  
<https://www.inaturalist.org/observations/101869611>
48. *Tulipa bifloriformis* Vved. (= *T. biflora* auct. non Pall.): Erg. CA, N113-00281. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes. – Intr.: 1962, Kazakhstan, Jambyl Region  
<https://www.inaturalist.org/observations/101875690>  
<https://www.inaturalist.org/observations/101875688>  
<https://www.inaturalist.org/observations/101870545>  
<https://www.inaturalist.org/observations/101870530>
49. *Tulipa fosteriana* W.Irving: Erg. CA, N113-00282. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes  
<https://www.inaturalist.org/observations/101875686>
50. *Tulipa hybrida* hort.: Erg. non CA. – Cultig. (N). – L. f.: Perennial; Cryptophyte. – Hab.: Synanthropic  
<https://www.inaturalist.org/observations/101872699>
51. *Tulipa kaufmanniana* Regel: Erg. CA, N113-00088. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes. – Intr.: 1961, Western Tian Shan, Uzbekistan, River Angren valley  
<https://www.inaturalist.org/observations/101870534>  
<https://www.inaturalist.org/observations/101875696>
52. *Tulipa sprengeri* Baker: Erg. non CA. – N. r.: Anat (N). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes  
<https://www.inaturalist.org/observations/101875719>  
<https://www.inaturalist.org/observations/101870842>
53. *Tulipa praestans* H.B. May: Erg. CA, N113-00089. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes. – Intr.: 1962, Western Tian Shan, Qurama Mountains  
<https://www.inaturalist.org/observations/101875695>  
<https://www.inaturalist.org/observations/101870543>
54. *Tulipa suaveolens* Roth (= *T. schrenkii* Regel): Erg. CA, N113-00093. – N. r.: EuAs-step (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes. – Intr.: 1961, Kazakhstan, the outskirts of Taldykorgan
55. *Tulipa undulatifolia* Boiss. var. *melchiana* (Hoog) Wilford (= *T. melchiana* Hoog): Erg. CA, N113-00285. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes. – Intr.: 1961, Turkmenistan, Kopet Dag, border checkpoint Chaek  
<https://www.inaturalist.org/observations/101873445>  
<https://www.inaturalist.org/observations/101875700>  
<https://www.inaturalist.org/observations/101873445>
56. *Tulipa urumiensis* Stapf (= *T. tarda* Stapf.): Erg. CA, N113-00090. – N. r.: AsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes. – Intr.: 1962, Kazakhstan, Trans-Ili Alatau

#### POACEAE

57. *Bromus sterilis* L.: Xen. – N. r.: subMed-AsC (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
58. *Bromus tectorum* L.: Xen. – N. r.: subMed-AsC (Y). – L. f.: Annual; Therophyte. – Hab.: Meadows
59. *Calamagrostis epigejos* (L.) Roth: Native. – N. r.: EuAs (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows  
<https://www.inaturalist.org/observations/101867972>
60. *Dactylis glomerata* L.: Native. – N. r.: PARct (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows
61. *Digitaria ischaemum* (Schreb.) Muehl.: Xen. – N. r.: EuC (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
62. *Digitaria sanguinalis* (L.) Scop.: Xen. – N. r.: AsSE (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
63. *Echinochloa crus-galli* (L.) P.Beauv.: Xen. – N. r.: As (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
64. *Elymus repens* (L.) Gould: Native. – N. r.: PARct (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows
65. *Lolium pratense* (Huds.) Darbysh. (= *Festuca pratensis* Huds.): Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows
66. *Melica altissima* L.: Escaped (from the plot "Rare Species of Ukrainian Flora"). – N. r.: EuAs-for-step (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Shrubs and edges
67. *Phleum pratense* L.: Native. – N. r.: PARct (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows
68. *Poa annua* L.: Native. – N. r.: Cosm (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
69. *Poa nemoralis* L.: Native. – N. r.: PARct (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Forests
70. *Poa pratensis* L.: Native. – N. r.: Hol (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows
71. *Setaria pumila* (Poir.) Roem. & Schult. (= *S. glauca* (L.) P. Beauv.): Xen. – N. r.: AsSE (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
72. *Setaria verticillata* (L.) P.Beauv.: Xen. – N. r.: AsSE (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

## ANGIOSPERMS. EUDICOTS

## ACERACEAE

73. *Acer campestre* L.: Native. – N. r.: Eu-subMed (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/94113034>
74. *Acer monspessulanum* L. subsp. *turcomanicum* (Pojark.) A.E. Murray (= *A. turcomanicum* Pojark.): Erg. CA, N113-00002. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests. – Intr.: 1961, Turkmenistan, Kopet Dag, former settlement Archabil (Firuza)
75. *Acer negundo* L.: Escaped (from tree plantations). – N. r.: AmN (N). – L. f.: Tree; Phanerophyte. – Hab.: Synanthropic
76. *Acer pentapomicum* Stewart ex Brand: Erg. CA, N113-00000. – N. r.: AsC-Him (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests. – Intr.: 1965, Tajikistan, Gissar Range
77. *Acer platanoides* L. subsp. *platanoides*: Native. – N. r.: Eu-subMed (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/65204449>
78. *Acer platanoides* subsp. *turkestanicum* (Pax) P.C. de Jong (= *A. turkestanicum* Pax): Erg. CA, N113-00003. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests. – Intr.: 1961, Western Tian Shan, Chatkal Range
79. *Acer pseudoplatanus* L.: Escaped (from tree plantations). – N. r.: EuC (N). – L. f.: Tree; Phanerophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/101875711>
80. *Acer tataricum* L. subsp. *semenovii* (Regel & Herder) A.E. Murray (= *A. semenovii* Regel. et Herd): Erg. CA, N113-00001. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests. – Intr.: 1961, Kazakhstan, Trans-Ili Alatau

## ADOXACEAE

81. *Sambucus nigra* L.: Native. – N. r.: Eu-subMed (N). – L. f.: Shrub; Phanerophyte. – Hab.: Forests
82. *Viburnum lantana* L.: Erg. non CA. – N. r.: EuW-subMed (N). – L. f.: Shrub; Phanerophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/101869616>

## AMARANTHACEAE

83. *Amaranthus retroflexus* L.: Xen. – N. r.: AmC (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
84. *Atriplex oblongifolia* Waldst. & Kit.: Native. – N. r.: subMed (Y). – L. f.: Annual; Therophyte. – Hab.: Clay  
<https://www.inaturalist.org/observations/101874163>
85. *Atriplex patula* L.: Native. – N. r.: Hol (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
86. *Atriplex sagittata* Borkh.: Xen. – N. r.: AsC (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic  
<https://www.inaturalist.org/observations/95181444>
87. *Chenopodium hybridum* (L.) S. Fuentes, Uotila & Borsch (= *Chenopodium hybridum* L.): Xen. – N. r.: Med (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
88. *Chenopodium album* L.: Native. – N. r.: Cosm (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
89. *Chenopodium betaceum* Andr.: Xen. – N. r.: subMedE (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
90. *Chenopodium opulifolium* Schrad.: Xen. – N. r.: subMed (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
91. *Chenopodium suecicum* J. Murr.: Xen. – N. r.: As (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

## ANACARDIACEAE

92. *Rhus typhina* L.: Erg. non CA. – N. r.: AmN (N). – L. f.: Shrub; Phanerophyte. – Hab.: Synanthropic  
<https://www.inaturalist.org/observations/101867984>

## APIACEAE

93. *Aegopodium podagraria* L.: Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Forests
94. *Anthriscus sylvestris* (L.) Hoffm.: Native. – N. r.: Cosm (Y). – L. f.: Biennial; Hemicryptophyte. – Hab.: Forests
95. *Chaerophyllum bulbosum* L.: Native. – N. r.: Eu-subMed (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/79394819>
96. *Conium maculatum* L.: Xen. – N. r.: subMed-AsC (Y). – L. f.: Annual; Hemicryptophyte. – Hab.: Synanthropic
97. *Falcaria vulgaris* Bernh.: Native. – N. r.: EuAsW (Y). – L. f.: Biennial; Hemicryptophyte. – Hab.: Shrubs and edges
98. *Heracleum sibiricum* L.: Native. – N. r.: Eu (N). – L. f.: Biennial; Hemicryptophyte. – Hab.: Meadows
99. *Heracleum sosnowskyi* Manden.: Escaped (from the plot “Caucasus”). – N. r.: Cauc (N). – L. f.: Biennial; Hemicryptophyte. – Hab.: Meadows
100. *Torilis japonica* (Houtt.) DC.: Native. – N. r.: EuAsS (N). – L. f.: Annual; Hemicryptophyte. – Hab.: Forests

## APOCYNACEAE

101. *Asclepias syriaca* L.: Escaped (from the former plot “System of Higher Plants”). – N. r.: AmN (N). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows
102. *Vincetoxicum hirundinaria* Medik.: Native. – N. r.: PARctW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges  
<https://www.inaturalist.org/observations/95260107>

ARALIACEAE

103. *Hedera helix* L.: Escaped (from the plots "Caucasus" and "Lianas"). – N. r.: EuW-subMed (N). – L. f.: Liana; Phanerophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101869618>

ASTERACEAE

104. *Achillea millefolium* L. subsp. *collina* (Wirtg.) Oborný: Native. – N. r.: Eu (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows

105. *Achillea nobilis* L.: Native. – N. r.: EuAs-for-step (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Steppes

<https://www.inaturalist.org/observations/94014186>

106. *Achillea pannonica* Scheele: Native. – N. r.: EuC-EuE (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/91379730>

107. *Achillea setacea* Waldst. & Kit.: Native. – N. r.: EuAsC (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Steppes

108. *Ambrosia artemisiifolia* L.: Xen. – N. r.: AmN (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

109. *Arctium* × *ambiguum* (Celak) Nym. (= *A. lappa* × *A. minus* (Hill) Bernh.): Native. – N. r.: Eu (N). – L. f.: Biennial; Hemicryptophyte. – Hab.: Synanthropic

110. *Arctium lappa* L.: Native. – N. r.: EuAsW (Y). – L. f.: Biennial; Hemicryptophyte. – Hab.: Shrubs and edges

111. *Arctium tomentosum* Mill.: Native. – N. r.: EuAs (Y). – L. f.: Biennial; Hemicryptophyte. – Hab.: Shrubs and edges

112. *Artemisia absinthium* L.: Xen. – N. r.: AsC (Y). – L. f.: Perennial; Chamaephyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/101873447>

113. *Artemisia annua* L.: Xen. – N. r.: AsE (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

114. *Artemisia vulgaris* L.: Native. – N. r.: Hol (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges

115. *Crepis foetida* L. subsp. *rhoeadifolia* (M.Bieb.) Celak.: Xen. – N. r.: subMed (Y). – L. f.: Annual; Therophyte. – Hab.: Steppes

116. *Erigeron annuus* (L.) Desf (= *Stenactis annua* (L.) Cass. ex Less.): Xen. – N. r.: AmN (N). – L. f.: Annual; Hemicryptophyte. – Hab.: Synanthropic

117. *Erigeron canadensis* L.: Xen. – N. r.: AmN (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

118. *Galinsoga parviflora* Cav.: Xen. – N. r.: AmS (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

119. *Lactuca serriola* L.: Xen. – N. r.: subMed-AsC (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

120. *Picris hieracioides* L.: Native. – N. r.: EuAsW (Y). – L. f.: Biennial; Hemicryptophyte. – Hab.: Synanthropic

121. *Solidago canadensis* L.: Escaped (from flower beds). – N. r.: AmN (N). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

122. *Sonchus oleraceus* L.: Xen. – N. r.: Med (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/101699361>

123. *Taraxacum officinale* aggr.: Native. – N. r.: EuAsW (N). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

124. *Taraxacum proximum* (Dahlst.) Dahlst.: Native. – N. r.: Eu (N). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

<https://www.inaturalist.org/observations/101875699>

BALSAMINACEAE

125. *Impatiens parviflora* DC.: Xen. – N. r.: AmN (N). – L. f.: Annual; Therophyte. – Hab.: Forests

BERBERIDACEAE

126. *Berberis aquifolium* Pursh: Escaped. – N. r.: AmN (N). – L. f.: Subhrub; Phanerophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101869613>

127. *Berberis vulgaris* L.: Native. – N. r.: Eu-subMed (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/95181450>

<https://www.inaturalist.org/observations/94131463>

BETULACEAE

128. *Corylus colurna* L.: Erg. non CA. – N. r.: subMedE (N). – L. f.: Tree; Phanerophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101867988>

BORAGINACEAE

129. *Anchusa officinalis* L.: Xen. – N. r.: Med (Y). – L. f.: Biennial; Hemicryptophyte. – Hab.: Synanthropic

130. *Symphytum asperum* Lepech.: Escaped (from the plot "Caucasus"). – N. r.: Cauc (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/101876898>

## BRASSICACEAE

131. *Alliaria petiolata* (M.Bieb.) Cavara & Grande: Native. – N. r.: PARctW (Y). – L. f.: Annual; Therophyte. – Hab.: Forests
132. *Berteroa incana* (L.) DC.: Native. – N. r.: EuAsC (Y). – L. f.: Biennial; Hemicryptophyte. – Hab.: Synanthropic
133. *Bunias orientalis* L.: Xen. – N. r.: subMed (N). – L. f.: Biennial; Hemicryptophyte. – Hab.: Synanthropic
134. *Capsella bursa-pastoris* (L.) Medik.: Xen. – N. r.: subMedE (Y). – L. f.: Annual; Hemicryptophyte. – Hab.: Synanthropic
135. *Diplotaxis tenuifolia* (L.) DC.: Escaped (from the former plot “System of Higher Plants”). – N. r.: subMed (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic  
<https://www.inaturalist.org/observations/53186234>
136. *Sisymbrium loeselii* L.: Xen. – N. r.: subMed (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
137. *Sisymbrium officinale* (L.) Scop.: Xen. – N. r.: Med (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

## CAMPANULACEAE

138. *Campanula bononiensis* L.: Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges
139. *Campanula rapunculoides* L.: Native. – N. r.: Eu-subMed (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges

## CANNABACEAE

140. *Celtis caucasica* Willd.: Erg. CA, N113-00136. – N. r.: subMed (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/101875708>  
<https://www.inaturalist.org/observations/94014187>
141. *Celtis occidentalis* L.: Escaped (from the plot “Caucasus”). – N. r.: AmN (N). – L. f.: Tree; Phanerophyte. – Hab.: Forests
142. *Humulus lupulus* L.: Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

## CAPRIFOLIACEAE

143. *Knautia arvensis* (L.) Coult.: Native. – N. r.: Eu (N). – L. f.: Biennial; Hemicryptophyte. – Hab.: Meadows  
<https://www.inaturalist.org/observations/93278363>
144. *Lonicera caprifolium* L.: Escaped (from the plot “Caucasus”). – N. r.: subMed (N). – L. f.: Liana; Phanerophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/101867987>
145. *Lonicera micrantha* Trautv. ex Regel: Erg. CA, N113-00201. – N. r.: AsC (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges
146. *Lonicera* × *notha* Zabel (= *L. ruprechtiana* × *L. tatarica*): Escaped (spontaneous hybrid). – Cultig. (N). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges
147. *Lonicera ruprechtiana* Regel: Escaped (from the plot «Far East»). – N. r.: FE (N). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges  
<https://www.inaturalist.org/observations/101875710>
148. *Lonicera tatarica* L.: Erg. CA, N113-000578. – N. r.: EuAsC (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges. – Intr.: 1961, Kazakhstan, Dzungarian Alatau
149. *Lonicera xylostereum* L.: Erg. non CA. – N. r.: Bor (N). – L. f.: Shrub; Phanerophyte. – Hab.: Forests
150. *Valeriana pratensis* Dierb. (= *V. collina* Wallr.): Native. – N. r.: Eu-subMed (N). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows  
<https://www.inaturalist.org/observations/101876888>

## CARYOPHYLLACEAE

151. *Cerastium holosteoides* Fries: Native. – N. r.: EuAs (N). – L. f.: Perennial; Chamaephyte. – Hab.: Meadows
152. *Cerastium semidecandrum* L.: Native. – N. r.: Eu-subMed (N). – L. f.: Annual; Therophyte. – Hab.: Meadows
153. *Rabelera holostea* (L.) M.T. Sharples & E.A. Tripp (= *Stellaria holostea* L.): Native. – N. r.: Eu-Cau (Y). – L. f.: Perennial; Chamaephyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/79393505>
154. *Saponaria officinalis* L.: Xen. – N. r.: Med (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows
155. *Silene coronaria* (L.) Clairv. (= *Coronaria coriacea* (Moench) Schischk. & Gorschk.): Erg. CA, N113-00261. – N. r.: subMed (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Forests
156. *Silene latifolia* Poir. subsp. *alba* (Miller) Greuter & Burdet (= *Melandrium album* (Mill.) Garcke): Native. – N. r.: EuAs (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows
157. *Silene vulgaris* (Moench) Garcke (= *S. latifolia* (Mill.) Rendle et Britt.): Native. – N. r.: PARct (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows
158. *Stellaria media* (L.) Vill.: Native. – N. r.: Cosm (Y). – L. f.: Annual; Hemicryptophyte. – Hab.: Synanthropic

CELASTRACEAE

159. *Euonymus europaeus* L.: Native. – N. r.: Eu-subMed (N). – L. f.: Shrub; Phanerophyte. – Hab.: Forests

CONVOLVULACEAE

160. *Convolvulus arvensis* L.: Native. – N. r.: PARct (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Synanthropic

CORNACEAE

161. *Cornus sanguinea* L. subsp. *australis* (C.A.Mey.) Jáv. (= *Swida australis* (C.A. Mey.) Pojark. ex Grossh.): Erg. non CA.  
– N. r.: subMedE (N). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/95384255>

CRASSULACEAE

162. *Hylotelephium maximum* (L.) Holub subsp. *maximum*: Native. – N. r.: Eu-subMed (N). – L. f.: Perennial; Cryptophyte.  
– Hab.: Forests

<https://www.inaturalist.org/observations/101867976>

DIPSACACEAE

163. *Dipsacus pilosus* L.: Native. – N. r.: subMed (N). – L. f.: Biennial; Hemicryptophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/91557334>

164. *Scabiosa ochroleuca* L.: Native. – N. r.: EuAsC (N). – L. f.: Biennial; Hemicryptophyte. – Hab.: Steppes

ELAEAGNACEAE

165. *Elaeagnus angustifolia* L.: Erg. CA, N113-00161. – N. r.: subMed-AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/95181446>

EUPHORBIACEAE

166. *Euphorbia cyparissias* L.: Native. – N. r.: EuC-subMed (N). – L. f.: Perennial; Cryptophyte. – Hab.: Synanthropic

167. *Euphorbia saratoi* Ard. (= *E. virgultosa* Klokov): Native. – N. r.: EuAsW (N). – L. f.: Perennial; Cryptophyte. – Hab.:  
Shrubs and edges

FABACEAE

168. *Caragana halodendron* (Pall.) Dum.Cours. (= *Halimodendron halodendron* (Pall.) Voss.): Erg. CA, N113-00044. – N. r.:  
AsC (Y). – L. f.: Shrub; Chamaephyte. – Hab.: Deserts. – Intr.: 1961, Kazakhstan, River Ili valley

<https://www.inaturalist.org/observations/101870535>

<https://www.inaturalist.org/observations/95384253>

169. *Coronilla varia* L.: Native. – N. r.: Eu-subMed (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges

170. *Gleditsia triacanthos* L.: Erg. non CA (ergasiolypophyte). – N. r.: AmN (N). – L. f.: Tree; Phanerophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101873446>

<https://www.inaturalist.org/observations/100876901>

171. *Medicago falcata* L.: Native. – N. r.: EuAs (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes

172. *Medicago lupulina* L.: Native. – N. r.: PARctW (N). – L. f.: Annual, biennial; Hemicryptophyte. – Hab.: Meadows

173. *Medicago* × *varia* Martyn (= *M. falcata* × *M. sativa* L.): Escaped (spontaneous hybrid). – Cultig. (N). – L. f.: Perennial;  
Cryptophyte. – Hab.: Synanthropic

174. *Melilotus albus* Medik.: Native. – N. r.: PARct (Y). – L. f.: Biennial; Hemicryptophyte. – Hab.: Sands

175. *Robinia pseudoacacia* L.: Erg. non CA (ergasiolypophyte). – N. r.: AmN (N). – L. f.: Tree; Phanerophyte. – Hab.: Forests

176. *Trifolium pratense* L.: Native. – N. r.: PARct (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

177. *Vicia grandiflora* Scop.: Native. – N. r.: EuAs-step (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/101875713>

178. *Vicia sativa* L. subsp. *nigra* (L.) Ehrh. (= *V. angustifolia* L.): Xen. – N. r.: subMed-AsC (Y). – L. f.: Annual; Therophyte.  
– Hab.: Synanthropic

179. *Vicia sepium* L.: Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Shrubs and edges

GERANIACEAE

180. *Erodium cicutarium* (L.) L'Her.: Native. – N. r.: Hol (Y). – L. f.: Annual; Therophyte. – Hab.: Steppes

181. *Geranium divaricatum* Ehrh.: Native. – N. r.: EuAsW (Y). – L. f.: Annual; Therophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101875712>

182. *Geranium pusillum* L.: Xen. – N. r.: subMed (Y). – L. f.: Annual; Hemicryptophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/91557336>

183. *Geranium robertianum* L.: Native. – N. r.: EuAsW (Y). – L. f.: Annual; Therophyte. – Hab.: Forests

## HYDRANGEACEAE

184. *Philadelphus incanus* Koehne: Erg. non CA. – N. r.: AsE (N). – L. f.: Shrub; Phanerophyte. – Hab.: Synanthropic

## JUGLANDACEAE

185. *Juglans regia* L.: Erg. CA, N113-00048. – N. r.: subMed (N). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges. – Intr.: 1965, Turkmenistan, Kopet Dag

## LAMIACEAE

186. *Ajuga genevensis* L.: Native. – N. r.: Eu-Cauc (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Shrubs and edges

187. *Ballota nigra* L.: Xen. – N. r.: subMedE (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic

188. *Glechoma hederacea* L.: Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Forests

189. *Lamium maculatum* (L.) L.: Native. – N. r.: Eu (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/65532253>

190. *Lamium purpureum* L.: Xen. – N. r.: Med (N). – L. f.: Annual; Hemicryptophyte. – Hab.: Synanthropic

191. *Leonurus quinquelobatus* Gilib.: Native. – N. r.: EuAsC (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic

192. *Nepeta grandiflora* M. Bieb.: Escaped (from the plot “Caucasus”). – N. r.: Cauc (N). – L. f.: Perennial; Cryptophyte. – Hab.: Meadows

193. *Prunella vulgaris* L.: Native. – N. r.: PARctW (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Forests

194. *Stachys annua* (L.) L.: Xen. – N. r.: subMed (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

## MALVACEAE

195. *Alcea nudiflora* (Lindl.) Boiss.: Erg. CA, N113-00019. – N. r.: AsC (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Intr.: 1961, Turkmenistan, Kopet Dag, former settlement Archabil (Firuza)

<https://www.inaturalist.org/observations/101874165>

196. *Alcea rugosa* Alef.: Escaped (from the plot “Crimea”). – N. r.: EuAs-step (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/95180108>

197. *Malva neglecta* Wallr.: Xen. – N. r.: AsC (Y). – L. f.: Biennial; Hemicryptophyte. – Hab.: Synanthropic

198. *Malva sylvestris* L.: Xen. – N. r.: Med (Y). – L. f.: Annual; Hemicryptophyte. – Hab.: Synanthropic

199. *Malva thuringiaca* (L.) Vis. (= *Lavatera thuringiaca* L.): Native. – N. r.: EuAsC (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes

## MORACEAE

200. *Morus alba* L.: Escaped (from tree and fruit plantations). – N. r.: AsE (N). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges

## NYCTAGINACEAE

201. *Mirabilis nyctaginea* (Michx.) MacMill.: Escaped. – N. r.: AmN (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic

## OLEACEAE

202. *Forsythia suspensa* (Thunb.) Vahl (= *F. fortunei* Lindl.): Erg. non CA (ergasiolipophyte). – N. r.: AsSE (N). – L. f.: Shrub; Phanerophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/101870533>

203. *Fraxinus excelsior* L.: Native. – N. r.: Eu-Cauc (N). – L. f.: Tree; Phanerophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101875681>

204. *Fraxinus pennsylvanica* Marshall: Erg. non CA. – N. r.: AmN (N). – L. f.: Tree; Phanerophyte. – Hab.: Forests

205. *Fraxinus sogdiana* Bunge: Erg. CA, N113-00042. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests. – Intr.: 1961, 1962, Uzbekistan, Tashkent Botanical Garden

<https://www.inaturalist.org/observations/101875685>

206. *Ligustrum vulgare* L.: Escaped. – N. r.: subMed (N). – L. f.: Shrub; Phanerophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/99546046>

207. *Syringa chinensis* Willd.: Erg. non CA. – Cultig. (N). – L. f.: Shrub; Phanerophyte. – Hab.: Synanthropic

208. *Syringa vulgaris* L.: Erg. non CA (ergasiolipophyte). – N. r.: Med (N). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/101875706>

## ONAGRACEAE

209. *Epilobium angustifolium* L. (= *Chamerion angustifolium* (L.) Holub): Native. – N. r.: Hol (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Shrubs and edges

OXALIDACEAE

210. *Oxalis stricta* L.: Xen. – N. r.: AmN (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic

PAPAVERACEAE

211. *Chelidonium majus* L.: Native. – N. r.: EuAs (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/68278200>

212. *Corydalis caucasica* DC.: Escaped (from the plot "Caucasus"). – N. r.: Cauc (N). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/102012808>

<https://www.inaturalist.org/observations/101870536>

<https://www.inaturalist.org/observations/101870542>

213. *Corydalis solida* (L.) Clairv.: Native. – N. r.: Eu-subMed (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/75513101>

<https://www.inaturalist.org/observations/57551020>

214. *Fumaria schleicheri* Soy.-Willem.: Xen. – N. r.: AsC (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

215. *Papaver dubium* L.: Xen. – N. r.: subMed (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

216. *Papaver rhoeas* L.: Xen. – N. r.: subMed (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

PLANTAGINACEAE

217. *Linaria vulgaris* Mill.: Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges

218. *Plantago lanceolata* L.: Native. – N. r.: PARctW (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows

219. *Plantago major* L.: Native. – N. r.: PARct (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows

220. *Veronica arvensis* L.: Xen. – N. r.: subMed-AsC (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

221. *Veronica chamaedrys* L.: Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Shrubs and edges

222. *Veronica hederifolia* L.: Xen. – N. r.: EuW-subMed (N). – L. f.: Annual; Therophyte. – Hab.: Meadows

223. *Veronica polita* Fr.: Xen. – N. r.: subMed-AsC (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

224. *Veronica sublobata* M. Fischer: Native. – N. r.: EuW (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

POLYGONACEAE

225. *Fallopia convolvulus* (L.) A. Love: Xen. – N. r.: As (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

226. *Fallopia dumetorum* (L.) Holub: Native. – N. r.: EuAs (Y). – L. f.: Annual; Therophyte. – Hab.: Shrubs and edges

227. *Persicaria amphibia* (L.) Delarbre: Native. – N. r.: Hol (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Wetlands

228. *Polygonum arenastrum* Boreau: Native. – N. r.: PARct (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

229. *Polygonum aviculare* L. subsp. *aviculare*: Native. – N. r.: PARctW (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

230. *Polygonum aviculare* subsp. *neglectum* (Besser) Arcang. (= *P. neglectum* Besser): Native. – N. r.: PARctW (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

231. *Rumex patientia* L. subsp. *patientia*: Escaped. – N. r.: Med (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows

232. *Rumex patientia* subsp. *pamiricus* (Rech.f.) Rech. f. (= *R. pamiricus* Rech.): Erg. CA, N113-00078. – N. r.: AsC (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows. – Intr.: 1961, Kazakhstan, Dzungarian Alatau

<https://www.inaturalist.org/observations/122801299>

233. *Rumex thyrsoflorus* Fingerh.: Native. – N. r.: EuAs (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows

<https://www.inaturalist.org/observations/101876899>

234. *Rumex tianschanicus* Losinsk.: Erg. CA, N113-00079. – N. r.: AsC (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows. – Intr.: 1961, Kazakhstan, Trans-Ili Alatau

<https://www.inaturalist.org/observations/101875702>

<https://www.inaturalist.org/observations/101873440>

<https://www.inaturalist.org/observations/101870539>

<https://www.inaturalist.org/observations/101867982>

PRIMULACEAE

235. *Lysimachia nummularia* L.: Native. – N. r.: Eu-Cau (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows

RANUNCULACEAE

236. *Anemone ranunculoides* (L.) Holub: Native. – N. r.: Eu-Cau (N). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

237. *Clematis vitalba* L.: Escaped (from the plot "Lianas"). – N. r.: subMed (N). – L. f.: Liana; Phanerophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/101750950>

238. *Helleborus orientalis* Lam. (= *H. caucasicus* A. Braun): Escaped (from the plot "Caucasus"). – N. r.: EuC (N). – L. f.: Perennial; Cryptophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/91286776>

239. *Ranunculus ficaria* L.: Native. – N. r.: PARctW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Forests  
 240. *Ranunculus illyricus* L.: Native. – N. r.: EuAs-step (N). – L. f.: Perennial; Cryptophyte. – Hab.: Steppes  
 241. *Ranunculus polyanthemus* L.: Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Shrubs and edges

## RHAMNACEAE

242. *Rhamnus cathartica* L.: Erg. CA, N113-00070. – N. r.: EuAsW (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges. – Intr.: 1961, Kazakhstan, Trans-Ili Alatau

## ROSACEAE

243. *Agrimonia eupatoria* L.: Erg. CA, N113-00018. – N. r.: Eu-subMed (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Shrubs and edges. – Intr.: 1961, Turkmenistan, Kopet Dag, former settlement Archabil (Firuza)

244. *Cotoneaster neoantoninae* A.N. Vassiljeva: Erg. CA, N113-00034. – N. r.: AsC (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges. – Intr.: 1961, Kazakhstan, Trans-Ili Alatau

<https://www.inaturalist.org/observations/101867983>

<https://www.inaturalist.org/observations/95891917>

245. *Crataegus* cf. *ambigua* C.A. Mey. ex A.K. Becker (= *C. sororia* C.A. Mey. ex Pojark.): Erg. CA, N113-00150. – N. r.: EuE-subMed (Y). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges

246. *Crataegus dsungarica* Zabel ex Lange (= *C. almaatensis* Pojark.): Erg. CA, N113-00036. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges. – Intr.: 1961, Kazakhstan, Dzungarian Alatau

<https://www.inaturalist.org/observations/91670642>

<https://www.inaturalist.org/observations/95183075>

<https://www.inaturalist.org/observations/93273153>

<https://www.inaturalist.org/observations/93278352>

<https://www.inaturalist.org/observations/57558761>

247. *Crataegus* × *kyrtostyla* Fingerh. (= *C. monogyna* × *C. rhipidophylla*): Native. – N. r.: Eu (N). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges

248. *Crataegus monogyna* (= *C. leiomonogyna* Klokov): Native. – N. r.: Eu-subMed (N). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges

248b. *C. monogyna* aggr. / *Crataegus lipskyi* Klokov: Native. – N. r.: EuC (N)

249. *Crataegus pseudoheterophylla* Pojark. subsp. *turcomanica* (Pojark.) K.I. Chr. (= *C. turcomanica* Pojark.): Erg. CA, N113-00154. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/95181445>

250. *Crataegus rhipidophylla* Gand.: Native. – N. r.: Eu-subMed (N). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/95384610>

251. *Crataegus submollis* Sarg.: Erg. non CA. – N. r.: AmN (N). – L. f.: Tree; Phanerophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/93278357>

252. *Crataegus turkestanica* Pojark.: Erg. CA, N113-00037. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges. – Intr.: 1956, Turkmenistan, Kopet Dag, former settlement Archabil (Firuza)

<https://www.inaturalist.org/observations/95384261>

253. *Crataegus* × *zangezura* nothosubsp. *pseudoambigua* (Pojark.) K.I. Chr. (= *C. pseudoambigua* Pojark.): Erg. CA, N113-00149. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/95384260>

<https://www.inaturalist.org/observations/93577264>

254. *Cydonia oblonga* Mill.: Erg. CA, N113-00157. – N. r.: AsW (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests. – Intr.: 1965, Uzbekistan, Surxondaryo Region, the outskirts of Sina kishlak

255. *Fragaria viridis* Weston: Erg. CA, N113-00041. – N. r.: EuAsW (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Intr.: 1961, Kazakhstan, Dzungarian Alatau

256. *Geum urbanum* L.: Native. – N. r.: PARctW (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Forests

257. *Malus domestica* Borkh.: Escaped. – Cultig. (Y). – L. f.: Tree; Phanerophyte. – Hab.: Synanthropic

258. *Malus niedzwetzkyana* Dieck: Erg. CA, N113-00059. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests. – Intr.: 1958, Western Tian Shan

<https://www.inaturalist.org/observations/101872696>

259. *Malus sieversii* (Ledeb.) Roem.: Erg. CA, N113-00060. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests. – Intr.: 1961, Kazakhstan, Trans-Ili Alatau

<https://www.inaturalist.org/observations/101867978>

260. *Malus sieversii* var. *kirghisorum* (Al. Fed. & Fed.) Ponomar. (= *M. kirghisorum* Al. Fed. & Fed.): Erg. CA, N113-00205. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests. – Intr.: 1961, Kazakhstan, Dzungarian Alatau

261. *Potentilla argentea* L.: Native. – N. r.: EuAs (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/95260102>

262. *Potentilla inclinata* Vill.: Native. – N. r.: EuN (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows  
<https://www.inaturalist.org/observations/95180102>
263. *Potentilla reptans* L.: Native. – N. r.: PARctW (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Meadows  
<https://www.inaturalist.org/observations/95893095>
264. *Prunus armeniaca* L.: Erg. CA, N113-00020. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges.  
 – Intr.: 1965, Kyrgyzstan, Fergana Range  
<https://www.inaturalist.org/observations/102592943>  
<https://www.inaturalist.org/observations/101875698>
265. *Prunus cerasifera* Ehrh.: Erg. CA, N113-00069. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte. – Hab.: Synanthropic. –  
 Intr.: 1952, Western Tian Shan  
<https://www.inaturalist.org/observations/101874170>  
<https://www.inaturalist.org/observations/101867974>
- 265b. *Prunus cerasifera* aggr. / *P. sogdiana* Vassilcz.: Erg. CA, N113-00068. – N. r.: AsC (Y). – L. f.: Tree; Phanerophyte.  
 – Hab.: Shrubs and edges. – Intr.: 1958, Western Tian Shan
266. *Prunus cerasus* L.: Erg. non CA. – Cultig. (N). – L. f.: Tree; Phanerophyte. – Hab.: Synanthropic
267. *Prunus mahaleb* L.: Erg. CA, N113-00030. – N. r.: subMed (Y). – L. f.: Tree; Phanerophyte. – Hab.: Stony. – Intr.: 1961,  
 Western Tian Shan, Qurama Mountains
268. *Prunus padus* L.: Erg. CA, N113-00061. – N. r.: EuAs (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests. – Intr.: 1958, Terskey Ala-too
269. *Prunus tomentosa* Thunb.: Erg. non CA. – N. r.: AsSE (N). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges  
<https://www.inaturalist.org/observations/101875687>
270. *Pyrus communis* L. subsp. *communis* (= *P. pyrastrer* (L.) Burgsd.): Native. – N. r.: Eu-subMed (N). – L. f.: Tree;  
 Phanerophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/101873448>
271. *Rosa canina* L.: Native. – N. r.: Eu-subMed (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges
272. *Rosa corymbifera* Borkh.: Native. – N. r.: Eu-subMed (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges  
 272b. *R. corymbifera* aggr. / *Rosa uncinella* Besser (= *R. corymbifera* var. *uncinella* (Besser) J. Keller): . – N. r.: EuAs-  
 step (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Steppes
273. *Rosa dumalis* Bechst.: Native. – N. r.: EuW (N). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges
274. *Rosa spinosissima* L.: Erg. CA, N113-00076. – N. r.: PARctW (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Stony. – Intr.:  
 1961, Kazakhstan, Dzungarian Alatau  
<https://www.inaturalist.org/observations/101872697>  
<https://www.inaturalist.org/observations/95384249>
275. *Rosa webbiana* Wall. ex Royle: Erg. CA, N113-00252. – N. r.: AsC-Him (Y). – L. f.: Subshrub; Phanerophyte. – Hab.:  
 Shrubs and edges  
<https://www.inaturalist.org/observations/95180110>
276. *Rubus caesius* L.: Native. – N. r.: PARctW (Y). – L. f.: Subshrub; Phanerophyte. – Hab.: Shrubs and edges
- RUBIACEAE
277. *Rubia tinctorum* L. (= *R. iberica* (Fisch. Ex DC.) C Koch.): Erg. CA, N113-00077. – N. r.: subMed-AsC (Y). – L. f.:  
 Perennial; Cryptophyte. – Hab.: Shrubs and edges. – Intr.: 1962, Kazakhstan, Almaty region  
<https://www.inaturalist.org/observations/101875715>
- SALICACEAE
278. *Populus × canescens* (Aiton) Sm. (= *P. alba* L. × *P. tremula* L.): Erg. CA, N113-00067. – N. r.: EuAsW (Y). – L. f.: Tree;  
 Phanerophyte. – Hab.: Forests. – Intr.: 1956, Uzbekistan, Tashkent Botanical Garden. – **Note.** *It was introduced and  
 planted under the name P. alba.*  
<https://www.inaturalist.org/observations/101867981>
279. *Salix alba* L.: Native. – N. r.: PARctW (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/101869610>  
<https://www.inaturalist.org/observations/95180100>
280. *Salix caspica* Pall.: Erg. CA, N113-00080. – N. r.: AsC (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges. –  
 Intr.: 1961, Kazakhstan, River Ili valley
- SANTALACEAE
281. *Viscum album* L.: Native. – N. r.: Eu-subMed (N). – L. f.: Subshrub; Phanerophyte. – Hab.: Shrubs and edges  
<https://www.inaturalist.org/observations/101867971>
- SCROPHULARIACEAE
282. *Verbascum lychnitis* L.: Native. – N. r.: PARctW (Y). – L. f.: Biennial; Hemicryptophyte. – Hab.: Sands
283. *Verbascum phlomoides* L.: Native. – N. r.: Eu-subMed (Y). – L. f.: Biennial; Hemicryptophyte. – Hab.: Sands

## SOLANACEAE

284. *Lycium barbarum* L.: Erg. non CA (ergasiolipophyte). – N. r.: AsE (N). – L. f.: Subhrub; Phanerophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/94131462>

285. *Solanum lycopersicum* L.: Escaped. – N. r.: AmC (N). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/101874164>

286. *Solanum nigrum* L. s.l.: Xen. – N. r.: Med (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic

## STAPHYLEACEAE

287. *Staphylea pinnata* L.: Escaped (from the plot “Caucasus”). – N. r.: Eu-subMed (N). – L. f.: Shrub; Phanerophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101873441>

## TAMARICACEAE

288. *Tamarix* cf. *aralensis* Bunge (= *T. bungei* Boiss.): Erg. CA, N113-00271. – N. r.: AsC (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/104333224>

289. *Tamarix* cf. *hohenackeri* Bunge: Erg. CA, N113-00272. – N. r.: EuAs-des (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges. – Intr.: 1958, Uzbekistan, Tashkent Botanical Garden – **Note.** Our plants have semi-open flowers, while typical *T. hohenackeri* plants in Central Asia have open flowers (Rusanov, 1949). It is quite probable that a hybrid of *T. hohenackeri* × *T. meyeri* Boiss. ‘Mayskij Sneg’ grows on the site.

<https://www.inaturalist.org/observations/104332744>

290. *Tamarix ramosissima* Ledeb.: Erg. CA, N113-00087. – N. r.: EuAs-des (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges. – Intr.: 1961, Kazakhstan, River Ili valley. – **Note.** There are two forms of this species in the collection.

<https://www.inaturalist.org/observations/104285486>

291. *Tamarix szovitsiana* Bunge: Erg. CA, N113-00086. – N. r.: AsW (Y). – L. f.: Shrub; Phanerophyte. – Hab.: Shrubs and edges. – Intr.: 1961, Kazakhstan, River Ili valley – **Note.** The most numerous in the collection; in previous inventory lists, this species was probably named *T. arceuthoides* Bunge (Kokhno, 1997). We have repeatedly tried to identify these plants and now refer to them as *T. szovitsiana*. This may not be the final solution, but most of the features of the plants in the plot correspond exactly to the descriptions of *T. szovitsiana* (Rusanov, 1949; Baum, 1978). Apparently, this group of tamarisks is not well studied in nature. For example, Rusanov first indicated *T. szovitsiana* for Central Asia (Rusanov, 1949), but Goloskokov (1963: 178-179) later concluded that *T. litvinovii* Gorschk. grows in this region instead of *T. szovitsiana*. Baum (1978) indicated for Central Asia both of these species, but considered *T. szovitsiana* to be more common.

<https://www.inaturalist.org/observations/104333221>

## TILIACEAE

292. *Tilia cordata* Mill.: Native. – N. r.: Eu-Cau (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests

293. *Tilia* × *europaea* L. (= *T. cordata* × *T. platyphyllos* Scop.): Escaped (from tree plantations, spontaneous hybrid). – N. r.: EuC (N). – L. f.: Tree; Phanerophyte. – Hab.: Forests

## ULMACEAE

294. *Ulmus glabra* Huds.: Native. – N. r.: Eu-subMed (N). – L. f.: Tree; Phanerophyte. – Hab.: Forests

295. *Ulmus laevis* Pall.: Native. – N. r.: Eu-subMed (N). – L. f.: Tree; Phanerophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101875684>

296. *Ulmus minor* Mill.: Erg. CA, N113-00288. – N. r.: Eu-subMed (Y). – L. f.: Tree; Phanerophyte. – Hab.: Forests

<https://www.inaturalist.org/observations/101876895>

<https://www.inaturalist.org/observations/101872700>

<https://www.inaturalist.org/observations/94188800>

297. *Ulmus pumila* L.: Erg. CA, N113-00094. – N. r.: AsE (Y). – L. f.: Tree; Phanerophyte. – Hab.: Shrubs and edges

<https://www.inaturalist.org/observations/95181437>

<https://www.inaturalist.org/observations/95180112>

## URTICACEAE

298. *Parietaria officinalis* L.: Escaped (from the former plot “System of Higher Plants”). – N. r.: subMed (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/60496700>

299. *Urtica dioica* L.: Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Cryptophyte. – Hab.: Synanthropic

<https://www.inaturalist.org/observations/101448449>

VIOLACEAE

300. *Viola arvensis* Murray: Xen. – N. r.: Med (Y). – L. f.: Annual; Therophyte. – Hab.: Synanthropic
301. *Viola hirta* L.: Native. – N. r.: EuAsW (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Shrubs and edges
302. *Viola odorata* L.: Native. – N. r.: Eu-subMed (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/101869608>
303. *Viola odorata* hybrid complex: Escaped (from flower beds). – Cultig. (N). – L. f.: Perennial; Hemicryptophyte. – Hab.: Shrubs and edges. – **Note.** Escaped ornamental cultivars, which are hybrids of *V. odorata* with *V. alba* Besser and other species.  
<https://www.inaturalist.org/observations/101870540>
304. *Viola suavis* M. Bieb.: Native. – N. r.: subMed (Y). – L. f.: Perennial; Hemicryptophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/101869609>
305. *Viola tricolor* L. subsp. *matutina* (Klokov) Valentine: Native. – N. r.: EuE (N). – L. f.: Annual; Hemicryptophyte. – Hab.: Synanthropic  
<https://www.inaturalist.org/observations/101867973>

VITACEAE

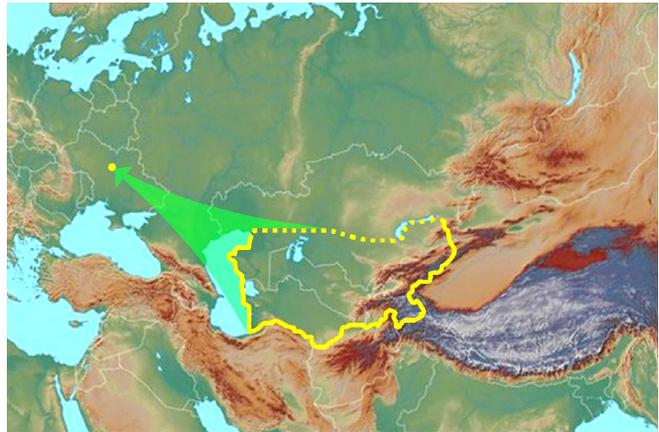
306. *Parthenocissus vitacea* (Knerr) Hitchc.: Escaped (from the plot “Lianas”). – N. r.: AmN (N). – L. f.: Liana; Phanerophyte. – Hab.: Forests
307. *Vitis amurensis* Rupr.: Escaped (from the plot “Far East”). – N. r.: FE (N). – L. f.: Liana; Phanerophyte. – Hab.: Forests  
<https://www.inaturalist.org/observations/95181449>
308. *Vitis riparia* Michx.: Escaped (from the plot “Lianas” or fruit plantation). – N. r.: AmN (N). – L. f.: Liana; Phanerophyte. – Hab.: Shrubs and edges

Appendix B. Angular points of the plot “Central Asia” contours according to 2021 inventory.

Nr	Side, name of the neighboring territory	Coordinates (WGS 84)	Nr	Side, name of the neighboring territory	Coordinates (WGS 84)	
1	West (from the plot “Lianas”)	50.411831°, 30.558196°	23	East (from the seed plot)	50.411658°, 30.563236°	
2		50.411928°, 30.558480°	24		50.411588°, 30.563430°	
3	North-West (from the plot of hermaphroditic plants)	50.411642°, 30.559024°	25	South-West (from the plot “Caucasus”)	50.411480°, 30.563318°	
4		50.411562°, 30.559261°	26		50.411368°, 30.563261°	
5		50.411519°, 30.559568°	27		50.411105°, 30.563205°	
6		50.411536°, 30.559827°	28		50.410778°, 30.563122°	
7		50.411621°, 30.560064°	29		South-West (from the administrative yard)	50.410888°, 30.562379°
8		50.411739°, 30.560248°	30			50.410637°, 30.562004°
9		50.412123°, 30.560397°	31			50.411034°, 30.561231°
10	North-East (from the plot “Altai”)	50.412104°, 30.560546°	32		50.411362°, 30.560519°	
11		50.412048°, 30.560757°	33		50.411234°, 30.560477°	
12		50.411955°, 30.560964°	34		50.411085°, 30.560265°	
13		50.411776°, 30.561311°	35		50.411030°, 30.560117°	
14		50.411775°, 30.561589°	36		50.410988°, 30.559939°	
15		50.412041°, 30.561774°	37		50.410972°, 30.559668°	
16		50.412139°, 30.561931°	38		50.410984°, 30.558943°	
17		50.412229°, 30.562304°	39		50.411252°, 30.558698°	
18		50.411992°, 30.562301°	40		50.411293°, 30.558745°	
19		50.411989°, 30.562826°	41		50.411430°, 30.558651°	
20		50.411668°, 30.562815°	42		50.411607°, 30.558287°	
21		50.411670°, 30.562926°	43		50.411835°, 30.558198°	
22		50.411644°, 30.562995°				

Appendix C. Illustrations.

**Figure C1.** Geographical scheme of directed introduction of plants from the region of Central Asia to the M.M. Gryshko National Botanical Garden.



**Figure C2.** Species of the genus *Allium* on the plot "Central Asia": **A** – *A. aflatunense*; **B** – *A. altissimum*; **C** – *A. caeruleum* var. *bulbiferum*; **D** – *A. caeruleum* var. *caeruleum*; **E** – *A. christophii*; **F** – *A. decipiens*.



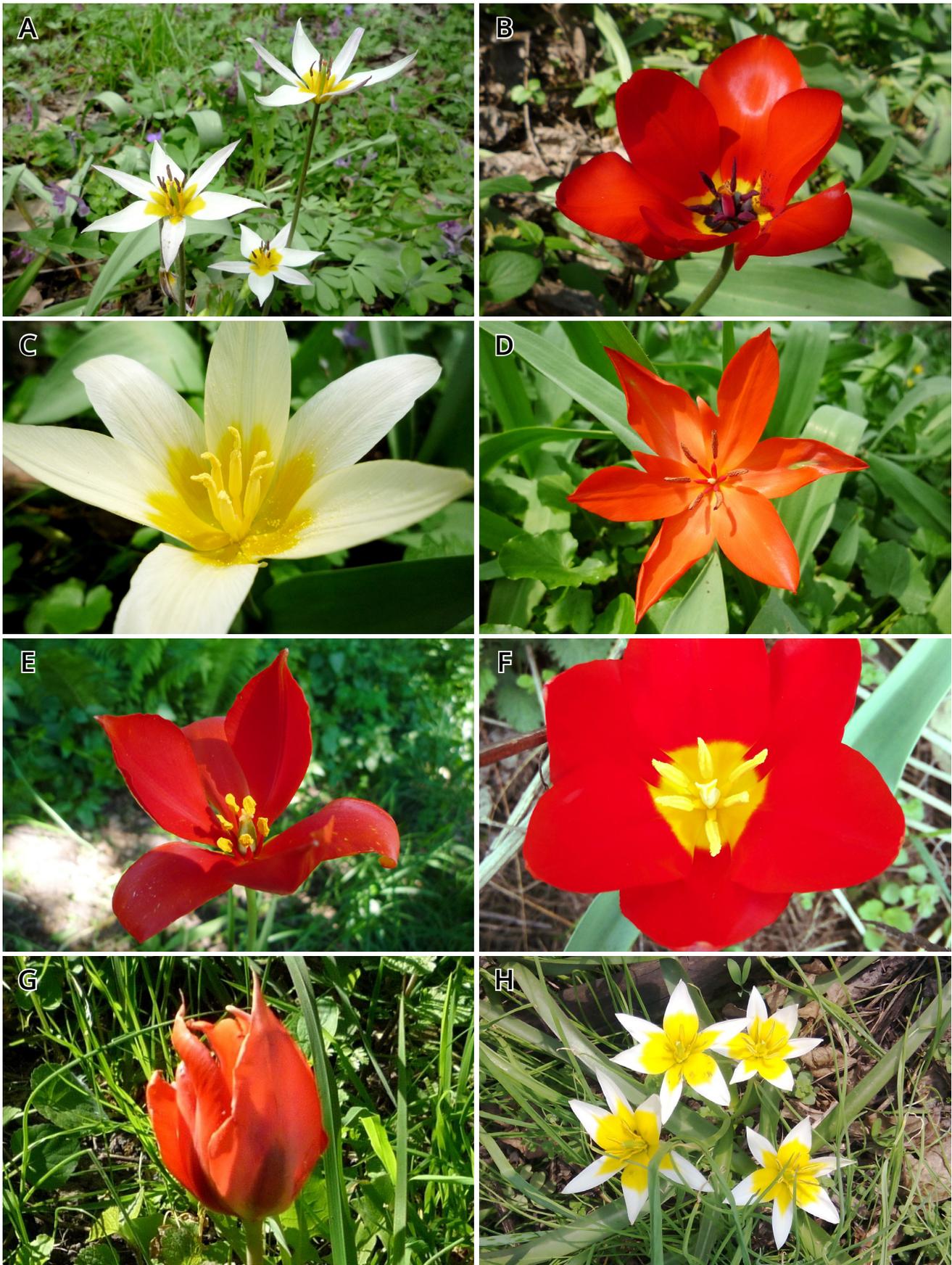
**Figure C2.** Continued. Species of the genus *Allium* on the plot "Central Asia": **G** – *A. fetisowii*; **H** – *A. nutans*; **I** – *A. rosenbachianum*; **J** – *A. schoenoprasum*; **K** – *A. stipitatum*; **L** – *A. tuberosum*; **M, N** – full-fledged introductory populations of *A. altissimum* and *A. christophii*.



**Figure C3.** Representatives of the genus *Crataegus* on the plot "Central Asia": **A, B** – *C. dsungarica*; **C** – *C. monogyna* (native plant); **D** – *C. submollis* (from North America); **E** – *C. pseudoheterophylla* subsp. *turkestanica*; **F** – *C. pseudoheterophylla* subsp. *turcomanica*; **G, H** – *C. x zangezura* subsp. *pseudoambigua*.



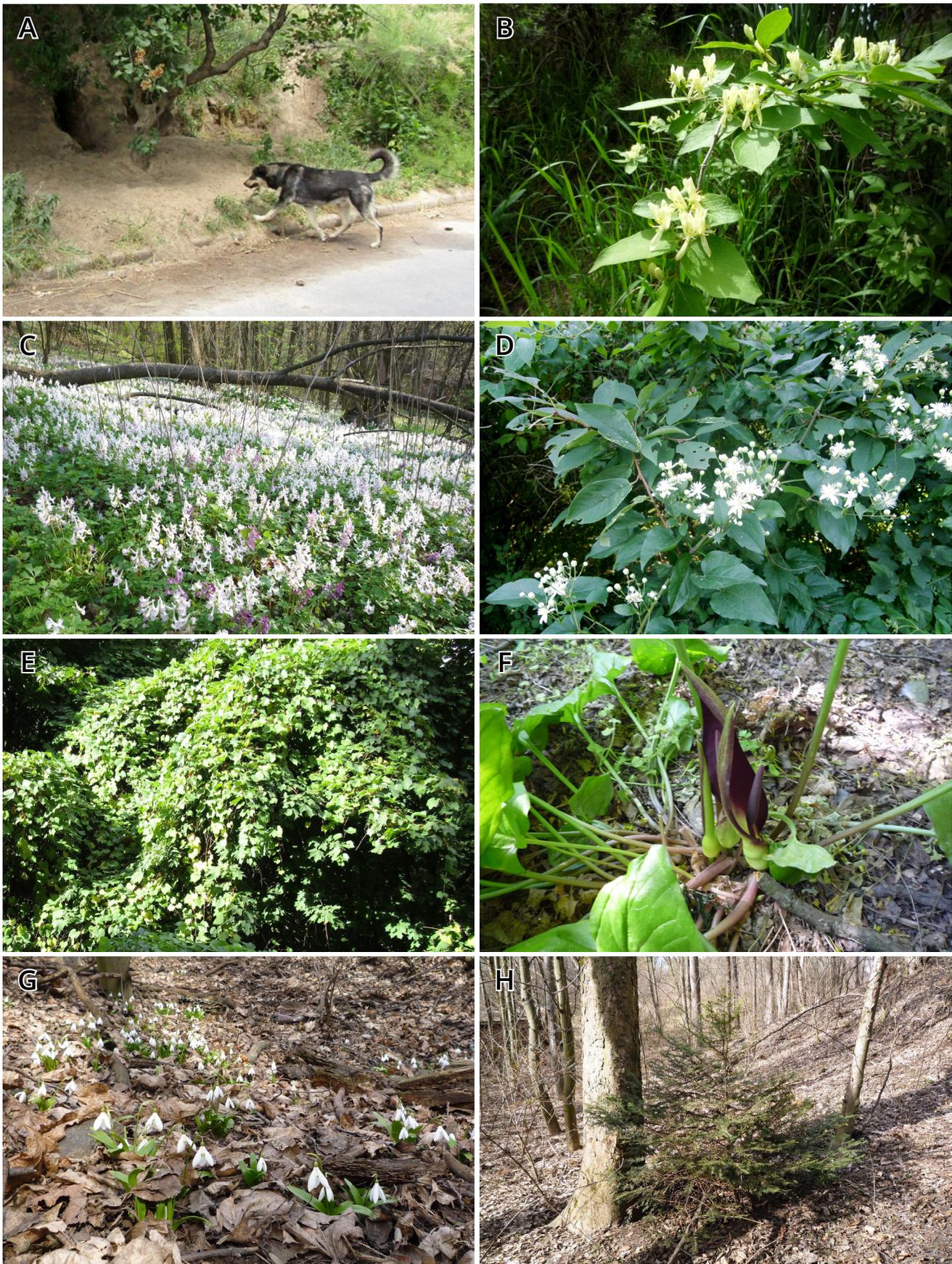
**Figure C4.** Species of the genus *Tamarix* on the plot "Central Asia": **A** – *T. cf. aralensis*; **B** – *T. hohenackeri* complex; **C, D** – forms of *T. ramosissima*; **E, F, G** – *T. szovitsiana*; **H** – *T. hohenackeri* complex.



**Figure C5.** Species of the genus *Tulipa* on the plot "Central Asia": **A** – *T. bifloriformis*; **B** – *T. fosteriana*; **C** – *T. kaufmanniana*; **D** – *T. praestans*; **E** – *T. sprengeri*; **F** – *T. suaveolens*; **G** – *T. undulatifolia* var. *micheliana*; **H** – *T. urumiensis*.



**Figure C6.** Habitats and introductory tulip populations on plot "Central Asia": A, B – *T. bifloriformis*; C, D – *T. fosteriana*; E – *T. kaufmanniana*; F, G – *T. praestans*; H – *T. urumiensis*.



**Figure C7.** Synanthropic and invasive organisms and escaped plants beyond the places of cultivation on the phytogeographical plot "Central Asia". Synanthropic animal: **A** – *Canis lupus* subsp. *familiaris*. Invasive plants: **B** – *Lonicera ruprechtiana*; **C** – *Corydalis caucasica*; **D** – *Clematis vitalba*, **E** – *Vitis riparia*. Escaped plants from the plot "Caucasus": **F** – *Arum elongatum*; **G** – *Galanthus woronowii*; **H** – *Taxus baccata*.

## Флора фітогеографічної ділянки "Середня Азія" у Національному ботанічному саду імені М.М. Гришка НАН України

Олександр Шиндер \*, Юлія Неграш

Національний ботанічний сад імені М.М. Гришка НАН України, вул. Тімірязєвська, 1, Київ, 01014,  
\* shinderoleksandr@gmail.com

Вперше було проведено повну інвентаризацію та аналіз таксономічного складу видів флори на фітогеографічній ділянці "Середня Азія" у Національному ботанічному саду імені М.М. Гришка НАН України. Ділянку було створено у 1953 р. з метою спрямованої інтродукції та натуралізації рослин із країн Середньої Азії до Києва. За весь час тут було випробувано понад 1000 видів рослин, що свідчить про великий обсяг експериментальної роботи. За результатами інвентаризації нині на ділянці зафіксовано 308 валідних таксонів (видів і підвидів) вищих судинних рослин зі 168 родів і 66 родин. З них 183 таксони належить до природної флори Середньої Азії. Структура флори рослин на дослідженій ділянці має певні риси флори країн Середньої Азії. Але в умовах Києва найкраще прижилися ті рослини середньоазійської флори, які пристосовані до зростання в помірно-кліматичних умовах (північні степи, придолинні і низькогірні ліси). У географічній структурі флори ділянки переважають ергазіофіти з середньоазійським (25,0%), євразійським і палеоарктичним (разом 34,2%) і субсередземноморським (10,9%) типами ареалів. 42 види ергазіофітів є ендемами Середньої Азії. У біоморфологічній структурі флори ділянки переважають багаторічники (47,3%), а частка дерев'янистих рослин становить 26,4%. За класифікацією життєвих форм Раункієра на ділянці переважають гемікриптофіти (28,4%), а також високими є частки фанерофітів і криптофітів (по 25,1%). В умовах Києва саме фанерофіти із гірських регіонів виявилися найбільш стійкими рослинами. Серед ергазіофітів середньоазійського походження найбільше представлено рослини, які ростуть у лісах, степах, чагарниках та на узліссях. Серед ергазіофітів, які ростуть на ділянці "Середня Азія" є 24 рідкісні види, що внесені червоних книг різних країн Центральної Азії. В нинішній час накопичилися деякі проблеми, які стосуються стану фітоценозів на фітогеографічній ділянці "Середня Азія" та її флори в цілому. Зокрема спостерігається загибель багатьох ергазіофітів середньоазійського походження через невідповідність кліматичних умов, експансія інвазійних організмів, зростаюче антропогенне навантаження тощо. Але завдяки великим масштабам інтродукційних робіт по створенню цієї ділянки, її колекція живих рослин має унікальний склад і залишається однією із головних прикрас Національного ботанічного саду імені М.М. Гришка.

**Ключові слова:** інтродукція, місцеві рослини, структура флори, рідкісні види, чужорідні види