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CONTRIBUTIONS TO THE STUDY OF ALIEN INVASIVE SPECIES IN HARGHITA COUNTY (ROMANIA)

SĂMĂRGHIȚAN Mihaela[1*], OROIAN Silvia[2], TANASE Corneliu[2]

Abstract: The paper presents the inventory and chorology of the invasive and potentially invasive alien species identified in Harghita County following the research carried out during 2019-2021. Following field research conducted in Harghita County, 47 species of invasive plants belonging to 23 families were identified. These include three species on the List of Invasive Alien Species of European Union concern: *Ailanthus altissima*, *Asclepias syriaca*, and *Impatiens glandulifera*. Although the presence of these species is particularly noticeable near human settlements and heavily ruderalized places, as a consequence of the abandonment of agricultural land, invasive species have been identified in various types of habitats, especially those of grasslands, meadows and wetlands near watercourses. In addition to the contribution to the distribution of the taxa identified in the perimeter of this county, aspects related to the impact exerted by each species on the coenotic structure of the habitats in the observation points are also presented. Due to the abundance with which these invasive species develop in certain regions, they lead to the depletion and even replacement of the native flora, causing disruptions to the state of conservation of natural habitats.
Keywords: allogenous plants, invasive species, European Union, Romania

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Introduction

The problem of alien species and especially the alien invasive ones are becoming more and more current and urgent, given the fact that their development represents one of the main threats to biodiversity (Lambdon et al. 2008).

The likelihood that species will be introduced, naturalised, and then spread is conditioned by a variety of factors including geographic, ecological, and socio-economic factors. Changes at the socio-economic level (demographic growth, expansion of urban agglomerations, changes in agricultural techniques, changes in land use, etc.) as well as those of geographical factors (climate changes, landslides, etc.) lead to fragmentation of habitats, damage to ecosystems and biodiversity loss (Richardson & Pyšek 2012, Hulme & al. 2013, Simberloff & al. 2013).

Knowing the distribution of invasive species, and the impact they exert on habitats and ecosystems provides tools for establishing adequate management to remove them, stop their spread and restore natural habitats (Booy & al. 2017, Gallardo & al. 2019).

The study area (Fig. 1), Harghita County, is situated in the north-central part of Romania, occupying an area of 6,639 square km. It is dominated by the Eastern Carpathian Mountain ranges representing 60% of the area. Settlement areas lie in intermontane valleys, including the Ciuc and Giurgeu depressions. In the SW part of the

[1] Mureș County Museum, Natural Sciences Department.
[2] "George Emil Palade" University of Medicine, Pharmacy, Science, and Technology of Târgu Mureș.
[*] Correspondence: msamarghitan@yahoo.com

county, the relief is dominated by hills and depressions with a sub-Carpathian character, being part of the Transylvanian Plateau. The main rivers that drain the county are Olt (southward), Mureș (northward), Târnava Mare, and Târnava Mică. The administrative organization of this county's territory is the following: 4 municipalities, 5 towns, 29 localities included in municipalities and towns, 58 communes, and 235 villages (Lege 290/2018).

The presence of alien invasive species in the areas of Harghita county was noted in previous studies made by Kovács (2006), Sîrbu & Oprea (2011), Kovács and Pálfalvi (2012), Danci & Oancea (2019) etc.. The objective of this study is the inventory and analysis of invasive and potentially invasive alien species in Harghita County, an area less studied from this point of view.

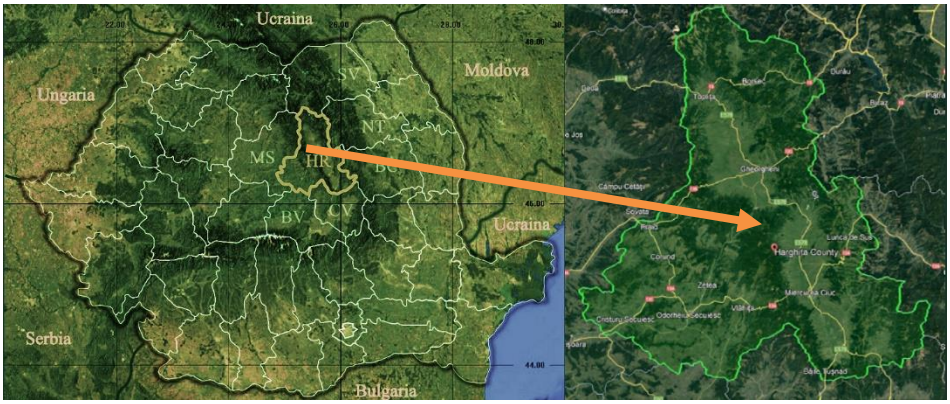

Fig. 1. The study area location

Material and methods

The paper presents the inventory and chorology of the invasive and potentially invasive alien species identified in Harghita County following our field research carried out in 2019-2021.

For the study of invasive alien species, the sampling and data collection methodologies developed in the "Guide for inventorying and mapping the distribution of invasive and potentially invasive alien plant species in Romania" (Anastasiu et al. 2019) were adopted. The main routes of introduction and transport of invasive species are directly or indirectly associated with anthropogenic activities. The species were studied along the main transport routes (roadsides, roads, footpaths, railways), the banks and beds of major watercourses (rivers, streams), and adjacent lands. For each record GPS coordinates were noted. The presentation of each species is accompanied by systematic and chorological data, bioforms, floristic elements, population size, reproduction ways, seed dispersal, and pathways.

The species name is consistent with Euro+Med (2006+) and Sârbu et al. (2013). The establishment of bioforms, floristic elements, and lifespan was done following Sârbu et al. (2013).

Results and discussion

To compile the inventory of invasive and potentially invasive species in Harghita County, 3824 records were analyzed. Regarding the distribution, alien plants are reported from the perimeter of 165 settlements (Fig. 2, Table 1).

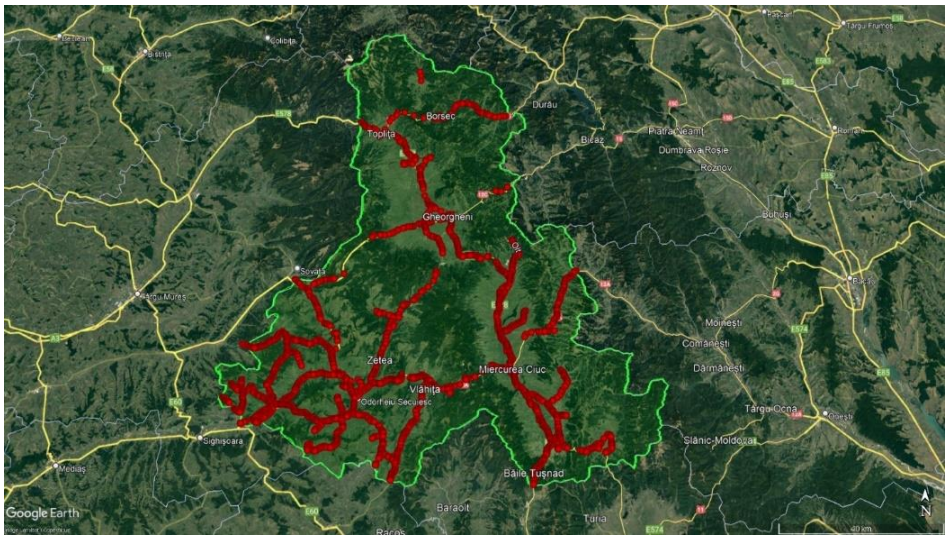

Fig. 2. The distribution of invasive alien species identified in Harghita County

Following field research conducted in the study area, 47 species of invasive plants belonging to 23 families were identified (Table 2).

In Romania, 490 neophytes whose presence has been confirmed, belonging to 93 families were reported. The top five families with the most alien species and subspecies are Asteraceae, Poaceae, Brassicaceae, Fabaceae, and Amaranthaceae (Anastasiu et al. 2016). The distribution of species in families in the study area generally follows the national pattern, the families with the most representatives are Compositae (Asteraceae) (15 taxa), Fabaceae, and Polygonaceae (3 taxa each), the rest of the families being present with 1-2 taxa. (Fig. 3).

The species with the highest frequency are *Erigeron annuus* subsp. *annuus* (757 records), *Robinia pseudoacacia* (538 records), and *Reynoutria japonica* (416 records). Remarkable frequencies have the species: *Erigeron canadensis* (298 points), *Echinocystis lobata* (233 records), *Solidago canadensis* (190 records), *Amaranthus retroflexus* (147 records), *Armoracia rusticana* (142 records), *Bassia scoparia* (137 records), *Helianthus tuberosus* (133 records), and *Xanthium orientale* subsp. *italicum* (132 records).

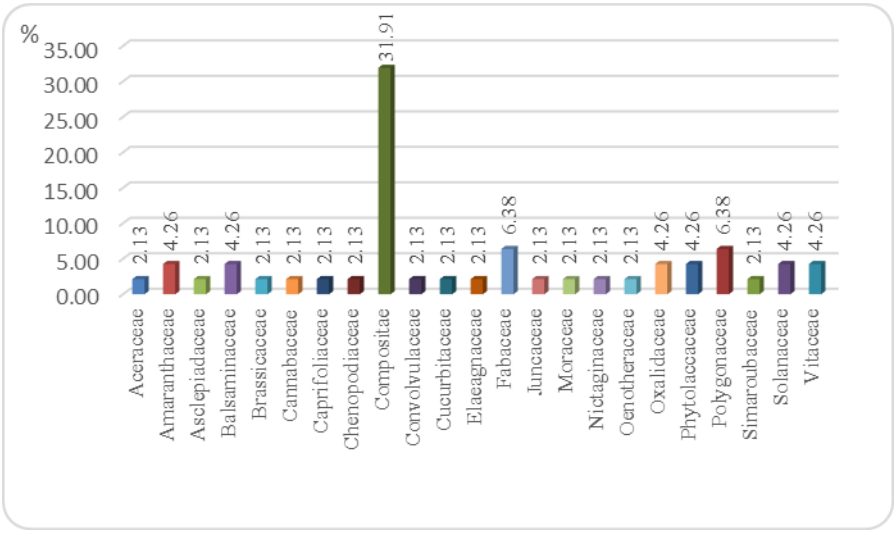

Fig. 3. The spectrum of families with alien species identified in Harghita County

Among the identified species are three species on the List of Invasive Alien Species of Union concern (EC, 2020): *Ailanthus altissima*, *Asclepias syriaca*, and *Impatiens glandulifera*.

Cultivated for ornamental purposes, and in forest plantations, for the control of soil erosion, and the restoration of some industrial habitats, *Ailanthus altissima* can have an expansive development, to the detriment of native species. In the investigated territory it was especially identified on the roadsides, mostly in the perimeter of human settlements or in their proximity, therefore it does not represent a danger from a conservation point of view. *Asclepias syriaca* was identified sporadically, in clumps of up to 100 individuals. These populations are not negatively affecting the native habitats in the study area. The identified populations of *Impatiens glandulifera* have a significant distribution, although currently, they do not enter natural plant communities with high conservation value, they persist in ruderal or segetal areas, at the site of anthropogenic disturbances, or in degraded semi-natural communities. Compact populations of up to 500 individuals have been identified on the banks of the waters.

Considering the introduction ways 36 of the species are hemerophytes and 11 xenophytes. Most of the identified species are perennial (29), 16 are annual and 2 are biennial (Table 2). The analysis of species considering their geographical origin highlights the predominance of North American species, followed by Asian ones (Fig. 4). In the bioforms spectrum, there is a prevalence of therophytes (40.43%), followed by hemicryptophytes (25.53%) and phanerophytes (23.40%). (Fig. 5). An important factor that influences the expansion of these invasive species is seed dispersal. Given this factor, anemochory seed dispersal prevails (9 species), sometimes associated with zoochory and anthropochory (total 20 species) being followed by zoochory (12 species).

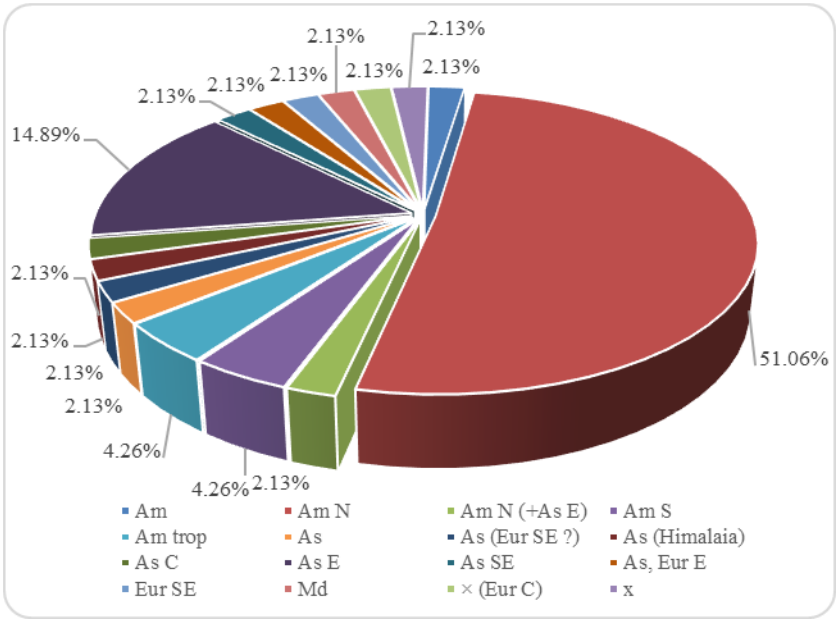

Fig. 4. Floristic elements of invasive alien species identified in Harghita County

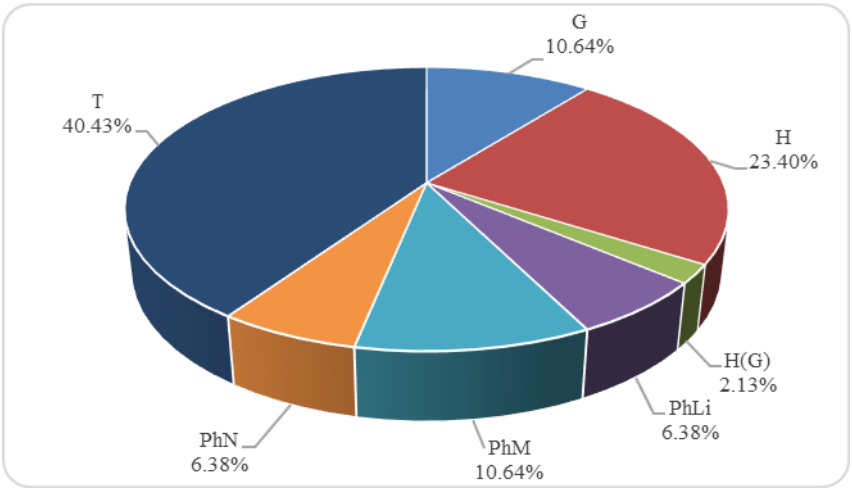

Fig. 5. The bioforms spectrum of alien invasive species identified in Harghita County

To establish the size of populations, a five-grade scale was used as indicated by Anastasiu et al. 2018; 1 (1-10 indv), 2 (11-50 indv), 3 (51-100 indv), 4 (101-500 indv), 5 (>501 indv). Regarding the size of the identified populations, the species *Erigeron annuus* subsp. *annuus* and *Erigeron canadensis* form dense populations (often over 500 individuals) especially in abandoned agricultural land and in grasslands where mowing is deficient or they are heavily ruderalized. *Solidago canadensis* achieves well-established

populations, with over 500 individuals, especially in the southwestern area of the county. The species invade natural and semi-natural plant communities, meadows located between roads and watercourses, abandoned lands, and hayfields. Also with high coverage, sometimes monospecific communities of *Reynoutria japonica* are found with high density, especially near watercourses, sometimes accompanying them over long distances. Next to this is *Helianthus decapetalus* (Table 3).

The presence of these alien invasive species is particularly noticeable near human settlements and heavily ruderalized places, as a consequence of the abandonment of agricultural land. In the study area, alien invasive species have been also identified in various types of natural habitats, especially those of grasslands and wetlands near watercourses. The presence of *Erigeron annuus* subsp. *annuus*, *E. canadensis*, and *Solidago canadensis* species were noted with remarkable frequencies in grassland habitats. Here they have a negative impact on the size and structure of natural habitats. Along the watercourses, the species *Reynoutria* sp., *Echinocystis lobata*, and *Helianthus tuberosus* are most frequent, sometimes spreading over very large areas, to the detriment of the native species. In anthropogenically disturbed habitats, roadsides, railways, and abandoned lands the species that make large covers are *Ambrosia artemisiifolia*, *Robinia pseudoacacia*, *Parthenocissus inserta*, *Amaranthus retroflexus*, *A. deflexus*, *Matricaria discoidea*. The species *Xanthium orientale* subsp. *italicum*, *Matricaria discoidea*, and *Armoracia rusticana*, are also found with high frequency and forming large populations, especially in crops but also in ruderal places on the roadside.

Conclusions

In addition to the contribution of the distribution to the taxa identified in the perimeter of this county, aspects related to the impact exerted by each species on the coenotic structure of the habitats in the observation points are also presented. Due to the abundance with which these invasive species develop in certain regions, they lead to the depletion and even replacement of the native flora, causing disruptions to the state of conservation of natural habitats. This correlative data can help to identify the types of habitats most affected by the presence of invasive plants, but also the natural and anthropogenic factors that can facilitate the spread of these endangered plants.

Further studies should be made to detail the impact of these alien invasive species on a particular type of habitat or in certain areas.

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Table 1. The checklist and distribution of invasive alien species in Harghita County

***Acer negundo* (56 records)**
Băile Chirui (1), Băile Tușnad (3), Bodogaia (1), Brădești (1), Ciceu (2), Corund (2), between Corund and Lupeni (1), Cristuru Secuiesc (1), Feliceni (1), Gârciu (2), Gheorgheni (1), Ineu (1), between Vlăhița and Băile Harghita (1), between Vlăhița and Miercurea Ciuc (1), Izvoru Mureșului (1), Lupeni (2), Mădăraș (2), Mugeni (2), Nădejdea, (2), Ocland (1), Ocna de Sus (1), Odorheiu Secuiesc (3), Porumbenii Mari, (2), Praid (1), Racu (1), Sâncrăieni (3), Sânmartin, (4), Sânpaul (2), Sărmaș (1), Satu Mare (2), Siculeni (1), Suseni (2), Tăureni (1), Văleni (1), Voșlăbeni (1), Zetea (1).
***Ailanthus altissima* (50 records)**
Atid (1), Avrămești (1), Băile Tușnad (1), Bisericani (1), Brădești (1) Capul Corbului (1), Casinu Nou (1), Ciucani (1), Corund (1), between Corund and Lupeni (1), Cristuru Secuiesc (5), Dejuțiu (1), Dîrjiu (2), Feliceni (1), Gheorgheni (3), Iacobeni (1), Joseni (5), Lăzarea (3), Lupeni (1), Merești (2), Mugeni (2), Odorheiu Secuiesc (2), Porumbenii Mari (1), Praid (1), Rugănești (3), Sânmartin (1), Satu Mare (1), Secuieni (3), Siculeni (1), Ulieș (1)
***Amaranthus deflexus* (1 record)**
Vlăhița (1)
***Amaranthus retroflexus* (147 records)**
Arvățeni (2), Atid (6), Bancu (1), Bârzava (2), between Bârzava and Frumoasa (1), Betești (2), Bodogaia (2), Borsec (3), Bucin (1), Ciaracio (1), Ciceu (1), Corbu (1), Crăciunel (2), Crișeni (3), Cristuru Secuiesc (3), Dejuțiu (1), Delnița (5), between Delnița and Păuleni Ciuc (1), Dîrjiu (5), Ditrău (1), Eliseni (1), Feliceni (3), Filiași (2), Firtușu (3), between Firtănuș and Medișoru Mic (1), Forțeni (2), Frumoasa (4), Gălăuțaș (1), Inlăceni (3), between Uilac and Eliseni (3), Izvoru Mureșului (1), Jolotca (1), Joseni (1), Liban (1), Lueta (1), Lunca de Jos (1), Lunca de Sus (1), Lupeni (1), Mărtiniș (1), Miercurea Ciuc (2), between Miercurea Ciuc and Delnița (3), Mihăileni (3), Minele Lueta (2), Mugeni (2), Mujina (3), Nădejdea (1), Ocna de Sus (2), Orășeni (1), Oțeni (1), Păuleni Ciuc (4), Petreni (1), Platonești (1), Polonița (1), Porumbenii Mari (1), Potiond (1), Rareș (1), Rugănești (1), Săcel (1), between Săcel and Șoimușu Mare (3), Sândominic (2), Sânmărtin (1), Sânpaul (4), Satu Mare (2), Satu Nou (1), Secuieni (2), between Secuieni and Filiași (1), Siculeni (1), between Subcetate and Sărmaș (1), Șoimeni (5), Șoimușu Mare (1), between Șoimușu Mare and Vidacuț (1), Șoimușu Mic (2), Tămașu (1), Tăureni (2), Toplița (1), Uilac (1), Ulieș (2), Văleni (3), between Vlăhița and Miercurea Ciuc (1), Voșlăbeni (1).
***Ambrosia artemisiifolia* (23 records)**
Băile Jigodin (1), Bisericani (1), Corund (2), Crăciunel (1), Crișeni (1), Crișeni (1), Cristuru Secuiesc (1), Frumoasa (1), between Lunca de Jos and Frumoasa (1), Lunca de Jos (1), Lupeni (3), Mădăraș (1), between Vlăhița and Miercurea Ciuc (1), Miercurea Ciuc (2), Mihăileni (1), Porumbenii Mari (1), Praid (2), Satu Mare (1).
***Amorpha fruticosa* (15 records)**
Băile Tușnad (2), Corbu (1), Corund (1), between Corund and Lupeni (1), Liban (1), between Păuleni and Lupeni (1), Lupeni (2), Porumbenii Mari (1), Porumbenii Mici (1), Praid (3), Tușnad (1).
***Armoracia rusticana* (142 records)**
Armășenii Noi (2), Atid (6), Bădeni (1), Băile Tușnad (1), Bârzava (4), Betești (2), Brădești (1), Brădești (1), Căpâlnița (1), Cârța (1), Cetățuia (4), Ciba (1), Ciceu (2), Ciucani (1), Ciucsângeorgiu (1), Corbu (1), Cozmeni (3), Crăciunel (2), Crișeni (1), Cristuru Secuiesc (2), Dănești (3), Dejuțiu (4), between Porumbenii Mari and Dejuțiu (1), Ditrău (1), Firtănuș (1), Forțeni (2), Frumoasa (1), Gârciu (1), Ineu (2), Izvoru Mureșului (2), Joseni (2), Lăzarea (2), Lueta (2), Lunca de Jos (3), Lunca de Sus (2), Lupeni (1), Mădăraș (2), Mărtiniș (1), Merești (2), Miercurea Ciuc (8), between Miercurea Ciuc and Delnița (1), Mihăileni (3), Minele Lueta (1), Mugeni (5), Nădejdea (3), Ocna de Sus (1), Păltiniș Ciuc

(2), Păuleni (1), Poloniţa (1), Racu (2), Rareș (1), Sâncrăieni (4), Sândominic (3), Sânmărtin (2), Sânpaul (1), Sânsimion (2), Sântimbru (1), Satu Nou (1), Secuieni (1), between Secuieni and Filiași (1), Siculeni (2), Șoimeni (2), Șoimușu Mare (1), Sub Cetate (1), Suseni (2), Tăureni (1), Tomești (1), Topliţa (1), Uilac (1), Văcărești (1), Vale (1), Valea Strâmbă (4), Vidacuț (1), Vlăhița (1), between Vlăhița and Miercurea Ciuc (1),Voșlăbeni (1), Vrabia (2).
***Artemisia annua* (2 records)**
Crișeni (1), Ineu (1).
***Asclepias syriaca* (6 records)**
Betești (1), Ciba (1), Eliseni (1), between Uilac and Eliseni (1), Filiași (1), Mătișeni (1)
***Bassia scoparia* (137 records)**
Avrămești (1), Bârzava (2), Betești (1), Betești (2), Bezidu Nou (1), Bodogaia (3), Borzont (2), Brădești (1), Cădaciu Mic (2), Căpâlnița (1), Ciceu (4), Cobătești (1), Corbu (1), Cozmeni (2), Crișeni (4), Cristuru Secuiesc (11), Delnița (1), Dîrjiu (1), Ditrău (1), Feliceni (3), Filiași (1), Frumoasa (3), Gheorgheni (2), Izvoru Mureșului (1), Joseni (3), Lăzarea (4), Lueta (2), Lutița (1), Mărtiniș (2), Morăreni (2), Mugeni (8), Ocna de Sus (2), Odorheiu Secuiesc (7), Orășeni (1), Păltiniș Ciuc (1), Păuleni Ciuc (4), Petreni (1), Porumbenii Mari (4), Racu (2), Rugănești (1), Sâncrăieni (4), Sândominic (1), Sânpaul (3), Sântimbru (1), Sântimbru Băi (1), Sărmaș (3), Satu Mare (8), Satu Nou (1), Secuieni (2), Siculeni (3), Șimonești (2), Șoimeni (2), Tăureni (1), Topliţa (1), Topliţa (1), Ulieș (1), Ulieș (1), Valea Strâmbă (1), Vlăhița (1), between Vlăhița and Miercurea Ciuc (1), Voșlăbeni (1).
***Bidens frondosus* (5 records)**
Remetea (1), Sântimbru (1), Sântimbru Băi (1), Topliţa (2).
***Datura stramonium* (7 records)**
Crăciunel (1), Eliseni (1), Mujina (1), Nicolești (1), Sânpaul (2), Secuieni (1)
***Echinocystis lobata* (233 records)**
Andreeni (2), Atid (9), Between Atid and Firtănuș (4), Avrămești (1), Băile Jigodin (2), Băile Tușnad (5), Bălan (1), Betești (1), Bezid (1), between Bezid and Crișeni (1), Bezidu Nou (1), Bisericani (2), Bodogaia (1), Brădești (1), Bucin (3), Călimănel (2), Carpitus (1), Cechești (2), Ciba (2), Ciceu (1), Cozmeni (3), Crăciunel (5), Crișeni (8), between Crișeni and Atid (10), Cristuru Secuiesc (8), Dănești (1), Dejuțiu (3), Dîrjiu (6), Eliseni (4), between Uilac and Eliseni (2), Feliceni (3), Filiași (1), Firtănuș (4), between Firtănuș and Medișoru Mic (2), Firtușu (1), Frumoasa (1), Gălăuțaș (2), Gălăuțaș (3), Goagiu (2), Hoghia (1), Iacobeni (1), Izvoru Mureșului (1), between Lacul Zetea and Șicasău (1), Lăzărești (1), Lueta (1), Lunca de Jos (2), Lupeni (1), Lutița (1), Mădăraș (1), Mărtiniș (1), Mătișeni (3), Medișoru Mic (3), Merești (3), Miercurea Ciuc (3), Mihăileni (1), Morăreni (2), Mugeni (5), Mujina (2), Nicolești (2), Ocland (1), Ocna de Sus (1), Odorheiu Secuiesc (2), Oțeni (2), Păuleni (2), Porumbenii Mari (6), between Porumbenii Mari and Dejuțiu (1), Porumbenii Mici (3), Potiond (1), Praid (2), Racu (2), Remetea (2), Rugănești (2), Runc (1), Săcel (3), between Săcel and Șoimușu Mare (3), Sâncrăieni (1), Sândominic (1), Sânpaul (5), Sânsimion (1), Sărmaș (1), Satu Mare (2), Satu Nou (1), Secuieni (5), Between Secuieni and Filiași (2), Siculeni (3), Șimonești (1), Șoimușu Mic (1), Sub Cetate (1), Tămașu (1), Târnovița (1), Tăureni (1), Tolești (1), Topliţa (2), Tușnadu Nou (2), Văcărești (1), Văgani (4), Valea Seaca (1), Vârșag (2), Vidacuț (4), Between Șoimușu Mare and Vidacuț (5), Voșlăbeni (1).
***Elaeagnus angustifolia* (23 records)**
Bălan (1), Borzont (2), Gheorgheni (2), Izvoru Mureșului (1), Joseni (1), Lăzarea (2), Mădăraș (1), Miercurea Ciuc (2), Sândominic (6), Between Sândominic and Bălan (1), Valea Strâmbă (1), Văleni (1), Voșlăbeni (2).
***Erigeron annuus* subsp. *annuus* (757 records)**
Andreeni (3), Armășeni (1), Atid (14), Between Atid and Firtănuș (9), Avrămești (3), Bădeni (2), Băile Chirui (6), Băile Harghita (3), Băile Homorod (6), Băile Tușnad (10),

Bălan (1), Bancu (2), Bârzava (3), Beteşti (7), Bezid (1), between Bezid and Crişeni (3), Bezidu Nou (3), Bisericani (2), Bodogaia (5), Borsec (1), Brădeşti (9), Bucin (8), Cădaciu Mare (1), Căpâlnița (3), Capul Corbului (1), Carpitus (3), Cârța (1), Casinu Nou (4), Cecheşti (3), Cetățuia (4), Chinușu (3), Ciaracio (3), Ciba (2), between Ciba and Ciceu (3), Ciceu (8), Ciucani (2), Ciucsângeorgiu (1), Ciumani (1), Corund (5), between Corund and Lupeni (1), Cozmeni (19), between Cozmeni and Casinu Nou (5), between Cozmeni and Lăzărești (3), Crăciunel (4), Crişeni (25), between Crişeni and Atid (14), Cristuru Secuiesc (11), Dănești (2), Dejuţiu (6), Delnița (4), Dîrjiu (2), between Dîrjiu and Ulieș (1), Ditrău (4), drumul spre Armășeni (1), Eliseni (5), Feliceni (3), Firtănuș (5), between Firtănuș and Medișoru Mic (6), Firtușu (7), Forțeni (4), Frumoasa (5), Gârciu (3), Gheorgheni (8), Goagiu (5), Harghita Mădăraș (1), Hoghia (5), Iacobeni (2), Imper (2), Ineu (2), Inlăceni (11), Izvoru Mureșului (10), Jigodin Băi (1), Jolotca (3), Joseni (8), lângă Lacul Zetea (4), Lăzarea (4), Lăzărești (1), Liban (3), Lueta (5), Lueta spre Băile Chirui (3), Lunca de Jos (4), Lunca de Sus (7), Lupeni (5), Lutiţa (3), Mădăraș (1), Mărtiniș (4), Mătişeni (2), Medișoru Mic (12), Merești (1), Miercurea Ciuc (12), Mihăileni (6), Minele Lueta (4), Morăreni (1), Mugeni (5), Mujina (4), Nădejdea (3), Nicoleşti (4), Ocland (9), Ocna de Sus (4), Odorheiu Secuiesc (4), between Odorheiu Secuiesc and Bisericani (2), Oţeni (1), Păltiniș Ciuc (1), Păuleni (13), between Păuleni and Lupeni (4), Păuleni Ciuc (4), Plăieșii de Jos (2), Poloniţa (1), Porumbenii Mari (10), between Porumbenii Mari and Dejuțiu (2), Porumbenii Mici (4), Praid (2), Racu (9), Remetea (2), Rugăneşti (1), Săcel (6), between Săcel and Șoimușu Mare (5), Sâncrăieni (6), Sândominic (12), Between Sândominic and Bălan (8), Sânmartin (9), between Sânmărtin and Cozmeni (1), Sânpaul (1), Sânsimion (2), Sântimbru (2), Sărmaș (1), Satu Mare (7), Satu Nou (1), Secuieni (3), Between Secuieni and Filiași (3), Sicasău (1), between Lacul Zetea and Șicasău (1), Şimoneşti (2), Șoimeni (6), Șoimușu Mare (3), Between Șoimușu Mare and Vidacuț (6), Șoimușu Mic (16), spre Miercurea Ciuc (3), Sub Cetate (3), Subcetate (3), Suseni (6), Tămaşu (2), Târnovița (2), Tăureni (3), Toleșeni (1), Tomești (1), Topliţa (1), Topliţa (1), Tulgheș (2), Tușnad (9), Tușnadu Nou (8), Uilac (4), between Uilac and Eliseni (11), Ulieș (3), Văcărești (4), Vale (2), Valea lui Antaloc (1), Valea Seaca (1), Valea Strâmbă (7), Văleni (4), Vârșag (5), Vidacuț (4), Vlăhița (9), between Vlăhița and Băile Harghita (10), between Vlăhița and Miercurea Ciuc (4), Voşlăbeni (15), Vrabia (2), Zetea (3).
***Erigeron canadensis* (298 records)**
Andreeni (1), Armășeni (1), Atid (13), Between Atid and Firtănuș (2), Bădeni (1), Băile Chirui (1), Băile Homorod (1), Băile Tușnad (4), Bălan (1), Bârzava (2), Beteşti (3), Bezid (2), between Bezid and Crişeni (2), Bezidu Nou (3), Bisericani (1), Bodogaia (1), Borsec (1), Brădeşti (1), Cădaciu Mare (1), Căpâlnița (1), Cârța (1), Cecheşti (1), Cetățuia (4), Chinușu (4), Ciba (2), between Ciba and Ciceu (2), Ciceu (2), Corbu (1), Cozmeni (1), between Cozmeni and Casinu Nou (1), Crăciunel (1), Crişeni (21), between Crişeni and Atid (9), Cristuru Secuiesc (11), Dănești (1), Delnița (1), between Delnița and Păuleni Ciuc (1), Dîrjiu (2), between Dîrjiu and Ulieș (1), Ditrău (3), Feliceni (1), Filiași (1), Between Secuieni and Filiași (1), Firtănuș (2), between Firtănuș and Medișoru Mic (4), Firtușu (2), Frumoasa (2), Gheorgheni (2), Goagiu (1), Hoghia (1), Imper (2), Inlăceni (6), Izvoru Trotușului (1), Jigodin Băi (1), Jolotca (1), Joseni (4), Lacu Roșu (1), Lăzarea (1), Liban (1), Lueta (4), Lueta spre Băile Chirui (3), Lunca de Jos (6), Lunca de Sus (3), Lupeni (2), Lutiţa (1), Mădăraș (1), Mărtiniș (1), Mătișeni (1), Medișoru Mic (3), Miercurea Ciuc (3), Mihăileni (1), Morăreni (1), Mugeni (5), Mujina (3), Nicoleşti (2), Ocland (1), Ocna de Sus (2), Odorheiu Secuiesc (6), Păuleni (6), Păuleni Ciuc (4), Poloniţa (1), Porumbenii Mari (5), between Porumbenii Mari and Dejuțiu (1), Porumbenii Mici (2), Potiond (2), Praid (1), Racu (2), Rareș (1), Rugăneşti (1), Runc (1), Săcel (2), between Săcel and Șoimușu Mare (1), Sâncrăieni (2), Sândominic (4), Sânmărtin (4), between Sânmărtin and Cozmeni (1), Sânpaul (1), Sântimbru (1), Sărmaș (1), Satu Mare (1), Sicasău (1), Şimoneşti (1), Șoimeni

(1), Șoimușu Mare (1), Between Șoimușu Mare and Vidacuț (3), Șoimușu Mic (8), spre Dîrjiu (1), Sub Cetate (2), Subcetate (3), Between Subcetate and Sărmaș (1), Suseni (1), Tămașu (1), Tăureni (1), Tăureni (Feliceni Haltă) (1), Tușnad (3), Tușnadu Nou (2), Uilac (1), between Uilac and Eliseni (5), Ulieș (2), Văcărești (1), Valea lui Antaloc (1), Valea Strâmbă (1), Văleni (2), Vidacuț (1), between Vlăhița and Băile Harghita (2), between Vlăhița and Miercurea Ciuc (4), Voșlăbeni (4), Zetea (1).
***Galinsoga parviflora* (9 records)**
Corund (1), Forțeni (1), Harghita Mădăraș (1) Lunca de Jos (1), Minele Lueta (1), Praid (1), Șoimușu Mare (1), Văcărești (1), Vlăhița (1).
***Gleditsia triacanthos* (13 records)**
Băile Tușnad (1), Corund (1), between Păuleni and Lupeni (1), Lupeni (1), Mugeni (3), Porumbenii Mari (1), Porumbenii Mici (4), Sânsimion (1).
***Helianthus decapetalus* (8 records)**
Cristuru Secuiesc (1), Mărtiniș (1), Mugeni (1), Porumbenii Mari (1), Sânpaul (1), Tăureni (1), Toplița (1), Vlăhița (1).
***Helianthus tuberosus* (133 records)**
Arvățeni (2), Atid (2), Between Atid and Firtănuș (1), Avrămești (1), Băile Chirui (1), Băile Jigodin (1), Bălan (2), Bețești (1), Bețești (2), Bisericani (1), Brădești (1), Căpâlnița (1), Cetățuia (2), Ciba (1), Ciceu (1), Ciumani (3), Cobătești (1), Crăciunel (2), Cristuru Secuiesc (4), Dănești (1), Delnița (2), Dîrjiu (1), Between Secuieni and Filiași (4), Filiași (1), Frumoasa (1), Gheorgheni (2), Goagiu (1), Harghita Mădăraș (1), Hoghia (1), Iacobeni (2), Lueta (2), Lueta spre Băile Chirui (1), Lutița (1), Mărtiniș (1), Mătișeni (1), Medișoru Mic (5), between Firtănuș and Medișoru Mic (3), Merești (1), Miercurea Ciuc (1), Mihăileni (1), Minele Lueta (1), Mugeni (3), Nicolești (3), Nicolești (2), Ocland (3), Ocna de Sus (3), Odorheiu Secuiesc (2), Păuleni (2), Păuleni Ciuc (1), Porumbenii Mari (3), Porumbenii Mici (1), Potiond (1), Racu (2), Rugănești (1), Rugănești (3), Sâncrăieni (1), Sândominic (6), Sânpaul (3), Sărățeni (1), Satu Nou (6), Siculeni (2), Șimonești (6), Șoimeni (2), Tăureni (2), Tomești (3), Toplița (1), Văgani (1), Vidacuț (1), Vlăhița (1), Voșlăbeni (1), Vrabia (1).
***Humulus japonicus* (5 records)**
Crăciunel (1), Crișeni (1), between Bezid and Crișeni (1), Tulgheș (1), Vidacuț (1).
***Impatiens glandulifera* (26 records)**
Băile Homorod (1), Bălan (1), Between Sândominic and Bălan (2), Ciba (1), Crișeni (1), Gheorgheni (1), between Vlăhița and Miercurea Ciuc (1), Izvoru Mureșului (1), Lueta (3), Lunca de Jos (1), between Lunca de Jos and Frumoasa (1), Lunca de Sus (1), Mădăraș (1), Minele Lueta (1), between Porumbenii Mari and Dejuțiu (2), Porumbenii Mici (2), Șoimeni (2), Vlăhița (3).
***Impatiens parviflora* (2 records)**
Lunca de Jos (1), Sântimbru Băi (1).
***Ipomoea purpurea* (17 records)**
Bârzava (1), Delnița (1), Eliseni (1), Feliceni (1), Filiași (1), Forțeni (1), Lueta (1), Ocland (1), Odorheiu Secuiesc (2), Porumbenii Mari (1), Sândominic (1), Sântimbru (1), Secuieni (1), Tăureni (1), Văleni (1), between Vlăhița and Miercurea Ciuc (1).
***Iva xanthiifolia* (2 records)**
Bodogaia (1), Cristuru Secuiesc (1).
***Juncus tenuis* (1 record)**
between Firtănuș and Medișoru Mic (1)
***Lonicera japonica* (47 records)**
Armășenii Noi (1), Bădeni (1), Bodogaia (1), Ciceu (1), Crișeni (1), Cristuru Secuiesc (10), Dîrjiu (2), Eliseni (1), Filiași (2), Forțeni (2), Gheorgheni (2), Mătișeni (1), Mugeni (1), Nicolești (2), Ocna de Sus (3), Odorheiu Secuiesc (1), Orășeni (1), Oțeni (1), Păuleni (1),

Petreni (1), Polonița (1), Rugănești (1), Satu Mare (1), Secuieni (1), Șoimușu Mare (1), Uilac (2), Văleni (1), Vidacuț (1), Voșlăbeni (1), Zetea (1)
***Lycium barbarum* (51 records)**
Armășeni (2), Băile Tușnad (1), Beteşti (1), Beteşti (1), Bisericani (1), Bodogaia (1), Brădeşti (1), Bucin (2), Capul Corbului (2), Cecheşti (1), Ciceu (1), Corbu (1), Crişeni (3), Cristuru Secuiesc (2), Eliseni (1), Firtănuș (1), Firtușu (1), Gârciu (1), Gheorgheni (1), Goagiu (1), between Firtănuș and Medișoru Mic (1), Lăzarea (2), Mugeni (2), Nicoleşti (1), Odorheiu Secuiesc (1), Oţeni (1), Petreni (2), Racu (1), Rareș (2), Sândominic (1), Sânpaul (3), Sântimbru (1), Satu Mare (1), Tomești (1), Tulgheș (1), Ulieș (1), Valea Strâmbă (1), Vlăhița (2).
***Matricaria discoidea* (105 records)**
Atid (3), Bădeni (1), Băile Harghita (2), Băile Homorod (3), Bălan (1), Bârzava (6), Bezid (1), Brădești (2), Căpâlnița (1), Casinu Nou (1), between Ciba and Ciceu (1), Ciceu (5), Corund (2), Cozmeni (4), between Cozmeni and Casinu Nou (1), between Cozmeni and Lăzărești (2), Crișeni (1), Delnița (1), Frumoasa (1), Goagiu (1), Inlăceni (1), Izvoru Mureșului (1), Jigodin Băi (1), Joseni (1), Lăzărești (1), Lunca de Jos (1), Lunca de Sus (1), Lupeni (2), Mădăraș (1), Miercurea Ciuc (5), between Miercurea Ciuc and Delnița (1), Mujina (1), Nădejdea (1), Ocna de Sus (1), Odorheiu Secuiesc (1), Păuleni (1), Praid (1), Racu (3), between Săcel and Șoimușu Mare (1), Sâncrăieni (5), Sândominic (2), Sânmărtin (4), between Sânmărtin and Cozmeni (1), Sânpaul (1), Sântimbru (1), Șoimeni (4), spre Miercurea Ciuc (1), Suseni (2), Târnovița (1), Tomești (1), Tușnad (4), Tușnadu Nou (2), Văcărești (2), Văleni (1), Vlăhița (1), between Vlăhița and Băile Harghita (1), Voșlăbeni (1), Vrabia (3), Zetea (1).
***Mirabilis jalapa* (3 records)**
Bădeni (1), Forțeni (1), Lueta (1).
***Morus alba* (1 record)**
Suseni (1)
***Oenothera biennis* (33 records)**
Băile Chirui (1), Bălan (2), Bezidu Nou (1), Bilbor (1), Cetățuia (1), Ciba (1), Ciceu (1), Corbu (1), Crișeni (2), Cristuru Secuiesc (1), between Săcel and Șoimușu Mare (2), Lunca de Sus (1), Mărtiniș (1), Mugeni (2), Nădejdea (1), Odorheiu Secuiesc (1), Orășeni (1), Păltiniș Ciuc (2), Petreni (1), Sânpaul (2), Sântimbru (1), Sărmaș (1), Sicasău (1), Siculeni (1), Șimonești (1), Tușnad (1), Vlăhița (1).
***Oxalis corniculata* (3 records)**
Crișeni (1), Delnița (1), Siculeni (1)
***Oxalis stricta* (2 records)**
Cristuru Secuiesc (1), Praid (1).
***Parthenocissus inserta* (94 records)**
Armășeni (1), Armășenii Noi (1), Arvățeni (1), Bălan (2), Bârzava (1), Beteşti (1), Bisericani (1), Bodogaia (2), Borsec (1), Borzont (3), Bucin (1), Căpâlnița (2), Chinușu (1), Ciceu (3), Ciucani (1), Ciumani (1), Corund (2), Cozmeni (1), Cristuru Secuiesc (5), Dănești (2), Delnița (2), Dîrjiu (1), Feliceni (1), Filiaşi (1), Frumoasa (1), Gheorgheni (4), Imper (1), Ineu (1), between Bezid and Crișeni (1), between Zetea and Sub Cetate (1), Jigodin Băi (1), Joseni (1), Lăzarea (3), Lăzărești (1), Mădăraș (1), Mădăraș (1), Merești (1), Miercurea Ciuc (2), Minele Lueta (2), Mujina (1), Ocland (2), Ocna de Sus (1), Odorheiu Secuiesc (4), Porumbenii Mari (1), Praid (3), Racu (1), Sâncrăieni (3), Sânmărtin (2), Sântimbru (1), Sărmaș (1), Satu Mare (2), Secuieni (1), Șoimeni (2), Sovata (1), Târnovița (1), Ulieș (1), Valea Strâmbă (1), Vlăhița (4), Voșlăbeni (1).
***Parthenocissus quinquefolia* (8 records)**
Andreeni (1), Ciceu (1), Cristuru Secuiesc (1), Goagiu (2), between Vlăhița and Miercurea Ciuc (1), Sărmaș (1), Vidacuț (1).

***Phytolacca acinosa* (3 records)**
Cristuru Secuiesc (1), Eliseni (1), Gheorgheni (1).
***Phytolacca americana* (3 records)**
Betești (1), Ditrău (1), Mugeni (1).
***Reynoutria japonica* (416 records)**
Andreeni (4), Armășeni (1), Atid (2), between Bezid and Crișeni (9), Between Atid and Firtănuș (1), Avrămești (3), Băile Harghita (1), Băile Homorod (4), Băile Jigodin (1), Băile Tușnad (6), Bălan (2), Bârzava (1), Betești (1), Betești (2), Bilbor (1), Bisericani (4), Bodogaia (5), Borsec (5), between Vale and Borsec (3), Brădești (1), Brădești (2), Cădaciu Mare (1), Cădaciu Mic (4), Călimănel (1), Capul Corbului (2), Cârța (1), Casinu Nou (1), Cetățuia (1), Ciba (2), Ciceu (6), Ciumani (1), Cobătești (4), Corbu (7), Corund (4), Cozmeni (3), Crișeni (4), Crișeni (2), Cristuru Secuiesc (26), Dănești (2), Delnița (1), Dîrjiu (13), Ditrău (4), Feliceni (7), Firtușu (1), Frumoasa (2), between Bârzava and Frumoasa (1), Gălăuțaș (1), Gălăuțaș (3), Gârciu (2), Gheorgheni (4), Goagiu (1), Iacobeni (2), Imper (1), Ineu (1), Izvoru Mureșului (3), Jolotca (3), Joseni (4), Lacu Roșu (3), Lăzarea (1), Lăzărești (1), Lueta (3), Lunca de Jos (6), Lunca de Sus (2), Lupeni (2), Lutița (1), Mădăraș (1), Medișoru Mic (1), Merești (5), Miercurea Ciuc (11), Mihăileni (6), Minele Lueta (4), Morăreni (9), Mugeni (8), Mujina (1), Nădejdea (1), Ocland (2), Ocna de Sus (6), Odorheiu Secuiesc (12), between Odorheiu Secuiesc and Bisericani (1), Oţeni (5), Păltiniș Ciuc (1), Păuleni (2), between Păuleni and Lupeni (1), Păuleni Ciuc (1), Plăieșii de Jos (1), Platonești (1), Poloniţa (2), Porumbenii Mari (4), between Porumbenii Mari and Dejuțiu (1), Praid (3), Racu (3), Remetea (1), Rugăneşti (7), Rugănești (3), Runc (2), Sândominic (21), Between Sândominic and Bălan (3), Sânpaul (2), Sânsimion (2), Sântimbru (1), Sărățeni (2), Sărmaș (2), Satu Mare (6), Satu Nou (2), Secuieni (6), Siculeni (2), Şimoneşti (3), Șimonești (2), Sub Cetate (1), Subcetate (1), Suseni (1), Târnovița (3), Tăureni (3), Tomești (2), Topliţa (2), Topliţa (6), Tulgheș (3), Tușnad (1), Ulieș (1), Văgani (2), Vale (2), Valea lui Antaloc (1), Valea Strâmbă (3), Văleni (2), Vârșag (1), Vlăhița (13), between Vlăhița and Miercurea Ciuc (1), Voșlăbeni (1), between Zetea and Sub Cetate (1), Zetea (1).
***Reynoutria sachalinensis* (3 records)**
Gheorgheni (1), Topliţa (1), Văgani (1).
***Reynoutria* × *bohemica* (3 records)**
Borsec (1), between Vlăhița and Miercurea Ciuc (1), Sândominic (1).
***Robinia pseudoacacia* (538 records)**
Andreeni (3), Armășeni (1), Armășenii Noi (2), Arvățeni (2), Atid (11), Between Atid and Firtănuș (2), Avrămești (5), Băile Chirui (2), Băile Homorod (7), Băile Tușnad (5), Bălan (2), Bârzava (1), Betești (2), Betești (1), Bezid (1), between Bezid and Crișeni (1), Bezidu Nou (1), Bilbor (1), Bisericani (3), Bodogaia (3), Borsec(7), Borzont (4), Brădești (2), Brădești (3), Bucin (5), Căpâlnița (2), Capul Corbului (2), Carpitus (2), Cârța (1), Cârța (3), Casinu Nou (2), Cechești (1), Cetățuia (1), Chinușu (2), Ciaracio (2), Ciceu (9), Ciucsângeorgiu (1), Ciumani (3), Cobătești (1), Corbu (5), Corund (7), Cozmeni (3), between Cozmeni and Lăzărești (1), Crăciunel (4), Crișeni (15), between Crișeni and Atid (7), Cristuru Secuiesc (12), Dănești (2), Dejuțiu (2), Delnița (2), Dîrjiu (3), Ditrău (7), Eliseni (2), Feliceni (5), Filiași (1), Firtănuș (2), between Firtănuș and Medișoru Mic (3), Firtușu (1), Forțeni (1), Frumoasa (1), Gălăuțaș (2), Gălăuțaș (1), Gârciu (3), Gheorgheni (10), Goagiu (3), Hoghia (1), Iacobeni (1), Imper (1), Ineu (2), Izvoru Mureșului (4), Jolotca (1), Joseni (7), lângă Lacul Zetea (3), Lăzarea (8), Lăzărești (1), Liban (2), Lueta (4), Lunca de Sus (2), Lupeni (7), Lutița (3), Mădăraș (2), Mădăraș (2), Mătișeni (1), Medișoru Mic (6), Merești (3), Miercurea Ciuc (10), Mihăileni (8), Minele Lueta (4), Morăreni (4), Mugeni (8), Mujina (1), Nădejdea (2), Nicolești (3), Ocland (4), Ocna de Sus (1), Odorheiu Secuiesc (5), between Odorheiu Secuiesc and Bisericani (1), Oţeni (4), Păltiniș Ciuc (1), Păuleni (7), between Păuleni and Lupeni (4), Păuleni Ciuc (3), Plăieșii de Jos (1), Platonești

(1), Poloniţa (1), Porumbenii Mari (10), between Porumbenii Mari and Dejuțiu (2), Porumbenii Mici (6), Praid (2), Racu (6), Rareș (1), Remetea (1), Rugăneşti (3), Runc (2), Săcel (3), between Săcel and Șoimușu Mare (1), Sâncrăieni (6), Sândominic (4), Between Sândominic and Bălan (1), Sânmărtin (5), Sânpaul (1), Sânsimion (2), Sântimbru (4), Sărățeni (2), Sărmaș (3), Satu Mare (12), Satu Nou (3), Secuieni (3), Sicasău (3), between Lacul Zetea and Sicasău (3), Siculeni (1), Şimoneşti (3), Șimonești (1), Șoimeni (3), Șoimușu Mare (3), Between Șoimușu Mare and Vidacuț (2), Șoimușu Mic (1), Sub Cetate (3), Subcetate (1), Between Subcetate and Sărmaș (1), Suseni (3), Tămașu (1), Tăureni (3), Tomeşti (4), Topliţa (10), Tulgheș (3), Tușnad (5), Tușnadu Nou (2), Uilac (2), Ulieș (1), Văcărești (4), Vale (2), Valea Seaca (1), Valea Strâmbă (5), Văleni (3), Vârșag (6), Vidacuț (1), Vlăhița (8), between Vlăhița and Băile Harghita (3), between Vlăhița and Miercurea Ciuc (5), Voșlăbeni (4), Vrabia (1), between Zetea and Sub Cetate (2), Zetea (3).
***Rudbeckia laciniata* (56 records)**
Andreeni (1), Atid (1), Băile Chirui (1), Băile Tușnad (1), Bălan (2), Bârzava (1), Beteşti (1), Bucin (2), Casinu Nou (1), Ciceu (1), Ciucsângeorgiu (1), Cozmeni (1), Crişeni (1), Cristuru Secuiesc (1), Ditrău (2), Dîrjiu (1), Feliceni (1), Frumoasa (1), Gârciu (1), Gheorgheni (1), Iacobeni (1), Joseni (1), Lăzarea (1), Lueta (1), Lunca de Sus (1), Mărtiniș (1), Miercurea Ciuc (2), Mihăileni (1), Morăreni (1), Mugeni (1), Nădejdea (1), Nicoleşti (2), Odorheiu Secuiesc (1), Petreni (1), Porumbenii Mari (1), Praid (3), Rugăneşti (1), Sâncrăieni (1), Sândominic (4), Sânmartin (1), Siculeni (1), Şimoneşti (2), Șoimeni (1), Tomești (1), Valea Strâmbă (1).
***Solidago canadensis* (190 records)**
Arvățeni (1), Atid (3), Băile Tușnad (2), Bârzava (2), Beteşti (2), Beteşti (1), Bisericani (1), Bodogaia (6), Călimănel (1), Chinușu (2), Ciucani (1), Cobăteşti (2), Cobăteşti (1), Corund (2), Crăciunel (2), Cristuru Secuiesc (14), Dănești (2), Dejuțiu (1), Eliseni (5), Feliceni (2), Filiași (1), Forțeni (1), Frumoasa (1), Gheorgheni (1), Between Atid and Firtănuș (1), between Bezid and Crișeni (1), between Crișeni and Atid (2), between Păuleni and Lupeni (2), between Săcel and Șoimușu Mare (6), Between Secuieni and Filiași (5), Between Șoimușu Mare and Vidacuț (5), between Uilac and Eliseni (14), between Vlăhița and Miercurea Ciuc (1), Lăzarea (1), Lueta (3), Lunca de Jos (3), Lupeni (3), Lutiţa (2), Mărtiniș (1), Mătișeni (2), Medișoru Mic (3), Merești (1), Miercurea Ciuc (1), Mihăileni (1), Minele Lueta (2), Morăreni (2), Mugeni (1), Ocland (3), Odorheiu Secuiesc (8), Orășeni (1), Păltiniș Ciuc (3), Păuleni (2), Păuleni Ciuc (1), Porumbenii Mari (1), Porumbenii Mici (2), Rugăneşti (4), Săcel (7), Sândominic (1), Sărățeni (1), Satu Mare (1), Secuieni (10), Şimoneşti (1), Șoimușu Mic (6), Tămașu (1), Tăureni (1), Topliţa (3), Uilac (3), Ulieș (2), Vale (1), Valea Seaca (1), Văleni (2), Vidacuț (4).
***Symphyotrichum lanceolatum* (13 records)**
Bârzava (1), Căpâlnița (1), Ciba (1), Lueta (1), between Lueta and Băile Chirui (2), Lunca de Jos (1), Lunca de Sus (2), Minele Lueta (1), Satu Mare (2), Vlăhița (1).
***Symphyotrichum salignum* (2 records)**
Brădești (1), Mărtiniș (1).
***Xanthium orientale* subsp. *italicum* (132 records)**
Andreeni (1), Atid (8), Between Atid and Firtănuș (1), Băile Harghita (1), Băile Homorod (1), Betești (1), Betești (1), Bodogaia (4), Ciceu (1), Corund (2), Crăciunel (5), Crișeni (3), between Crișeni and Atid (4), Cristuru Secuiesc (7), Delnița (1), between Delnița and Păuleni Ciuc (1), Dîrjiu (3), between Uilac and Eliseni (9), Eliseni (2), Filiași (1), Firtușu (2), Frumoasa (1), Iacobeni (1), Inlăceni (4), Joseni (1), Lueta (2), Lunca de Jos (1), Lunca de Sus (2), Lupeni (4), Medișoru Mic (2), Merești (2), Miercurea Ciuc (1), Mihăileni (2), Morăreni (1), Ocland (2), Ocna de Sus (2), Odorheiu Secuiesc (1), Orășeni (1), Păuleni (5), between Păuleni and Lupeni (1), Păuleni Ciuc (1), Poloniţa (1), Porumbenii Mari (1), Praid (2), Rugăneşti (1), Săcel (2), between Săcel and Șoimușu Mare (4), Sânpaul (1), Satu Mare (1), Satu Nou (1), Secuieni (3), Șoimeni (2), Șoimușu Mare (2), Between Șoimușu Mare and Vidacuț (3), Șoimușu Mic (6), spre Dîrjiu (1), Tămașu (1), Tăureni (1), Ulieș (1), Vidacuț (2).

Table 2. The characteristics of alien invasive species from Harghita County

Species	Family	Floristic elements	Bio form	Life span	Introduction ways	Repro-duction	Seed dispersal
Acer negundo	Compositae	Am N	PhM	P	h	G+V	anemochory
Ailanthus altissima	Simaroubaceae	As E	PhM	P	h	G+V	anemochory
Amaranthus deflexus	Amaranthaceae	Am S	H	P	x	G	anemochory, zoochory, anthropochory
Amaranthus retroflexus	Amaranthaceae	Am N	T	A	h	G	anemochory, zoochory, anthropochory
Ambrosia artemisiifolia	Compositae	Am N	T	A	x	G	anthropochory
Amorpha fruticosa	Fabaceae	Am N	PhN	P	h	G+V	hydrochory, zoochory
Armoracia rusticana	Brassicaceae	Eur SE	H	P	h	V	zoochory
Artemisia annua	Compositae	As (Eur SE ?)	T	A	h	G	anemochory
Asclepias syriaca	Asclepiadaceae	Am N	H(G)	P	h	G	anemochory
Bassia scoparia	Chenopodiaceae	As, Eur E	T	A	h	G	anemochory, anthropochory, hydrochory
Bidens frondosus	Compositae	Am N	T	A	x	G	zoochory, hydrochory
Datura stramonium	Solanaceae	Am	T	A	h	G	anemochory, anthropochory, hydrochory
Echinocystis lobata	Cucurbitaceae	Am N	T	A	h	G	barochory, hydrochory
Elaeagnus angustifolia	Elaeagnaceae	As	PhN	P	h	G+V	zoochory, hydrochory, anthropochory
Erigeron annuus subsp. *annuus*	Compositae	Am N	T	B	x	G	anemochory, hydrochory
Erigeron canadensis	Compositae	Am N	T	A	x	G	anemochory, hydrochory
Galinsoga parviflora	Compositae	Am S	T	A	h	G	anemochory, zoochory, anthropochory
Gleditsia triacanthos	Fabaceae	Am N	PhM	P	h	G+V	anemochory
Helianthus decapetalus	Compositae	Am N	H	P	h	G+V	hydrochory, anthropochory
Helianthus tuberosus	Compositae	Am N	G	P	h	V	hydrochory, anthropochory
Humulus japonicus	Cannabaceae	As E	T	A	h	G	hydrochory
Impatiens glandulifera	Balsaminaceae	As (Himalaia)	T	A	h	G	autochory, hydrochory, anthropochory
Impatiens parviflora	Balsaminaceae	As C	T	A	x	G	autochory, hydrochory, anthropochory

Species	Family	Floristic elements	Bio form	Life span	Introduction ways	Repro-duction	Seed dispersal
Ipomoea purpurea	Convolvulaceae	Am trop	T	A	h	G+V	anthropochory, zoochory
Iva xanthiifolia	Compositae	Am N	T	A	x	G	anemochory, anthropochory
Juncus tenuis	Juncaceae	Am N	G	P	x	G+V	anemochory, zoochory
Lonicera japonica	Caprifoliaceae	As E	PhLi	P	x	G+V	zoochory
Lycium barbarum	Solanaceae	As E	PhN	P	h	V+G	zoochory
Matricaria discoidea	Compositae	Am N	T	A	h	G	anemochory
Mirabilis jalapa	Nyctaginaceae	Am trop	T	P	h	G	zoochory, anthropochory
Morus alba	Moraceae	As SE	PhM	P	h	G+V	zoochory, hydrochory, anthropochory
Oenothera biennis	Oenotheraceae	Am N	T	B	h	G	anthropochory
Oxalis corniculata	Oxalidaceae	Md	H	P	h	V	autochory
Oxalix stricta	Oxalidaceae	Am N (+As E)	H	P	x	G+V	autochory, zoochory
Parthenocissus inserta	Vitaceae	Am N	PhLi	P	h	G	zoochory
Parthenocissus quinquefolia	Vitaceae	Am N	PhLi	P	h	G	zoochory
Phytolacca acinosa	Phytolaccaceae	As E	H	P	h	G+V	zoochory, hydrochory, anthropochory
Phytolacca americana	Phytolaccaceae	Am N	H	P	h	G+V	zoochory, hydrochory, anthropochory
Reynoutria japonica	Polygonaceae	As E	G	P	h	V	hydrochory, anthropochory
Reynoutria sachalinensis	Polygonaceae	As E	G	P	h	G+V	hydrochory, anthropochory
Reynoutria x *bohemica*	Polygonaceae	× (Eur C)	G	P	h	V	hydrochory, anthropochory
Robinia pseudoacacia	Fabaceae	Am N	PhM	P	h	V+G	anemochory, zoochory
Rudbeckia laciniata	Compositae	Am N	H	P	h	V+G	anemochory
Solidago canadensis	Compositae	Am N	H	P	h	V+G	anemochory, anthropochory
Symphyotrichum lanceolatum	Compositae	Am N	H	P	h	V+G	anemochory
Symphyotrichum x *salignum*	Compositae	x	H	P	h	V+G	anemochory
Xanthium orientale subsp. *italicum*	Compositae	Am N	T	A	x	G	zoochory, barochory, anthropochory

Abbreviations: A (annual), P (perennial), B (biennial); h (hemerophyte), x (xenophyte); V (vegetative), G (germinative)

Table 3. The number of records correlated with population size

Species \ Population size, No. of records	1 (1-10 indv)	2 (11-50 indv)	3 (51-100 indv)	4 (101 - 500 indv)	5 (>501 indv)
Acer negundo	38	13	4	1	-
Ailanthus altissima	50	-	-	-	-
Amaranthus deflexus	-	1	-	-	-
Amaranthus retroflexus	17	83	29	16	2
Ambrosia artemisiifolia	3	6	6	5	3
Amorpha fruticosa	6	7	2	-	-
Armoracia rusticana	11	65	45	17	4
Artemisia annua	2	-	-	-	-
Asclepias syriaca	1	3	1	-	-
Bassia scoparia	33	84	19	-	-
Bidens frondosus	2	3	-	-	-
Datura stramonium	6	1	-	-	-
Echinocystis lobata	19	120	66	20	8
Elaeagnus angustifolia	23	-	-	-	-
Erigeron annuus subsp. *annuus*	7	148	235	183	184
Erigeron canadensis	12	131	79	52	24
Galinsoga parviflora	2	3	3	1	-
Gleditsia triacanthos	5	7	1	-	-
Helianthus decapetalus	1	5	2	-	-
Helianthus tuberosus	12	54	37	14	16
Humulus japonicus	4	1	-	-	-
Impatiens glandulifera	3	9	9	5	-
Impatiens parviflora	-	-	-	1	-
Ipomoea purpurea	5	11	1	-	-
Iva xanthiifolia	1	1	-	-	-
Juncus tenuis	-	-	1	-	-
Lonicera japonica	13	26	8	-	-
Lycium barbarum	18	22	9	1	1
Matricaria discoidea	11	63	20	4	7
Mirabilis jalapa	3	3	-	-	-
Morus alba	1	-	-	-	-
Oenothera biennis	8	19	6	-	-
Oxalis corniculata	1	2	-	-	-
Oxalix stricta	1	1	-	-	-
Parthenocissus inserta	8	50	18	7	11
Parthenocissus quinquefolia	5	2	1	-	-
Phytolacca acinosa	3	-	-	-	-
Phytolacca americana	3	-	-	-	-
Reynoutria japonica	82	176	90	45	23
Reynoutria sachalinensis	-	3	-	-	-
Reynoutria × bohemica	2	1	-	-	-
Robinia pseudoacacia	157	246	92	40	3
Rudbeckia laciniata	5	40	7	2	2
Solidago canadensis	13	57	49	29	42
Symphyotrichum lanceolatum	2	7	3	1	-
Symphyotrichum × salignum	-	1	1	-	-
Xanthium orientale subsp. *italicum*	7	51	45	24	5