

CONTRIBUTIONS TO THE STUDY OF THE ALIEN AND INVASIVE SPECIES IN SOME PROTECTED AREAS IN MUREȘ COUNTY, ROMANIA

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Abstract: This study was conducted to increase the understanding of the impact of the invasive plants on a local level. The paper specifically details Natura 2000 sites ROSCI0019 and ROSCI0227 that overlap some natural reserves in Mureș County. The study presents the inventory and chorology of alien and invasive species indentified in some of these protected areas in Mureș County. The diversity of habitat types present in the studied area enables the presence of invasive species with varying ecological requirements. The presence of these species is particularly noticeable near human settlements and heavily ruderalized sites, as a consequence of abandoning agricultural land. In addition to these areas certain invasive species have been identified in various habitat types, especially grasslands and wetlands near watercourses. Some of the alien species met with high frequency and they often form dense vegetation groups. Among these we mention *Echinocystis lobata*, *Erigeron annuus* subsp. *annuus*, *Impatiens glandulifera*, *Reynoutria japonica*, *Rudbeckia laciniata*, *Solidago canadensis*, etc. The study highlights the origin of these species and the impact they have on the state of conservation of natural habitats. In addition, the most aggressive invasive species and habitat types affected by their spread are noted.

Key words: alien plants, protected areas, Mureș County, Romania

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Introduction

Because of the increasing interest around the world on alien and especially invasive alien species along with the significant impact to biodiversity created by the invasion of alien species to the native species; this situation creates an urgent need for stringent guidelines to control these alien and especially invasive alien species. This study was conducted to increase the understanding of the impact of these invasive plants on a local level.

Studies on invasive species, related to their biology, their spread and dispersal ways, their impact on native species and biodiversity, have become increasingly widespread in recent decades. Through their spread and development, these invasive species succeed in replacing native species adapted to local pedoclimatic conditions, resulting in changes to habitat structure and in biodiversity disruption. This invasion process is generally correlated with the presence of the anthropogenic factor and the inadequate exploitation ways of ecosystems (McNeely et al. 2001).

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The paper presents the inventory and chorology of alien and invasive species identified in some of the protected areas in Mureș County.

The lack of studies and sustainable actions to conserve natural protected areas, can lead to invasive alien species impacting entire ecosystems, thus altering their structure and function, including their ability to provide valuable ecosystem services, such as water regulation, flood control or even pollination (Kumschick et al. 2012).

There are several studies on alien species in Romania. Thus, Dihoru (2004) mentions a number of 66 invasive alien species. Anastasiu & Negrean (2005) published a list of 435 invasive species in Romania, of which 384 are neophytes. In 2009, the same authors (Anastasiu & Negrean 2009) described a number of 365 neophytes in Romania, of which 38 are considered invasive. According to Sîrbu and Oprea (2011) in Romania 671 alien species were mentioned, of which 112 are considered invasive. More recently, Anastasiu et al. (2016) published a list of 490 neophytes whose presence in Romania is confirmed.

Worries regarding the impact of invasive plants on natural protected areas have increased in the last few years (Foxcroft et al. 2013, Monaco & Genovesi 2014). The seriousness of the phenomena was felt in Romania and studies on varying protected areas were done as a result of gravity of the situation (Pop et al. 2011, Dumitrașcu et al. 2012, Anastasiu 2014, Goia et al. 2014, Kucsicsa et al. 2015).

Knowing the presence and distribution of invasive species in a given area enables us to assess the impact they have on the biodiversity of the site and to establish appropriate management measures to preserve local natural habitats.

Material and methods

The study of alien invasive species was conducted during the period 2012-2017, based on field research. The presentation of each species is accompanied by data on the origin and geographic distribution, biology and phytocoenology and its frequency in the investigated area. In addition, the types of habitats where the species occur in the study area is noted.

The species' name, bioform, floral elements and coenology were given in accordance with Sîrbu et al. (2013). The terminology and the definitions recommended by Richardson et al. (2000) and Pyšek et al. (2004) were taken into consideration in order to establish the types of invasive plants present in the study areas.

It is highlighted the origin and impact of the presence of these species on the state of conservation of natural habitats. In addition, the study reports the most aggressive alien invasive species and habitat types affected by them.

Habitat types are coded in accordance with Gafta & Mountford (ed.) (2008) and Doniță et al. (2005).

Abbreviations: Adv. – alien, G – Geophyte, H – Hemicryptophyte, Ht – Hemitherophyte, Ph – Phanerophyte, T – Therophyte.

Results and discussion

According to Law No. 5/2000, H.G. no. 2151/30.11.2004 and H.G. no. 1143/18.09.2007 there are 16 protected areas of national interest (nature reserves) in Mureș County, covering an area of 29,265 ha.

To these a number of Natura 2000 sites are added that complete the total areas under different protection stages.

On the Habitats Directive, O.M. no. 1.964/2007, respectively OM no. 2387/2011, the Order of the Minister of Environment and Sustainable Development on the establishment of the protected natural habitat regime of sites of Community importance, 9 sites (2007), with a total area of 225,030 ha, were designated as part of the European ecological network Natura 2000 in Romania, respectively another 12 sites (2011) with a total area of 8,030 ha.

On the Birds Directive, by H.G. no. 1.284/2007, respectively H.G.no. 971/2011 regarding the declaration of the special protection areas of avifauna as an integral part of the European ecological network Natura 2000 in Romania. 5 special avifaunistic protected areas (2007) with a total area of 136,000 ha were designated, and one special avifaunistic protected area was added - Călimani Mountains, overlapped over Călimani National Park (24,000 ha).

The total area of Natura 2000 sites in 2014 was 266,467 ha, representing 40% of the county's area (According to APM Mureş).

This study mainly concerns the two Natura 2000, ROSCI0019 and ROSCI0227 sites overlapping some of the natural reserves existing in Mureş County (Table 1).

Table 1 The studied protected areas

Nr. crt.	Natural protected areas of Community interest - Natura 2000 sites	Natural protected areas of national interest - Natural Reserves
1.	ROSCI0019 Călimani – Gurghiu	National Park Călimani Mountains Natural Park Defileul Mureşului Superior Defileul Deda-Topliţa Reserve Seaca Reserve
2.	ROSCI0227 Sighişoara - Târnavă Mare	Breite Ancient Oak Tree Reserve
3.	ROSCI0297 Dealurile Târnavei Mici – Biches	
4.	ROSCI0079 Fânaţele de pe Dealul Corhan - Săbed	Săbed Forest
5.	ROSCI0100 Lacurile Fărăgău - Glodeni	Fărăgău Lake
6.	ROSCI0368 Râul Mureş între Deda şi Reghin	
7.	ROSCI0408 Zau de Câmpie	Zau de Câmpie Steppe Peony Reserve (Rezervaţia de bujor Zau de Câmpie)
8.	ROSCI0320 Mociar	Mociar Secular Oak Forrest (Pădurea Mociar Gurghiu)
9.		The Vălenii de Mureş checkered lily reserve (Rezervaţia cu lalea pestriţă Vălenii de Mureş)
10.		Gurghiu Daffodils Meadow (Poiana cu narcise Gurghiu)
11.		Ursu Lake (Bear Lake) and adjacent brush (Lacul Ursu şi arboretele de pe sărături)

The great variety of relief and pedo-climatic conditions in the territory under study results in a wide variety of flora and habitat types identified in the area.

The study focused on the identification, characterization and mapping of alien species with significant impact on habitats and with an important role in vegetation dynamics.

A number of 23 invasive alien plant species have been identified in the studied territory.

Checklist of alien invasive species identified in study area

Amaranthus crispus (Lesp. et Thévenau) N. Terrac. – annual, T, Adv. (Argentina), *Sisymbrium*, *Lolio-Plantaginion*, *Onopordion*.

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0297

Localities/Observation points: Gurghiu, Saschiz, Sighișoara, Șilea Nirajului, Bereni. It has been sporadically encountered in several locations, in ruderal places, without having an impact on natural habitats

Amaranthus retroflexus L. – annual, T, Adv. (N America), *Chenopodietalia albi*

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0100, Natural Park Defileul Mureșului Superior, Defileul Deda-Toplița Reserve.

Localities/Observation points: Valea Gurghiului, Fărăgău, Răstolița, Sighișoara.

The species has a high competitive capacity in favorable conditions (Sârbu & Oprea 2011). In the studied territory it meets in anthropic habitats, ruderal places on the side of roads. It is also found in agricultural crops. It was sporadically encountered, without forming dense communities.

Asclepias syriaca L. – perennial, H(G), Adv. (N America) (Fig. 1)

Distribution in protected areas: ROSCI0227

Localities/Observation points: Apold, Saschiz, Criș, Daia, Ștejereni

Invaded habitats: 6510, 6240

In the studied area, the species occurs sporadically and isolated in ruderal communities, along roads and near human settlements. Isolated specimens have been identified without forming well-established populations in meadows belonging to the habitats 6510, 6240 and in pastures. It may present a threat because it has great potential for vegetative and seed propagation.

Conyza canadensis (L.) Cronq. (*Erigeron canadensis* L.) – annual, T, Adv. (N America), *Stellarietea mediae*, *Brachyaction ciliatae*, *Atropetalia*, *Sisymbrietalia*

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0297, ROSCI0100, ROSCI0368, Natural Park Defileul Mureșului Superior, Defileul Deda-Toplița Reserve.

Localities/Observation points: Aluniș, Bereni, Daneș, Fărăgău, Ibănești, Lăpușna, Mihai Viteazu, Răstolița, Saschiz, Sighișoara, Sovata, Șilea Nirajului, Stânceni – Gudea Mare Valley, Câmpu Cetății-Poiana Copăș

Invaded habitats: 6520, 6210, 6240, 6440.

Considered the most common ruderal plant (Prodan 1946, quoted by Sîrbu & Oprea 2011), this species is frequently found in the study area, forming numerous populations, especially on abandoned land, or disturbed by the anthropic factor. It was also noted in semi-natural habitats, without significantly affecting their structure. Having a high capacity of dissemination and reproduction and a high tolerance to environmental factors, affects agricultural crops. It is also an intermediate host for various micro-organisms and insects damaging to crops.



Fig. 1: *Asclepias syriaca* at Apold (photo Silvia Oroian)



Fig. 2: *Echinocystis lobata* in Defileul Deda-Topliţa Reserve (photo Silvia Oroian)

Echinocystis lobata (Michx.) Torr. et A. Gray- annual, T, Adv. (N America), *Senecion fluviatilis* (Fig. 2)

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0368, Natural Park Defileul Mureşului Superior, Defileul Deda-Topliţa Reserve

Localities/Observation points: Apold, Daia, Daneş, Gurghiu, Răstoliţa, Bistra Mureşului, Stânceni, Sălard, Ciobotani, Reghin, Saschiz, Sighişoara, Solovăstru, Stejăreni, Vânători

Invaded habitats: 6430

It is one of the invasive plant species most commonly found in Transylvania, with well-distributed populations along the watercourses, canals, hedges and meadow forests as well as on ruderal fields (Kovács 2006).

In the studied territory they form dense communities with high coverage, on surfaces of a few square meters. Due to lush development it affects the growth of native species and leads to disturbance of the habitats structure.

Erigeron annuus (L.) Pers. subsp. *annuus* – annual-biennial-perennial, T, Ht, H, Adv. (N America), *Stellarietea mediae*, *Dauco-Melilotion*

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0368, ROSCI0297, ROSCI0079, ROSCI0320, ROSCI0408, National Park Călimani Mountains, Seaca Reserve, Natural Park Defileul Mureşului Superior, Defileul Deda-Topliţa Reserve, Vălenii de Mureş checkered lily reserve, Zau de Câmpie Steppe Peony Reserve, Ursu Lake, Gurghiu Daffodils Meadow

Localities/Observation points: Aluniş, Apold, Archita, Beica de Sus, Caşva, Câmpu Cetăţii - Pârâul Cald, Chiheru de Sus, Ciobotani, Cloaşterf, Criş, Daia, Daneş, Gurghiu, Ilieş, Lăpuşna, Lunca Bradului-Valea Ilişoara, Lunca Mureşului, Miercurea Nirajului, Mihai Viteazu, Neagra, Orşova, Pârâul Rusu, Reghin, Răstoliţa, Saschiz, Săbed, Sighişoara, Stejărenii, Şaeş, Şilea Nirajului, Săcădat, Sovata, Stânceni, Gudea

Mare Valley, Gurghiului Valley, Sălardului Valley, Secuieu Valley, Sovata Valley, Nirajului Mic Valley, Nirajului Mare Valley, Vălenii de Mureș, Zau de Câmpie

Invaded habitats: 6520, 6210, 6240, 6440, 6430, 62C0, 6230, 6410

This species is one of the most common alien invasive species encountered in the studied territory. It is installed on abandoned agricultural land, forming well-covered populations with large coverage. It was also found in grasslands in semi-natural and natural habitats. Where the atropic pressure is high, this species grows abundant, causing the structure of habitats to be disrupted and the native species replaced.

Galinsoga parviflora Cav. – annual, T, Adv. (S America), *Panico-Setarion*, *Brachyaction ciliatae*, *Chenopodietalia albi*

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0100, National Park Călimani Mountains, Seaca Reserve, Natural Park Defileul Mureșului Superior, Defileul Deda-Toplița Reserve,

Localities/Observation points: Brădețel, Daneș, Fărăgău, Gălăoia, Gurghiu, Gura Fâncel, Lăpușna, Lunca Bradului- Ilișoara Valley, Ilva Mare Valley, Răstolița, Saschiz, Sighișoara, Sovata, Nirajului Mare Valley, Secuieu Valley, Sirodul Mic Valley

Invaded habitats: 6430

The species has a great invasion capacity, especially in anthropogenic vegetation communities and less in the natural ones. It causes significant damage to invaded crops.

In the studied territory there are sporadically encountered, in ruderal communities, uncultivated lands, and riversides. It was also found in phytocoenoses edified by *Petasites hybridus* and *Telekia speciosa* belonging to habitat 6430 without having a significant impact on them.

Helianthus decapetalus L. – perennial, H, N America, *Galio-Urticetea*, *Senecion fluviatilis*, *Artemisietea vulgaris*

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0368, Natural Park Defileul Mureșului Superior, Defileul Deda-Toplița Reserve,

Localities/Observation points: Apold, Borzia, Daia, Daneș, Răstolița, Reghin, Saschiz, Sighișoara

The populations studied in the territory occupy limited areas at a few square meters on the banks of the waters, entering the phytocoenoses of the habitats 6430 and 91E0* (HdR R4401, R4402, R4405, R4407, R4408)

Helianthus tuberosus L. – perennial, G, N America, *Galio-Urticetea*, *Senecion fluviatilis*, *Artemisietea vulgaris*

Distribution in protected areas: ROSCI0227, ROSCI0368

Localities/Observation points: Reghin, Sighișoara

Invaded habitats: 6430, 91E0* (HdR R4401, R4402, R4405, R4407, R4408)

It is a less widespread plant in the studied area but forms monodominant populations that meet along the river bed, degraded riparian forests and tall herbs.

Impatiens glandulifera Royle – annual, T, Hymalaia, *Convolvuletalia sepium*, *Salicion albae*, *Arction* (Fig. 3)

Distribution in protected areas: ROSCI0019, ROSCI0227, Natural Park Defileul Mureșului Superior, Defileul Deda-Toplița Reserve,

Localities/Observation points: Daneș, Gălăoia, Lunca Bradului, Răstolița, Saschiz, Sighișoara, Sălard, Stânceni, Gudea Mare Valley

Invaded habitats: 3220, 6430

In the studied area this species forms dense populations on the water banks, being found in the communities belonging to the habitats 3220 and 6430. In the Mureş Gorge there was encountered well-developed stands dominated by this species. It was also found as a companion species in communities dominated by *Calamagrostis pseudophragmites*. By forming often dense communities, the expansive development of the species can reduce the specific wealth of habitats by replacing native species. However, some authors consider that the invasion of this species is not a major problem for the conservation of native biodiversity in riparian communities (Kasperek 2004, Hejda & Pyšek 2006).

Juncus tenuis Willd. – perennial, G, Adv. (N America), *Potentillion anserinae*, *Lolio-Plantaginion*

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0100, Natural Park Defileul Mureşului Superior, Defileul Deda-Topliţa Reserve

Localities/Observation points: Archita, Ciobotani, Daia, Deda, Fărăgău, Gurghiu, Ibăneşti Pădure, Ilieş Lăpuşna, Lunca Bradului, Răstoliţa-Valea Iodului, Saschiz, Şarpatoc, Sălardului Valley, Vulcan

Invaded habitats: 6520.

The species was found in grasslands belonging to the 6520 - Mountain meadows Natura 2000 habitat, without having a negative impact on them. It was also noted from anthropically disturbed habitats, road sides, paths.

Lycium barbarum L. – shrub, Ph, China, *Arction*, *Prunion spinosae* (Fig. 4)

Distribution in protected areas: ROSCI0227 (Apold, Sighişoara)

It was met at several points in the area of Apold and Sighişoara localities in the ROSCI0227 Natura 2000 site, forming insular populations at the edge of the vineyards and orchards, as well as in ruderal places.



Fig. 3: *Impatiens glandulifera* in Răstoliţa (photo Silvia Oroian)



Fig. 4: *Lycium barbarum* – Sighişoara (photo Silvia Oroian)

Matricaria discoidea DC. – annual, T, Adv. (NE Asia, N America), *Lolion-Plantaginion*, *Sisymbriion*, *Cynosurion*

Distribution in protected areas: ROSCI0019 at Deda, Ibăneşti, Şirodului Valley

The species was sporadically encountered in several locations, in ruderal places, without having an impact on natural habitats.

Oxalis stricta L. – perennial, H, Adv. (N America), *Stelarietetea mediae*

A few specimens of the species have been found in the Gurghiu Narcissus Glade reserve, without impacting native species or habitat.

Portulaca oleracea L. – annual, T, Cosmopolite, *Amarantho-Chenopodion albi*, *Eragrostietalia*, *Stellarietea mediae*

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0368

Localities/Observation points: Apold, Cloașterf, Daneș, Deda, Gurghiu, Reghin, Saschiz, Sighișoara, Stejăreni

Common weed, sporadically encountered in ruderal places, abandoned agricultural land, without forming large populations and without having a negative impact on native species and habitats in the study area.

Reynoutria japonica Houtt. – perennial, G, E Asia

Distribution in protected areas: ROSCI0019, ROSCI0227, Natural Park Defileul Mureșului Superior, Defileul Deda-Toplița Reserve

Localities/Observation points: Apold, Daneș, Gălăoaia, Ibănești, Răstolița, Sighișoara

Invaded habitats: 6430, 91E0* (HdR R4401, R4402, R4405, R4407, R4408)

The species is considered to be one of the most damaging alien invasive species in most of Europe (Sîrbu & Oprea 2011). It forms dense communities in which it can reduce to zero the biodiversity of native species through shading, the reduction of soil resources as well as due to the allelopathic substances.

In the studied territory, the species form dense populations, occupying relatively large areas. It penetrates the vegetation communities that accompany the watercourses and riparian forests with *Salix* spp.

Reynoutria sachalinensis (F.Schmidt) Nakai – perennial, G, Sackhalin (Extreme Orient)

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0320

Localities/Observation points: Ibănești Pădure, Gurghiu, Cașva, Solovăstru, Beica de Sus, Isticeu

Invaded habitats: 6430, 91E0* (HdR R4401, R4402, R4405, R4407, R4408)

Is it sporadically encountered on the shores of Mureș River tributaries, in the studied protected areas, where they form dense, mono-dominant populations that replace indigenous species.

Robinia pseudoacacia L. – tree, Ph, N America.

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0320, ROSCI0297, Natural Park Defileul Mureșului Superior, Defileul Deda-Toplița Reserve, Săbed Forest

Localities/Observation points: Aluniș, Androneasa, Apold, Beica de Sus, Bereni, Bistra-Mureșului, Cloașterf, Daneș, Deda, Fărăgău, Gălăoaia, Gurghiu, Ibănești, Iod, Lunca Bradului-Sălard, Miercurea Nirajului, Răstolița, Săbed, Saschiz, Sighișoara, Sovata, Șilea Nirajului, Vânători, Zau de Câmpie

Invaded habitats: 6520, 6240, 6440, 6430, 62C0, 6230, 6410

The species invades the semi-natural and even natural habitats in various stages of degradation, especially in the hilly and plain area, but can also be found in the mountainous region of the studied territory. It may have beneficial effects in land consolidation, but its presence must be monitored, especially in the vicinity of valuable

habitats. It was noted in grasslands, pastures, anthropical disturbed habitats, forest fringes or forest habitats.

Rudbeckia laciniata L. – perennial, H, Adv. (N America) (Fig. 5)

Distribution in protected areas: ROSCI0019, ROSCI0227, ROSCI0368, ROSCI0320, Natural Park Defileul Mureșului Superior, Defileul Deda-Toplița Reserve

Localities/Observation points: Apold, Brâncovenești, Cașva, Câmpu Cetății, Chiheru de Jos, Gurghiu, Lăpușna, Reghin, Sighișoara, Șaeș, Solovăstru, Sovata, Sovata- Sebeș Valley, Stânceni- Gudea Mare Valley

Invaded habitats: 6440, 6430

This is a species characteristic to riparian habitats and form large clusters that can suffocate the other species. Although they do not affect extensive territories in the study area, they must be kept under control to avoid their development to the detriment of indigenous species.

Solidago canadensis L. – perennial, H, Adv. (N America), *Galio-Urticetea*, *Artemisietea*, *Senecion fluviatilis* (Fig. 6)

Distribution in protected areas: ROSCI0227

Localities/Observation points: Apold, Daneș, Saschiz, Sighișoara, Șaeș, Stejăreni
Invaded habitats: 6520, 6210, 6240, 6440, 62C0

In the studied areas, *Solidago canadensis* is the alien invasive species with an almost constant presence and extremely high abundance, constituting an exceptional biological invasion event. It occurs both in ruderal places, on abandoned land, but also penetrates in natural and semi-natural habitats, making compact, mono-dominant clusters. By its proliferation at the expense of indigenous species, floral composition and habitat functions are affected.



Fig. 5: *Rudbeckia laciniata* at Stânceni- Gudea Mare Valley (photo Silvia Oroian)



Fig. 6. *Solidago canadensis* in Șaeș (photo Silvia Oroian)

Solidago gigantea Aiton subsp. *serotina* (Kuntze) McNeill – perennial, H, Adv. (N America), *Arction*, *Artemisietea*

Distribution in protected areas: ROSCI0227 (Daia, Saschiz)

Invaded habitats: 6520, 6210, 6240, 6440, 62C0

In the study area, this species occur into various phytocoenoses, from degraded ones (ruderal communities along the road, abandoned lands in regeneration, plantations)

to the most natural (xerophilic and xero-mesophilic grasslands, high herbs and galley forests along the water courses).

Once this species, as well as the previous one, enter the abandoned land, it prevents the native vegetation from being installed and the normal vegetation succession.

Veronica persica Poir. – annual, T, Adv. (SW Asia), *Stellarietea mediae*

Distribution in protected areas: ROSCI0019, ROSCI0368, Natural Park Defileul Mureşului Superior, Defileul Deda-Toplița Reserve

Localities/Observation points: Gurghiu, Lunca Bradului, Răstolița, Reghin

It has been encountered on ruderal land, overflow, abandoned land, and agricultural crops. Does not affect native species and habitats.

Xanthium orientale L. subsp. *italicum* (Moretti) Greuter – annual, T, N&S America (Adv. in S Europe), *Sisymbrium*, *Bidentium*

Distribution in protected areas: ROSCI0227, ROSCI0368

Localities/Observation points: Apold, Daia, Reghin

In the study area it was found in ruderal places, abandoned farmlands, where they form numerous populations, which develop to the detriment of indigenous species.

Considering the number of localities and observation points in which they were identified, we can conclude that among the species mentioned in the paper, the species most widespread are: *Conyza canadensis*, *Echinocystis lobata*, *Erigeron annuus* subsp. *annuus*, *Galinsoga parviflora*, *Juncus tenuis*, *Robinia pseudoacacia*.

Species with the best cohesive and dense populations are *Erigeron annuus* subsp. *annuus*, *Reynoutria japonica*, *Reynoutria sachalinensis*, *Rudbeckia laciniata*, *Solidago canadensis*, *Solidago gigantea* subsp. *serotina*. At some points, they form monodominant coenoses, replacing the native species.

Taking in consideration the number of invasive plant species present in the studied locations it is found that this is correlated with the intensity of the anthropogenic phenomena present in the area.

Among the invasive species, 10 are xenophytes, being introduced accidentally, while others are introduced by humans for various purposes, especially ornamental plants, and secondary to the spontaneous flora (hemerophyte species - 13 species) (Table 2).

Most identified species are integrated into anthropic habitats. Part of it also penetrates into semi-natural habitats: forest edges, riverbanks, meadows, grasslands and pastures, etc., often having a strong negative impact on them.

The protected areas where most invasive plant species occur are ROSCI0227 (21 species) and ROSCI0019 (16 species), due in particular to the large areas of these two sites and the variety and heterogeneity of the habitat types found here.

These 23 invasive species were found in the next nine following types of Natura 2000 habitats:

6520 Mountain hay meadows

6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometea*)

6240 Sub-pannonic steppic grasslands

6440 Alluvial meadows of river valleys of the *Cnidion dubii*

6430 Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels

62C0 Ponto-Sarmatic steppes

6230 Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and sub-mountain areas, in Continental Europe)

6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

91E0* (HdR R4401, R4402, R4405, R4407, R4408) Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

In spite of constant conservation efforts, biodiversity loss is estimated to be 100-10,000 times higher relative to the rate of fossil record in Cenozoic (May et al. 1995), and invasions of alien species are, along with habitat loss, the use of land, direct exploitation, pollution and climate change, one of its major causes (Sala et al. 2000).

Table 2 Alien invasive species in protected areas of Mureş County, category, pathways of introduction, impact and abundance/aggressiveness

Species	Category	Pathway of introduction	Impact	Abundance /aggressiveness
<i>Amaranthus crispus</i>	X*	accidental	Aggressive and competitive weed	Rare
<i>Amaranthus retroflexus</i>	X	accidental	Aggressive and competitive weed	Sporadic
<i>Asclepias syriaca</i>	H*	ornamental	Aggressive weed, contains toxic substances that may cause poisoning	Abundant
<i>Conyza canadensis</i>	X	accidental	It can affect the structure of habitats, crops, hosts for various insects, fungi, viruses.	Sporadic
<i>Echinocystis lobata</i>	H	ornamental	Ecosystem degradation, replacement of native species	Abundant, on small areas (several m ²)
<i>Erigeron annuus</i> subsp. <i>annuus</i>	H	ornamental	Competitive species, leading to ecosystem degradation, affect the structure of habitats	Abundant
<i>Galinsoga parviflora</i>	X	accidental	Highly competitive and can spread quickly, habitat degradation, generates considerable economic impact on crop systems	Sporadic
<i>Helianthus decapetalus</i>	H	ornamental	It affects the structure of habitats, crops	Sporadic
<i>Helianthus tuberosus</i>	H		Noxious invasive plants with high potential to become weed in agricultural landscape	Sporadic
<i>Impatiens glandulifera</i>	H	ornamental	reduce native plant diversity, and negatively impact habitat for wildlife	Abundant
<i>Juncus tenuis</i>	X	accidental	May affect native species through competition with other plants and	Abundant

			the alteration of valuable native habitats; generally not regarded as a noxious invasive taxon.	
<i>Lycium barbarum</i>	H	ornamental	Replaces native species	Sporadic
<i>Matricaria discoidea</i>	X		Replaces native species	Sporadic
<i>Oxalis stricta</i>	X		Very limited effect on native species.	Rar
<i>Portulaca oleracea</i>	X	accidental	Aggressive weed, degradation of ecosystems	Sporadic
<i>Reynoutria japonica</i>	H	ornamental	Aggressive and competitive weed, replaces native species and disturb natural habitats	Abundant
<i>Reynoutria sachalinensis</i>	H	ornamental	Aggressive and competitive weed, replaces native species and disturb natural habitats	Sporadic
<i>Robinia pseudoacacia</i>	H	ornamental	Competitive species can replace native species	Abundant
<i>Rudbeckia laciniata</i>	H	ornamental	A competitive species affects the structure of habitats	Abundant
<i>Solidago canadensis</i>	H	ornamental	Competitive weed, replaces native species and disturb natural habitats	Abundant
<i>Solidago gigantea</i> subsp. <i>serotina</i>	H	ornamental	One of the most aggressive invasive plants, threatens habitats and natural vegetation communities	Abundant
<i>Veronica persica</i>	X	accidental	Weed in agricultural crops	Rare
<i>Xanthium orientale</i> subsp. <i>italicum</i>	X	accidental	Competitive species, can replace native species, cause allergies and intoxications, invade crops	Sporadic

*X – xenophyte, H – hemerophyte

Conclusions

Alien invasive species from 8 Natura 2000 sites and 11 protected areas of national interest (nature reserves) from Mureș County were studied.

As a result of field research 23 alien invasive plant species were identified on the study area. Some of these 23 species are more widespread, being encountered in numerous of the studied protected areas. Among these we mention *Conyza canadensis*, *Echinocystis lobata*, *Erigeron annuus* subsp. *annuus*, *Galinsoga parviflora*, *Juncus tenuis*, *Robinia pseudoacacia*.

The species with the greatest impact on the local communities and native species are *Erigeron annuus* subsp. *annuus*, *Reynoutria japonica*, *Reynoutria sachalinensis*, *Rudbeckia laciniata*, *Solidago canadensis*, *Solidago gigantea* subsp. *serotina*, which in some places form well-developed populations, some almost mono-dominante.

The habitats in which these species are present are predominantly anthropic, disturbed habitats, abandoned agricultural land, where invasive species with high competitiveness succeed in replacing native species, and can also prevent the restoration

of native vegetation, disturbing the plant succession. Frequently invasive species have been encountered in natural and semi-natural habitats, some of which are very valuable and have a specific biodiversity. Although the impact on them is often low, careful monitoring of invasive species and measures to reduce their spread is required.

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