

# List of invasive plant species in the Danube Delta Biosphere Reserve and pilot measures to control the IAS in the Danube Delta within the LIFE WILDisland project

“Invasive alien species in the Danube Region – IAS of regional concern”  
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# Danube Delta Biosphere Reserve (580,000 ha)

- ✓ The Danube Delta Biosphere Reserve is the third-richest biosphere reserve in the world in terms of biodiversity, after Australia's Great Barrier Reef and Ecuador's Galapagos Islands.
- ✓ It is the only delta in the world declared entirely as a biosphere reserve.
- ✓ Its area represents about 2.5% of Romania's surface and it is the second largest delta in Europe, after Volga delta.
- ✓ It shelters the largest compact area of reedbeds on the planet and supports 30 types of ecosystems
- ✓ It is part of NATURA2000 network.



The Danube Delta was declared biosphere reserve in **1990** by the Government of Romania



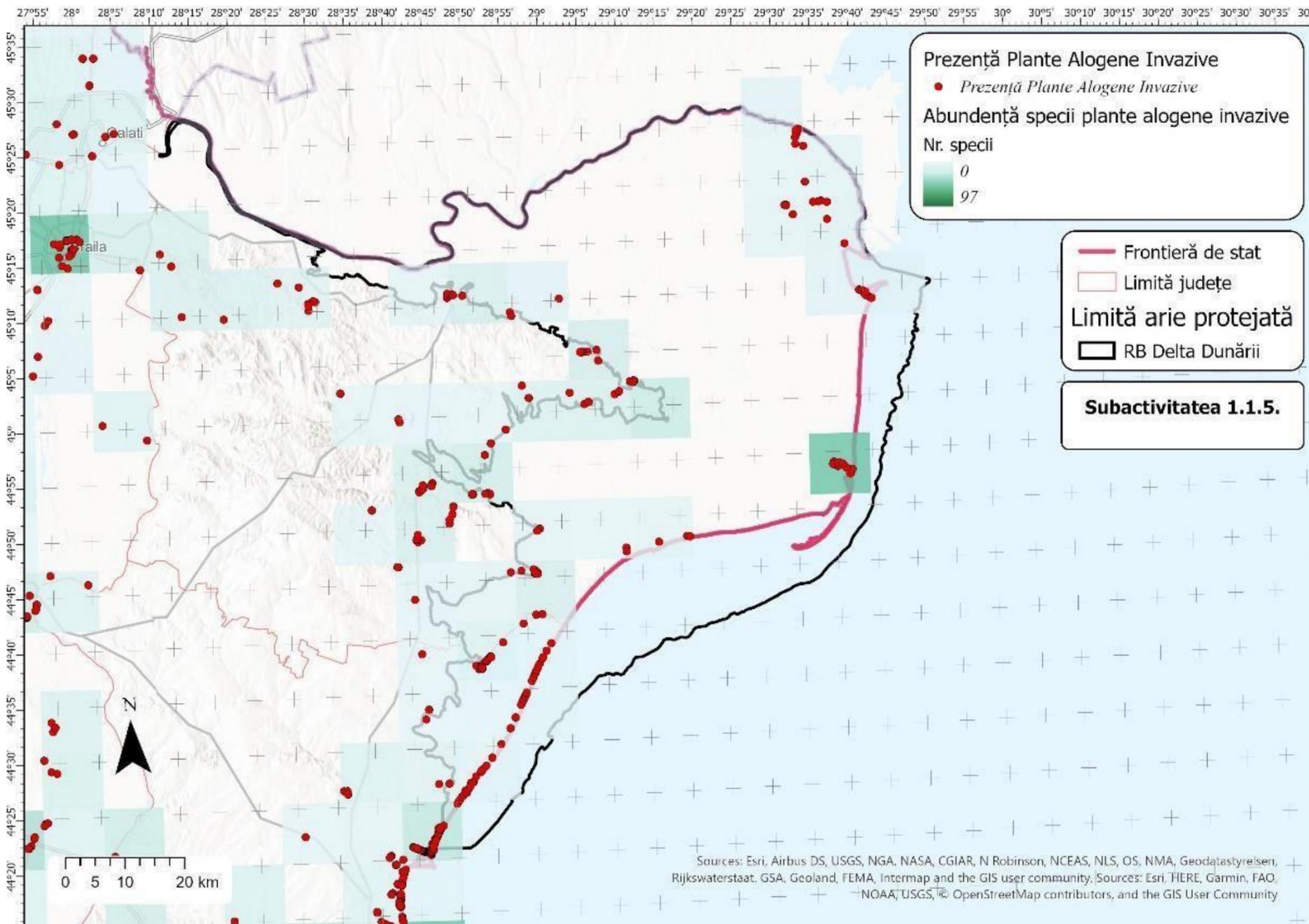
## Plant invasive alien species in the Danube Delta Biosphere Reserve

Within the POIM 120008 Project - “Appropriate management of invasive species in Romania, in accordance with EU Regulation 1143/2014 on the prevention and management of the introduction and spread of invasive alien species” (<https://invazive.ccmesi.ro/publicatii/>) implemented by the Romanian Ministry of Environment, Waters and Forests, in the period 2020-2022, the following plant IAS have been reported for the Danube Delta Biosphere Reserve:

*Abutilon theophrasti*, *Acer negundo*, *Acorus calamus*, *Ailanthus altissima*, *Amaranthus albus*, *Amaranthus blitoides*, *Amaranthus blitum* subsp. *blitum*, *Amaranthus deflexus*, *Amaranthus retroflexus*, *Ambrosia artemisiifolia*, *Ambrosia tenuifolia*, *Amorpha fruticosa*, *Armoracia rusticana*, *Artemisia annua*, *Azolla filiculoides*, *Bidens frondosa*,  
*Chenopodium ambrosioides*, *Citrullus lanatus*, *Commelina communis*, *Cucumis sativus*, *Cuscuta campestris*, *Cyperus odoratus*,  
*Datura stramonium*, *Datura wrightii*,  
*Eclipta prostrata*, *Elaeagnus angustifolia*, *Elodea nuttallii*, *Erigeron annuus* subsp. *annuus*, *Erigeron canadensis*, *Euphorbia maculata*,  
*Gaillardia aristata*, *Galinsoga parviflora*, *Gleditsia triacanthos*,  
*Helianthus annuus*, *Helianthus tuberosus*,  
*Ipomoea purpurea*, *Iva xanthiifolia*,  
*Lemna minuta*, *Lycium barbarum*,  
*Morus alba*, *Morus nigra*,  
*Oenothera biennis*, *Oenothera glazioviana*, *Oxalis dillenii*,  
*Parthenocissus inserta*, *Paspalum paspalodes*, *Pennisetum alopecuroides*, *Perilla frutescens*, *Persicaria orientalis*, *Petunia parviflora*, *Phytolacca americana*, *Portulaca oleracea*, *Prunus armeniaca* var. *amarella*, *Prunus cerasifera*,  
*Robinia pseudoacacia*, *Rudbeckia laciniata*,  
*Solanum lycopersicum*, *Solanum triflorum* var. *ponticum*, *Sorghum halepense*,  
*Vallisneria spiralis*,  
*Xanthium orientale* subsp. *italicum*, *Xanthium spinosum*.

These species are joined by others, identified during studies prior to those within the present project.  
(In 2014, Anastasiu and co. published a list of 163 allogeneic taxa for the Danube Delta Biosphere Reserve).

# Plant invasive alien species in the Danube Delta Biosphere Reserve



Danube Delta Biosphere Reserve has over 60 invasive and potentially invasive alien species and subspecies.

This high concentration is explained by many factors operating in this area.

First of all, it is about the water factor, which represents a good vector for seeds, fruits and other parts of alien plants.

Then, transport, tourism, the urbanization process and the cultivation of ornamental species are other factors that contribute to favoring plant invasions in the Danube Delta.

## Plant invasive alien species in the Danube Delta Biosphere Reserve

<i>Acer negundo</i>	<i>Bidens connata</i>	<i>Elaeagnus angustifolia</i>	<i>Matricaria discoidea</i>
<i>Acorus calamus</i>	<i>Bidens frondosa</i>	<i>Elodea canadensis</i>	<i>Morus alba</i>
<i>Aegilops crassa</i>	<i>Bidens vulgatus</i>	<i>Elodea nuttallii</i>	<i>Oenothera biennis</i>
<i>Ailanthus altissima</i>	<i>Brachyactis ciliata</i>	<i>Erigeron annuus</i>	<i>Oenothera parviflora</i>
<i>Althaea rosea</i>	<i>Buddleja davidii</i>	<i>Erigeron canadensis</i>	<i>Oxalis corniculata</i>
<i>Amaranthus albus</i>	<i>Carex flava</i>	<i>Erigeron sumatrensis</i>	<i>Panicum capillare</i>
<i>Amaranthus blitoides</i>	<i>Cenchrus longispinus</i>	<i>Eruca sativa</i>	<i>Parthenocissus inserta</i>
<i>Amaranthus blitum</i>	<i>Chenopodium album</i>	<i>Euphorbia maculata</i>	<i>Paspalum paspalodes</i>
<i>Amaranthus crispus</i>	<i>Chenopodium ambrosioides</i>	<i>Fraxinus pennsylvanica</i>	<i>Petunia parviflora</i>
<i>Amaranthus deflexus</i>	<i>Chenopodium botrys</i>	<i>Galingsoga parviflora</i>	<i>Phytolacca americana</i>
<i>Amaranthus emarginatus</i>	<i>Chenopodium chenopodioides</i>	<i>Groenlandia densa</i>	<i>Polygonum orientale</i>
<i>Amaranthus hybridus</i>	<i>Chenopodium hybridum</i>	<i>Helianthus tuberosus</i>	<i>Robinia pseudoacacia</i>
<i>Amaranthus powellii</i>	<i>Chenopodium polyspermum</i>	<i>Heliotropium curassavicum</i>	<i>Rudbeckia laciniata</i>
<i>Amaranthus retroflexus</i>	<i>Chenopodium pumilio</i>	<i>Hibiscus moscheutos</i>	<i>Sagittaria trifolia</i>
<i>Ambrosia artemisiifolia</i>	<i>Coronopus didymus</i>	<i>Hibiscus syriacus</i>	<i>Sicyos angulatus</i>
<i>Ambrosia coronopifolia</i>	<i>Corynephorus canescens</i>	<i>Hordeum jubatum</i>	<i>Solanum retroflexum</i>
<i>Ambrosia psilostachya</i>	<i>Cuscuta campestris</i>	<i>Ipomoea purpurea</i>	<i>Solidago canadensis</i>
<i>Amorpha fruticosa</i>	<i>Cyperus difformis</i>	<i>Iva xanthiifolia</i>	<i>Solidago gigantea</i>
<i>Androsace elongata</i>	<i>Cyperus odoratus</i>	<i>Juncus tenuis</i>	<i>Vallisneria spiralis</i>
<i>Armoracia lapathifolia</i>	<i>Datura stramonium</i>	<i>Lemna minuta</i>	<i>Veronica persica</i>
<i>Armoracia rusticana</i>	<i>Diplotaxis eruroides</i>	<i>Lindernia dubia</i>	<i>Xanthium orientale subsp. italicum</i>
<i>Artemisia annua</i>	<i>Dysphania ambrosioides</i>	<i>Lonicera japonica</i>	<i>Xanthium spinosum</i>
<i>Asclepias syriaca</i>	<i>Echinocystis lobata</i>	<i>Lycium barbarum</i>	
<i>Azolla filiculoides</i>	<i>Eclipta prostrata</i>	<i>Lythrum scabrum</i>	

Danube Delta National Institute of Research and Development (DDNI) performed ecological research on some alien plant species from the Danube Delta in the previous years and for the revision of the DDBRA Management Plan.

This list includes more than 90 allochthonous species, of which more than 60 are woody species. Among them, the most widespread woody plant IAS in the Danube Delta are *Amorpha fruticosa*, *Robinia pseudoacacia* in the river delta and *Elaeagnus angustifolia* in the river-maritime delta;

An important role in the development of phenological stages is played by local climatic conditions and spatiality; Due to its frequent cultivation along the banks of regularized/dragged channels, the species *Amorpha fruticosa* is very common in the river delta;

The highest frequency of alien woody species is higher in areas with low drainage and salinity. In the fluvio-maritime delta, the species are found in the area of the banks of the channels and uncommonly in the areas with sandy substrate, the exception being *Elaeagnus angustifolia* and *Lycium barbarum*.



*Allanthus altissima* (Miller) Swingle



*Robinia pseudoacacia* L.



*Acer negundo* L.



*Lycium barbarum* L.



*Fraxinus pennsylvanica* Marsh.



*Elaeagnus angustifolia* L.



*Amorpha fruticosa* L.

## Danube Delta Biosphere Reserve Authority's Experience in the IAS Management

According to the current RBDD Management Plan, one of the management objectives in the Danube Delta Biosphere Reserve is to stop the decline of biological diversity and to conserve natural heritage through invasive species inventory actions and develop precautionary measures for their management.



Based on the inventory lists of the invasive species of flora and fauna existing and provided by Danube Delta Research Institute, DDBRA has implemented over time a series of measures to support this objective:

- Imposing conditions / measures in the regulatory acts (licenses, permits, etc.) during the appropriate environmental impact assessment procedure to carry out works such as interventions to eradicate them, reducing the potential for reproduction and spreading of these species, green landscaping with plant and shrub species specific to the area, etc. in coastal cordon areas, in forest, wetlands, meadows habitats, etc.
- Activities carried out within the European funded projects
- Educational and public awareness activities.

## IASON and IASON+ Projects financed by the Black Sea Basin and INTERREG NEXT BSB Programmes

**IASON PROJECT** - "Invasive Alien Species Observatory and Network Development for the Assessment of Climate Change Impacts in Black Sea Deltaic Protected Areas"

The aim is to create an international network for invasive species (IAS) in the Black Sea deltaic ecosystems and to assess their response to current or projected climatic conditions. One result is an organizational structure (**Observatory**) through which Information and Communication Technologies (**ICT services**) are not only for **IAS monitoring** and assessments (**information & research capacity**) but also for **networking with/and engaging citizens** towards improving and using updated results of the project (**institutional capacity**).

**IASON + PROJECT** – "Invasive Alien Species Observatory and Network Development for the Assessment of Climate Change Impacts and Contextual Ecosystem Services Evaluation in Black Sea Deltaic Protected Areas"

The overall objective is to continue the activities of establishing and performing joint monitoring actions for Invasive Alien Species (IAS), the evaluation of their influence in defining Ecosystem Services in Black Sea deltaic ecosystems from five countries (Romania, Ukraine, Greece, Turkey and Georgia) and assess the resilience under current and predicted climatic conditions, to create and promote climate change adaptation premises.

DDBRA together with the partners from Danube Delta National Institute of Research and Development (Lead Partner) selected 5 IAS species (*Amorpha fruticosa*, *Xanthium strumarium*, *Elodea nuttallii*, *Leptinotarsa decemlineata*, *Perccottus glenii*) for our protected area.





# Pilot measures to control the IAS in the Danube Delta within the LIFE WILDisland project

## LIFE WILDisland Project / LIFE NAT 20/AT/000063

**Project period:** 1<sup>st</sup> Sept. 2021 – 31<sup>st</sup> August 2027

**Budget:** 14,2 Mio. € (EU 63,98%)

8 Danube countries, 15 partners, 59 strategic partners

### Objectives:

- Establishment of **ecological corridor for dynamic riverine habitats** (Danube islands as stepping stones);
- Promotion of river dynamics & non-intervention management & **riverine wilderness**;
- **Restoration** of islands and dynamic riverine habitats;
- Improvement of **conservation status of 91E0\*** as „umbrella habitat“;
- **Cross-sectoral cooperation** (nature conservation, waterway, hydropower, forestry);
- WILDisland habitat eco-corridor as **best practice Green & Blue Infrastructure for large rivers in Europe**;



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## Best practice of IAS management in the Danube Delta Biosphere Reserve – 43 ha

Location: five selected island in the Danube Delta Biosphere Reserve, Romania

Background: For LIFE WILDIsland, five islands (RO163, RO97, RO86, RO109, RO43) have been selected which are in a very natural status, but their habitat conditions of soft wood forests is strongly reduced by invasive alien tree species.

Natural rejuvenation of 91E0\* habitat is limited in particular by the *Amorpha fruticosa*, *Fraxinus pennsylvanica* and *Acer negundo*.

Objective: to prepare a first best practice IAS management project for the Danube Delta. The activities provided by the project have the character of a pilot project to counteract the establishment and spread of invasive forest species in the islands of the Danube Delta.

The restoration actions will take place on an area of 43 ha in total. It includes the supervision and monitoring of the management actions and the maintenance work in the follow-up year. This long-term approach ensures the improvement of the habitat quality on the tackled islands also after project finalization.



Studies were carried out to characterize the main stand in terms of composition, consistency, age, vitality and average taxonomic elements (diameter and height), but also on non-native invasive forest species in terms of composition, abundance and sizes of specimens of these species. In the perspective of establishing some actions to fight Amorpha, Pennsylvania ash and American maple specimens, the characterization of accessibility conditions on the island was considered.



To combat invasive forest species, two of the most used methods of intervention were studied: the mechanical method and the chemical method. Although more effective and efficient, the chemical method to combat invasive species could not be adopted, because of the protection regime established on the territory of the DDBR that excludes the use of plant protection substances and chemicals.

Thus, the option of mechanical intervention was adopted, which involves differentiated methods in relation to the sizes of specimens of invasive forest species, as follows:

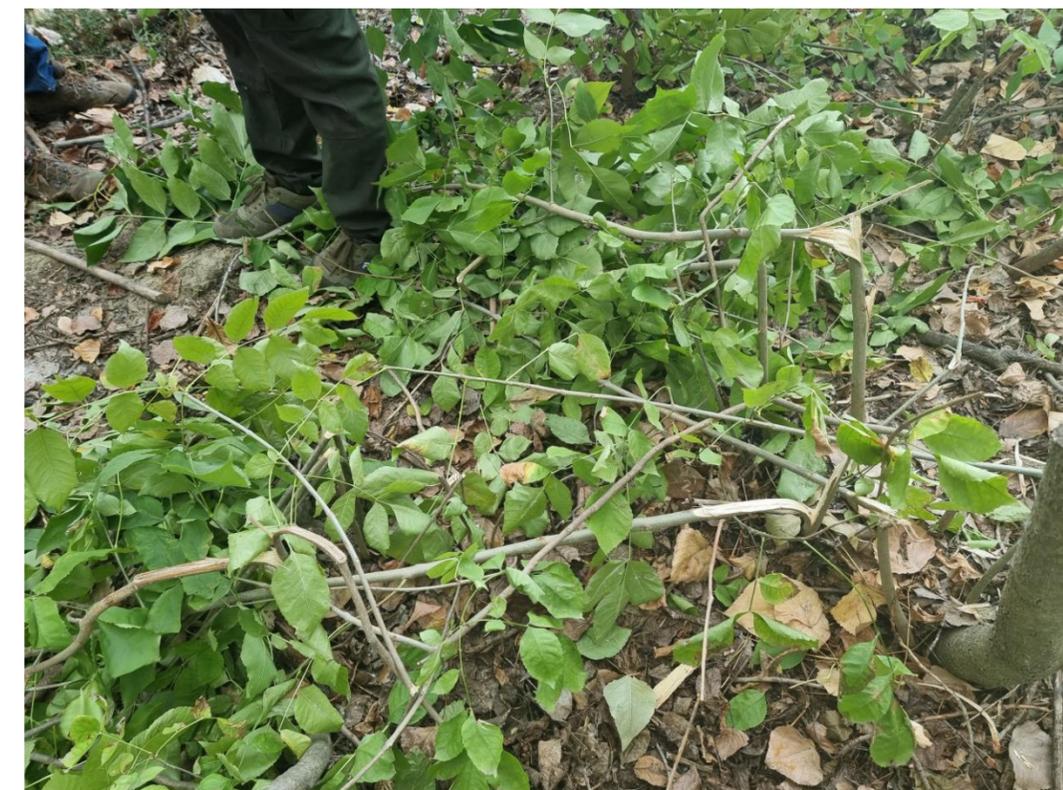
- *For the IAS plants with the diameter of less than 1 cm, pulling out the saplings of IAS.*

The work involves walking on the work surface, identifying specimens of invasive species (amorpha, Pennsylvania ash, American maple) with diameters under 1 cm, manually pulling them out, shaking them off the dirt, forming bundles of seedlings (about 50 specimens in a bundle), tying them into bundles and suspending them from the mature trees at a height above the flood level;



- For the diameter between 1 and 3 cm, stem breaking of the invasive forest species specimens.

The work involves walking over the entire work surface, identifying specimens of invasive species (Amorpha, Pennsylvania ash, American maple) with diameters between 1 and 3 cm, breaking manually the stem at a height of 30-50 cm from the ground; The broken stems, not detached from the trunk, will languish, their growth being stopped; this intervention is expected to significantly slow down the growth and vitality of these specimens, which can lead to overcrowding and drying or to a delay in plant development and a drastic fruiting reduction, with effects on the formation and dissemination of IAS on the site.





- *For diameter over 3 cm, girdling/ bark ringing of specimens of invasive forest species.*

The work involves walking over the entire surface, identifying specimens of invasive species (Amorpha, Pennsylvania ash, American maple) with diameters over 3 cm, making a circular ring at the level of the bark and removing it on a band of approximately 10-15 cm wide at the height of 30 – 50 cm from the ground. The ringing practiced will be done in depth into the hard, woody tissue, thus eliminating the cambial tissue (cambium) with a role in the circulation of raw sap from the soil to the crown. In the absence of a supply of vital raw sap (water and mineral substances), the ringed specimens will languish, will no longer bear fruit and within one or more growing seasons will dry out on their feet.



In order to monitor the proposed activities, the project requires the installation of permanent control areas on the ground, where the inventory of the remaining specimens of invasive forest species will be carried out annually. At the end of each growing season, the value of some monitoring indicators shall be determined.

The specificity of the natural conditions, the large ecological amplitude and the extreme prolificacy of invasive forest species lead to an increased risk that the invasive species will return after the works will be terminated.



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## Conclusions

- ✓ The IAS management is a challenge and a great responsibility for a protected area administrator;
- ✓ Preventing the introduction of invasive species - a priority that requires national and international efforts;
- ✓ Raising awareness on the global climate change which represents a significant factor contributing to the spread and establishment of IAS which is a major problem affecting native diversity in many parts of the world;
- ✓ The involvement of citizens in the observation, communication and control of the IAS is very important;
- ✓ Cross-border and regional collaboration, information and experience exchange at all levels of society (education, protected area administrators, decision makers, local communities).





<https://wildisland.danubeparks.org/>

Thank you for your attention!

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