

# ORIGINAL PAPERS

## INVASIVE PLANTS IN THE MEADOWS OF ROSCI 0354 PROTECTED AREA COTMEANA PLATFORM

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### INTRODUCTION

ROSCI 0354 Cotmeana Platform covers a surface of 12 529 ha, of which 86% on the territory of Arges County, 12% in Vâlcea County and 2% in Olt County. The meadows lie on a surface of 6%. The current study aimed at identifying adventive species with invasive potential and at limiting their spread. Invasive species are taxa whose presence is due to accidental or intentional introduction into a habitat as a result of human activity (Richardson et al., 2000; Pysek et al., 2002).

The study of invasive plants is the main topic of debate in numerous scientific events, the foundations of which were laid at the International Conference on Biological Invasions (September 6<sup>th</sup> edition, Copenhagen) and the World Conference on Biological Invasion and Ecosystem Functioning (BIOLIEF, 1<sup>st</sup> edition in November 2009 in Porto, Portugal and 2<sup>nd</sup> edition in 2011 in Mar del Plata, Argentina). The map of this site surprises us by its very fragmented and implicitly vulnerable aspect in a hilly area where there are localities, lands destined for agriculture and animal breeding.

### MATERIAL AND METHOD

In 2020 and 2021, Sengher Systeme conducted works to maintain a favourable conservation status to limit the installation of species indicative of degradation in habitats 3260, 3270, 40C0\*, 6430, 6510 and 9130. The works were undertaken in the forest ecosystems of this Natura 2000 site, but subsequent interventions in the meadows were also necessary.

The investigations were performed according to the method of monitoring grassland habitats and the method of monitoring invasive species. Transects were made, surveys were conducted and the quantitative values of the unwanted species were noted.

### RESULTS AND DISCUSSIONS

Observations for the registration of invasive species were made on itineraries and surveys, every month, in the meadows of the Cotmeana site between

April and August 2020. During this time, invasive species were identified, test markets were established, invasive species were harvested and incinerated, the perimeters with invasive species were mapped and an ecological reconstruction of habitats 3260, 3270, 40C0\*, 6430, 6510 and 9130 was achieved by limiting the installation of degradation indicator species. As a result of field work on Valea Topologului, the following adventive plant species were identified on both banks of the river: *Phytolacca americana*, *Ambrosia artemisiifolia*, *Amorpha fruticosa*, *Helianthus tuberosus*, *Juncus tenuis*, *Reynoutria x bohemica*. This is a strongly anthropized area through the works of agricultural lands, the presence of transport routes, the illegal dumping of garbage and waste materials from farms, the abandonment of lands where gravel excavations were made. In the Cotmenița Valley, *Phytolacca americana*, *Reynoutria x bohemica*, *Juncus tenuis* have been identified.

There are invasive species neither in habitat 3260 Watercourses from the plain area to the mountain floor, with vegetation of *Ranunculon fluitantis* and *Callitricho-Batrachion* nor in the habitat 40C0\* - Ponto-Sarmatic deciduous shrubs.

In the habitat 3270 Rivers with muddy banks, with vegetation of *Chenopodion rubri* p.p. and *Bidention* p.p., which is characteristic of the muddy banks of the rivers from the plain area to the submountain floor, with annual pioneering nitrophilous vegetation from the *Chenopodion rubri* p.p. and *Bidention* p.p.; the most undesirable are *Phytolacca americana* and *Ambrosia artemisiifolia*.

*Phytolacca americana* is a common weed in Romanian localities. On this occasion, we found it in two points. One is at 44° 57534924; 24° 23105072, Predești village, with a single specimen in a phytocenosis of *Urticetum dioicae* with *Sambucus ebulus*. It is brought with the garbage improperly stored in these places.

There are only weeds on the garbage piles, the local flora disappears for very long periods of time. The other point is in the village of Cotmenița (44° 981115; 24° 262293). There are some samples which will not be destroyed and will be able to multiply freely. They prefer semi-shady places and resist drought. They are an indicator of disturbed habitats.

The early destruction of these plants, even if they are few at present, once reaching these lands, regardless of the method, can lead to its extinction.

*Ambrosia artemisiifolia* (common ragweed or low ragweed) seems to be a rare appearance in the meadow of Topolog River, between the discharge area and the gravel pit. In Romania, it has many citations, from almost the entire territory of the country.

We find it in this area for the first time and we believe that it will always have a reserve of seeds that will allow it to appear in the coming years. History shows that it is an endangered species with a highly competitive potential. We identified it in the following points: 44° 560888; 24° 171396; 44° 57342036; 24° 22140376, Predești village, has small areas but can be extended; 44° 5720376; 24° 20560472, downstream of Valea Rîului point; 44° 981115; 24° 262293.

The dominant vegetation downstream of Valea Rîului, on the Topolog water, is of black alder (*As. Stellario nemorum - Alnetum glutinosae*). In more open places, reeds (*Calamagrostis epigeios*) are generally present near the water. In point 44° 56□ 42 00 / 24° 10□ 06 63, there is a phytocenosis of short rush (*Typha minima*), which is currently no longer considered a rare vegetation or association. We believe that it will not compete with *Ambrosia* because they have different ecological requirements. The current areas of *Ambrosia* can be successfully controlled, as the plants can be mowed or harvested before fruition, and later they can be chemically destroyed only off-site.

*Helianthus tuberosus* forms compact vegetation on the edge of the crops, respectively the Topolog canal has not spread over large areas but the control of this species is very difficult.

*Reynoutria japonica* was found in Cotmenița village, outside the perimeter of the site, along the road and the brook. Although frequently found in other localities, we record it for the first time in this locality. It is a species with a wide ecological range which adapts to any type of habitat. It spreads easily through fragments of rhizomes carried by running water. It has an extremely high rhizome propagation capacity. To the purpose of destroying this plant, some measures are recommended to be used exclusively off-site: using very effective herbicides, burning vegetative residues, informing the locals about the destructive potential of this plant. Any means of destruction is welcome. The smaller the surfaces, the more affordable the restoration costs will be.

*Juncus tenuis* forms small phytocenoses but is present in the meadows of Topologului Valley.

Among the invasive species there is the adventive weed of the genus *Xanthium* sp. which has a very high propagation capacity. It can be kept under control by agricultural work at the right time and the removal of vegetation from the 2<sup>nd</sup> month.

*Sambucus ebulus*, popularly known in English under several names – danewort, dane weed, danesblood, dwarf elder or European dwarf elder, dwarf elderberry, elderwort or blood hilder – is present downstream of the gravel pit, on Topolog River (44° 560888 / 24° 171396, 44° 560638 / 24° 171701) and Cotmenița - (44° 5436468 / 24° 36309312). It grows on dry, alluvial soil, has a strong root system and can have an anti-erosion role on slopes. It is usually settled in places where plants have rotted or there is animal manure. Given that it removes primary vegetation, we consider it a nitrophilous plant.

Over the years, the consumption of nitrogen reserves in the soil can no longer be a danger even if scattered plants appear. As a precautionary measure, we can suggest that the garbage from the villages be deposited only on the garbage platform and not be thrown frequently on the bank of the Topolog brook. The existing plants can be covered with earth, which does not require high costs. It is good to remove it early, from the 2<sup>nd</sup> month of vegetation.

*Robinia pseudoacacia*, acacia, is present on the dam of Topolog River (44° 560888 / 24° 171396 and 44° 5651396 / 24° 17204, on the dam) where it is accompanied by other invasives such as *Sambucus ebulus* (with low spread), *Rubus caesius* (with large spread) and *Ambrosia artemisiifolia* on paths. This phytocenosis does not pass into agricultural land. Conversely, *Sorghum halepense*, Johnsongrass, a weed specific to arable land, does not pass into the meadow vegetation.

Upstream of the bridge (44° 560577 / 24° 17002), the acacia has a cover of 1-10% of the vegetation; it is possible to extend although it is strongly competed by the willows. *Amorpha fruticosa*, dwarf acacia, was cultivated in Romania for dam protection, it is adventive and competitive, but on the Topolog dam, it was seen in few specimens in only one place. In this type of vegetation, *Salix alba* and *Phragmites australis* have the highest vegetation cover, reaching 80% in some places. Regardless of the subsequent evolution of vegetation, the perimeter of these forests will not change significantly. The alluvium has raised the secondary bed, the vegetation layers are contoured but the diversity of species is still reduced.

*Rubus caesius*, known as blackberry, is not an invasive species but overwhelms the vegetation on alluvial soils. It is very difficult to fight against it. It is present on the entire lower course of the Topolog River, where it extends because it has intensive suckers, but it has very little expansion in Cotmenița (44° 5456322 / 24° 3648024 and 44° 5518624 / 24° 3615192). Over the years, in some places, phytocenoses such as willows can form and constitute an impenetrable habitat which can host diverse fauna. The blackberry becomes a problematic weed when it enters the crops on the waterfront. It is combatted by deep plowing, dense plowing,

harvesting of stems and cutting roots, as well as treatments with herbicides.

In habitat 6150 Low altitude grasslands, undesirable species such as *Pteridium aquilinum* and *Eryngium campestre* have been identified. The state of conservation can be kept under control by works to remove the young specimens in the 2<sup>nd</sup> month of vegetation but also in the phase of subsequent formation of the root suckers. The dominant vegetation in which *Pteridium aquilinum* settled is represented by *As. Festuco rubrae* - *Agrostietum capillaris* Horvat 1951.

*Festuca rubra* was found to dominate these phytocenoses, and locally, it covers some areas up to 90%. *Pteridium aquilinum* forms insular phytocenoses that generally grow at the edge of the forest and gradually colonize the meadows because it has an underground network of rhizomes that expand and generate new plants. This feature makes it difficult to combat, only to the point of reducing its extension by mowing a little. When the network of rhizomes is dense and dense plants appear on the surface, they eliminate the native grass species until extinction. It largely reduces the species diversity, although we did not find any red list species in the analysed places.

We can accept this type of vegetation as salutary on landslides and as an early stage for a succession of long-lasting, desirably woody vegetation.

It is well-known that, when land is no longer economically exploited, the vegetation begins to consolidate and form the basis of a sufficiently sustainable secondary ecosystem. Deciduous shrubs and some woody plants appear over the decades. In our case, the slope incline was low and the surrounding grassy vegetation was low to medium productivity. The ferns can be kept under measurable control when they have small areas because they do not require a large amount of work.

*Eryngium campestre*, known in English as field eryngo, or Watling Street thistle is a weed from overcrowded meadows but is not invasive. After drying, it detaches from the package area and is spread through the wind at a distance depending on the particularities of the relief and the wind speed, so it can reach the hayfields.

Seeds germinate more easily on intensively grazed pastures. It was identified on the pasture from Valea Rîului. This thorn covers over 20% of the surface, which indicates a strong degree of anthropization. Shrubs are cleared, fodder value is low, species diversity is diminished. The diversity of this meadow is relatively good. Elsewhere, on the Cotmenita Valley (44° 54234504; 24° 36250776) near the edge of the Natura 2000 site is an area where *Eryngium* covers about 10% of an area of 4-5 ha. The

land is heavily grazed with cattle, the condition is poor. Upstream it is invasive in a vegetation of *Agrostis tenuis* with *Festuca rubra*. Species diversity is low.

Another indicator of degraded habitat is the abundant presence of *Crataegus monogyna*, which reaches a coverage of 20%. Another outbreak is near the village of Cotmeana (44° 5221072; 24° 38285216). In order to prevent this plant from multiplying, it is recommended that these thorns be cleared in the future. Dry grass fires in spring are not recommended because they are difficult to control and we cannot estimate the effects on the first centimetres of soil.

*Prunus spinosa*, called blackthorn or sloe, has small areas near Cotineni (44° 55215; 24° 39520), on a land that has been abandoned for many years and has become hay. It is not an invasive species but extends in the form of lentil. In places with a steep slope, it can have an anti-erosion role and be a sub-tree species. It is not desirable on flat lands or on which species of protective interest can vegetate. Such areas need to be observed and analysed for long-term effects.

Habitat 6430 Edge communities with high hygrophilous grasses from the plains and from the mountain to the alpine floors is most affected by the presence of dangerous weeds such as *Ambrosia artemisiifolia*, *Reynoutria x bohemica*, *Robinia pseudoacacia*, *Rubus caesius* *Helianthus tuberosus* and *Sambucus ebulus*, which can be kept under control if they are destroyed early, from the 2<sup>nd</sup> month of vegetation and are prevented from forming young specimens. However, their presence may be limited at low cost because they did not affect large areas (Table 1).

Methods of mechanical, chemical, manual control, etc. are known for each unwanted species, but in this site, in order to restore the vegetation, appropriate works, monitoring, reduction of the anthropo-zogenic pressure in the targeted places and stimulation of the vegetation successions are necessary.

Other species that we have not analysed are *Erigeron annuus* and *Solidago canadensis*. *Erigeron annuus* has appeared abundantly on the Negrilă Hill, following the cessation of agricultural works, it has a high reproductive capacity, it depreciates the quality of the meadows, but by weakening the anthropo-zoogenic pressure, the grass competition is stimulated and it is naturally reduced. Later a secondary meadow with native species was formed. Restoration costs are minimal.

*Robinia pseudoacacia* and *Ailanthus altissima* have entered the forests, rarely in the meadows, and can become invasive if they are not kept under control.

Table 1. Invasive and overwhelming species in meadow habitats from the ROSCI 0354 Cotmeana Platform site

SPECIES	Disturbed habitat, locality/toponym	Disturbed surfaces	Combatting methods	Combatting interval *
<i>Ambrosia artemisiifolia</i>	6430 Edge communities with high hygrophilous grasses from the plains and from the mountain to the alpine	low	3 extractions (plant uprootal, mowing)	Every 2 months in V, VII and IX
<i>Helianthus tuberosus</i>	6430 Edge communities with high hygrophilous grasses from the plains and from the mountain to the alpine	low	2 extractions + treatment**	Not appreciated
<i>Phytolacca americana</i>	3270 Rivers with muddy banks, with vegetation of <i>Chenopodium rubri</i> p.p. and <i>Bidention</i> p.p.	low	2 mechanised extractions	Every 2 months in V and VII
<i>Reynoutria x bohemica</i>	6430 Edge communities with high hygrophilous grasses from the plains and from the mountain to the alpine floors	low	2 extractions + treatment**	Minimum 3-4 times/year
<i>Solidago canadensis</i>	6510 Low altitude hayfields	low	mowing	2/year, in V and VIII
<i>Robinia pseudacacia</i>	6430 Edge communities with high hygrophilous grasses from the plains and from the mountain to the alpine floors	medium	scarification + mechanical mowing	Every 3 months in III, V and VII
<i>Eryngium campestre</i> (overwhelming)	6510 Low altitude hayfields	high	mowing	2/year, in V and VII
<i>Prunus spinosa</i> (overwhelming)	6510 Low altitude hayfields	low	2 mechanised extractions	Every 2 months in V and VII
<i>Pteridium aquilinum</i> (overwhelming)	6510 Low altitude hayfields	medium	2 manual mowing sessions	2/an in V and VIII
<i>Rubus caesius</i> (overwhelming)	6430 Edge communities with high hygrophilous grasses from the plains and from the mountain to the alpine floors	low	scarification + mechanical mowing	2/year, in V și VII
<i>Sambucus ebulus</i> (overwhelming)	6430 Edge communities with high hygrophilous grasses from the plains and from the mountain to the alpine floors	low	mowing	Every 1-2 months
<i>Xanthium riparium</i> (overwhelming)	3270 Rivers with muddy banks, with vegetation of <i>Chenopodium rubri</i> p.p. and <i>Bidention</i> p.p.	low	mowing on dams to annul fruition	2/year, V and VIII

\*Monitoring periods will be chosen so that plants will never get to fruition.

\*\* Chemical treatments and herbicides being strictly forbidden in Natura 2000 network, we can suggest depositing unfermented manure to burn and prevent new plants from forming.

## CONCLUSIONS

Indigenous colonising species are expanding into habitats of conservative interest, competing with valuable native species, which are gradually eliminated, while the structural composition of these habitat changes. These are: *Eryngium campestre*, *Prunus spinosa*, *Pteridium aquilinum*, *Rubus caesius*, *Sambucus ebulus* and *Xanthium riparium*.

Invasive species have accidentally reached the area, expanding and colonizing important areas of agricultural land and the protected area; later, they spread to grassland habitats, have the ability to produce drastic changes in natural habitats, reshape ecosystem relationships, representing a danger to their state of preservation.

These are *Ambrosia artemisiifolia*, *Helianthus tuberosus*, *Phytolacca americana*, *Reynoutria x bohemica*, *Solidago canadensis*, *Robinia pseudoacacia*. Isolated specimens of *Ailanthus altissima* have appeared in the forests and can spread their seeds in the meadows. *Amorpha fruticosa* was found on the dam of Topolog River, near the village, probably planted a long time ago to strengthen the shore and we do not think it can become a source of invasive specimens. In this site, we report them for the first time, although they have disturbed small areas of habitats.

The pressure of the adventive species on the habitats can be reduced if the intensive grazing near the protected perimeters is limited, because the consumption of good forage species helps the proliferation of non-forage ones and leads to a larger seed bank or even their penetration into the marginal areas.

This aspect would be absolutely necessary for *Eryngium campestre*. The access roads can initiate processes of anthropization of the habitats by means of the unpermitted storage of the garbage and, at the same time, through some seeds of adventive plants, as well as the modification of the water regime for the plants next to the roads.

The invasive plants should be removed in such a way that they do not extend their perimeters or exceed 5% of the habitat share. This goal is difficult to achieve in the case of *Pteridium aquilinum* plants under the current conditions as long as the population of the villages is aging and lacks labour force; therefore, the meadow habitats will degrade progressively.

## ABSTRACT

Adventive species are found countrywide in Romania and significant efforts are necessary to prevent them from becoming an aggression even to

reservations. In the perimeters in which invasive species have spread, extraction works were necessary to the purpose of containing them under 5%.

Species such as *Ambrosia artemisiifolia*, *Amorpha fruticosa*, *Carpinus betulus*, *Crataegus monogyna*, *Helianthus tuberosus*, *Phytolaca americana*, *Reynoutria bohemica*, *Robinia pseudacacia*, *Rubus caesius* end *Sambucus ebulus* have been extracted. Even so, the balance of the abiotic and biotic parameters of the affected areas is relatively delicate.

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