

Allochthonous woody taxa in Zasavica ecosystem

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Abstract:

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Special Nature Reserve Zasavica is an important wetland in Serbia. Therefore, it was designated as “Special Nature Reserve of the First Category“ in 1997. Moreover, it has been included in the national network of Ramsar sites (the Ramsar Convention on Wetlands of International Importance), in 2006. Considering importance of Special Nature Reserve Zasavica and the fact that stability of ecosystems can be disturbed by introducing alien species, we analyzed extent and coverage of allochthonous woody taxa within the Reserve region. Researching area comprised 1821 hectares. We found 21 allochthonous woody taxa that belong to *Magnoliophyta* subdivision. The most individuals are located within the first zone of protection.

Key words: *Alburnoides bipunctatus*, Cyprinidae, mesohabitat, phenotype plasticity

Introduction

The ecological impact of fast spreading introduced plant species (invasive species) on natural communities has been analysed in numerous articles (Elton 1958; Drake et al. 1989; Di Castri et al. 1990). Some alien tree species used in commercial forestry and agroforestry cause major problems as invaders of natural and seminatural ecosystems. Exotic plant species are considered as one of major threats to biodiversity (Richardson, 1998, Richardson et al., 2000). In this article we analyzed the coverage of allochthonous woody taxa within the Zasavica Reserve region.

Special nature reserve Zasavica is a marshy lowland, located in north-west Mačva, within the municipalities Sremska Mitrovica and Bogatić. It is named after the watercourse Zasavica which is 33.1 km long, 80 m wide. During normal water levels, the river is 2.5 metres deep on average. Zasavica forms six large meanders. The terrain surrounding the meanders is marshland (Pavić, 2001).

In 1997 Zasavica was designated as “Special Nature Reserve of the First Category“ by the Government of the Republic of Serbia and as a protected area of exceptional importance for the Republic (Official Gazette RS, 19/97). In 2006 the reserve was included in the Ramsar list of wetlands of international importance. The reserve is covered by a two-degree regime of protection: 1150 ha are the first degree, and 671 ha are the second category of protection.

Taking into account that, by intentional or unintentional introduction of allochthonous woody species to wet ecosystems, their stability is disturbed, this study analyses the state and the influence of allochthonous woody species to the area of the reserve (DAISIE, 2010).

Materials and methods

During investigation period that covered two complete vegetation seasons (March 2009 to October 2010), we recorded each individual of

allochthonous woody taxa that were determined according to Šilić, 1998.

For each individual we assessed the age, phytopathological and entomological damage. We used separate scales to assess the vitality and ornamental value of individuals (Očokoljić, et al. 2009).

We used the combined abundance-coverage scale (Braun-Blanquet, 1965) to assess the importance of each species within investigated area.

Results and discussion

During the research, we recorded 1850 individuals of 21 allochthonous woody taxa. Ten species originate from the North American Continent and ten from Asia. *Populus x euramericana* is a hybrid species. Its presence in Zasavica was expected because it grows in plantations (46,600 individuals) of the FE Sremska Mitrovica. All species belong to *Magnoliophyta* subdivision.

Acer negundo L. (Fam. *Aceraceae*)

This species is represented throughout the reserve with 95 individuals. Their age varies from 10 to 60 years. Combined abundance-coverage value of the species is 3. Average mark of vitality is 4, and depending on individuals, vitality ranges from 2 to 5. Average mark of ornamental value is 3, and it varies from 2 to 4. There are no phytopathological and entomological injuries on the trees.

Ailanthus altissima (Mill.) Sw. (Fam. *Simarubaceae*)

This species is represented throughout the reserve with 120 individuals. Tree age ranges from 10 to 20 years. Coverage is evaluated by mark 3. Average mark of vitality is 4, and depending on individuals, vitality ranges from 2 to 5. Average mark of ornamental value is 5. There are no phytopathological and entomological injuries on any trees.

Amorpha fruticosa L. (Fam. *Leguminosae*)

This species is represented throughout the reserve with 550 individuals. Average age is 20 years. Coverage is evaluated by mark 4, and at some places the abundance attains mark 5. Average mark of vitality is 4, and depending on individuals, vitality ranges from 3 to 5. Average mark of ornamental value is 4, and it varies from 4 to 5. No phytopathological and entomological damage is observed in any of the individuals. According to

SNR Zasavica data, the removal of false indigo was performed in 2008.

Caragana arborescens Lam. (Fam. *Leguminosae*)

C. arborescens is recorded at the site Ribnjača Bara as a single individual. Its age is 10 years. Coverage is evaluated by mark +. Vitality mark is 3, and mark of ornamental value is also 3. This specimen does not show any phytopathological and entomological damage.

Catalpa bignonioides Walt. (Fam. *Bignoniaceae*)

C. bignonioides is recorded in this area only at the locality Cerik as one tree aged about 20 years. Its coverage is marked +. Its vitality is low (mark 1) and its ornamental value is also evaluated by the same mark.

Gleditsia triacanthos L. (Fam. *Cesalpiniaceae*)

This species is recorded at two localities in the reserve: Jovača and Široka Bara. There are 25 individuals on these two sites. Tree age ranges from 10 to 20 years. Coverage is evaluated by mark 1. Average mark of vitality is 4, and depending on individuals, vitality ranges from 3 to 5. Average mark of ornamental value is also 4, and it varies from 2 to 5. There are no phytopathological and entomological injuries on any trees. Based on the analysis at these localities, it is concluded that *Gleditsia triacanthos* L. occurs mainly along the roads in minor line groups.

Maclura aurantiaca Nutt. (Fam. *Moraceae*)

M. aurantiaca is recorded at two localities in the reserve: Jovača and Prekopac with 20 individuals. Tree age ranges from 10 to 20 years. Coverage is evaluated by mark 1. Average mark of vitality is 3, and depending on individuals, vitality ranges from 2 to 5. Average mark of ornamental value is 5. There are no phytopathological and entomological injuries on any trees.

Mahonia aquifolium (Pursh) Nutt. (Fam. *Berberidaceae*)

M. aquifolium is recorded as one individual at the site Jovača. The shrub age is about 10 years. Its coverage is therefore marked with +. Vitality and ornamental value are evaluated as 4.

Morus alba L. (Fam. *Moraceae*)

M. alba is represented throughout the reserve with 65 individuals. Tree age is from 20 to 30 years. Coverage is evaluated by mark 3. All the analysed specimens show exceptional vitality and ornamental value (average mark 5). There are no

phytopathological and entomological injuries on any individuals.

***Morus nigra* L. (Fam. Moraceae)**

M. nigra is represented throughout the reserve with 46 individuals. Tree age is 30 to 50 years. Coverage is evaluated by mark 3. Vitality is evaluated with 5. Its average mark of ornamental value is also the highest (5). There are no phytopathological and entomological injuries on any trees.

***Parthenocissus quinquefolia* (L.) Planch. (Fam. Vitaceae)**

P. quinquefolia is a climber, which is recorded at the site Široka Bara (1 individual). Its age is about 10 years. Coverage is evaluated by mark +. Vitality mark is 3, and the mark of ornamental value is 4. There are no phytopathological and entomological injuries on this tree.

***Populus alba* 'Pyramidalis' L. (Fam. Salicaceae)**

P. alba 'Pyramidalis' is a taxon which is represented throughout the reserve with 60 individuals. Tree age ranges from 20 to 30 years. Coverage is evaluated by mark 1, because the trees at the study locality are solitary. Average mark of vitality is 4, and depending on individuals, vitality ranges from 3 to 5. Average mark of ornamental value is 4, and it varies from 3 to 5. There are no phytopathological and entomological injuries on any trees. Only male individuals are represented.

***Populus deltoides* Marshall (Fam. Salicaceae)**

P. deltoides is recorded at two locality in reserve: Cerik and Vrbovac with 11 individual. Tree age ranges from 20 to 30 years. Coverage is evaluated by mark 2. Average mark vitality is 4, and depending on individuals, vitality ranges from 2 to 5. Average mark of ornamental value is 4, and it varies from 3 to 5. There are no phytopathological and entomological injuries on any trees.

***Prunus cerasifera* Ehrh. (Fam. Rosaceae)**

P. cerasifera is represented throughout the reserve with 450 individuals. This taxon grows both as a shrub and as a tree; the age is up to 20 years. Coverage is evaluated by mark 4, and at the site Valjevac, its coverage is 5. Its average mark of vitality is 4, and depending on individuals, vitality ranges from 3 to 5. Average mark of ornamental value is 5. There are no phytopathological and entomological injuries on any individuals. Reduction of individuals was performed during the previous period. Aerial photographs from 2008, 2009 and 2010 show the aggressive spreading and invasion of the territory of the pasture Valjevac.

***Quercus borealis* Michx. (Fam. Fagaceae)**

Q. borealis is recorded only at the locality Jovača as one individual, its age is about 20 years. Coverage is evaluated by mark +. This exceptionally vital tree, with regular crown, is evaluated with mark 5, and the mark of ornamental value is also the highest (5). There are no phytopathological and entomological injuries on this tree.

***Robinia pseudoacacia* L. (Fam. Leguminosae)**

This species is represented throughout the reserve with 400 individuals. Tree age varies from 10 to 30 years. Coverage is evaluated by mark 4. Average mark of vitality is 5. Average mark of ornamental value is also 5. There are no phytopathological and entomological injuries on any trees.

***Salix babylonica* L. (Fam. Salicaceae)**

This is recorded in the reserve at the following localities: Modran, Gaj, Cerik and Zovik with 4 individuals. Tree age ranges from 10 to 30 years. Coverage is evaluated by mark 1. As for tree vitality, all 4 trees are evaluated with mark 5, and also their ornamental value is excellent (5). There are no phytopathological and entomological injuries on any trees.

***Salix matsudana* Koidz. (Fam. Salicaceae)**

S. matsudana is recorded in the reserve at the localities: Modran, Cerik and Zovik with three individuals. Tree age ranges from 10 to 30 years. Coverage is evaluated by mark +. Average mark of vitality is 4, and the marks range from 3 to 5. Ornamental value is evaluated 4 (all three trees). There are no phytopathological and entomological injuries on any trees.

***Sophora japonica* L. (Fam. Leguminosae)**

This is recorded at the locality Modran as one individual. The observed tree age is about 20 years. Coverage is evaluated +. Its vitality is excellent (5), and also its ornamental value (5).

***Ulmus pumila* L. (Fam. Ulmaceae)**

This is recorded in the reserve at the locality Ribnjača Bara with three individuals. Tree age is from 10 to 20 years. Coverage is evaluated by mark +. All trees are evaluated with mark 4 both for vitality and for ornamentalness. There are no phytopathological and entomological injuries on any trees.

Conclusion

Analysing trees and shrubs in SNR Zasavica, we recorded 1850 individuals of alien species. Half of the analysed taxa occupy the second zone of protection, and 50 % grow both in the first and in the second zones of protection. Total number of recorded taxa is 20 and all of them belong to the subdivision *Magnoliophyta*.

The most abundant taxon is *Amorpha fruticosa* (550 individuals). On the other side, we recorded only one individual of *Caragana arborescens*, *Catalpa bignonioides*, *Quercus borealis* and *Sophora japonica*.

The comparative analysis shows an exceptionally high vitality (4) of the alien species. This indicates on their good adaptation to environmental conditions within the study area. The species with the highest vitality (mark 5) are *Amorpha fruticosa*, *Morus alba*, *Morus nigra*, *Quercus borealis*, *Robinia pseudoacacia* and *Salix babylonica*. The lowest vitality (mark 1) was detected for *Catalpa bignonioides*. High marks support the thesis of good adaptability of allochthonous taxa.

The comparative analysis of the marks of ornamental value of all individuals shows that the average mark is 4. At the taxon level, the highest average mark (mark 5) is attained by: *Ailanthus altissima*, *Maclura aurantiaca*, *Morus alba*, *Morus nigra*, *Prunus cerasifera*, *Quercus borealis*, *Robinia pseudoacacia*, *Salix babylonica* and *Sophora japonica*, and the lowest by *Catalpa bignonioides* (mark 2).

The research confirms the occurrence of spontaneous spreading in 30 % of taxa: *Acer negundo*, *Ailanthus altissima*, *Amorpha fruticosa*, *Gleditsia triacanthos*, *Prunus cerasifera* and *Robinia pseudoacacia*. In 20 %: *Acer negundo*, *Ailanthus altissima*, *Amorpha fruticosa* and *Prunus cerasifera*, spreading can be characterised as invasiveness. All invasive taxa are characterised by extremely good coppicing power. Their spreading potential is high since their seeds are readily dispersed by wind to very distant places or zoochoriously.

This study indicates that the long-term monitoring is necessary to detect the effect of allochthonous woody taxa on the stability of ecosystems in the Zasavica nature reserve.

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