

Output 3.1

Recommendations
on tree species to use and promote

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Key messages

- The stability of riparian forests is declining, serious damages have been observed in case of most native keystone species.
- The environmental stress is projected to increase.
- Introduction of exotic species is limited by conservation constraints, current legal background and by the lack of scientific knowledge, therefore it is not recommended.
- Utilization of genetic diversity of native species has been identified as the best measure to improve or maintain resilience in riparian forests.

Background

Forest and conservation management communities share the concern on the present and future condition of riparian forest ecosystems. Novel tools, solutions and constructive dialogue between science, forestry, conservation and policy are needed to effectively conserve natural heritage of riparian forests as well as to maintain economic functions and services for the local communities.

WP3 '*Interpreting knowledge*' is aimed to systematically collect and review current knowledge on riparian forests and its fundamental tree species. Biological characteristics of key riparian tree species have been reviewed and an extensive plant trait database has been compiled (D3.1.1 *Report on the biological traits connected to persistence and regeneration of riparian tree species and their migration potential*). Factors and agents of the increasing biotic pressure have been shortlisted in D3.1.2 *Report on native pests and diseases threatening persistence and regeneration of riparian ecosystems* and D3.1.3 *Report on alien species (pests, diseases, invasive competitors) threatening persistence and regeneration of riparian ecosystems*. SO1 '*Recommendations on tree species to use and promote*' provides a list of species that are most likely to persist and adapt to the changing abiotic and biotic environment in riparian forest ecosystems. Present tree species composition in the MDD BR by countries and relevant information regarding national restrictions on the use of tree species have been extracted from D6.1.1 '*Report on the overview of the national legislations of the five countries constituting MDD BR*'.

Considerations

Present state and future perspectives

Riparian forests are among the most dynamic and the most threatened forest communities in Europe. Forest management measures vary substantially across the MDD BR ranging from no management, through management for nature protection, to intensive short-rotation management, monoculture forestry managed for producing quality timber or energy-related biomass. The ecological functions of forests are resilient to certain rates and degrees of disturbance, as forests evolve under the influence of natural disturbances.

Additionally, the current composition and structure of forests of the project area reflect a variety of historic and novel anthropogenic disturbances. Land use change led to notable reduction and fragmentation of the forest cover. Modified flood frequency, duration, and/or intensity; depressed floodplain water tables and changes in alluvium deposition regime and pattern have contributed to the change in riparian forest.

The invasion of the introduced plant species altered competitive hierarchies and led to regeneration failures. Introduction of novel pests and diseases has already taken a toll on the hardwood gallery forests when Dutch elm disease decimated the elms, changing the species composition and opening the elm niche for the invasion of *Fraxinus pennsylvanica* and *Acer negundo*. Recently, rapid and extensive decline of ash species caused by *Hymenoscyphus fraxineus*, black alder decline caused by *Phytophthora* species and notable damages on pedunculate oak caused by *Corythucha arcuata* were observed. Native black alder genetic resources suffer hybridization and juvenile competition pressure from introduced poplars and poplar hybrids. Thus, we have to conclude that almost all keystone riparian species are already facing serious challenges.

The projected effects of the climate change on the riparian forests include problems in effective water availability due to changes in fluvial dynamics, altered precipitation regime with extreme precipitation events and increasing drought frequency. The growing abiotic exposition will be coupled by increasing biotic pressure.

Options for adaptation

Magnitude differences can be observed comparing the temporal characteristics of the recent environmental changes and of the dynamics of the forest ecosystems, or, the time frame of the forest management systems. When long life span, long generation or management cycle meets relatively rapid changes, the need for stability is getting more and more articulated, as well as the importance of the biological resources. Identifying and

utilizing the appropriate plant material is the best pro-active method for maintaining or building up resilience in forest systems.

Introduction of novel plant material (exotic species, hybrids) to forestry systems used to raise serious concerns. Currently, the possibility of species introduction to the MDD BR is clearly limited by the national regulations, although the legal barrier is not general and uniform, and by the interests of the conservation community. Although the native riparian species are under serious environmental pressure and declining, introduction of exotic species is not recommended due to the missing scientific background.

Instead, utilization of the existing intraspecific genetic diversity of the native riparian species may serve as a feasible and legal alternative. The use of site adapted (or pre-adapted) seed or planting material of high genetic diversity, high quality and increased tolerance/resistance properties is considered as primary option for artificial regeneration, afforestation or habitat reconstruction activities.

However, recommendations for transition forests include exotic taxa that are being already managed in riparian systems for their economic value. Special conditions and cases have been identified when use of these exotic species is limited only, but not prohibited.

Recommended species

As the biosphere reserve consists of different habitats, the species recommendations have been specified for 4 habitat categories. (1) Riverine willow shrub is pioneer vegetation that develops specifically in riverbanks; it is connected to the greater rivers and often forms a narrow belt between the riverbed and the softwood forests. Willow mire shrubs, that are usually occupying areas lacking surface drainage and old oxbow lakes, are also covered here. (2) Softwood riparian forests are growing on the lower parts of floodplains, these hygrophilous, willow and poplar dominated forests still get regular flooding. (3) Hardwood riparian forests are occurring on the higher parts of actual or former floodplains in the lowlands, wide valleys of colline regions, and at foothills. (4) Transition forests include heavily transformed, artificial forests or intensively managed plantations.

Species	Willow shrubs	Softwood forests	Hardwood forests	Transition
<i>Acer campestre</i>			X	X
<i>Alnus glutinosa</i>		X	X	X
<i>Alnus incana</i>		X	X	X
<i>Carpinus betulus</i>			X	X
<i>Fraxinus angustifolia</i>			X	X
<i>Fraxinus excelsior</i>			X	X
<i>Juglans nigra</i>				X
<i>Malus sylvestris</i>			X	X
<i>Padus avium</i>		X	X	X
<i>Populus alba</i>		X	X	X
<i>Populus hybrids</i>				X
<i>Populus nigra</i>	X	X	X	X
<i>Populus x canescens</i>		X		X
<i>Pyrus pyrastrer</i>			X	X
<i>Quercus robur</i>			X	X
<i>Salix alba</i>	X	X		X
<i>Salix fragilis</i>	X	X		X
other <i>Salix</i> spp.*	X			
<i>Tilia cordata</i>			X	X
<i>Ulmus glabra</i>			X	X
<i>Ulmus laevis</i>			X	X
<i>Ulmus minor</i>			X	X

*including *S. cinerea*, *S. elaeagnos*, *S. purpurea*, *S. triandra*, *S. viminalis*