

Conservation of genetic resources of black and white poplar in Europe

Black and white poplars (*Populus nigra* and *P. alba*) are trees of ecological importance as indicator species for biodiversity of riparian woodlands. Each in its own natural distribution range they are unique pioneer species of European riparian ecosystems which contribute to the natural control of flooding and water quality. Together with other members of the *Salicaceae* family they dominate the early successional stages of floodplain woodlands in many temperate and Mediterranean areas. Floodplain forests are among the most diverse ecosystems in Europe. Poplars are associated to a large number of threatened and common species and their importance as centres for biodiversity has only recently been recognized. Today,



there is a real interest in the restoration of riparian ecosystems for the natural control of flooding and also because the river borders can serve as corridors through which larger nature areas are connected. The monitoring and conservation of the genetic resources of Black and White poplar in this dynamic ecosystem are therefore of major importance.

Furthermore, Black poplar (*Populus nigra*) is also a tree of social and economic interest. It is predominantly used as a parent pool in breeding programmes in many parts of the world; 63 % of the poplar cultivars descend from it, either directly or from interspecific hybrids involving *Populus nigra*. Hybrids of *Populus nigra* and *Populus deltoides* or other exotic poplar species provide adaptability to various soil and climate conditions, rooting ability, and high resistance to bacterial canker caused by *Xanthomonas populi*, fair resistance to *Marssonina brunnea* and to poplar mosaic virus as well as poplar rust *Melampsora larici-populina*. Black poplar is also of economic interest as a pure species. It is widely planted in East European countries for domestic use and due to its plasticity, used as a pure



Male flower of a black poplar. Poplar trees are of either male or female gender

species for soil protection and afforestation in polluted industrial zones. White poplar (*Populus alba*) is used as pure species in many Mediterranean countries mainly for the production of matches and fruit boxes and as parent to the widely known *Populus x canescens* hybrids all over the world. These hybrids are being used as amenity and ornamental trees on roadsides in cities and countryside. The species is of great interest in the south of Europe for its tolerance to water and saline stress and high levels of genetic diversity have been found in populations living under extreme conditions.

Black poplar and to a lesser degree also white poplar are among the most threatened tree species in Europe. Three main factors could be seen as the causes for this threat.



- The first one is the alteration of riparian ecosystems throughout the species' distribution areas by human activities. With hydraulic engineering, native poplar stands were displaced by agriculture and floodplain areas were subject to urbanisation. Moreover, regulation of floods has altered the

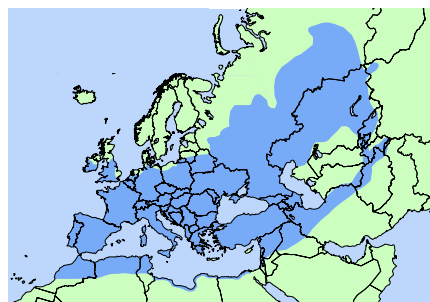
EUFORGEN Populus nigra Network



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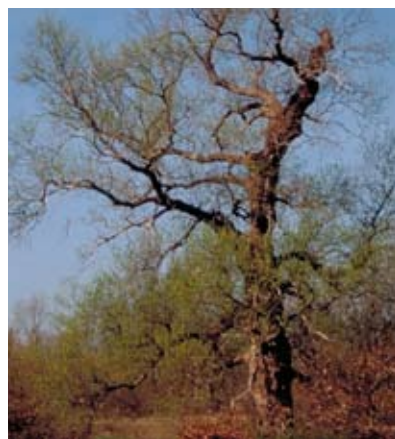
regeneration capacities of the two species and favoured the succession of poplar stands by hardwood forests. Although the species may demonstrate locally highly successful regeneration, some regions of Europe have witnessed significant reductions in populations or the complete disappearance of black and white poplar.

- Second, the autochthonous black poplar resources have been overexploited and faster growing hybrid poplars have been planted to replace the autochthonous populations.
- Finally, gene introgression (*i.e.* movement of genes between genetically distinguishable populations) from cultivated and other poplar species is a potential threat for black poplar, in the sense that very few clones are extensively cultivated and contribute to a large extent in the pollen and seed pools. Not only exotic hybrids are concerned, but also pure *Populus nigra* varieties like the male Lombardy poplar (*P. nigra* cv. *Italica*) distributed all over the continent.



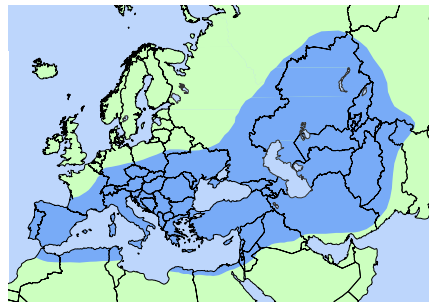
Black poplar has a large distribution range throughout Europe and is also found in northern Africa and central Asia

Within the distribution range the trees perform scattered along rivers and are not widespread. Like in many



Black poplars could reach an age as old as 400 years

other forest tree species, most of the genetic diversity in black poplar is found within stands or river systems and very little genetic differentiation is found between them.



White poplar has a very similar distribution range; however most of the Northern and North-Western countries (including the British Isles) are excluded from this range

In white poplar the organisation of genetic diversity is yet only poorly understood.

In 1995 the *Populus nigra* Network was established as part of the European Forest Genetic Resources Programme (EUFORGEN) and since 1999 its activities were also extended to include *Populus alba*.

The network, comprising members from 21 countries, promoted an integrated approach to the conservation of black and white poplar and its sustainable use, both in wild populations *in situ* and through tree improvement activities *ex situ*. In 2005 the *Populus nigra* Network was merged into the EUFORGEN Network for Scattered Broadleaves. The outputs provided by this Network aim at facilitating the development and practical implementation of national strategies in all European countries and include increased information flow, joint methodologies, common documentation standards, databases, and identified research needs and project proposals regarding the species involved.

The aim of the EUFORGEN Networks is to conserve, at a European level, the still existing genetic resources available and, where possible, to maintain or restore the genetic diversity through a number of measures.

Both *in situ* and *ex situ* methods are used to encourage the dynamic conservation of genetic resources.

Ex situ conservation of genetic resources includes clonal archives and arboreta, seed orchards, seed and pollen storage, *in vitro* tissue culture, and provenance and progeny trials. The main objective of *ex situ* conservation is to ensure the availability of genetic resources at different localities and periods of time.

In situ conservation of black and white poplar is the most appropriate method for maintaining its genetic diversity, which is a prerequisite for adaptation to changing environmental conditions, including climate change. *In situ* conservation in “gene reserve forests” should maintain the gene pool of natural populations over many generations. Successful *in situ* gene conservation must ensure that:

- The network of populations in gene conservation units is sufficiently large to cover the spatial genetic variation of the species involved;
- The number of trees within a reserve or gene conservation unit is large enough to include most of the gene pool within that particular population and to prevent loss of genetic diversity in successive generations;
- The regenerated stock must predominantly originate from mating within that particular population.



Product of art created from the lower part of the trunk of a black poplar