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Termőföldtől az asztalig

# Restoration of rare or endangered species based on examples of black poplar (*Populus nigra*) in Hungary

*(Results of a complex of gene conservation and silviculture of Black Poplar since 1998)*

dr. Sándor BORDÁCS , dr. István BACH, Ferenc VÁRHIDI

ProCoGen Dissemination Workshop 1st – 3rd September 2014

Kámoni Arborétum Szombathely, Hungary

“Genomics and the conservation of conifer genetic resources”

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# Personal introduction

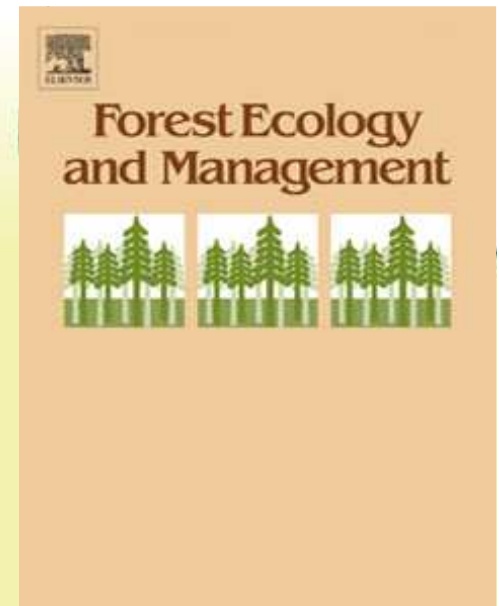
## Who am I?



- Forester and forest geneticist
- Expertised in
  - forest reproductive material (FRM)
  - forest genetic resources (FGR)
- Never worked with conifers
- For the better visualization



## Paper referenced



# Genetic considerations in ecosystem restoration using native tree species

Evert Thomas , Riina Jalonen, Judy Loo, David Boshier , Leonardo Gallo, Stephen Cavers, Sándor Bordács, Paul Smith, Michele Bozzano

**In press 2014**

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# THE STATE OF THE WORLD'S FOREST GENETIC RESOURCES – THEMATIC STUDY

FAO Rome, 2014

## GENETIC CONSIDERATIONS IN ECOSYSTEM RESTORATION USING NATIVE TREE SPECIES

Evert Thomas , Riina Jalonen, Judy Loo, David Boshier , Leonardo Gallo, Stephen Cavers, Sándor Bordács, Paul Smith, Michele Bozzano

Chapter 15.2. Restoration and afforestation with *Populus nigra* in Hungary p.233  
(Sándor Bordács and István Bach)



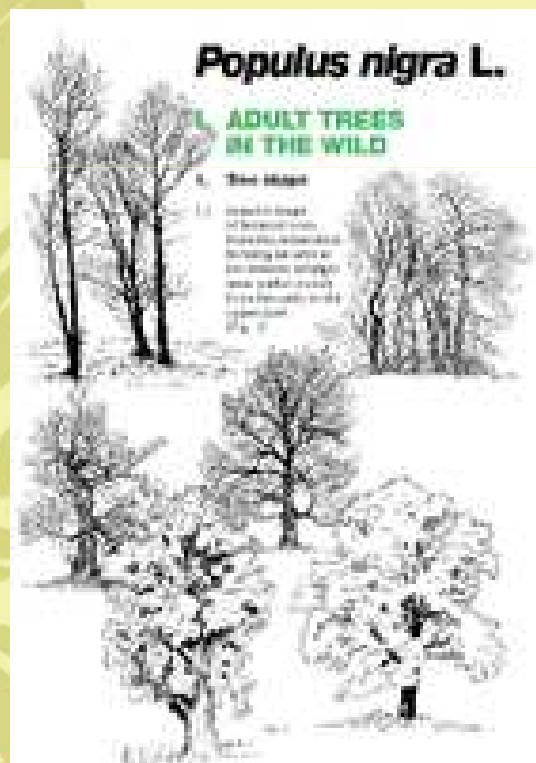
# Contents of paper



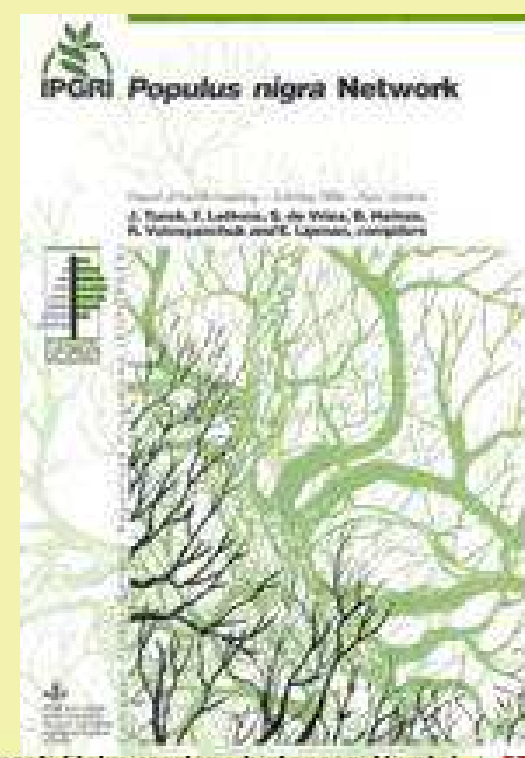
- **Role of EUFORGEN activities:**
  - **Listed Black poplar as an endangered species**
- **Black poplar in Hungary**
- **Gene conservation programme for Black poplar in Hungary**
- **Restoration programme of Black poplar**
- **Recent results**



## Identification sheet of black poplar

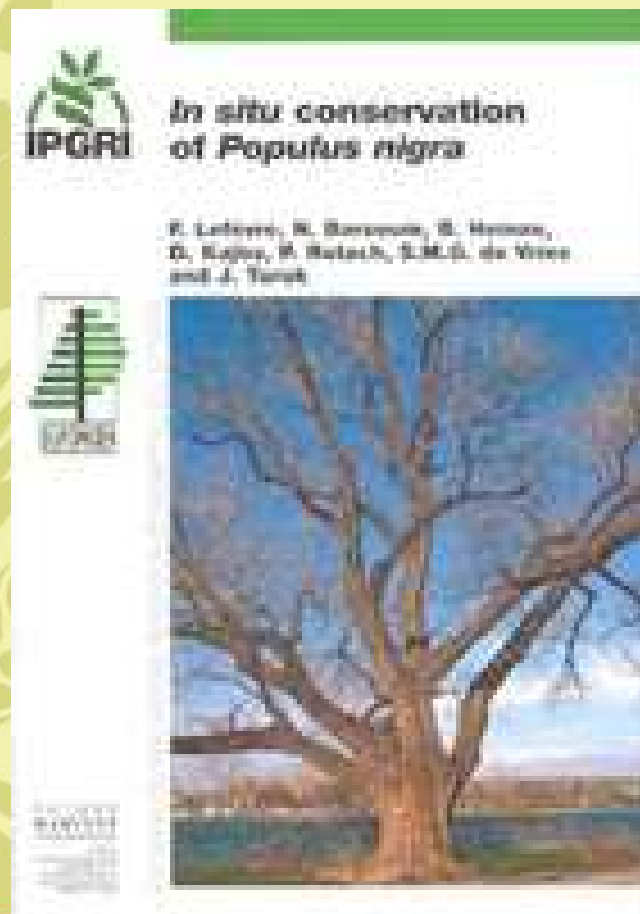


## Populus nigra Network reports





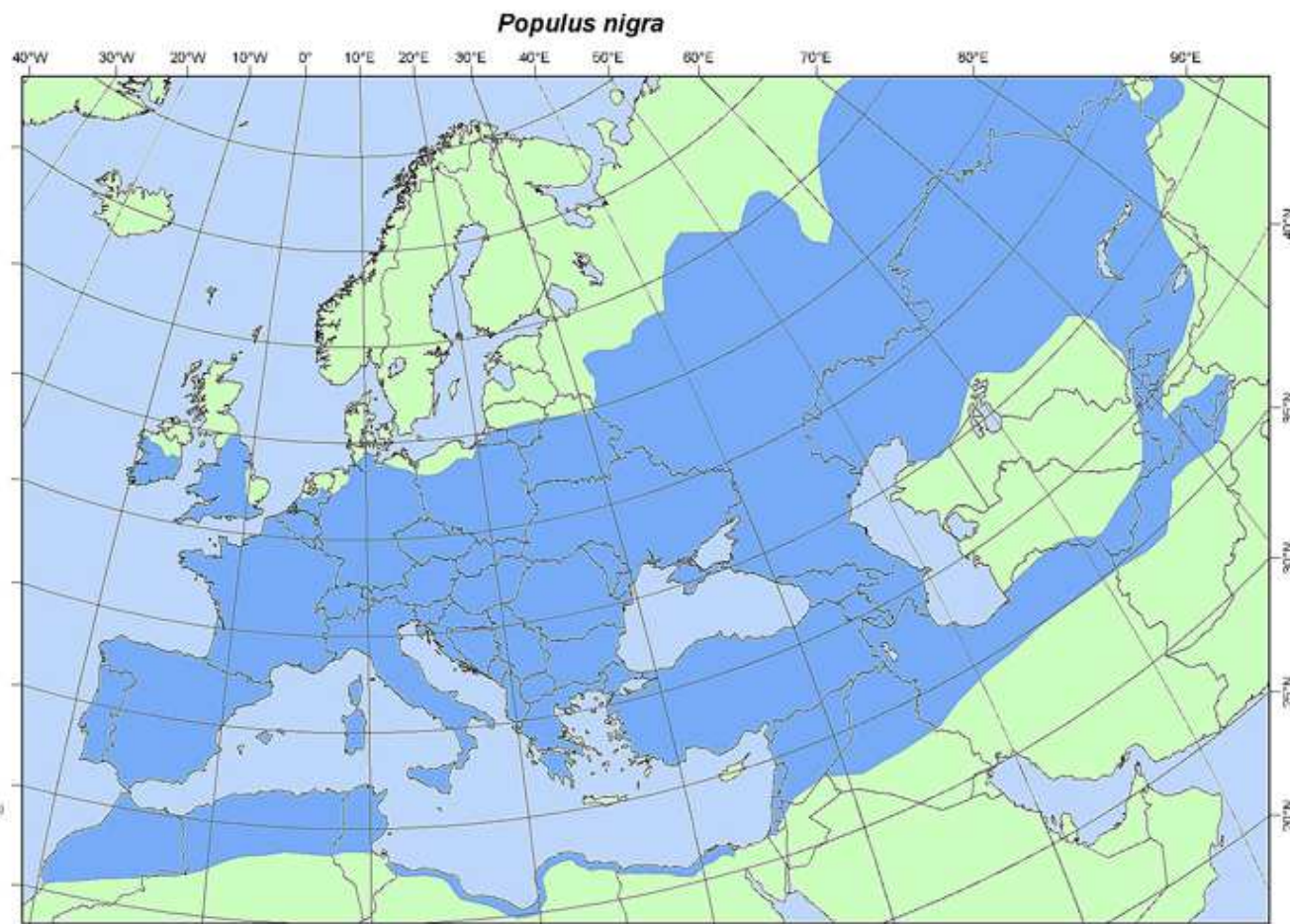
# In situ conservation of *Populus nigra* (Thematic publication)



# Technical guideline



# Distribution map of *Populus nigra*



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c/o Bioversity International  
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More information  
and other maps at  
[www.euforgen.org](http://www.euforgen.org)

This distribution map, showing the natural distribution area of *Populus nigra* was compiled by members of the EUFORGEN Networks

Citation: Distribution map of Black poplar (*Populus nigra*) EUFORGEN 2009, [www.euforgen.org](http://www.euforgen.org).

First published online in 2004



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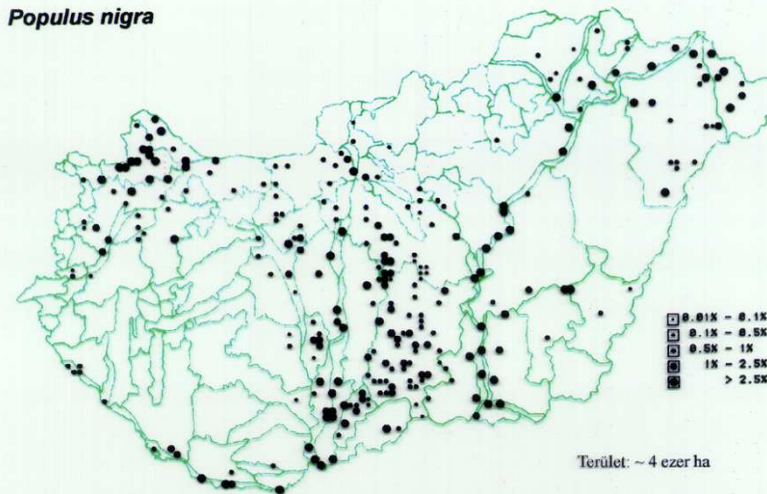




# Populus nigra in Hungary


Rivers, lakes, marshlands and swampy areas 2000 years ago (modelled)

*Populus nigra*



Bartha, Mátyás, 1995



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Magyarország Nemzeti Atlasza, 1989



# Milestones of policy and legislation in Hungary



- **Decreasing demands on improved FRM (1990s)**
- **Increasing demands on autochthonous FRM (1990s)**  
(Requirements of Parl. Act on Nature conservation No. 53/1996)
- **Ministerial decrees**
  - **on forest reproductive materials** (based on 1999/105 Counc. Dir.)
  - **and on plant genetic resources (PGR)**
- **Governmental funds for plant genetic resources (1995)**
- **Use of EUFORGEN recommendations (1998)**

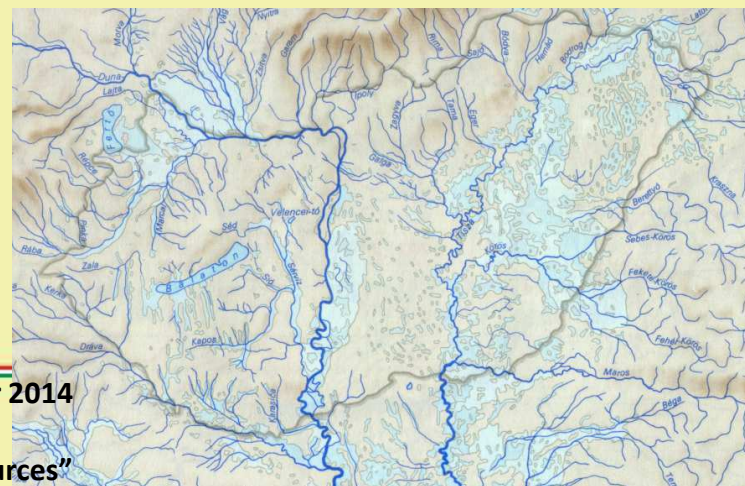




# Black poplar as a target species for gene conservation programmes



- Gene conservation has been started for about 20 years
- Multipurpose demands on use of *P. nigra*
- Results expected by the public in a short term
- Governmental funds to finance PGRs



# Milestones of gene conservation and management of *Populus nigra* in Hungary

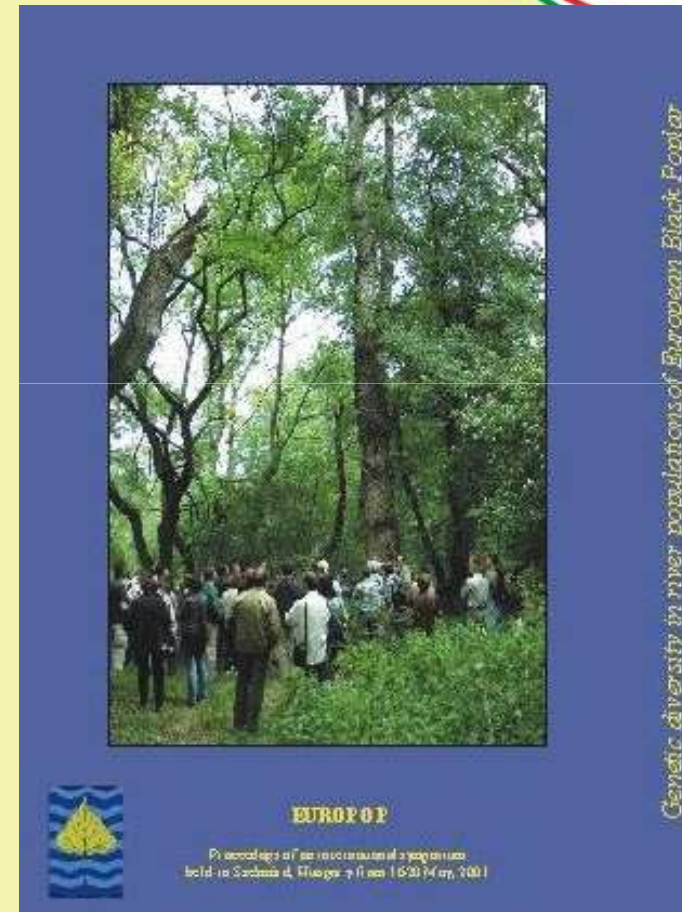
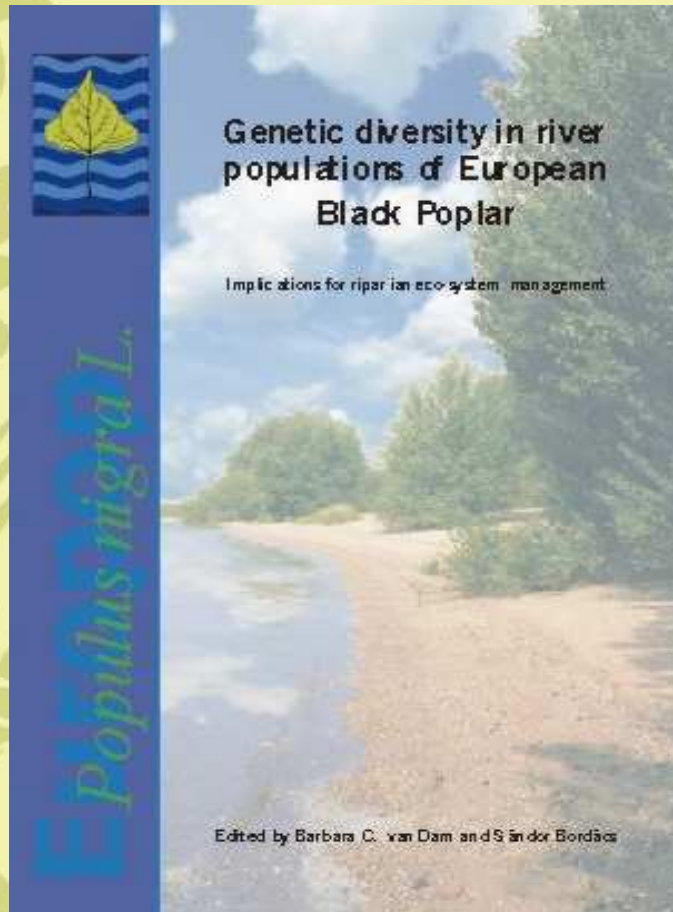


- Inventory made by mapping and data recording (1993)
- Participation in EUFORGEN *Populus nigra* Network (1994)
- Genetic inventory by genetic markers (1997)
- Participation in EUROPOP (1997-2001) project (FAIR RTD PL97-3386)
- Establishing *ex situ* gene collections (1996)
- Establishing basic materials (stool beds 1997, seed orchards 2000)
- Selection and approval of seed stands (2003)
- Production of certified FRM (cuttings 1998, seedlings 2003)





# Genetic diversity of European Black Poplar (EUROPOP)



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# Molecular markers used (EUROPOP)



Molecular markers			Purpose of use
<b>DNA markers</b>	<i>Nuclear DNA</i>	Heinze's specific	Hybridisation/introgression
		Microsatellite DNA	Clonal variation
		AFLP	Clonal variation
		RAPD	Clonal variation
	<i>Chloroplast DNA</i>	cpDNS haplotípus	Maternal hybridisation and genetic diversity
<b>Protein markers</b>	<i>Isozyme markers</i>	LAP , AAT , PGM, PGI	Hybridisation/introgression and genetic diversity



# Basic elements of ex situ conservation

1. Field work : selecting, marking and mapping of trees
2. Data register
3. Genetic analysis to exclude hybrids
4. Establishing local clonal collection by cuttings
5. Establishing stool beds (super elite)
6. Establishing ex situ stands

# Selection, mapping, recording and sampling of black poplars since 1993



## ERDÉSZETI TÖRZSFA/MEGŐRZÖTT GENOTÍPUS TÖRZSLAPJA

Fajai magyar neve:	Feketenyár
Fajai/taxon tudományos neve:	<i>Populus nigra</i> L.
új törzsfa, genotípus leírása	régebbi gyűjteményben őrzött genotípus regisztrációja

### Azonosító adatok

Erdőgazdasági táj megnevezése és az AESZ szerinti decimális kódja:		Kód:
Megye, községhatár, tag, részlet:		
Erdőgazdálkodó neve, címe:	Természetvédelmi Hatóság neve, címe:	
Földrajzi koordináták szélesség	hosszúság	Természetvédelmi besorolás:

### Termőhelyi adatok

Klíma:	Hidrológiai viszonyok:	Vízgazdálkodási fok:	Tengerszint feletti magasság:.....m
Alapkőzet:	Fizikai talajféleség:	Termőréteg vastagság:	Ártéri fekvés:
Genetikai talajtípus: Fatermesztést korlátozó talajhiba, környezeti tényező:		Ártéren a vízjárás jellemzői (évente hány-szor, évszak, borítás ideje, magassága, stb.):	

### Állományjellemző adatok\*

Erdősítés éve:	Kor felvételekor:	Záródás %	Hálózat:	Egyedszám: .....
Fatómeg: .....	m <sup>2</sup> /ha	Eredet: % mag	% sarj	db/ha
Növekedés: kiváló - jó - közepes - gyenge	Üzemtervi FTO:			
Erdőtípus:				
Jellemző lágyszárú növények:				
Elegyfaj(ok): %, helyzete:		Cserjeszint ?		
%, helyzete:		nincs / van. % borítottság		
Az állomány története: szaporítóanyag származása, erdősítés módszere, tisztítások, gyérítések, károsítás, stb.				



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# Use of Heinze's specific (win3) nuclear DNA marker (Heinze 1997)



- 1 *Populus nigra* 'Thevestina'
- 2 *Populus nigra*
- 3 *Populus deltoides*
- 4 *Populus x euramericana*





# Ex situ clonal collection (Fadd, Hungary 1997)



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# Ex situ clonal collection (Tolna, Hungary 1999)



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# Ex situ conservation stand (Tolna, Hungary 2013, 14 years old)

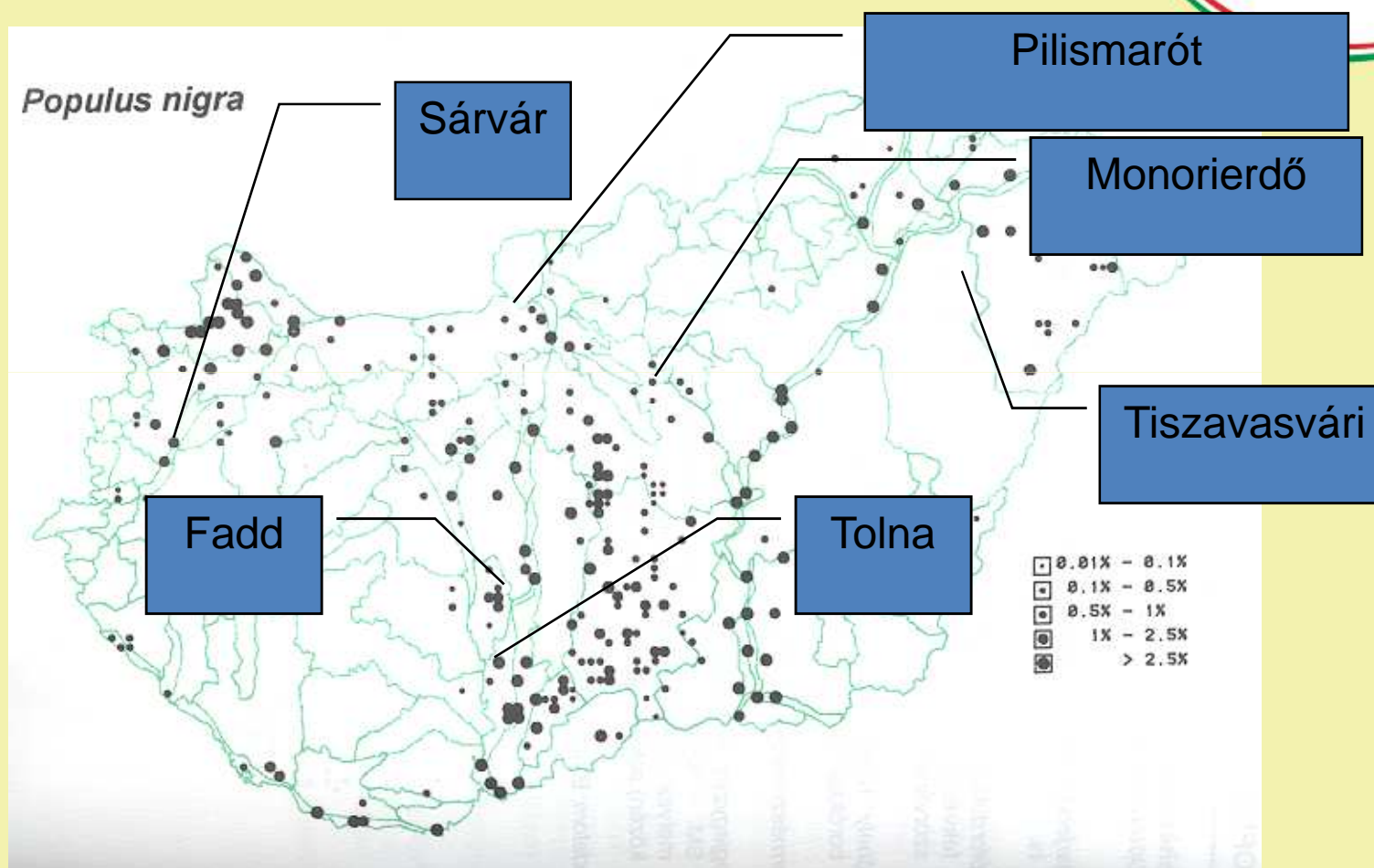


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# Ex situ gene collections and conservation stands of *Populus nigra* in Hungary



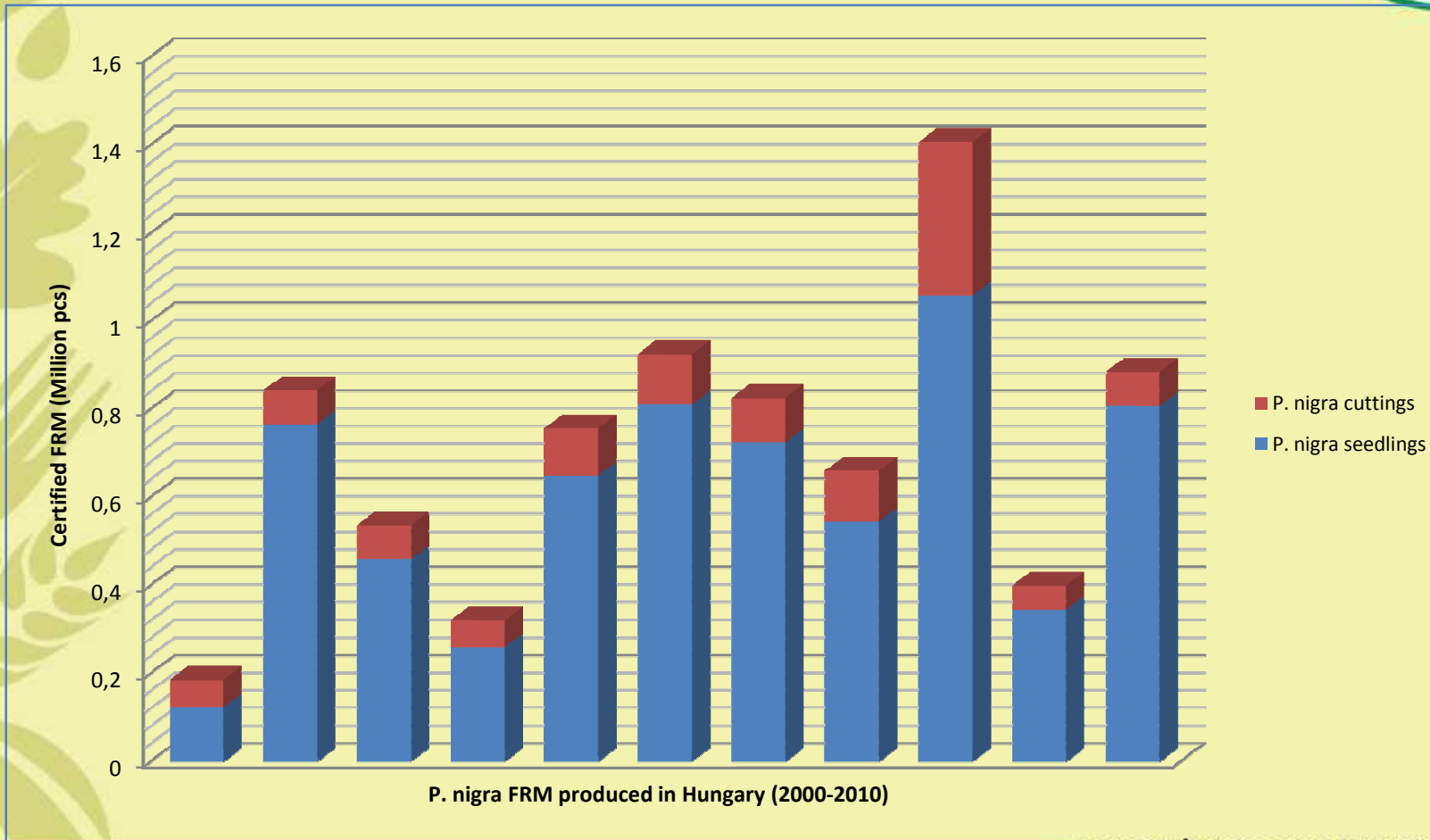
# Results of active gene conservation programme (1993 – 2010) in Hungary



- Approx. 1800 genotypes preserved ex situ in 5 regional gene banks
- Stool beds established in 15 regional nurseries ( in total 4,5 ha)
- Seed orchard established in Moha (6 ha)
- Seed stands (18) registered on National List of Basic Materials
- Only DNA tested FRM can be certified and marketed
- Local gene collections and basic materials ensure local use of FRM
- Improvement of gene banks and basic materials is continued
- **Publications:** (Genetikai ismereteink a fekete nyárról. *(Hibridek, klónok, magoncok; tények és tévhit a fekete nyárról)* dr. Bordács Sándor – dr. Borovics Attila Az 'Év fája' a fekete nyár (Populus nigra L.), Erd. Lapok 2004.)



# Certified reproductive material of black poplar produced in Hungary (2000 – 2010)





**First re-forestation by clonal mixture of black poplar in a protected area of Gemenc Zrt. & Duna-Dráva NP (20 April, 1998)**



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# Black poplar seedlings produced in nurseries tested by Heinze's marker (DNA)



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# Re-afforestation by clonal mixture of black poplar (Gemenc Zrt. )



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# Recent results

## Danubepark Step2.0 project linked to black poplar programme in Hungary



- In former projects 82 trees selected and registered
- 153 new trees selected
- All new trees tested by species specific DNA marker
- The 'pure' genotypes (151) ready to use by official registration (National List of ex situ gene collections)
- Cuttings of 118 trees collected to be used for stool beds/seed orchard
- Pre-selection of areas for pilot projects of in situ management of poplar-willow forests has been started





# Potential areas for in situ management





# Thank you for your kind attention!



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