Management of genetic diversity: protected areas and dynamic in situ conservation of genetic resource

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Management of genetic diversity: protected areas and dynamic *in situ* conservation of genetic resource

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CRGF
COMMISSION DES RESSOURCES GENETIQUES FORESTIERES

EUFORGEN

1) Importance of the genetic diversity regarding climate change

- Basic level of biodiversity determining the response of the ecosystem
- The concept of genetic resources (GR) and their values

2) Conservation of GR in theory : necessary dynamic approach

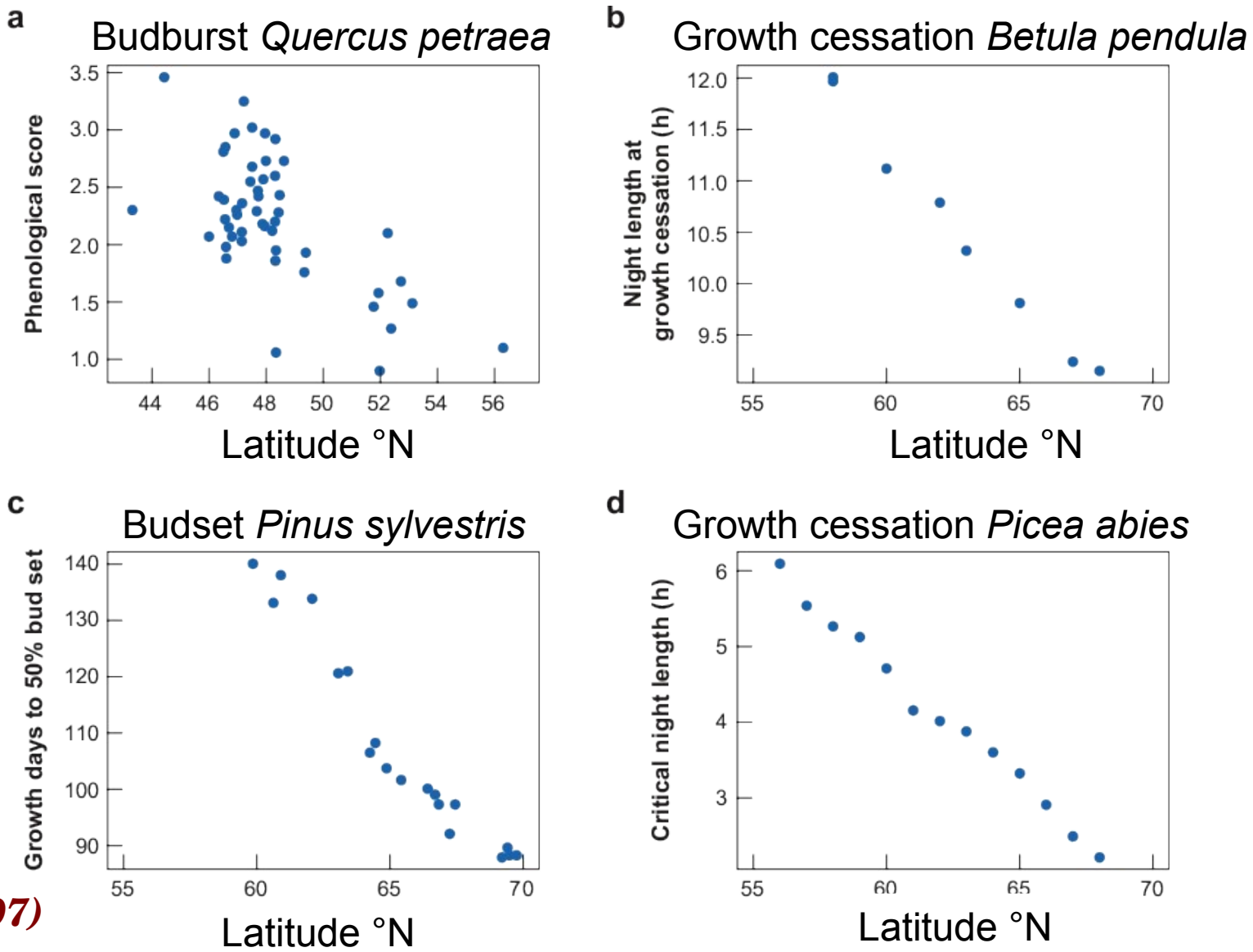
- Diversity means evolution
- Dynamic approach of conservation

3) Conservation of GR in practice : the example of forest GR

- Case studies at national (France) and continental (Europe) scale
- Reconciliate GR conservation and protected areas systems

4) General recommendations

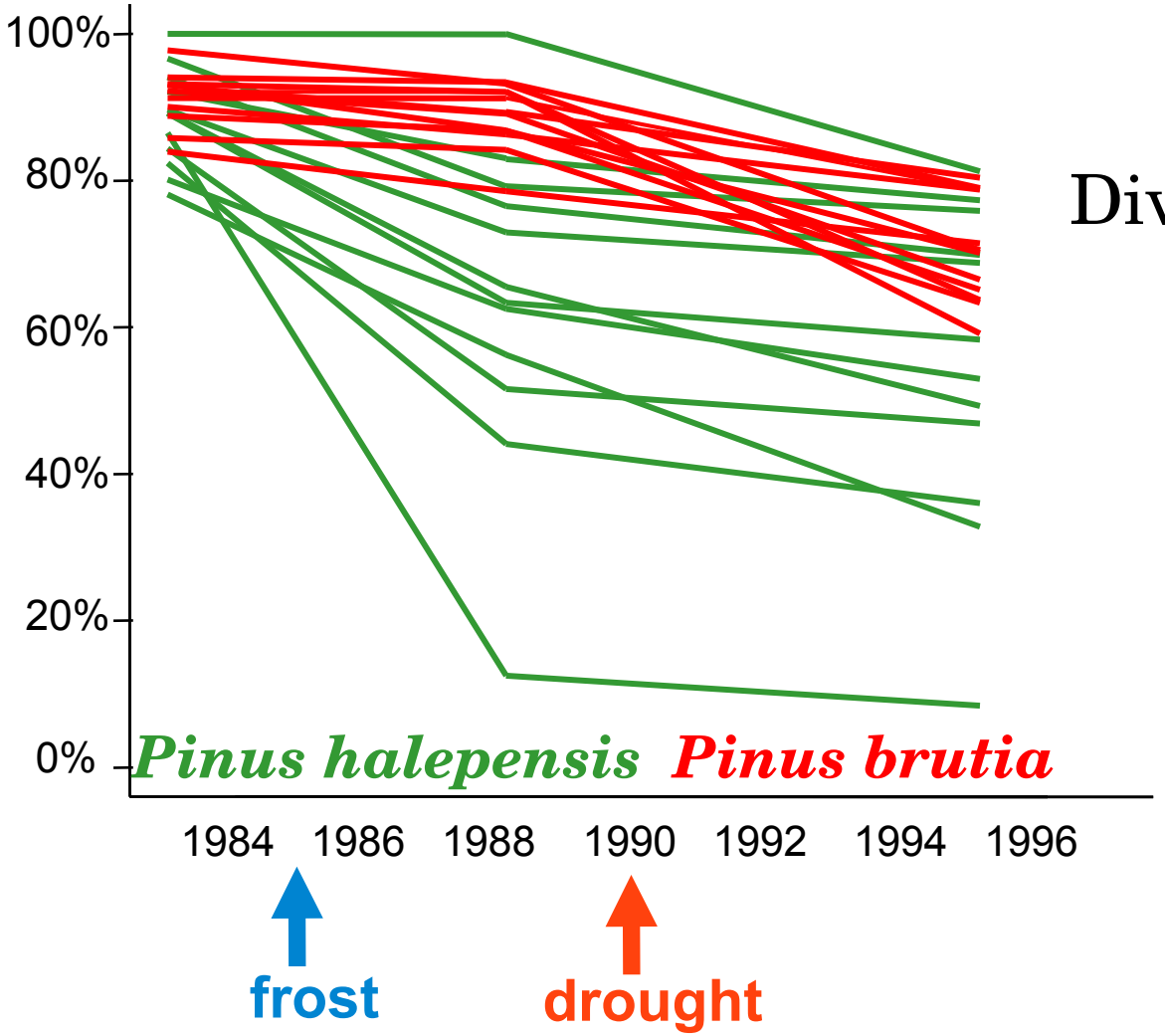
The genetic diversity within species is huge



(Savolainen et al, 2007)

The genetic diversity within species is huge

Survival *in 1 test site, 22 provenances (2 species)*



Diversity within species :

- between populations
- within populations

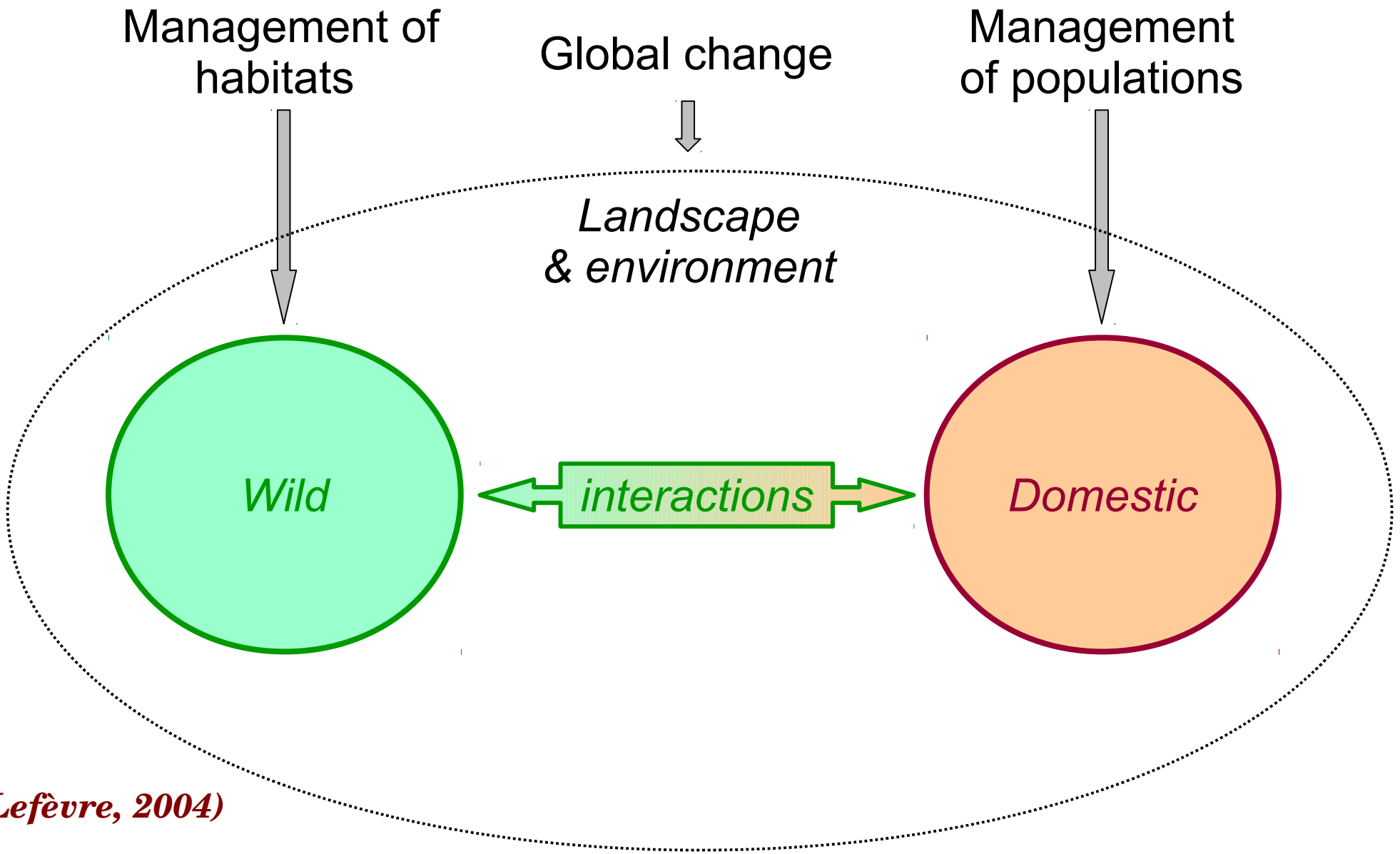
(Pichot et al, 1998)

The concept of genetic resources (GR)

*GR means genetic material of **actual** or **potential value**.*

genetic material means any material of plant, animal, microbial or other origin containing functional units of heredity

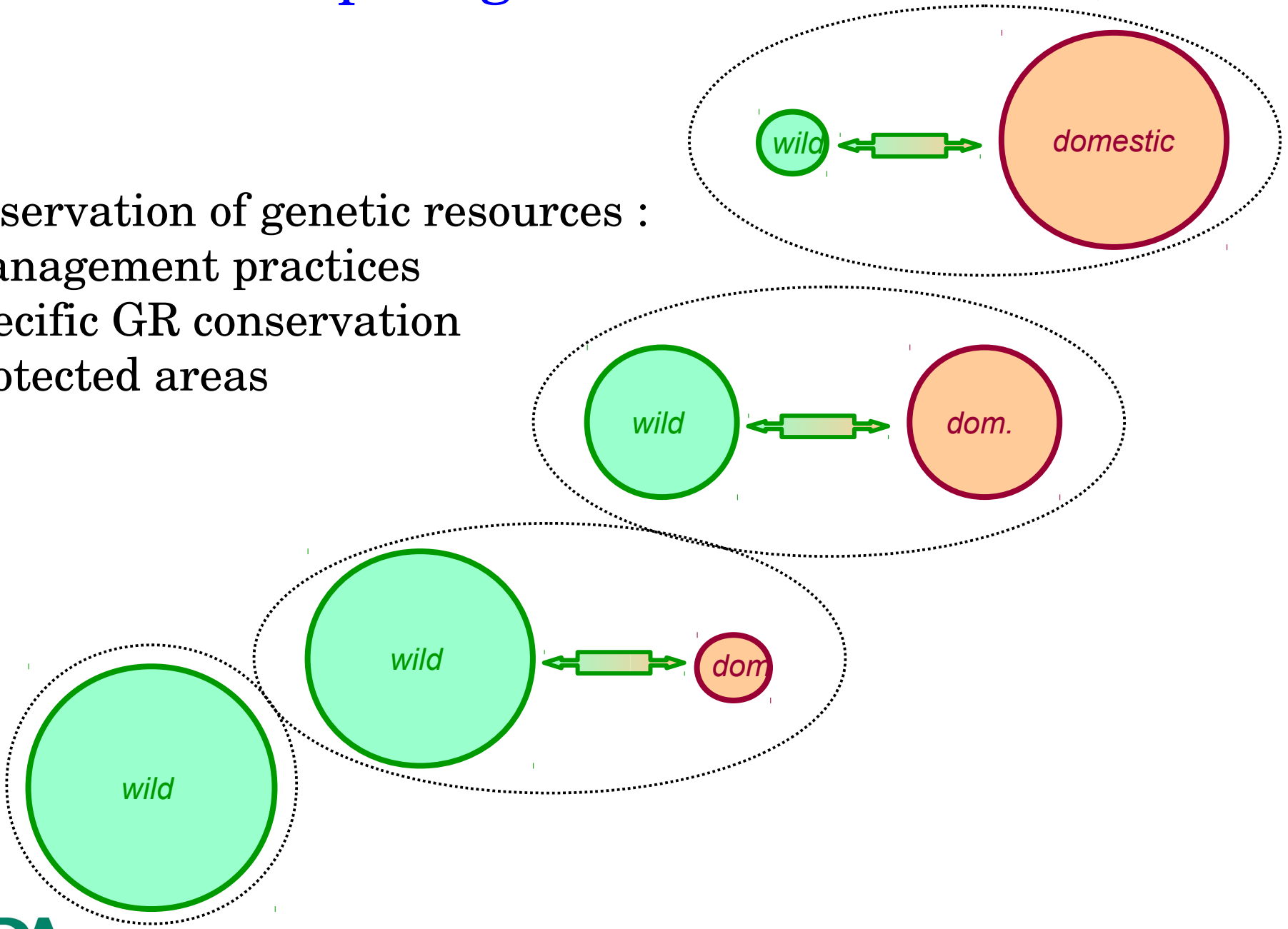
The concept of genetic resources (GR)



(Lefèvre, 2004)

The concept of genetic resources (GR)

Conservation of genetic resources :
- management practices
- specific GR conservation
- protected areas



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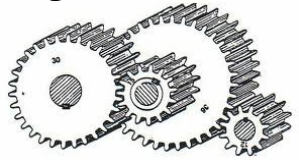
Diversity = evolution: the dynamics of adaptation

Relatives are *alike* but not *identical* : sexual reproduction continuously generates new genetic combinations

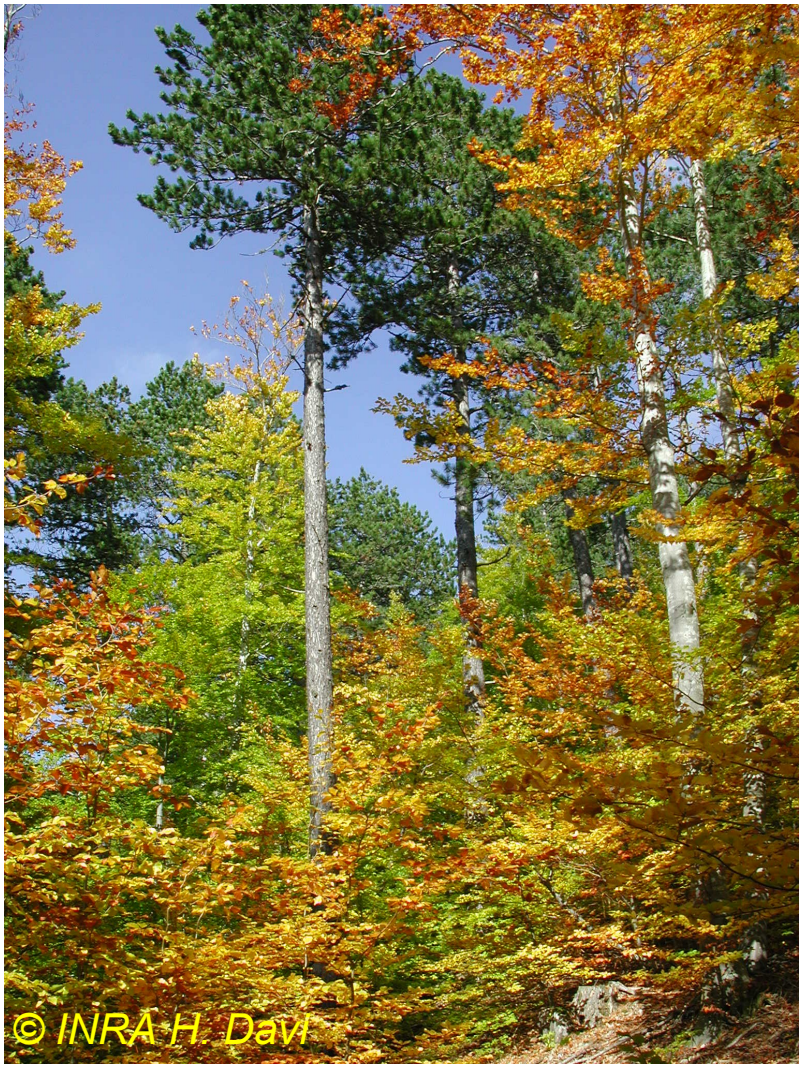
Dynamics



Genetic diversity is not fixed, genetic adaptation occurs if :
(1) better performing genotypes emerge during reproduction
(2) the best performing genotypes spread in the population before it goes extinct

Diversity = evolution: the dynamics of adaptation

As the community evolves during maturation of the forest, the genetic diversity evolves across generations



Diversity = evolution: the dynamics of adaptation

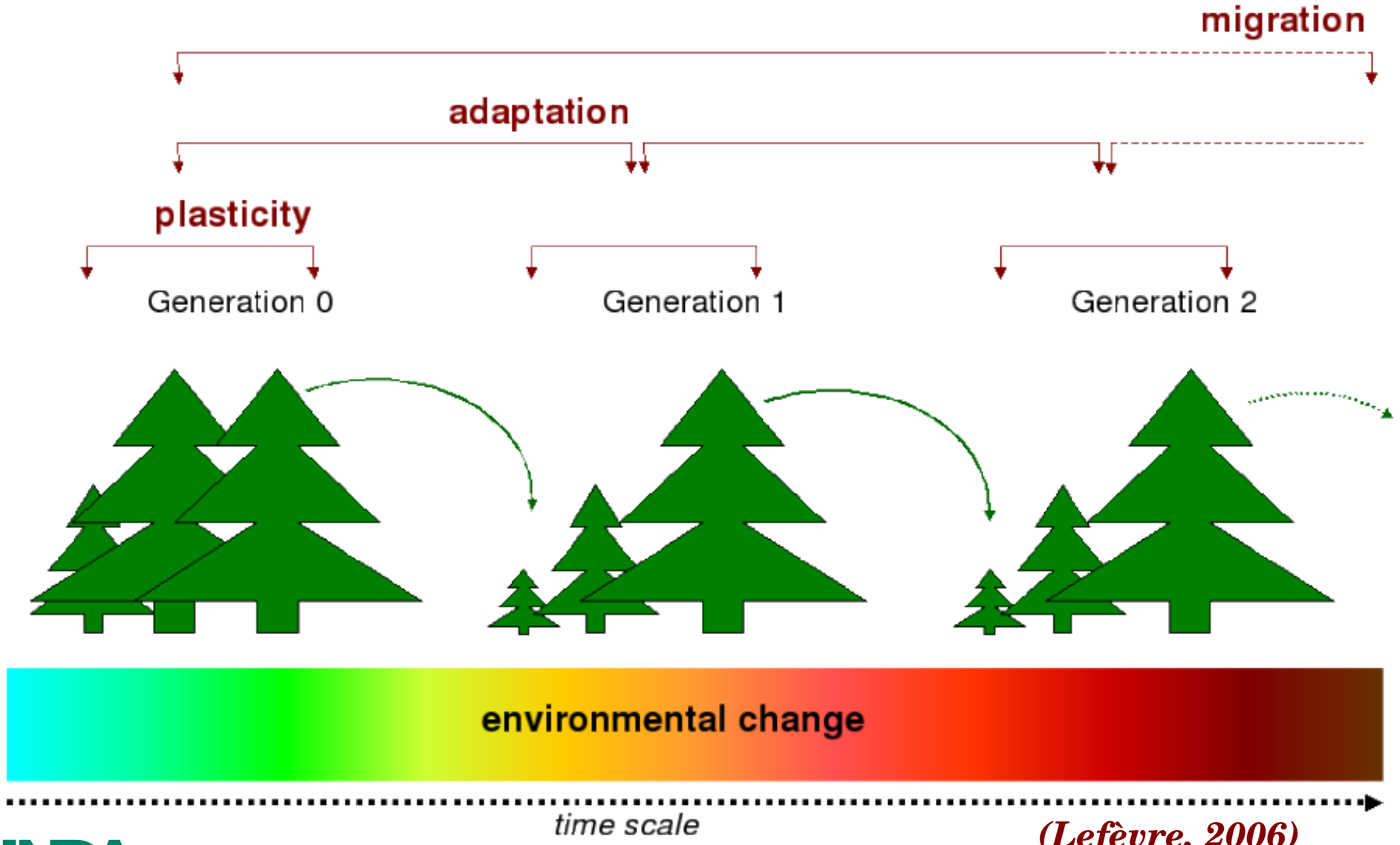
Pinus radiata, the most planted tree : enlarging its realised climatic niche thanks to plasticity and/or genetic evolution

Region	Annual rainfall (mm)	Tmean (°C) coldest month	Tmean (°C) warmest month
California (5 pops)	**420 – 700**	**10 – 11**	**16 – 18**
N-Z (Southland)	***960 – 1000***	***3 – 5***	***13 – 15***
N-Z (Kaingaroa)	***1300 – 1500***	***7 – 9***	*11 – 19*
Chile (Valdivia)	***2350***	***7.7***	*17*
South Afr. (Cape)	***900 – 1100***	*10 – 13*	***20 – 24***
China (Sichuan)	*490 – 590*	***-3.4 – -0.7***	***25 - 28***
Aust. (Bathurst)	*650 – 950*	***0.4 – 0.6***	***24 – 28***
Aust. (Tumut)	*800 – 1300*	***0.5 – 0.8***	***25 – 30***

(Yan et al, 2006)

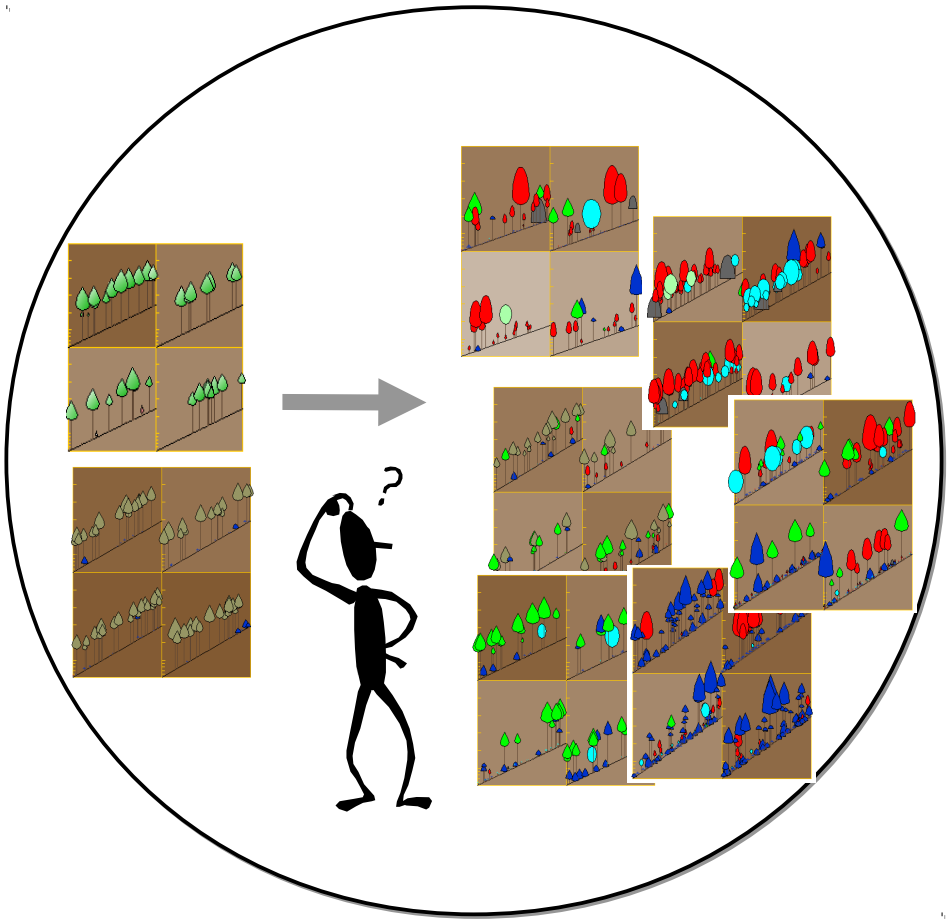
Diversity = evolution: the dynamics of adaptation

A matter of velocity : velocity of changes vs. velocity of adaptation



(Lefèvre, 2006)

A necessary dynamic approach of conservation



- Facing multiple uncertainties, 2 principles:
  - *preserve diversity*
  - *foster evolution*
- Think in trajectories rather than ideotype or steady state
- Avoid hasty decisions that reduce future options

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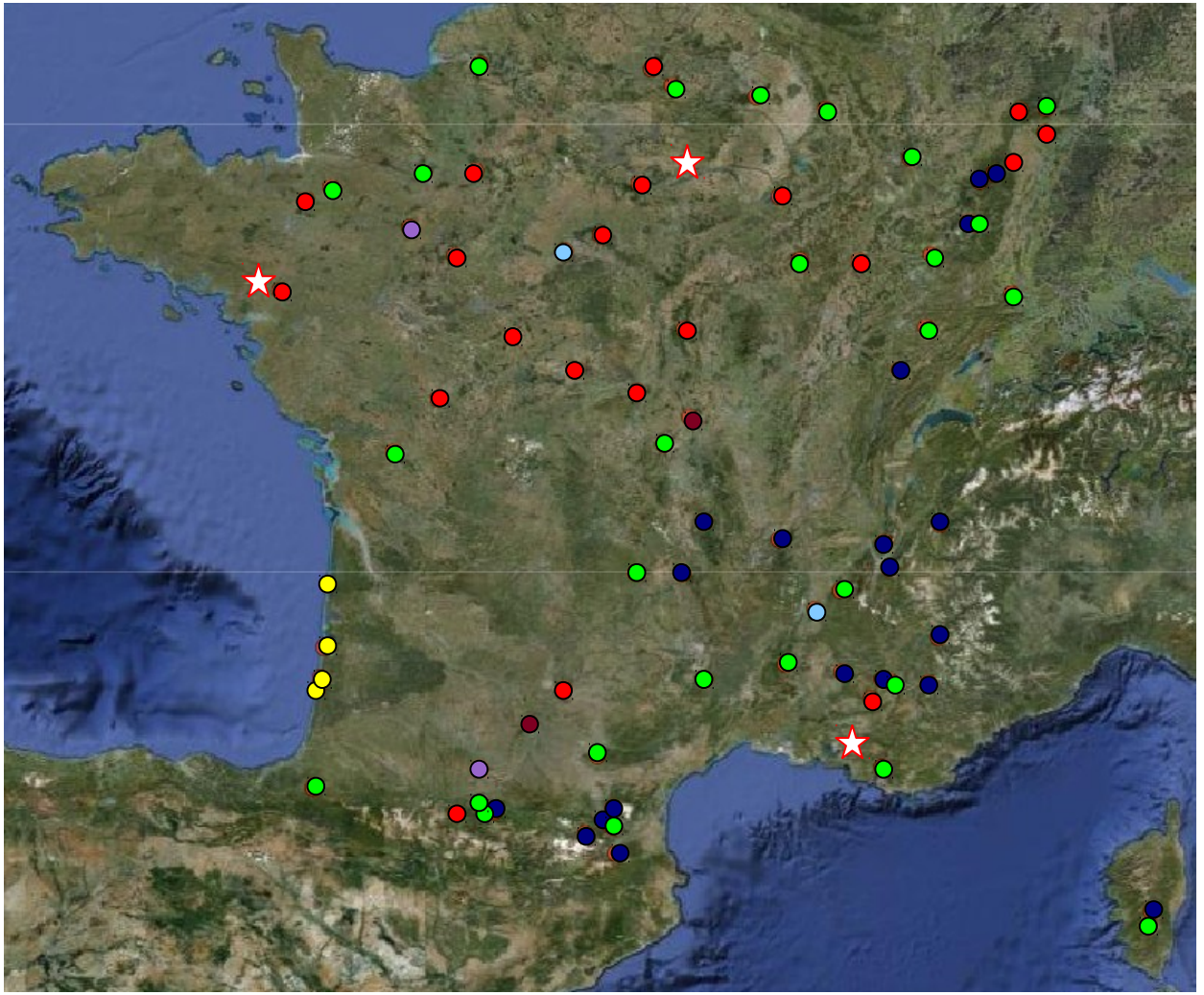
Conservation of forest genetic resources in France



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Complementary *in situ* and *ex situ* strategies

species-oriented approach

requirements for *in situ* conservation units

Conservation of forest genetic resources in France

Involving protected areas in the FGR conservation network requires to investigate the complementarities and incompatibilities

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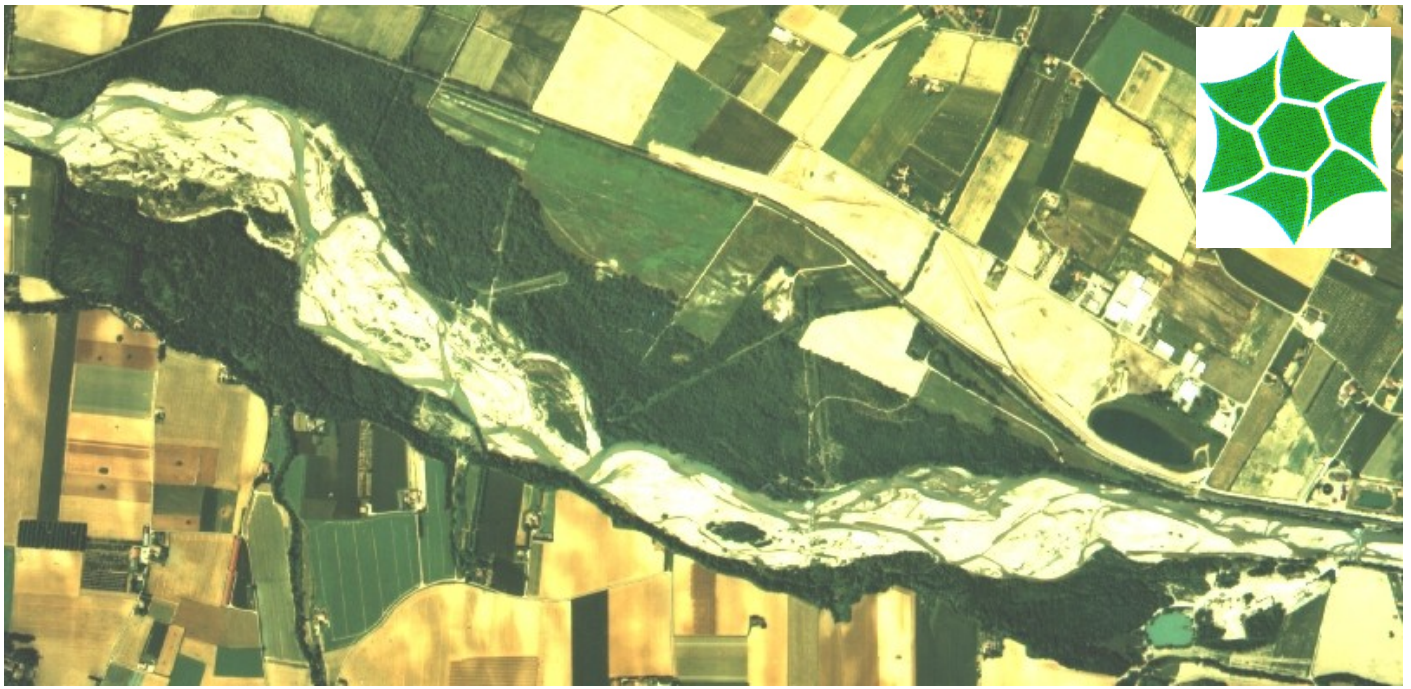
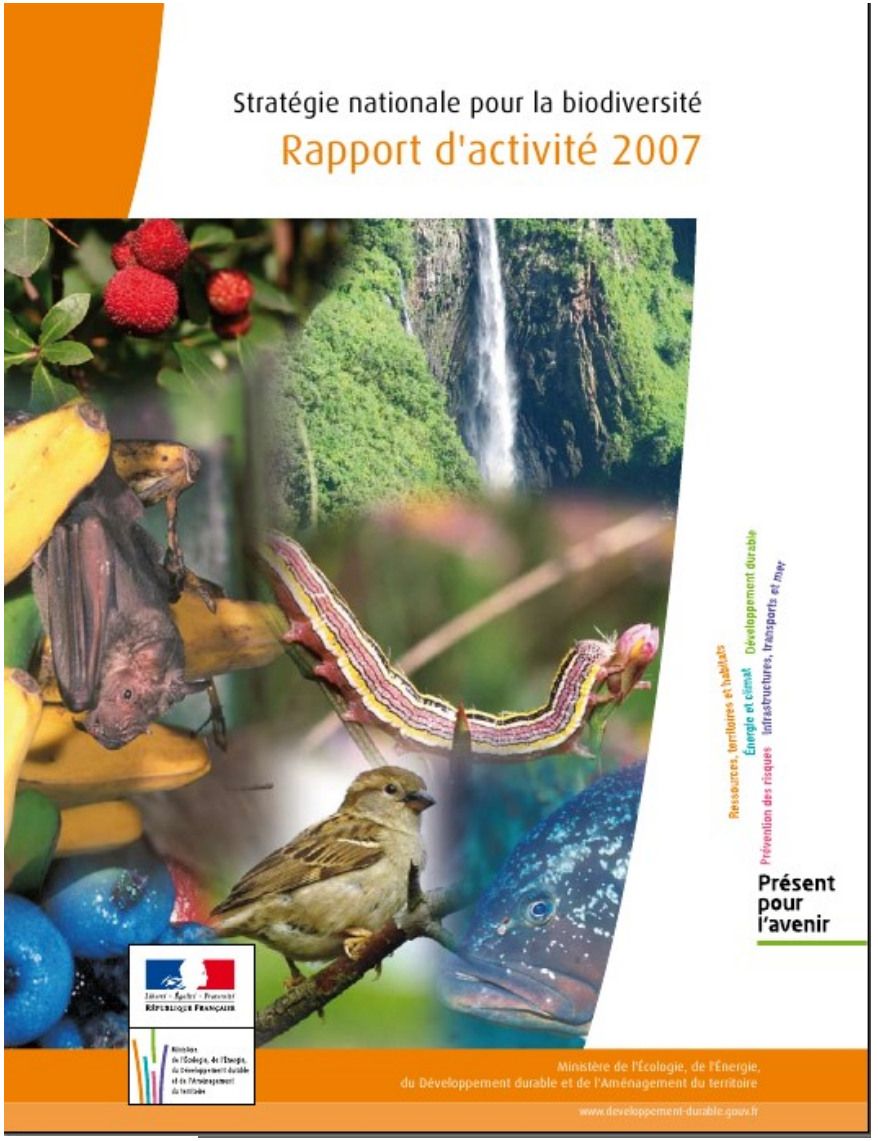
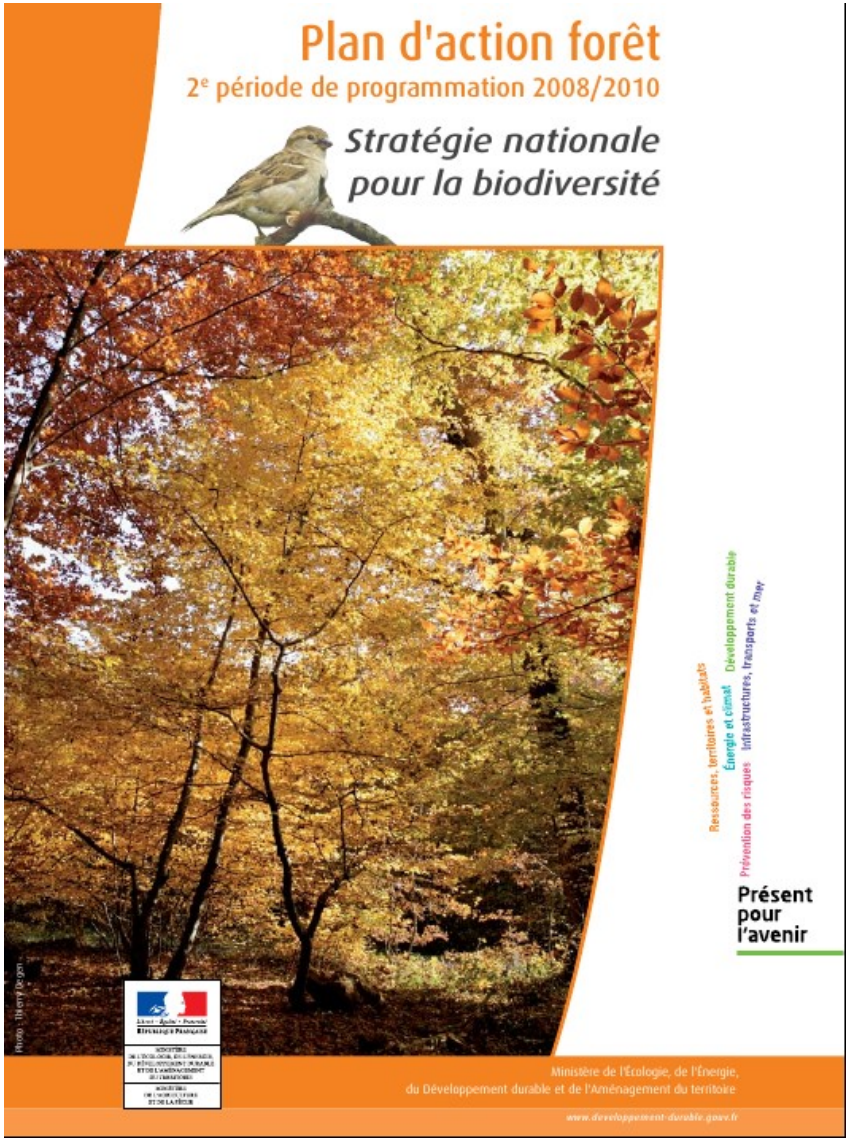


Riparian Nature Reserves participate to the conservation of poplar and elm genetic resources

Conservation of forest genetic resources in France

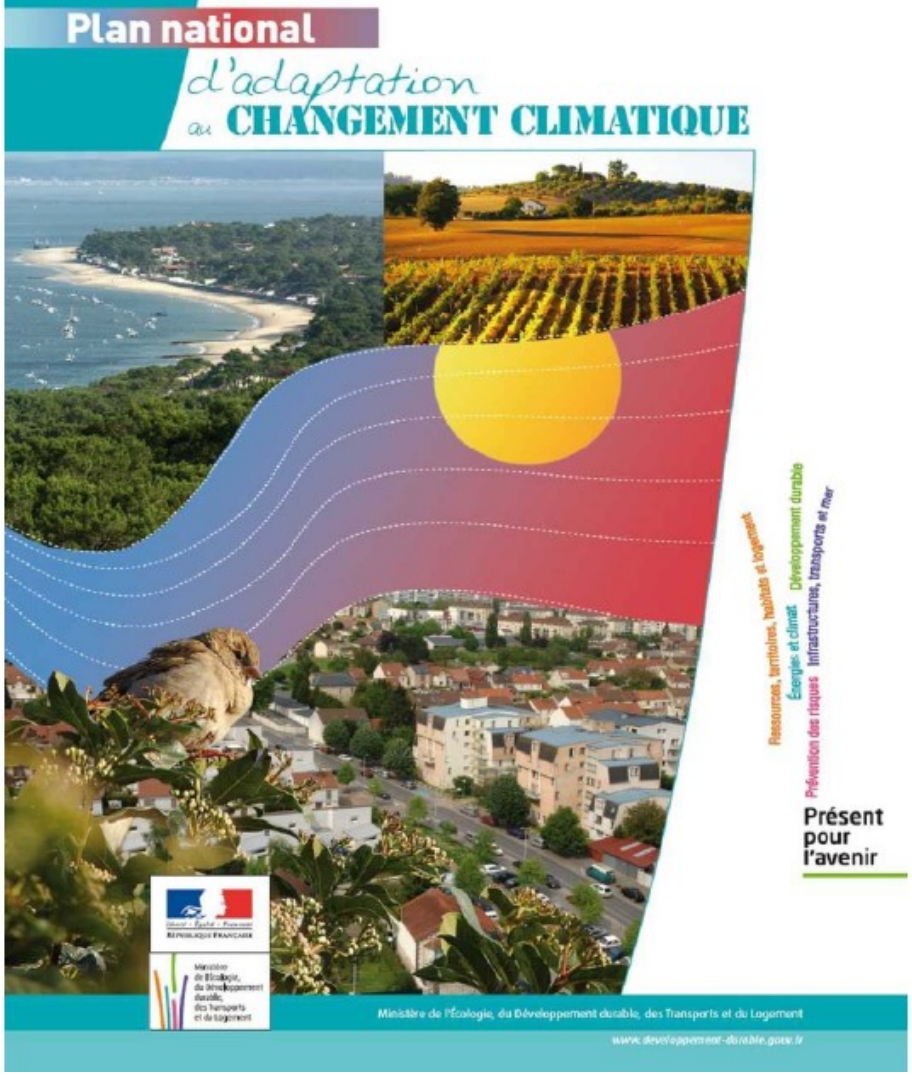
National Strategy on Biodiversity : 7 actions on FGR





Conservation of forest genetic resources in France

National Plan of Adaptation to CC : 1 flag action for the forests conserve, adapt and diversify FGR



RÉPUBLIQUE FRANÇAISE

MINISTERE DE L'AGRICULTURE ET DE LA PÊCHE

DGPAAT/SOUS-DIRECTION DE LA FORÊT ET DU BOIS

Commission on Forest Genetic Resources

Preservation and use of the diversity of forest genetic resources to strengthen the adaptability of forests to climate change

Genetic resources cover an area of biodiversity of actual or potential value. In forests, genetic diversity of trees is also a key factor which fosters general biodiversity of the ecosystem and interacts with its function. The diversity within species is not always easy to observe but it exists between and within populations of trees. Driven by the laws of genetics, it is dynamic, through seed and pollen

European Forest Genetic Resources Programme

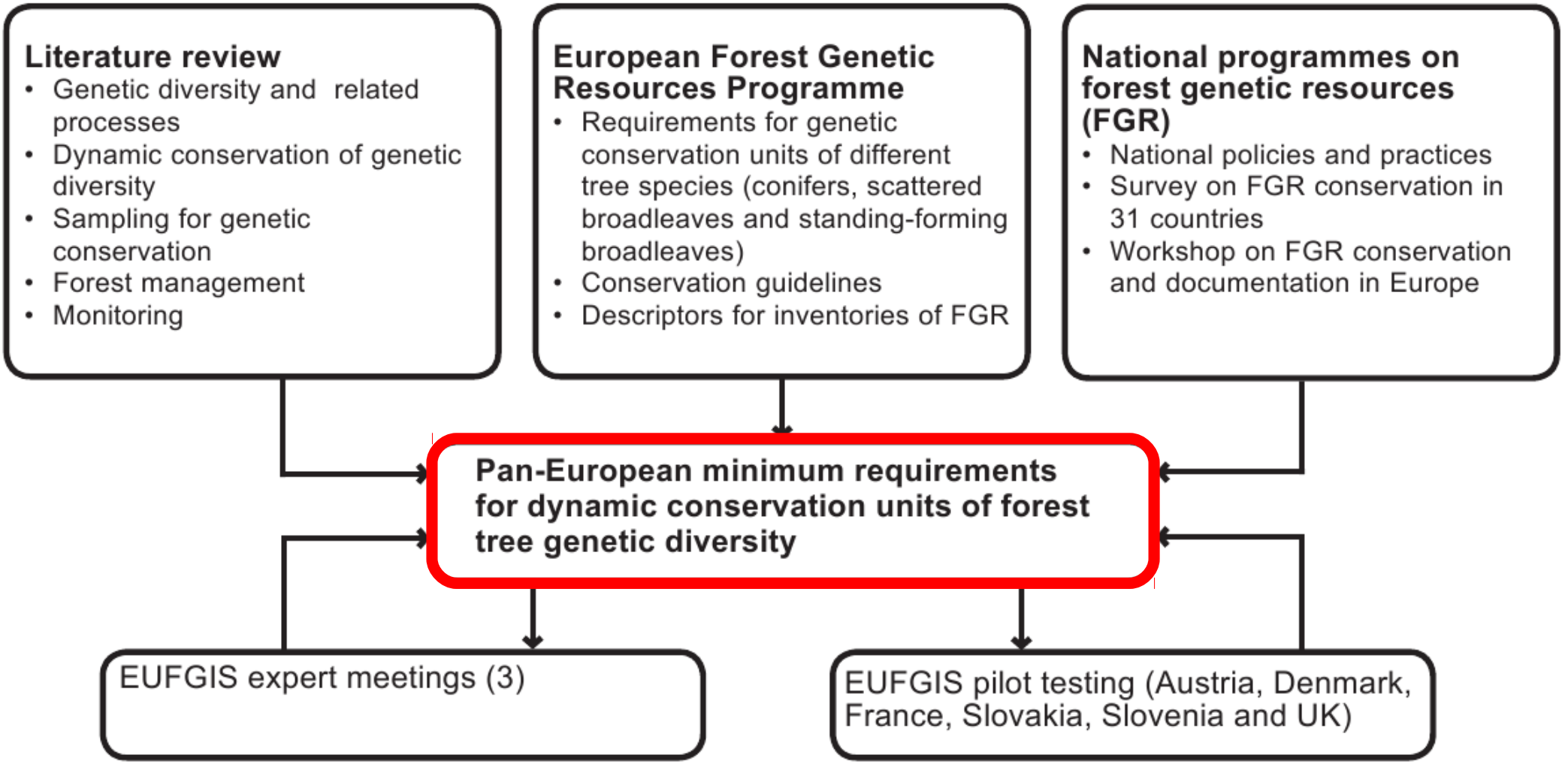
Jarkko Koskela
EUFORGEN Coordinator
Bioversity International, Regional Office for Europe, Rome

- A collaborative mechanism among countries to promote conservation and sustainable use of FGR in Europe
- Established in October 1994 to implement a resolution of the pan-European forest policy process (Ministerial Conference on the Protection of Forests in Europe)
  - Resolution S2: Conservation of forest genetic resources, Strasbourg Conference, 1990
  - Resolution V4: Conserving and enhancing forest biological diversity in Europe, Vienna, 2003
  - Warsaw Declaration, 2007

Conservation of forest genetic resources in Europe

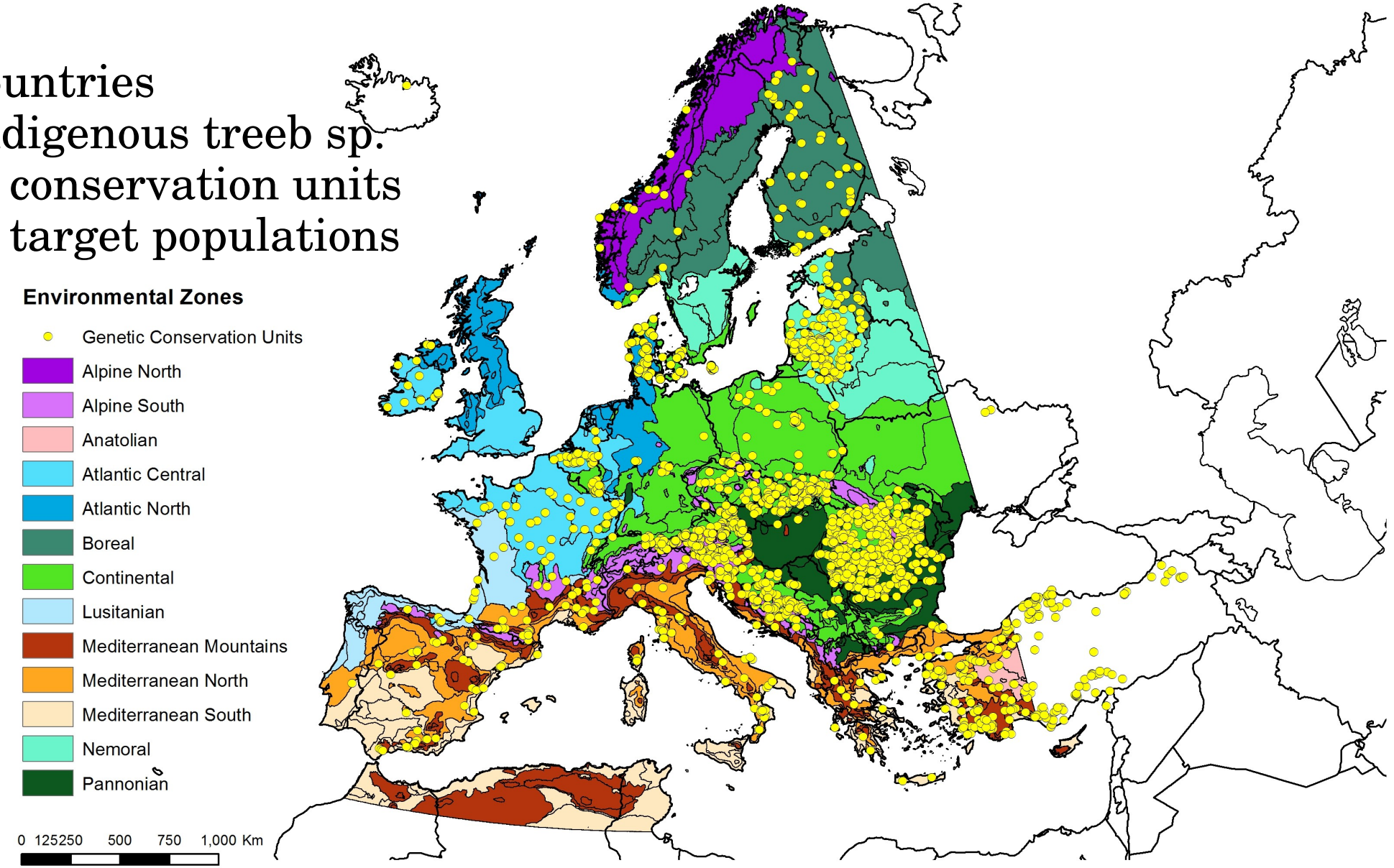
EUFGIS : information system on dynamic conservation of FGR at continental scale based on minimum requirements and standards

(Koskela et al, Biol. Cons. in press) **www.eufgis.org**



Conservation of forest genetic resources in Europe

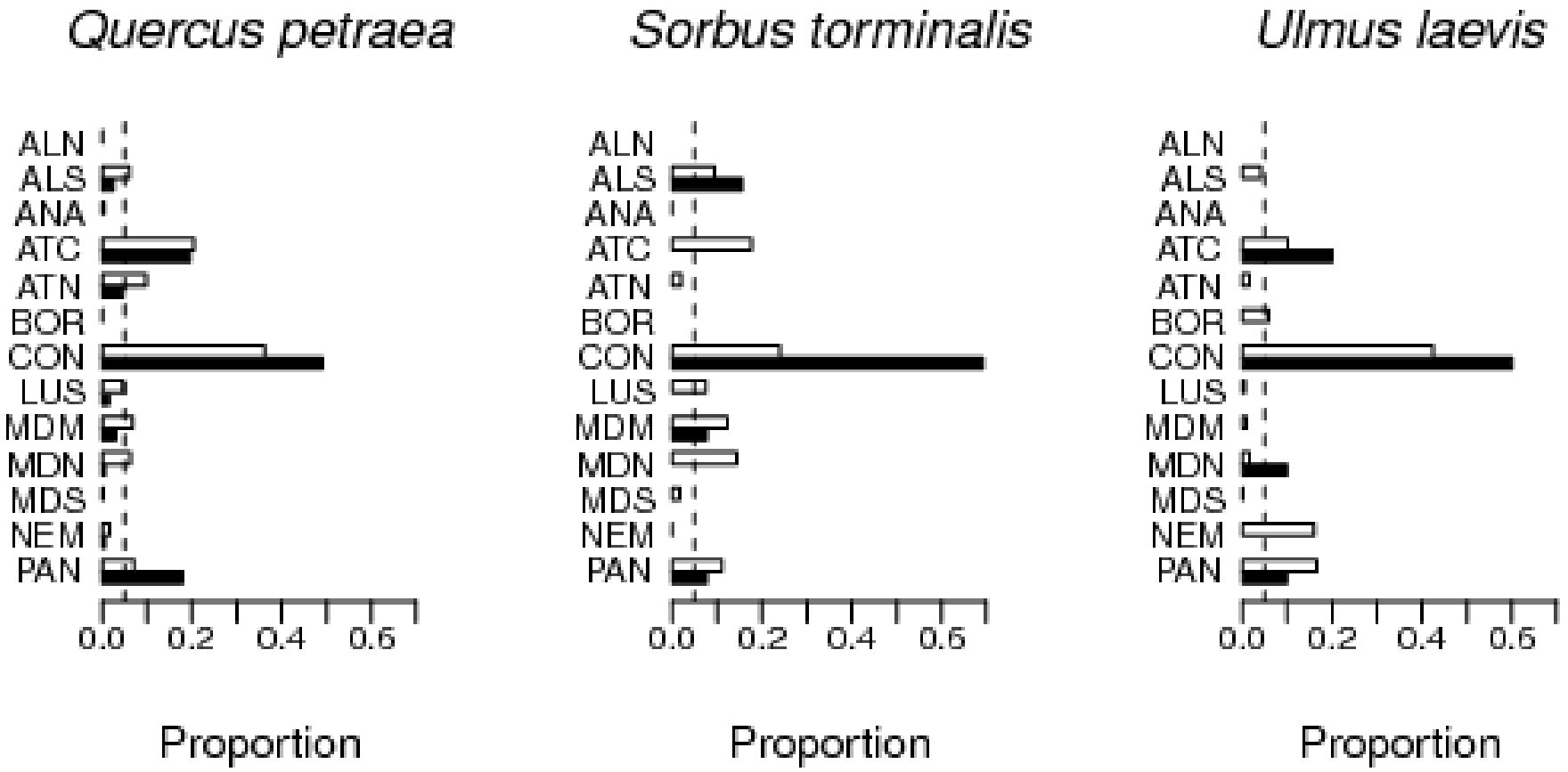
33 countries
86 indigenous treeb sp.
1967 conservation units
2737 target populations



(Lefèvre et al, Cons. Biol. in press ; envir. zones by Metzger et al, 2005)

Conservation of forest genetic resources in Europe

Indicators of the environmental coverage of the FGR network



(Lefèvre et al, Cons. Biol. in press ; envir. zones by Metzger et al, 2005)

Conservation of forest genetic resources in Europe

Management objectives other than FGR conservation assigned to the conservation units:
little connection between FGR conservation and protected areas

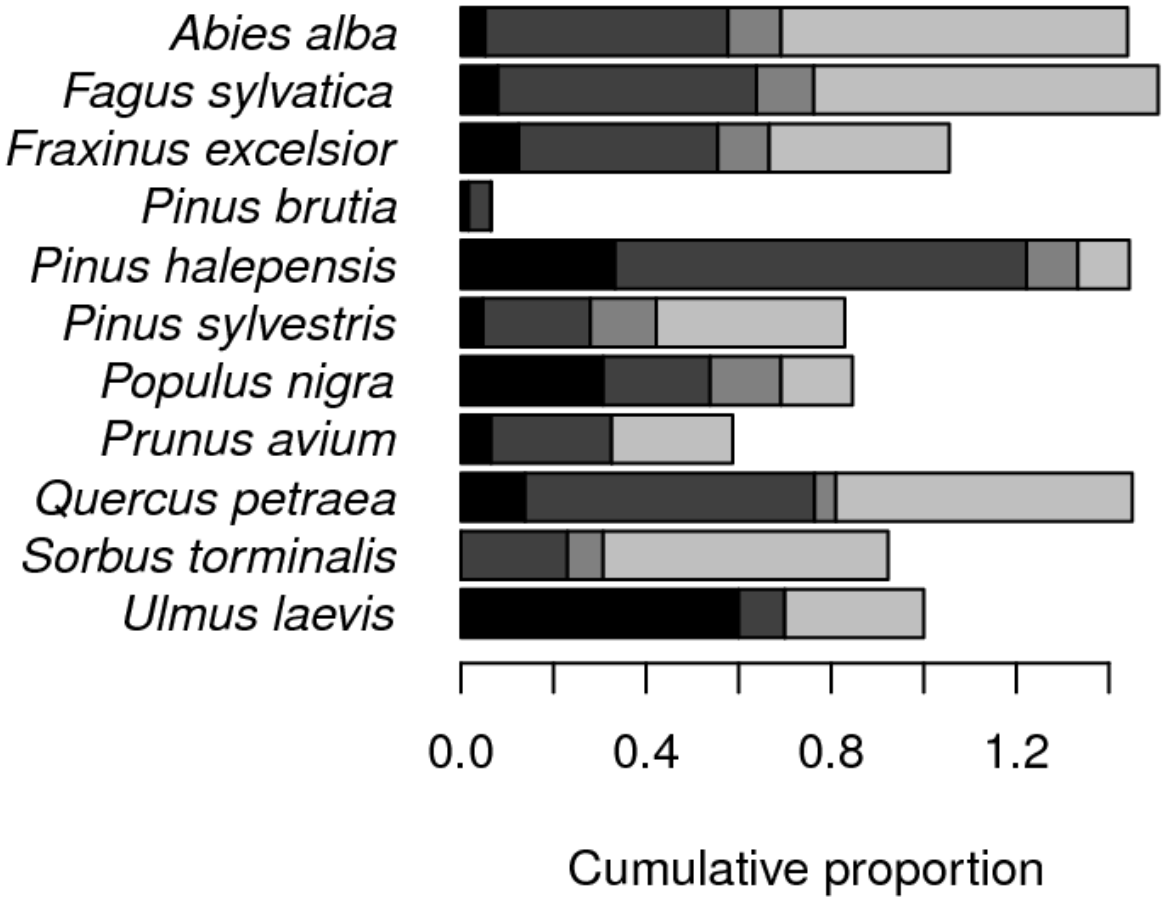
conservation of habitat

forestry seed production

protection area

wood production

(Lefèvre et al, Cons. Biol. in press)



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General recommendations

1. conserve the genetic diversity to keep a range of options for uncertain future and various regional scenarios,

2. give priority to dynamic conservation strategies because the genetic diversity changes continuously, partly driven by management and landscape planning,

3. develop and reinforce the conservation networks of genetic resources at national and continental scale ; standardize surveys and improve the monitoring process.

4. include the conservation of genetic resource as an objective in protected areas whenever compatible based on minimum requirements and standards.