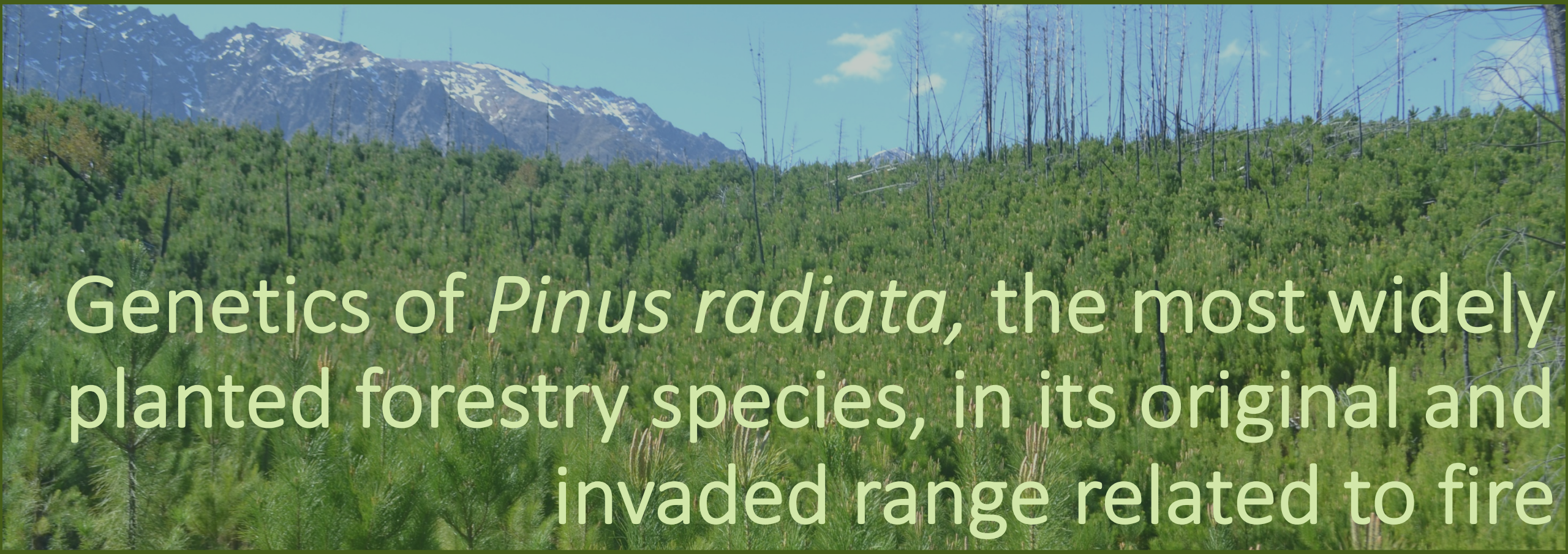
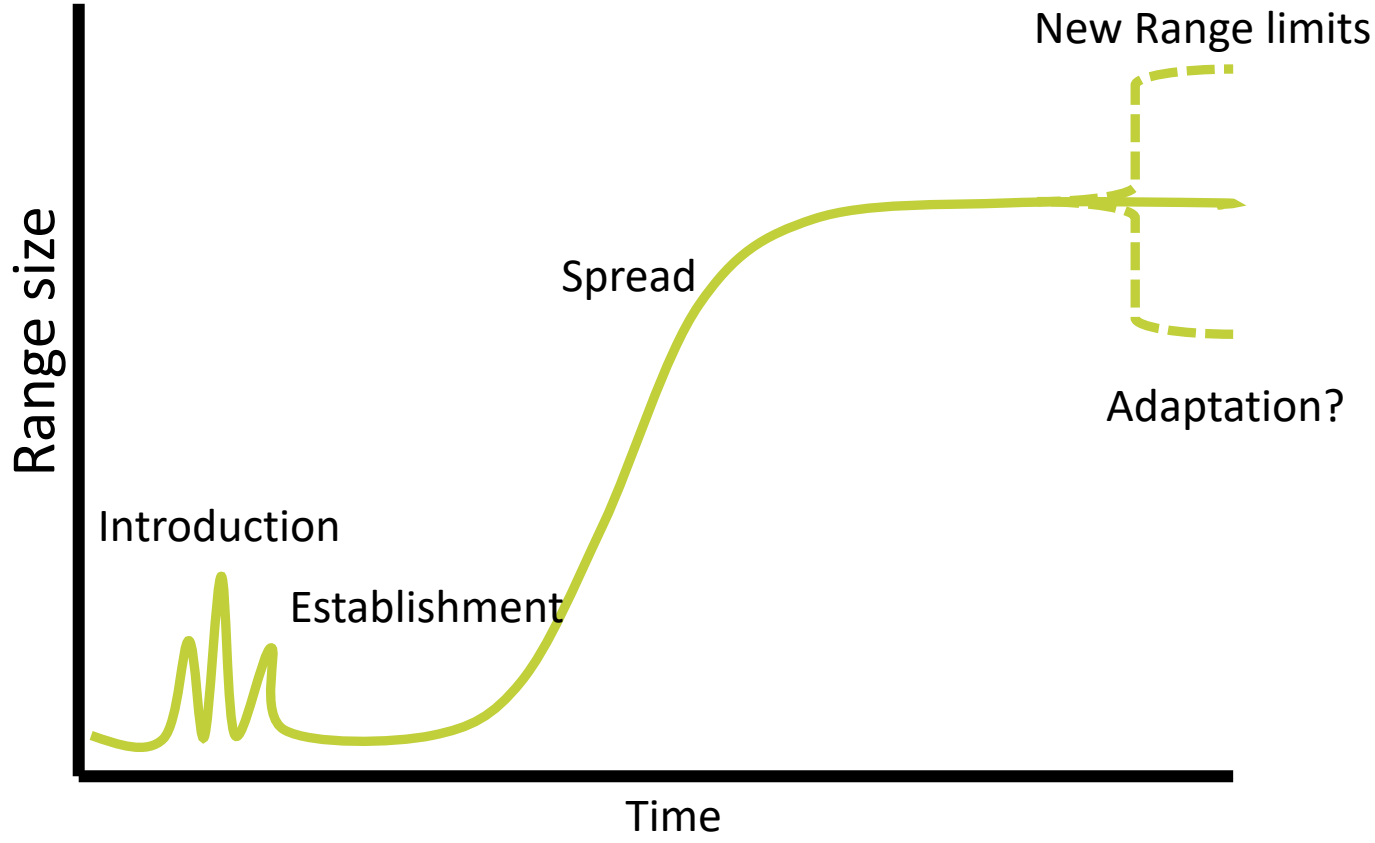


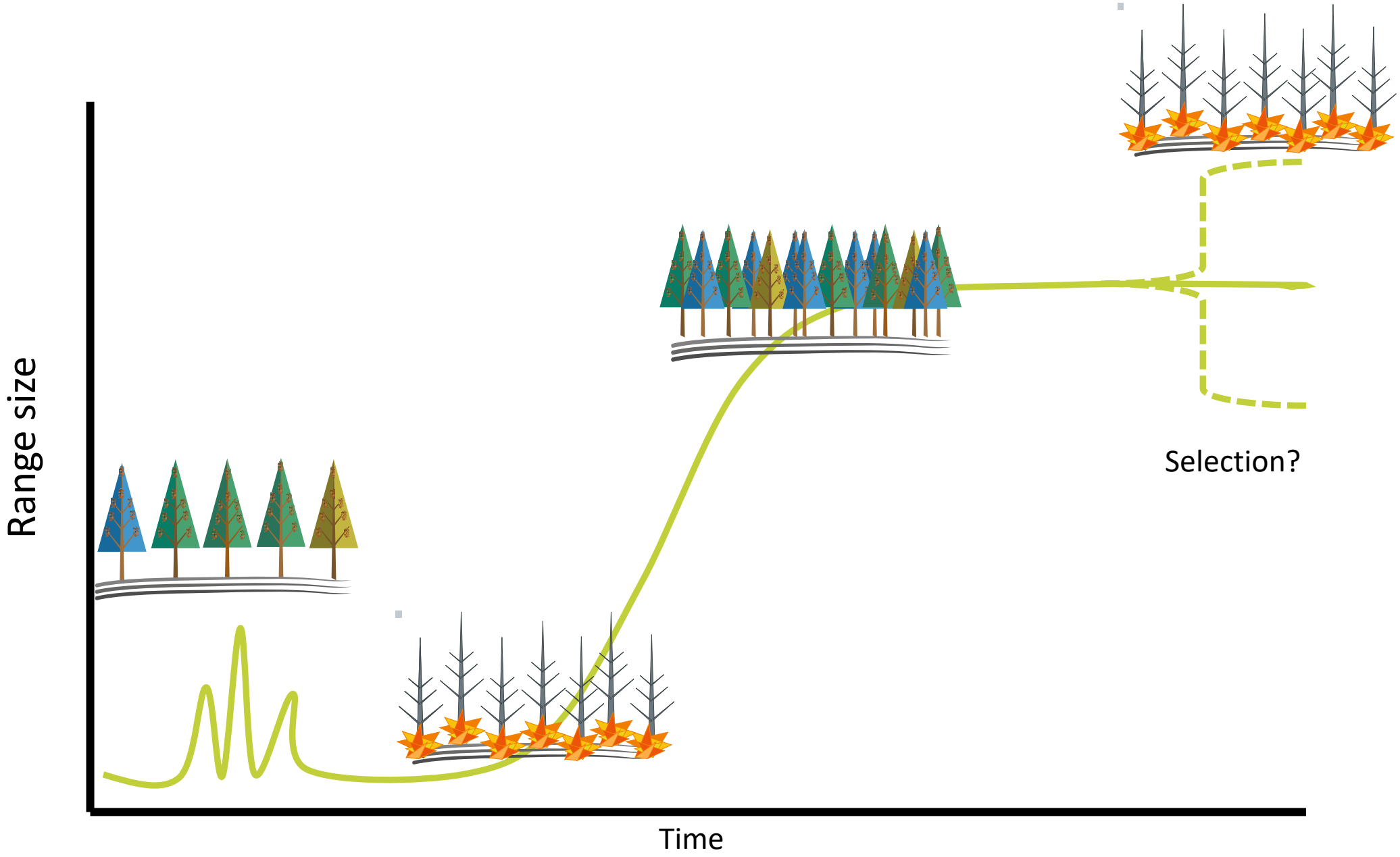
Genetics of *Pinus radiata*, the most widely planted forestry species, in its original and invaded range related to fire

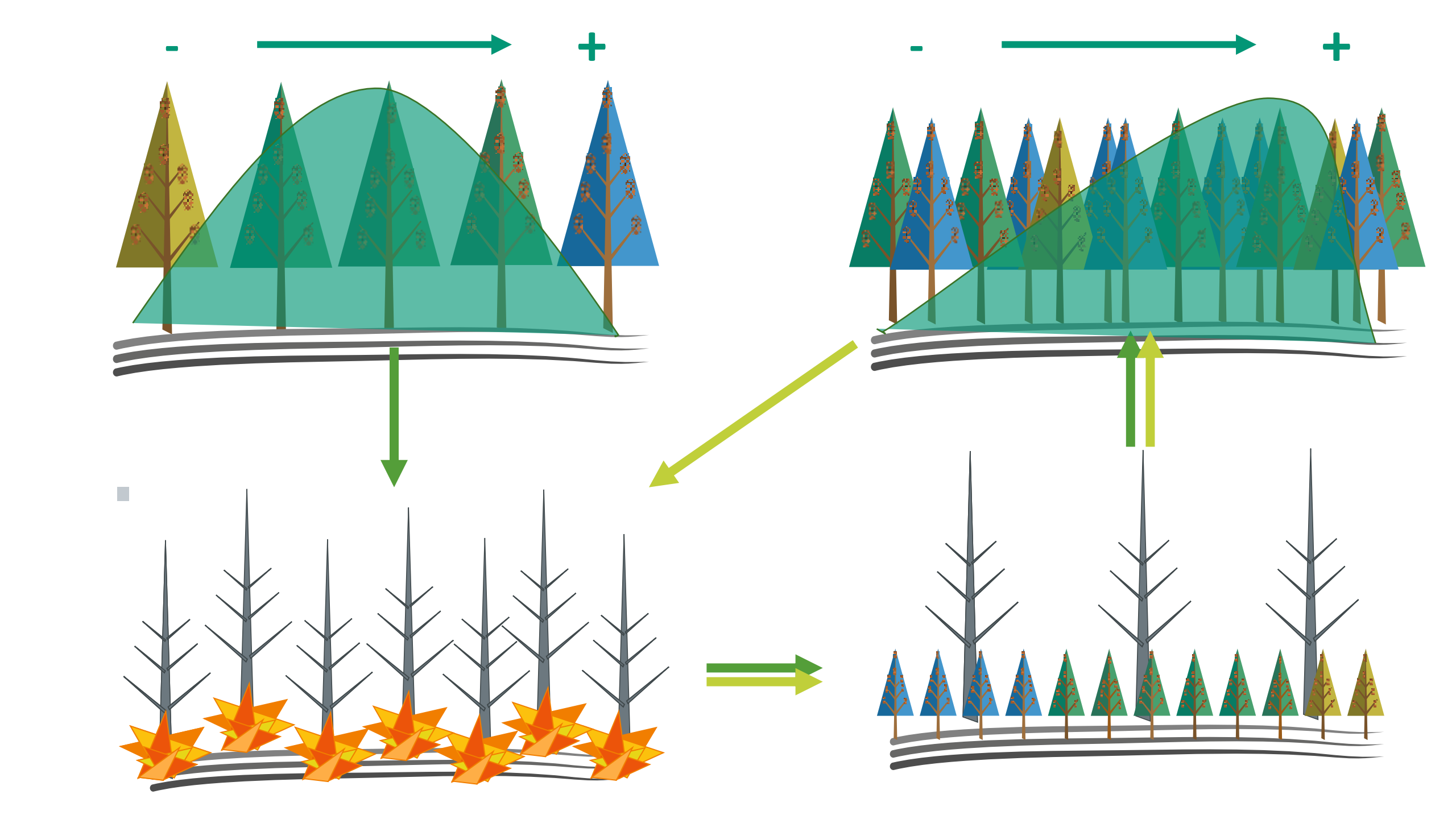
Ripa R.R., Franzese J., Raffaele E., Premoli A.C.
National Council of Scientific and Technical Research (CONICET), INIBIOMA, UNCo, Laboratorio ECOTONO



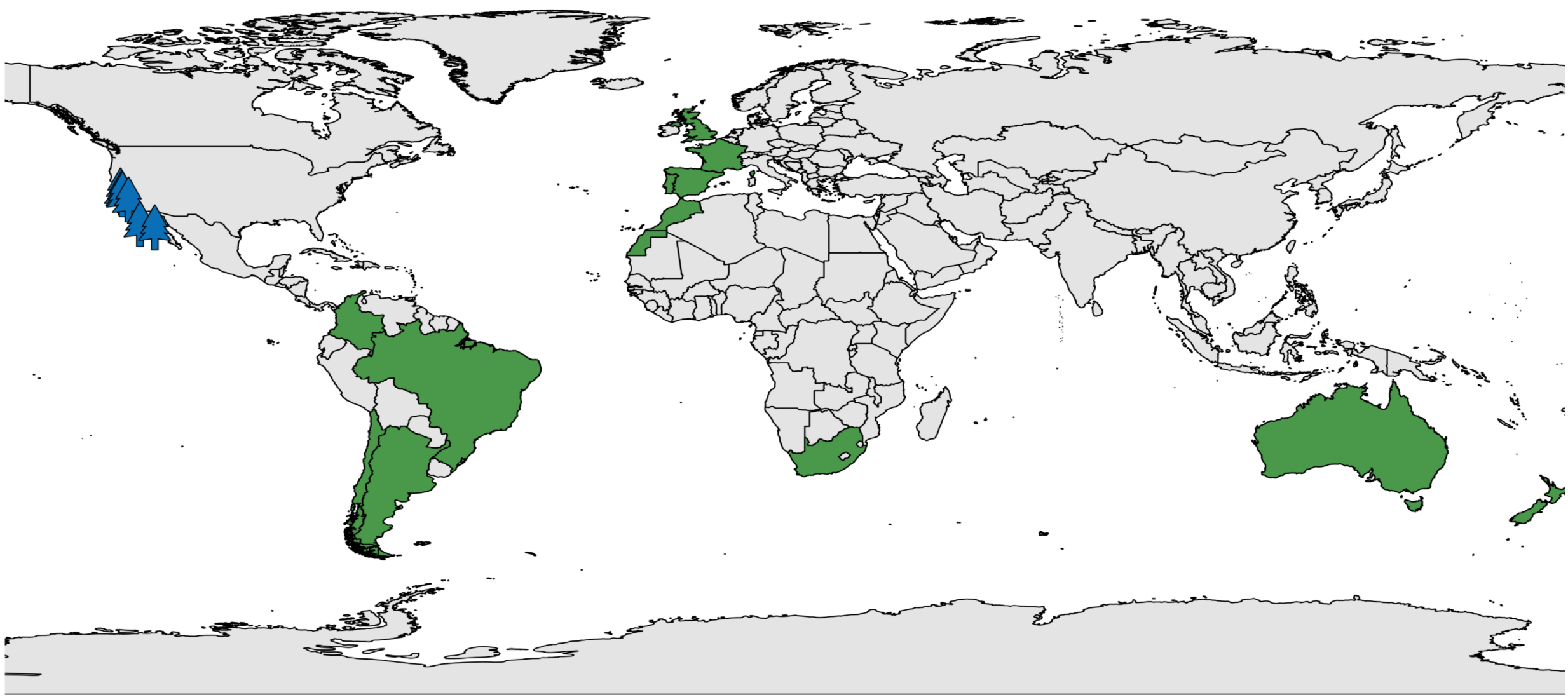
Barriers to plant invasion

Adaptative evolution process operating

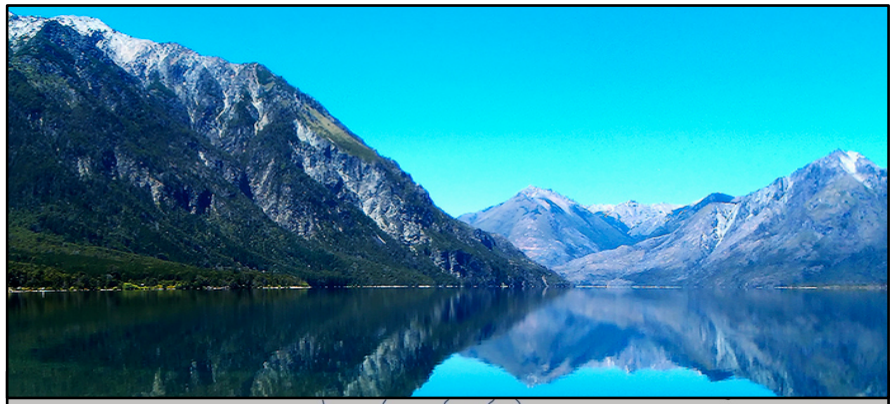

Range size
Time
Selection?

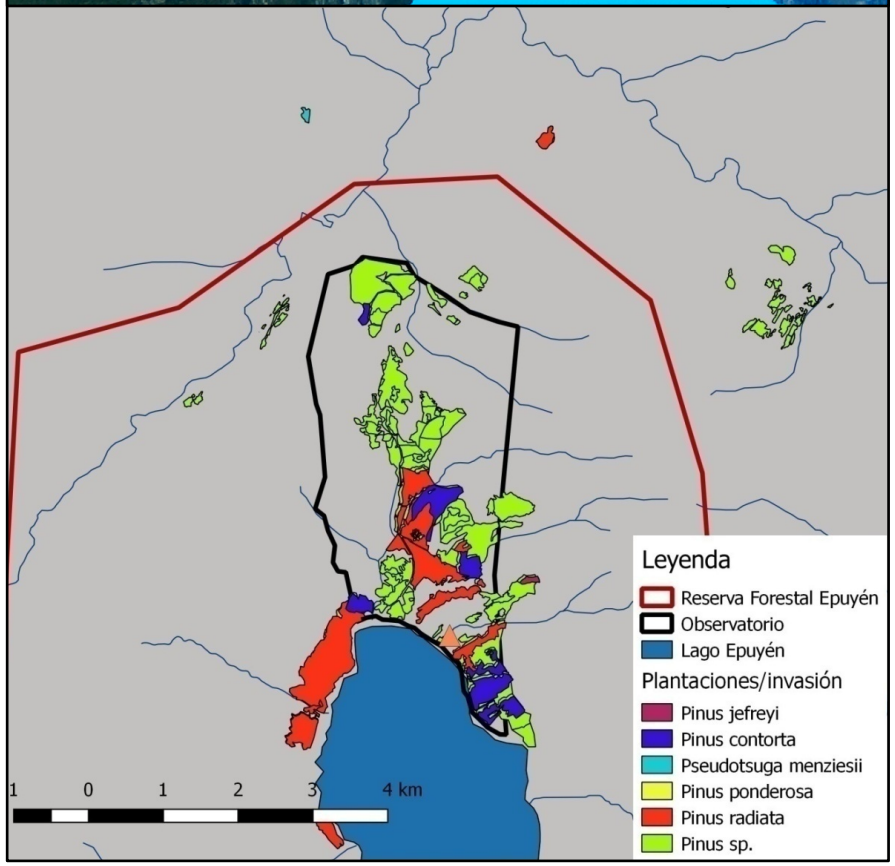


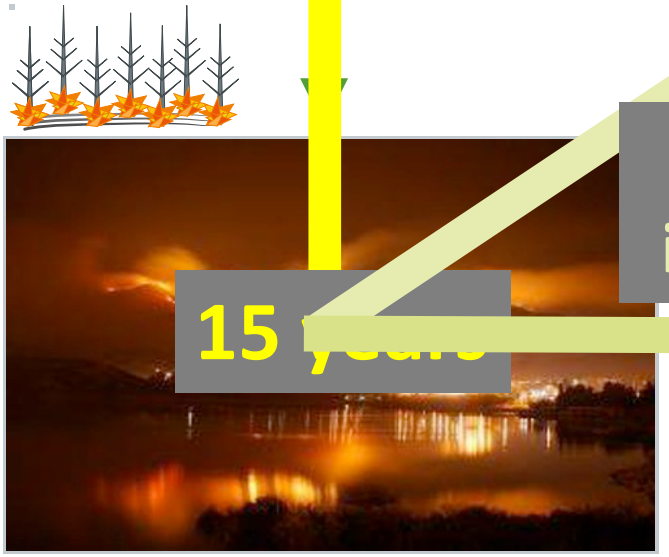
Study Species

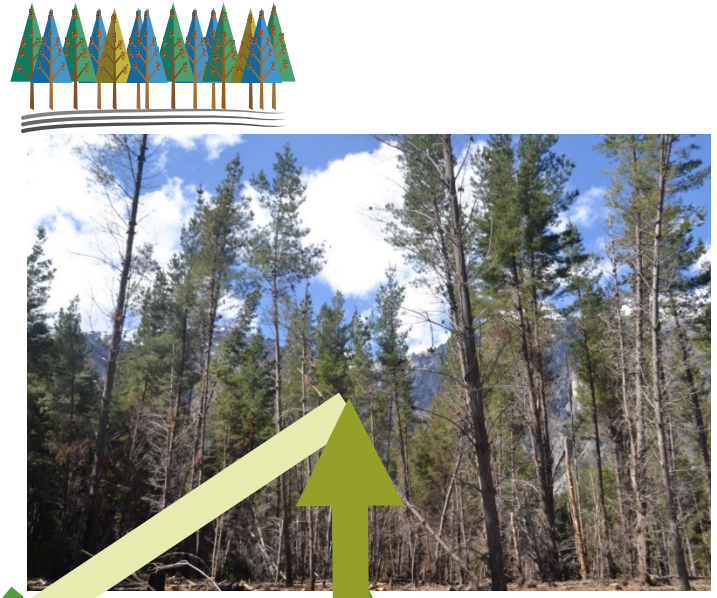

Legend
Native populations of P. radiata
Countries were P. radiata are implanted
Argentina
Australia
Brasil
Chile
Colombia
España
Nueva Zelanda
Sudáfrica
Francia
Marruecos
Portugal
Reino Unido
Sahara Occidental

Study Site





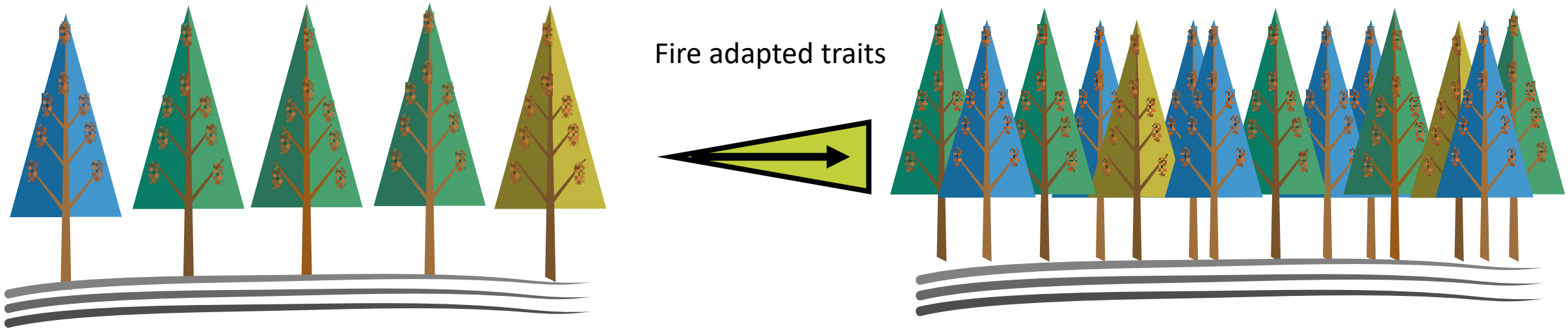




15 years

Three times
in ~ 60 years

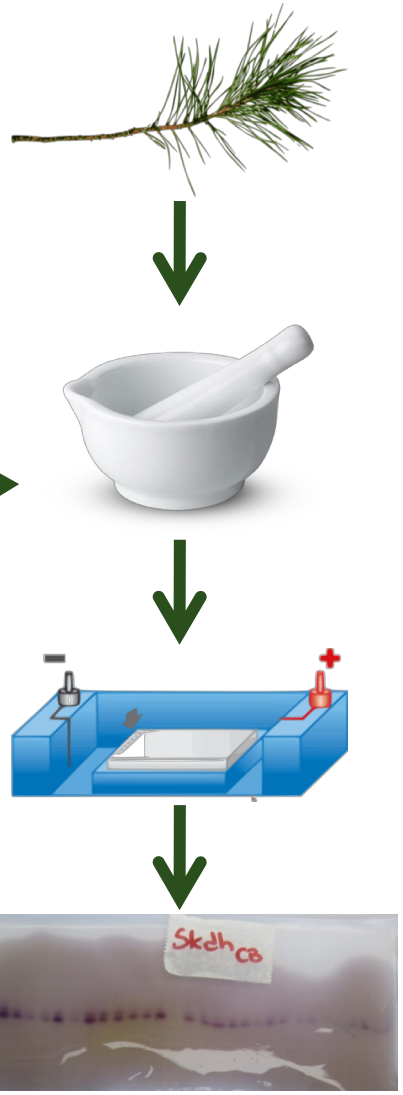
Objectives



- Analyze the role of fire as a selection agent and its effect on the genetic structure and diversity of *P. radiata* plantations and post-fire invasions in Patagonia Argentina;
- Study the genetic differentiation between its native and two exotic ranges: Australia and Patagonia Argentina.

Methods

100 pines per cohort



Data Analysis

For 3 data sets:

- 12 loci in 4 cohorts of Patagonia, Argentina
- All loci reported for 5 population of North America and 7 population of Australia
- 6 common loci to all populations

We Analyze:

- We calculate indicators of intra-population genetic variability: the percentage of polymorphic loci (%P), the number of alleles per locus (Na), observed and expected heterozygosis (Ho and He) and the fixation index (F)
- Between populations we calculate a divergence index (FST)

Methods

And quantify:

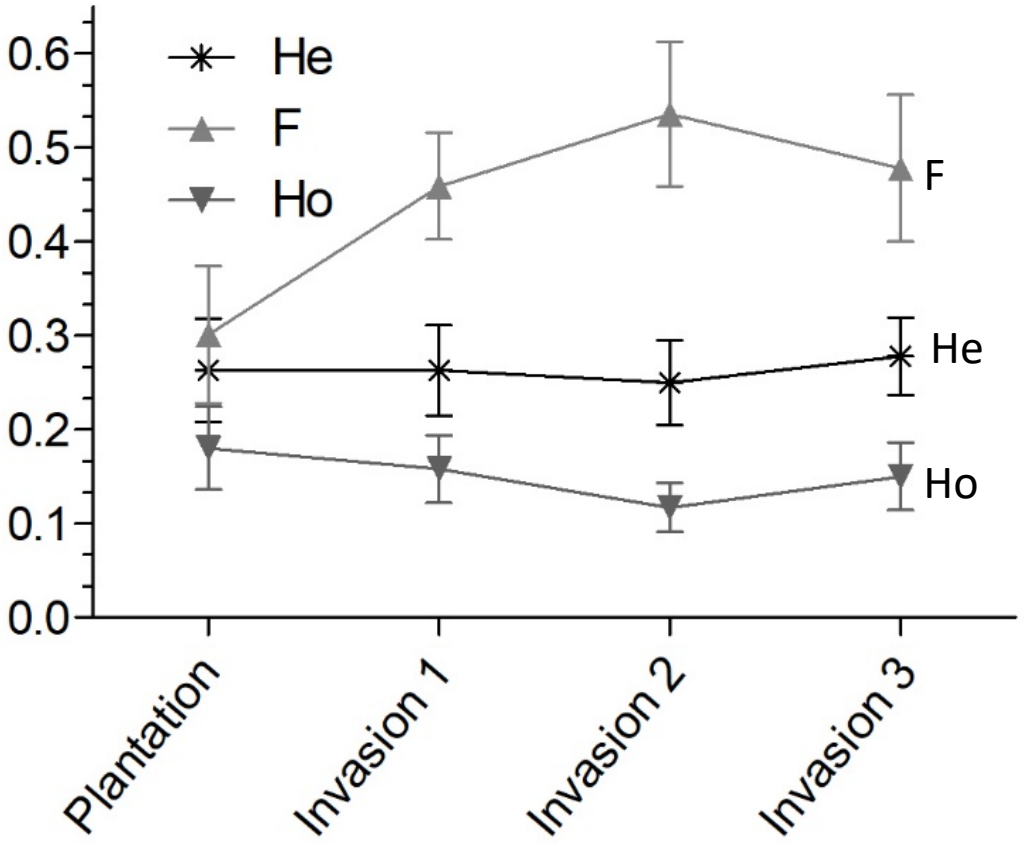
- Changes in frequencies for an adaptative trait as serotiny

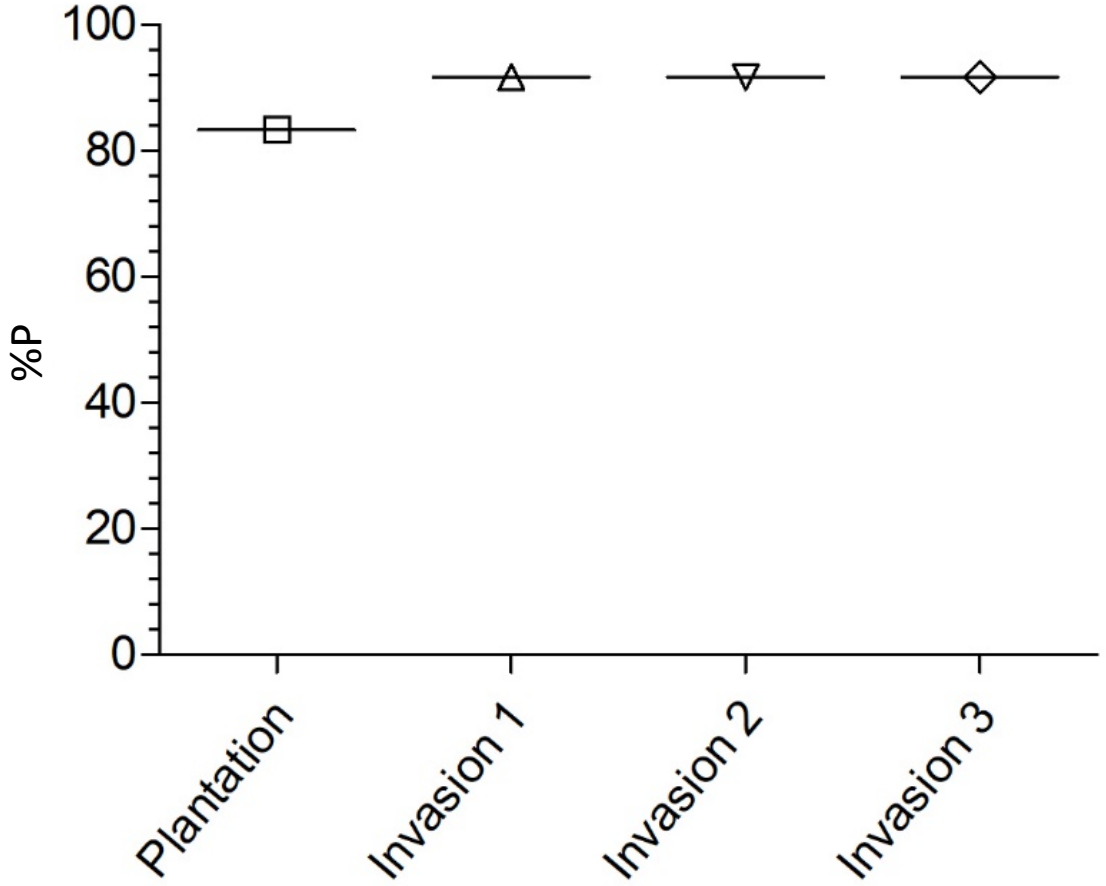
For 2 cohorts:

- Plantations
- Post-fire invasion

Results

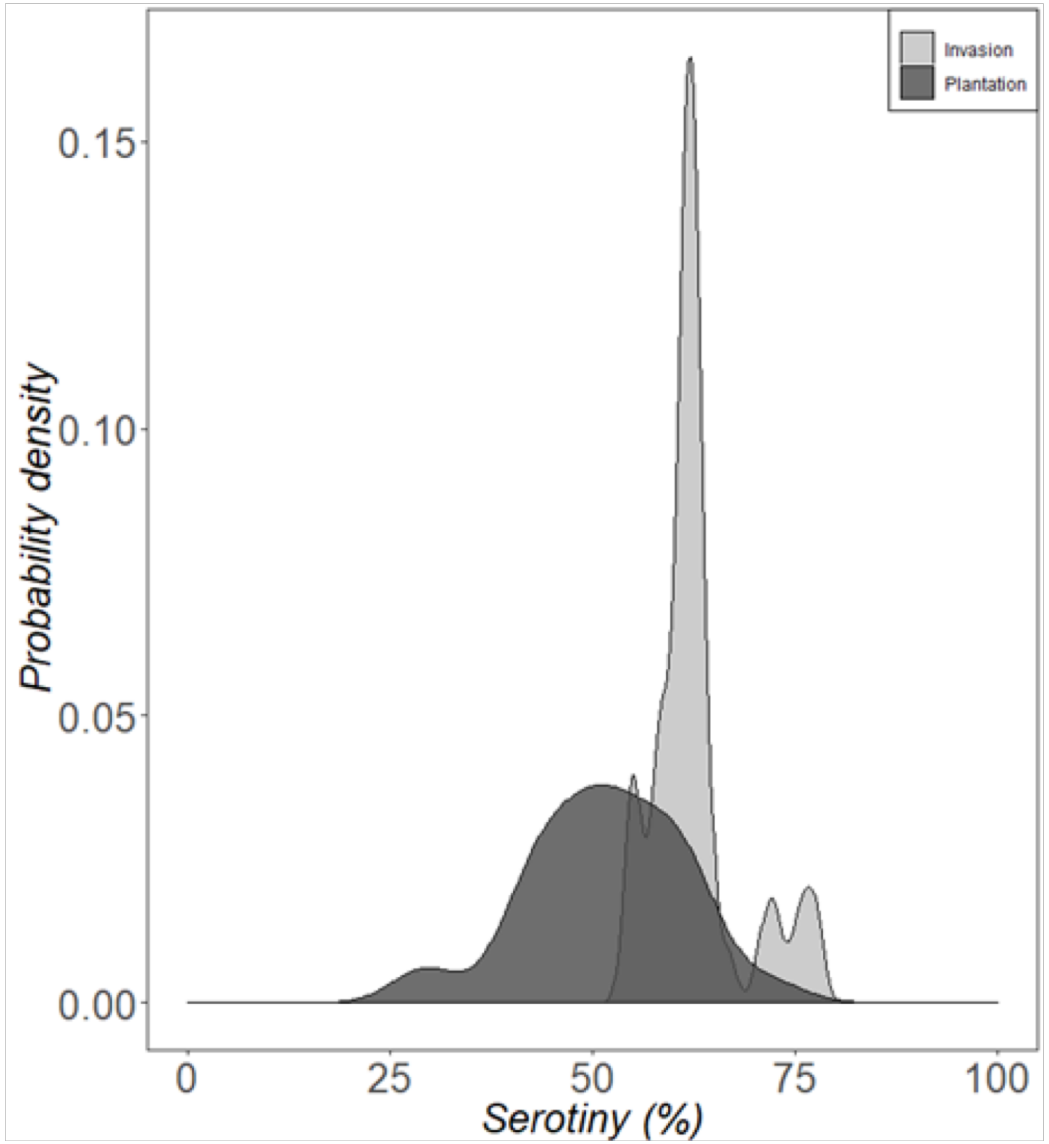
Effect of fire on the genetics of *P. radiata in Patagonia*

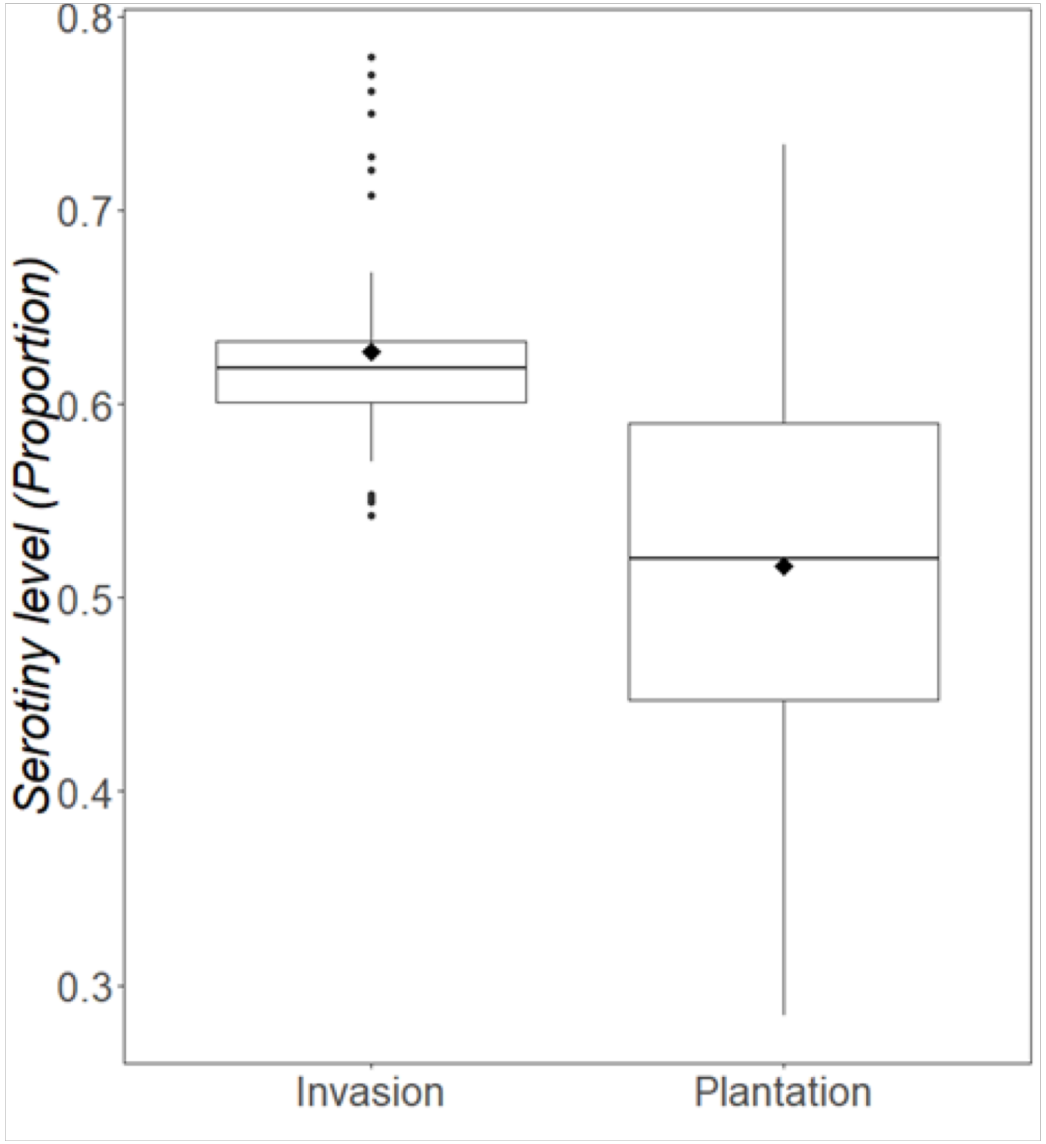




Results

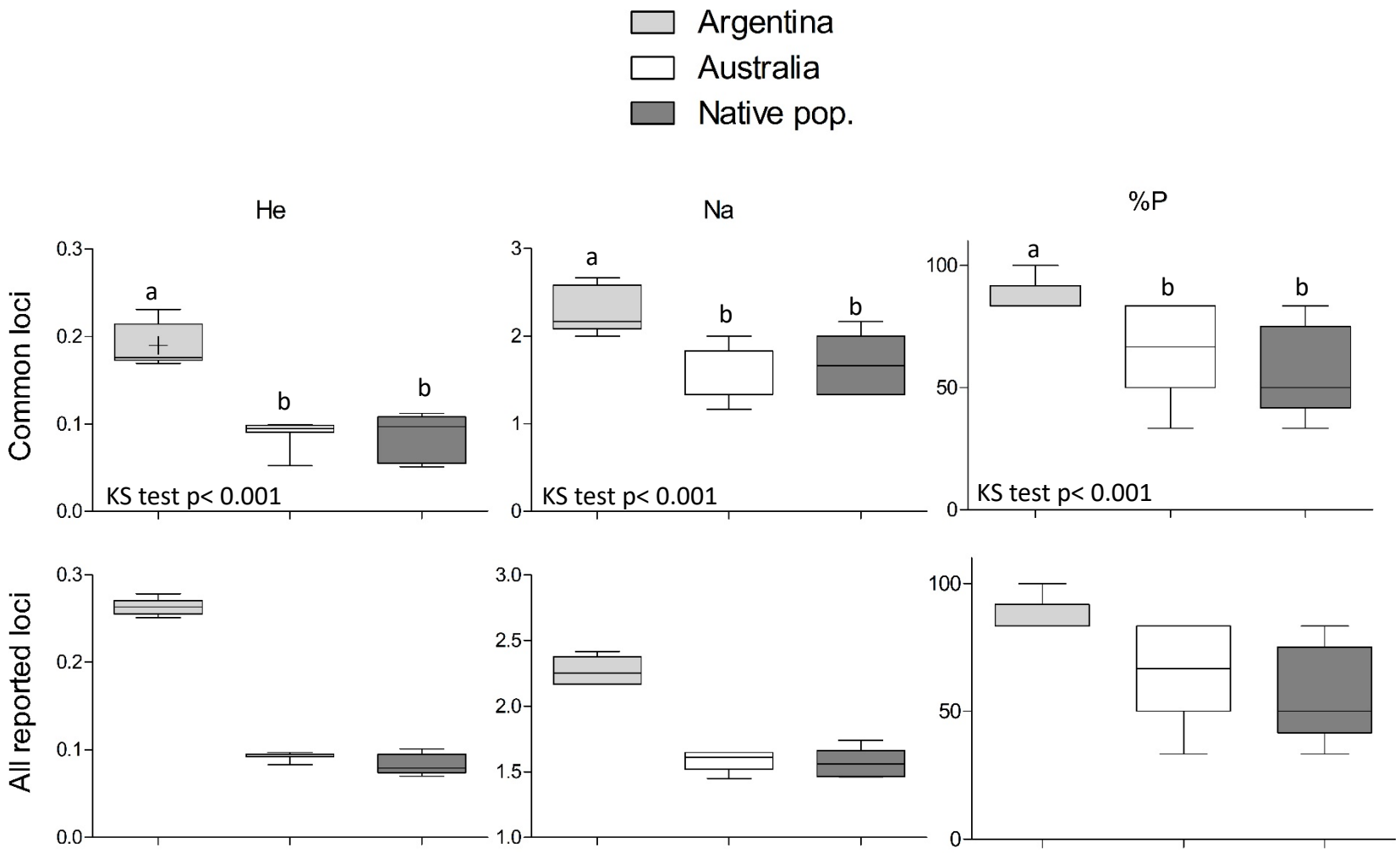
Effect of fire on the frequencies for an adaptive trait of *P. radiata in Patagonia*

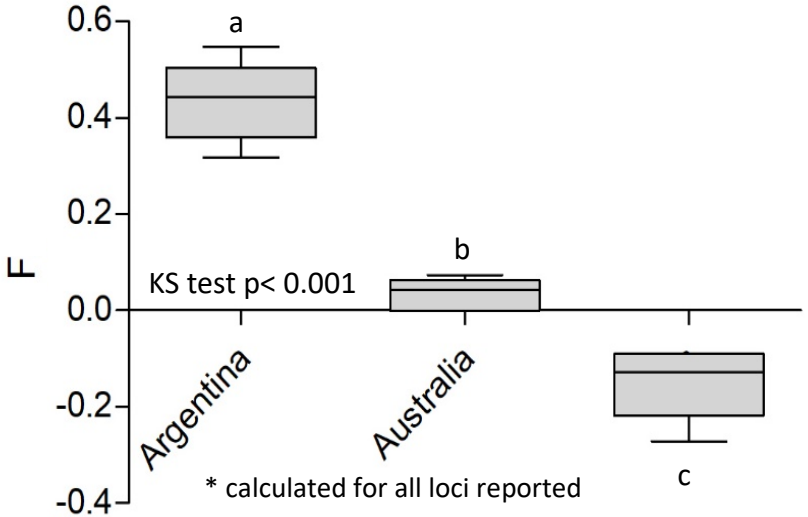


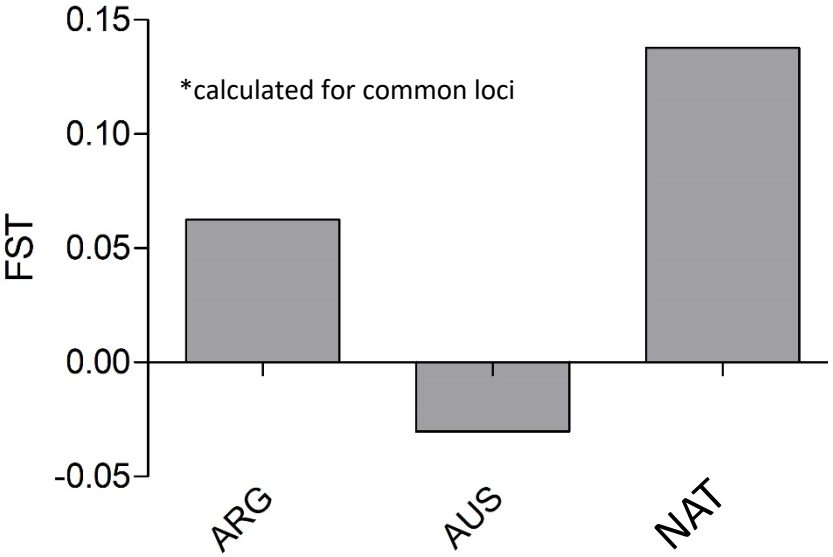


Results

Genetic differentiation between its native and two exotic ranges







Conclusions and discussion

- **Post-fire invasion** is characterized by a **higher frequency** of individuals with high serotiny levels. This suggests that **fire could be increasing the expression** of certain adaptative characters in post-fire cohorts.

- A tendency for an **increase in inbreeding** was observed in the **cohorts recruited after the fire** due to **bottlenecks** in each fire event. Yet level of polymorphism was high which can indicate that individuals with greater aptitude leave more offspring, thus producing an adaptative selection process and an increase in genetic diversity.

Conclusions and discussion

- The hypothesis of **bottlenecks in the introduction** of exotic species events **is not supported by** the higher values of the **number of alleles, polymorphism and genetic diversity in the exotic ranges**. New environments in the exotic range are probably favoring genetic variants that were eliminated by selection in the native range.

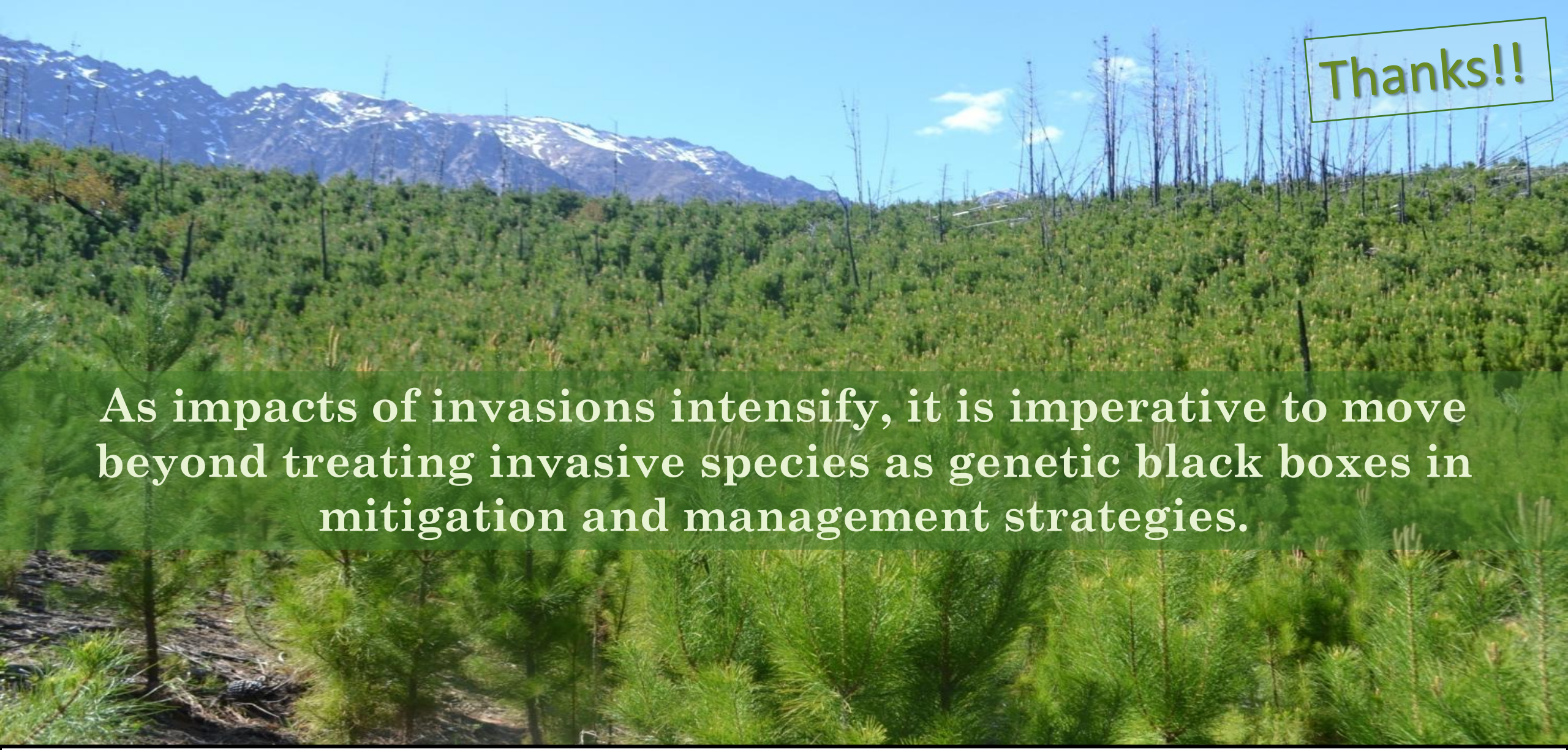
- The highest values of fixation index (F) in the two exotic ranges may reflect small population sizes after introduction, while native populations have high levels of exogamy.

Conclusions and discussion

- **High genetic divergence** is observed between the **native populations** (represented by the FST), that agrees with the geographic distance between them.

- At the same time, **no significant divergence** was observed among the **populations of Australia** that can be considered as a single population. This may be due to the fact that the same gene pool was used in the introduction of the species in all the sites and that they have not been subjected to differentiated evolutionary forces that could make them diverge.

- For **Patagonia**, a **moderate genetic divergence** was observed, which may be the product of genetic drift after fire events.



FONCYT AGENCIA

The Rufford Foundation

OBSERVATORIO NACIONAL DE LA DEGRADACIÓN DE TIERRAS Y DESERTIFICACIÓN

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