Long-term experimental site in temperate oak-pine forest

Nathalie Korboulewsky, Philippe Balandier, Yves Boscardin, Olivier Chaintreuil, Adélie Chevalier, Camille Couteau, Yann Dumas, Marion Gosselin, Jean-Pierre Hamard, Aviva Kara, et al.

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OPTMix

Oak Pine Tree Mixture

https:\\optmix.inrae.fr

Long-term experimental site in temperate oak-pine forest

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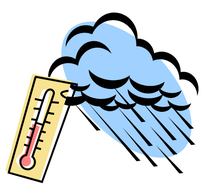
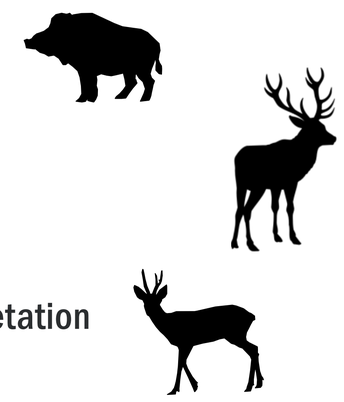
In the CONTEXT of climate change,



the increase of wood demand, the development of populations of wild ungulates, and the need to preserve soil and the biodivsersity, management practices have to evolve.

The OBJECTIVE is to study the effects of



- **stand composition** (pure oak, pure pine, mixed pine-oak) and
- **stand density** (number of trees/ha) combined with
- **presence of wild ungulates** (roe deer, wild boar, red deer),

on the ecosystem functioning such as tree productivity, resource use and allocation (including water and nutrients), biodiversity and understory vegetation dynamics including regeneration.

OPTMix is an experimental site

- ✓ **33 plots of 0.5 ha,**
- ✓ **40 ha** (including buffer zone)
- ✓ even-aged,
- ✓ lowland temperate forest stands
- ✓ 60-80 years old

The experiment consists of a partially **crossed factorial experiment:**

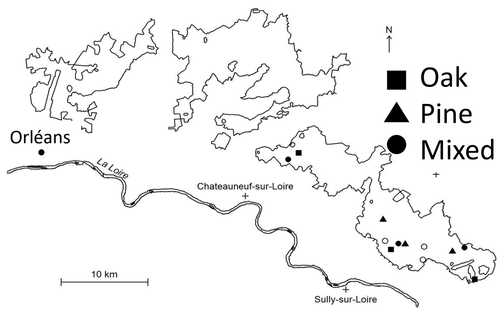
- ✓ stand composition and tree density (low and medium) have a completely crossed factorial design;
- ✓ the third factor, herbivory, is completely crossed with stand composition only for the low tree density.
- ✓ We added mixed control stands without any harvest (with the aim to study self-thinning process).

The site is equipped with sensors (temperature, light, relative humidity, rainfall, soil water content, soil water table depth) connected to a datalogger.

INRAE, G. Maisonneuve

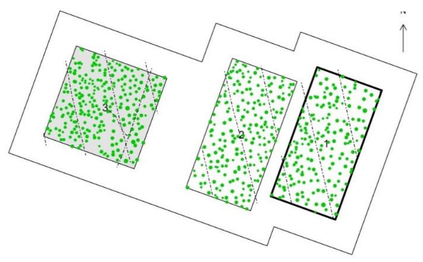
Some figures:

- 10 000 trees measures;
- 180 trees equipped with automatic dendrometers;
- 670 sensors for 15 000 data measured/day;
- 480 plots to study forest regeneration & plant diversity;
- 250 oak & 250 pine trees equipped for foliar sampling;
- 100 plant and animal species identified

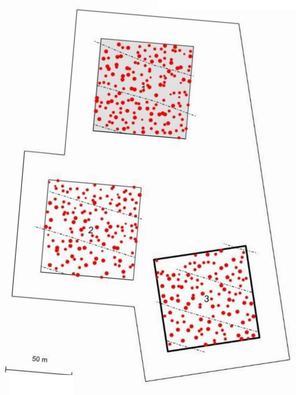


***Study site** in Orleans state forest in Central France (47° 49' N, 2° 29' E), and example of the experimental design for one of the three replicates.*

■ Pure sessile Oak, *Quercus petraea*



▲ Pure Scots pine, *Pinus sylvestris*

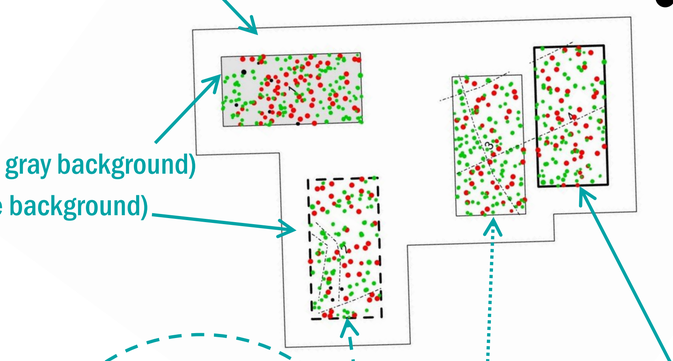


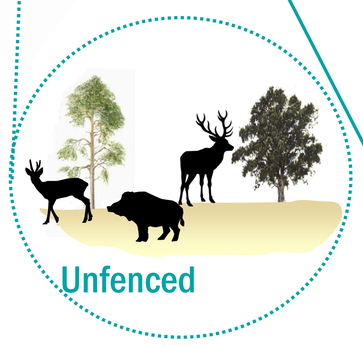
● Mixture oak-pine

Buffer zone (>20 m-wide)

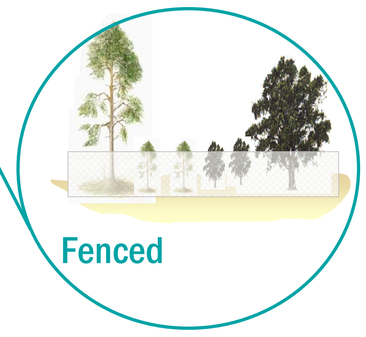
Stand density:

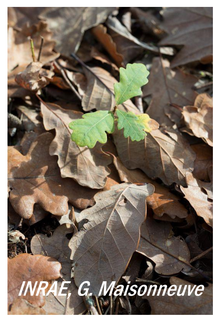
- **medium** (RDI=0.7, gray background)
- **low** (RDI=0.4, white background)





Total exclusion or partially open for large ungulates





We study various parameters on soil (physico-chemical parameters, water, nutrient cycle), vascular plants, bryophytes and lichens (diversity, cover, litter quantity and chemistry) and animals (diversity, predation) in order to understand:

(i) the functioning of mixed stands vs monospecific stands, (ii) the role of biotic and abiotic factors on forest dynamics including biodiversity and tree regeneration, (iii) benefits and limits of management practices to face climate change and (iv) the vulnerability of forests towards global change.

The experiment will benefit to forest managers and stakeholders to meet the socio-eco-environmental challenges.

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