Accelerated succession in novel riparian ecosystems with long-term impact legacies, evidence from cross-comparison with a reference site

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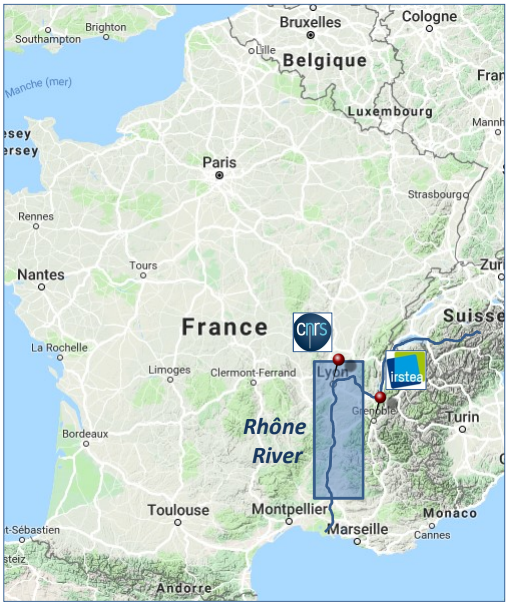
Just to introduce myself…



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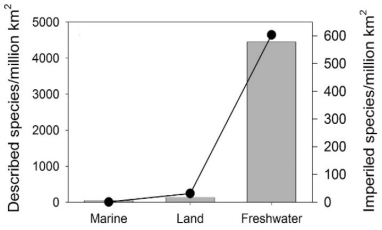
- Community structure on gravel bars

- Ecological trajectory of riparian forests

Riparian zones

Riparian ecosystems are small natural features with ecological importance disproportionate to their size



Riparian communities from the upper to the lower part of the banks

Poff et al. 1997, Strayer & Dudgeon 2010, González et al. 2016, Naiman and & Decamps 1997, Sabo et al. 2005

Human-induced changes

Worldwide, riparian zones have been profoundly impacted by human activity

Channelization and flow regulation

↓

Flow and sediment regimes

↓

Abiotic and biotic conditions

↓

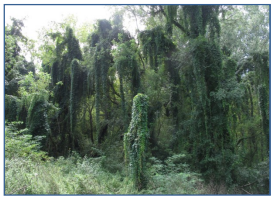
Relict, hybrid and novel ecosystems

Dudgeon et al. 2006; Feld et al. 2011; Nilsson et al. 2005; Poff et al. 2007; Poff & Zimmerman 2010

Research questions

Understand whether channelization and flow regulation induce changes in riparian forests attributes among successional phases

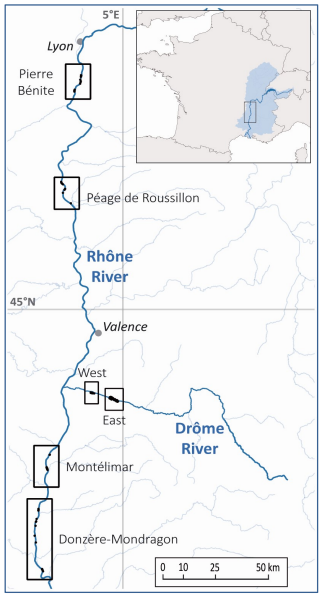
- How functional, structural and compositional riparian forest attributes vary with stand age along highly altered and a near-natural river margins?
- Are successional trajectories of riparian forests different between both river systems?



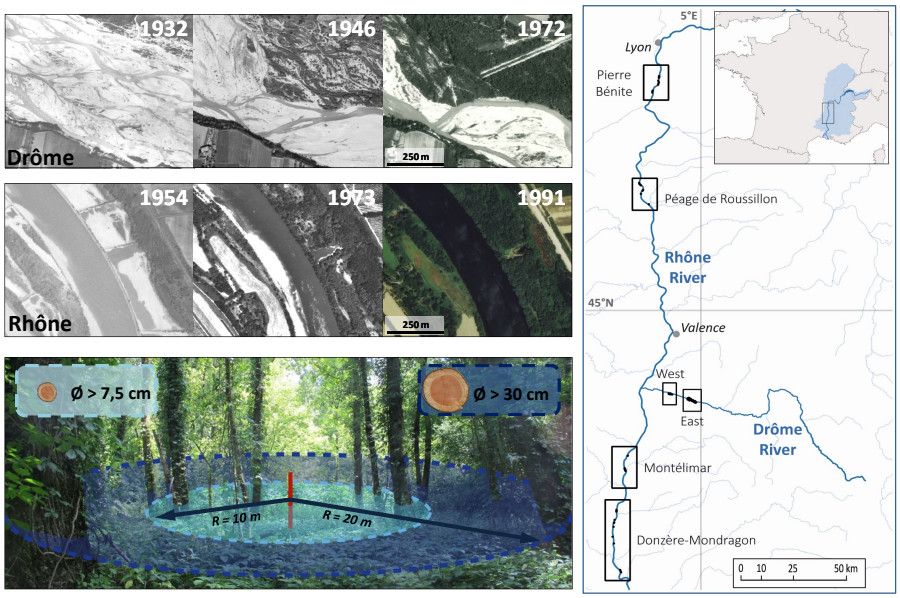
Study area and sampling design

- Drôme: near-natural reference:
  n = 69, 5-62 years

- Rhône: channelized/regulated:
  n = 65, 16-76 years

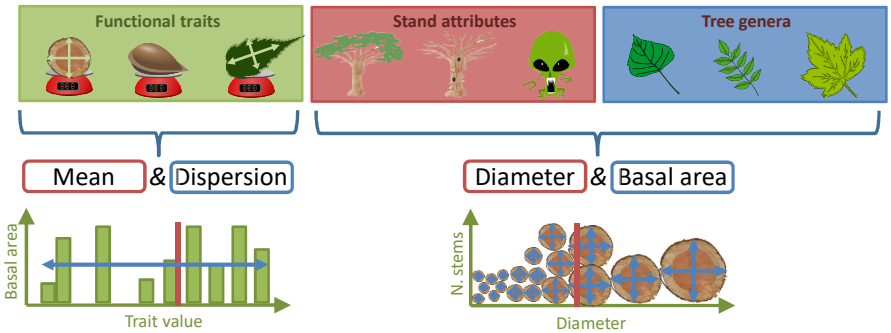


Study area and sampling design



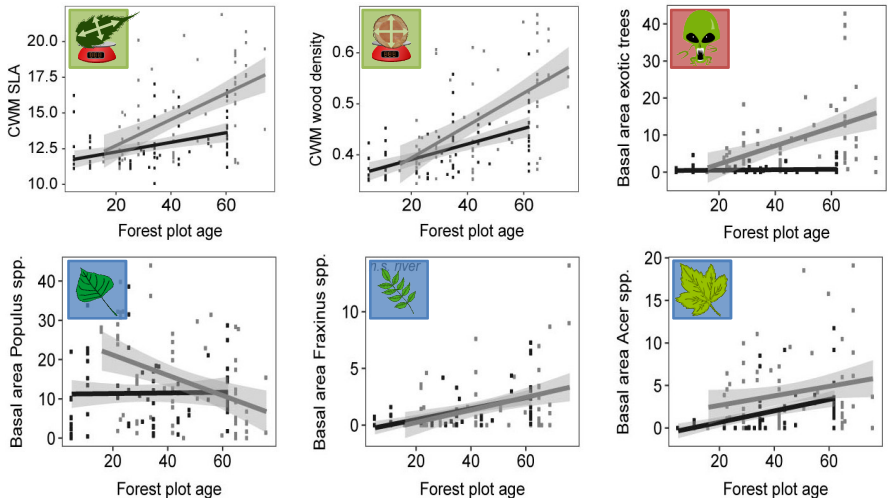
Analytical strategy

- Three groups of forest stand variables (LMMs / GLMMs)



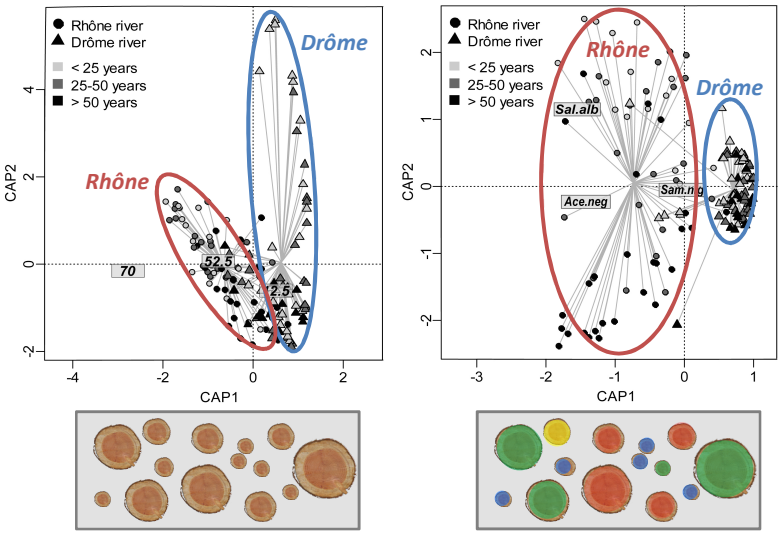
- Structure and composition (multivariate GLMs)

Results

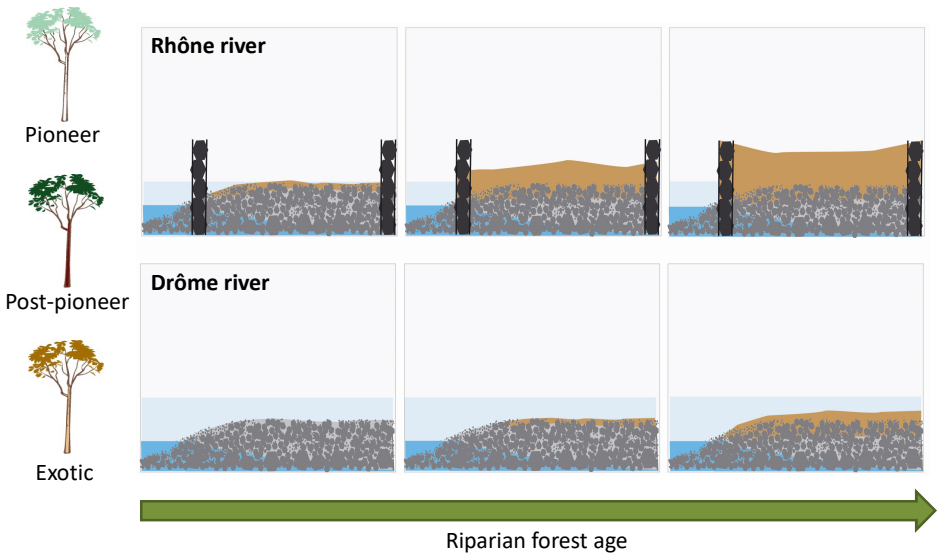


Rhône Drôme

Results: stand structure and composition



Synthesis



Take-home messages…

- Common pattern of shifting in functional traits or in species composition exist in the early successional phase;
- Differences in composition and structure appear and increase along successions between both river systems;
- Channelization and flow regulation have induced a more rapid terrestrial-like succession and accelerated transition to the mature successional phase;
- Resource-rich environment facilitate the establishment success of exotic invasive species;
- Differences in abiotic and biotic conditions lead to rapid and irreversible divergences in ecological trajectories;
- Riparian forests along the Rhône river could be regarded as a “novel ecosystem” for which restoration thresholds are most likely exceeded;
- Alternative strategies should be developed to manage degraded riparian forests.

Acknowledgements

Plant trait values:

TRY Plant Trait Database

The LEDA Traitbase

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LabEx DRIIHM

Investissements d'avenir

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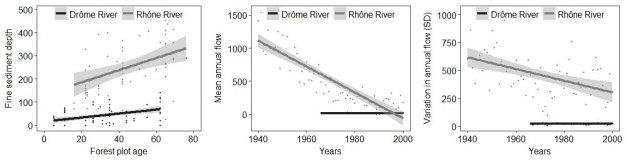
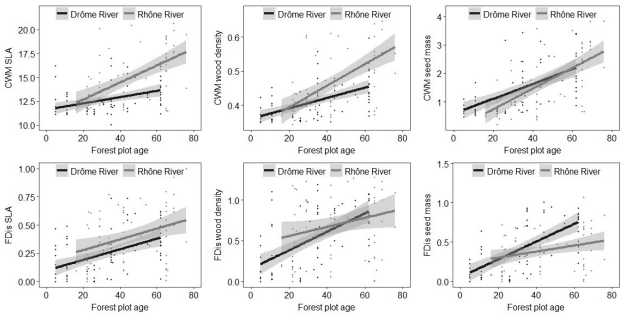
Others results

- Abiotic parameters

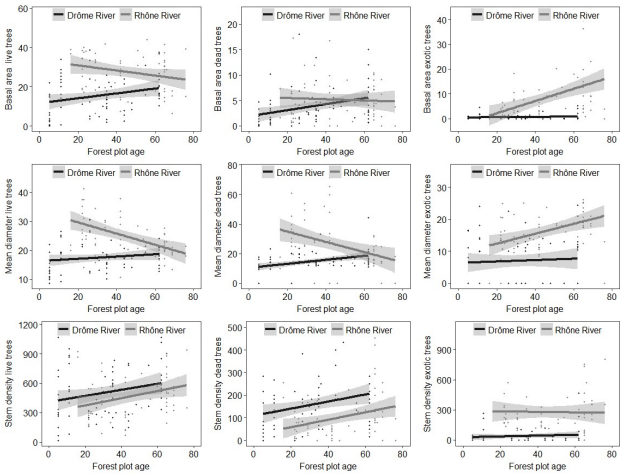


- Biotic parameters : functional traits



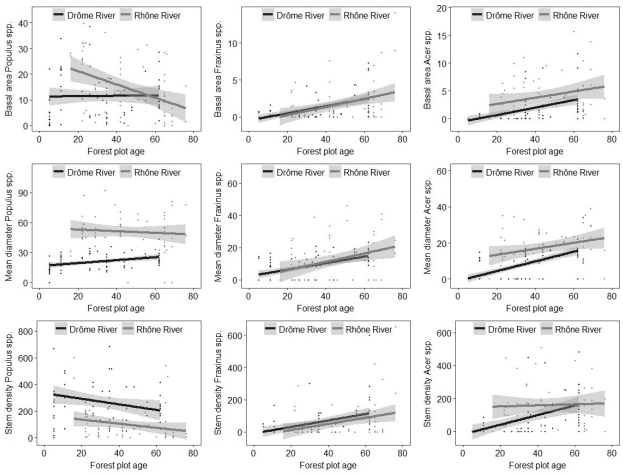
Others results

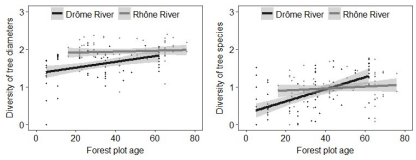
- Biotic parameters : stand attributes



Others results

- Biotic parameters : tree genera



Others results

- Biotic parameters : diversity indices