PHD POSITION OFFERED IN FOREST ECOLOGY

'The impact of global warming on the hardwood-conifer balance in temperate mixed forests - an intercontinental approach'

CONTEXT AND OBJECTIVES

The equilibrium of mixed deciduous-conifer forests is threatened by global warming. Signs of dieback and decreasing tree growth trends have been recently observed on montane/boreal coniferous species such as Fir (*Abies alba*) or Spruce (*Picea abies*). At present, the extent to which the recent decreasing growth trends affect species competitiveness in mixed coniferous-broadleaves stands remains poorly known. **The objective of this PhD thesis project is to explore the hypothesis of a progressive decline of conifer competitiveness in mixed hardwood-coniferous forests with global warming**. In order to develop a general conceptual approach, we will work with a couple of tree species emblematic of mixed forests in Europe and North America: the beech-fir mixture that is dominant in the European mid-elevation mountains and the more complex multi-species mixtures characteristic of the mixed forests of the northeastern United States.

The project will be structured into three work packages aiming to : (1) assess the temporal growth trends of coniferous species compared to deciduous species from 1900 to 2022, focusing on the last decade, which contains 7 of the 10 warmest years ever measured; (2) test the hypothesis of a coniferous vulnerability in the warm part of the climatic gradient and a growth stability in the cold part; (3) explore the effect of the interspecific competition on the growth trends in mixed forests experiencing different competition levels (between 2 to 4 species in Europe and between 4 to 12 in North America).

STUDIED AREAS, DATA, AND METHODS

In France, we will study growth trends in mixed forests among several existing network of plots in mountain ranges: Vosges Mountains, Jura and Alps. New sampling (tree cores) will be performed by the PhD student and our team. He/she will then study silver fir (*Abies alba*), spruce (*Picea abies*), beech (*Fagus sylvatica*) and sessile oak (*Quercus petraea*). Another set of cores will be taken by the PhD student and the US team in existing 100-120 plots in northeastern United States on 12-18 tree species. The growth characteristics will be processed according dendrochronological approaches to analyze and model growth patterns along altitudinal and climatic conditions.

RESEARCH TEAM

The PhD will be carried out at the Nancy center of AgroParisTech in the SILVA Research Unit (Université de Lorraine, AgroParisTech, INRAE), which aims to carry out multidisciplinary research on wood, trees and forest ecosystems. This project tackles a central research axis of UMR Silva aiming at a better knowledge of the impact of climate change on temperate forest in order to anticipate forest management in a changing environmental context. This project also supports ongoing collaboration between Silva researchers and the Harvard Forest, a research station of Harvard University.

PhD SUPERVISORS:

- PhD Director: Damien Bonal, Research director at INRAE in ecology and ecophysiology, UMR SILVA.
- PhD co-Director: Paulina PINTO, Research Engineer on plant ecology and tree growth, AgroParisTech, UMR SILVA.

Participation to the PhD supervision: Neil Pederson, Ecologist and senior scientist at the Harvard Forest, Harvard University. Cyrille Rathgeber, Research director at INRAE in wood formation and climatic change and Jean-Claude Gegout Professor of Forest ecology at AgroParisTech.

CANDIDATE PROFILE: The candidate must hold a Master's degree in ecology, forest or environmental sciences and engineering, or a related field, with a good English level. Experience in conducting field work and handling big datasets, modelling, statistical analysis are preferred (particularly with R), but not exclusive for the successful candidate.

TYPE of CONTRACT/Salary and Conditions:

Three-year PhD thesis scholarship funded by Lorraine University of Excellence. All lab and travel expenses covered by funded project.

TO APPLY:

On-line via the ADUM website of Université de Lorraine, or by sending your application to paulina.pinto@agroparistech.fr and damien.bonal@inrae.fr with email subject: "Application for PhD HACOR Project" and the following documents:

- (1) Motivation letter
- (2) Detailed CV
- (3) Grades of Master or Engineer degree and copy of Diploma
- (4) 1-2 letters of recommendation.

DEADLINE TO APPLY: 28th of June, 2023, midnight.

BEGINNING OF PhD CONTRACT: October 2023.