Metaprogram
BIOSEFAIR

ECART

PATHFINDER PROJECT

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Do retention trees remain efficient for forest biodiversity conservation in a climate change context?

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Keywords
Green tree retention
Microclimate
Tree crown
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Tree dieback

Thematics involved
Micrometeorology
Community ecology
Forest ecology
Bryology
Mycology
Forest ecophysiology

Departments involved
AgroEcoSystem
ECODIV
PHASE

Units involved
UR EFNO
URZF
UMR BIOGECO
UMR ISPA
USC Ecodiv-Rouen
UE PAO

Partners
Office national des Forêts (ONF)
Centre National de la Propriété Forestière (CNPF)
Département Santé des Forêts (DSF)

Backgrounds and challenges

Retention forestry is recommended to benefit biodiversity. This practice implies that habitat-trees are deliberatly selected and retainded beyong harvesting cycles. By maintaining a steady microclimate in the undersory and providing microhabitats, retention trees are intended to hel forest specialist species to realize their ecological niche. Retention trees may be stressed by ongoing climate changes (drought, heat) with possible consecutive dieback. Crown defoliation may modify the forest microclimate as well as its stratification along a vertical gradient from the soil to the canopy. When being exposed to highly unusual climatic conditions both at their vertical (canopy/atmosphere) and horizontal (closed canopy forest patch/forest gap) frontiers, do retention trees remain efficient for forest biodiversity conservation?

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Objectives

We will compare the distribution of microclimatic variables and biodiversity of two focus taxa (bryophytes, fungi) over the whole tree (trunk + crown) and along three different gradients (healthy vs. declining oak tree, pedunculate vs. sessile oak, at the center vs. at the edge of the retention patch). We aim at understanding how new and unusual climatic conditions, as well as tree dieback, determine the presence of the species, that is to say the efficiency of retention practicies for the conservation of biodiversity. We also aim at identifying the best strategies to conserve forest biodiversity, taking into account new climatic conditions and their interactions with the 3 D structure of the trees and retention patches, as well as the requirements of forest managers.

Approaches

Several technical challenges have to be addressed in order to built an innovative protocol to combine microclimatic and biodiversity data collection on a double (vertical and horizontal) gradient in the whole tree. Tree climbers (EFNO unit) will collect both bryophytes and fungi data through sampling points distributed vertically (along the trunk) and horizontally (on crown branches, in the inner and in the outer crown). They will install microclimatic sensors on the same locations. We will compare on the field two technical solutions to collect and send the macroclimatic data. One is based on wired sensors (developed by URZF Unit) whereas the other is wireless (ISPA and BIOGECO units).

In order to relate the distribution of the microclimate and biodiversity over the whole treee with the tree species and its sanitary status, we will apply the previous protocol to paired trees, according to the tree species (sessile vs. pedunculate oak, 8 replicates) or the sanitary status (healthy vs. declining, 8 replicates). In order to analyse the effect of the environment around the tree, we will study oak tree retention patches within regeneration stands. The distribution of the microclimate and biodiversity over the whole treee will be analysed depending on the tree location (ceter or edge of the patch) and the size (large or small) of the patch (5 replicates).