FICHE PROJET

www.list.lu/fr/recherche/projet/forfus-rt21/?no_cache=1&cHash=a55b34a87d20aae619c378c67ef78b11

FORFUS-RT2.1

PhD project on drought and heat damage to trees, part of the "Forest function under stress" doctoral training unit (FORFUS)

Inspiration

Although the mechanism by which drought and heat damages trees is poorly understood, it is known that water depletion from plant tissues and the associated low water potential values can result in a destructive embolism inside water transport tissues, hence reducing their potential to resume the water supply after the drought. To prevent such damage, trees can close their stomata when the water supply from the root system is inadequate. However, this reduces CO2 uptake and photosynthesis, potentially leading to carbon starvation over extended time periods.
Experiments suggest that water preservation is more crucial than CO2 uptake during a drought, but stomatal closure, especially during a heat wave, also carries the risk of reaching lethal leaf temperatures in sun-exposed leaves.

Innovation

The objectives of FORFUS-RT2.1 are to (a) develop methods to quantify heat and drought damage to trees, and (b) better understand how vulnerable different tree species at different sites are to hydraulic failure and heat damage during heat/drought waves. The doctoral candidate will leverage LIST's extensive network of monitoring sites and a new rain exclusion experiment carried out in collaboration with FORFUS-RT1.2.

Thermographic infrared cameras will be installed at selected sites to record leaf temperatures, and stem dendrometers to record stem growth and water status. Stem psychrometers are available to establish links between the stem water deficit and water potential. Monitoring activities can be complemented by both episodic leaf gas exchange measurements to assess the vitality of leaves, and the sampling of twig materials, followed by a laboratory analysis of their hydraulic conductivity and embolism degree.

Impact

The scientific knowledge generated in this project will help identify the tree species and forest types with good survival chances i n future climates in Luxembourg. The understanding and methods developed as part of the project are expected to be useful for similar studies at different sites around the world, in order to strengthen our ability to understand, anticipate and ultimately prevent drought and heat-related forest decay.

Partenaires
Administration de la nature et des forêts (LU) , BOKU (AT) , Center for International Climate Research , Groupement des Sylviculteurs a.s.b.l (LU) , Luxembourg Institute of Socio-Economic Research (LU) , Musée national d'histoire naturelle Luxembourg , National Institute of Statistics and Economic Studies (LU) , Swedish University of Agricultural Sciences (SWE) , Technical University Delft (NL) , University of Naples (IT) , University of Agriculture Krakow (PL) , University Göttingen (DE) , University of Trier (DE) , University of Edinburgh (UK) , University of Tartu (EE) , The National Institute for Public Health and the Environment (NL) , INRAE (FR) , Université Catholique de Louvain (BE) , Ville de Luxembourg , Sapienza University Rome (IT) , Wageningen University (NL)

Support financier
Fonds National de la Recherche Luxembourg , Luxembourg Institute of Science and Technology

Contact
5, avenue des Hauts-Fourneaux
L-4362 Esch-sur-Alzette
tél : +352 275 888 - 1 | LIST.lu

Stanislaus SCHYMANSKI
(stanislaus.schymanski@list.lu)

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST