

Research internship for a Master's student, year 1 or 2, in ecophysiology

Urban trees and climate adaptation: cooling capacity under drought stress

Research Unit: Research Institute for Horticulture and Seeds (Institut de Recherche en Horticulture et Semences, IRHS)

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Internship period: 3 to 6 months including July and as far as possible August

Location: Angers, France

Context: Climate change is raising temperature and increasing the frequency of extreme heat waves, which are recognized as disasters requiring risk reduction measures. In cities, where over half of the world's population is expected to live by 2050, the effects of heat waves are amplified by the urban heat island phenomenon, and disproportionately affect vulnerable populations' health and well-being. Vegetalisation is a key strategy for cooling cities that, in addition, provides important co-benefits, including improvement of mental health and well-being, social cohesion and biodiversity. Street trees improve the thermal comfort of residents. However not all species have the same cooling capacity, and with climate change, urban trees are increasingly subject to summer drought episodes that can affect their cooling performance. Yet, a knowledge gap remains: we poorly understand which tree characteristics determine species cooling capacity, especially under increasing drought stress. **The intern will participate in a research project** that aims to identify the morphological and ecophysiological traits that determines tree cooling capacity under variable water conditions—knowledge essential for selecting trees that maintain climate services in the future.

Research objective: The objective of the internship is to study the effect of variable water access on two urban tree species and the consequences on the cooling they provide, seeking to identify which morphological and ecophysiological traits best explain differences in tree cooling services.

Methods: The internship will be based on an experimental approach using a setup including aligned street trees of two species, each subjected to two water regimes, and mineral street zones (without trees) serving as controls for climate services. The morphological and ecophysiological characteristics of the trees, along with the cooling services they provide, will be measured and related for each species-water regime combination to identify which traits determine cooling capacity.

Intern's missions:

You will be supervised by a researcher and a PhD student and will work closely with other researchers and technicians in an **interdisciplinary environment**. You will gain hands-on experience with **modern field technologies** and contribute to research with direct **implication for urban planning policies**. Your missions will consist of:

- Familiarizing yourself with the scientific literature
 - Participating in field work and measurements to characterize tree ecophysiological functioning and morphological development. You will use LIDAR imaging technology.
 - Perform data analyses and interpretation to:
 - Assess the water status of the trees throughout the season
 - Compare the development of the two species under the most favorable water conditions
 - Evaluate the effects of the water restriction on the evolution of tree leaf area, morphology, transpiration according to the specie.
 - Relate these results to the climate services provided by the trees to identify which tree traits best explain the differences in services.
- Cooling services measurements—based on microclimatic data and the calculation of a human thermal comfort index—will be acquired and pre-processed by the PhD student, with whom you will interact.

Desired skills and interest:

- Good knowledge in ecophysiology
- Strong writing skills
- Experience with data processing (statistical tools, R software, Python language welcome but not essential)
- Interest in interdisciplinary work (in this case ecophysiology-bioclimate)
- Knowledge in bioclimate is welcome but not mandatory

Specific conditions of the internship:

- For students, the internship will be compensated according to the French government scale. As of 01/01/2024, the hourly compensation rate was 4.35 €/hour.
- 35 hours of work per week
- You will be hosted at the Institute of Research in Horticulture and Seed (IRHS, [link](#)), a research unit under the supervision of the University of Angers, INRAE, and Institut Agro Rennes-Angers. You will be based in Angers, a university city in western France, located in the **Loire Valley**, a UNESCO World Heritage site.

Link with the Sustainable Development Goals (SDG) and global EU GREEN vision: This internship fits into several interconnected SDGs: primary SDG 11 ("Sustainable cities and communities" Targets 11.7, 11.b, 11.5) by developing knowledge for climate-resilient urban green spaces, and SDG 13 ("Climate action" Target 13.1) by strengthening adaptive capacity to heat waves, with secondary benefits for SDG 3 ("Good health and well-being" Target 3.9) through heat stress reduction. This research aligns with the EU GREEN alliance's vision of sustainability as it tackles global challenges through locally-anchored solutions to climate adaptation, that can be replicated across urban European cities and beyond.