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UNIVERSITÉ DE NEUCHÂTEL

Assisted tree migration for tolerant and resilient forests: drone- and ground-based assessment of phenotypic plasticity in candidates from warmer climates

Research context and objectives:
With mean annual temperature increases of 1.9-5.4°C and up to 25% reduction of summer precipitations, the ongoing climate change will severely challenge the tolerance and resilience of forest ecosystems in Central Europe and affect the essential services they provide. Assisted migration of Southern European tree species, better adapted to warmer climatic conditions, is one option in discussion and under research for promoting the tolerance and resilience of Central European forests. The WSL PHENO ADAPT project aims at combining drone-based multispectral imaging and ground-based truthing to assess the plasticity of phenological, xeromorphic and growth traits in large-scale tree species trials performed in Central Europe. The principal objectives in this master thesis are to 1) characterize the phenotypic plasticity in several candidate species for assisted migration and 2) improve current understanding of the trait-based intra- and interspecific variation in multispectral data from drones

Research program:
The study network consists of five multi-tree species trials established in 2012 in climatically different regions of Central Europe with, each, five non-native and thermophilous species (*Abies bornmuelleriana* Mattf., *Cedrus libani* A. Rich., *Fagus orientalis* Lipsky, *Tilia tomentosa* Moench and *Tsuga heterophylla* Sarg.) and one site-specific native species, serving as a local reference. By means of field campaigns repeated over the next two years, information about leaf pigments, canopy temperatures and tree height/diameter will be derived from drone-based remote sensing data. The thesis candidate will be integrated into the international PHENO ADAPT team and will participate to field campaigns. His/her specific contribution to evaluating the phenotypical plasticity will include the assessment of functional traits in foliage (leaf/needle morpho-anatomy, leaf/needle elements or stable isotopes) and edaphic properties (soil type, potential soil water holding capacity). Trait and remote sensing measurements will be compared, to identify ecophysiological signals in the multispectral data. The proposed master thesis will thus include field work and laboratory analyses and provide hands-on opportunities to get acquainted with drones and remote sensing technologies. The detailed research program will be determined in close collaboration with the thesis candidate. This master thesis is especially suited for students interested in interdisciplinary research on plant and soil in the context of climate change science.

Keywords: climate change, assisted migration, drone-based remote sensing, functional traits

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Work place: Swiss Federal Institute for Forest Snow and Landscape research WSL, Birmensdorf/ZH, UNIL

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