



# Bachelor/Master Thesis: Adaptability of trees to drought and lethal drought thresholds

Start: April 2014

Within the E<sup>3</sup> project we are working on the influence of drought on and the adjustment abilities of different tree species and provenances. Experiments involve seedlings of *Pinus sylvestris*, *Quercus petraea* and *Castanea sativa*. These experiments are conducted in

- i. a greenhouse comprising a Scots Pine provenance trial. Provenances from 10 different regions are subjected to seasonal drought events. Our aim is to evaluate the suitability of these provenances under future climate change and their adjustment abilities.
- ii. a greenhouse assessing the adjustment abilities and lethal thresholds of *Pinus sylvestris*, *Quercus petraea* and *Castanea sativa* against seasonal droughts on different soil types.
- iii. an open space site equipped with a rainout shelter. *Pinus sylvestris*, *Quercus petraea* and *Castanea sativa* subjected to prolonged drought events and artificial air warming. We will apply chlorophyll-a fluorescence kinetics to sense drought stress



We are focusing on the following topics that can be integrated into our different experiments.

## Membrane stability:

One critical aspect of how trees can overcome drought periods is to prevent cell membrane collapse and maintain turgor pressure of leaves and needles although their water content is decreasing. We will measure membrane stability and its adjustment to previous droughts by electrolyte leakage and link this to seedlings' water status.

## Resistance to cavitation:

One of the main drivers of tree death during drought is the occurrence of xylem embolism impairing water transport. Tree species pursue different strategies to prevent or to deal with the threat of cavitation. We will evaluate the resistance to and the recovery from cavitation and the adjustment ability of the hydraulic system.

## Sensing drought stress with chlorophyll-a fluorescence kinetics:

Methods to evaluate drought stress are often very time consuming and invasive. Chlorophyll-a fluorescence kinetics are a powerful tool to screen various stressors and provide multiple parameters to do so. We will correlate these parameters to tree seedlings' water status.

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## Bachelor-/Masterarbeiten: Anpassungsfähigkeit von Bäumen gegen Trockenheit und tödliche Trockenheitsgrenzwerte

Beginn: April 2014

Der Klimawandel wird zukünftig eine bedeutende Gefahr für Wälder darstellen. Innerhalb unseres Projektes E<sup>3</sup> beschäftigen wir uns mit dem Einfluss von Trockenheit auf Bäume. Unter anderem sind wir besonders daran interessiert, wie sich saisonale/langanhaltende Dürren, erhöhte Temperaturen und unterschiedliche Bodentypen auf die Anpassungsfähigkeit von Jungpflanzen auswirken und tödliche Trockenheitsgrenzwerte beeinflussen.

Die Experimente beinhalten Jungpflanzen von *Pinus sylvestris*, *Quercus petraea* und *Castanea sativa*. Sie werden in Gewächshäusern und auf einer Freifläche, die mit einem Rain-Out-Shelter und einem Heizungssystem ausgestattet ist, durchgeführt.

Wir erfassen verschiedenste Parameter, wie z.B. Wasserpotential, Blatt- und Xylemleitfähigkeit, Stabilität von Zellmembranen, Chlorophyllfluoreszenz und Wachstum.

Die Messungen sollen während der Wachstumsperiode in Dürnast durchgeführt werden.

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## Bachelor/Master Theses: Adaptability of trees to drought and lethal drought thresholds

Start: April 2014

Climate change will be one important threat to forests in the future. Within our E<sup>3</sup> project we are working on the influence of drought on trees. Among other topics, we are especially interested in the influence of seasonal/prolonged droughts, increased temperature and different soil types on the adaptability of seedlings and lethal drought thresholds.

Experiments involve seedlings of *Pinus sylvestris*, *Quercus petraea* and *Castanea sativa*. These experiments are conducted in greenhouses and on an open space site equipped with a rainout shelter and an air warming system.

We measure different parameters to determine drought stress and resistance, e.g. water potential, leaf and xylem hydraulic conductivity, cell membrane stability, chlorophyll fluorescence and growth.

Measurements will be conducted during the growing season 2014 in Dürnast near Freising.

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