Identification of suitable tree species for future urban environments based on dendroecological analyses

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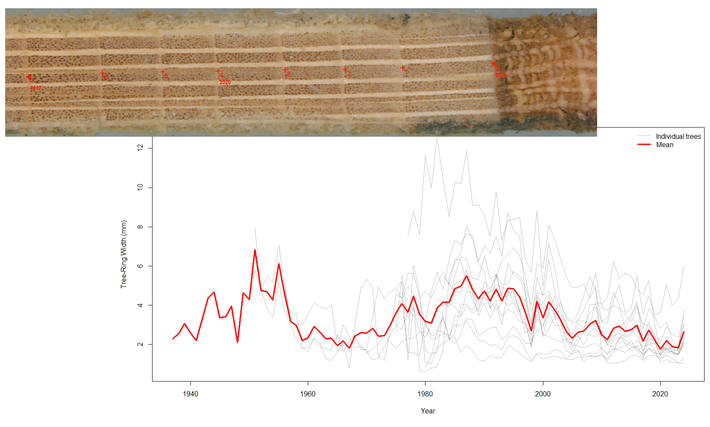
Which tree species should we plant in our cities?

Trees growing in urban environments face multiple challenges, ranging from **heat, drought and restricted rooting space to salt loading in winter**. At the same time, **urban trees become increasingly important** as they provide shade, cooling and many other essential ecosystem services. To identify suitable tree species for future climatic conditions, we carried out **dendroecological analyses on twelve native and non-native tree species**.

We have collected tree cores in two heat- and drought-prone cities – **Freiburg and Karlsruhe**, with trees located in **streets, parks and peri-urban forests** to cover a gradient of urban stress.

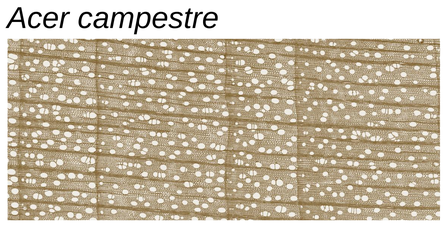
How do urban trees cope with heat and drought?

Tree-ring width
The correlation of annual stem diameter growth with weather data illustrates the trees‘ sensitivity to climatic variability. Annual increment can also be used to assess tree resilience to climatic extremes such as drought and heat.



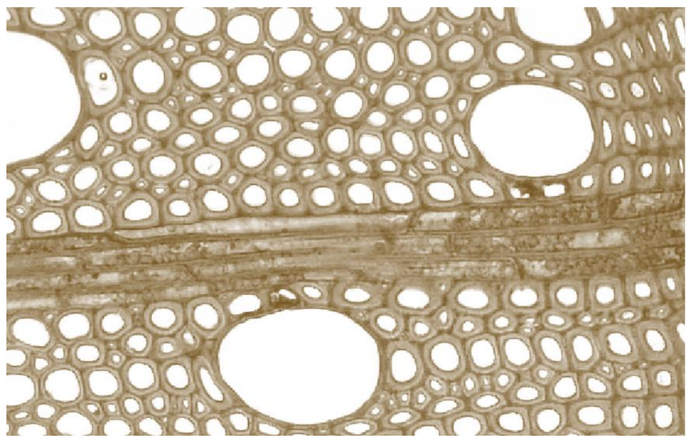
Wood anatomy
Characteristics of vessels and their spatial patterns show the hydraulic plasticity at an intra- and inter-annual level. Based on this xylem response, the vulnerability to dry conditions can be quantified.

Acer campestre



Tilia cordata

Stable isotopes
Carbon and oxygen isotopic composition of the wood give insight into the physiological response to weather conditions and effects of drought and heat on water-use efficiency.



Can we support urban tree vitality by adjusting the substrate trees grow in?

Urban soils are human-impacted substrates with unique characteristics not found in forests. Analysing the trees‘ growth response with respect to soil conditions may help to optimise the substrate for future plantings.

Output

Ranking of tree species suitability for urban environments subject to drought and heat

Recommendations for soil substrate to enhance tree resilience