

## Sustainable establishment of woody vegetation for urban school grounds

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### Background

Sustainable school grounds is a PhD project led by PhD student Sanna Ignell at the Swedish university for agricultural sciences (SLU) with the goal of finding interesting and suitable woody species and establishment concepts for school grounds in urban environments. This is done with the purpose of enabling the development of sustainable and varied green areas for children in cities. Vegetation and natural areas integrated at multiple scales are essential for ensuring healthy development for children (Chawla, 2015). In urban areas, where natural green areas often are lacking, school grounds play an important role for children in providing opportunities for contact with nature (Herrington and Studtmann, 1998). In addition to the challenges facing urban vegetation in general; e.g. soil compaction (Watson et al., 2014) and the urban heat island effect (Oke, 1982), school grounds pose additional challenges. The mayor added challenge is the increased level of wear and tear caused by active use of the vegetation (Gunnarsson and Gustavsson, 1989), a type of disturbance which is enhanced in school grounds of limited size. Thus, suitable species for school grounds in urban areas should preferably manage growing conditions which include lower water availability and higher temperatures while simultaneously tolerate active use of the vegetation. There is a need to increase the knowledge of suitable species for school grounds in urban areas and these species' limitations. This concerns shrubs in particular, which are important for play but rarely studied.

### Project outline

A controlled greenhouse experiment was conducted during the summer of 2020 and 2021. The experiment included 11 different species which were chosen based on their CSR-strategy. The species included ranged from more to less tolerant towards drought-stress and disturbance. The treatments of the experiment was drought and biomass loss, chosen to mirror this drought-stress and disturbance factor. Drought stress was monitored with measurements of leaf water potential and stomatal conductance, two indicators of water status in plants (Scholander, 1965; Williams & Araujo, 2002). In addition to this, the leaf water potential at wilting point, i.e. the turgor loss point (TLP), was determined. In addition to these physiological tests, the treatments effect on biomass and morphological changes, e.g. specific leaf area, have also been monitored. Root/shoot ratio is of specific interest since this has been seen to be affected by both drought and biomass loss (Keefover-Ring et al., 2016) and simultaneously is of great importance for the establishment of vegetation.

An interview study with professionals have been conducted to compile the current knowledge concerning establishment of woody vegetation in school grounds. This was done with the purpose of complementing the controlled experiment and focused on experiences of challenges and success factors concerning technical, organizational and social aspects of school ground greening. Practitioners within various fields were included as many different actors working with school grounds have interesting knowledge concerning this subject.

The knowledge gathered in these two parts of the project will build the base for the in situ experiment on school grounds in Malmö, Sweden. The experiment will be planted in November 2022 and the included schools are for children aged 6-12. The focus for the experiment is to test different size of plant beds, which came forward in the interview study as an interesting factor, and the 4 best performing species from the greenhouse experiment. The vegetation development in the school grounds will be monitored for two growing seasons, focusing on survival, growth and patterns of wear and tear in the plantings. Controlled experiments on vegetation establishment are important for gaining knowledge, but due to the complex conditions on school grounds, studies in sites may deepen the understanding for the different factors possibly affecting the actual establishment.

The results from this project will deepen the understanding of the problems concerning establishment of woody vegetation on urban school grounds and hopefully also increase the knowledge in how to tackle these problems.

## References:

- CHAWLA, L. 2015. Benefits of Nature Contact for Children. *Journal of Planning Literature*, 30, 433-452.
- GUNNARSSON, A. & GUSTAVSSON, R. 1989. Etablering av lövträdsplantor. *Stad&Land*.
- HERRINGTON, S. & STUDEMANN, K. 1998. Landscape interventions: new directions for the design of children's outdoor play environments. *Landscape and Urban Planning*, 42, 191-205.
- KEEFOVER-RING, K., RUBERT-NASON, K. F., BENNETT, A. E. & LINDROTH, R. L. 2016. Growth and chemical responses of trembling aspen to simulated browsing and ungulate saliva. *Journal of Plant Ecology*, 9, 474-484.
- OKE, T. R. 1982. The energetic basis of the urban heat island. *Quarterly Journal of the Royal Meteorological Society*, 108, 1-24.
- WATSON, G. W., HEWITT, A. M., CUSTIC, M. & LO, M. 2014. The Management of Tree Root Systems in Urban and Suburban Settings: A Review of Soil Influence on Root Growth. *Arboriculture & Urban Forestry*, 40.

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