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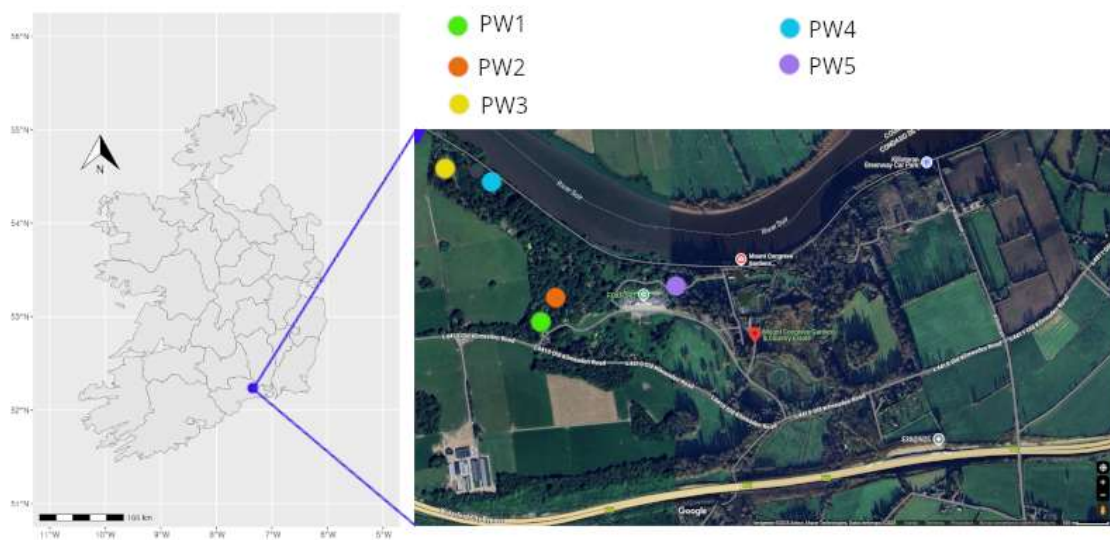
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PhD project: Investigating ecosystem interactions to safeguard soil health for sustainable communities using a transdisciplinary approach

The concept of soil health (SH) has developed in recent years to describe soil as a complex living ecosystem. The European Union (EU) Soil Strategy defines a healthy soil when its chemical, biological, and physical conditions enable the continuous of terrestrial ecosystem services. In addition, the EU Soil Strategy highlights the need for the mobilisation of societal engagement, shared knowledge, monitoring, and the use of sustainable practices on soils.

In this context, the PhD project “Investigating ecosystem interactions to safeguard soil health for sustainable communities using a transdisciplinary approach” uses different disciplinary perspectives to create a comprehensive framework to explore SH. The project explores SH in Mount Congreve Gardens (MCG), Co. Waterford, Ireland (Figure 1). MCG were established in the 1960s, when Mr Ambrose Congreve employed Mr Herman Dool, a Dutch horticulturist, as a head gardener. Together, they began a journey of plant collecting and garden design that spanned for more than four decades. After the death of Mr Congreve in 2011, MCG were held in Trust for the State. The gardens comprise a 70 acre-planted woodland and a four-acre walled garden.

Fig 1.



Sampling areas at MCG. PW is an acronym of planted woodland.

SH is being explored in MCG using nematodes as environmental indicators and exploring their relationship with plant diversity. In addition, different plant communities and their relationship with SH are being studied. From a sociological point of view, the site presents the possibility to explore SH with experts in gardening and horticulture. From a transdisciplinary and educational standpoints, MCG provides an occasion for co-producing and exchanging knowledge on SH, and to integrate local and scientific knowledge in a digital platform.

Nematodes are widely used as environmental indicators of SH because they provide information about decomposition pathways, soil nutrient cycles, and the effects of contaminants and management practices on the structure of the soil food web.

Preliminary results indicated the presence of 33 nematode families across sampling areas, and only five nematode families were common between them: Anguinidae, Tylenchidae, Cephalobidae, Plectidae, Rhabditidae. The presence of these families indicated enriched environments and soil nutrient availability, as

indicated in the Nematode-Based Indices, the Enrichment Index (EI), and the Structure Index (SI). The SI is a measure of the food web structure, with higher values indicating a well-structured food web.

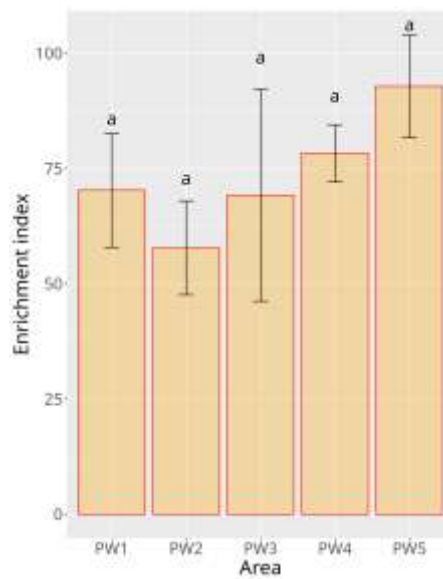


Fig 2. Enrichment Index (EI) for each sampling area. Bars are showing Mean \pm SD. Same lowercase letters indicate differences between sampling areas were not statistically significant (Tukey's HSD, $p < 0.05$).

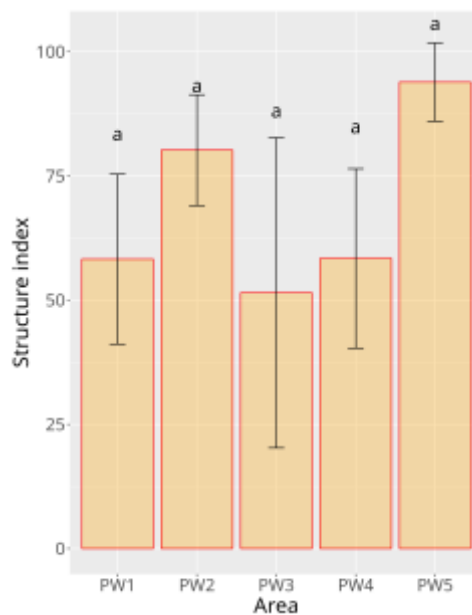


Fig 3. Structure Index (EI) for each sampling area. Bars are showing Mean \pm SD. Same lowercase letters indicate differences between sampling areas were not statistically significant (Tukey's HSD, $p < 0.05$).

In addition, a total of 25 plant families were found across all sampling areas, and only four plant families were common between them: Ericaceae, Onagraceae, Fagaceae, and Araliaceae. A combination of ornamental and native plant families was found for all sampling areas. The SI and the EI were positively correlated with higher plant diversity.

These preliminary results are part of an exploration of SH in MCG to create baseline information for built environments. Although not indicative of interaction, the correlations could be used to investigate ecosystem function and promote SH.

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