

Ecological Fractal Network

In the Netherlands

The Ecological Fractal Network (EcoFracNet) is an international collaboration dedicated to understanding the spatial scales at which biodiversity and ecosystem processes operate, and how these scales influence changes in diversity over space and time. The network applies a standardized monitoring design, rooted in the concept of mathematical fractals (geometric patterns that repeat at different scales; see Fig. 1).

While the network is globally oriented, we are currently launching a Dutch branch of EcoFracNet. Over the next several years, we aim to establish long-term monitoring sites across a wide range of typical Dutch habitats, offering a comprehensive approach to studying biodiversity at multiple scales.

Study design

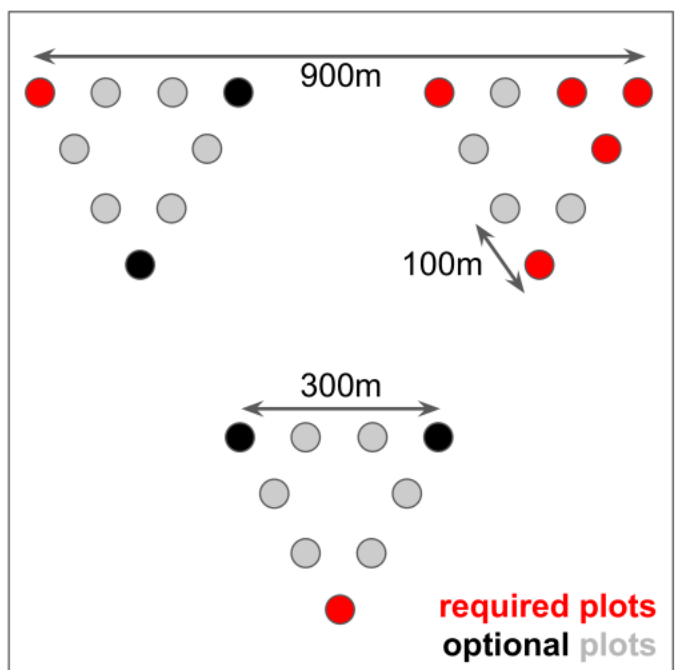


Fig.1: EcoFracNet plot design

EcoFracNet employs a system of 1x1 meter plots arranged in triangular patterns as the foundation of its monitoring design (Fig. 1), each still further divided in 4 quarters. These plots are spaced and oriented in a fixed arrangement to allow for detailed analysis of spatial scale effects. The standard design includes 27 plots distributed within a square kilometer. However, this can be expanded with an additional 27 plots concentrated in a core 100x100 meter area (not shown in Fig. 1).

The number of plots and hierarchical levels can be adapted based on local conditions, with a minimum of 7 plots (indicated by red dots in Fig. 1) or more, depending on the site's feasibility and accessibility. In each 1x1 meter plot, we will record plant species diversity and cover (using visual estimates). Additionally, selected plots may include microclimate sensors, typically the TOMST TMS4 (Fig. 2), although alternative sensors can be used depending on local needs and issues (e.g., large mammals).

In the future, other ecosystem variables such as decomposition rates or nutrient cycling may be integrated, depending on available resources and local interest. These plots are intended for long-term monitoring to capture temporal changes in biodiversity.

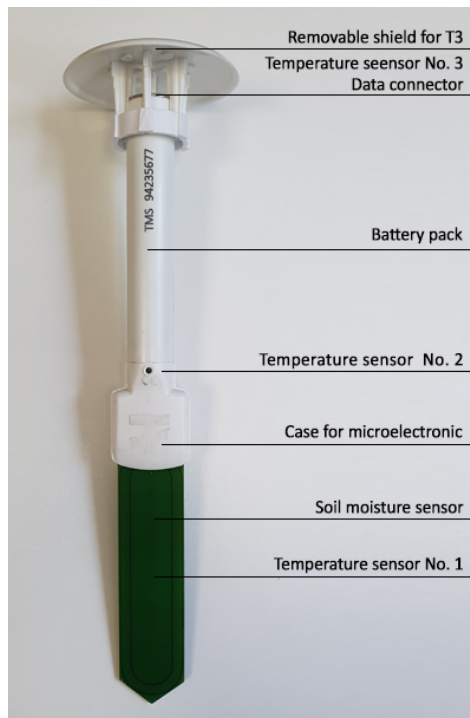


Fig. 2: TOMST TMS4 microclimate sensor

Research questions

EcoFracNet will enable us to explore biodiversity across a wide range of spatial and temporal scales within the Netherlands and beyond. The insights gained from this work will have significant implications for nature management and ecological restoration, helping us to determine the optimal scales for conservation efforts and identify the most beneficial heterogeneity for biodiversity.

Some key research questions we aim to address include:

- At what spatial scale do we observe the greatest variation in plant biodiversity, and how does this scale vary across different Dutch habitats?
- What spatial scale shows the most variation in microclimatic conditions across diverse Dutch ecosystems, and does this variation correspond to differences in plant communities?
- To what extent is spatial variation driven by human land use and management practices, and how much do natural factors (e.g., topography, soil type, vegetation structure) contribute to this variation?

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