

WORK PACKAGE 1.1: SOILS

The aim of Work Package (WP) 1.1, is to develop new tools and approaches for the sustainable management of soils in Scotland, so that they can continue to provide the range of benefits required of them.

Soils provide us with crucial benefits while at risk from numerous drivers of change. They are required to support a number of functions from the same land and landscapes, such as food production, biodiversity conservation, nutrient cycling, carbon storage and the regulation of water quality.

This WP will improve our knowledge and understanding of soil processes and how these contribute to the functioning and resilience of soils in Scotland.

The focus is on semi-natural systems including peatlands, machair, extensive grasslands and low-input arable and will complement work on water (WP 1.2) and biodiversity (WP 1.3). All three WPs will contribute to work on integrated approaches to land management (see WP 1.4). Relevant findings from both intensive and extensive agricultural systems will be brought together via collaboration with Productive Land Use Theme researchers (e.g. WP 2.3). WP 1.1 outputs will also enhance our ability to monitor soils and assess how the benefits they provide are affected by disturbance, supporting the implementation of the Soil Monitoring Action Plan.

A diverse team of natural scientists and socio-economic researchers will work with stakeholders (e.g. via the Soil Engagement Group) to develop tools for decision makers, and raise awareness of how sustainable management and restoration of degraded soils can benefit society. Case studies developed and tested through research will be used to demonstrate sustainable soil management practices to stakeholders.

WP 1.1 will deliver knowledge, information and tools to improve Scotland's capacity for sustainable management of soil for multiple benefits, through:

- Experiments to explore how soil functions are affected by different management interventions, including peatland restoration and rotational management.
- Sampling and characterising soil fungal communities at different stages of peatland restoration to look at their role in restoring soil functions, including carbon and nitrogen cycling.
- Developing indicators and measures for soil nutrient cycling based on soil organisms and soil properties, and testing their performance in grassland and barley systems.
- New models of how soils in semi-natural ecosystems respond to disturbance, to assess resilience.
- A user-friendly tool to measure and manage soil structure (to help combat soil compaction/erosion).
- Field experiments and models to improve quantification of greenhouse gas (GHG) uptake and release in peatland/moorland ecosystems, including identification of 'GHG hotspots'.
- Improved understanding of the impacts of management practices (such as muirburn) and changes in management (such as long-term agricultural intensification) on soil carbon sequestration.
- A Digital Soil Map for Scotland including risk mapping (e.g. for soil erosion) and mapping of soil-derived ecosystem services (e.g. those related to soil hydrology).
- Assessment of how monetary and non-market benefits associated with soils and key soil habitats (e.g. peatlands) influence land managers' decision-making.
- Decision tools based on cost-effectiveness and cost-benefit analyses, to help achieve peatland restoration targets and overcome barriers to managing peatlands for multiple benefits.

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