WESTERN SYDNEY
UNIVERSITY

Hawkesbury Institute
for the Environment

RESEARCH CAPABILITY

Soil Biology & Biochemistry

Unveiling the intricacies of the world beneath our feet

Acknowledgement

Western Sydney University acknowledges the peoples of the Darug, Tharawal, Eora and Wiradjuri nations. We acknowledge that the teaching, learning and research undertaken across our campuses continues the teaching, learning and research that has occurred on these lands for tens of thousands of years.

Researchers

To contact HIE Soil Biology and Genomics Theme scientists, please go to:
www.westernsydney.edu.au/hie/research/soil_biology_and_genomics

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Innovative research from genes to ecosystems

Composed of minerals, water, air and organic matter, soil provides primary nutrient cycling for plant and animal life, and acts as a basis for feed, fuel, fibre and medicine. We depend on soils and the ecological services they provide to support life on Earth.

Soils are a dynamic and limited natural resource. The living component of soil including mega, macro, meso, and microfauna, is a key element of soil ecology and functioning, driving most of the processes for soil health and fertility, water filtration, climate change regulation and aboveground productivity

Soil contains the greatest diversity of any habitat on the planet.

There are more organisms in 1 gram of healthy soil than there are people on Earth.

Climate change will greatly influence soil biodiversity, impacting ecosystem functions and services that support life.


S.NO. 34
Site 8s

Soil research

Our soil research aims to innovate, integrate and extend knowledge on soil biodiversity and how the ecosystem services they provide are linked with environmental sustainability. Our main focus is to assess belowground responses to environmental and global change and management practices.

- Impacts of climate change and natural disturbances
- Management practices to improve soil health and plant productivity
- Functional microbial ecology
- Nutrient cycling and provision of ecosystem services
- Soil community ecology
- Soil biota from micro to macro fauna

The life in our soils

Megafauna

Ground disturbing animals are the principal agents of soil turnover and distribuition.

Macrofauna

Earthworms, termites, and ants help with soil drainage and aeration.

Mesofauna

Microscopic invertebrates including nematodes, mites, and tardigrades are biological regulators of decompostion.

Microfauna & Microorganisms

Bacteria, protozoans, fungi & nematodes are responsible for biogeochemical processes. These are the smallest & most numerous organisms in the soil.

Main research topics

Ecosystem ecology

Community and the role of ecosystem ecology: microbial community assembly, and the role of soil fauna maintaining ecosystem functioning

Biochemical cycling

Responses of biogeochemical cycling to climate change drivers

Above-below ground

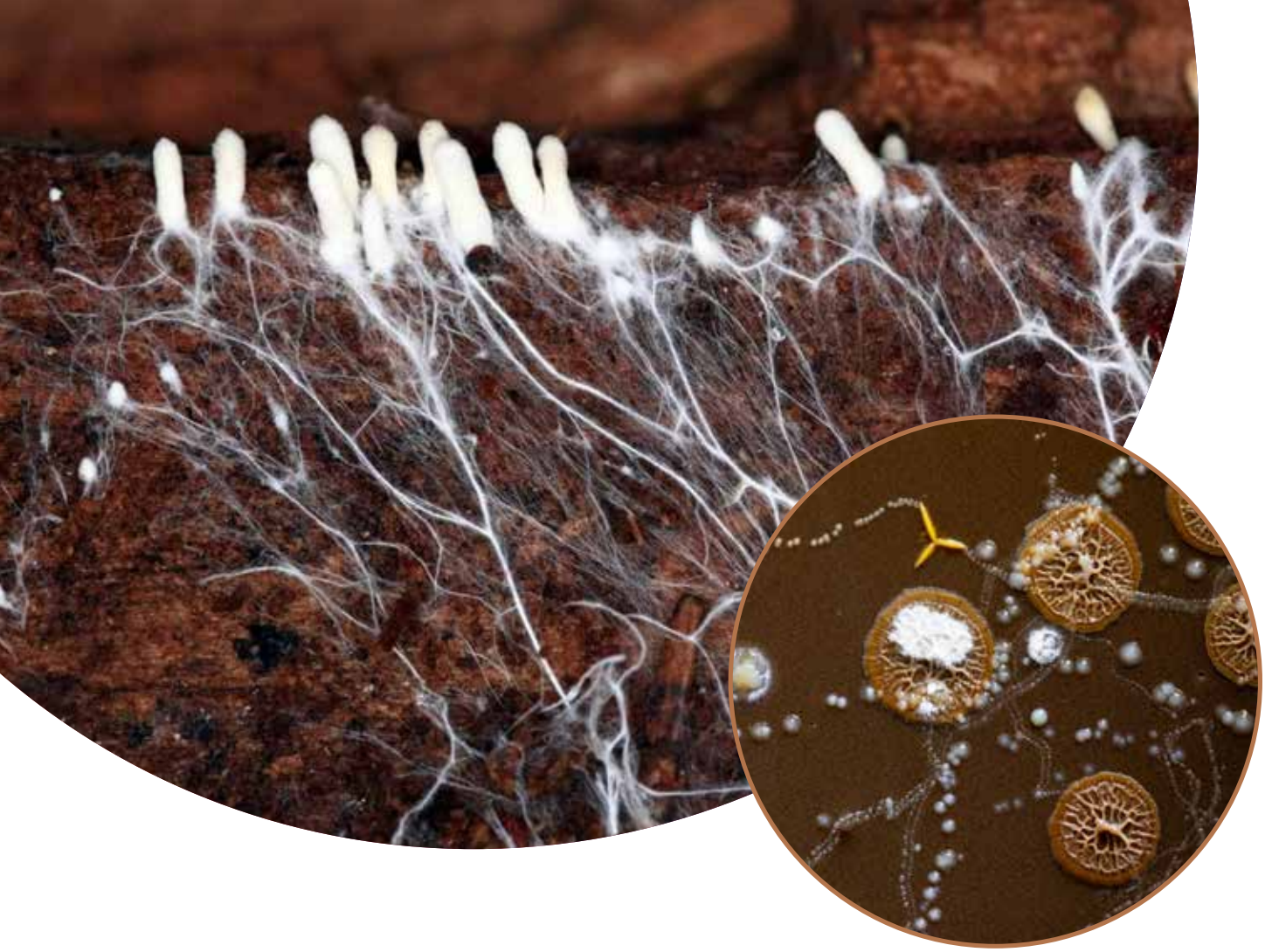
Above-below ground interactions: symbioses, molecular signalling, maintenance of plant productivity and microbiomes

Ecological theories

Testing large scale ecological theories on the soil environment

Sustainability

Soil sustainability and management



RESEARCH DIRECTIONS

Endophytic fungi in soil carbon sequestation

Increasing soil carbon and promoting soil organic matter formation has positive impacts on CO_2 emissions, carbon sequestration, plant productivity, food security, soil water storage and filtration, nutrient cycling and biodiversity. Our researchers are utilising growth chambers and laboratory assays to investigate the variation across different endophyte isolates in terms of soil carbon formation and residence time, and to evaluate fungal traits leading to enhanced soil carbon sequestration and plant health.

RESEARCH DIRECTIONS

Rhizosphere mediation of soil greenhouse gas fluxes

Our researchers are investigating the interacting effects of plant roots, microbes, and soil minerals in the decomposition and residence time of soil organic carbon. By evaluating temperature sensitivity of enzymes, microbes and soils in the context of land-use change at sites across Australia with contrasting soil properties, the results will be integrated into a land surface model to improve predictions of future climate change at regional to continental scales, reducing a large source of uncertainty related to carbon – climate feedbacks

RESEARCH DIRECTIONS

The role of soil fauna in nutrient transformations of agricultrual soils

Soil fauna are an essential component of soil biodiversity and significantly drive litter decomposition, microbial community composition, and nutrient cycling. Our researchers are identifying soil faunal communities, revealing their interactions with soil microorganisms, and deciphering their roles in regulating nitrogen and phosphorus cycles using combined morphological identification, using advanced stable isotope tracing technique, and state-of-the-art molecular approaches in a national effort to link quantitative soil faunal data across the size spectrum to a range of soil functions in Australia's agricultural land.

Our researchers undertake soil biology research in a varied range of ecosystems, from native to managed grasslands and pastures, native woodlands, vineyards, orchards, and other crops of economic relevance for Australia.

RESEARCH DIRECTIONS

Microbiome management

Softwood plantation growers throughout Australia depend on efficient nursery and management practises to reliably produce resilient and high productivity trees. Our researchers are working with nursery managers to fully utilise and benefit from a healthy microbiome by developing empirically standardised recommendations with regards to microbiome management practices within the nursery, and rigorously tested tailored inoculum and supplements to promote beneficial microbes throughout the lifecycle of their product.

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We invite researchers and investors to explore future opportunities to work with the **Hawkesbury Institute for the Environment.**

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