WESTERN SYDNEY
UNIVERSITY

Hawkesbury Institute
for the Environment

RESEARCH CAPABILITY

Ecosystem Functioning & Modelling

Understanding ecological processes
and interactions in a changing world

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 Ecosystem Function and Integration scientists, please go to:
www.westernsydney.edu.au/hie/research/ecosystem_function_and_integration

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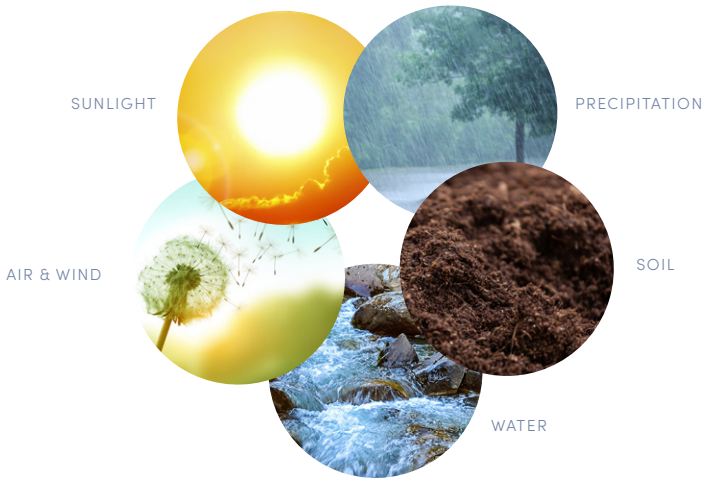
Ecosystem components

The biotic and abiotic elements of all ecosystems interact with each other in a myriad of processes across different spatial and temporal scales.

Understanding how these processes occur and what ecosystem elements define these interactions is vital for assessing the impact of future global change.

Predictions of ecosystem responses to future conditions including elevated atmospheric carbon dioxide (CO_2), drought, fire, fluctuating temperatures and water availability, are needed to guide conservation efforts and mitigation strategies.

Abiotic components (Non-living Things)

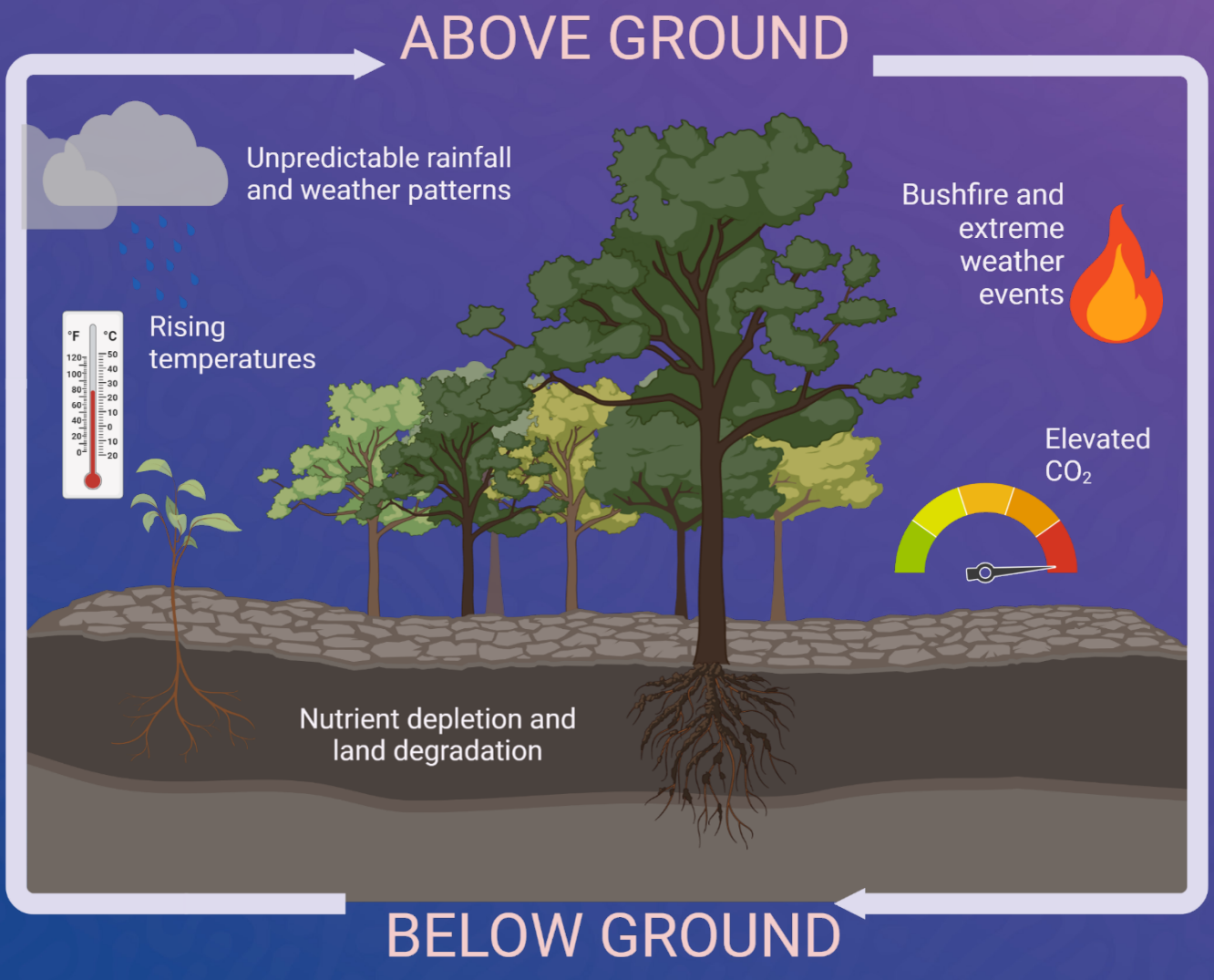


Biotic components (Living Things)

Ecosystem functioning & modelling research

Research at the Hawkesbury Institute for the Environment focusing on ecosystem functioning investigates the linkages and impacts of climate change stressors and environmental elements above and below ground.

Experimental data are incorporated into environmental models to synthesize and interpret results in broad, global contexts.



Above ground

Plant ecophysiology

Plant ecophysiology, leaf traits and plant growth.

Elevated CO_2

Impacts of elevated CO_2 in Eucalyptus woodlands (EucFACE).

Landscape ecology

Landscape ecology and management of fire-prone ecosystems.

Forest flammability

Modelling forest flammability and fuel loads.

Warming

Impacts of warming in rainforest vegetation.

Climate change

Impacts of climate change drivers at leaf, plant and community levels.

Response models

Evidence-based models of responses of productivity, plant communities and water use efficiency to global change.

Below ground

Nutrient cycles

Regulation of nutrient cycles in terrestrial ecosystems.

Elevated CO_2

The role of soil nutrient availability on the response of plants to elevated CO_2.

Greenhouse gases

Biosphere-atmosphere exchange of greenhouse gases.

Organic matter

The influence of plant and soil communities on soil organic matter decomposition.

Plant diversity

Microbial and plant diversity interactions as regulators of ecosystems' multifunctionality.

Soil respiration

Predictive understanding of temperature sensitivity of soil respiration and its components.

Fire impacts

Fire impacts on soil carbon.

RESEARCH DIRECTIONS

Gathering large-scale environmental data & measuring change

Our researchers are providing crucial environmental data that underpin the conservation management of the critically endangered Cumberland Plain Woodland, which faces major pressures from invasive weeds and pests to extreme climate events.

We provide publicly available data streams on soil-vegetation-atmosphere exchanges, nutrient cycling, dynamics of biodiversity, and other measures through a network of interconnected field sites and facilities.

The Cumberland Plain Woodland is a critically endangered ecological community and a vital habitat for native birds, animals and plants. It is unique to Western Sydney and under direct threat from urban growth. Under 6% of the original woodland remains.

The Cumberland Plain Woodland is recognised as a natural heritage site. It is also the home of the Institute's Free Air CO_2 Enrichment (EucFACE) facility.

RESEARCH DIRECTIONS

Predicting the effects of future climate conditions

The level of CO_2 in the air is currently around 400 ppm and rising. Our researchers are exposing large areas of native Cumberland Plain Woodland to elevated CO_2 at around 550 ppm, which we expect to reach by 2050.

Predicting the effects of rapidly rising atmospheric carbon dioxide on Australia's unique native forests, animals, soils and grasses will contribute insights into how our unique, native Eucalyptus-dominated ecosystems react.

RESEARCH DIRECTIONS

A unified dynamic vegetation model for Australia

Our researchers are synthesising current theory and data to develop a predictive, process-based model for Australian vegetation dynamics in response to environmental change. Existing theories and data models are extensive, but fragmented.

Our research will transform our understanding of Australian vegetation, its place in a global context, and provide significant ongoing benefits for land management, fire management, agriculture and conservation.

RESEARCH DIRECTIONS

The influence of climate change on bushfire fuels

Benefiting future land management and policy design, our researchers are using a range of methodologies to address where and when we can expect changes in community and species composition due to altered climate and fire activity, and how fuel loads may change in the future. We are also providing direct social benefits by providing scenarios of change in fire risk under climate change that will improve the resilience of vulnerable human communities and lead to more informed fire management and landscape conservation planning and action.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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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