

WESTERN SYDNEY
UNIVERSITY



Hawkesbury Institute
for the Environment

Whole Tree Chambers

SCIENTIFIC FACILITIES



Whole Tree Chambers

Twelve Whole Tree Chambers provide fully enclosed, controlled environments for trees up to nine metres tall. In these chambers, researchers can manipulate the environment around a tree including air temperature, soil moisture, irrigation, CO₂ levels and humidity to predict the integrated effects of altered climates on tree physiology. Once the trees reach two metres tall, researchers can measure whole system gas and water exchange which enables them to build a detailed and precise picture of the water and gas inflows and outflows through soils and trees at any point in time. At the end of the experiment, the trees can be cut and detailed recordings of carbon gain over time can be compared with baseline measures of trees grown in ambient conditions to assess the effects of increasing CO₂, higher temperatures or other treatments.



IMPROVING PREDICTIONS AT FOREST SCALE

The Whole Tree Chambers are a unique facility in the world of forest responses to climate change. For the first time, these chambers allow researchers to fully explore the complex relationships between temperature, atmospheric gas levels and water flow in whole trees.

The chambers allow trees to be grown under controlled conditions to moderate size, while monitoring carbon uptake and water loss at 15 minute resolution. They also allow researchers to carry out independent short-term manipulation of conditions in order to better understand how plants acclimate to altered conditions.

“Twelve Whole Tree Chambers enable researchers to precisely control numerous variables of growing conditions for trees up to nine metres tall...”

This information is invaluable to models that can be used to predict the impact of climate change scenarios on future forests.

SCIENTIFIC DIRECTIONS

Experiments currently running in the Whole Tree Chambers explore how elevated CO₂, water and temperature interact to affect eucalypt physiology and water and carbon flow between the soil, trees and the atmosphere.

Insights from these experiments will inform Australian and global carbon and water models to predict effects of future climates on forest health and productivity.

Key questions include:

- How does drought and elevated temperature impact on carbon gain, water use and soil microbial functioning?
- How do these conditions affect insect communities within eucalypts and what implications emerge for managing ecosystem health?
- What changes do these conditions cause in the soil environment and how do these changes impact on eucalypt function?



Hawkesbury Institute for the Environment

Western Sydney University, Locked Bag 1797, Penrith NSW 2751 Australia

Bourke Street, Richmond NSW 2753 Australia. Phone: +61 2 4570 1125 Email: hieinfo@lists.westernsydney.edu.au

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