Progress Report STP 2020-017 (FY 2020-2021)

The dynamic demography of water ages our trees are using

Ecosystem Science

Project Core Team

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Project Team	granted
Program Leader	required
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The age of water utilised by trees may prove to be a useful indicator of the resillience of forests to drought and heat stress, and to assess impacts of forest management on changes to the unsaturated zone hydrology experienced by trees. Isotope methods have been previously developed to identify potential different water sources used by tress, e.g. groundwater versus shallow soil moisture, when these sources have distinct isotopic signatures. This method seeks to use isotopes to establish how long since the water fell as rain did it reside in the soil before it was used by the plant for transpiration. To establish the potential of the method a laboratory experiment was planned.

A multidisciplinary experiment involving engineers, isotope geochemists and plant physiologists was conceived and completed as part of Luke McCauley's Masters Thesis. A total of eight plants were installed in gas chambers and over a period of two weeks the isotopic composition of chamber air was measured at 1 second intervals. The results of the experiment contribute to Luke McCauley's Masters of Engineering thesis. The results demonstrated the ability of the method to quantify the proportion of "new" water transpired by each sapling. A model to simulate the full distribution of water ages from the results of the experiment is in development. A journal article to report on the model and the experiment is in preparation.