

II. Abstract

As deforestation and climate change alter the distribution of tree species, the need to understand how these human impacts will change the availability and quality of water resources becomes urgent. The overall objective of my research is to examine the role of trees in the water cycle, starting with the structure and function of individual trees, and scaling up to ecosystem-level tree water flux. My goal is to develop widely applicable techniques to study the role of trees in the water cycle to help inform hydrologic models, forest management decisions, and public policy. One of the missing pieces in understanding the role of trees in the water cycle is the residence time of water in trees, including differences in tree species. How long does it take a molecule of water to move from the base of the trunk to the leaves? This piece of information would help increase our knowledge of the timing of water uptake in trees and inform hydrological models where water movement through vegetation is not well understood. As part of my dissertation, I plan to carry out an isotope tracer study to measure the residence time of water in trees of different species within a forest ecosystem.