EGU23-7551, updated on 01 Mar 2024
https://doi.org/10.5194/egusphere-egu23-7551
EGU General Assembly 2023

Tracing the origin of imported carbon and nitrogen reserves: remobilization during spring leaf expansion and recovery following defoliation

Erin Wiley[1], Ashley Hart[2], and **Simon Landhäusser**[2]
[1]Biology Department, University of Central Arkansas, Conway, AR, USA (ewiley3@uca.edu)
[2]2Department of Renewable Resources, University of Alberta, Edmonton, Alberta, CA

Woody plants rely on the remobilization of carbon (C) and nitrogen (N) reserves to support growth and survival when resource demand exceeds supply at seasonally predictable times like spring leaf flush and following unpredictable disturbances like defoliation. Despite their importance, we still have a poor understanding of how reserve remobilization is regulated and whether remobilization and the allocation of mobilized reserves is constrained by distance between source and sink tissues. This leads to uncertainty in which reserves—and how much—are actually available to support plant functions like leaf growth during spring flush or following defoliation. To better understand the source of remobilized reserves and constraints on their allocation, we used stable isotopes (^{13}C,^{15}N) to label C and N reserve pools in aspen (*Populus tremuloides* Michx.) saplings, and then grafted unlabeled and labelled stems to labelled and unlabeled root stocks, to create organ-specific labelled reserves. We then tested for differences in reliance on reserves from different organs between 1) upper and lower leaves 2) early and late leaves and 3) early flush and reflush leaves produced after defoliation. During spring flush, both C and N reserves were preferentially allocated to sinks nearer the reserve source (i.e the roots), but reliance on C reserves was reduced over time. Additionally, N appeared to be preferentially remobilized from sources closer to the developing leaves. However, following defoliation, we found that reflush leaves imported the same proportion of N from the roots as spring flush leaves, but that a lower proportion of C was imported from root reserves. The lower import of reserve C suggests reflush leaves must rely more on their own photosynthetic gains to fuel leaf growth, which may explain the reduced total leaf mass of reflush canopies (31% of initial mass). The reduced import of reserves occurred even though roots retained significant starch reserves (~5% dry wt), suggesting aspen prioritizes the maintenance of root C reserves at the expense of fast canopy recovery.