

## A potential role for xylem–phloem interactions in the hydraulic architecture of trees: effects of phloem girdling on xylem hydraulic conductance

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**Summary** We investigated phloem–xylem interactions in *Acer rubrum* L. and *Acer saccharum* Marsh. Our experimental method allowed us to determine xylem conductance of an intact branch by measuring the flow rate of water supplied at two delivery pressures to the cut end of a small side branch. We found that removal of bark tissue (phloem girdling) upstream of the point at which deionized water was delivered to the branch resulted in a decrease (24% for *A. rubrum* and 15% for *A. saccharum*) in branch xylem hydraulic conductance. Declines in hydraulic conductance with girdling were accompanied by a decrease in the osmotic concentration of xylem sap. The decrease in xylem sap concentration following phloem girdling suggests that ion redistribution from the phloem was responsible for the observed decline in hydraulic conductance. When the same measurements were made on branches perfused with KCl solution ( $\sim 140$  mOsm kg<sup>-1</sup>), phloem girdling had no effect on xylem hydraulic conductance. These results suggest a functional link between phloem and xylem hydraulic systems that is mediated by changes in the ionic content of the cell sap.

**Keywords:** *Acer rubrum*, *Acer saccharum*, hydrogel, xylem sap ion concentration.