

FLOW OF SAP FOR MAPLE SYRUP PRODUCTION (optional)

You have learned that phloem is the principal pathway of sugar movement in vascular plants. However, under certain circumstances, sugars do move in the xylem, as is seen in the flow of maple sap. In late winter a sugary solution, derived from carbohydrates stored in the stem, can be tapped from the xylem of several kinds of trees, but most notably the sugar maple (*Acer saccharum*). The source of the sugar is the xylem parenchyma cells. Cold nights lead to the hydrolysis of starch reserves in the parenchyma cells; the sugars thus produced are actively transported out of the parenchyma cells into the apoplast and eventually move into the tracheids and vessels. Warm temperatures during the day cause the release of CO₂ from solution in the xylem, thus creating a positive pressure in the xylem. Water and sugar are forced up the trunk by the expanding CO₂ bubbles.