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# Stemflow: A literature review and the challenges ahead

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Stemflow is the rainfall portion that flows down to the ground via trunks or stems. It is a localized point source input of precipitation and solutes at the stem base, creating islands of soil moisture and fertility. It accounts on average for less than 5% of the gross rainfall but maximum figures can reach 3.5%, 11.3%, and 19% in tropical, temperate and semi-arid plant communities, respectively. However, recent research has shown these statistics could be twice as large in overstocked semi-arid, subtropical and temperate forest stands. Tree and shrub species funnel different stemflow depths and canopy features; diameter at breast height, top height, canopy area and volume, branch number and position; bark smoothness, etc. are the most frequent independent variables employed to explain the large intrinsic variation. The funneling ratio evaluates the hydro-pedological importance; calculated by the division of stemflow volume by the stem base area and by the rainfall depth. Statistics quite often show funneling ratios » 1. Assessments of the stemflow infiltration area quite frequently show the islands of soil moisture are at least twice as large as the soil depth wetted by rainfall in the open and calculations are in agreement with several visual observations. Empirical evaluations quite often also show the potential contribution of stemflow to groundwater recharge and streamflow generation. However, assessments of the infiltration area and depth quite frequently deviate from visual observations conducted by dying pathways, showing roots are the most frequent sources of stemflow transport within soils. Should this be the case for most trees, then the number of roots and their position within the soil profile would help to better forecast the stemflow (rootflow) infiltration depth and the potential triggering of other hydrological processes. Current mathematical approaches challenge future research on stemflow and rootflow to better understand the hydro-eco-pedological importance of point source inputs of plant communities.