

Abstract

Stemflow research is one of the most understudied aspects of the discipline of hydrology, due mostly to the fact that until recently, scientists believed it was inconsequential in the hydrological cycle. Stemflow has been studied for approximately 140 years, but there have not been very many that quantify its infiltration area into soil. In the last 30 years however, there has been a larger focus on stemflow infiltration into soil, and how it is of hydrological, geomorphological, and biogeochemical importance. We attempted to further knowledge of stemflow infiltration into soil through three research objectives: (i) for isolated ponderosa pine trees in a semi-arid environment we related total depth and intensity of rainfall to stemflow yield and the rate of flow associated with stemflow. (ii) we determined if the surface saturated hydraulic conductivity of the soil varies as a function of soil characteristics and (iii) we determined the infiltration area (I_f) of stemflow around selected trees and related the extent of this area to stemflow flow rates. We used stemflow collection collars, dye tracers, and statistical analysis to answer each of our questions. Our study is significant because up to 2023, there have been no studies we know of studying stemflow in a semi-arid environment with exclusively ponderosa pine trees.