

Phosphorus Leaching Behavior from Extensive Green Roof Substrates

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ABSTRACT

The substrate is the key component of a green roof system that directly influences the system's stormwater mitigation performance; however, it is also identified as a potentially significant source of contaminants. It is interesting whether substrate phosphorus discharge behavior is predictable and, if so, whether the study of substrate phosphorus leaching behavior is representative of the green roof system performance. The substrates tested were extracted from a 4-year-old extensive green roof and a 1-year-old proprietary substrate from an agricultural (Ag) green roof. The column test for the extensive green roof substrate (comprised of 90% v/v pumice and 10% v/v compost) was designed to simulate 3 years of precipitation in a 3-month period, based on field monitoring of rainfall from 2018 to 2020, and assuming precipitation occurred equally each month. Double the amount of precipitation was applied to the Ag substrate to make up for the shorter duration field exposure before the laboratory experiment. Total phosphorus (TP) concentrations in the permeate from the extensive and the Ag substrates showed exponential decreases with cumulative water flow. The decreasing rates of TP concentrations were similar regardless of the initial phosphorus in the two different substrates. Field monitoring indicated that the TP discharge from the newly built green roof behaved differently compared with its substrate in the laboratory. However, substrate tests could be an extension of field monitoring to estimate the phosphorus discharge for aged green roofs.

Full text:

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