

Nutrient cycling in conifer forests in Ireland and implications of management and disturbance on their sustainability

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The services that forests provide such as fibre, fuel, water quality and climate mitigation depends on the long-term stability of their biogeochemical cycles. In semi-natural systems, nutrient cycling is relatively closed—most nutrients are cycled internally with little inputs or losses to the external environment. Nutrient cycling tends to optimize the limited pool of available nutrients and makes them available for tree nutrition. However, when cycles are disturbed—due to management activity or environmental causes, nutrient cycles can become open, with losses from the system. These in turn can take a long time to be regenerated. In Ireland, forests are predominantly located on thin, acid soils with limited nutrient and low fertility compared to agricultural areas. The sustainability of these forests depends on the maintenance of their nutrient cycles, which conserve nutrient resources. In this study we quantified the major fluxes and pools of nitrogen, phosphorus and potassium in a mature Sitka spruce (*Picea sitchensis* (Bong.) Carr) stand on a peaty-podzol soil in County Wicklow. We also used weekly observations of soil solution chemistry from below the forest floor and mineral soil to identify the processes controlling nutrient cycling at the plot.

Keywords: biogeochemical cycles, nitrogen, phosphorus, and potassium

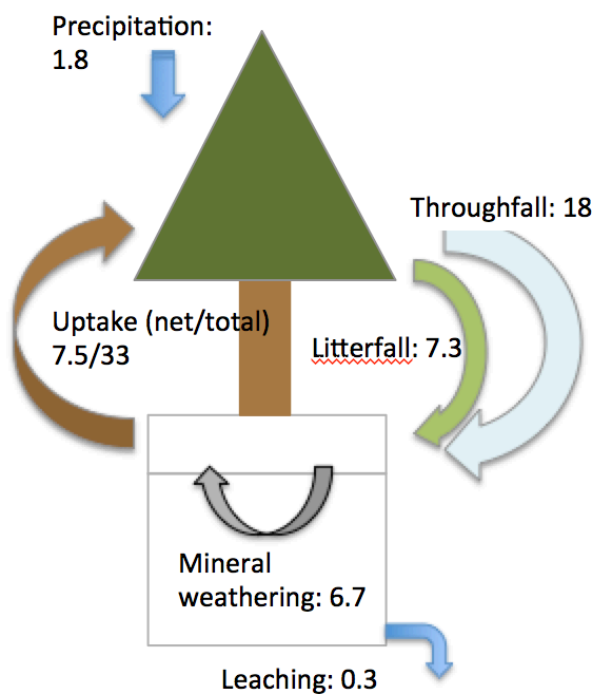


Figure: Simplified schematic of potassium cycle. All values in $\text{kg ha}^{-1} \text{ year}^{-1}$