

Overcoming the Challenges of Estimating Water Use in Temperate, Mixed Deciduous Forest of S. Korea

About 80% of forests in Korea occur in mountainous regions and are composed of a rich diversity of mixed deciduous tree species. Mountains in this region receive more rainfall and act as fountains that supply fresh water to the lowland and quantifying the hydrologic components of the forested mountain catchments is critical for sustainable water resource management. Forest trees play a significant role in ecosystem water budget and understanding of forest water use is crucial for water budgeting. High diversity in tree species, however, complicates the upscaling of forest water use by mixed forests, since trees are likely to function differently. A simplified approach is to identify common functionality gradients that define tree water use irrespective of phylogeny. A research initiative established under the International Training Group: Complex Terrain and Ecological Heterogeneity (TERRECO) sought to identify common structure and functionality among tree species that could allow for a convergent definition of water use in mixed deciduous forests in S. Korea. Using a wide range of thermal techniques to quantify water use in 7 different species located in 3 mountains with unidentical climates, we have related forest and tree structural properties to species water use. To understand spatial differences in tree water use, two species (*Quercus dentata* and *Q. mongolica*) were chosen as comparative species common to the three locations. Water use was significantly correlated with diameter at breast height (DBH) for all overstory species. The maximum transpiration was about 3 mm d⁻¹ in all three different locations and daily transpiration was well described by microclimate and DBH irrespective of the location as long as soil moisture was not limiting. These initial findings are aiding our upscaling procedures.