Quantifying water use by forests growing on complex mountainous terrain is difficult and understanding of controls on water use by these forests a challenge. Yet mountains are crucial as water towers and better understanding of their hydrology and ecology is critical for sustainable management. Consequently, there is a growing need for new research approaches designed with attention to the particular needs and constraints of large-scale studies and that have the potential to generate reliable and accurate data. The use of a combination of different sapflow-measurement techniques provides a unique opportunity to monitor water use by the understory and canopy forest tree species at micro-scale, allowing for accurate estimation of total forest water use. The obtained data, in conjunction with intensively measured climatic variables, allow for better understanding and interpretation of transpiration results. A research initiative under the International Training Group: Complex Terrain and Ecological Heterogeneity (TERRECO) seeks to address pertinent issues related to forest water use and production in complex terrain. Stem Heat balance (SHB) and Heat Dissipation techniques have been employed to measure sapflow in the understory woody plants and tree branches and on stems of canopy trees respectively. Measurements have been stratified to account for differences in tree sizes and species diversity. To better understand the data, we are intensively monitoring soil moisture at 5, 10 and 30 cm depths, in addition to a range of micrometeorology sensors that have been set up below, within and above the canopy. These measurements have been planned, taking into account altitudinal/elevation gradient, aspect and within site differences in species composition and tree sizes and to generate data for large-scale modeling of the entire catchment. A total of 70 trees from 9 species growing in six different locations at varying elevations and aspects are being monitored. Peak daily water use by trees during mid summer amounts to 45 kg d-1 but varies significantly with sapwood area. Within a species, there is a consistent relationship between tree size (DBH) and sapwood area irrespective of elevation. We have also established a common trend in the relationship between wood density and sap flux density (Js) that transcends the boundaries of species differences. These initial findings are critical for our planned upscaling of water use by the forest catchment. In addition to soil moisture, vapor pressure deficit (VPD) and light play a crucial regulatory role on forest water use. We are at the stage of establishing a common link that brings together micrometeorology and transpiration that will allow for large scale modeling of forest water use