



## **A large sample study exploring the contrasting effects of native forest and forest plantation on catchment water yield in Chile**

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Over the last 40 years, south-central Chile has experienced massive conversion from native forests (NF), shrublands, and grasslands, to *Pinus radiata* and *Eucalyptus* spp. exotic forest plantations (FP). Previous studies have associated the conversion of NF to FP to a reduction in water provision (quality and quantity), in Chile and throughout South America. This study aims to strengthening these findings by providing novel evidence on the contrasting effects of NF and FP land covers on water yield using a large-sample dataset.

We analyse annual and seasonal water yields in 56 catchments covered by different combinations of NF and FP in southern Chile (35°-41°S). The water yield is represented by the runoff coefficient (RC), calculated as the ratio between accumulated runoff —streamflow normalised by watershed area— and accumulated rainfall, at annual and seasonal scales. To characterise forest cover types, we select catchments from the CAMELS-CL dataset with at least 15% of their area covered by different combinations of NF and FP, and calculate a forest plantation index (FPI), defined as the ratio of area covered by FP to total forested area (area covered by NF and FP). This index ranges from 0 (when the tree-covered area of the watershed has only native forest) to 1 (when there is only forest plantation). It should be noted that a given catchment may present other land cover types in addition to forest cover.

We fit a linear regression model to relate annual and seasonal RC with the FPI. To explore for confounding factors affecting these correlations, we included several catchments attributes as predictors representing climatic and topographic conditions. Our results show that the selected predictors are able to explain more than 60% of variance in RC, and that the FPI contributes with about a 30% of that skill. We show that annual and seasonal RC decrease with higher relative area of forest plantation compared to the area covered by native forest, especially in spring-summer, which corresponds to the dry season. These results are consistent with lower water yields associated with forest plantations documented for South America, associated to higher evapotranspiration rates and lower soil water storage capacity compared to native forests.