

Effects of land use change on water availability and water efficiency in the temperate basins of south-central Chile

- Esse C.^a
- Ríos N.^b,
- Saavedra P.^f,
- Fonseca D.^c,
- Encina-Montoya F.^{c, d},
- Santander-Massa R.^{a, e},
- De los Ríos-Escalante P.^{d, g},
- Figueroa-Muñoz G.^{h, i, j},
- López-Pérez A.^k,
- Correa-Araneda F.^a

Abstract

Background: Forest ecosystems provide services that are important for human use; one of the most critical ecosystem services is the provision and regulation of water. Basins with high forest improves hydrological functionality by promoting reduction in surface runoff, increase infiltration and aquifer recharge, and ensures base flow regulation amongst others. On the other hand, the conversion towards highly anthropized productive systems is usually accompanied by precarious environmental management that alters the hydrological cycle and reduction in water quality in basins. Aim: The goal of this study was to analyze land use changes and their effect on water efficiency index (WEI) in three sub-basins. Methodology: The methodology included a multi-temporal analysis of satellite images to identify land uses, also the use of SWAT (Soil and Water Assessment Tool) model for hydrological analysis in each sub-basin, information needed for calculating the WEI. Results: The results revealed the existence of no significant difference in terms of WEI between the sub-basins with predominant tree cover of native or artificial, being higher (0.89) than the WEI values reported by the sub-basin with agricultural land use (0.65). It is concluded that hydrological functions are more efficient in basins with forest cover, made up of native or exotic species, than agricultural land use with annual crop rotations. The results contribute to decision making on public policies associated to the rural productive activities. Concluded: Finally, we conclude the necessity of the promotion of forest plantation management techniques that avoid clear-cutting and multiple rotations in basin headwaters and riparian areas. © 2021 The Author(s)

Author keywords

Clear-cutting; Land cover; Land use; Mixed forest; Native forest; SWAT