Geophysical Research Abstracts
Vol. 14, EGU2012-8364, 2012
EGU General Assembly 2012

Designing forest thinning to compensate stream flow for climate change

R. P. Silberstein, W. R. Dawes, and C. K. Macfarlane
CSIRO, Land and Water, PO Wembley, Australia (richard.silberstein@csiro.au)

Prior to the 1970s, stream flow in south-western Australian water supply catchments was typically 10 to 15% of rainfall. Since then rainfall has declined about 15% and average annual streamflow has declined by 80%, threatening water supplies and aquatic and riparian ecosystems. The decline in stream flow is due primarily to the reduction in rainfall, but also to the increased density of the forest, and possibly to activities such as fire. Furthermore, in 2011 substantial areas of forest died as the region underwent the worst drought with the lowest annual rainfall on record. It has been proposed that thinning the forest is a viable option to increase stream flow benefiting both aquatic ecosystems dependent on permanent water and human resources as the water could be captured in reservoirs downstream. This may also reduce terrestrial competition for the scarcer soil moisture and thus give some level of protection to the remaining forest. However, the question of how much thinning is required, where in a catchment it should take place, and how effective and persistent it would be needs to be addressed. Furthermore, there are likely to be impacts on terrestrial ecosystems that need to be assessed against the proposed benefit to the aquatic and riparian systems and human resources.

In this paper we explore the effectiveness of thinning a catchment to adapt a system to the effects of climate change by using a physically based catchment model with a dynamic forest growth component (Topog). The model has been calibrated with stream flow, groundwater dynamics and forest water balance monitored in small subcatchments. A range of thinning options are explored under a selection of possible future climates. We find significant differences in stream flow outcome depending on location of treatment in the catchment and, of course, climate, and that the ability to simulate active forest growth has a major influence on the model output.