



The hydrological impact of the mediterranean forest: a review of French research

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Received 27 June 2003; revised 8 June 2004; accepted 25 June 2004

Abstract

Forest hydrology studies carried out in France have focused mainly on the Mediterranean part of the country. Three experimental catchment groups exist and have been monitored over a long period. Some forested catchments (Draix catchment) underwent no change during the study period, while others experienced either clear cutting (Lozère catchment) or forest fires (part of the Réal Collobrier catchments). In each case studied, the behaviour of the forested catchment was compared to that of a control catchment.

Included with the experimental catchment studies are the results of research with a fundamentally different approach. The research is based on a statistical study of the interrelated development of afforestation rates and runoff characteristics for average-sized catchments (around 100 km²) in that part of the southern French Massif Central which is subject to Mediterranean rainfall conditions.

The results differ considerably from one site to another, indicating the degree of complexity of the rainfall/runoff relationship. An increase in extreme flood events due to forest disturbance could by no means be confirmed in every case. A closer look at the hydrological behaviour of the catchments cleared up the apparent inconsistencies. It is mainly the contrast between bare soil and vegetated soil, rather than between forest and other types of vegetation which is relevant in explaining the hydrological behaviour.

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Keywords: Forest hydrology; Floods; Annual discharge; Mediterranean climate

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doi:10.1016/j.jhydrol.2004.06.040

1. Introduction

There is much controversy about the hydrological impact of forests with respect to flood events, low flows, and even annual runoff (Bosch and Hewlett, 1982; Bruijnzeel, 1990; Fritsch, 1992; Calder, 1998). It is true that the influence of forest on flows depends on a large number of factors, which explains the widely dissimilar results observed.

In the South of France, research on the subject focused on three research catchments in the humid Mediterranean zone. The sites differ in pedological and geomorphological characteristics, although all three are subject to heavy rainfall in autumn and sometimes during the summer. The wide variety of responses observed prompted an attempt to isolate the hydrological mechanisms that would explain the effect of plant cover on catchment hydrological behaviour.

2. Study sites and experimental conditions

The three sites chosen for study were the Draix basin, situated on the black marls of the Digne area in the Provençal hinterland; the Réal Collobrier basin located close to the shores of the Mediterranean;

and the Mont-Lozère basin in the south-eastern foothills of the Massif Central (Fig. 1).

The main site characteristics are shown below in Table 1.

These three groups of catchments have not been managed with the same objective, and forest hydrology did not necessarily play a major role in setting them up. Therefore, it is not surprising that the methods differed for each independently conducted study.

The Draix catchments are located on land (Oxfordian black marls) with major erosion problems due principally to the fact that the rock (black marls) is very susceptible to erosion. Erosion induces steep slopes. The question remains on the origin of the erosion: incision of the main stream, deforestation at the early age of human occupation.

The main objective there was to estimate the protective role of the forest within the framework of a national soil conservation project. The experimental set-up consists of two catchments: one (the Brusquet) that was re-afforested towards the end of the nineteenth century. The stands on the Brusquet are classified as ‘conservation forest’ by the French Forest Service, and as such, have been left untouched for the last 100 years; The second (the Laval) was an un-afforested one where vegetation cover is sparse

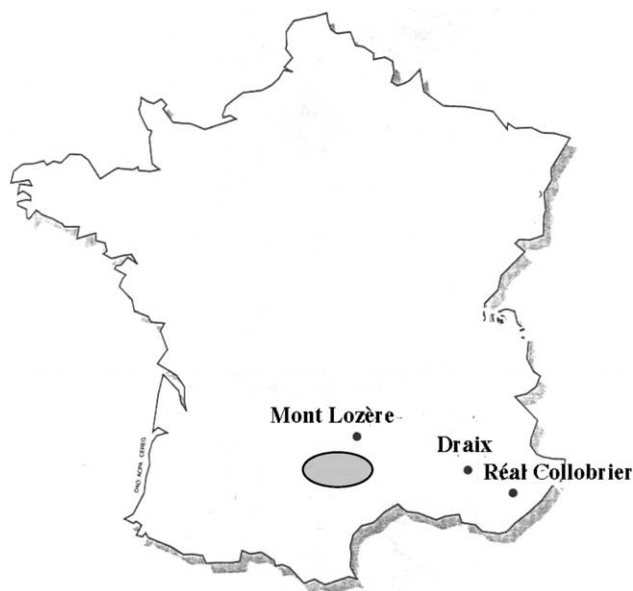


Fig. 1. Sites of forest hydrology research in Mediterranean France (Catchments studied in the Southern Massif Central are indicated in grey).

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