

Evaluation of the post-fire erosion and flood control works in the area of Cassandra (Chalkidiki, North Greece)

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Abstract: We quantified morphological and hydrographical characteristics of two drainage basins (Chanioti and N. Skiomi) on Cassandra peninsula of Chalkidiki (North Greece), and evaluated the effectiveness of post-fire flood and erosion control works. The drainage basins were chosen because of their severe damage by fire, post-fire potential for erosion and flood due to the steep relief, and the importance of the area for residential and tourism development. The first measures taken in the area after the fire were salvage cutting of burned trees, a total ban on grazing, and construction of three types of works, log erosion barriers (LEBs), log check dams and contour branch barriers. Almost all necessary post-fire works were completed in both catchments but many construction failures were recorded. Approximately 75% of the LEBs and 45% of the contour branch barriers functioned properly, while the remainder failed. Nearly 80% of the log dams were sedimented to 0–20% of the dam height, 14.3% were 20–40% filled and 5.9% collapsed. Despite these failures, peak discharge declined by 10.5% in Chanioti and 20.4% in N. Skiomi catchment. The main reasons for works failures were the rush of construction and the limited supervision of workers, which resulted in floods during the years that followed.

Keywords: erosion, catchment, contour branch barrier, erosion, flood, log dam, log erosion barrier, post-fire management

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Introduction

Wildfire is a natural process in many conifer-dominated ecosystems. After fire, both total runoff and peak flow can increase dramatically in burned watersheds, causing flooding, debris flows, and high rates of soil loss and sedimentation (Robichaud et al. 2008b). Commonly used flood and erosion control measures are log erosion barriers, log check dams and contour branch barriers, while there are several hillslope treatments such as broadcast seeding, mulching, contour trenching, terrace construction, scarification, slash spreading, and installation of straw wattles, silt fences, geotextiles, and sand bags.

During the last 20 years in Greece these flood and erosion control works have been constructed in burned drainage basins but, in many cases, the efficiency of these works has been criticized. Faults arise from ineffectiveness of works due to inadequate supervision of construction and consequently inadequate implementation of the construction rules (Baloutsos et al. 2007).

An intense forest fire occurred on Cassandra peninsula in August 2006 that burned 5500 ha of forest and crops, while the catchments of Chanioti and N. Skiomi were totally burned (Figure 1).

Sediments, ash, burned logs and branches were transported by overland flow during the first rainfalls after the fire to two downstream settlements. This caused problems including the destruction of parts of roads. The most significant problem was the contamination and fouling of the sea and the beaches of the area, which resulted in cancellation of several tourist bookings for that summer. The financial losses resulting from the cancelled reservations proved to be serious for the local community.

Pine forest, olive trees and crops were destroyed, leaving the soil unprotected and, therefore, increasing runoff and soil erosion. Fire might also have changed some physical properties of the forest soils, such as moisture content, structure, leaching potential, absorption capacity and water penetration, mainly due to the fact that the soil organic matter, the basic factor of particle aggregation, was destroyed. Additionally, a hydrophobic layer of