



## Comparing post forest fire erosion to erosion in vineyards in a Mediterranean environment

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In Mediterranean France, severe soil erosion can occur in two environmental contexts: on forested slopes shortly after a forest fire and in vineyards. Soils are particularly vulnerable to erosion during the first year after a fire. Vineyards tend to occupy gentler slopes in alluvial plains and the first foothills of steeper landscapes. They can be exposed to erosion throughout the year depending on storm characteristics and inter row grass cover which is variable both spatially and temporally. The objective of this case study was to compare estimated rates of erosion and potential inputs of sediments into stream channels from post forest fire and agricultural contexts.

The studied catchment has a surface area of about 234 km<sup>2</sup>, where about 199 km<sup>2</sup> are forested, 18 km<sup>2</sup> are vineyards, and the remaining 17 km<sup>2</sup> are mainly grassed or urban. Forest fire records are too recent to calculate return periods for large fires but it is estimated at about 25-35 years in the study catchment. In 2003, a 2,000 ha fire burned through the catchment, and sediment traps on a N facing slope were used to estimate erosion rates during a period of about 2.5 years after the fire. Total event erosion for the burned area was estimated using non-linear curves where erosion decreased exponentially with time according to slope orientation: vegetation on N facing slopes recovers more quickly than on S facing slopes so erosion rates tend to remain greater for a longer period on the latter. Soil erosion in vineyards was estimated by adapting the Revised USLE. Conservation practises (P) were modified to account for terracing and vine row orientation with regards to slope orientation. Vegetation cover (C) was modified to account for seasonal variations in inter row grass cover. The other factors in the equation were not altered.

In this case study, post forest fire erosion rates were particularly low due to an absence of significant storms during the first post fire winter. Mean soil erosion rate for the first year was about 2.7 T ha<sup>-1</sup>, and total event erosion was estimated at 5.4 T for the first year and 8.4 T over a 6 year period. Assuming a return period of 25 years for a fire of similar magnitude, this would represent the 25 year sediment input value. Mean annual vineyard erosion rate was 5.5 T ha<sup>-1</sup>. This corresponds roughly to about 9,900 T during any typical year and to about 247,500 T over a 25 year period.

Several factors affect post fire erosion estimation, including return period, burned surface area, and rainfall intensities during the first year after a fire. The 2,000 ha fire used in the case study is considered a large fire in a region where fires rarely surpass 6,000 ha due to agricultural and urban densities. Post fire erosion is particularly sensitive to rainfall characteristics and the unusually low rainfall during the year of study underestimates long term post fire erosion rates. Actual long term rates may be 5 to 10 times greater for a normal rainfall year. Reasonable increases in surface area and rainfall would provide a very rough long term average estimate of about 100 T ha<sup>-1</sup> for the first post fire year and about 150 T ha<sup>-1</sup> for the entire forest fire event. Hence, typical sediment input from the burn scar may be as much as 10 times greater than input from vineyards the first year after a fire, but long term vineyard erosion rates may be as great as 1,000-2,000 times greater than from forest fires.