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Influence of forest managements on water runoff and soil erosion, in steep forestlands from northern Italy.

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In forestlands on steep slopes, where the shallow soil can be considered a non-renewable resource, erosion is of special concern. The increase in the precipitation intensity causes a significant positive trend in the proportion of total precipitation contributed by heavy precipitation events. The vegetation cover provides essential protection to the soil against the erosivity of rainfall and reduces considerably the water erosion rate. We focused our attention on the forestland cover subjected to different types of managments practices and harvesting age. With the aim of obtaining information on surface water flow and the mineral soil loss, in May 2005 three runoff-erosion plots (10 m long $\times$ 3 m wide) were installed in a catchments in Lombardy Alps (Intelvi Valley, Como) at three stands (one each stand): a coppice 40 years old (*Coppice cum*) and two conversions from coppice to high forest respectively cut in the 1994 (*Conv. 1994*) and 2004 (*Conv*. 2004). Previously we measured the tree stems density referring to one hectares, so that the plots (30 m^2) were representative of the forest structure. In the coppice stand, the plot contained two multi-stemmed trees because the higher values of canopy cover and stem density. Moreover in June 2006 was built up one plot more in the coppice stand (*Coppice sine*), without stems, in order to understand their influence on the data samples. In July 2005, the soil cover was measured for each stand using a wood frame (50 x 50 cm), thrown randomly 50 times on the soil. Finally, in July 2006 data about the canopy cover (Plant Area Index) were collected by hemispherical photography and CAN_EYE software analysis. All the stands selected were located on slopes ranging between 28-32 degree. Runoff and sediment losses were collected from June through October 2005 and from May through October

2006 (from June for the *Coppice sine* plot) every 15 days and after each heavy rainfall event. The soil loss samples were oven dried and then weighted. We also related the soil erosion and runoff with climate data, focusing on three rainfall events occurred at full and off summer season. Our results showed that the harvesting practices significantly affect the water runoff and soil erosion with marked differences among the plots. The conversion to high forest stands showed the higher values of soil loss decreasing with the age of harvest. This is due principally to the lower tree density, the smaller canopy cover and the different soil cover composition. In particular the 2004 conversion, which had the lowest values of tree density and mosses and canopy covers, showed the highest soil loss value after heavy precipitation event and during the aridness periods. The coppice forest showed the highest runoff (higher in the plot without stem) and the lowest soil loss value; as expected, these findings suggest its major role in soil erosion protection.