THESIS

RUNOFF AND SEDIMENT YIELD IN A SEMIARID PIÑON-JUNIPER WOODLAND, NEW MEXICO

Submitted by

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ABSTRACT OF THESIS
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Over a three-year period precipitation, runoff, and sediment yield were continuously measured to understand the amount of runoff and sediment movement within a piñon-juniper woodland. Seventeen plots were installed to measure total runoff and sediment yield from different ground cover types and slope lengths. Eleven plots had slope lengths of 1-3 m and contained either sparse (<30%), transitional (30%-70%), or dense (>70%) ground cover. Three plots had slope lengths of 6-8 m and contained patches of dense and sparse ground cover ('integrated plots'). The other three plots had slope lengths of 1 m and were located beneath tree canopies ('canopy plots'). The objectives of this study were to determine the effects of ground cover on runoff and sediment yield, and to evaluate the effects of spatial scale on runoff and sediment yield.

There were 95 naturally occurring rainstorms that produced a total of 790 mm precipitation during the study period. Runoff accounted for 37% of the annual water budget for the sparse plots, 20% for the dense and integrated plots, and 6% for the canopy plots.

Sixteen of the 95 rainstorms had more than 15 mm of precipitation ('large storms'). These large storms were typically either high-intensity convective storms or low-intensity frontal storms, and together they accounted for over 50% of the total rainfall during the study period. The large high intensity storms each generated an

average of 18 mm of runoff and 190 g/m^2 of sediment from the sparse plots, 15 mm of runoff and 30 g/m^2 of sediment from the dense plots, 13 mm of runoff and 60 g/m^2 of sediment from the integrated plots, and 4 mm of runoff and 6 g/m^2 of sediment from the canopy plots. Almost all sediment yield occurred during the large convective storms. The large frontal storms each generated an average of 14 mm of runoff and 16 g/m^2 of sediment from the sparse plots, 5 mm of runoff and 1 g/m^2 of sediment from the dense plots, 7 mm of runoff and 3 g/m^2 of sediment from the integrated plots, and <1 mm of runoff and <1 g/m^2 of sediment from the canopy plots.

Fifty-four of the 95 rainstorms had less than 5 mm total precipitation and accounted for 20% of the total precipitation. On average, each of these small storms generated less than 1 mm of runoff and very little sediment from the sparse plots; no runoff or sediment was generated from the dense or integrated plots.

The results show that the sparse patches are the primary sources of runoff and sediment and the dense patches are the primary sinks. Integrated plots with both sparse and dense patches generated significantly less runoff and sediment than the corresponding subplots. On average, 18% of the precipitation was stored within the integrated plots during the large frontal and large convective storms. Most storage was observed to occur at the interface between the sparse and the dense patches. In a moisture-limited ecosystem, storage of water may be critical to vegetation establishment and sustainability. This information on runoff and sediment movement should assist in making more informed land management decisions.

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