UNDER-CANOPY AND INTER-CANOPY VARIATION IN HERBACEOUS VEGETATION, SOIL MOISTURE, AND SOIL TEMPERATURE OF ONE-SEED JUNIPER (Juniperus monosperma) STANDS TREATED WITH HERBICIDE

A. Introduction

- Pinyon-Juniper woodlands cover approximately 76 million acres in southwestern North America (Ernst and Pieper, 1996). Reduction in forage for livestock and game, loss of understory cover (Tausch et al., 1981), and loss of soil due to runoff (Wilcox and Davenport, 1995) are associated with juniper encroachment of grasslands.
- Much of the documented research has been conducted on controlling one-seed juniper for increase forage yield, however, little is known about the influence of tree removal and heavy understory defoliation on soil water dynamics on under-tree canopies and inter-canopy spaces.
- The objective of this study was to determine the influence of tree control and understory defoliation on soil water dynamics.

Hypotheses

- In response to one-seed juniper control, there is more biomass and herbaceous cover under 1) herbicide-treated trees than under non-treated trees and 2) in the inter-canopy spaces.
- In response to precipitation, inter-canopy shallow soil moisture is higher than under-canopy shallow soil moisture.
- In response to solar radiation, inter-canopy soil temperature is higher than under-canopy soil temperature for both herbicide and control trees.

B. Materials and methods

- The study was conducted at New Mexico State University’s Corona Range and Livestock Research Center located in central NM.
- Biomass in under-canopy (12m²) and inter-canopy plots was obtained by clipping all herbaceous vegetation.
- Basal cover by species was estimated at the beginning and the end of the study using a ten placements of a 10-pin frames in each plot.
- A set of three soil moisture probes were installed at each the tree canopy dripline covering 0-25 cm, 25-50 cm, and 50-75cm. For inter-canopy plots, one soil moisture probe was installed at the superficial soil layer (0-25 cm). Three soil temperature probes were installed at 20 cm depth per exclosure next soil moisture probe.

Methods con’t

- 50 rain gauges were installed at the drip line at 80 cm height next to soil moisture probe in under-canopy and inter-canopy plots.

Experimental design

- Three exclosures were selected, half of each exclosure had been treated with herbicide in 1995 and half had been left as a untreated. Within both herbicide and control areas, individual trees were randomly selected for defoliation or no defoliation.
- Data were analyzed using a split-plot design where treatment (herbicide and control) was the whole plot factor, defoliation treatment was split-plot factor, and time was split-split factor.

C. Vegetation results

- Bare ground was significantly different in canopy cover. Inter-canopy had higher bare ground compared to under-canopy plots.
- Litter was significantly different by canopy cover. Under-canopy litter was higher than inter-canopy plots.
- Treatment had a significant effect on herbaceous vegetation cover. Higher vegetation cover was found under herbicide trees than under control trees (untreated).
- There was strong evidence of treatment effect on understory biomass production. Plots associated with herbicide treatment had higher biomass than control plots.

D. Implications

- This study suggests that controlling one-seed juniper with tebuthiuron in central New Mexico will increase herbaceous cover and biomass production by releasing water and nutrient resources.
- Herbicide treatment influenced soil temperature with warmer temperatures under treated trees and inter-canopy plots where higher cover and biomass were collected.
- It seems that treated plots with herbicide made more water available to herbaceous plants but did not affect the vertical water movement through different depths.

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