

## RANGELAND

### UNDERSTORY AND SOIL MOISTURE RESPONSE TO INFREQUENT HEAVY DEFOLIATION OF CHEMICALLY THINNED PINYON JUNIPER WOODLANDS

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**THE STORY IN BRIEF:** We conducted a study to determine the influence of simulated heavy infrequent defoliation on herbaceous vegetation and superficial soil moisture (0-25 cm) under canopies or in interspaces between dead and live juniper trees. Herbaceous biomass production and basal cover of grasses and forbs under dead trees (that had been treated with tebuthiuron 13 years prior to this study) were higher than under live trees. Basal cover but not herbaceous biomass was higher in dead vs. live tree interspaces. Superficial soil moisture under dead trees was lower than under live trees during part of the rainfall season (Aug-Oct) in 2006. However, soil moisture in the tree interspaces did not show any change during the study period.

Infrequent heavy defoliation of herbaceous vegetation under canopies of dead and live juniper trees had no effect on herbaceous basal cover although biomass production tended to decrease with this defoliation regime. In interspaces among dead and live juniper trees, herbaceous basal cover increased with defoliation while biomass production was not affected. Superficial soil moisture was not affected by the defoliation regime we applied.

**THE PROBLEM:** Pinyon-juniper woodlands (PJ) occupy over 30 million hectares in western United States and Mexico and have been encroaching into adjacent grasslands over recent decades. Pinyon-juniper encroachment is thought to be driven by changes in fire frequency, improper grazing, and climatic change. Invasion of PJ is associated with a reduction in herbaceous vegetation cover, which results in reduced forage for livestock and wildlife, an increase in runoff and redistribution of nutrients, and an alteration of water movement patterns and the hydrological cycle. Efforts to control PJ encroachment have included treatments such as mechanical clearing, chemical control, prescribed burning, and targeted grazing with small ruminants. Little is known about the effects of defoliation regimes imposed by targeted grazing on herbaceous vegetation and soils.

**OBJECTIVE:** To determine the influence of simulated heavy infrequent defoliation on herbaceous vegetation and superficial soil moisture (0-25 cm) under canopies or in interspaces between dead and live juniper trees.

**EXPECTED OUTCOMES:** We expect to determine the effect of infrequent heavy defoliation on understory herbaceous basal cover, above-ground biomass production and superficial soil water content.

**DURATION:** January 2005 to March 2007

**APPROACH:** The study area had been chemically treated with the herbicide tebuthiuron in 1995 and had been excluded from cattle grazing since the early 1990's. In

each grazing enclosure, dead and live trees were randomly selected and plots under trees or in tree interspaces were instrumented with soil moisture sensors. Understory vegetation in most plots was clipped before the growing season (March). Herbaceous biomass production by species ( $\text{kg ha}^{-1}$ ) and basal cover (%) were determined before and after the defoliation treatment. Superficial soil moisture was also measured in all plots.

**RESULTS:** Dead trees had higher herbaceous understory cover and biomass production than live trees. Herbaceous cover was not affected by the defoliation regime while total herbaceous and blue grama biomass production decreased in defoliated plots (Figure 1). Plots in dead tree interspaces had higher perennial herbaceous cover compared to plots in live tree interspaces. Unlike what occurred in under-canopy plots, the defoliation regime increased the total herbaceous cover of plots in interspaces (Figure 2). However, neither prior chemical treatment nor the defoliation regime applied in this study affected herbaceous biomass production of these plots. Superficial soil moisture (0-25 cm depth) was higher under live than dead trees from August to October in 2006. However, the defoliation treatment applied did not have a significant effect on this variable.

**POTENTIAL APPLICATION:** Two consecutive dormant season intense defoliation events which simulated targeted grazing with small ruminants did not affect understory basal cover but caused a decrease in aboveground biomass production of grasses and forbs. Our results also suggest water resources that are released by controlling adult juniper trees at our research site may eventually be completely utilized by the grass understory.

**EDUCATIONAL PLAN:** A detailed account of the results of this study will be submitted for publication in a peer-reviewed rangeland management journal. Our final article will be posted on the Corona Range and Livestock Research Center's web site (<http://corona.nmsu.edu>).

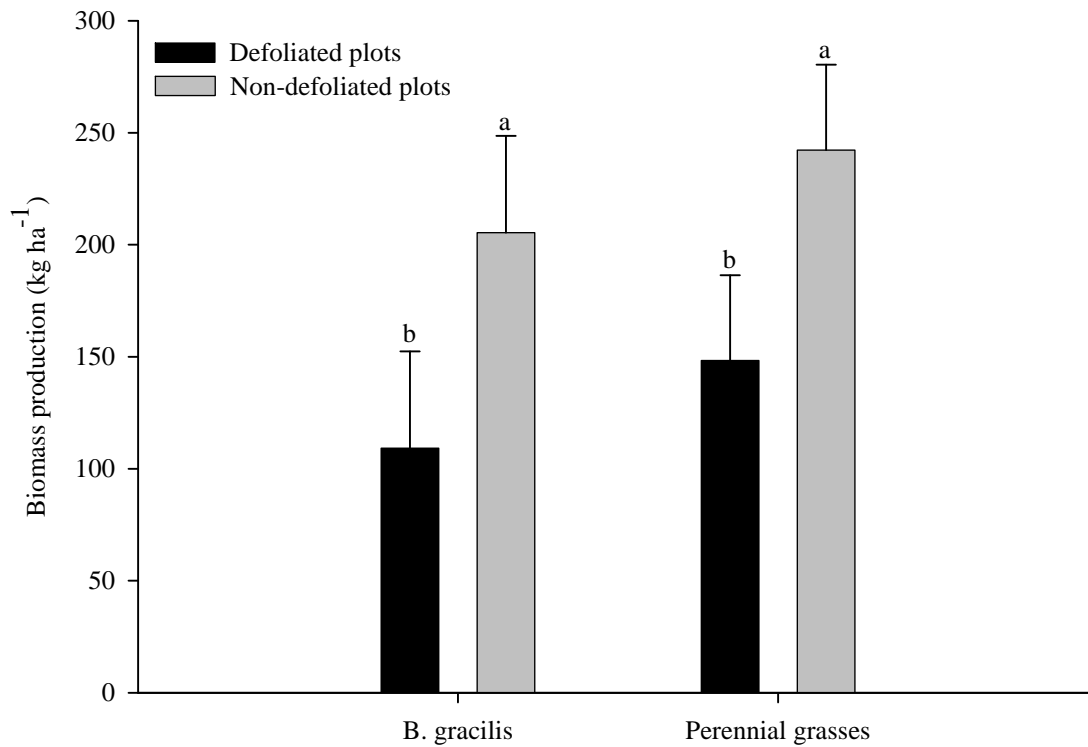


Figure1. Average biomass production of understory vegetation in plots under live and dead tree canopies. Different letters within species indicate detectable differences (P = 0.05). Bars indicate SE of the least square means.

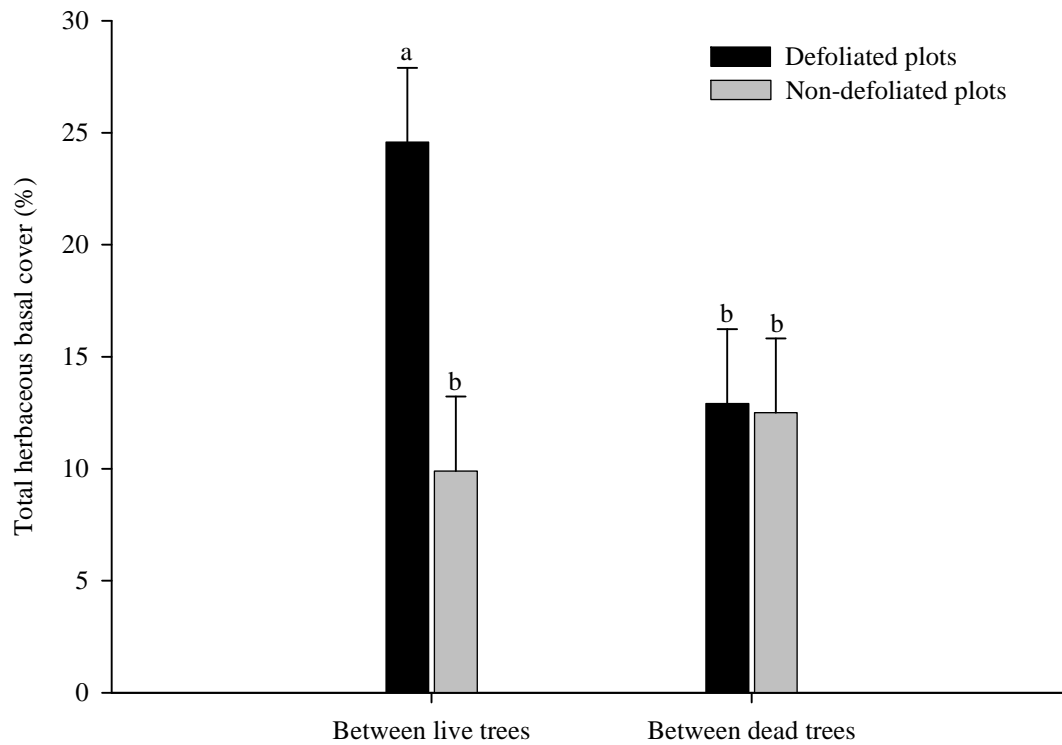


Figure 2. Total herbaceous basal cover in inter-canopy plots. Different letters within tree status (between dead or live trees) indicate detectable differences ( $P = 0.05$ ). Bars indicate SE of the least square means