



What We've Learned:

Conifer removal with a diameter restriction on junipers retained larger junipers, with no detectable effect to understory plant communities.

Did conifer removal reduce encroaching juniper or alter understory plant community composition?

The purpose of this project is to assess whether conifer removal treatments implemented with a 16" dbh restriction on junipers successfully reduced juniper encroachment, and whether treatments had an effect on understory plant communities.

Key Findings (1 yr post-treatment)

- Conifer treatments reduced the number of juniper and pine trees between < 10" in invaded plots, but did not result in decreased canopy cover.
- Over five years, the number of conifers per acre in all size classes increased in the invaded, untreated plot.
- Herbaceous plant cover was lower in 2021 relative to 2015, but this decrease was not related to treatments.



In areas where most conifers were < 10" dbh, trees per acre were visibly reduced from pre-treatment levels (left) to post-treatment (right)



Where most conifers exceeded 10" dbh, the treatment effect on tree density was negligible, as in this treated stand shown pre-treatment (left) and post-treatment (right)



Monitoring Overview

Monitoring of shrublands encroached by juniper and pine in the Plum Project was initiated in 2015. Five 0.5 acre plots were established: two in encroached treatment areas, one in an untreated, encroached stand, and two in adjacent uninvaded habitat. Data on tree density, species and diameters were collected in 2015, along with understory composition data. In 2020, conifers were removed within treatment areas. In 2021, tree and understory data was re-monitored within plots.

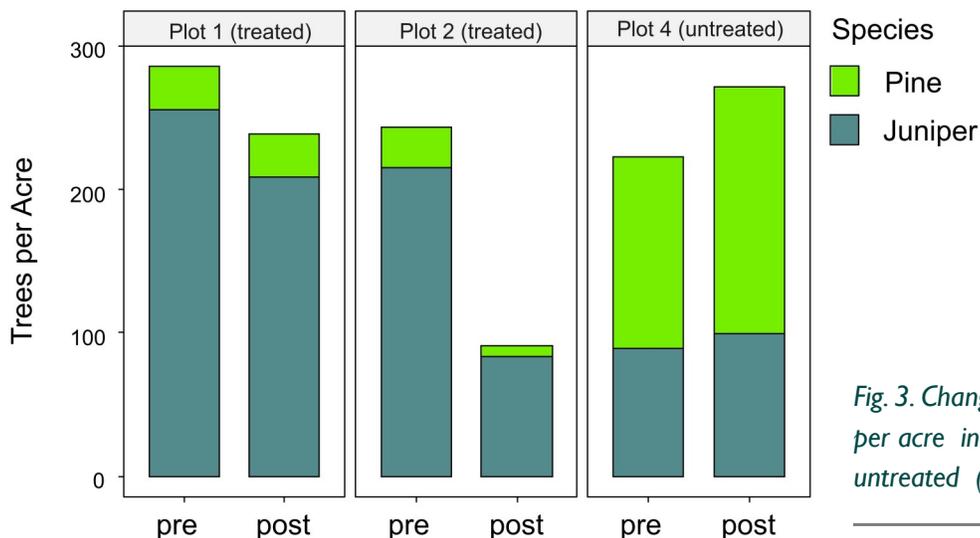


Fig. 3. Changes in juniper, pine, and total trees per acre in treated (Plot 1, Plot 2) and untreated (Plot 4) plots.

Treatments were successful in reducing the number of trees per acre (TPA) in treatment plots (Fig. 3), with a modest decrease from 285 TPA to 238 TPA in Plot 1, and a more substantial decrease from 242 TPA to 91 TPA in Plot 2. The untreated plot increased from 222 TPA to 261 TPA due to the continued encroachment of pine trees.

A 16" dbh cut-off for juniper resulted in the reduction of conifers at smaller size classes (Fig. 4), but the retention of larger juniper across the landscape. In practice, there were decreases only at size classes <10" dbh in treated plots. This was likely due to feasibility constraints during treatment implementation.

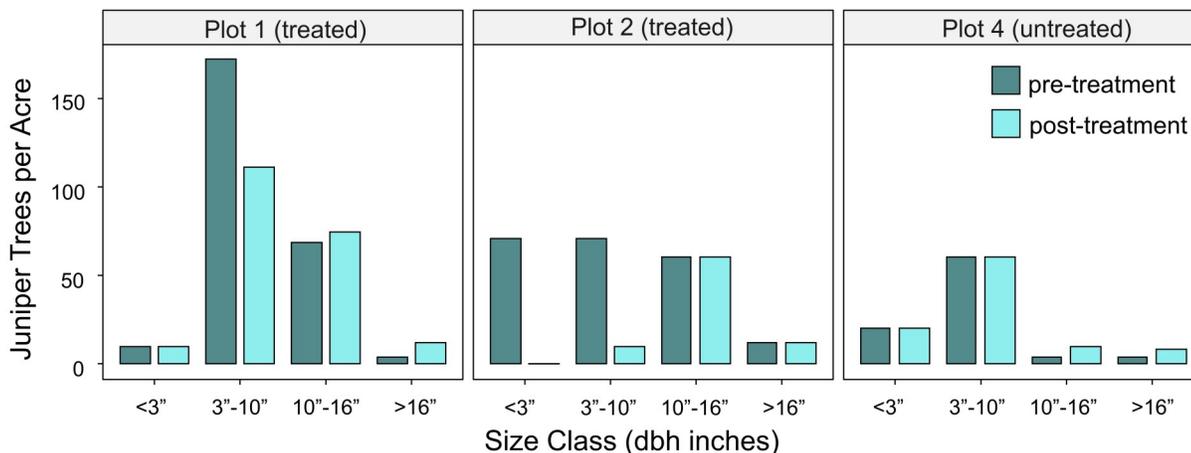


Fig. 4. Pre-treatment and post-treatment juniper trees per acre by size class in treated and untreated plots.



Monitoring of the understory plant community occurred in treated and untreated plots, as well as in adjacent habitat not invaded by conifers. Unencroached plots had significantly higher shrub cover than encroached plots. However, encroached and unencroached plots differed in dominant shrub species, with encroached plots characterized by bitterbrush and big sagebrush, and unencroached plots characterized by low sagebrush or silver sage (Fig. 5) These differences suggest that underlying differences in site hydrology may effect species composition.

Differences in cover of perennial graminoids, annual and perennial forbs and invasive grasses did not vary significantly by plot or treatment, but did differ significantly by monitoring year. While shrub cover remained stable between 2015 and 2021, cover of perennial grasses, perennial forbs, annual forbs, and invasive grasses declined significantly. (Fig. 5).



Fig. 6. Silver sage was the dominant shrub species in one of the unencroached plots.

These results suggest that, in the short-term, factors such as temperature, precipitation, or site hydrology may have had a greater influence on understory plant community composition than conifer removal treatments. Treatments did not result in a decrease in canopy cover post-treatment, suggesting a minor effect to the growing environment for understory plants. While both sampling years were drier than average years, plots experienced summer temperatures well above average in 2021.

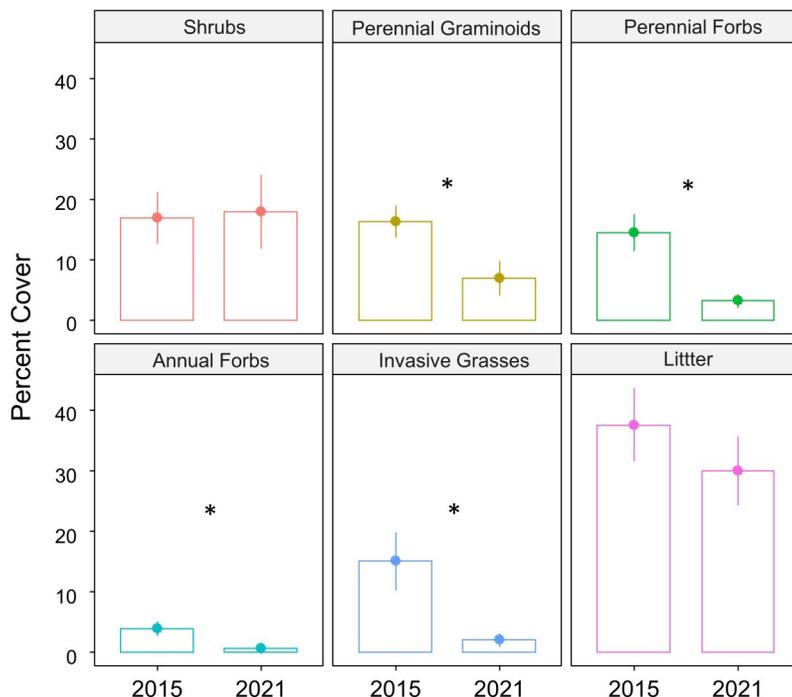


Fig. 5. Mean cover by functional group and year (dot) and standard error (line) An asterisk indicates that the change between 2015 and 2021 was significant after accounting for potential differences between plots and treatments.

Between 2015 and 2021, cover of herbaceous plants declined while shrubs remained stable, regardless of whether a plot was treated.