

ABSTRACT

An evaluation was made of the effect of four levels of shrub release, in the first year after treatment, on annual growth and physiological functioning of 4-yr-old ponderosa pine saplings. The study was done at Latour Demonstration State Forest, California, which is about 50 miles east of Redding at an elevation of approx. 5,400 feet. At the start of the study, the plantation had 100 percent predominantly manzanita shrub cover. In 1986, twelve 20-tree plots were established to provide three replications of four completely randomized levels of shrub cover. These treatments consisted of leaving 0, 15, 30, and 100 percent shrub cover by removing the appropriate proportion of leaf area. Measurements taken included total height growth, stem diameter, needle length, soil water depletion, fine root production, leaf water potential, and stomatal conductance.

At the end of the summer, soil water content was 36.5% in plots with no shrub cover and 25.6% where shrub cover was 100%. Pines growing with no shrub competition had, relative to trees growing with 100% shrub cover: 3-cm greater needle length, seven-times greater average daily stomatal aperture, six-times higher average daily transpiration; and half the average daily water stress. Over the summer, water relations of the pines steadily deteriorated from the 0% to the 15, 30, and 100% shrub cover areas. At the end of the summer manzanita had twice the leaf conductance and transpiration of the pines, in all levels of shrub cover, despite having consistently higher water stress.

It is well known that release from shrub competition often results in enhanced growth of pine plantations. This study shows that this release is associated with improved soil water content and less plant water stress.