

FOLIAGE BIOMASS AND COVER RELATIONSHIPS BETWEEN TREE- AND SHRUB-DOMINATED COMMUNITIES IN PINYON-JUNIPER WOODLANDS

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ABSTRACT.—Woodlands dominated by singleleaf pinyon (*Pinus monophylla* Torr. and Frem.) and Utah juniper (*Juniperus osteosperma* [Torr.] Little) cover extensive areas in the Great Basin and Southwest. Both species are aggressive and can nearly eliminate the previous shrub-dominated community. Successional pathways from shrub-dominated communities before tree establishment to the tree-dominated communities that follow are known only for a few specific sites. How site growing conditions affect successional patterns needs further study. We compared the relationship of foliage biomass and percentage of cover between paired shrub-dominated and tree-dominated plots over several sites. Sites studied are from different elevation and topographic conditions on one mountain range. Foliage biomass in shrub-dominated plots had about a three-to-one variation over the range of site conditions sampled. Tree-dominated plots varied by about two to one. Cover in shrub-dominated plots had a four-to-one variation; cover in the tree-dominated plots varied by about two to one. Total foliage biomass in both tree- and shrub-dominated plots correlated best with the site index of height at 200 years of age. Variation in percentage of cover in both tree- and shrub-dominated plots correlated best with elevation. Foliage biomass variation in shrub-dominated plots was proportional to the variation in the paired tree-dominated plots. A similar proportional relationship was present for percentage of cover between paired tree- and shrub-dominated plots. Foliage biomass was more sensitive to topographic differences than to cover. Variation in plant species sampled in the shrub-dominated plots correlated with total foliage biomass of the same plots. Species sampled also correlated with pinyon height at 200 years of age and total foliage biomass in the paired tree-dominated plots.

Singleleaf pinyon (*Pinus monophylla* Torr. and Frem.) and Utah juniper (*Juniperus osteosperma* [Torr.] Little) woodlands cover more than 72,000 km² (18 million acres) in the Great Basin, coverage greater than it was before European settlement (Tausch et al. 1981). Both species are successionaly aggressive and, once established, can nearly eliminate the understory. Loss of forage and increased soil erosion can result from dominance by the trees (Doughty 1987). Established woodlands provide wood products, pine nuts, and habitat for many wildlife species.

Successional pathways from shrub-dominated communities before tree establishment to the resulting tree-dominated communities that follow are known from only a few specific sites (Barney and Frischknecht 1974, Tausch et al. 1981, Young and Evans 1981, Everett and Ward 1984, Everett 1987). Variability in both tree- and shrub-dominated communities (Ronco 1987) complicates extrapolation of these results to sites of different growing conditions. Comparisons of biomass and cover

relationships between shrub- and tree-dominated communities on the same sites are needed for more locations.

Woodlands have a higher percentage of cover at higher than at lower elevations and on north than on south aspects (West et al. 1978, Tueller et al. 1979). Both tree- and shrub-dominated communities appear to show an increase in cover, and in biomass, on the better sites. The potential three-dimensional form of these relationships is illustrated in Figure 1. Orientation of the X, Y, and Z axes in Figure 1 is for clarity of presentation of the three-dimensional representation.

The vertical X axis represents improving site conditions. Increasing cover or biomass in tree-dominated communities is represented by the Y axis. The Z axis represents increasing cover or biomass in shrub-dominated communities. The line a-e (Fig. 1) represents the relationship between site and shrub cover or biomass. The line a'-e' represents the same relationship with site for biomass or cover of tree-dominated communities. If the relation-

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