Zonation of Understory Vegetation Around a Juniper Tree

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The effect of one-seed juniper (*Juniperus monosperma*) on the composition of understory of perennial grasses, forbs, and half-shrubs was indicated by a detailed study of the vegetation around a tree near Show Low, Arizona. The tree selected for this study was 18 feet tall and had a crown diameter of 19 feet.

Oriented along the four cardinal points of the compass, four 50-foot line transects were stretched from the base of the tree to establish limits of four vegetation zones (Figure 1). Then within each zone, four ten-foot transects were centered and placed perpendicular to the 50-foot lines. The lengths of the transects were adjusted to fit the inner zone. Measurements of vegetation were made according to the line intercept method of Canfield (1941). Perennial grasses and forbs were clipped within a four-inch strip along each transect to determine herbage yields.

As shown in the tabulation in Figure 1, the zone immediately surrounding the base of the tree had no herbaceous vegetation. This zone comprised 91 square feet. It received the least light of the four zones, and because of stemflow, presumably the greatest amount of moisture (Johnsen 1962).

The second zone from the center of the tree, elongated towards the north, included an area of 154 square feet. It contained several species of which snakeweed (*Gutierrezia sarothrae*) had the greatest cover and western wheatgrass (*Agropyron smithii*) was second. Snakeweed showed a fairly high canopy intercept. Western wheatgrass, a cool-season species, occupied about twice as much space in this zone as did blue grama (*Bouteloua gracilis*), a summer grower. This zone produced 293 pounds of air-dry perennial grass and forb herbage per acre.

The second zone was elongated toward the north because the tree's shadow was cast in this direction for the major part of the year and influenced soil moisture. Since lateral roots of the tree were generally large in this zone, there were few root hairs to absorb soil moisture. Moisture conditions in this zone were evidently more favorable to the growth of western wheatgrass and snakeweed than in the third zone. As shown in Figure 2, rings of snakeweed, representing the second zone, are commonly found where scattered juniper trees are removed by control practices.

The third zone from the center of the tree covered 1,879 square feet. In contrast to the second zone, blue grama here occupied three times the area occupied by western wheatgrass. No snakeweed was found in the transects, although there were a few plants in the zone. This zone

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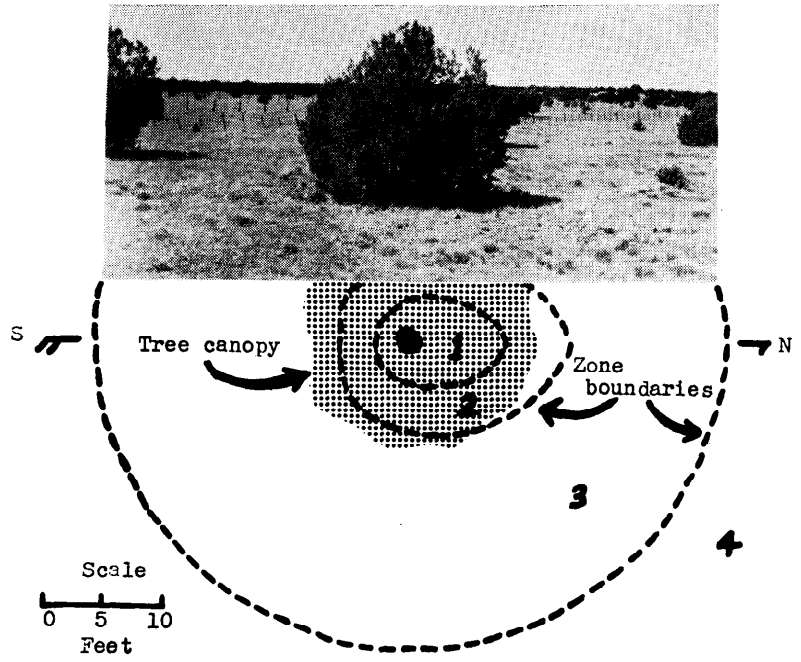

ZONE:		1	2	3	4
INTERCEPT:	Forbs	0	0.20	0.30	0.35
	Galleta	0	.40	.30	.55
	Blue grama	0	.62	1.48	1.38
	Western wheatgrass	0	1.18	.45	2.00
	Total	0	2.40	2.53	4.28
	Snakeweed	0	7.00	0	9.66
HERBAGE YIELD:	Pounds per acre air-dry	0	293	190	475
AREA:	Square feet	91	154	1,879	

FIGURE 1. The juniper showing zones of influence on understory vegetation.

produced 100 pounds per acre less than the second zone.

Although the third zone received full sunlight and precipitation, it was in this zone the root hairs of the tree absorbed and thus depleted soil moisture most rapidly. In this zone, depletion of soil moisture during the tree's growing period in spring probably prevented full development of western wheatgrass and snakeweed. These species have shown a marked release where overstory trees have been removed. The composition approaches that of the fourth zone a few years after juniper control.

The fourth zone showed a perennial grass composition in which the intercept of western wheatgrass was almost twice that of blue grama. The intercept of snakeweed here was the highest of the four zones. Samples of herbage yields averaged 475 pounds of air-dry matter per acre. This zone not only received the full benefit of precipitation and sunlight but was also beyond the influence of the tree. It represents the plant composition and cover that can ultimately be obtained by the control of junipers.

Competition for soil moisture may account for the differences in composition among the three outer zones. The tree probably used much of the soil moisture in the third zone, which may account for the small amount of western wheatgrass and snakeweed.

This limited study indicates that plants of different life forms are associated with one another in definite zonal patterns under and adjacent to juniper trees. This association warrants more detailed ecological study.

LITERATURE CITED

CANFIELD, R. H. 1941. Application of the line interception method in sampling range vegetation. Jour. Forestry 39: 338-394, illus.

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FIGURE 2. Ring of snakeweed that was released after the removal of a juniper.