

# Large Alligator Junipers Benefit Early-Spring Forage

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**Highlight:** *The production of early-spring grasses in central Arizona was four to five times higher under crowns of large alligator juniper than for similar sized areas away from the trees. Virtually all utilization of green forage by grazing animals at this time of the year occurred under the juniper crowns. These large alligator junipers should be protected during pinyon-juniper control operations.*

In the early years of livestock grazing in the Southwest, ranges tended to be badly overstocked and little real management was practiced. As a result, many mid- to lower elevation ranges are presently lacking in cool-season grasses and forbs. Their restoration is an important objective in most management plans.

Several governmental agencies have frequently removed juniper (*Juniperus* sp.) and pinyon (*Pinus edulis*) in the Southwest to promote the growth of forage. Casual observation of this work has indicated that, on many sites, cool-season grasses were more abundant under large alligator junipers (*Juniperus deppeana*) than in either natural openings or in those created by juniper removal. Grasses such as mutton bluegrass (*Poa fendleriana*), bottlebrush squirreltail (*Sitanion hystrix*), prairie junegrass (*Koeleria cristata*), and western wheatgrass (*Agropyron smithii*) seemed to benefit from the presence of the large trees. In fact, the shaded areas under these trees could often be traced in the summer by the pattern of increased production and composition of desirable cool-season forage plants.

The specific reasons for this phenomenon have not been determined although there are several possibilities. The presence of a low tree canopy creates a cooler and more modulated temperature regime, which probably favors those cool-season species. The phytotoxic effect of juniper litter also keeps blue grama (*Bouteloua gracilis*) from growing under the juniper crowns (Jameson, 1966) thus reducing the competition for space and other factors.

A beneficial effect of blue oak canopy

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on forage production and utilization in the California annual grasslands has previously been reported (Duncan, 1967).

The early spring forage associated with alligator juniper was studied in the Brad Pasture area, Coconino National Forest in the spring of 1971. Much of this area has a savannalike aspect of approximately 12 alligator juniper trees per acre and herbaceous composition strongly dominated by blue grama. The elevation is 6,300 ft; the annual precipitation is approximately 20 inches. The soils are primarily of the Gem and Springerville series which were formed over basalt and volcanic cinders (Williams and Anderson 1967).

About two alligator juniper per acre were large, mature to overmature trees with a definite trunk over 12 inches dbh. Their crown diameters averaged 24 ft. The herbage under and around 26 of these trees was sampled in early April. The sampling was organized by three concentric zones (Fig. 1):

**Crown zone**—that area under the tree crown.

**Root zone**—that area from the crown zone out to three times the crown radius. Although specific information is not available on alligator juniper, it appears that, based on studies of other juniper (Johnsen, 1962; Arnold, 1964), this zone should define the limit of virtually all juniper root activity.

**Open zone**—that area outside the root zone, which is assumed to be beyond tree influence.

Each zone was sampled by three randomly located 9.6 ft<sup>2</sup> plots. Current production of green material was determined by the weight estimate method (Pechanec and Pickford, 1937). Every sixth plot was clipped, oven-dried, and weighed to determine the conversions of the green weight estimates to dry weight. Current utilization by grazing animals was determined by the ocular estimate by plot method.

The results demonstrated significantly higher early spring yields in the crown zone, as compared to the root and open zones for (1) total herbage production, (2) grass production, and (3) forage consumption (Table 1).

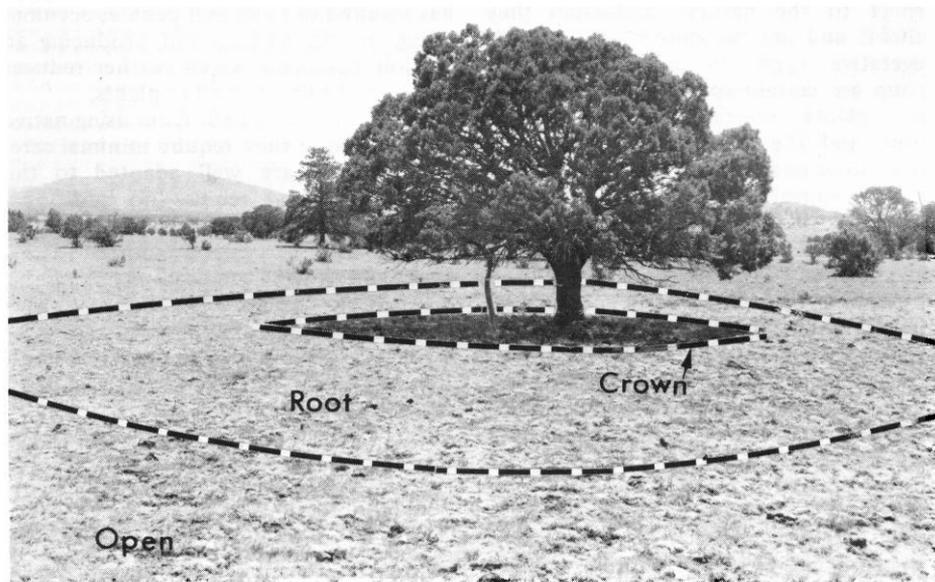
An average of 3.6 lb. of oven-dry early spring forage (cool-season grasses) was produced under each tree crown as compared to 0.8 lb. for a treeless area equivalent in size. Green feed under the crown was concentrated in a manner which allowed more efficient use by grazing animals (average use was 25% than did the green feed away from the trees, which was so scattered that little more than a trace was used).

The principal species contributing to early forage were mutton bluegrass, bottlebrush squirreltail, and prairie junegrass.

**Table 1. Early-spring total herbage and grass production (lb./acre) and forage consumption (lb./acre) by sampling zones.**

Production and consumption	Crown zone	Root zone	Open zone
Total herbage production	377.1**	120.5	147.6
Grass production	350.2**	73.0	78.3
Forage consumed	87.6**	2.0	0.5

\*\*Significantly greater at  $\alpha = 0.01$ .



**Fig. 1. Sampling zones around a large alligator juniper.**

Large alligator junipers, locally known as "apple trees," have several good qualities in addition to benefiting spring feed. A savanna of alligator juniper has aesthetic appeal and furnishes shade in summer and shelter in winter to both livestock and wildlife. The berries produced by juniper trees are at times important food items in the winter diet of turkey<sup>1</sup> and elk (Reeves and Swank, 1955; U. S. Forest Service, 1967). In the area of this study, alligator juniper is the primary juniper within the normal winter range of these two game species, and therefore the primary source of juniper mast.

The land manager must weigh the merits of leaving trees, such as those described, against the advantages gained by removing them. Studies of the relation of blue grama production to juniper suggest that little change in blue grama yields per acre would be expected upon removal of a scattered stand of trees (Jameson, 1966). This means that by removing large junipers, small yields of readily utilized cool-season forage under the crowns would be sacrificed to benefit

a small increase in warm-season forage, which in this area is used very little by livestock (Clary and Pearson, 1969). It makes little sense, in areas where geography and land ownership patterns tend to dictate spring-fall livestock use, to expend funds removing large alligator juniper trees when the result is a small net loss of cool-season forage. This fact is reflected in the current Coconino National Forest woodland management policy, which includes the retention and protection of large alligator junipers when other junipers or pinyon on the same area are being removed.

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