Relationship between

Trees and Cattle

in ponderosa pine

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Multiple-use management of wildlands becomes increasingly important as population pressure rises in California. Certain areas are capable of producing several products for maximum returns. In some cases several uses are compatible on the same area, while in others conflicts develop. Before any cultural practices are widely applied on areas which have a potential for multiple-use management, the effects of such practices must be studied.

Some areas are capable of producing timber, livestock, and game. Investigations have shown that fertilizing increases forage production in many areas of the state. A study was initiated in Teaford's Forest, Madera County, to determine if fertilizing could be used for the mutual benefit of the ponderosa pine seedlings and the forage. The area is grazed mainly by cattle and supports a cover of ponderosa pine with an understory of annual grasses and forbs. The herbaceous cover is dense in the openings between the pine and becomes sparse under the canopy of the trees. Cattle are present in the area from early June to early winter.

Twenty-four permanent quadrats, each $4' \times 4'$, were established at three locations in the forest. The following treatments were included: fertilized and fenced; fertilized and unfenced; unfertilized and fenced; and unfertilized and unfenced. Thus there were eight quadrats at each location with each treatment occurring twice at each location. The fertilizer was ammonium phosphate applied on May 15, at the rate of 200 pounds nitrogen per acre and 250 pounds phosphorus per acre.

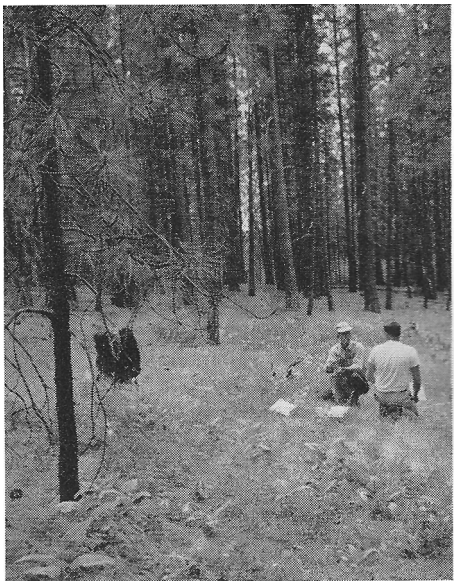
The mortality of the ponderosa pine seedlings for two growing seasons is given in the accompanying table. The data in the table were tested to determine if the differences in total percent mortality were significant, using the unfertilized and fenced treatment as the expected since it was neither fertilized nor browsed and was considered to show the mortality attributable to other factors. The mortality of the pine seedlings on the other treatments was significantly higher than that on the unfertilized and fenced treatment below the 1% level.

The greatest mortality of the pine seedlings occurred during the summer of the second year, reflecting the season's extremely dry conditions. Mortality was relatively low for all treatments during the first year, except for the fertilized quadrats during late summer and fall, when the mortality was 16.3%.

The mortality of the pine seedlings was greater in the unfenced quadrats than in the fenced quadrats, suggesting that cattle utilization was a factor in seedling mortality. However, during the course of the study all seedlings which had been noticeably browsed were recorded; they totaled only 12 out of 677. However, some may have been eaten off completely and were thus unobserved. Of those browsed, only seven had died by October 24 of the second year. The difference in mortality between the fenced and unfenced fertilized plots was contributed largely by one quadrat on which about half of the seedlings died during the first year.

Mortality of Ponderosa Pine Seedlings Under Four Treatments of Fertilizing and Fencing on Teaford's Forest During Two Growing Seasons

Treatment	Number of seedlings	Mortality, % of total number					
		May 15 to July 8	July 9 to Aug. 14	Aug. 15 to Dec. 6	Dec. 7 to May 9	May 9 to Oct. 24	Total
Fertilized and fenced	151	6.0	8.6	4.6	6.0	18.5	43.7
Fertilized and unfenced	160	5.6	6.9	16.3	5.0	16.3	50.0
Unfertilized and fenced	202	1.5	2.0	4.0	2.0	12.9	22.3
Unfertilized and unfenced	164	3.0	3.7	3.7	1.2	20.7	32.3



In the open spots, the Teaford Forest produced 1,700 pounds of oven-dry forage per acre the first summer. The amount of forage was in direct relation to the density of trees. In the densest stands of trees there was very little forage.

Pine seedling mortality was greater on the fertilized quadrats than on the unfertilized quadrats. This difference in mortality possibly resulted from increased competition from herbaceous plants on the fertilized quadrats.

The seedlings were measured periodically. The fertilized seedlings grew an average of 3″ in height during the two growing seasons, while the unfertilized seedlings grew an average of only 2.52″. This difference was significant at the 1% level. The studies showed that both fertilizing and browsing increased mortality of pine seedlings, with the effect from fertilizing exceeding that from browsing. However, on these particular plots, still too many seedlings survive for proper stocking. Further studies are needed to determine those particular situations in which some seedling mortality might even be desirable and those situations in which it does over-all damage to the stand.

The study has also suggested additional fields of investigation, among them the effects of grazing the herbaceous cover on the competitive relationship of the grass and pine seedlings, and the influence of fertilizer on this relationship.

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