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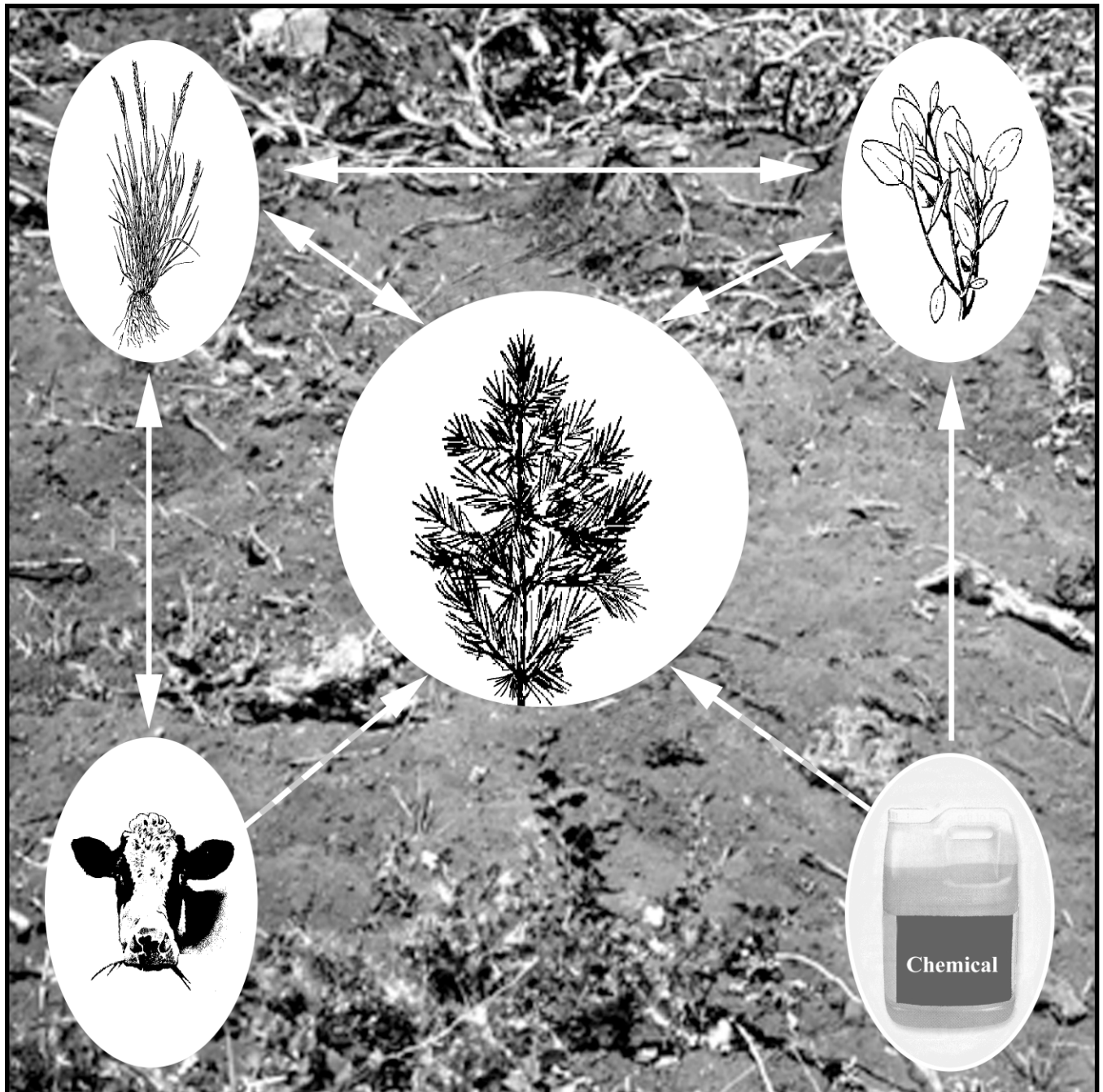
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Effect of Cattle Grazing, Seeded Grass, and an Herbicide on Ponderosa Pine Seedling Survival and Growth

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Abstract

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On a site of above-average quality in northern California, an early shrub-forb-grass plant community was treated by artificially seeding two forage grass species at plantation age 3, cattle grazing with and without seeded grasses, and applying a soil-active chemical (Velpar). Planted ponderosa pines were part of this community. Results for a 10-year period (1988-1997) are presented for planted pines, manzanita, other shrubs, forbs, and grasses (natural and seeded). In general, the pines, manzanita, and grasses were numerous and developing well after 10 years, and the other shrubs and forbs were declining in density or foliar cover or both. Velpar was the only treatment that significantly improved pine seedling growth. Grazing did not. The seeded (introduced) grasses, which were heavily grazed, probably reduced damage to the pines. The grasses also helped reduce manzanita foliar cover when grazed. No evidence was found that the introduced grasses served as a biological control in terms of reducing the density of manzanita or other shrubs.

Retrieval Terms: cattle grazing, northern California, plant community dynamics, ponderosa pine, seeded grasses, vegetation management

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Although plantations are established and maintained to ensure that conifer and hardwood seedlings grow at the potential of the site, some bare ground usually is present, particularly when the seedlings are small. This bare ground is susceptible to erosion and is considered by some people to be unsightly. Covering the ground with plants that have low competition potential in terms of moisture use would mitigate or solve the problems of erosion and unsightliness. If this vegetation was palatable and of sufficient quantity, the cattle that it sustains could serve as another yield from the land and help pay for the cost of establishing the plantation. Furthermore, if the cattle concentrated on it, it could mean less damage to the conifer seedlings. And, if this vegetation would inhibit the germination of shrub seeds in the soil, or seeds of other weeds that were carried into the area, it would act as a biological control.

The objectives of this 10-year (1988-1997) study were fourfold: (1) to identify and quantify the vegetation that became present in a young ponderosa pine plantation in the northern Sierra Nevada of California; (2) to evaluate the effectiveness of two direct vegetation management treatments—herbicide and cattle grazing—for reducing the size and number of plants in various categories of competing vegetation; (3) to evaluate two species of introduced forage grasses for their ability to rapidly cover the land and grow well, for their potential to inhibit the density and development of other species of vegetation, and for their potentially negative effect on the growth of planted ponderosa pine seedlings; and (4) to quantify the survival and growth of the pine seedlings in these treatments.

Some of these objectives were achieved, and others were only partially successful. For the first objective, plant diversity increased from 17 species in fall 1987 to 35 species in 1997, and trends in density, foliar cover, and height were determined for manzanita, other shrubs, forbs, and grasses over the 10-year study period. In general, manzanita and grasses (native and introduced) prospered, and other shrubs and forbs declined. Total number of plants in the fenced and ungrazed control was 298,400 per acre at the beginning of the study and 128,750 per acre at the end. For the second objective, the herbicide Velpar lowered the density and foliar cover of plants in most of the vegetation categories, although most differences were not statistically significant. The cattle grazed the grasses heavily but not much else. Overall, cattle grazing was not a significant treatment for reducing the vegetation that was competing for site resources with the pine seedlings.

For objective three, the introduced grasses became established quickly, grew well, and spread to other treatment areas. No evidence was found that they reduced the density and development of other species or the growth of ponderosa pine seedlings. They probably did prevent the cows from damaging the terminal shoots of the pine seedlings. For the fourth objective, only Velpar significantly increased the average diameter, height, and foliar cover of the ponderosa pine seedlings relative to most of the other treatments. None of the other treatments differed significantly among themselves. Thus, introduced grass, grazing, their combination, and interaction with the pines did not produce significant results.

Forest vegetation managers have many techniques to manipulate unwanted vegetation in young conifer plantations. If the vegetation is palatable, one such technique is to use cattle. Increasing evidence shows that to be effective, release must take place when the conifer seedlings are young. However, young seedlings are vulnerable to consumption and trampling by cattle. In this study, cattle grazed the area only 3 months after planting—a possibly risky, but sound option that enhances grazing as a vegetation management technique. In spite of this effective beginning, grazing by cattle never significantly enhanced the growth of ponderosa pine seedlings. Although the pines did not benefit, the cattle did, and the owner was pleased with their performance and probably with the economic return. Thus, the acceptability of grazing the transitory range in plantations should be judged on the basis of both the growth of the trees and that of the animals.

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