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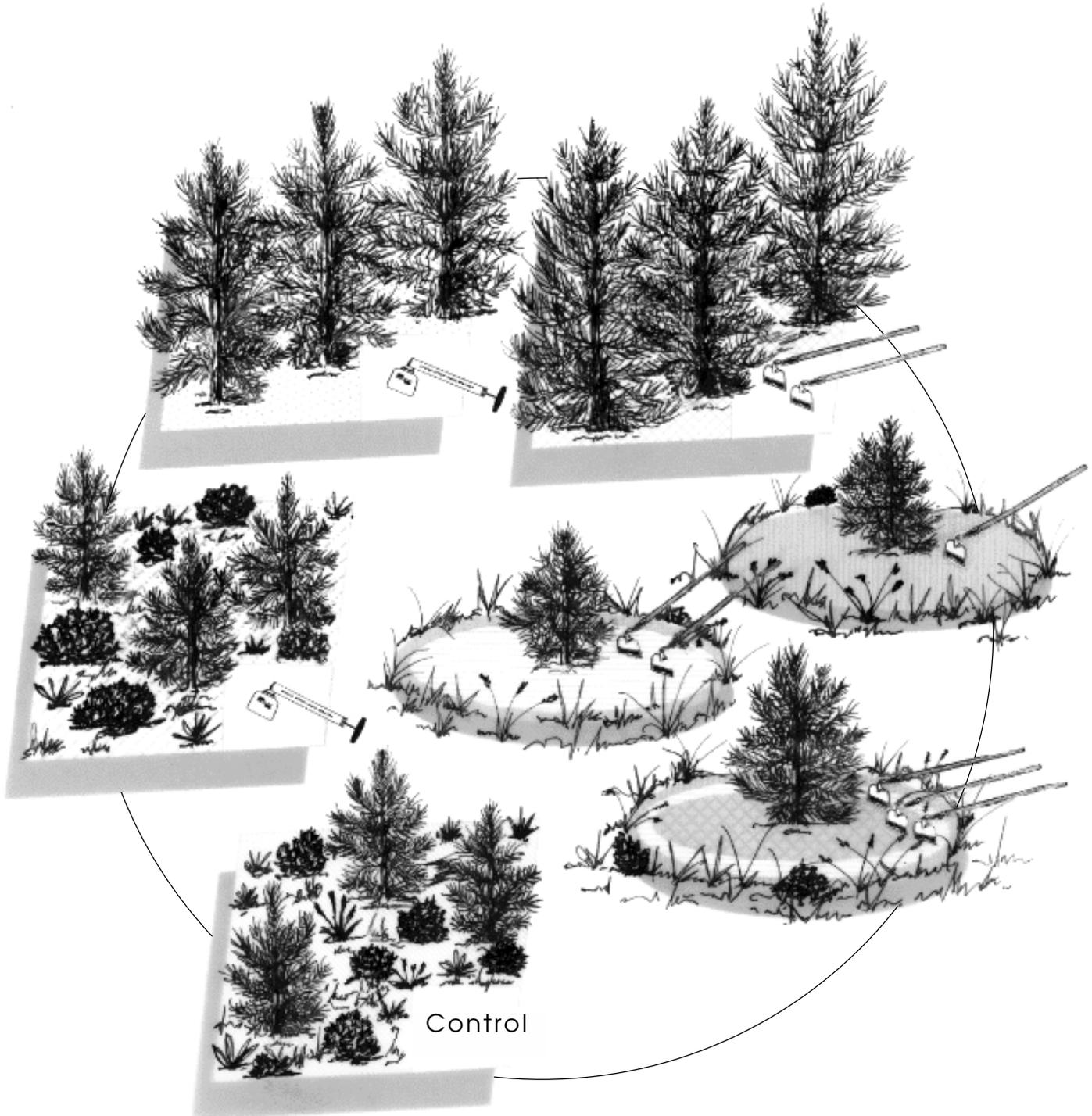
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# Development of a Mixed Shrub- Ponderosa Pine Community in a Natural and Treated Condition

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**Abstract**

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On a medium site in northern California, a mostly shrub community was treated by two manual release techniques and by two herbicides, to study its development in both a natural (control) and treated condition. Survival and growth of planted ponderosa pine seedlings were quantified for 8 to 11 years after initial treatment applications. Treatments included manual release in a 4-foot radius around pine seedlings one, two, and three times; grubbing the entire one-seventh acre plot two times; applying 2,4-D and Velpar herbicides to the entire plot one time; and a control. Data are presented for the most abundant species (greenleaf manzanita), second most abundant species (snowbrush), by the two species combined, and by all 10 shrub species combined. At the end of the study in 1990, manzanita was the most abundant species with 15,267 plants per acre, cover of 24,800 ft<sup>2</sup>, and height of 5.4 feet. Ponderosa pine developed best in plots where the entire area was grubbed twice (mean diameter at 12 inches above ground of 6.3 inches) and in the Velpar-treated plots (mean height of 14.2 feet). The cost of grubbing the entire area twice was almost \$1,700 per acre. Applying Velpar, including cost of the the chemical, was about \$100 per acre. Site preparation without subsequent release led to a brushfield similar to that present before the study began.

*Retrieval Terms:* cost, greenleaf manzanita, manual and chemical release, northern California, ponderosa pine seedlings, shrub community

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## In Brief

Conifer plantations characteristically occupy areas that have been severely disturbed by wildfire or timber harvest, often where slash was windrowed and usually burned, and where most remaining vegetation was uprooted and removed. Soil surfaces in these areas often are bare and temporarily devoid of most plants and animals. Available site resources, however, are high because large quantities of organic material are incorporated into the soil through harvesting and site preparation, and large amounts of moisture are absorbed by this organic matter. Warm temperatures and added moisture cause a rapid buildup of microorganisms that decompose organic material and liberate nutrients. In this unstable and rapidly changing environment, plants of many species often become abundant. Competition the first 5 years on productive sites often is intense and early densities of some species cannot be sustained. Consequently, the normal progression in the revegetation of disturbed areas is toward increasingly smaller numbers of taller and wider plants—a condition noted for shrubs in the untreated control in this study.

In treated plots, the amount of shrubs and other vegetation is a product of the kind and number of treatments. In turn, the amount of growth by planted ponderosa pine seedlings is a function of the amount of competing vegetation that remains and its rate of recovery. Amount and competitive potential of new vegetation also is important. Consequently, the treatment that best controls competing vegetation soon after planting almost always is best for ponderosa pine seedling growth. Early treatment denies competing plants the chance to recover or to utilize the high levels of site resources typically present after disturbance.

The four manual and two chemical treatments evaluated in this study created a plant community dominated either by planted pines or greenleaf manzanita and a few other shrubs. Forbs and grasses were virtually absent after 5 years. The most effective treatments (applying Velpar in liquid form or grubbing the entire area two times) created the pine community; the other treatments led to communities of pines and shrubs. Doing nothing (no treatment after site preparation) was rapidly leading to a plant community much like that before the study began—essentially a brushfield—with the exception that planted pine seedlings were present.

The most effective treatments with rapidly growing pines have high potential to create a forest similar to that present before the man-caused fires 50–120 years ago caused the brushfield. A forest probably is the more natural, stable, and desired condition. Certainly, the forest has more opportunities to provide a broad array of amenities and commodities needed by society than a brushfield. In ecosystem management, however, various amounts of shrubs, which provide berries, forage, and cover for wildlife, could be valuable. If mixes of pines and shrubs are desired, the study treatments show how to attain them and the costs of doing so. Costs ranged from \$37 per acre for applying 2,4-D one time to almost \$1,700 per acre for grubbing the entire plot two times. Cost-effective treatments that promote rapid growth of conifer seedlings have a place in ecosystem management. A mature forest, for example, may be needed a century from now in a particular area, and knowledge on how to get it established and growing at the potential of the site will be useful.

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