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Forest Service

**Pacific Southwest
Research Station**

Research Paper
PSW-RP-246

Timing and Duration of Release Treatments Affect Vegetation Development in a Young California White Fir Plantation

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Publisher

Albany, California
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http://www.psw.fs.fed.us

March 2001

Pacific Southwest Research Station

Forest Service
U.S. Department of Agriculture

Abstract

McDonald, Philip M.; Fiddler, Gary O. 2001. **Timing and duration of release treatments affect vegetation development in a young California white fir plantation.** Res. Paper PSW-RP-246. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 14 p.

The density and development of snowbrush, greenleaf manzanita, goldenbush (rabbitbrush), and graminoids were evaluated in a young California white fir plantation in northern California from 1986 through 1995. Manual grubbing and an herbicide created treatment regimes that lasted for 3 to 6 years and vegetation recovery times of 4 to 10 years. The timing and duration of the grubbing and spraying operations constituted the treatments. In terms of foliar cover and height, snowbrush was the most vigorous shrub species. By the end of the study it had more foliar cover (16,350 ft^2 per acre) in the control than all the other species combined and had the greatest height (2.9 feet). It also was significantly wider and taller in the control than in any other treatment. California white fir survival and height, diameter, and foliar cover growth were all enhanced by early release. Releasing every year for the first 3 years and for the first 6 years after planting were significantly effective treatments. However, treating for the first 6 years had no significant advantage over treating for the first 3 years. Delaying treatment for 3 years and then treating each year for years 4 through 6 gave no significant growth advantage over seedlings in the control. For white fir seedlings in the control, their foliar cover was less than that of the shrubs and graminoids, and their average height was less than that of snowbrush. Increased mortality and lower growth for these seedlings are likely. Early release was effective because it kept the competing shrubs and graminoids from recovering from the effects of site preparation, providing needed site resources to the white fir seedlings.

Retrieval Terms: competing vegetation, northern California, plant succession, white fir seedlings, timing of release

The Authors

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In Brief. . .

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Shrinking budgets and a lack of resources have often caused the treatment of competing vegetation in young conifer plantations to be postponed, sometimes for two or three growing seasons or even longer. At such times, forest vegetation managers wonder: "Where did all that grass and all those shrubs come from?" "What will they do to the growth of my conifer seedlings?"

Grass and shrubs are normal in most plantations in California, especially on poorer sites at higher elevations. In this 1986 to 1995 study with planted California white fir seedlings, which was on a poor site at the 5,600-foot elevation, the original plant community was one of mature shrubs and a few forbs and graminoids (grasses plus sedges) with no conifers. After site preparation (crush and burn), most of the original species reappeared from root-crown sprouts (shrubs), from dormant seeds in the soil (shrubs, some graminoids), and from windblown seeds (graminoids, forbs). A total of 16 species were found in treated plots and control during the 10-year study, which ranked it last (range was 17 to 46 species) in terms of species richness in our National Forest Service Administrative Study on alternative release methods.

This study differs somewhat from most studies that evaluate alternatives for controlling competing vegetation in young conifer plantations. We wished to document the recovery of the vegetation after a series of manipulations that were applied at different times and continued for several durations. We hypothesized that the amount of vegetation and when it was present, relative to site preparation and release, would affect the various species in the community and in turn affect the conifer seedlings. Thus, the manual grubbing and herbicide that we applied served only to accomplish the treatments. The different timings and durations were the treatments. These were:

- Treat first 6 years (1986-1991), develop naturally last 4 years: **T-first-6**;
- Treat first 3 years (1986-1988), develop naturally last 7 years: **T-first-3**;
- Delay 3 years, treat next 3 years (1989-1991), develop naturally last 4 years: **T-second-3**;
- No treatment after site preparation, develop naturally entire 10 years of the study (1986-1995): **Control**.

Colonization, as quantified in the control, was rapid. After one growing season, the number of snowbrush plants was 6,350 per acre; greenleaf manzanita, 4,350 per acre; goldenbush, 450 per acre; and graminoids 1,700 plants per acre. By the study's end, similar values were snowbrush, 3,500 plants per acre; greenleaf manzanita, 10,900 plants per acre; goldenbush, 17,400 plants per acre; and graminoids, 65,050 plants per acre. Foliar cover was greatest by far for snowbrush, which by the end of the study, was 16,350 ft^2 per acre. Average height at the study's end ranged from 1.l feet for goldenbush to 2.9 feet for snowbrush.

Among treatments, average density and foliar cover values were generally higher in the control for the three shrub species, but lower for the graminoids. Average height tended to be highest in the control for snowbrush and greenleaf manzanita, but intermediate for goldenbush and the graminoids.

Time since disturbance, or time for the competing vegetation to recover, often is cited as being important. But in this study, not giving the competing species in the community time to recover was the key. Early release—that applied soon after planting—was the most effective treatment. For white fir seedlings, applying it for the first 3 years resulted in statistically significant increases in survival and average growth (height, diameter, foliar cover) relative to the control. Continuous early treatment for 6 years also was effective, but no more so, at least for stem height, than releasing for the first 3 years. On the basis of worker's comments, it was also more expensive. Delaying treatment for the first 3 years and then treating each year for years 4 through 6 produced average white fir height, diameter, and foliar cover values that did not differ significantly from those in the control. Just site preparation alone, as in the control, produced white fir seedlings that had less foliar cover than that of shrubs and graminoids and were shorter than snowbrush plants. On the basis of data and graphs, survival of white fir seedlings in the control is threatened, and loss of growth relative to the early treatments is almost certain.

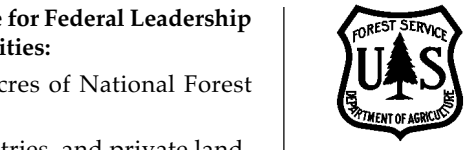
The forest land manager now has some idea of the species that develop in a young white fir plantation on a poor site, and their density, development, and competitive potential relative to various timings and durations of treatment. Survival and growth of planted California white fir seedlings also are indicated, as well as statistical differentiation among treatments. Ecologically, the data presented in this study show species richness and early succession in this plant community.

The Forest Service, U.S. Department of Agriculture, is responsible for Federal Leadership in forestry. It carries out this role through four main activities:

- Protection and management of resources on 191 million acres of National Forest System lands;
- Cooperation with State and local governments, forest industries, and private landowners to help protect and manage non-Federal forest and associated range and watershed lands;
- Participation with other agencies in human resource and community assistance programs to improve living conditions in rural areas; and
- Research on all aspects of forestry, rangeland management, and forest resources utilization.

The Pacific Southwest Research Station

- Represents the research branch of the Forest Service in California, Hawaii, American Samoa, and the western Pacific.



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