

# Spot-wise Seeding for Redwood

artificial reforestation by seeding or planting  
necessary on cutover land devoid of seed trees

Emanuel Fritz

**Cutover redwood** timber lands—those without seed trees—can not be expected to reforest naturally and need help from artificial reforestation.

In addition to the currently clear-cut cutover lands—about 500 acres per year—there are in California about 200,000 acres on good growing sites, accumulated during 40 to 50 years on which there are no seed trees. Where seed trees are left no artificial reforestation is necessary.

Broadcast seeding as a way of artificially reforesting with redwood was tried experimentally on six widely distributed plots in Humboldt and Mendocino counties—varying from five to 51 acres each and totaling 141 acres. Redwood seeds were broadcast at the rate of one pound of seed per acre. Germination was so spotty that only a very low degree of stocking—less than 10%—could have been achieved.

Broadcast seeding results were so poor that later efforts were concentrated on spot seeding.

## Spot-wise Seeding

In a series of long-term spot-wise seeding experiments, beginning in 1934, sites in Humboldt County were chosen where the original timber stands had been from 50,000 to over 100,000 board feet per acre. Cutting was clean and no seed trees were left standing.

Redwood—*Sequoia sempervirens*—was the principal species sown, with Douglas fir—*Pseudotsuga taxifolia*—and Port Orford cedar—*Chamaecyparis lawsoniana*—represented in some of the plots.

The seed spots were prepared by rak-

ing the top soil to a depth of one to two inches. The seed was sprinkled on the loosened soil. The surface was again raked to cover the seed and the spot was lightly tamped with the foot.

An excess of seed, from 50 to 200, was used—somewhat less than one pound of seed per acre of about 500 spots—to assure at least 10 to 20 viable seeds in each spot.

Many spots produced no germination at all. Others produced from one to 30 seedlings. Highest survival was obtained from early seeding.

Mortality began early, the apparent principal cause being surface dessication soon after the rainy season.

To give seedlings a better chance to establish themselves before the advent of the dry season, the spots in alternate rows of several of the Salmon Creek plots were first dug about eight inches deep with a mattock, the lumps broken down, and the surface smoothed before seeding. When possible, seeding was avoided when the soil was moist enough to stick to the rakes.

Most of the redwood stumps had already sprouted, or sprouted shortly after the seeding. Some seed spots were located too close to these stumps, with the result that in three years the long branches of the sprouts reached over and shaded the closest spots.

In spite of this shade which was almost complete in five years, such seedlings as were found on the spots five summers after seeding, remained alive and in good color, but made very slow growth. This attests the very high ability of redwood to endure shade. It is likely that the heavy shade helped conserve soil moisture and

thus compensated in part for the lack of light.

The important factor in spot-wise seeding, aside from direct cost, is the number of successful spots which can be expected and the resulting degree of stocking.

A seed spot was considered successful if it had on it at least one seedling of such thrift and location as to warrant the assumption that it had a reasonable chance to survive and become definitely established.

If there are 500 well-distributed saplings per acre, the stocking should be sufficient for redwood, as is also a 9 × 9 foot spacing. Natural sprouts may reduce the required number of successful seed spots to 400. Allowing for spot failures of 50%, the spots to be planted will then number approximately 800, with the spacing about 6 × 6 feet or less, depending on the size of the mother stumps and their proliferation and the obstructions occasioned by chunks and tops.

## Findings

An experienced man should be able to seed 800 spots, or one acre per day. About 0.75 pound of seed is sufficient.

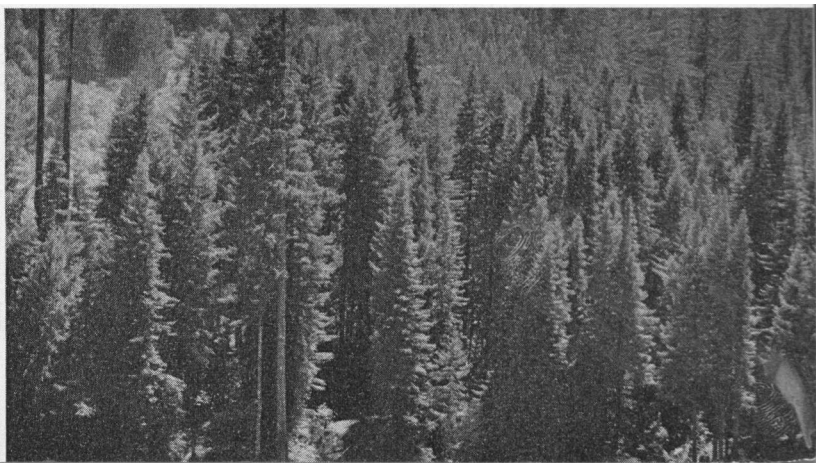
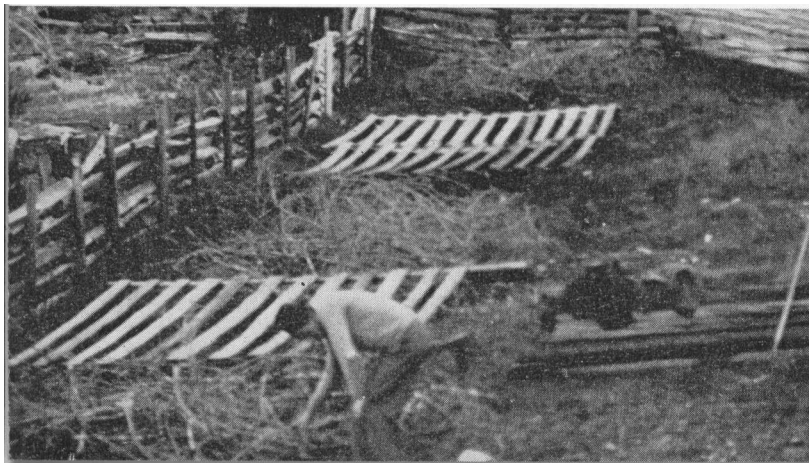
Probably it is cheaper to space the plots closely at the outset than to reseed fail spots.

The seed must be good and must not be buried more than 0.25 inch. The best redwood seed—with 20% to 40% germination capacity—comes from fresh squirrel-cut cones.

Since most of the cutover land slopes are rather steep, spots must be so pre-

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**Left:** One of the experimental seedspot areas where studies were made to determine shade requirements. **Right:** Natural reproduction on redwood cutover land with seed from near-by seed trees. Where no seed trees are available artificial reforestation by seeding or planting must be practiced.



## REDWOOD

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pared that there is least likelihood of soil washing and embedding the seed too deeply, and that the spot itself will not wash out.

Seeding should be done early in the year. Seedlings germinating after April 1 may not have time to extend their roots into soil areas having sufficient water throughout the long dry season.

Redwood will germinate on shaded and unshaded soil, and on mineral soil, logs, in debris, and under other vegetation, provided the required moisture is available. To survive after germination, it must have adequate moisture during the dry season.

Seedlings under head-high native shrubs can maintain a healthy condition but their height growth is slow. Once they have equalled the shrubs in height they can accelerate height growth and ultimately smother the shrubs.

Soil that has been deeply disturbed by cultivation, or by being moved, as for example on roadside shoulders, railroad beds, and bulldozer overcasts, provides a better growing site than a soil in its naturally compacted state.

Most redwood soils from which the humus has been burned are quite hard and dense. Although their surface in some cases becomes friable on exposure, it is difficult for initial roots to penetrate them.

Some negative influence may derive from a change in the soil from acidity to alkalinity because of the slash. Yet, seedlings often start abundantly on the site of a burned debris pile.

Fireweeds often cover burned cutover lands solidly but apparently redwood seedlings can withstand their competition. After the first year the fireweed stands thin out quickly. Natural regeneration, where there was a copious supply of seed, has been excellent on such areas and has developed into young forests of at least 70% stocking.

Rodents find and consume some of the redwood seeds and after germination they do considerable damage. Quail find the prepared seed spots desirable dusting beds. Brush rabbits, in particular, eat off the seedling tops. The large gray squirrel and the pack rat apparently do no damage until the tree has passed the sapling stage. Thereafter squirrel damage may be serious though spotty. If the seedling is not eaten off below the line of the cotyledons it is not necessarily killed, and is very likely to resprout. Deer and cattle browse seedlings that are more than a foot high.

Seed spotting shows promise of greater success than the planting of nursery-grown stock. Redwood seedlings are so sensitive to transfer from the nursery to

the field that they succumb readily on average exposed sites. Damage to the roots is inevitable and the balance between root and crown is disturbed.

Among other species in the experiments, Port Orford cedar gave the greatest degree of success up to the tenth year. Seedlings start readily, although many seeds hold over for one season. The one-year seedlings are very small, but they develop rapidly and even surpass redwood in height growth.

Douglas fir is a satisfactory associate in the new redwood forest. It was less successful than the redwood on the seed spots. Its larger seed is a more choice morsel for seed-eating birds and rodents. In height growth the seedlings equal redwood.

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