

# Propagating California Native Oaks in Bareroot Nurseries<sup>1</sup>

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Krelle, Bill; McCreary, Doug. 1992. Propagating California native oaks in bareroot nurseries. In: Landis, T.D., technical coordinator. Proceedings, Intermountain Forest Nursery Association; 1991 August 12-16; Park City, UT. General Technical Report RM-211. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 117-119. Available at: <http://www.fcnet.org/proceedings/1991/krelle.pdf>

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Abstract. To help develop practical guidelines for producing vigorous bareroot oak seedlings, various studies were initiated to evaluate alternative sowing and undercutting treatments. Early sowing followed by early root pruning have been most effective. A mini-plug+1 oak seedling trial is also discussed.  
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## INTRODUCTION

In California today there is evidence that several species of native oaks are not regenerating sufficiently in certain areas of the state to maintain current stand densities or distributions. In addition to poor natural regeneration, the total acreage of these species has also been depleted from residential and commercial development, agricultural conversions, and firewood harvesting. While native oaks have little commercial value, they are exceedingly important for wildlife and are highly valued for aesthetics. To ensure these species remain an important component of the natural landscape of the state, methods to artificially regenerate them are needed. Until a couple of years ago, little was known about how to do this and almost no research had been directed towards developing techniques for growing, vigorous, healthy stock. Until recently, no bareroot oak seedlings were produced in California.

1 Paper presented at the Intermountain Forest Nursery Association Meeting at Park City, UT. August 12-16, 1991.

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To help develop practical guidelines for producing vigorous bareroot native California oak seedlings, various studies were initiated to evaluate alternative sowing treatments and various undercutting treatments. An additional study was started this year resulting in a mini-plug+1 oak seedling.

## METHODS

These various studies were performed at the California Department of Forestry and Fire Protection at Magalia, California. This Nursery is located in Butte County at an elevation of 2650 feet.

The oaks that are grown at Magalia Nursery include valley oak (Quercus lobata), interior live oak (Q. wislizenii), blue oak (Q. douglasii) and black oak (Q. kelloggii). Most specific data from these studies was obtained from a detailed study which compared sowing and undercutting treatments for blue oak. This study began in the fall of 1987 when acorns were collected and stored in plastic sacks in cold storage until sowing. The acorns were hand sown in standard nursery beds on three different dates (late fall, mid-winter, and early spring). Acorns were placed on their sides in eight rows per bed and covered with approximately 1/2 inch of soil. Sowing density was approximately 18 per square foot.

Three different root pruning treatments were attempted in this study. These

treatments included and early pruning (May), an early and late (August) and a late only. The early pruning was done with a standard 1/2 inch blade at a depth of approximately 6-7 inches. The late pruning was done at approximately 8-9 inches.

Since this study, various other trials have been performed on all four species of oaks grown at Magalia Nursery. Most of these studies have also concentrated on sowing dates and root pruning treatments.

One additional study was initiated this year which resulted in a mini-plug+1 blue oak seedling. This study began at our L.A. Moran Reforestation Center located at Davis, California. Here, early last December, acorns were sown in a 1 1/2" x 1 1/2" x 3" foil covered plant sleeve (mini-plug). These were kept there until middle April when they were transported to Magalia Nursery and hand planted in trenches in the nursery bed.

#### RESULTS

The results shown here are a summary of the different studies performed on the four oak species grown at Magalia Nursery.

**Sowing Date:** Seedlings from a late fall or a mid-winter sowing perform much better than those from an early spring sowing. Seedlings from the first two sowings begin coming up in mid-March, while those from the early spring sowing don't begin to emerge until a month later. Those that were sown in early spring are not ready for the earliest root pruning and remain behind the others throughout the year.

**Pruning Treatment:** Time of root pruning has shown to be very important in both the shape of the root systems and in the size of the seedlings. Seedlings that are only undercut late have thick single tap roots with only a few small laterals originating from the point where the tap root was cut. Those from the other treatments (early or early and late) have much more branched, fibrous root systems. The combined early and late pruning treatments also helped to keep the root shoot ratio in better balance. Survival after the first year of outplanting was very high for seedlings from the first two undercutting treatments, but was significantly lower for seedlings from the late only treatment. Year end height exhibited a similar pattern. Seedlings from the first two treatments grew vigorously, while those from the late only treatment were stunted.

**Mini-plug+1:** This study is in its early stages and no field results are

available. When these seedlings were transplanted from their sleeves they already had a fibrous root system that had been air pruned naturally in its three, inch open bottom container. Shortly after being transplanted in the nursery bed, these seedlings continued to develop a root system much more fibrous than comparable 1-0 bareroot oak seedlings. After one growing season, these transplanted seedlings had roots that weighted up to twice that of comparable 1-0 seedlings.

#### DISCUSSION

Until recently no native oak seedlings have been grown in bareroot nurseries in California. The CDF nursery at Magalia is the first nursery to commercially produce bareroot native oak seedlings and these are the first studies we are aware of which have evaluated the effects of alternative culturing practices. One goal in these studies was to determine if bareroot production is a promising alternative. The second goal was to evaluate and compare different undercutting and sowing treatments.

Results from these studies indicates that vigorous healthy oak seedlings, with potential for high survival and rapid growth after outplanting, can be produced in one year in a bareroot nursery. Time of sowing and root pruning techniques are of most importance. Oak seedlings need to be root pruned very early in the season and at a depth as shallow as the blade will allow without dragging under the young seedlings. The blade should be sharpened at the end of each bed. A second pruning in mid summer at a depth approximately two inches below the first pruning has shown promising results. In one study, both pruning methods resulted in at least 98 percent survival without any irrigation after outplanting.

Sowing date also influenced nursery production. In one study, early spring sowing resulted in greatly delayed emergence, such that only 60 percent of the seedlings had emerged at the time of the first root pruning. Since early pruning is essential, and undercutting before the shoots have emerged greatly increases the chances of damage (since seedlings can more easily be pulled under by the blade), early sowing is recommended. The earlier that seedlings have emerged, the earlier the first pruning can be made.

Even though the mini-plug+1 oak seedling study is still in its early stages, the first year trial of nearly 150

seedlings looks most impressive. These seedlings have the advantage of being air pruned through the open bottom of the three inch plant sleeve and have already formed a fibrous root system. Two additional root prunings while in the transplant beds seem to improve the root system even more.

#### CONCLUSIONS

Results indicate that late sowing delays emergence and results in reduced seedling production in the nursery while early sowing results in earlier emergence which allows for earlier root pruning resulting in a more fibrous root system. Seedlings from the early and late under-

cutting treatments performed well after outplanting, while those undercut late only fared poorly.

These results suggest that healthy, vigorous oak seedlings can be produced in bareroot nurseries, but that its important to sow acorns by mid-winter and undercut as early in spring as possible and again in the middle of summer. The first pruning should be as shallow as possible without dragging under the young seedlings and the second pruning should be about two to three inches below the first pruning.

The mini-plug+1 oak seedling needs further study, but indications are that it may be a superior seedling to the 1-0 bareroot seedling.