

Assessing the Influence of Irrigation and Treeshelters on the Root Development of Three California Native Oak Species

Laurence R. Costello and Douglas D. McCreary

Guidelines for the natural and artificial regeneration of native oaks in California have been based largely on research identifying optimal conditions for top or canopy growth. Few studies have investigated the influence of cultural practices on root development. Recent research, however, suggests that factors which enhance top growth do not necessarily enhance root development. This study will investigate the effects of two cultural practices (irrigation and treeshelters) on the root development of two stock types of three native California oak species. Root mass and distribution will be measured and shoot-root ratios established for each of the species and treatment combinations. Information regarding irrigation and treeshelter effects on the rooting patterns of oaks will be very helpful in developing guidelines for optimizing oak growth both above and below ground. This information will have application to the management of other tree species in urban and wildland areas. Work for years 1 and 2 of this project has been completed. Trees will be grown for another year at the Bay Area Research and Extension Center (BAREC) in San Jose, CA and harvested in Sept./ Oct. 2000.

Objectives

- 1) To characterize the root system size and distribution of blue oak (*Quercus douglasii*), valley oak (*Q. lobata*), and coast live oak (*Q. agrifolia*) grown for three years in an agricultural field soil from both acorns and 5-gallon container stock.
- 2) To assess the effects of irrigation levels on root and top development of the three oak species and two stock types.
- 3) To evaluate the effects of treeshelters and irrigation levels on the root and top development of acorn stock for each of the species.
- 4) To demonstrate for horticultural professionals and the general public the most up-to-date, research-

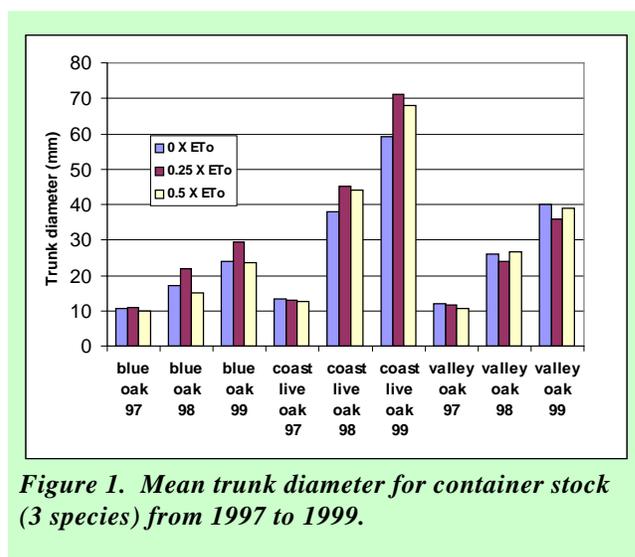


Figure 1. Mean trunk diameter for container stock (3 species) from 1997 to 1999.

based procedures for planting, establishing, and growing oaks.

Accomplishments

Objectives 1- 3. Trees and acorns planted in Year 1 have been established and maintained through Years 2 and 3. Both stock types were irrigated at treatment levels (0, 0.25, and 0.5 ET₀) and the plot was periodically mowed and treated to control weeds. Soil moisture levels are monitored on a periodic basis.

Survival has continued at the same level as for Years 1 and 2: 82% for acorn stock and 100% for container stock. Trunk diameter data taken in 1997-99, show that all plants have grown substantially through Year 3 (Fig. 1). Treatment effects have not, however, been substantial or consistent.

Although it was our plan to harvest all plants in Fall, 1999, this work needed to be rescheduled to Fall, 2000. The schedule change resulted from abnormal weather patterns during 1997-98 (El Niño) and 1998-99 (La Niña). These unusual conditions resulted in abnormally high soil moisture conditions through Spring, 1998, and below normal air temperatures in 1999. As a result, treatment effects have been minimized (Fig. 1).

“Monitor” plants of both container and acorn stock will be excavated in August, 1999, to provide an assessment of root size and distribution. Root systems of two coast live oaks in the acorn plot (one with a treeshelter and one without) will be exposed, while 3 plants (one of each species) in the container plot will be excavated. Unlike previous years, excavations will be

made using a Treespade™, a hand-held tool connected to a compressor that produces a jet of air moving at approximately 1,800 feet per second which dislodges soil around roots. It has been used successfully in several other root excavation projects. Several “monitor” trees in the plot will be excavated this year to practice our technique and gain an understanding of time requirements.

Objective 4. To continue to serve our educational objective, this study will be a featured part of the 1999 Annual Turf and Landscape Field Day at BAREC. This program attracts over 200 landscape professionals from around the Bay Area each year. In previous years

we have excavated “monitor” plants in both the container and acorn plots to show root development. This will be repeated in August 1999. Comparisons to root size and distribution in Years 1 and 2 will be made. Slosson funding is acknowledged during this presentation.

Laurence R. Costello is Environmental Horticulture Advisor, UC Cooperative Extension, San Mateo and San Francisco Counties; and Douglas D. McCreary is Natural Resource Specialist, Integrated Hardwood and Range Management Program, Sierra Foothill Research and Extension Center.