

# Eucalyptus out-perform other species in salty, flooded soils

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Landscape plants are often needed for difficult sites. To find plants that would grow in saline, frequently flooded soils, we evaluated 106 species on a nonirrigated floodplain underlain with salt water along the Napa River in northern California. The site was one of many established throughout the state for landscape tree evaluation.

Our project, which began in 1972, has been limited to testing species for survival and growth. The planted area has a silty clay-loam soil with a salt water table at approximately 3 feet. Flooding occurs frequently in winter, and water may remain on the surface for up to 16 weeks. Measurements indicate that the groundwater table is within 30 inches of the surface for seven months of the year.

Soil and groundwater samples during the trial showed soil salinity ranging from 1.6 to 46.7 millimhos per centimeter with consistently high average soil salinity and brackish groundwater (see table). By comparison, garden soil salinity is usually below 3 millimhos per centimeter. The major salts present were sodium, calcium, and magnesium chlorides.

Average salinity of soil and of ground water at Napa Valley College test site, 1972-1976

Depth	Millimhos per centimeter		
	May 1972	June 1974	June 1976
<b>Soil salinity:</b>			
0-1 ft	3.9	8.5	14.5
1-2 ft	—	12.1	13.5
2-3 ft	—	13.1	10.9
3-4 ft	15.4	12.9	13.5
<b>Ground water salinity:</b>			
—	40.0	27.0	26.8

The soil was double-disked before planting. Sixty of the species, provided by the University of California at Davis, were selected for uniformity and planted in a replicated design. The rest, donated by the Saratoga Horticultural Foundation, were planted for observation only. The UC Davis species were actively growing seedlings from 1-gallon stock, planted in hand-dug holes approximately 6 inches deep. They were less than 18 inches tall and were not root-bound. Others were 1- or 3-

gallon size, representative of ordinary quality nursery stock. All species were basin-irrigated and surface-mulched during the first year. No fertilizers or soil amendments were used.

The seedlings were planted over a three-year period (1972 to 1974) and grew for eight to ten years until final data collection in May 1982. Weather extremes occurred at the site, including the December 1972 freeze, flooding, the 1976-77 drought, and a subsequent rise in the water table.

Of the 55 *Eucalyptus* species planted, 26 remain. Of the 51 other species, only 3 survived. *Eucalyptus* thus seems better able to tolerate difficult soil conditions.

Appearance changed as plants matured. Many species rated acceptable during one evaluation were unacceptable during later evaluations; others changed from unacceptable to acceptable form and appearance. (Acceptable plants were vigorously growing with no visible salt injury, such as twig dieback and marginal leaf burn; unacceptable plants showed severe salt injury and/or stunted growth.) Trees grown on this site appear stunted and frequently show evidence of salt burn when compared with sister plants on better sites.

After eight to ten years of periodic flooding in saline soil and the 1976-77 drought, 17 *Eucalyptus* species had survived as acceptable landscape candidates (see accompanying list). Sixteen *Eucalyptus* and 13 other species were healthy until six or eight years of age and then died. A total of 38 species, including 6 *Eucalyptus*, died within a year or two after planting and should not be planted on similar sites. Acceptable species varied in shape and form from low spreading to tall skyline types, from dense to open branching habits, and from heavy- to fine-textured foliage.

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## Landscape species field performance, evaluated May 1982, Napa

### SURVIVING, ACCEPTABLE

#### *Eucalyptus* species

*E. bauerana* (o)  
*E. bicolor* (f)  
*E. camaldulensis* var. *rostrata* (f)  
*E. cornuta*  
*E. cosmophylla*  
*E. fruticetorum* (o)  
*E. grossa* (o)  
*E. incrassata*  
*E. lansdowneana* (o)  
*E. melliodora* (o)  
*E. microtheca*  
*E. occidentalis*  
*E. populifolia*  
*E. rudis* (f)  
*E. sargentii*  
*E. spathulata*  
*E. tetraptera*

### SURVIVING, BUT NOT ACCEPTABLE

#### *Eucalyptus* species

*E. aggregata* (f)  
*E. albens*  
*E. anceps*  
*E. blakelyi*  
*E. burdettiana*  
*E. eremophila*  
*E. falcata*  
*E. platypus*  
*E. rugosa*

#### Other species

*Callistemon salignus* (o)  
*Pinus brutia*  
*Populus euphratica*

### ACCEPTABLE UNTIL 1978, ALL OR MOST PLANTS DEAD IN 1982

#### *Eucalyptus* species

*E. archeri*  
*E. bancroftii*  
*E. botryoides*  
*E. camphora*  
*E. diversifolia*  
*E. forrestiana* (o)  
*E. goniantha*  
*E. griffithsii*  
*E. gunnii*  
*E. intertexta* (o)  
*E. maculata*  
*E. mannifera* subsp. *maculosa* (o)  
*E. parvifolia* (o)  
*E. perriniana*  
*E. robusta*  
*E. salmonophloia*

#### Other species

*Betula tianschanica* (o)  
*Coprosma* 'Brown Sleeves'  
*Coprosma* 'Copper Shine'  
*Coprosma* 'Green Sleeves'  
*Grevillea* 'Canberra' (o)  
*Grevillea juniperina* 'Rosea' (o)  
*Grevillea tridentifera* (o)  
*Hakea oleifolia* (o)  
*Hakea petiolaris* (o)  
*Leptospermum flavescens* var. *grandiflorum* (o)

*Leptospermum lanigerum*  
*Myoporum parvifolium* 'Horshum'  
*Ornithostaphylos oppositifolia* (o)

**NOT ACCEPTABLE UNTIL 1978;  
 ALL OR MOST PLANTS  
 DEAD IN 1982**

***Eucalyptus* species**

*E. exserta*  
*E. kitsoniana*  
*E. megacornuta*  
*E. morrissi*  
*E. pyriformis*  
*E. rhodantha*  
*E. stricklandii*

**Other species**

*Artemisia fragrans*  
*Olea africana* 'Dwarf' (o)  
*Pinus eldarica* (o)

**NO SITE TOLERANCE:  
 DIED WITHIN 1 - 2 YEARS**

***Eucalyptus* species**

*E. caesia*  
*E. fastigata* (o)  
*E. longicornis*  
*E. niphophila* (o)  
*E. propinqua* (o)  
*E. simmondsii* (o)

**Other species**

*Acer laevigatum* (o)  
*Acer macrophyllum*  
*Acer morrisonense* (o)  
*Acer tegmentosum* (o)  
*Artemisia reptans* (o)  
*Atriplex rhagodioides*  
*Callistemon montanus* (o)  
*Calothamnus validus* (o)  
*Camptotheca acuminata* (o)  
*Celtis sinensis* var. *japonica*  
*Comarostaphylis polifolia* (o)  
*Coprosma pumila*  
*Coprosma* 'Lofty'  
*Coprosma* 'Shiner'  
*Cytisus decumbens*  
*Dodonaea ceratocarpa* (o)  
*Dodonaea viscosa* (o)  
*Gaultheria odorata* (o)  
*Genista lydia*  
*Ginkgo biloba* (o)  
*Grevillea crithmifolia* (o)  
*Grevillea victoriae* (o)  
*Hakea gibbosa* (o)  
*Hakea sericea* (o)  
*Ilex paraguayensis* (o)  
*Jacaranda mimosifolia* (o)  
*Leptospermum scoparium* (o)  
*Marianthus pictus* (o)  
*Nothofagus fusca* (o)  
*Nothofagus obliqua* (o)  
*Photinia davidsoniae* (o)  
*Platanus* 'Autumn Glory' (o)

**NOTES:**

All planted on salty, flooded soil in spring 1972, 1973, or 1974; received one-year basin irrigation only; no pruning or staking.  
 (o) Observation only; plants donated by Saratoga Horticulture Foundation; all others provided by Department of Environmental Horticulture, UC Davis.  
 (f) Survived December 1972 freeze as one-year-old plants.

Jack Kelly Clark



Of the 55 *Eucalyptus* species planted, 26 remain and 17 are rated acceptable. Nine of the acceptable species are shown here. Only 3 of the other species planted survived.

Dick Venne



Jack Kelly Clark



Many trees planted on the salty plain seemed to thrive for six or more years before succumbing. This may be an individual trait, not species failure, since others of the same species survive and are highly acceptable. *Eucalyptus sargentii* (above) adjacent to the dying *E. camaldulensis* (left) continues to grow as a superior specimen.