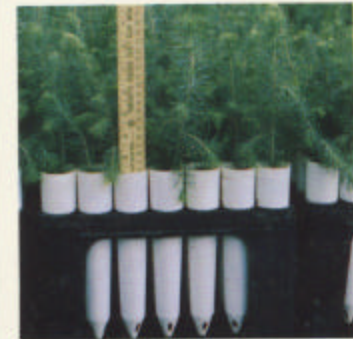




# Seedling Propagation



Volume One	Nursery Planning, Development, and Management (1995)
Volume Two	Containers and Growing Media (1990)
Volume Three	Atmospheric Environment (1992)
Volume Four	Seedling Nutrition and Irrigation (1989)
Volume Five	The Biological Component: Nursery Pests and Mycorrhizae (1990)
Volume Six	Seedling Propagation (1999)
Volume Seven	Seedling Processing, Storage, and Outplanting

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# The Container Tree Nursery Manual

## Volume Six Seedling Propagation

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## Preface

Work on the first comprehensive technical manual on the production of container tree seedlings, "How To Grow Tree Seedlings in Containers in Greenhouses" by Richard W. Tinus and Stephen E. McDonald, was begun in June 1975 and was published by the U.S. Department of Agriculture (USDA) Forest Service as a General Technical Report (GTR RM-60) in May 1979. This manual achieved worldwide acceptance as the primary reference on the culture of container tree seedlings. "How To Grow Tree Seedlings..." was originally intended as an interim publication and has been reprinted several times. However, it is currently out of print.

In 1982, planning began for writing a new container nursery manual based on "How To Grow Tree Seedlings in Containers in Greenhouses" but adding several new chapters. The writing team consisted of four authors: Thomas D. Landis, Richard W. Tinus, Stephen E. McDonald, and James P. Barnett, with the assistance of Rebecca G. Nisley as managing editor. Guest authors were invited to write specific chapters, and their contributions are acknowledged in the individual chapter title pages.

Realizing that container nursery management had changed considerably over the previous decade, the team surveyed container tree nursery practices in North America in 1984. To gain additional data for volume three on how nurseries regulated the nursery environment, nurseries were again surveyed in early 1991. Information from these surveys helped to determine writing priorities and emphasis and has been used to complement the published literature.

The Container Tree Nursery Manual consists of seven volumes; they are being published in the order they are written, all under the same series number-USDA Agricultural Handbook 674. Each volume contains chapters on closely related subjects concerning the production of tree seedlings in containers. The volumes can be accumulated and used as a complete nursery manual or can be used separately by specialists needing information on a particular subject. Because several subjects must be discussed in more than one volume, there will be some redundancy in the manual. Such repetition is justified, however, because most readers will be using the manual as a technical reference and will not be reading the entire text.

The Container Tree Nursery Manual has been functionally organized to follow the normal sequence of nursery development, seedling propagation, and outplanting. Volume one discusses the various steps that should be followed in developing a nursery facility. Volume two is concerned with the selection of types of containers and growing media. Volume three and volume four analyze the "limiting factors" that affect seedling growth, and discuss how they can be manipulated in container nurseries. Volume five analyzes the various biological organisms that can affect seedlings, either negatively as pests or positively as mycorrhizae. Volume six shows how to develop growing schedules and how seedlings are propagated through the three growth phases. Volume seven (still to be written) discusses how container seedlings are processed, stored, and handled both at the nursery and on the outplanting site.

The seven volumes are structured around an outline of numerical organizational headings that allow the reader to locate a specific subject quickly, without referring to an index. The general outline of volume and chapter titles is as follows:

### Volume One--Nursery Planning, Development, and Management

- Chapter 1 Initial Planning and Feasibility Assessment
- Chapter 2 Site Selection
- Chapter 3 Nursery Design and Site Layout
- Chapter 4 Environmental Control and Safety Equipment
- Chapter 5 Service Buildings and Equipment
- Chapter 6 Nursery Management
- Chapter 7 Troubleshooting Nursery Problems

### Volume Two--Containers and Growing Media

- Chapter 1 Containers: Types and Functions
- Chapter 2 Growing Media

### Volume Three--Atmospheric Environment

- Chapter 1 Temperature
- Chapter 2 Humidity
- Chapter 3 Light
- Chapter 4 Carbon Dioxide

### Volume Four--Seedling Nutrition and Irrigation

- Chapter 1 Mineral Nutrients and Fertilization
- Chapter 2 Irrigation and Water Management

Volume Five--The Biological Component: Nursery Pests and Mycorrhizae

- Chapter 1 Disease and Pest Management
- Chapter 2 Mycorrhizae

Volume Six--Seedling Propagation

- Chapter 1 Crop Planning
- Chapter 2 Seed Propagation
- Chapter 3 Vegetative Propagation
- Chapter 4 Seedling Development: The Establishment, Rapid Growth, and Hardening Phases

Volume Seven--Seedling Processing, Storage, and Outplanting

- Chapter 1 Harvesting and Storage
- Chapter 2 Handling and Transportation
- Chapter 3 Outplanting

The manual is based on the best current knowledge of container tree nursery management and should be used as a general reference. Recommendations were made using the best information available at the time and are, therefore, subject to revision as more knowledge becomes available. Much of the information in this manual was developed for western and southern conifer seedlings in the United States. Although the authors attempted to include information for species from other geographical areas, because of the wide variation in individual species responses, container nursery managers will need to adapt these principles and procedures to their own nursery situation. There is no substitute for individual experience, and recommended cultural practices should be tested before being implemented on an operational scale.

**Trade names are used throughout the manual, but only to provide examples, and no endorsement of specific products, or exclusion of equally suitable products, is implied. The mention of specific pesticides is intended only for general information and should not be construed as an endorsement. Because of frequent changes in pesticide registration and labeling, the reader should check with local authorities to make sure that an intended use is both safe and legal. Remember that pesticides can be harmful to humans, domestic animals, desirable plants, and fish or other wildlife if they are not handled or applied properly. Use all pesticides selectively and carefully, following the label directions. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.**

The Container Tree Nursery Manual was organized into separate volumes to allow for revisions and updating. The authors request that readers bring any errors in the text to their attention and also offer suggestions for improvement. Submit any suggestions to Thomas D. Landis, USDA Forest Service, State and Private Forestry, PO Box 3623, Portland, OR 97208, USA; send e-mail to:

» nurseries@aol.com «

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Chapter 4-Seedling Development: The Establishment, Rapid Growth, and Hardening Phases

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