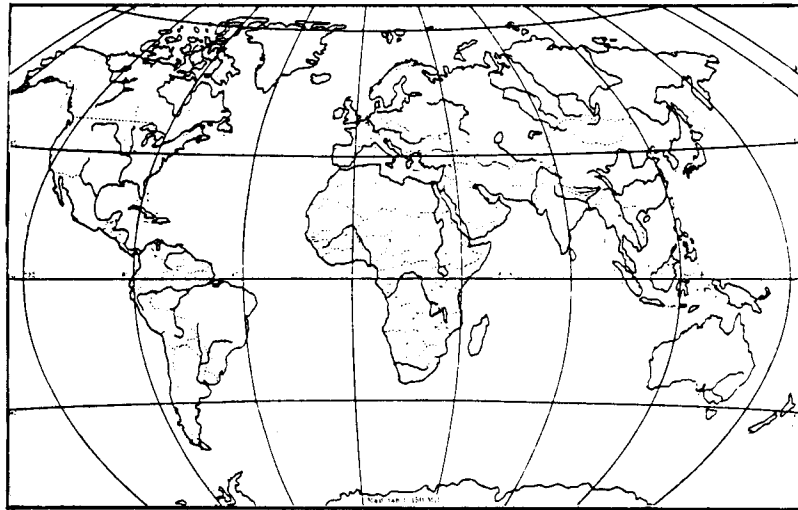


**Proceedings of the
International Symposium
on Nursery Management Practices
for the Southern Pines**



August 4-9, 1985

Cosponsored by
School of Forestry
Alabama Agricultural Experiment Station
Auburn University
and
International
Union of Forestry Research Organization
Subject Group S3.202-03 "Nursery Operations"



In cooperation with the Auburn University
Southern Forest Nursery Management Cooperative,
MacMillan Bloedel, Inc.,
Alabama Forestry Association
and
U.S. Forest Service

PROCEEDINGS OF THE
INTERNATIONAL SYMPOSIUM ON
NURSERY MANAGEMENT PRACTICES
FOR THE SOUTHERN PINES

Edited by

David B. South

Montgomery, Alabama

August 4-9, 1985

Cosponsored by
School of Forestry
Alabama Agricultural Experiment Station
Auburn University
and
International Union of Forestry Research Organization
Subject Group S3.202-03 "Nursery Operations"

In cooperation with the Auburn University
Southern Forest Nursery Management Cooperative,
MacMillan Bloedel, Inc.,
Alabama Forestry Association
and
U.S. Forest Service

P R E F A C E

Southern pines are currently used for plantation establishment on five continents. During the past decade, the worldwide production of southern pine seedlings has more than doubled. Current nursery production exceeds two billion seedlings annually. Therefore, southern pine nursery management research plays a key role in world-wide reforestation. However, seldom have there been opportunities for southern pine nursery researchers from throughout the world to meet and establish working relationships. The purpose of this symposium was to exchange worldwide information about the latest research and practice of southern pine nursery management.

Acknowledgements are made to the Planning Committee Chairman, R.E. Mitchell of MacMillan Bloedel, Inc., Pine Hill, Alabama, and the Program Planning Committee:

Walter D. Kelley, Department of Botany, Plant Pathology, and Microbiology
Auburn University, Alabama

Clark W. Lantz, U.S. Forest Service
Atlanta, Georgia

Jack T. May, M & G Consultants
Dadeville, Alabama

William H. Padgett, Alabama Forestry Commission
Montgomery, Alabama

Samuel J. Rowan, U.S. Forest Service
Athens, Georgia

Emmett F. Thompson, School of Forestry
Auburn University, Alabama

Thanks go to the contributors for the work in preparing their papers and to the attendants for their participation. There were more than 150 attendees at the Symposium representing 10 countries. The session moderators also did an excellent job of keeping sessions on schedule.

Most papers are printed in the Proceedings as received from the authors--in camera-ready form. However, some papers were retyped to conform with Symposium Guidelines. Authors are responsible for the content of their papers. Printing and production were supervised by the Alabama Agricultural Experiment Station, Auburn University, Alabama.

A limited number of copies of this Proceedings are available for sale at \$25.00 (US) each, including mailing at domestic book rate. Orders should be placed with Department of Research Information, 103 Comer Hall, Auburn University, Alabama 36849.

David B. South
General Chairman

C O N T E N T S

	Page
GENERAL SESSION	
Worldwide Planting of Southern Pines.	1
<i>Stephen McDonald and Stanley L. Krugman</i>	
Seed Procurement and Nursery Management of the Southern Pines in the People's Republic of China.	20
<i>Robert C. Kellison</i>	
South African Nursery Practice - The State of the Art	25
<i>D. G. M. Donald</i>	
Bare-root Exotic Pine Nursery Practice on the Coastal Lowlands of Queensland: A Historical Perspective	48
<i>D. Ward and J. Simpson</i>	
Nursery Technology of Pine Seedling Production in Korea	58
<i>Kyong-Bin Yim</i>	
Heat Unit Summation Theory in Commercial Nursery Management	64
<i>T. J. Hodgson</i>	
Bare-root versus Container Production of Pines in the American Tropics	72
<i>Charles R. Venator, Leon H. Liegel, and James P. Barnett</i>	
SEED HANDLING	
The Separation of Full Dead Seed from Live Seed in <i>Pinus elliottii</i>	83
<i>D. G. M. Donald</i>	
Optimum Germination Temperatures for Seeds of Six Central American Pine Species.	89
<i>Earl W. Belcher</i>	
Using Electrical Conductivity of Seed Leachate as a Measure of Seed Quality in Southern Pines	94
<i>J. A. Vozzo and Frank T. Bonner</i>	
Techniques for Improving the Performance of Southern Pine Seeds in Nurseries	102
<i>James P. Barnett</i>	
Do Southern Pine Species Benefit from Cold Stratification?.	113
<i>Raul Moreno</i>	

SEEDBED DENSITY

- Determination of Optimum Seedling Bed Density for Bare-root
Honduras Caribbean Pine. 118
D. Ward and Terry Johnston
- Seedbed Density Affects Performance of Slash and Loblolly
Pine in Georgia. 126
Samuel J. Rowan
- Seedbed Density, Undercutting, and Lateral Root Pruning Effects
on Loblolly Seedling Morphology, Field Survival, and Growth. 136
Russell J. Nebgen and Joann F. Meyer
- Nursery Cultural Practices Affect Field Performance of Longleaf Pine . 148
Glyndon E. Hatchell

VEGETATIVE PROPAGATION

- Vegetative Propagation of Loblolly Pine 157
J. P. van Buijtenen and D. V. Shaw
- Vegetative Propagation of *Radiata* Pine in New Zealand 167
M. I. Menzies, T. Faulds, M. Dibley, and J. Aitken-Christie

SOIL MANAGEMENT

- Organic Matter Maintenance in Southern Pine Nursery Soils 191
Kenneth R. Munson
- Use of Inorganic Fertilizers and Cover Crops in Exotic Pine
Nurseries of Southern Queensland, Australia. 203
J. A. Simpson
- Continuous cropping at the Stauffer Nursery in Alabama. 213
Jack T. May and A. R. Gilmore
- Trends in the Maintenance of Soil Fertility in Mississippi Nurseries. 222
L. E. Nelson and G. L. Switzer
- Continuous Cropping at New Kent 237
Thomas A. Dierauf
- Benefits and Application of Ectomycorrhizae in Southern
Forest Tree Nurseries. 244
Charles E. Cordell and Donald H. Marx

PHYSIOLOGY

Physiology of Southern Pine Seedlings	251
<i>M. G. R. Cannell</i>	
Outplanting Performance in Virginia of Genetically Improved Virginia Piedmont Loblolly Pine Seedlings Produced in South Carolina and Virginia Nurseries.	275
<i>Robert W. Rose, Jr.</i>	
Manipulation of Pine Seedling Physiology by Water Stress Conditioning	290
<i>Jon D. Johnson, John R. Seiler, and Ken L. McNabb</i>	
Seasonal Variation in Mitotic Index in the Stem Apex of Loblolly Pine Seedlings.	303
<i>William Carlson</i>	
Loblolly Seedling Genotypic Xylem Pressure Potential Responses to Cutting Practices in the Nursery.	311
<i>K. K. Kisse, R. J. Newton, and L. Carroll</i>	
Variation in Root Growth Potential of Loblolly Pine from Seven Nurseries.	317
<i>Peter P. Feret, Robert C. Freyman, and Richard E. Kreh</i>	
Root Regeneration in Out-Planted Loblolly Pine (<i>Pinus taeda</i> L.) Seedlings.	329
<i>M. Victor Bilan and Edwin R. Ferguson</i>	
A Physiological Interpretation of Nursery Stock Conditioning Through Intensive Root Wrenching	342
<i>G. J. Bacon</i>	
An Evaluation of Root-Wrenched and Stored Loblolly Pine Seedlings . .	351
<i>M. F. Hammer, K. F. Ray, and A. E. Miller</i>	
Ethylene Production by Stored Pine Seedlings and its Relation to Root Regeneration and Survival.	363
<i>K. Garrett-Kraus, C. A. Blanche, and W. W. Elam</i>	
Dormancy, Chilling Requirements, and Storability of Container-Grown Loblolly Pine Seedlings.	372
<i>James N. Boyer and David B. South</i>	
Seedling Quality - <i>Radiata</i> Pine as a Case Study	384
<i>M. I. Menzies, J. C. van Dorsser, and J. M. Balneaves</i>	
Physiological Characteristics of Loblolly Pine Seedlings in Relation to Field Performance	416
<i>Paul J. Kramer and Robert W. Rose, Jr.</i>	

PEST MANAGEMENT

- Diphenylether Herbicides in Southern Pine Nurseries 441
David B. South
- Fusiform Rust and its Control in Southern Forest Tree Nurseries . . . 454
Walter D. Kelley and S. J. Rowan
- Bayleton (*triadmefon*) Affects Ectomycorrhizal Development
on Slash and Loblolly Pine Seedlings in Nurseries. 460
Donald H. Marx and Charles E. Cordell
- Field Trials for Control of *Rhizoctonia* Blight of
Longleaf Pine Seedlings: Effects of Seedbed Planting
Densities, Fungicides and Mulches. 476
S. P. Gilly, E. L. Barnard, and R. A. Schroeder
- Phytophthora cinnamomi* Infection in Sand Pine Seedlings
in Florida Nurseries and Effects on Outplant Survival. 486
E. L. Barnard, R. S. Webb, S. P. Gilly, and W. D. Lante

SOIL FUMIGATION

- Soil Fumigation in Southern United States Forest Tree Nurseries . . . 496
C. E. Cordell and Walter D. Kelley
- Fumigation in South African Forest Nurseries. 505
D. G. M. Donald
- Phytophthora cinnamomi* Root Rot in *Pinus* Nurseries
Soil Fumigation and Disease Prevention by Hygiene. 507
Bruce Brown

SEEDLING HANDLING

- Impact of Clay Dipping and Nursery Handling Procedures on
Field Growth and Survival of Honduras Caribbean Pine 515
T. N. Johnson and D. Ward
- A Fully Integrated System for Planting Bare-Root Seedlings
of *Radiata* Pine in New Zealand 524
A. R. D. Trewin and A. W. J. Cullen
- Handling and Care of Southern Pine Seedlings. 549
Clark W. Lantz
- Current Quality Requirements of Seedlings in Finland. 557
Pasi Puttonen
- Assessment of Seedling Vigor Attributes: Outline for Integration . . 565
Pasi Puttonen

WRAP-UP

Components of Symposium and Nursery Practice. 577
Gary J. Bacon

APPENDIX I - REGISTRATION LIST 584

APPENDIX II - ALPHABETICAL LIST OF AUTHORS 592