Science
stacks

ree Planters' Notes

Department of Agriculture—Forest Service

Volume 47, Number 4—Fall 1996

UNIVERSITY OF GEORGI

JUN 0 9 1998

LIBRARIES
DEPOSITORY

Comments

Tree Planters' Notes
is published quarterly by State and Private Forestry, Forest Service, U.S. Department of Agriculture, Washington, DC 20250. The Secretary of Agriculture has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Department.

Editor-in-chief: Rebecca Nisley (Hamden, CT)
Assistant editors: James Barnett (Pineville, LA) and Thomas Landis (Portland, OR).
Associate editors: John Brissette (Orono, ME), Karen Burr (Coeur d'Alene, ID), Kasten Dumroese (Moscow, ID), Steven Grossnickle (Vancouver, BC), Robert Karrfalt (Dry Branch, GA), Clark Lantz (Atlanta, GA), Laurie Lippitt (Davis, CA), Robert Mangold (Washington, DC), Vincente Arriaga Martinez (Mexico City, DF), John Mexal (Las Cruces, NM), Ronald Overton (St. Paul, MN), Robin Rose (Corvallis, OR), William Schroeder (Indian Head, SK), Irwin Smith (Thunder Bay, ON), David South (Auburn, AL), Richard Tinus (Flagstaff, AZ), and Denise Tousignant (St.-Modeste, QC).

Articles in all sections except the "Practical Tips" and "Little-Known Classics" are peer-reviewed by two outside, anonymous referees. Articles in the "Practical Tips" section are reviewed by a technology transfer specialist and a scientist on the advisory board. "Little-Known Classics" are chosen by the editorial board from regional and state newsletters and publications already in print.

Cover: Southern cone rust on slash pine (photograph courtesy of Florida Division of Forestry, Department of Agriculture & Consumer Services, Gainesville, Florida; submitted by E. L. Barnard).

Ten Years of *Tree Planters' Notes* Indexed in This Issue

It seems like just yesterday that I was arranging the 10-year index for volumes 27 to 38, but it was really 1988! In this issue we print another 10-year index, one for volumes 38 to 48. We hope that it will be useful to you, our readers and customers! This index was prepared by Donna Loucks, forestry information specialist at Centralia, Washington. If you cannot obtain copies of any articles listed from the library of your state's forestry school (usually at the land-grant university) or federal depository library, you can order copies (for a fee) from Ms Loucks, by mail at 174 Jones Road, Centralia, WA 98531, by e-mail at loucksd@localaccess.com, or by FAX at 360-736-5929.

Going Electronic: The SNTI Homepage Will Include *Tree Planters' Notes*

Those of you who use the World-Wide Web have probably visited the USDA Forest Service's Seedling, Nursery, and Tree Improvement Team's homepage at

http://willow.ncfes.umn.edu/snti.htm

This issue of Tree Planters' Notes—Fall 1996, volume 47, number 4—will be published electronically at this site. In addition, we will be working to make back issues available as well. Please visit us and check out all the other features of the SNTI webpage. You can read ***Tree Planters' Notes*** and ***Forest Nursery Notes***; order copies of articles mentioned in *FNN* and arrange to use the *FNN* Reference Database; locate nurseries and seed dealers in on-line directories; and read about SNTI programs and the National Tree Seed Laboratory. For you dedicated net surfers, there are links to related websites and to the Native Plant Network.

Rebecca G. Nisley
editor-in-chief
USDA Forest Service
Northeastern Forest Experiment Station
Hamden, Connecticut

Note: Our concept of this editorial space is that it should be a place to publish opinions and ideas relating to the nursery, reforestation, and restoration professions. We invite you to submit ideas for commentaries. The views expressed here are solely those of the author(s) and do not necessarily reflect those of the ***Tree Planters' Notes*** editorial staff, the Forest Service, or the U.S. Department of Agriculture. — RN and the editorial board.

Individual authors are responsible for the technical accuracy of the material mentioned in *Tree Planters' Notes*. The mention of commercial products in this publication is solely for the information of the reader, and endorsement is not intended by the Forest Service or the U.S. Department of Agriculture.

This publication reports research involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate state and/or federal agencies before they can be recommended. **Caution: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish and other wildlife**—if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.

Contents

Volume 47, Number 3 — Summer 1996

COMMENTS

Ten Years of *TPN* Indexed in This Issue; Going Electronic—The SNTI Homepage Will Soon Include *TPN* 117
Rebecca G. Nisley

RESEARCH REPORTS

CONIFERS: A Computer Program for Liquid Fertilization in Container Nurseries 120
John T. Harrington and Patrick A. Glass

Aerial Application Trial for Control of Southern Cone Rust in a Slash Pine Seed Orchard Using Triadimefon 126
E.L. Barnard, M. Yin, E. C. Ash III, L. R. Barber, and T. Miller

INDEX

Tree Planters' Notes 10-Year Index for Volumes 38–47 (1987 to 1996) 133
Donna Loucks

Index of Subjects and Species 134

Index of Authors 153

Cumulative Tables of Contents 159

See page 126

CONIFERS: A Computer Program for Liquid Fertilization in Container Nurseries

John T. Harrington and Patrick A. Glass

Assistant professor and senior research assistant, New Mexico State University Mora Research Center, Mora, New Mexico

Most nurseries that produce conifer species in controlled environments use liquid-based fertility programs. Many of these nurseries rely on commercially available fertilizer formulations. The microcomputer program CONIFERS calculates mixing rates and run times for liquid-based fertilizer incorporation into irrigation systems, using commercially available fertilizer formulations. The program, based on setting target nitrogen levels for a commercial fertilizer formulation, calculates the amount of nitrogen, phosphorus, and potassium applied and provides mixing instructions for stock solutions. The CONIFERS software program provides a rapid and accurate means of adjusting fertilizer applications to the container nursery grower using liquid- based fertilizer solutions. Tree Planters' Notes 47(4):120–125; 1996.

Injecting liquid fertilizer solutions (solutions of granular fertilizers) into an irrigation system—often called "fertigation"—is the most common means of fertilizing conifer species grown in controlled environments in container nurseries (Landis and others 1989). Fertigation offers many advantages over other fertilization systems, including the ability to adjust nutrient levels and ratios to match the growth stages of a nursery crop. Many nurseries and greenhouses use commercial, premixed, water-soluble fertilizers for fertigation. Commercial fertilizers are available in a wide range of formulations and ratios of nitrogen (N), phosphorus (P), and potassium (K).

Several steps are required to determine mixing rates for these fertilizers. First, a target nitrogen level is set for the applied solution. The amount of fertilizer required to achieve the targeted nitrogen application rate is then calculated. This value is then adjusted for the injection ratio of the fertigation system. To determine phosphorus and potassium levels in the applied solution, a series of calculations are completed. CONIFERS, a microcomputer program requiring an IBM-compatible computer with DOS 2.1 or higher, simplifies this process and can reduce computational time associated with these steps to less than 1 minute. The program can also provide a rapid means of determining the duration of fertilizer application necessary to achieve target amounts of fertilizer on a per-seedling basis by using irrigation and container system characteristics. The application time feature assists nursery managers in reducing fertilizer costs and runoff by reducing over- and under-fertilization. The application time portion of the program is adaptable to both fixed and traveling boom irrigation systems.

Running CONIFERS

Fertilizer mixing. The fertilizer mixing portion of the program, which the user needs to enter as prompted by the program, requires the following information:

- Target level of N in parts per million (ppm)
- Ratio of N, P, and K from the fertilizer label
- Injection ratio of the irrigation system

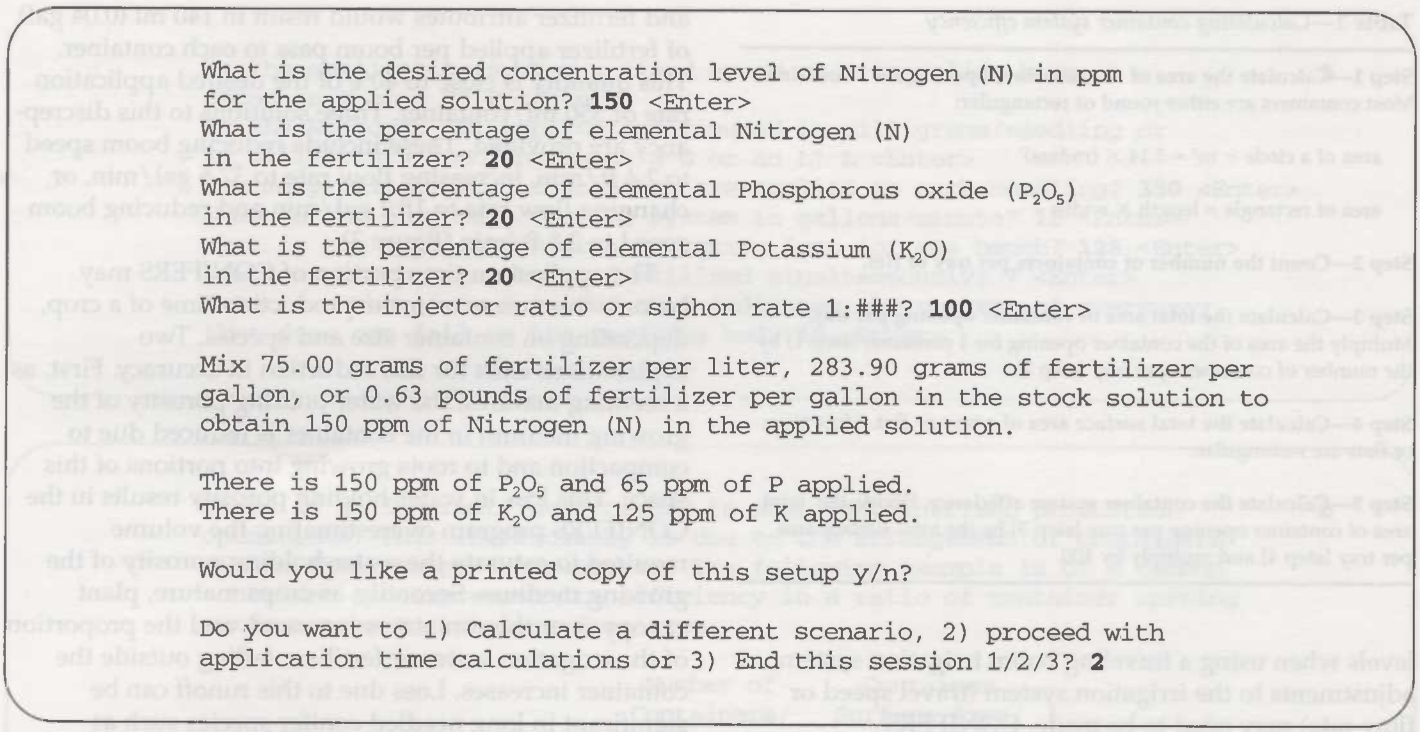
CONIFERS was written for commercial fertilizers with phosphoric oxide (P_2O_5) being the only source of P and potassium oxide (K_2O) the only source of K. CONIFERS automatically converts P_2O_5 to P and K_2O to K by using the following 2 equations:

$$\text{"A" ppm } P_2O_5 \times 0.4364 = \text{"B" ppm P}$$
$$\text{"C" ppm } K_2O \times 0.8301 = \text{"D" ppm K}$$

If no injection system is used, the value 1 is entered as the injection ratio.

For example, a targeted applied solution with 150 ppm N, using a 20:20:20 (N-P_2O_5-K_2O) fertilizer with an injection ratio of 1:100 requires that 75.0 g (2.65 oz) of fertilizer be mixed in 1 L of water (0.6 lbs/gal). This solution will contain 150 ppm N, 65 ppm P, and 125 ppm K (figure 1). This output can be printed if necessary. At this point, CONIFERS offers the user the option to run a different fertilizer scenario, proceed with the application time calculation, or end the session.

Determining run time. The second portion of the CONIFERS program determines the run time required to saturate the water-holding capacity of the growing medium. This portion of CONIFERS was written using a combination of both English and SI units. This was done because measuring devices commonly used in container nurseries differ in their respective units of measure (that is, flow meters in gallons per minute and graduated cylinders in milliliters). The user will be prompted by the program to enter the following information:



```
What is the desired concentration level of Nitrogen (N) in ppm
for the applied solution? 150 <Enter>
What is the percentage of elemental Nitrogen (N)
in the fertilizer? 20 <Enter>
What is the percentage of elemental Phosphorous oxide (P2O5)
in the fertilizer? 20 <Enter>
What is the percentage of elemental Potassium (K2O)
in the fertilizer? 20 <Enter>
What is the injector ratio or siphon rate 1:###? 100 <Enter>

Mix 75.00 grams of fertilizer per liter, 283.90 grams of fertilizer per
gallon, or 0.63 pounds of fertilizer per gallon in the stock solution to
obtain 150 ppm of Nitrogen (N) in the applied solution.

There is 150 ppm of P2O5 and 65 ppm of P applied.
There is 150 ppm of K2O and 125 ppm of K applied.

Would you like a printed copy of this setup y/n?

Do you want to 1) Calculate a different scenario, 2) proceed with
application time calculations or 3) End this session 1/2/3? 2
```

Figure 1—*An example of the fertilizer mixing instructions generated by CONIFERS.*

- target amount of fertilizer solution (in milliliters) or N (in milligrams) to be applied to each container
- flow rate of the irrigation system in gallons per minute
- irrigation system efficiency
- container system efficiency
- area of crop to be irrigated

Determining the target amount of fertilizer to be applied to each container can be determined several ways. The upper limit of the target amount would be to saturate the entire water-holding porosity of the medium in the container. Landis and others (1990) provide detailed instructions for determining this value. An abbreviated version of this procedure is also described in the CONIFERS User's Manual. In most cases, however, the water-holding porosity is not allowed to be completely depleted between irrigations or fertigations. Therefore, only in a few instances, such as leaching salt build-ups in the medium, would the water-holding porosity amount be used. Currently, measuring container weight is the most common approach in container forest nurseries to determine irrigation rate—see Landis and others (1989) for a description of this technique.

Irrigation system efficiency (percentage of irrigation water landing on the crop) is never 100% because irrigation water lands on non-crop surfaces such as walkways and walls. Several detailed techniques exist to calculate irrigation system efficiency, but nursery managers familiar with their own systems can provide close approximations of this value. Container system efficiency (percentage of crop space occupied by container openings) is less than 100% because of gaps or voids on surface areas between container openings due to the arrangement of containers or their support structures. A simple method to determine container system efficiency is provided in table 1 and in the CONIFERS User's Manual.

For fixed irrigation systems, the program requires the surface area of 1 bench in square feet and the number of benches being irrigated or fertilized simultaneously. The program uses this information to calculate the total area being irrigated or fertilized. When using traveling boom systems, the width of seedling bed, that is, the boom width (in feet), the length of the boom run (in feet), and the boom speed (in feet/minute) are necessary. Many traveling boom irrigation systems are available today. CONIFERS was programmed to consider 1 pass in 1 direction as a single pass. If a traveling boom irrigation system irrigates in both directions, the length the boom travels must need to be adjusted accordingly. To achieve target fertilization

Table 1—*Calculating container system efficiency*

Step 1—Calculate the area of the container opening for 1 container. Most containers are either round or rectangular:

area of a circle = πr^2 = 3.14 × $(\text{radius})^2$

area of rectangle = length × width

Step 2—Count the number of containers per tray or flat.

Step 3—Calculate the total area of container opening per tray. Multiply the area of the container opening for 1 container (step 1) by the number of containers per tray (step 2).

Step 4—Calculate the total surface area of a tray or flat. Most trays or flats are rectangular.

Step 5—Calculate the container system efficiency. Divide the total area of container opening per tray [step 3] by the total surface area per tray [step 4] and multiply by 100.

levels when using a traveling boom irrigation system, adjustments to the irrigation system (travel speed or flow rate) may need to be made. CONIFERS automatically computes these adjustments if the actual application rates differ from target rates. To correct this discrepancy, other simple adjustments can be made, including changing fertilizer concentration in the applied solution, or changing the injection ratio. Running CONIFERS several times and adjusting these attributes usually achieves an acceptable solution.

For example, using the fertilizer formulation calculated above (150 ppm N, 65 ppm P, 125 ppm K), CONIFERS can calculate the volume of stock solution and application time necessary to apply 350 ml (0.09 gal) of applied fertilizer solution to a crop growing in 3.7-L (1-gal) pots using a fixed irrigation. The pots are 15.14 cm (6 in) in diameter arranged in a square grid (79% of the area is occupied by container openings) with 4 seedlings/ft^2. The fixed irrigation system has the following attributes: flow rate = 15 gal/min, and an over spray = 10% (a 90% efficiency for the irrigation system). Seven 128-ft^2 (11.9-m^2) benches are to be fertilized. According to the program, this application would require 31.07 min to apply 350 ml (0.09 gal) of the applied fertilizer solution using a stock solution with 1,323.21 g (2.91 lbs) of fertilizer dissolved in 17.64 L of water (2.91 lbs/4.66 gal) (figure 2).

Using the same target application rate of 350 ml (0.09 gal) of fertilizer/seedling and the same container system (3.7-L pots) and a traveling boom irrigation system with the following characteristics bed width = 12 ft, travel length = 200 ft, flow rate = 15 gal/min; overspray = 10%, and boom speed = 6 ft/min CONIFERS generates the output in figure 3. Using the stated irrigation system and fertilizer attributes would result in 140 ml (0.04 gal) of fertilizer applied per boom pass to each container. This quantity is close to 40% of the desired application rate of 350 ml/container. Three solutions to this discrepancy are provided. These include reducing boom speed to 2.4 ft/min, increasing flow rate to 37.5 gal/min, or changing flow rate to 18.2 gal/min and reducing boom speed to 2.8 ft/min (figure 3).

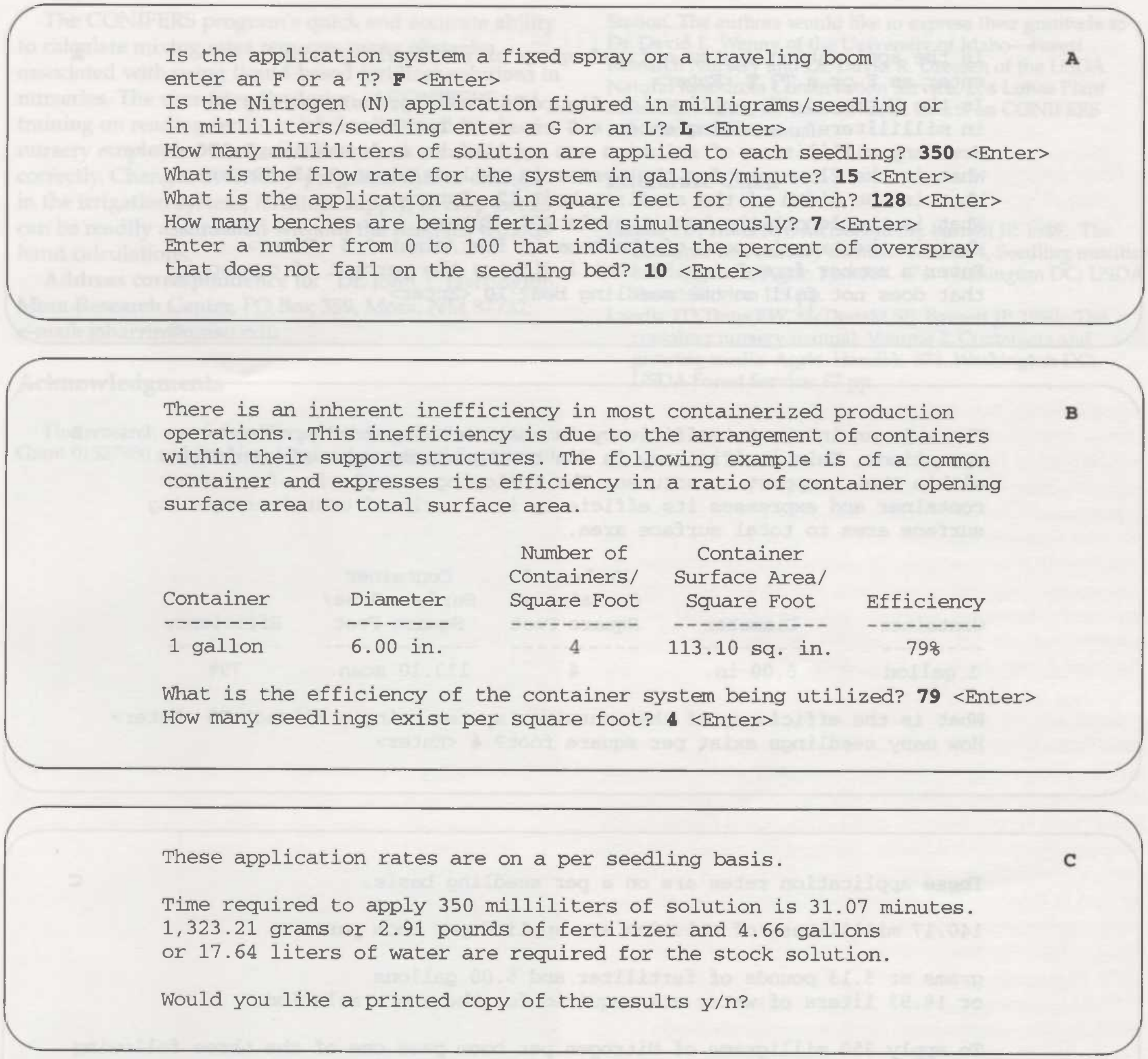
The application time portion of CONIFERS may become inaccurate over the production time of a crop, depending on container size and species. Two explanations exist for this reduction in accuracy. First, as a seedling matures, the water-holding porosity of the growing medium in the container is reduced due to compaction and to roots growing into portions of this space. This loss in water-holding porosity results in the CONIFERS program overestimating the volume required to saturate the water-holding porosity of the growing medium. Secondly, as crops mature, plant canopy over the containers increases, and the proportion of the irrigation water or fertilizer falling outside the container increases. Loss due to this runoff can be significant in long needled conifer species such as ponderosa pine or in broad leaved species. At the New Mexico State University—Mora Research Nursery, we found that CONIFERS underestimates fertigation time after 8 to 12 weeks following germination for long-needled pines and broad-leaved plants, depending on species and growth rate. For spruces, true firs, and Douglas-fir, fertigation time is underestimated later in the crop cycle. The decline of application time accuracy may be due to a trade-off in reduced water-holding porosity and reduced infiltration due to canopy runoff. When underestimation is suspected, we recommend using the container weighing system or by monitoring the leachate volume passing through the container to determine irrigation and fertigation duration.

Obtaining CONIFERS

CONIFERS is a public domain program available free of charge. The program can be downloaded from the New Mexico State University Mora Research Center's home page on the World Wide Web:

http://taipan.nmsu.edu/aght/mora/mora.html

At this site, go to the nursery research hyperlink. The nursery research page contains the information required to download the software and the corresponding manual. A second option for obtaining the CONIFERS program and manual is to send a stamped, self-addressed disk mailer and 3 ½-inch formatted (IBM) diskette to Mora Research Center, PO Box 359, Mora, NM 87732.



```
Is the application system a fixed spray or a traveling boom
enter an F or a T? F <Enter>
Is the Nitrogen (N) application figured in milligrams/seedling or
in milliliters/seedling enter a G or an L? L <Enter>
How many milliliters of solution are applied to each seedling? 350 <Enter>
What is the flow rate for the system in gallons/minute? 15 <Enter>
What is the application area in square feet for one bench? 128 <Enter>
How many benches are being fertilized simultaneously? 7 <Enter>
Enter a number from 0 to 100 that indicates the percent of overspray
that does not fall on the seedling bed? 10 <Enter>
```

```
There is an inherent inefficiency in most containerized production
operations. This inefficiency is due to the arrangement of containers
within their support structures. The following example is of a common
container and expresses its efficiency in a ratio of container opening
surface area to total surface area.

                                Number of      Container
                               Containers/   Surface Area/
Container         Diameter     Square Foot    Square Foot      Efficiency
---------         --------     -----------   -------------     ----------
1 gallon          6.00 in.          4        113.10 sq. in.       79%

What is the efficiency of the container system being utilized? 79 <Enter>
How many seedlings exist per square foot? 4 <Enter>
```

```
These application rates are on a per seedling basis.

Time required to apply 350 milliliters of solution is 31.07 minutes.
1,323.21 grams or 2.91 pounds of fertilizer and 4.66 gallons
or 17.64 liters of water are required for the stock solution.

Would you like a printed copy of the results y/n?
```

Figure 2—*Examples of the irrigation system input screen for the application time portion of CONIFERS (A); container efficiency input screen (B); and output screen generated by CONIFERS using the* **fixed irrigation system** *described in the text (C).*

The CONIFERS program's quick and accurate ability to calculate mixing rates removes many obstacles associated with using liquid-based fertilizer solutions in nurseries. The user-friendly design of CONIFERS and training on reading fertilizer labels allows all levels of nursery employees to mix fertilizer stock solutions correctly. Changes in fertility programs due to changes in the irrigation system, fertilizer supply, or crop needs can be readily assimilated without the need for tedious hand calculations.

Address correspondence to: Dr. John T. Harrington, Mora Research Center, PO Box 359, Mora, NM 87732; e-mail: joharrin@nmsu.edu

Acknowledgments

This research was funded, in part, through McIntire-Stennis Grant 01527980 and the New Mexico Agricultural Experiment Station. The authors would like to express their gratitude to Dr. David L. Wenny of the University of Idaho—Forest Research Nursery and Dr. David R. Dreesen of the USDA Natural Resources Conservation Service, Los Lunas Plant Materials Center, for their editorial efforts on CONIFERS software and its manual.

Literature Cited

Landis TD, Tinus RW, McDonald SE, Barnett JP. 1989. The container tree nursery manual: Volume 4, Seedling nutrition and irrigation. Agric. Handbk. 674. Washington DC: USDA Forest Service: 119 pp.

Landis TD,Tinus RW, McDonald SE, Barnett JP. 1990. The container nursery manual: Volume 2, Containers and growing media. Agric. Handbk. 674. Washington DC: USDA Forest Service: 87 pp.

Aerial Application Trial for Control of Southern Cone Rust in a Slash Pine Seed Orchard Using Triadimefon

E. L. Barnard, M. Yin, E. C. Ash III, L. R. Barber, and T. Miller

Forest pathologist, Florida Department of Agriculture and Consumer Services, Division of Forestry, Forest Health Program; graduate student, University of Florida, Department of Statistics; forest biologist, Florida Department of Agriculture and Consumer Services, Division of Forestry, Forest Health Program, Gainesville, Florida; entomologist, USDA Forest Service, Southern Region, Forest Health Protection, Asheville, North Carolina; and courtesy professor, University of Florida, School of Forest Resources and Conservation, Gainesville, Florida

A nonreplicated field trial was conducted in a slash pine seed orchard in north-central Florida to evaluate the efficacy of aerially applied triadimefon fungicide for control of southern cone rust caused by Cronartium strobilinum. *A single, late January application of fungicide was apparently ineffective, but trees receiving an additional application 16 days later had significantly fewer rust-infected conelets. Clonal variation with respect to disease susceptibility and apparent genotype-treatment interactions were observed. The potential of triadimefon-based cone rust control is discussed.* Tree Planters' Notes 47(4)126–131; 1996.

Southern cone rust—caused by the fungus *Cronartium strobilinum* (Arth.) Hedgc. & Hahn—sporadically causes serious losses of first-year female strobili on slash (*Pinus elliottii* Engelm. var. *elliottii*) and longleaf (*P. palustris* Mill.) pines in the Atlantic and Gulf Coastal Plains of the deep southern United States. Infected conelets typically swell rapidly (figure 1a), abort, and drop from the tree by mid to late summer, but some hypertrophied red-brown to brown, somewhat shriveled "mummies" may cling to trees for longer periods (Goolsby and others 1972; Hedgcock and Hahn 1922; Hepting and Matthews 1970; Maloy and Matthews 1960; Matthews 1964; Miller 1987). In some years, cone (and subsequently seed) losses directly attributable to southern cone rust infections have ranged from 20 to nearly 100% in certain areas (Goolsby and others 1972; Hedgcock and Hahn 1922; Hepting and Matthews 1970; Maloy and Matthews 1960). Fatzinger and others (1992) reported losses of not less than 24% in a slash pine seed orchard in north Florida in 1980. Losses in another slash pine seed orchard in north central Florida were very high in 1993, 1994, and 1995 (estimated >75% in 1995 by Barnard and others, unpublished field observations). Responding to a survey questionnaire, 8 of 12 seed orchard managers in Florida, southern Georgia, and southern Alabama estimated their 1995 losses of first-year slash pine cones to be in excess of 50% (Barnard, unpublished data).

a

b

Figure 1—*Symptoms and signs of southern cone rust on slash pine: Infected (lower left) and disease-free first-year conelets (**a**). Infected first-year cones displaying profuse powdery masses of yellow-orange aeciospores (**b**).*

Control of southern cone rust has been reported with appropriately timed spray applications of ferbam fungicides (Hepting and Matthews 1970; Lightle 1959; Maloy and Matthews 1960; Matthews 1964). However, due to the non-systemic, prophylactic mode of action of ferbam, effective control requires repeated applications, perhaps at 5-day intervals for a period of some 25 to 30 days, commencing as soon as female strobili emerge from their bud scales and continuing until pollination has ended. Accordingly, the overall efficacy of ferbam-based control programs may be less than adequate due to weather conditions and costs of applications (especially if applications are aerial).

Since the early 1980's, triadimefon fungicide (Bayleton®, Bayer Corporation) has become the industry standard for controlling fusiform rust caused by *Cronartium quercuum* (Berk.) Miyabe ex Shirai f. sp. *fusiforme* (Hedgc. & N. Hunt) Burdsall & G. Snow, a close relative of *C. strobilinum*, in southern pine nurseries (Carey and Kelley 1993; Kelley 1985; Kelley and Runion 1991; Powers 1984; Rowan 1982; Snow and others 1979). Triadimefon's mode of action is systemic, and to some extent eradicant, as opposed to preventive only; triadimefon controls or eradicates some preexistent infections and prevents new infections. In addition, single low rate applications (for example, 280 g ai/hectare or 4 oz ai/ac) of triadimefon provide effective control of fusiform rust in pine seedlings for up to 3 to 4 weeks.

Accordingly, we designed this study to determine if aerially applied triadimefon fungicide would be effective in controlling southern cone rust in pine seed orchards. If effective, this approach could reduce the number of fungicide applications required for adequate disease control and provide orchard managers flexibility with respect to timing of spray applications.

Materials and Methods

Trial layout and fungicide application. In 1996, we established fungicide trials in 4 seed orchards in Florida. Due to the erratic nature of the disease, southern cone rust did not occur in 3 orchards but did occur at the Florida Division of Forestry's Withlacoochee Seed Orchard near Brooksville, FL. Accordingly, we are able to report results from only of 1 of the 4 seed orchards.

In the Withlacoochee Seed Orchard, we selected a 20-ha (~ 50 ac) block of slash pine and identified 2 (5-row) zones for fungicide application (figure 2). Application zones were chosen to avoid orchard block edges, minimize disturbance(s) to a bordering landowner, and provide a reasonable buffer (9 rows = about 82 m, or 270 ft) between zones. The 4 corner trees in each of the 5-row zones were marked with flagging in their crowns, and each spray zone corner was marked on the ground to facilitate pilot identification/location. The size of the orchard and limitations of flight patterns precluded replication (figure 2).

The first application of triadimefon (Bayer Corporation's Bayleton® 50% DF) was applied to both application zones on January 29. On February 14, a second application was applied to 1 zone only. The result was a 5-row zone of trees receiving a single application of triadimefon (1/29, 1×) and another 5-row zone receiving 2 applications (1/29 and 2/14, 2×). The 2 zones were separated by a 9-row (about 82 m, or 270 ft) unsprayed buffer zone (figure 2).

Both fungicide applications were delivered by fixed-wing aircraft calibrated to deliver 19 L of spray/ha (= 5 gal/ac) with a droplet size of volume median diameter (VMD) = 350 µm. On both application dates, the respective target zones were double flown, making the actual application 38 L of spray/ha (= 10 gal/ac). The spray mixture consisted of 227 g (½ lb) of Bayleton 50 DF and 0.24 L (½ pint) of Agri-Dex® nonionic spray adjuvant/38 L (10 gal) of total spray/ha. Thus, about 280 g (10 oz) ai of triadimefon fungicide was applied per hectare per application on the 2 test zones.

Data collection. Incidence of southern cone rust was assessed between April 29 and May 2. Total cone counts and the number of cones exhibiting symptoms and/or signs of cone rust infection (for example, distinctive hypertrophy of cone scales or conelets, orange discoloration, and/or the presence of aecial pustules or aeciospores of *C. strobilinum*; figure 1) were determined on the eastern half of the crown on each selected sample tree. Counts were made from a bucket truck, and as each cone was counted, it was sprayed with fluorescent paint to prevent inadvertent recounts.

Primary sample trees were selected in the 2 sprayed zones from trees within the interior 3 rows of each zone (figure 2). Control trees were selected in the largest unsprayed zone from among trees within 4 adjacent rows that were at least 9 rows (about 82 m, or 270 ft) distant from the nearest sprayed zone (triadimefon 1×). Sample trees were selected on the basis of ramet availability for individual clones within the designated sampling zones. Three ramets per clone per area were desired, but some clones only provided 2, or in some cases, 1. The total sample consisted of 57 trees (3 clones with at least 3 ramets/clone/zone, 3 clones with 2 ramets/clone/zone, and 3 clones with only 1 ramet/clone/zone). Two additional clones were sampled, but these clones (308 and 402) were represented in only single orchard zones (table 1). Additionally, and in a similar manner, we determined the proportions of cones with cone rust on a single clone (403) for which we could find at least 2 ramets in each of

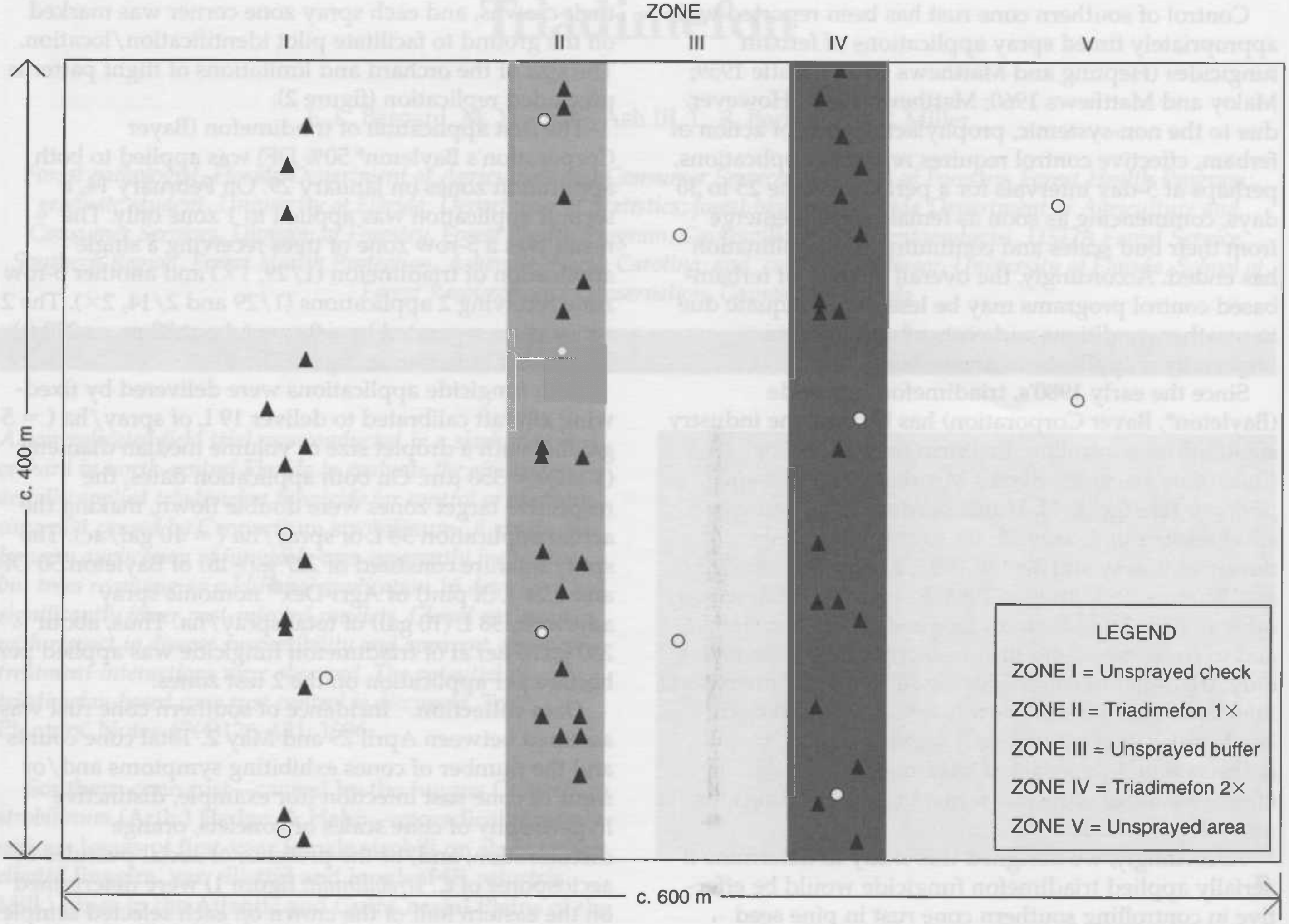


Figure 2—Layout of a field trial evaluating aerially applied triadimefon fungicide (Bayleton® 50% DF) for control of southern cone rust in a slash pine seed orchard; Florida Division of Forestry's Withlacoochee Seed Orchard, Brooksville, FL, 1996. Solid triangles and clear circles represent individual sample trees with the circles indicating individual ramets of clone 403 sampled across all 5 orchard zones.

the 5 zones across the orchard (figure 2). This supplemental sample was taken to evaluate the possibility of a disease gradient occurring across the orchard, possibly confounding analysis of treatment effects in zones I (control), II (triadimefon 1×), and IV (triadimefon 2×) (table 1 and figure 2).

Data analysis. Because this study involved unreplicated treatment plots, there are limitations to the inferences that can be drawn from the data collected. Nonetheless, statistical analyses were used as an aid in evaluating the validity of observed differences in cone rust levels between orchard zones and/or treatments. Data were subjected to logit regression analysis because the response variable was dichotomous, that is, the cones either had or did not have rust. The statistics package SPLUS® (Statistical Sciences, Inc.) was employed for data processing. In the first analysis, only the data from zones I (control), II (triadimefon 1×), and IV (triadimefon 2×) were analyzed. Clones 308, 402, and 306 were not included in the analysis. Clones 308 and 402 clones could not be included because they were represented only in single orchard zones (table 1). Clone 306 was omitted as a probable anomaly (outlier) because it was the only clone of 9 represented that showed a dramatic "increase" in rust infection in zone II (triadimefon 1×) over zone I (control), a difference based on only single measurements (that is, single trees) in each of the 2 zones (table 1). Each of the other 8 remaining clones showed essentially no difference in rust infection levels between zones I (control) and II (triadimefon 1×) (table 1). A second analysis, of the supplemental sample, was performed using only the data from clone 403 across all 5 orchard zones (table 1 and figure 2).

Table 1—*Total number of cones evaluated and percentage of cones infected (in parentheses) by Cronartium strobilinum by clone, ramet, and seed orchard zone (treatment)*

Clone & ramet	Zone I (controls)	Zone II (triadimefon 1×)	Zone III (buffer, nonsprayed)	Zone IV (triadimefon 2×)	Zone V (buffer,nonsprayed)
2					
1	82 (4.9%)	205 (11.7%)	—	110 (4.6%)	—
2	130 (13.9%)	63 (14.3%)	—	75 (12.0%)	—
3	150 (15.3%)	133 (9.0%)	—	99 (6.1%)	—
7					
1	68 (7.3%)	42 (21.4%)	—	117 (11.1%)	—
2	179 (15.9%)	77 (7.8%)	—	79 (16.5%)	—
3	150 (11.3%)	99 (8.1%)	—	110 (16.4%)	—
4	75 (2.7%)	—	—	—	—
403*					
1	192 (12.0%)	225 (4.0%)	123 (11.4%)	55 (1.8%)	98 (30.6%)
2	109 (10.1%)	197 (13.2%)	148 (6.1%)	120 (1.7%)	206 (4.8%)
3	75 (17.3%)	189 (16.9%)	—	239 (8.4%)	—
19					
1	255 (23.5%)	176 (22.7%)	—	92 (15.2%)	—
2	63 (14.3%)	92 (16.3%)	—	76 (10.5%)	—
27					
1	37 (51.4%)	71 (43.7%)	—	175 (54.3%)	—
2	130 (40.0%)	134 (41.0%)	—	65 (56.9%)	—
304					
1	194 (28.9%)	150 (29.3%)	—	107 (16.8%)	—
2	89 (24.7%)	149 (18.8%)	—	62 (9.7%)	—
11					
1	42 (38.1%)	38 (31.6%)	—	33 (21.2%)	—
2	—	23 (34.8%)	—	—	—
3	—	32 (21.9%)	—	—	—
26					
1	108 (15.7%)	80 (17.5%)	—	91 (11.0)	—
306					
1	163 (4.9%)	168 (18.4%)	—	75 (5.3%)	—
308					
1	91 (18.7%)	—	—	—	—
402					
1	—	—	—	57 (7.0%)	—
2	—	—	—	44 (11.4%)	—
3	—	—		44 (9.1%)	

* Clone 403 values were included in the analysis of zones I (control), II (triadimefon 1×), and IV (triadimefon 2×)(figure 3). In addition, values for this clone for all 5 zones (treatments) were analyzed alone (figure 4).

Results and Discussion

Our data document considerable clonal variation, not only with respect to the incidence of cone rust within specific clones (and therefore susceptibility/resistance to infection), but also with respect to clonal responses to our triadimefon applications as well (table 1). For example, average cone rust infection within individual clones represented by at least 2 ramets ranged from 9.2 (clone 7) to 45.7% (clone 27). Similar clonal variation has been observed previously by Fatzinger and others (personal communication). They observed average clonal infection ranging from 3.5 to 36.2% in a 1980 outbreak of cone rust in a slash pine seed orchard in north Florida. Our analyses suggest possible genotype by treatment and/or zone interactions (not separable due to the unreplicated nature of the trial). For example, clones 2, 403, 19, 304, 11, and 26 exhibited significantly less ($P = 0.05$) rust infection in zone IV (triadimefon 2×) than in either zone I (control) or zone II (triadimefon 1×). In contrast, clones 7 and 27 exhibited more (NS) rust infection in zone IV than in zones I and 11. Average rust infection levels in zones I (control) and II (triadimefon 1×) did not differ significantly (figures 3 and 4). Also, our analysis of infection levels in clone 403 confirmed that only in zone IV (triadimefon 2×) did cone rust infection levels differ significantly from those of zone I (control) at $P = 0.05$ (figure 4). Indeed, rust levels for clone 403 in zone V (unsprayed area), not differing significantly from zones

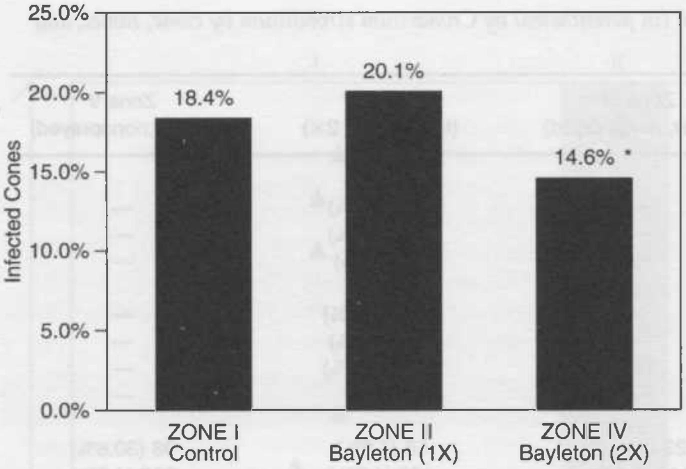


Figure 3—*Mean incidence of southern cone rust infection (% cones infected) in a slash pine seed orchard treated with aerially applied triadimefon (Bayleton® 50% DF). Values/bars annotated with an asterisk differ significantly from those of zone I (control) at* P = *0.05.*

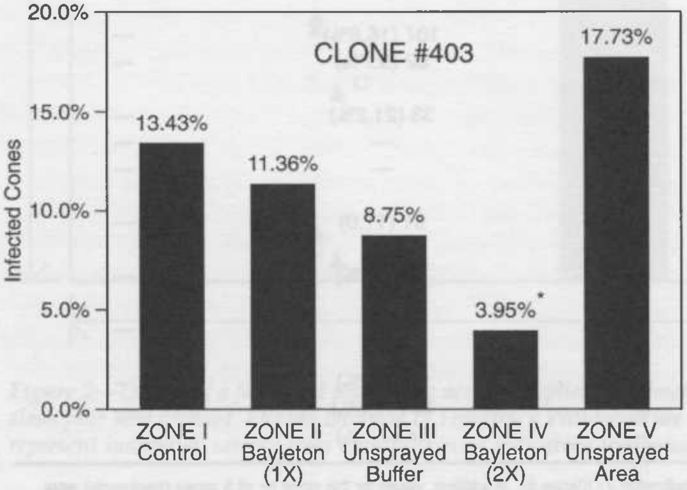


Figure 4— *Mean incidence of southern cone rust infection (% cones infected) in a single clone of slash pine across 5 seed orchard zones treated or untreated with aerially applied triadimefon (Bayleton® 50% DF). Values/bars annotated with an asterisk differ significantly from those of zone I (control) at P = 0.05*

I (control), II (triadimefon 1×), and III (buffer), argue against there being a disease gradient across the seed orchard (figure 4).

Altogether, our data suggest that our double fungicide application (triadimefon 2×) may have reduced the level of cone rust infection in this trial. However, due to the unreplicated nature of our trial, and the consequent confounding of zone (orchard position) with treatment, unequivocal statements with respect to treatment efficacy are premature. Further, should the observed differences in cone rust levels in fact be a function of our fungicide treatments, our data would not enable us to determine whether the effect of the triadimefon 2× treatment was due to the repeated application or simply better timing of the second application. In this respect, we are inclined to prefer the latter explanation as rust levels in our single application zone (triadimefon 1×) did not differ significantly from those in the control zone. Regardless, we are intrigued by our initial results and the possibilities. We believe further trials are in order.

Benefits and costs? Economic justification for aerial triadimefon applications for control of southern cone rust must be determined almost on a case-by-case basis. Cone/seed production per hectare of seed orchard, the value of seed, costs of chemicals (fungicide and adjuvants), costs of aerial application contracts, disease pressure, and level of disease reduction are all factors to be considered. Assuming that our trial results provide a reasonable basis for expected control of southern cone rust (that is, a direct 20% reduction in disease occurrence), calculating the cost effectiveness of an aerial triadimefon spray program will depend largely on the anticipated level of disease incidence, a factor for which we currently have no reliable predictor(s).

For example, assuming 22 kg of seed produced/ha (20 lb/ac), $110/kg of seed ($50/lb), $136 for chemicals/ha ($55/ac) [inclusive; , based on 1,121 g (1 lb) of triadimefon plus adjuvant total for both applications], $74/ha ($30/ac) for total application costs (2 flights), and a disease incidence and control efficacy equivalent to those on our trial, control costs would be $210/ha ($85/ac) and the value of seed saved would be $88/ha ($37/ac); a net loss of $122/ha ($48/ac) for "control". If, however, a single application of triadimefon provided the same level of control, then control costs would still exceed the value of seed saved by $17/ha ($5.50/ac) . For comparison, if disease pressure were greater (for example, 50% cone/seed losses without control) and all other factors remained the same, a double application would result in a net gain of $32 worth of seed/ha ($15/ac), whereas a single application would provide a net gain of $137 worth of seed/ha ($57.50/ac).

Notwithstanding the above, application costs for triadimefon may, in effect, be "reduced" due to the fact that application schedules are essentially coincident with those recommended (Dixon and others 1991) for insecticidal control of slash pine flower thrips—*Gnophothrips fuscus* (Morgan)—and tank mixes of fungicide and insecticide are feasible. In our trial, applications were scheduled to coincide with insecticide applications and laboratory tests for tank mix compatibility using Bayer's Bayleton 50 DF and Riverside/Terra Corporation's Malathion 5®, showed no evidence of incompatibility (unpublished data). Further, the use of triadimefon for rust control in slash pine seed orchards may provide additional indirect benefits by reducing activity of the south coastal coneworm—*Dioryctria ebeli* Mutuura and Munroe—which preferentially attacks rust-infected conelets. If unchecked, populations of this insect build up in rust-infected conelets, with subsequent generations attacking second-year cones, thus causing even greater losses (Dixon and others 1991; Merkel 1958; Miller 1987).

Address correspondence to: Dr. E.L. Barnard, Department of Agriculture & Consumer Services, Forest Health Program, PO Box 147100, Gainesville, FL 32614.

Acknowledgments

The authors extend their sincere appreciation to Mr. Roy Clardy of the Florida Division of Forestry for his very capable field support and technical assistance. Trade names are used in this publication solely to provide specific information, and mention of a trademark or proprietary product does not constitute a guaranty or warranty of the product by the U.S. Department of Agriculture, the Forest Service, or the Florida Department of Agriculture and Consumer Services nor imply its approval to the exclusion of other products that may be suitable.

Literature Cited

Carey WA, Kelley WD. 1993. Seedling production trends and fusiform rust control practices at southern nurseries, 1981–1991. Southern Journal of Applied Forestry 17: 207–211.

Dixon WD, Barnard EL, Fatzinger CW, Miller T. 1991. Insect and disease management. in: Duryea ML,Dougherty PM, eds. Forest regeneration manual. Dordrecht, The Netherlands: Kluwer Academic Publishers: 359–390.

Fatzinger CW, Yates HO, Barber LR. 1992. Evaluation of aerial applications of acephate and other insecticides for control of cone and seed insects in southern pine seed orchards. Journal Entomological Science 27: 172–184.

Goolsby RP, Ruehle JL, Yates HO III. 1972. Insects and diseases of seed orchards in the South. Rep. 28. Macon: Georgia Forestry Research Council. 25 p.

Hedgcock GG, Hahn GG. 1922. Two important pine cone rusts and their new cronartial stages. Phytopathology 12: 109–122.

Hepting GH, Matthews FR. 1970. Southern cone rust. For. Pest Leaflet 27. Washington, DC: USDA Forest Service. 4 pp.

Kelley WD. 1985. Recommended Bayleton® treatments for control of fusiform rust in forest tree nurseries. Res. Note 21. Auburn, AL: Auburn University, Southern Forest Nursery Management Cooperative. 2 p.

Kelley WD, Runion GB. 1991. Control of fusiform rust on loblolly and slash pine seedlings in forest nurseries in the southeastern United States. In: Hiratsuka Y, Samoil JK, Blenis PV, Crane PE, Laishley BL. Rust of Pine; Proceedings, 3rd IUFRO Rust of Pine Working Party; 1989 September 18–22; Banff, AB. Info. Rep. NOR-X-317. Edmonton, AB: Forestry Canada, Northwest Region: 338–340.

Lightle PC. 1959. Cone rust on slash pine controlled by ferbam (abstract). Phytopathology 49: 318.

Maloy OC, Matthews FR. 1960. Southern cone rust: distribution and control. Plant Disease Reporter 44: 36–39.

Matthews FR. 1964. Some aspects of the biology and control of southern cone rust. Journal of Forestry 62: 881–884.

Merkel EP. 1958. Dioryctria cone moth attack as related to cone rust of slash pine in north Florida. Journal of Forestry 56: 651.

Miller T. 1987. Southern pine cone rust. In: Sutherland JR, Miller T, Quinard RS. Cone and seed diseases of North American conifers. NAFC Publ. 1. Victoria, BC: North American Forestry Commission: 11–15.

Powers HR Jr. 1984. Control of fusiform rust of southern pines in the USA. European Journal Forest Pathology 14: 426–431.

Rowan SJ. 1982. Influence of method and rate of application of bayleton on fusiform rust on slash pine seedlings. Tree Planters' Notes 33(1): 15–17.

Snow GA, Rowan SJ, Jones JP, Kelley WD, Mexal JG. 1979. Using Bayleton (triadimefon) to control fusiform rust in pine tree nurseries. Res. Note SO-253. New Orleans: USDA Forest Service, Southern Forest Experiment Station. 5 p.

Tree Planters' Notes

Ten-Year Index (1987-1996)

Volumes 38-47

Index of Subjects and Species

Index of Authors

Cumulative Tables of Contents

Donna Loucks
Forestry information specialist, Centralia, Washington

Index of Subjects and Species

- *Abies*
  - *fraseri.* See Fraser fir
  - *procera.* See Noble fir
- *Acer.* See Maple
- ***Acer saccharinum.*** See Sugar maple
- **Afforestation**
  - establish plantations on pastureland 46(3):73–75, Summer 1995
- *Ailanthus.* See Tree-of-Heaven
- **Alaska-cedar**
  - plantation performance, southeast Alaska 43(3):60–66, Summer 1992
  - seed germination, stratification requirements 44(1):21–24, Winter 1993
- ***Albizia julibrissin.*** See Mimosa
- **Alder.** See individual species' common names
- ***Alnus.*** See Tag alder
- ***Alnus rubra.*** See Red alder
- **Animal damage and control, mechanical**
  - bird netting to protect germinating seedlings 40(4):14–17, Fall 1989
  - MT&DC project 43(3):97–104, Summer 1992; 46(2):36–45, Spring 1995
  - nutria and baldcypress seedlings 38(3):26–29, Summer 1987
  - tree shelters improve establishment on dry sites 45(1):13–16, Winter 1994
- **Animal damage and control, repellents**
  - BGR-P and garlic on western redcedar 46(1):4–6, Winter 1995
  - deer and elk in Douglas-fir plantations 38(3):22–25, Summer 1987
  - MT&DC project 46(2):36–45, Spring 1995
- **Antitranspirants**
  - 5 tested on white spruce and white pine 41(1):34–38, Winter 1990
  - film-forming, black spruce 38(4):23–26, Fall 1987
  - Moisturin® on Douglas-fir and ponderosa pine 46(3):97–101, Summer 1995
  - Vapor gard on cold-stored sycamore 38(1):26–30, Winter 1987
- ***Araucaria columnaris.*** See Cook pine
- **Ash.** See individual species' common names
- **Aspen.** See individual species' common names
- **Atlantic white-cedar**
  - regeneration, natural and artificial 46(3):78–85, Summer 1995
  - seed germination
    - tests of substrate and temperature 45(4):125–127, Fall 1994
    - treatments, viability 45(3):104–111, Summer 1994
  - vegetative propagation, cuttings 45(3):104–111, Summer 1994
- **Austrian pine**
  - seed germination, sterilized seed 38(3):18–21, Summer 1987
- **Autumn olive**
  - seed germination, stratification 38(1):14–17, Winter 1987
- **Baldcypress**
  - animal damage control, nutria 38(3):26–29, Summer 1987
  - rooting stem cuttings 44(3):125–127, Summer 1993
- **Bareroot production.** See more specific terms
- ***Betula alleghaniensis.*** See Yellow birch
- **Birch.** See individual species' common names
- **Biodiversity**
  - role of nurseries 43(2):25–27, Spring 1992
- **Black cherry**
  - plantation performance, northern California 38(4):31–36, Fall 1987
  - plantlet growth and survival, effect of various media 39(3):31–34, Summer 1988
- **Black cottonwood**
  - plantation performance, cuttings, Pacific Northwest 38(4):27–30, Fall 1987
  - species trials, Oregon 44(1):38–42, Winter 1993
- **Black locust**
  - herbicides, screening 3 pre-emergence 39(2):13–18, Spring 1988
- **Black spruce**
  - cold tolerance, measurement by chlorophyll fluorescence 46(3):107–111, Summer 1995
  - container seedlings transplanted from mini-plugs to paperpots 40(2):18–21, Spring 1989
  - growth in worm-casting-amended media 43(2):43–47, Spring 1992
  - moisture stress, effect of 3 antitranspirants 38(4):23–26, Fall 1987
  - overwintering under insulating blanket 45(2):47–52, Spring 1994
  - plantation performance, root pruning and wrenching effects 40(2):33–39, Spring 1989
  - seed deterioration during storage and processing 40(3):5–8, Summer 1989

- seed treatment, priming accelerates container stocking 43(1):11–13, Winter 1992

Black walnut
- nursery practices improve root morphology 41(3):21–32, Summer 1990
- plantation performance
  - differences among stock types 40(3):29–32, Summer 1989
  - mine spoils 41(2):3–5, Spring 1990
  - northern California 38(4):31–36, Fall 1987

Black willow
- cuttings, rooting success 39(4):30–32, Fall 1988

Blue oak
- sowing date affects performance 41(2):6–9, Spring 1990
- top pruning, container seedlings 44(2):73–77, Spring 1993

Blue spruce
- bud dormancy control with lighting 46(1):11–14, Winter 1995
- flooding tolerance, survival after complete submergence 42(2):45–48, Spring 1991
- stem injury from dicloran 41(1):39–42, Winter 1990

Caragana
- plantation performance, relationship of root collar diameter 42(1):36–39, Winter 1991

Carbohydrate reserves
- cold storage effects on 3 conifers 38(2):11–15, Spring 1987

Carolina silverbell
- seed germination, pretreatments, stratification 46(4):134–137, Fall 1995

Carya aquatica. See Pecan

Carya illinoensis. See Pecan

Cat greenbrier
- seed germination, light required 40(1):34–37, Winter 1989

Cherry. See individual species' common names

Celtis occidentalis. See Hackberry

Chamaecyparis nootkatensis. See Alaska-cedar

Chamaecyparis thyoides. See Atlantic white-cedar

Cherry. See individual species' common names

Chemicals. See Fungicides; Herbicides; Insecticides

Chlorophyll fluorescence
- cold tolerance measurement, black spruce 46(3):107–111, Summer 1995

Cold hardiness
- black spruce, measurement by chlorophyll fluorescence 46(3):107–111, Summer 1995
- Douglas-fir, testing to time lifting 47(2):62–67, Spring 1996
- *Eucalyptus macarthurii* and *E. viminalis* in Pacific Northwest 38(4):27–30, Fall 1987
- method, simple, for evaluating whole plant 38(2):16–18, Spring 1987
- *Paulownia*, genetic variation 41(2):31–33, Spring 1990
- ponderosa pine, testing to time lifting 47(2):62–67, Spring 1996
- value of testing 47(2):45–46, Spring 1996

Cold storage
- black spruce, overwintering under insulating blanket 45(2):47–52, Spring 1994
- Fraser fir container seedlings, effect on growth 38(2):19–21, Spring 1987
- freezer storage practices on 5 conifers 38(2):7–10, Spring 1987
- loblolly pine, effect of benomyl root dip 38(4):19–22, Fall 1987
- physiological effects on 3 conifers 38(2):11–15, Spring 1987

Common greenbrier
- seed germination, light required 40(1):34–37, Winter 1989

Compost–sawdust sludge
- effect on 3 conifer species 38(2):22–27, Spring 1987

Computer program
- calculating filled cells 44(2):49–52, Spring 1993
- calculation of daily potential evapotranspiration 39(3):9–12, Summer 1988
- CONIFERS, calculating liquid fertilizer for containers 47(4):120–125, Fall 1996
- LOTUS 123® template for nutrient calculation 40(2):5–7, Spring 1989
- portable data recorders in nurseries 40(1):3-10, Winter 1989
- weather monitoring for irrigation scheduling 41(4):22-27, Fall 1990

Cone. See Seed

Cone morphology
- tamarack, phenotypic variation 42(3):18–22, Summer 1991

Container design
- ISSA system, multipots vs. phytosacks 43(4):146–149, Fall 1992
- type and watering regime affect western larch 40(3):13–15, Summer 1989

Container production. See more specific terms

Cook pine
- seeds, germination, maturity, storage conditions 39(3):17–25, Summer 1988

Cost. See Economics

Cuttings. See Vegetative propagation

Direct seeding
  loblolly pine, compared to planting, in rips 43(2):48–51, Spring 1992
  northern red oak, seed position influences survival 47(2):68–75, Spring 1996
Dormancy, bud
  cold storage effects on 3 conifers 38(2):11–15, Spring 1987
  control with photoperiod lighting 46(1):11–14, Winter 1995
Douglas-fir. See also Rocky Mountain Douglas-fir.
  animal damage, repellents for deer and elk 38(3):22–25, Summer 1987
  cold hardiness tests, container seedlings 47(2):62–67, Spring 1996
  cold storage, physiological effects 38(2):11–15, Spring 1987
  fertilization requirements of container seedlings 46(1):15–18, Winter 1995
  flooding tolerance, survival after complete submergence 42(2):45–48, Spring 1991
  freezer storage practices 38(2):7–10, Spring 1987
  fungicides, 16 tested on *Phomopsis* 39(2):26–29, Spring 1988
  grafts, leader growth, plagiotropism, root stock age effects 38(4):14–18, Fall 1987
  growth in sawdust-sludge compost 38(2):22–27, Spring 1987
  mycorrhizae inoculation, growth response 38(1):18–21, Winter 1987
  plantation performance
    antitranspirant effect 46(3):97–101, Summer 1995
    lifting date, effect after 13 years 40(3):20–24, Summer 1989
    planting date effect on container seedlings 42(2):52–55, Spring 1991
    root form, effect after 10 years 44(2):53–57, Spring 1993
  roots in small containers, affected by sowing depth 44(3):122–124, Summer 1993

Eastern white pine
  antitranspirants, 5 tested on container seedlings 41(1):34–38, Winter 1990
  Fusarium on seeds survives cold storage 40(4):34–36, Fall 1989
  inventory monitoring system in seed orchard 39(4):23–29, Fall 1988
  plantation performance, mine spoils 41(2):3–5, Spring 1990
  root hydraulic conductance 39(3):5–8, Summer 1988
  seed germination, effect of extended prechilling 38(4):6–9, Fall 1987
  seedborne fungi, effect of prechilling 38(4):6–9, Fall 1987
  seedling handling, performance after rough handling 45(4):142–146, Fall 1994
Economics
  bulk lifting, bareroot nursery 42(3):13–15, Summer 1991
  cost of insecticide treatment in container nursery 45(1):5–9, Winter 1994
  fertilizer type, difference between value and cost 46(4):126–129, Fall 1995
  impact of increased stock cost, red pine 40(1):11–14, Winter 1989
  integrated pest management, two-spotted spider mite control 44(4):154–156, Fall 1993
  nursery soil fumigants, comparison of 3 39(4):16–22, Fall 1988
  planting costs, hand vs. machine, southern U.S. 43(3):89–92, Summer 1992
  weed control of hybrid poplar 43(3):81–86, Summer 1992
Elaeagnus commutata. See Silverberry
Elaeagnus umbellata. See Autumn olive
Engelmann spruce
  flooding tolerance, survival after complete submergence 42(2):45–48, Spring 1991
  mycorrhizae inoculation, growth response 38(1):18–21, Winter 1987
Equipment
  auger to extract wood density samples 45(1):10–12, Winter 1994
  dispenser for top-dressing containers 42(2):56–61, Spring 1991
  GPS, MT&DC project 46(2):36–45, Spring 1995
  herbicide application, spray boom vs. roller-wiper 43(2):36–38, Spring 1992
  lifting, economics of bulk lifting 42(3):13–15, Summer 1991
  lighting, control bud dormancy 46(1):11–14, Winter 1995
  machine vision, MT&DC project 43(3):97–104, Summer 1992; 46(2):36–45, Spring 1995
  mobile seedling coolers 44(1):16–18, Winter 1993
  nursery, drawings available 38(2):3–6, Spring 1987; 45(1):17–20, Winter 1994
  planting tools
    container seedlings, 3 types 40(2):22–24, Spring 1989
    planting auger and hammer-action hand planter 42(4):7–8, Fall 1991
  pollen collection
    cyclone dust collector 42(4):4–5, Fall 1991
    larch seed orchard 44(4):141–145, Fall 1993

  - MT&DC project 43(3):97–104, Summer 1992
- pollination
  - air duster 42(4):4–5, Fall 1991
  - duster in Douglas-fir seed orchards 46(4):118–125, Fall 1995
  - Hardi-Combi I mist blower 38(4):3–5, Fall 1987
  - MT&DC project 46(2):36–45, Spring 1995
- portable data recorders in nurseries 40(1):3–10, Winter 1989
- pressure chamber, improved PMS technique 39(3):3–4, Summer 1988
- pruning, MT&DC project 46(2):36–45, Spring 1995
- root pruning, MT&DC project 43(3):97–104, Summer 1992; 46(2):36–45, Spring 1995
- seed collection
  - aerial lifts 45(1):21–25, Winter 1994
  - mechanized net retrieval system, loblolly pine 44(3):101–104, Summer 1993
  - MT&DC project 46(2):36–45, Spring 1995
- seed handling, gravity seed separator 42(2):62–64, Spring 1991
- seed sowing
  - acorn seeder 42(3):16–17, Summer 1991
  - comparison of 2, loblolly pine 43(3):93–96, Summer 1992
  - electronically controlled optical seeder 42(3):4–8, Summer 1991
  - MT&DC project 43(3):97–104, Summer 1992
  - precision sower, longleaf pine 41(4):33–38, Fall 1990
  - progeny seeder 42(3):9–12, Summer 1991
- seedling box lifter 42(4):6, Fall 1991; 43(3):97–104, Summer 1992
- seedling counter 44(1):8–12, Winter 1993
- site preparation
  - cable yarder on steep slopes 38(1):6–10, Winter 1987
  - MT&DC projects 43(3):97–104, Summer 1992
  - scalpers, 2 on crawler-tractors 38(1):3–5, Winter 1987
  - scarifiers for shelterwoods 44(1):13–15, Winter 1993
- tree shakers
  - loblolly pine seed orchard 39(2):19–21, Spring 1988
  - new techniques in older orchards 41(1):26–28, Winter 1990

Eucalyptus
- seed cleaning, pelletizing and sowing 40(1):27–30, Winter 1989
- sowing pelletized seed 45(2):58–62, Spring 1994

Eucalyptus macarthurii
- plantation performance, Pacific Northwest 38(4):27–30, Fall 1987

Eucalyptus nitens. See Shining gum

Eucalyptus viminalis
- plantation performance, Pacific Northwest 38(4):27–30, Fall 1987

European aspen
- tissue culture propagation methods 39(3):28–30, Summer 1988

European larch
- herbicides, screening 3 pre-emergence 39(2):13–18, Spring 1988
- mycorrhizae in container seedlings inoculated with 8 species 40(2):12–17, Spring 1989

Evapotranspiration
- computer program for calculation of daily potential 39(3):9–12, Summer 1988

Fertilization
- computer program, CONIFERS, nutrient calculation 47(4):120-125, Fall 1996
- computer program, LOTUS 123®, nutrient calculation 40(2):5–7, Spring 1989
- controlled release, jeffrey and pinyon pine in containers 42(1):27–33, Winter 1991
- disease control, *Botrytis*, container-grown giant sequoia 44(2):68–72, Spring 1993
- lime causes growth distortions in container seedlings 41(3):12–17, Summer 1990
- requirements based on nutrient uptake by 4 conifers 40(2):8–11, Spring 1989
- requirements for container-grown Douglas-fir 46(1):15–18, Winter 1995
- response to different types, Mexican conifers 46(4):126–129, Fall 1995

Fir. See individual species' common names

Flooding
- tolerance of 4 western conifers 42(2):45–48, Spring 1991

Fraser fir
- cold storage effect on container seedlings of 2 seed sources 38(2):19–21, Spring 1987

Fraxinus pennsylvanica. See Green ash

Fumigants, soil
- dazomet
  - compared to thiram and captan, stunting and long-term survival 41(1):29–33, Winter 1990
  - control of *Macrophomina* 45(3):91–95, Summer 1994
  - mechanical incorporation 45(2):53–57, Spring 1994
  - ponderosa pine bareroot nursery 39(4):16–22, Fall 1988
- metam sodium
  - control of *Macrophomina* 45(3):91–95, Summer 1994

ponderosa pine bareroot nursery 39(4):16–22, Fall 1988
methyl bromide
  alternatives 45(2):43–47, Spring 1994
  management without it 44(1):3–4, Winter 1993; 44(3):87–90, Summer 1993; 47(3):85–86, Summer 1996;
  ponderosa pine bareroot nursery 39(4):16–22, Fall 1988
Fungi and disease. See also Fungicides
  blister rust, sugar pine, controlled by triadimefon 43(1):7–10, Winter 1992
  Botrytis
    carried by fungus gnats in container nurseries 46(2):48–53, Spring 1995
    fertilization effects, container-grown giant sequoia 44(2):68–72, Spring 1993
    reduction by vacuuming dead needles 43(2):30–32, Spring 1992
  brown spot in longleaf pine 38(3):16–17, Summer 1987
  damping off
    comparison of management strategies 41(1):29–33, Winter 1990
    level in slash pine bareroot nursery 39(2):30–36, Spring 1988
    fungicide usage, principles for container nurseries 39(2):22–25, Spring 1988
  Fusarium
    control with 3 soil fumigants 39(4):16–22, Fall 1988
    control with incorporated dazomet 45(2):53–57, Spring 1994
    germination of sterilized seeds, 4 conifers 38(3):18–21, Summer 1987
    survival on cold-stored seeds, eastern white pine 40(4):34–36, Fall 1989
    susceptibility of longleaf pine and hybrid 47(1):11–15, Winter 1996
    in tree shelters, oak 45(3):88–90, Summer 1994
  Macrophomina
    loblolly pine, nursery to field carryover 45(2):68–71, Spring 1994
    dazomet and metam sodium in Florida nursery 45(3):91–95, Summer 1994
  Mycosphaerella, susceptibility of longleaf pine and hybrid 47(1):11–15, Winter 1996
  pest survey for nurseries 43(1):14–16, Winter 1992
  Phomopsis, control on Douglas-fir 39(2):26–29, Spring 1988
  Phytophthora
    control in Pacific Northwest nurseries 38(4):37–40, Fall 1987
    susceptibility of Pacific Northwest conifers 40(1):15–18, Winter 1989
  Pythium
    control with 3 soil fumigants 39(4):16–22, Fall 1988
    control with incorporated dazomet 45(2):53–57, Spring 1994
    reducing pesticide use with sanitation, ventilation, growing regimes 41(4):28–32, Fall 1990
    reducing with sodium metabisulfite cleaning of containers 44(4):161–165, Fall 1993
  seedborne
    management in western nurseries 41(4):3–7, Fall 1990
    white spruce and eastern white pine 38(4):6–9, Fall 1987
  Septoria, reducing risk in hybrid poplar 44(3):128–131, Summer 1993
  Sirococcus, fungicides for control, Jeffrey pine 40(2):30–32, Spring 1989
  southern cone rust, control using triadimefon 47(4):126-131, Fall 1996
Fungicides
  application, MT&DC project 46(2):36–45, Spring 1995
  benomyl
    loblolly pine seedlings, performance after root dip and cold storage 38(4):19–22, Fall 1987
    root dip, longleaf pine, improved performance 46(3):93–96, Summer 1995
    sycamore seedlings before cold-storage 38(1):26–30, Winter 1987
  bleach on seeds of 4 conifers 38(3):18–21, Summer 1987
  dicloran, stem injury to container blue spruce 41(1):39–42, Winter 1990
  disinfecting seed surfaces, western nurseries 41(4):3–7, Fall 1990
  metalaxyl, *Phytophthora* root rot 38(4):37–40, Fall 1987
  principles for usage, container nurseries 39(2):22–25, Spring 1988
  propiconazol, sycamore seedlings before cold storage 38(1):26–30, Winter 1987
  propiconazole, penconazole, triadimefon on *Sirococcus*, Jeffrey pine 40(2):30–32, Spring 1989
  sodium metabisulfite, reduces fungi in containers 44(4):161–165, Fall 1993
  test of 16 on Douglas-fir for *Phomopsis* control 39(2):26–29, Spring 1988
  triadimefon
    control of southern cone rust in seed orchard 47(4):126-131, Fall 1996

controls blister rust on sugar pine in greenhouse 43(1):7–10, Winter 1992

Genetic analysis
Forest Service laboratory established 40(4):25–29, Fall 1989
genotyping longleaf pine ramets 44(4):157–160, Fall 1993
Genetic gain
benefits of improved seed 38(3):3–8, Summer 1987
Genetically improved seed
Douglas-fir, Pacific Northwest, utilization and follow-up 38(3):3–8, Summer 1987
Germinants
sowing in containers 46(1):7–10, Winter 1995
Giant sequoia
fertilization affects *Botrytis* on container seedlings 44(2):68–72, Spring 1993
Gleditsia triacanthos. See Honeylocust
Government programs
America the Beautiful program 42(1):3–5, Winter 1991; 42(1):6–9, Winter 1991; 42(1):10–14, Winter 1991; 42(1):15–17, Winter 1991
Stewardship Incentive Program 42(4):1–2, Fall 1991
Grafting
Douglas-fir, leader growth, plagiotropism, root stock age effects 38(4):14–18, Fall 1987
Green ash
plantation performance, relationship of root collar diameter 42(1):36–39, Winter 1991
Greenhouses
heating with waste oil 44(4):146–148, Fall 1993
Growing media
amended with worm-casting, growth of black spruce 43(2):43–47, Spring 1992
growth distortions caused by lime 41(3):12–17, Summer 1990
superabsorbent polymers increase water-holding capacity 38(1):24–25, Winter 1987
texture influences seedling water stress, white spruce 43(2):39–42, Spring 1992
various types, effect on survival of micropropagated black cherry 39(3):31–34, Summer 1988

Hackberry
seed sources for Great Plains 44(2):78–82, Spring 1993
Halesia tetraptera. See Carolina silverbell
Hardwoods. See also specific common names
seed quality increased with brush machines 43(2):33–35, Spring 1992
species trials, native and non-native, Oregon 44(1):38–42, Winter 1993
top pruning, review of literature 47(1):34–40, Winter 1996
weed control with DCPA/napropamide, germinants of 7 species 44(4):149–153, Fall 1993
Heating
greenhouses with waste oil 44(4):146–148, Fall 1993
Herbicides
application, spray boom vs. roller-wiper system 43(2):36–38, Spring 1992
DCPA/napropamide, hardwood germinants 44(4):149–153, Fall 1993
diphenamid, hexazinone, simazine, effects on 6 species 39(2):13–18, Spring 1988
hexazinone and sulfometuron, effect on loblolly pine survival and growth 45(4):116–120, Fall 1994
hexazinone, sulfometuron, imazapyr, loblolly pine old fields 44(1):25–32, Winter 1993
oxyfluorfen, lodgepole pine seedbeds 39(2):3–9, Spring 1988
site preparation, 7 treatments, loblolly pine 39(2):10–12, Spring 1988
Himalayan blue pine
plantation performance, northeast U.S. 43(3):76–80, Summer 1992
Honeylocust
Seed testing, moisture determination 43(3):72–75, Summer 1992
Hybrid larch
pollen collection, mechanized, seed orchards 44(4):141–145, Fall 1993
Hybrid poplar
cutting diameter, importance of, on early growth 47(2):76–80, Spring 1996
disease risk, selection impacts yield 44(3):128–131, Summer 1993
plantation performance, 9-year results, Ontario 42(2):49–51, Spring 1991
species trials, Oregon 44(1):38–42, Winter 1993
weed control program 43(3):81–86, Summer 1992
Hybrids. See Kellogg hybrid pine, Loblolly × pitch pine
Hymanea stilbocarpa
seed size effect on seedling growth 46(4):130–133, Fall 1995

Indexes, Tree Planters' Notes
1977–1986, Volumes 28–37 39(1):3–45, Winter 1988
1987, Volume 38 39(4):3–5, Fall 1988
1987–1996, Volumes 38–47 47(4):133–171, Fall 1996
1988, Volume 39 40(4):3–13, Fall 1989
1989–1990, Volume 40–41 43(1):17–24, Winter 1992
Insect damage and control. See also Insecticides
fir aphid, white fir bareroot seedlings 41(4):8–12, Fall 1990

- float testing for acorn insects, northern red oak 46(4):143–147, Fall 1995
- fungus gnats spread *Botrytis* in container nurseries 46(2):48–53, Spring 1995
- in tree shelters, oak 45(3):88–90, Summer 1994
- Nantucket pine tip moth, longleaf pine 45(3):86–87, Summer 1994
- pales weevil, threat to longleaf pine 43(3):87–88, Summer 1992
- pest survey for nurseries 43(1):14–16, Winter 1992
- pine weevil, resistance of Himalayan blue pine 43(3):76–80, Summer 1992
- pine weevil, treatment of container seedlings 45(1):5–9, Winter 1994
- reducing pesticide use with sanitation, ventilation, growing regimes 41(4):28–32, Fall 1990
- seed orchard inventory monitoring helps plan control 39(4):23–29, Fall 1988
- tarnished plant bug, southern pine nursery 40(4):30–33, Fall 1989
- *Taylorilygus* on pine, causes bushy tops 44(2):63–67, Spring 1993
- termites, subterranean, on pecan seedlings 38(2):28–30, Spring 1987
- two-spotted spider mite, greenhouse-grown poplars 44(4):154–156, Fall 1993

Insecticides
- 4 tested on fir aphid on white fir 41(4):8–12, Fall 1990
- application, worker exposure in container nursery 45(1):5–9, Winter 1994
- Lorsban 4E, on subterranean termites in pecan seedlings 38(2):28–30, Spring 1987
- permethrin, on large pine weevil in container seedlings 45(1):5–9, Winter 1994

Integrated pest management
- reducing pesticide use with sanitation, ventilation, growing regimes 41(4):28–32, Fall 1990
- two-spotted spider mite management, greenhouse-grown poplars 44(4):154–156, Fall 1993

Interior spruce
- cold storage, physiological effects 38(2):11–15, Spring 1987

International forestry
- opportunities for exchanges 44(4):137–138, Fall 1993

Irrigation
- measuring soil water using TDR 47(3):88–93, Summer 1996
- rate calculation for nurseries 41(4):22–27, Fall 1990

Jack pine
- plantation performance
  - not improved with root dip 41(3):18–20, Summer 1990
- root pruning and wrenching effects 40(2):33–39, Spring 1989
- vegetative propagation, effect of crown position and plant age 47(3):100–104, Summer 1996

Jeffrey pine
- disease control, fungicides tested on *Sirococcus* 40(2):30–32, Spring 1989
- fertilization of container seedlings 42(1):27–33, Winter 1991

Juglans nigra. See Black walnut

Juniperus scopulorum. See Rocky Mountain juniper

Kellogg hybrid pine
- herbicides, screening 3 pre-emergence 39(2):13–18, Spring 1988

Knobcone × Monterey pine hybrid
- plantation performance, container seedlings on harsh dam site 41(1):8–14, Winter 1990

Larch. See individual species' common names

Larix decidua. See European larch

Larix eurolepis. See Hybrid larch

Larix laricinia. See Tamarack

Larix occidentalis. See Western larch

Lifting
- Douglas-fir, date affects 13-year performance 40(3):20–24, Summer 1989
- economics of bulk lifting 42(3):13–15, Summer 1991
- longleaf pine, date affects field survival 42(3):28–31, Summer 1991
- ponderosa pine, lifting windows 42(1):18–21, Winter 1991

Limba
- seed treatment, scarification with hot water, bleach, acid 43(4):150–152, Fall 1992

Limber pine
- mycorrhizae inoculation, growth response 38(1):18–21, Winter 1987

Liriodendron tulipifera. See Yellow-poplar

Loblolly pine
- allelopathic effects of shining sumac 41(3):33–34, Summer 1990
- container production, shading reduces growth 40(1):23–26, Winter 1989
- fall mosaic, may be related to mycorrhizal colonization and undercutting 40(1):19–22, Winter 1989
- mulch and fertilizer effects 42(3):32–35, Summer 1991
- natural regeneration, carry-over of seed 42(4):17–18, Fall 1991
- plantation performance
  - after 7 site preparation herbicide treatments 39(2):10–12, Spring 1988

- comparing container, bareroot and seeding 45(2):63–67, Spring 1994
- comparing stock types, root dips, mycorrhizae inoculation 41(2):13–21, Spring 1990
- disease carryover from nursery 45(2):68–71, Spring 1994
- effect of height, shoot:root ratio, benomyl root dip 38(4):19–22, Fall 1987
- old fields, Arkansas 44(1):25–32, Winter 1993
- release important for naturally seeded and container seedlings 45(4):128–136, Fall 1994
- rutted site after 3 years 46(1):28–31, Winter 1995
- seeding versus planting, in rips 43(2):48–51, Spring 1992
- treated with sulfometuron or hexazinone 45(4):116–120, Fall 1994
- pollen distribution in seed orchard 38(4):3–5, Fall 1987
- pollen production, effect of wire girdle 38(3):33–35, Summer 1987
- seed collection, mechanized net retrieval system 44(3):101–104, Summer 1993
- seed collection, shakers, mechanical and helicopter 39(2):19–21, Spring 1988
- seed germination, carry-over on forest sites 42(4):17–8, Fall 1991
- seed germination, seed condition, stratification and temperature effects 46(4):139–142, Fall 1995
- seed, pregermination treatment effects 39(4):36–38, Fall 1988
- seed sources, don't forget about 43(1):1–2, Winter 1992
- seed sowing, comparison of 2 seeders 43(3):93–96, Summer 1992
- seedling morphology, seedbed density, sowing date, 53 southern nurseries 39(3):13–16, Summer 1988
- vegetative propagation from needle fascicles 43(3):67–71, Summer 1992

Loblolly × pitch pine hybrid
- plantation performance, after 17 years, Maryland 39(3):26–27, Summer 1988

Lodgepole pine
- cold storage, physiological effects 38(2):11–15, Spring 1987
- flooding tolerance, survival after complete submergence 42(2):45–8, Spring 1991
- freezer storage practices 38(2):7–10, Spring 1987
- mycorrhizae inoculation, growth response 38(1):18–21, Winter 1987
- seedbed coverings affect germination, growth, frost heaving 41(4):13–16, Fall 1990
- weed control in seedbeds with oxyfluorfen 39(2):3–9, Spring 1988

Longleaf pine
- container production, shading reduces growth 40(1):23–26, Winter 1989
- Nantucket pine tip moth infestation 45(3):86–87, Summer 1994
- nursery practices affect field survival 42(3):28–31, Summer 1991
- pales weevil threat 43(3):87–88, Summer 1992
- plantation performance
  - root dip and scalping improve 46(3):93–96, Summer 1995
  - seedling size, effect 38(3):16–7, Summer 1987
- seed source test, 5-year results 47(1):6–10, Winter 1996
- susceptibility to *Fusiform* rust and brown-spot needle blight 47(1):11–15, Winter 1996
- vegetative propagation from needle fascicles 43(3):67–71, Summer 1992

Machine vision
- MT&DC project 43(3):97–104, Summer 1992; 46(2):36–45, Spring 1995

Maple. See also individual species' common names
- seed germination, optimum temperature for stratification 40(3):9–12, Summer 1989

Methods
- evaluating container stock quality with shoot:root ratio 46(3):102–106, Summer 1995
- evaluating whole plant cold hardiness 38(2):16–18, Spring 1987
- nondestructive test for pine seed quality 42(2):41–44, Spring 1991
- pest survey system for nurseries 43(1):14–16, Winter 1992
- pollen storage using freeze drying 40(4):18–19, Fall 1989
- pressure chamber, increasing speed, accuracy, safety 39(3):3–4, Summer 1988
- quantifying new root production 45(4):121–124, Fall 1994
- sampling for seedling inventory 42(4):9–13, Fall 1991
- soil water content measurement using TDR 47(3):88–3, Summer 1996
- stock quality assessment 44(3):113–121, Summer 1993

Micropropagation
- black cherry, survival in various media 39(3):31–34, Summer 1988
- European aspen, method for tetraploids 39(3):28–30, Summer 1988
- somatic embryogenesis comes of age 47(2):48–57, Spring 1996

    valley oak shoots 41(2):27–30, Spring 1990
Mimosa
  seed testing, moisture determination 43(3):72–75, Summer 1992
Mine spoil reclamation
  autumn olive, seed germination 38(1):14–17, Winter 1987
  mycorrhizae species occurrence, oak and pine forests 41(1):15–23, Winter 1990
  root dips improves survival, 8 species 43(4):159–162, Fall 1992
  species performance
    18 species after 47 years 47(1):24–29, Winter 1996
    5 oaks 46(2):54–57, Spring 1995
    6 species tested 41(2):3–5, Spring 1990
    8 species on different soil mixtures 44(4):166–171, Fall 1993
Moisture retention
  containers, using superabsorbent polymer 38(1):24–25, Winter 1987
  Liqua-Gel on cold-stored sycamore 38(1):26–30, Winter 1987
  root dips, use in North America 45(1):26–31, Winter 1994
Moisture stress
  antitranspirants
    black spruce 38(4):23–26, Fall 1987
    white pine and white spruce container seedlings 41(1):34–38, Winter 1990
  measurement with pressure chamber, improved technique 39(3):3–4, Summer 1988
  soil texture influences, white spruce 43(2):39–42, Spring 1992
Mulch
  loblolly pine, combined with fertilizer 42(3):32–35, Summer 1991
  MT&DC project 46(2):36–45, Spring 1995
Multiple leaders
  caused by tarnished plant bug, southern nursery 40(4):30–33, Fall 1989
  caused by *Taylorilygus* on pine 44(2):63–67, Spring 1993
Mycorrhizae
  colonization in fumigated or nonfumigated beds, western redcedar 42(4):14–16, Fall 1991
  European larch container seedlings, inoculated with 8 mycorrhizae 40(2):12–17, Spring 1989
  fall mosiac in loblolly pine may be from differences in colonization 40(1):19–22, Winter 1989
  Glomus mosseae, inoculation of redwood 41(3):7–11, Summer 1990
  Pisolithus tinctorius
    inoculation of 5 Rocky Mountain conifer species 38(1):18–21, Winter 1987
    inoculation of loblolly and shortleaf pine 41(2):13–21, Spring 1990
  species collected in oak and pine forest and on surface mines 41(1):15–23, Winter 1990
  species on western redcedar in containers and field 44(1):33–7, Winter 1993
  white spruce stunting, effect of soil sterilization 38(1):22–23, Winter 1987
Native plants
  biodiversity and nurseries 43(2):25–27, Spring 1992
  Carolina silverbell, seed germination, pretreatments, stratification 46(4):134–137, Fall 1995
  conservation forestry, need for multipurpose species 43(3):55–57, Summer 1992
  containerless transport of desert shrubs 45(3):82–85, Summer 1994
  greenbrier, common and cat, seed germination 40(1):34–37, Winter 1989
  propagation of wetland species 44(3):93–97, Summer 1993
  silverberry, seed stratification for optimal germination 41(1):24–25, Winter 1990
Natural regeneration
  loblolly pine, carry-over of seed 42(4):17–18, Fall 1991
Nitrogen fixation
  legumes sown on logged sites 46(1):19–27, Winter 1995
Noble fir
  freezer storage practices 38(2):7–10, Spring 1987
  growth in sawdust–sludge compost 38(2):22–27, Spring 1987
Non-industrial private forests
  opportunity to provide reforestation assistance 45(1):1–2, Winter 1994
Northern red oak
  direct seeding, seed position influences survival 47(2):68–75, Spring 1996
  herbicides, screening 3 pre-emergence 39(2):13–18, Spring 1988
  nursery practices improve root morphology 41(3):21–32, Summer 1990
  plantation performance
    graded stock 39(4):33–35, Fall 1988
    mine spoils 41(2):3–5, Spring 1990
    northern California 38(4):31–36, Fall 1987
    tree shelters, competition control 45(4):137–141, Fall 1994
  seed testing by float method 46(4):143–147, Fall 1995
  seedbed density, effects on seedlings 40(3):3–4, Summer 1989

Nursery operations
history plots, installation, monitoring 38(3):9–15, Summer 1987
inventory, optimal sample size 42(4):9–13, Fall 1991
inventory with seedling counter 44(1):8–12, Winter 1993
production scheduling 47(1):1–2, Winter 1996
quality control system, Forest Service nurseries 41(1):3–7, Winter 1990
Nutrients
amount removed from nursery by 4 conifers 40(2):8–11, Spring 1989
concentrations in 3 compost-grown conifers 38(2):22–27, Spring 1987
composted lime-treated horse manure, effect on soil pH 40(1):31–33, Winter 1989
legumes sown on logged sites 46(1):19–27, Winter 1995

Oak. See also individual species' common names
insects and diseases in tree shelters 45(3):88–90, Summer 1994
plantation performance, mine spoils 46(2):54–57, Spring 1995
species trials, Oregon 44(1):38–42, Winter 1993
Paulownia
genetic variation of height, winter injury 41(2):31–33, Spring 1990
spacing trials 42(1):34–35, Winter 1991
vegetation propagation
fungicide increases sprouting 45(3):101–103, Summer 1994
sprouting and growth 45(3):95–100, Summer 1994
Pecan
grafting sweet pecan to bitter pecan rootstock 40(3):25–28, Summer 1989
termites, subterranean, damage to seedlings 38(2):28–30, Spring 1987
Pelletized seed
Eucalyptus, cleaning and sowing 40(1):27–30, Winter 1989
Photoperiod
extended, effect on 7 conifers 44(3):105–12, Summer 1993
Picea
engelmannii. See Engelmann spruce; Interior spruce
glauca. See White spruce; Interior spruce
mariana. See Black spruce
pungens. See Blue spruce
Pin cherry
seed germination and temperature fluctuation 38(3):30–32, Summer 1987
Pine. See individual species' common names
Pinus.
ayacahuite, container seedlings jellyrolled for transportation 47(3):105–109, Summer 1996
banksiana. See Jack pine
clausa. See Sand pine
contorta. See Lodgepole pine
douglasiana, fertilizer, response to different types 46(4):126–129, Fall 1995
echinata. See Shortleaf pine
elliottii. See Slash pine
flexilis. See Limber pine
greggii, seed production, natural stands, Mexico 46(3):86–92, Summer 1995
jeffreyi. See Jeffrey pine
lambertiana. See Sugar pine
monophylla. See Single leaf pinyon pine
monticola. See Western white pine
nigra. See Australian pine
nigra x densiflora. See Kellogg hybrid pine
palustris. See Longleaf pine
ponderosa. See Ponderosa pine
ponderosa var. *scopulorum.* See Rocky Mountain ponderosa pine
pseudostrobus
container seedlings jellyrolled for transportation 47(3):105-109, Summer 1996
fertilizer, response to different types 46(4):126-129, Fall 1995
resinosa. See Red pine
rigida. See Loblolly × pitch pine hybrid
strobus. See Eastern white pine
sylvestris. See Scotch pine
taeda. See Loblolly pine
virginiana. See Virginia pine
wallichiana. See Himalayan blue pine
Plagiotropism
Douglas-fir grafts 38(4):14–8, Fall 1987
Plant communities
site preparation, effect of 3 methods 41(4):39–42, Fall 1990
Plantation performance
Alaska-cedar, southeast Alaska 43(3):60–66, Summer 1992
Atlantic white-cedar, natural and artificial swamp regeneration 46(3):78–85, Summer 1995
baldcypress, damage by nutria 38(3):26–29, Summer 1987
black cherry, northern California 38(4):31–36, Fall 1987

black cottonwood, species trials, Oregon 44(1):38–42, Winter 1993
black spruce
  antitranspirants, effect of 3 38(4):23–26, Fall 1987
  root pruning and wrenching effects 40(2):33–39, Spring 1989
black walnut
  differences among stock types 40(3):29–32, Summer 1989
  northern California 38(4):31–36, Fall 1987
blue oak, top pruning improves performance 44(2):73–77, Spring 1993
caragana, relationship of root collar diameter 42(1):36–39, Winter 1991
container seedlings after manual site preparation 47(2):58–61, Spring 1996
Douglas-fir
  after animal damage by deer and elk 38(3):22–25, Summer 1987
  antitranspirant effect 46(3):97–101, Summer 1995
  lifting date, effect after 13 years 40(3):20–24, Summer 1989
  planting date effect on container seedlings 42(2):52–5, Spring 1991
  root form, effect after 10 years 44(2):53–57, Spring 1993
eastern white pine, after rough handling 45(4):142–146, Fall 1994
Eucalyptus macarthurii and *E. viminalis* 38(4):27–30, Fall 1987
green ash, relationship of root collar diameter 42(1):36–9, Winter 1991
Himalayan blue pine, northeast U.S. 43(3):76–80, Summer 1992
hybrid poplar
  9-year results, Ontario 42(2):49–51, Spring 1991
  importance of cutting diameter 47(2):76–80, Spring 1996
  species trials, Oregon 44(1):38–42, Winter 1993
jack pine, root pruning and wrenching effects 40(2):33–39, Spring 1989
knobcone × Monterey pine hybrid, container seedlings on harsh dam site 41(1):8–14, Winter 1990
loblolly pine
  after 7 site preparation herbicide treatments 39(2):10–12, Spring 1988
  comparing container, bareroot and seeding 45(2):63–67, Spring 1994
  comparing stock types, root dips, mycorrhizae inoculation 41(2):13–21, Spring 1990
  disease carryover from nursery 45(2):68–1, Spring 1994
  effect of height, root:shoot ratio, root dip 38(4):19–22, Fall 1987
  mulch and fertilizer effects 42(3):32–35, Summer 1991
  old fields, Arkansas 44(1):25–32, Winter 1993
  release important for naturally seeded container seedlings 45(4):128–136, Fall 1994
  rutted site after 3 years 46(1):28–31, Winter 1995
  seeding vs. planting, in rips 43(2):48–51, Spring 1992
  treated with sulfometuron or hexazinone 45(4):116–120, Fall 1994
loblolly × pitch pine hybrid, after 17 years, Maryland 39(3):26–27, Summer 1988
longleaf pine
  nursery practices, effects 42(3):28–31, Summer 1991
  root dip and scalping improve 46(3):93–96, Summer 1995
  seed source, results of 5-year test 47(1):6–10, Winter 1996
  seedling size, effect 38(3):16–17, Summer 1987
mine spoils
  18 species after 47 years 47(1):24–29, Winter 1996
  6 species tested 41(2):3–5, Spring 1990
  8 species on different soil mixtures 44(4):166–171, Fall 1993
native plants, containerless transport of desert shrubs 45(3):82–85, Summer 1994
northern red oak
  enhanced by tree shelters and competition control 45(4):137–141, Fall 1994
  graded stock 39(4):33–35, Fall 1988
  northern California 38(4):31–36, Fall 1987
  seed position influence 47(2):68–75, Spring 1996
oak
  5 species on mine spoils 46(2):54–57, Spring 1995
  species trials, Oregon 44(1):38–42, Winter 1993
Paulownia, spacing trials 42(1):34–35, Winter 1991
Pinus pseudostrobus, P. ayacahuite, container seedlings
  jellyrolled for transportation 47(3):105–109, Summer 1996
  planting deeper increases survival 41(4):17–21, Fall 1990
ponderosa pine
  antitranspirant effect 46(3):97–101, Summer 1995
  effect of lifting time 42(1):18–21, Winter 1991
  planting date effect on container seedlings 42(2):52–55, Spring 1991
  seedling quality and weather effects 47(1):16–3, Winter 1996
  stock comparisons, 1+0 and 2+0 43(4):153–158, Fall 1992

- red alder, Pacific Northwest 38(4):27–30, Fall 1987
- Rocky Mountain ponderosa pine, causes of mortality, container seedlings 40(3):16–19, Summer 1989
- root dip
  - effect on red pine, jack pine, and white spruce 41(3):18–20, Summer 1990
  - improves survival, 8 species 43(4):159–162, Fall 1992
  - review of use in North America 45(1):26–31, Winter 1994
- shining gum, water improves survival 46(2):46–47, Spring 1995
- shortleaf pine, comparing stock types, root dips, mycorrhizae inoculation 41(2):13–21, Spring 1990
- slash pine
  - comparing container, bareroot and seeding 45(2):63–67, Spring 1994
  - effect of seed and seedling size 42(3):23–27, Summer 1991
- sycamore, treatment with fungicide, antitranspirant super absorbent polymer 38(1):26–30, Winter 1987
- tests to assess stock quality 44(3):113-121, Summer 1993
- tree shelters, improve establishment on dry sites 45(1):13-16, Winter 1994
- western larch, comparison of stock types and season of planting 40(4):20-24, Fall 1989
- western white pine, planting date effect on container seedlings 42(2):52-55, Spring 1991
- white spruce
  - after rough handling 45(4):142-146, Fall 1994
  - root pruning and wrenching effects 40(2):33-39, Spring 1989
  - root pruning effects 43(1):4-6, Winter 1992
- yellow-poplar, root collar diameter effects 47(1):30-33, Winter 1996

Planting
- cost comparison, hand vs. machine, southern U.S. 43(3):89–92, Summer 1992
- date affects survival, western larch 40(4):20–4, Fall 1989
- deeper planting increases survival 41(4):17–21, Fall 1990
- manual site preparation for container seedlings 47(2):58–61, Spring 1996
- tools
  - container seedlings, 3 types 40(2):22–24, Spring 1989
  - planting auger and hammer-action hand planter 42(4):7–8, Fall 1991
- tropical forests, establishment techniques 43(4):125–132, Fall 1992; 43(4):133–141, Fall 1992

Plantlet growth and survival
- black cherry, in various media 39(3):31–34, Summer 1988

Platanus occidentalis. See Sycamore

Pollen
- collection
  - cyclone dust collector 42(4):4–5, Fall 1991
  - MT&DC project 43(3):97–104, Summer 1992
- distribution
  - air duster 42(4):4–5, Fall 1991
  - duster in Douglas-fir seed orchards 46(4):118–125, Fall 1995
  - mist blower in loblolly pine seed orchard 38(4):3–5, Fall 1987
- production, loblolly pine, effects of wire girdle 38(3):33–35, Summer 1987
- storage using freeze drying 40(4):18–19, Fall 1989
- yield, western white pine 46(2):64–69, Spring 1995

Ponderosa pine
- cold hardiness tests, container seedlings 47(2):62–67, Spring 1996
- freezer storage practices 38(2):7–10, Spring 1987
- growth in sawdust–sludge compost 38(2):22–27, Spring 1987
- lifting windows 42(1):18–21, Winter 1991
- mycorrhizae inoculation, growth response 38(1):18–21, Winter 1987
- plantation performance
  - antitranspirant effect 46(3):97–101, Summer 1995
  - planting date effect on container seedlings 42(2):52–55, Spring 1991
  - seedling quality and weather effects 47(1):16–23, Winter 1996
  - stock comparisons, 1+0 and 2+0 43(4):153–158, Fall 1992
- seed covering materials in nursery 38(1):11–13, Winter 1987
- seed germination, sterilized seed 38(3):18–21, Summer 1987
- soil fumigants, bareroot nursery 39(4):16–22, Fall 1988

Poplar. See individual species specific names

Populus. See Hybrid poplar
- ***tremula.*** See European aspen
- ***tremuloides.*** See Quaking aspen
- ***trichocarpa.*** See Black cottonwood

Pruning
- equipment, MT&DC project 46(2):36–45, Spring 1995
- top. See Top pruning

Prunus
- ***pensylvanica.*** See Pin cherry
- ***serotina.*** See Black cherry

Pseudotsuga menziesii. See Douglas-fir

Pseudotsuga menziesii var. *glauca*. See Rocky Mountain Douglas-fir

Quaking aspen
  seed collection and extraction 44(3):98–100, Summer 1993
  seed production, development, germinability 40(2):25–29, Spring 1989
Quercus. See Oak
  alba. See White oak
  douglasii. See Blue oak
  lobata. See Valley oak
  nigra. See Water oak
  rubra. See Northern red oak

Red alder
  plantation performance 38(4):27–30, Fall 1987
Red pine
  economic impact of increased stock cost 40(1):11–14, Winter 1989
  plantation performance, not improved with root dip 41(3):18–20, Summer 1990
Redwood
  mycorrhizae effects on growth 41(3):7–11, Summer 1990
Reforestation. See also Planting
  America the Beautiful Program 42(1):3–5, Winter 1991; 42(1):6–9, Winter 1991; 42(1):10–14, Winter 1991; 42(1):15–17, Winter 1991
  conservation forestry, need for multipurpose species 43(3):55–57, Summer 1992
  government programs, Stewardship Incentive Program 42(4):1–2, Fall 1991
  need to replant in the South 46(1):1–2, Winter 1995
  opportunities for international exchanges 44(4):137–138, Fall 1993
  opportunity to assist NIPF owner 45(1):1–2, Winter 1994
  seed certification 46(2):33–34, Spring 1995
  tropical American rain forest 43(4):114–118, Fall 1992; 43(4):119–124, Fall 1992
Rhus copallina. See Shining sumac
Robinia pseudoacacia. See Black locust
Rocky Mountain Douglas-fir. See also Douglas-fir.
  seed germination, sterilized seed 38(3):18–21, Summer 1987
  vegetative propagation by stem cuttings 41(3):3–6, Summer 1990
Rocky Mountain juniper
  vegetative propagation from shoot tip cuttings 47(3):94–99, Summer 1996
Rocky Mountain ponderosa pine
  plantation performance, causes of mortality, container seedlings 40(3):16–19, Summer 1989
Root dips
  loblolly and shortleaf pine survival 41(2):13–21, Spring 1990
  loblolly pine survival after clay slurry and benomyl dip 38(4):19–22, Fall 1987
  longleaf pine, improved performance 46(3):93–96, Summer 1995
  red pine, jack pine, and white spruce survival 41(3):18–20, Summer 1990
  review of use in North America 45(1):26-31, Winter 1994
  water-absorbent gel improves survival, 8 species 43(4):159–162, Fall 1992
Root form
  10-year effect, Douglas-fir 44(2):53–57, Spring 1993
  multipot containers better than phytosacks 43(4):146–149, Fall 1992
Root growth potential
  cold storage effects on 3 conifers 38(2):11-15, Spring 1987
  method to quantify new root production 45(4):121–124, Fall 1994
  value of testing 47(2):45–46, Spring 1996
Root hydraulic conductance
  eastern white pine 39(3):5–8, Summer 1988
Root pruning
  effect on plantation performance
    white spruce 43(1):4–6, Winter 1992
    white spruce, black spruce, jack pine 40(2):33–39, Spring 1989
  equipment, MT&DC project 43(3):97–104, Summer 1992; 46(2):36–45, Spring 1995
Rooting compounds
  IBA and NAA on Scouler willow 46(2):58–63, Spring 1995
  yellow birch cuttings, rooting success 39(2):37–42, Spring 1988

Salix humboldtiana. See Black willow
Salix nigra. See Black willow
Salix scouleriana. See Scouler willow
Sampling
  sample size for seedling inventory 42(4):9–13, Fall 1991
Sand pine
  cone maturation, seed yield 41(2):22–26, Spring 1990
  seed germination, improved by aerated stratification 42(1):22–26, Winter 1991
Scotch pine
  seed germination, sterilized seed 38(3):18–21, Summer 1987

- **Scouler willow**
  - vegetative propagation, with IBA and NAA 46(2):58–63, Spring 1995
- **Seed certification** 46(2):33–34, Spring 1995
- **Seed collection**
  - equipment, MT&DC project 46(2):36–45, Spring 1995
  - mechanized net retrieval system, loblolly pine 44(3):101–104, Summer 1993
  - Quaking aspen, collection and extraction 44(3):98–100, Summer 1993
  - sand pine, date affects yield 41(2):22–26, Spring 1990
  - tree shakers 39(2):19-21, Spring 1988; 41(1):26–28, Winter 1990
  - tropical species, problems 43(4):142–145, Fall 1992
- **Seed germination**
  - Alaska-cedar, stratification requirements 44(1):21–24, Winter 1993
  - Atlantic white-cedar, tests of substrate and temperature 45(4):125–127, Fall 1994
  - autumn olive, stratification 38(1):14–17, Winter 1987
  - bleach sterilization of seeds, 4 conifers 38(3):18–21, Summer 1987
  - Carolina silverbell, pretreatments, stratification 46(4):134–137, Fall 1995
  - common and cat greenbrier, light required 40(1):34–37, Winter 1989
  - Cook pine, different storage conditions 39(3):17–25, Summer 1988
  - eastern white pine, effect of prechilling 38(4):6–9, Fall 1987
  - limba, scarification with hot water, bleach, acid 43(4):150–152, Fall 1992
  - loblolly pine
    - allelopathic effects of shining sumac 41(3):33–34, Summer 1990
    - carry-over in forest sites 42(4):17–18, Fall 1991
    - pregermination treatment 39(4):36–38, Fall 1988
    - seed condition, stratification and temperature effects 46(4):139–142, Fall 1995
  - maple, optimum temperature for stratification 40(3):9–12, Summer 1989
  - pin cherry, recommendations for 38(3):30–32, Summer 1987
  - quaking aspen, catkin growth, seed production, artificial ripening 40(2):25–29, Spring 1989
  - sand pine, improved by aerated stratification 42(1):22–26, Winter 1991
  - shortleaf pine, presowing treatments 44(2):58–62, Spring 1993
  - sowing rate, calculation 44(1):19–20, Winter 1993; 44(2):49–52, Spring 1993
  - tree-of-heaven, stratification not required 41(2):10–12, Spring 1990
  - tropical species, recalcitrant seeds 43(4):142–145, Fall 1992
  - water oak, enhanced by seedcoat removal 43(2):52–53, Spring 1992
  - white spruce, effect of prechilling 38(4):6–9, Fall 1987
- **Seed handling**
  - brush machines increase hardwood seed quality 43(2):33–35, Spring 1992
  - gravity seed separator 42(2):62–64, Spring 1991
  - tropical American species 43(4):114–118, Fall 1992; 43(4):119–124, Fall 1992
- **Seed orchard**
  - equipment
    - aerial lifts 45(1):21–25, Winter 1994
    - pollen collection and distribution 42(4):4–5, Fall 1991
    - pollen collection, larch 44(4):141–145, Fall 1993
    - pollen distribution
      - duster for mass pollination 46(4):118–125, Fall 1995
      - MT&DC project 46(2):36–45, Spring 1995
      - mist blower 38(4):3–5, Fall 1987
  - girdling to increase pollen production, loblolly pine 38(3):33–35, Summer 1987
  - inventory monitoring system helps plan pest management 39(4):23–29, Fall 1988
- **Seed pellets**
  - *Eucalyptus* raising in tropical nurseries 45(2):58–62, Spring 1994
- **Seed production**
  - Pacific Northwest seed orchards 38(3):3–8, Summer 1987
  - *Pinus greggii*, natural stands, Mexico 46(3):86–92, Summer 1995
  - tamarack, phenotypic variation 42(3):18–22, Summer 1991
- **Seed size**
  - *Hymanea stilbocarpa*, effect on seedling growth 46(4):130–133, Fall 1995
  - slash pine, effect on growth 42(3):23–27, Summer 1991
- **Seed sources**
  - fertilization requirements differ, Douglas-fir 46(1):15–18, Winter 1995
  - hackberry in Great Plains 44(2):78–82, Spring 1993
  - hardwood root morphology affected 41(3):21–32, Summer 1990
  - loblolly pine, don't forget about 43(1):1–2, Winter 1992
  - longleaf pine, results of 5-year test 47(1):6–10, Winter 1996

Seed sowing. See also Direct seeding
- black spruce, priming accelerates container stocking 43(1):11–13, Winter 1992
- depth in container affects roots, Douglas-fir 44(3):122–124, Summer 1993
- equipment
  - acorn seeder 42(3):16–17, Summer 1991
  - electronically controlled optical seeder 42(3):4–8, Summer 1991
  - MT&DC project 43(3):97–104, Summer 1992
  - progeny seeder 42(3):9–12, Summer 1991
  - pelletized seed 40(1):27–30, Winter 1989
- germinants in containers 46(1):7–10, Winter 1995
- loblolly pine
  - comparing 2 seeders 43(3):93–96, Summer 1992
  - time of, 53 southern nurseries 39(3):13–16, Summer 1988
- longleaf pine
  - date affects field survival 42(3):28–31, Summer 1991
  - precision sower 41(4):33–38, Fall 1990
- oak, blue and Valley, date affects performance 41(2):6–9, Spring 1990
- recommendations based on history plots 38(3):9–15, Summer 1987
- slash pine, rate and spacing 39(2):30–36, Spring 1988
- sowing rate, calculation 44(1):19–20, Winter 1993; 44(2):49–52, Spring 1993

Seed storage
- Cook pine, effect on germination 39(3):17–25, Summer 1988
- quaking aspen 44(3):98–100, Summer 1993

Seed testing
- float method, northern red oak acorns 46(4):143–147, Fall 1995
- leachate conductivity, on 6 pines 42(2):41–44, Spring 1991
- moisture determination, honeylocust and mimosa 43(3):72–75, Summer 1992

Seed treatment
- Atlantic white-cedar, germination, stratification, viability 45(3):104–111, Summer 1994
- black spruce, priming accelerates container stocking 43(1):11–13, Winter 1992
- limba, scarification with hot water, bleach, acid 43(4):150–152, Fall 1992
- pin cherry, stratification, temperature 38(3):30–32, Summer 1987
- silverberry, stratification for optimal germination 41(1):24–25, Winter 1990
- spin drying improves handling 45(1):32–35, Winter 1994

Seed viability
- deterioration during storage and processing, black spruce 40(3):5–8, Summer 1989
- leachate conductivity test on 6 pines 42(2):41–44, Spring 1991

Seed yield
- collection date affects yield, sand pine 41(2):22–26, Spring 1990

Seedbed coverings
- affect germination, growth, frost heaving of white spruce and lodgepole pine 41(4):13–16, Fall 1990
- dispenser for top-dressing containers 42(2):56–61, Spring 1991
- effect on ponderosa pine 38(1):11–13, Winter 1987
- Geotech® at Westvaco 40(2):3–4, Spring 1989

Seedbed density
- hardwood root morphology affected 41(3):21–32, Summer 1990
- loblolly pine, 53 southern nurseries 39(3):13–16, Summer 1988
- longleaf pine, affects field survival 42(3):28–31, Summer 1991
- northern red oak and yellow-poplar, effects on seedlings 40(3):3–4, Summer 1989
- yellow-poplar, effect on plantation performance 47(1):30–33, Winter 1996

Seedling grading
- northern red oak, effect on survival 39(4):33–35, Fall 1988
- slash pine, effect on plantation performance 42(3):23–27, Summer 1991

Seedling growth and survival, in nurseries. See also Plantation performance
- black spruce, in worm-casting-amended soilless media 43(2):43–47, Spring 1992
- Douglas-fir, in compost-sawdust sludge 38(2):22–27, Spring 1987
- Douglas-fir, mycorrhizae inoculation effect 38(1):18–21, Winter 1987
- Engelmann spruce, mycorrhizae inoculation effect 38(1):18–21, Winter 1987
- extended photoperiod, effect on 7 conifers 44(3):105–112, Summer 1993
- Fraser fir, cold storage effects, 2 seed sources 38(2):19–21, Spring 1987
- limber pine, mycorrhizae inoculation effect 38(1):18–21, Winter 1987
- loblolly pine, shading reduces growth 40(1):23–26, Winter 1989
- lodgepole pine, mycorrhizae inoculation effect 38(1):18–21, Winter 1987
- longleaf pine, shading reduces growth 40(1):23–26, Winter 1989

noble fir, in compost–sawdust sludge 38(2):22–27, Spring 1987
pecan, effect of termites 38(2):28–30, Spring 1987
ponderosa pine, in compost–sawdust sludge 38(2):22–27, Spring 1987
ponderosa pine, mycorrhizae inoculation effect 38(1):18–21, Winter 1987
ponderosa pine, seed covering in nursery 38(1):11–13, Winter 1987
slash pine bareroot nursery, level monitored 39(2):30–36, Spring 1988
western larch, container type and watering regime effects 40(3):13–15, Summer 1989

Seedling handling
container seedlings jellyrolled for transportation 47(3):105–109, Summer 1996
containerless transport of native plants 45(3):82–85, Summer 1994
mobile coolers 44(1):16–18, Winter 1993
performance after rough handling, white pine, white spruce, 45(4):142–146, Fall 1994

Seedling morphology
loblolly pine, 53 southern nurseries 39(3):13–16, Summer 1988
tests to assess stock quality and plantation performance 44(3):113–121, Summer 1993

Seedling quality
effect on field survival, ponderosa pine 47(1):16–23, Winter 1996
evaluation by shoot:root ratio 46(3):102–106, Summer 1995
quality control system, Forest Service nurseries 41(1):3–7, Winter 1990
tests to forecast plantation performance 44(3):113–121, Summer 1993
value of testing 47(2):45–46, Spring 1996

Sequoia sempervirens. See Redwood

Sequoiadendron giganteum. See Giant sequoia

Shelterbelts. See Windbreaks

Shining gum
water improves survival 46(2):46–47, Spring 1995

Shining sumac
allelopathic on loblolly pine 41(3):33–34, Summer 1990

Short rotation forestry
comparison of alder, cottonwood, eucalyptus 38(4):27–30, Fall 1987

Shortleaf pine
inventory monitoring system in seed orchard 39(4):23–29, Fall 1988
plantation performance, comparing stock types, root dips, mycorrhizae inoculation 41(2):13–21, Spring 1990

seed germination, presowing treatments 44(2):58–62, Spring 1993

Silverbell. See Carolina silverbell

Silverberry
seed treatment, stratification for optimal germination 41(1):24–25, Winter 1990

Singleleaf pinyon pine
fertilization of container seedlings 42(1):27–33, Winter 1991

Site preparation
herbicides, 7 tested, loblolly pine 39(2):10–12, Spring 1988
herbicides, screening of 3 pre-emergence on 6 species 39(2):13–18, Spring 1988
manual, performance of container seedlings 47(2):58–61, Spring 1996
mechanical
  cable-yarder on steep slopes 38(1):6–10, Winter 1987
  MT&DC project 43(3):97–104, Summer 1992; 46(2):36–45, Spring 1995
  rips, seeding compared to planting 43(2):48–51, Spring 1992
  scalpers, 2 on crawler-tractors 38(1):3–5, Winter 1987
  scarifiers for shelterwoods 44(1):13–15, Winter 1993
  species diversity, effect of 3 methods 41(4):39–42, Fall 1990

Slash pine
control of southern cone rust with triadimefon 47(4):126–131, Fall 1996
plantation performance
  comparing container, bareroot and seeding 45(2):63–67, Spring 1994
  effect of seed and seedling size 42(3):23–27, Summer 1991
seedling growth and survival, bareroot nursery cultural regimes 39(2):30–36, Spring 1988
vegetative propagation from needle fascicles 43(3):67–71, Summer 1992

Smilax
glauca. See Cat greenbrier
rotundifolia. See Common greenbrier

Soil amendments
effect of composted lime-treated horse manure on soil pH 40(1):31–33, Winter 1989
lime causes growth distortions in container seedlings 41(3):12–17, Summer 1990
worm-castings, growth of container black spruce 43(2):43–47, Spring 1992

Soil sterilization. See also Fumigants, soil
alternatives to methyl bromide 44(3):87–90, Summer 1993; 45(2):43–47, Spring 1994

management without methyl bromide 44(1):3–4, Winter 1993; 44(3):87–90; 47(3):85–86, Summer 1996
mechanical incorporation of dazomet 45(2):53–57, Spring 1994
mycorrhizae colonization effects, western redcedar 42(4):14–16, Fall 1991
mycorrhizae deficiency, white spruce 38(1):22–23, Winter 1987

Soil water
calculation for irrigation scheduling 41(4):22–27, Fall 1990
measurement using TDR 47(3):88–93, Summer 1996

Somatic embryogenesis
technology comes of age 47(2):48–57, Spring 1996

Sowing. See Seed sowing; Direct seeding

Spruce. See individual species' common names

Stock comparisons
black walnut, grafts, seed orchard and nursery-run seedlings 40(3):29–32, Summer 1989
loblolly and shortleaf pine, bareroot vs. container 41(2):13–21, Spring 1990
loblolly and slash pine, container, bareroot and seeding 45(2):63–67, Spring 1994
ponderosa pine, 1+0 and 2+0 43(4):153–158, Fall 1992
western larch, bareroot and container seedlings 40(4):20–24, Fall 1989

Sugar maple
plantation performance, mine spoils 41(2):3–5, Spring 1990

Sugar pine
blister rust control with triadimefon 43(1):7–10, Winter 1992

Superabsorbent polymers
increase water-holding capacity in containers 38(1):24–25, Winter 1987
root dip improves survival, 8 species on mine spoil 43(4):159–162, Fall 1992
use as root dips 45(1):26–31, Winter 1994

Sycamore
chemical treatment effects, cold-stored seedlings 38(1):26–30, Winter 1987
plantation performance, mine spoils 41(2):3–5, Spring 1990

Tag alder
herbicides, screening 3 pre-emergence 39(2):13–18, Spring 1988

Tamarack
cones and seeds, phenotypic variation 42(3):18–22, Summer 1991

Taxodium distichum. See Baldcypress

Terminalia superba. See Limba

Thuja plicata. See Western redcedar

Timber supply
establish plantations on pastureland 46(3):73–75, Summer 1995
need to replant in South 46(1):1–2, Winter 1995

Tissue culture. See Micropropagation

Top pruning
blue oak container seedlings 44(2):73–77, Spring 1993
hardwoods, bareroot, review of literature 47(1):34–40, Winter 1996
slash pine, effects on seedlings 39(2):30–36, Spring 1988
yellow-poplar, effect on plantation performance 47(1):30–33, Winter 1996

Transplanting
black spruce, from mini-plugs to paperpots 40(2):18–21, Spring 1989

Tree improvement
Pacific Northwest, review and implications for nursery manager 38(3):3–8, Summer 1987
tropical American programs 43(4):125–132, Fall 1992; 43(4):133–141, Fall 1992

Tree Planters' Notes
indexes
1977–1986, Volumes 28–37 39(1):3–45, Winter 1988
1987, Volume 38 39(4):3–15, Fall 1988
1987, Volume 39 40(4):3–13, Fall 1989
1987-1996, Volumes 38-47 47(4):133-172, Fall 1996
1989-1990, Volume 40-41 43(1):17–24, Winter 1992
policies and procedures 42(3):1–2, Summer 1991; 43(4):107–108, Fall 1992; 44(1):5, Winter 1993; 44(2):45–46, Spring 1993; 45(2):39–40, Spring 1994; 45(3):79–80, Summer 1994; 45(4):113–114, Fall 1994; 46(3):76, Summer 1995; 46(4):113–114, Fall 1995; 46(4):115, Fall 1995; 47(1):3, Winter 1996; 47(2):46, Spring 1996; 47(4):117, Fall 1996

Tree shakers
mechanical and helicopter, loblolly pine 39(2):19–21, Spring 1988
new techniques in older orchards 41(1):26–28, Winter 1990

Tree shelters
enhance growth of northern red oak 45(4):137–141, Fall 1994
improve establishment on dry sites 45(1):13–16, Winter 1994
insects and diseases of oak 45(3):88–90, Summer 1994

Tree-of-heaven
herbicides, screening 3 pre-emergence 39(2):13–18, Spring 1988
seed germination, stratification not required 41(2):10–12, Spring 1990
Tropical forestry
auger to extract wood density samples 45(1):10–12, Winter 1994
forest dynamics, reforestation, seed handling and management 43(4):114–118, Fall 1992; 43(4):119–124, Fall 1992
plantation establishment techniques 43(4):125–132, Fall 1992; 43(4):133–141, Fall 1992
role of USDA Forest Service 43(4):109–111, Fall 1992
seed size effect on seedling growth, *Hymanea stilbocarpa* 46(4):130–133, Fall 1995
seed technology challenge 43(4):142–145, Fall 1992
seed treatment, limba, scarification with hot water, bleach, acid 43(4):150–152, Fall 1992
sowing pelletized *Eucalyptus* seed 45(2):58–62, Spring 1994
topic for *Tree Planters' Notes* 43(4):107–108, Fall 1992
Tsuga heterophylla. See Western hemlock

Undercutting
fall mosaic in loblolly pine may be related 40(1):19–22, Winter 1989
improves hardwood root morphology 41(3):21–32, Summer 1990

Valley oak
micropropagation of shoots 41(2):27–30, Spring 1990
sowing date affects performance 41(2):6–9, Spring 1990
Vegetative propagation
Atlantic white-cedar, cuttings 45(3):104–111, Summer 1994
baldcypress stem cuttings 44(3):125–127, Summer 1993
black willow, rooting success 39(4):30–32, Fall 1988
hybrid poplar, importance of cutting diameter on early growth 47(2):76–80, Spring 1996
jack pine, effect of crown position and plant age 47(3):100–104, Summer 1996
loblolly, slash and longleaf pine, from needle fascicles 43(3):67–71, Summer 1992
Paulownia, fungicide increases sprouting 45(3):101–103, Summer 1994
Paulownia, sprouting and growth 45(3):95–100, Summer 1994
pecan, grafting sweet pecan to bitter pecan rootstock 40(3):25–28, Summer 1989
Rocky Mountain Douglas-fir stem cuttings 41(3):3–6, Summer 1990
Rocky Mountain juniper, from shoot tip cuttings 47(3):94–99, Summer 1996
Scouler willow, with IBA and NAA 46(2):58–63, Spring 1995
valley oak, micropropagation of shoots 41(2):27–30, Spring 1990
yellow birch, rooting success 39(2):37–42, Spring 1988
yellow-poplar, longitudinal splitting technique 38(4):10–13, Fall 1987

Virginia pine
plantation performance, mine spoils 41(2):3–5, Spring 1990

Walnut. See individual species' common names
Water oak
seed germination, enhanced by seedcoat removal 43(2):52–53, Spring 1992
Water
testing for contamination by *Phytophthora* 38(4):37–40, Fall 1987
Water treatment
constructed wetland 44(3):93–97, Summer 1993
Water uptake
root hydraulic conductance, eastern white pine 39(3):5–8, Summer 1988
Weed control. See also Herbicides
hardwood germinants, DCPA/napropamide 44(4):149–153, Fall 1993
hybrid poplars, combined mechanical-chemical program 43(3):81–86, Summer 1992
loblolly pine, important for naturally seeded and container seedlings 45(4):128–136, Fall 1994
loblolly pine, old fields, Arkansas 44(1):25–32, Winter 1993
loblolly pine, seedlings treated with sulfometuron or hexazinone 45(4):116–120, Fall 1994
lodgepole pine seedbeds, with oxyfluorfen 39(2):3–9, Spring 1988
tropical forests, plantation establishment 43(4):125–132, Fall 1992; 43(4):133–141, Fall 1992
Western hemlock
freezer storage practices 38(2):7–10, Spring 1987
Western larch
Botrytis reduction, vacuuming dead needles 43(2):30–32, Spring 1992
container type and watering regime affect growth 40(3):13–15, Summer 1989
plantation performance, comparison of stock types and season of planting 40(4):20–24, Fall 1989

Western redcedar
- animal damage control, BGR-P and garlic 46(1):4–6, Winter 1995
- mycorrhizae in containers and field 44(1):33–37, Winter 1993
- mycorrhizae in fumigated or nonfumigated beds 42(4):14–16, Fall 1991

Western white pine
- plantation performance, planting date effect on container seedlings 42(2):52–55, Spring 1991
- pollen yield estimation 46(2):64–69, Spring 1995

Wetland
- constructed wetland to treat wastewater, propagate plants 44(3):93–97, Summer 1993

White fir
- fir aphid control by 4 insecticides 41(4):8–12, Fall 1990

White oak
- nursery practices improve root morphology 41(3):21–32, Summer 1990

White spruce
- antitranspirants, 5 tested on container seedlings 41(1):34–38, Winter 1990
- damping off, comparison of treatments 41(1):29–33, Winter 1990
- mycorrhizae deficiency, stunting 38(1):22–23, Winter 1987
- plantation performance
  - not improved with root dip 41(3):18–20, Summer 1990
  - root pruning and wrenching effects 40(2):33–39, Spring 1989
- root pruning, effect on plantation performance 43(1):4–6, Winter 1992
- seed germination, effect of extended prechilling 38(4):6–9, Fall 1987
- seedbed coverings affect germination, growth, frost heaving 41(4):13–16, Fall 1990
- seedborne fungi, effect of prechilling 38(4):6–9, Fall 1987
- seedling handling, performance after rough handling 45(4):142–146, Fall 1994
- soil texture influences seedling water stress 43(2):39–42, Spring 1992

Willow. See individual species' common names

Windbreaks
- benefit potato yield in Australia 47(3):110–115, Summer 1996
- seedling growth and survival, caragana and green ash 42(1):36–39, Winter 1991
- test of 3 species in Australia 45(2):72–75, Spring 1994

Wood density
- auger sampling method in tropical hardwoods 45(1):10–12, Winter 1994

Yellow birch
- vegetative propagation, rooting success 39(2):37–42, Spring 1988

Yellow-poplar
- plantation performance, root collar diameter effects 47(1):30–33, Winter 1996
- seedbed density, effects on seedlings 40(3):3–4, Summer 1989
- vegetative propagation, longitudinal splitting technique 38(4):10–13, Fall 1987

Index of Authors

Abriel, Ray 42(1):10–14, Winter 1991
Adams, D. 41(3):7–11, Summer 1990
Adams, David L. 42(2):52–55, Spring 1991
Adams, J.C. 38(1):24–25, Winter 1987; 43(2):52–53, Spring 1992; 46(1):28–31, Winter 1995
Affeltranger, C.E. 38(2):28–30, Spring 1987
Allen, Kurt 45(3):88–90, Summer 1994
Alm, Alvin 41(3):18–20, Summer 1990
Alm, Alvin A. 40(2):22–24, Spring 1989
Amorini, Emilio 43(4):146–149, Fall 1992
Anderson, Harvey W. 42(2):49–51, Spring 1991
Anderson, Steven 44(2):78–82, Spring 1993
Ash, E.C. 45(3):91–95, Summer 1994; 46(3):93–96, Summer 1995
Ashby, W. Clark 46(2):54–57, Spring 1995; 47(1):24–29, Winter 1996
Atkinson, Mary 43(4):153–158, Fall 1992

Bainbridge, David A. 45(1):13–16, Winter 1994; 45(3):82–85, Summer 1994
Baldet, Patrick 44(4):141–145, Fall 1993
Baldwin, Bruce 42(1):15–17, Winter 1991
Ballester, Pierre 47(3):88–93, Summer 1996
Barber, Hollis W., Jr. 40(4):20–24, Fall 1989
Barnard, E.L. 45(2):68–71, Spring 1994; 45(3):91–95, Summer 1994; 46(3):93–96, Summer 1995; 47(3):85–86, Summer 1996; 47(4)126-131, Fall 1996
Barnett, James P. 39(3):3–4, Summer 1988; 40(1):23–26, Winter 1989; 41(2):22–26, Spring 1990; 42(3):28–31, Summer 1991; 42(4):17–18, Fall 1991; 44(2):58–62, Spring 1993; 44(4):166–171, Fall 1993; 45(2):63–67, Spring 1994; 45(4):128–136, Fall 1994
Bassman, John H. 40(3):13–15, Summer 1989
Batdorff, James H. 44(2):53–57, Spring 1993
Beagle, Glenn 44(3):93–97, Summer 1993
Bearce, Bradford C. 40(1):34–37, Winter 1989
Beaton, K. 47(2):58–61, Spring 1996
Beckjord, Peter R. 41(1):15–23, Winter 1990; 42(1):34–35, Winter 1991
Beese, W.J. 44(1):33–37, Winter 1993
Belcher, Earl W. 46(4):139–142, Fall 1995
Berch, S.M. 42(4):14–16, Fall 1991; 44(1):33–37, Winter 1993
Berguson, W.E. 44(3):128–131, Summer 1993
Bernier, Pierre Y. 43(2):39–42, Spring 1992
Bernier, P.Y. 46(3):102–106, Summer 1995
Bianchetti, A. 45(4):125–127, Fall 1994
Bickelhaupt, Donald H. 40(1):31–33, Winter 1989
Birch, Lowell E. 38(1):3–5, Winter 1987
Black, R. Alan 40(3):13–15, Summer 1989
Blanchette, R.A. 41(1):29–33, Winter 1990
Blankenhorn, Paul R. 43(3):81–86, Summer 1992
Bledsoe, Caroline 38(2):22–27, Spring 1987
Bloese, Paul D. 39(2):13–18, Spring 1988
Bonner, F.T. 42(2):41–44, Spring 1991; 43(3):72–75, Summer 1992; 43(4):142–145, Fall 1992
Borkenhagen, John E. 40(1):11–14, Winter 1989
Bowersox, Todd W. 43(3):81–86, Summer 1992
Boyer, James N. 38(4):19–22, Fall 1987; 39(3):13–16, Summer 1988; 39(4):36–38, Fall 1988
Boyle, Eileen D. 45(3):104–111, Summer 1994
Braham, Richard R. 38(4):10–13, Fall 1987; 39(3):31–34, Summer 1988
Brandt, Frank A. 41(2):22–26, Spring 1990
Brown, David 41(4):33–38, Fall 1990
Brown, Kevin R. 40(2):25–29, Spring 1989
Brown, R.A. 38(4):3–5, Fall 1987
Browne, R.D. 47(3):100–104, Summer 1996
Bryan, Harry 40(4):30–33, Fall 1989
Bryan, Harry W. 44(2):63–67, Spring 1993
Buckles, Oliver 41(1):26–28, Winter 1990
Burger, J.A. 41(2):3–5, Spring 1990
Buse, Lisa J. 40(2):33–39, Spring 1989; 45(2):47–52, Spring 1994

Cain, Michael D. 45(4):128–136, Fall 1994
Camp, R.F. 40(2):8–11, Spring 1989
Campbell, Sally J. 39(4):16–22, Fall 1988; 40(1):15–18, Winter 1989; 41(4):3–7, Fall 1990; 45(2):53-57, Spring 1994 [see also Cooley, Sally J.]
Cantrell, B.G. 40(3):25–28, Summer 1989
Carroll, E.R. 44(4):157–160, Fall 1993
Chandler, Laurie A. 43(3):93–96, Summer 1992
Chapman, Walter 40(1):19–22, Winter 1989
Cline, Michael L. 38(1):18–21, Winter 1987
Coleman, Mark 38(2):22–27, Spring 1987
Colombo, S.J. 38(4):23–26, Fall 1987; 43(2):43–7, Spring 1992
Conkle, M. Thompson 40(4):25–29, Fall 1989
Conner, William H. 38(3):26–29, Summer 1987
Cooley, Sally J. 38(4):37–40, Fall 1987 [see also Campbell, Sally J.]
Copes, D.L. 44(3):125–127, Summer 1993; 46(4):118–125, Fall 1995
Copes, Donald L. 38(4):14–8, Fall 1987
Cordell, Charles E. 41(4):33–38, Fall 1990
Crews, Jerry T. 41(1):15–3, Winter 1990
Croghan, Catherine F. 38(1):22–23, Winter 1987

Cunningham, Patrick G. 44(3):122–124, Summer 1993
Cyr, D. 47(2):48–57, Spring 1996

Daa, Mohamed 42(2):52–55, Spring 1991
Davidson, C.G. 47(3):100–104, Summer 1996
Day, Robert J. 40(2):33-39, Spring 1989
Deom, E. 42(4):14–16, Fall 1991; 44(1):33–37, Winter 1993
Devisscher, Garry 46(3):107–111, Summer 1995
DeYoe, David 38(3):22–25, Summer 1987
Dickinson, G.R. 45(2):72–5, Spring 1994; 47(3):110–115, Summer 1996
Dierauf, Thomas A. 47(1):30–33, Winter 1996

Dills, Kimala L. 39(3):31–34, Summer 1988
Dinkel, Gary 42(3):16–17, Summer 1991
Dixon, R.K. 40(2):12–17, Spring 1989;
Dixon, Wayne 45(2):43–47, Spring 1994
Dixon, W.N. 46(3):93–96, Summer 1995
Doggett, Coleman 45(3):86–87, Summer 1994
Doggett, Coleman A. 43(1):14–16, Winter 1992; 43(3):87–88, Summer 1992
Donahue, J.K. 46(3):86–92, Summer 1995
Dubois, Mark R. 43(3):89–92, Summer 1992
Dumroese, R. Kasten 38(3):18–21, Summer 1987; 41(3):12–17, Summer 1990; 41(4):28–32, Fall 1990; 42(2):56–61, Spring 1991; 43(2):30–32, Spring 1992; 44(4):161–165, Fall 1993; 46(2):48–53, Spring 1995; 47(3):94–99, Summer 1996
Dunlap, Joan 38(2):22–27, Spring 1987
Dutton, David 38(2):22–27, Spring 1987
Dyer, James M. 40(3):25–28, Summer 1989

Echols, R.J. 41(2):13–1, Spring 1990
Edson, John L. 42(3):4–8, Summer 1991; 46(2):58–63, Spring 1995; 47(3):94–99, Summer 1996
Edwards, Jerry L. 39(2):19–21, Spring 1988; 41(1):26–28, Winter 1990
Eggleston, Kent L. 44(3):105–112, Summer 1993
Enebak, S.A. 41(1):29–33, Winter 1990
Everett, R. 46(1):19–27, Winter 1995
Ezell, A.W. 41(2):13–21, Spring 1990

Fabbio, Gianfranco 43(4):146–149, Fall 1992
Farley, James P. 46(1):4–6, Winter 1995
Farmer, Robert E., Jr. 42(2):49–51, Spring 1991; 42(3):18–22, Summer 1991
Farr, David F. 41(1):15–23, Winter 1990
Farrish, K.W. 43(2):52–53, Spring 1992; 46(1):28–31, Winter 1995
Felden, Richard 42(2):62–64, Spring 1991
Fidelibus, Matthew W. 45(3):82–85, Summer 1994
Filer, T.H. 38(1):26–30, Winter 1987
Fimbel, Robert A. 41(2):31–33, Spring 1990
Fischer, James W. 41(1):39–42, Winter 1990
Fisher, James T. 45(4):121–124, Fall 1994
Fiveash, John 40(4):18–19, Fall 1989
Fletcher, Rick 44(1):38–42, Winter 1993
Folk, Raymund S. 44(3):113–121, Summer 1993
Fowler, Dale K. 38(1):14–17, Winter 1987
Fowler, Linda J. 38(1):14–17, Winter 1987
Fraedrich, Stephen 45(2):43–47, Spring 1994
Fraedrich, Stephen W. 44(3):87–90, Summer 1993
France, Raymond C. 38(1):18–21, Winter 1987; 39(4):36–38, Fall 1988
Francis, John K. 45(1):10–12, Winter 1994
Friedman, Sharon T. 40(4):25–29, Fall 1989
Friedman, S.T. 44(4):157–160, Fall 1993
Fung, Martin Y.P. 44(3):98–100, Summer 1993

Gardiner, A.S. 45(1):32–35, Winter 1994
Gardiner, E.S. 44(1):25–32, Winter 1993
Garner, James W. 47(1):30–33, Winter 1996
Garrett, Peter W. 40(3):9–12, Summer 1989; 43(3):76–80, Summer 1992
Gasvoda, Dave 44(1):8–12, Winter 1993
Geary, Thomas F. 40(1):27–30, Winter 1989
Genys, John G. 39(3):26–27, Summer 1988
Gilly, S.P. 45(3):91–95, Summer 1994
Giordano, Peter A. 44(1):38–42, Winter 1993
Gisselberg, Thomas 42(2):56–61, Spring 1991
Glass, Patrick A. 47(4)120-125, Fall 1996
Gleason, John 43(4):153–158, Fall 1992
Gobin, S.M. 47(3):100–104, Summer 1996
Gordon, Andrew M. 39(4):33–35, Fall 1988; 41(1):34–38, Winter 1990; 45(4):142–146, Fall 1994
Gosling, P.G. 45(1):32–35, Winter 1994
Graham, Russell T. 42(2):52–55, Spring 1991
Gramling, Charles 41(4):33–38, Fall 1990
Graves, William R. 41(2):10–12, Spring 1990
Gribko, Linda S. 46(4):143–147, Fall 1995
Grossnickle, S.C. 47(2):48–57, Spring 1996
Grossnickle, Steven C. 44(3):113–121, Summer 1993
Guge, P.A. 44(4):157–160, Fall 1993

Haack, Robert A. 39(2):30–36, Spring 1988
Haase, Diane 43(4):153–158, Fall 1992
Haase, Diane L. 44(2):53–57, Spring 1993; 46(3):97–101, Summer 1995
Haase, Sally M. 40(3):16–19, Summer 1989; 42(1):18–21, Winter 1991
Haavisto, V.F. 40(3):5–8, Summer 1989
Hallman, Dick 42(4):7–8, Fall 1991; 43(3):97–104, Summer 1992; 44(3):101–104, Summer 1993; 45(1):17–20, Winter 1994
Hallman, Richard 43(2):36–38, Spring 1992
Hamaker, James M. 43(3):67–71, Summer 1992
Hamel, Barbara A. 44(3):98–100, Summer 1993

Hamm, Philip B. 40(1):15–18, Winter 1989
Hammitt, William E. 40(3):29–32, Summer 1989
Hannah, Peter R. 39(2):37–42, Spring 1988
Hanover, James W. 39(2):13–18, Spring 1988
Hansen, Dave 42(4):9–13, Fall 1991
Harmsworth, D. 38(4):6–9, Fall 1987
Harrington, John T. 45(4):121–124, Fall 1994; 47(4):120-125, Fall 1996
Hart, Elwood R. 44(4):154–156, Fall 1993
Haverty, Michael I. 41(4):8–12, Fall 1990
Haywood, James D. 42(3):32–35, Summer 1991; 43(2):36–38, Spring 1992; 44(4):166–171, Fall 1993; 45(2):63–67, Spring 1994
Hee, Stephen M. 38(2):7–10, Spring 1987
Heidmann, L.J. 40(3):16–19, Summer 1989; 42(1):18–21, Winter 1991
Hennon, Paul E. 43(3):60–66, Summer 1992
Herzberg, Diane 42(3):9–12, Summer 1991; 44(1):8–12, Winter 1993; 44(1):16–18, Winter 1993
Hibbs, David E. 44(1):38–42, Winter 1993
Hicks, Ray R., Jr. 43(4):159–162, Fall 1992
Hix, David M. 45(4):137–141, Fall 1994
Holbrook, Sandi 46(1):4–6, Winter 1995
Hooda, M.S. 43(3):72–75, Summer 1992
Howe, George E. 41(3):3–6, Summer 1990
Huebschmann, Michael M. 43(2):48–51, Spring 1992
Huffman, G.R. 44(4):149–153., Fall 1993
Huffman, Gregory R. 39(4):23–29, Fall 1988
Huner, Norman P.A. 46(3):107–111, Summer 1995
Huntt, Caryn D. 42(1):27–33, Winter 1991

Irving, D.E. 40(3):5–8, Summer 1989
Iyer, J.G. 40(2):8–11, Spring 1989

James, R.L. 39(2):22–25, Spring 1988
James, Robert L. 44(4):161–165, Fall 1993; 46(2):48–53, Spring 1995
Jasumback, Tony 42(4):4–5, Fall 1991; 45(1):21–25, Winter 1994
Java, B. 46(1):19–27, Winter 1995
Jermstad, K.D. 44(4):157–160, Fall 1993
Jobidon, Robert 41(4):39–42, Fall 1990
Johnsen, Kurt H. 39(3):5–8, Summer 1988
Johnson, David R. 43(1):7–10, Winter 1992
Johnson, G.R. 46(4):134–137, Fall 1995
Johnson, Kim R. 41(2):27–30, Spring 1990
Jones, Brad 40(2):22–24, Spring 1989
Jones, S.K. 45(1):32–35, Winter 1994
Jones, William E. 46(4):143–147, Fall 1995
Justin, John 44(3):93–97, Summer 1993

Kangas, Juhani 45(1):5–9, Winter 1994
Kangas, Roy 42(3):16–17, Summer 1991
Karrfalt, Robert 46(2):33–34, Spring 1995
Karrfalt, Robert P. 38(3):9–15, Summer 1987; 43(2):33–35, Spring 1992
Karsky, Dick 42(4):6, Fall 1991; 44(1):13–15, Winter 1993
Kelley, Walter D. 40(1):19–22, Winter 1989
Kellison, R.C. 45(4):125–127, Fall 1994
Kelpsas, Bruce R. 39(4):16–22, Fall 1988; 45(2):53–57, Spring 1994
Khasa, P.D. 43(4):150–152, Fall 1992
Kienzler, Mariann F. 40(2):12–17, Spring 1989
Kinloch, Bohun B., Jr. 43(1):7–10, Winter 1992
Kliejunas, John 39(2):26–29, Spring 1988; 40(2):30–33, Spring 1989
Kolb, T.E. 40(3):3–4, Summer 1989
Kreh, Richard E. 38(2):19–21, Spring 1987
Kuikka, Martti 45(1):5–9, Winter 1994
Kuser, John E. 41(2):31–33, Spring 1990; 45(3):104–111, Summer 1994; 46(3):78–85, Summer 1995

Ladrach, William E. 43(4):125–132, Fall 1992; 43(4):133–141, Fall 1992
Laidlaw, T.F. 38(3):30–32, Summer 1987
Lambany, Gill 47(3):88–93, Summer 1996
Lambert, S. 46(1):19–27, Winter 1995
Lamhamedi, M.S. 46(3):102–106, Summer 1995
Landgren, Chal 44(1):38–42, Winter 1993
Landis, T.D. 47(3):105–109, Summer 1996
Landis, Thomas D. 38(3):9–15, Summer 1987; 41(1):39–42, Winter 1990; 41(4):3–7, Fall 1990; 42(1):10–14, Winter 1991; 43(2):25–27, Spring 1992; 46(4):115, Fall 1995
Langston, F. Wayne 45(3):86–87, Summer 1994
Lantz, Clark 46(1):1–2, Winter 1995
Lantz, Clark W. 43(1):1–2, Winter 1992; 44(1):3–4, Winter 1993
Lauer, Dwight K. 38(3):16–17, Summer 1987
Leege-Brusven, Annette 47(3):94–99, Summer 1996
Leege-Brusven, Annette D. 46(2):58–63, Spring 1995
Linderman, Robert 45(2):43–47, Spring 1994
Linghai, Zeng 43(3):67-71, Summer 1992
Lockaby, B.G. 38(1):24–25, Winter 1987
Lopez-Upton, J. 46(3):86–92, Summer 1995
Lott, Jim 38(2):3–6, Spring 1987
Lott, L.H. 47(1):11–15, Winter 1996
Loucks, Donna 47(4)133-172, Fall 1996
Lowman, Ben 38(1):3–5, Winter 1987; 38(1):6–10, Winter 1987; 41(4):33–38, Fall 1990; 46(2):36–45, Spring 1995
Luedeke, Michael C. 40(1):11–14, Winter 1989

Malavasi, Marlene de Mato 46(4):130–133, Fall 1995
Malavasi, Ubirajara Contr 46(4):130–133, Fall 1995

Malek, Ladislav 43(1):11–13, Winter 1992; 46(3):107–111, Summer 1995

Mangold, Robert 42(1):3–5, Winter 1991; 43(4):107–108, Fall 1992; 44(2):45–46, Spring 1993; 44(4):137–138, Fall 1993; 45(1):1–2, Winter 1994; 45(2):39–40, Spring 1994; 45(3):79–80, Summer 1994; 45(4):113–114, Fall 1994

Mangold, Robert D. 42(3):1–2, Summer 1991; 42(4):1–2, Fall 1991

McCain, Arthur H. 43(1):7–10, Winter 1992

McCaughey, Ward W. 42(2):45–48, Spring 1991

McConnell, James L. 39(2):19–21, Spring 1988; 40(4):18–19, Fall 1989; 41(1):26–28, Winter 1990

McCreary, Douglas 44(2):73–77, Spring 1993

McCreary, Douglas D. 41(2):6–9, Spring 1990

McDonald, Philip M. 38(4):31–36, Fall 1987

McDonald, Stephen E. 41(1):3–, Winter 1990

McDonnell, Steven P. 39(3):5–8, Summer 1988

McGilvray, John M. 39(3):3–4, Summer 1988; 42(4):17–18, Fall 1991

McKinley, C.R. 41(2):13–21, Spring 1990

McLemore, B.F. 39(2):10–12, Spring 1988

McNeel, Charles A. 45(4):137–141, Fall 1994

McTague, John Paul 47(1):16–23, Winter 1996

Meagher, M.D. 46(2):64–69, Spring 1995

Medlicott, George 41(1):8–14, Winter 1990

Meier, C.E. 41(2):13–21, Spring 1990

Melhuish, John H., Jr. 42(1):34–35, Winter 1991

Melhuish, John L., Jr. 41(1):15–23, Winter 1990

Menes, P.A. 43(2):43–7, Spring 1992

Mexal, J.G. 46(4):126–29, Fall 1995; 47(3):105–109, Summer 1996

Mexal, John G. 45(4):121–24, Fall 1994

Miller, Chestley L. 39(4):30–2, Fall 1988

Miller, Raymond O. 39(2):13–18, Spring 1988

Miller, Richard G. 40(4):25–29, Fall 1989; 41(1):3–7, Winter 1990

Milodragovich, Eli 39(2):19–21, Spring 1988

Minore, Don 44(3):122–124, Summer 1993

Mittal, R.K. 38(4):6–9, Fall 1987; 40(4):34–6, Fall 1989

Mize, Carl 42(4):9–13, Fall 1991

Moeller, Art W. 41(1):34–8, Winter 1990

Morgenson, Greg 41(1):24–25, Winter 1990

Myers, Joseph F. 41(3):3–6, Summer 1990

Neale, D.B. 44(4):157–160, Fall 1993

Nelson, C. Dana 43(3):67–71, Summer 1992

Nelson, E.A. 38(1):26–30, Winter 1987

Nelson, Warrick R. 46(2):46–47, Spring 1995

Neumann, R. 46(4):126–129, Fall 1995

Nisley, Rebecca 45(2):39–40, Spring 1994; 46(3):76, Summer 1995; 46(4):113–14, Fall 1995

Nisley, Rebecca G. 47(1):3, Winter 1996; 47(2):46, Spring 1996; 47(4):117, Fall 1996

Nolte, Dale L. 46(1):4–, Winter 1995

Odell, J.D. 44(4):149–53., Fall 1993

O'Dell, T. 46(1):19–27, Winter 1995

Odlum, K.D. 38(4):23–26, Fall 1987

Oester, Paul 44(1):38–42, Winter 1993

Omi, Steven K. 44(3):105–112, Summer 1993

O'Reilly, Gwennoth, J. 42(3):18–22, Summer 1991

O'Reilly, Gwenoth 42(2):49–51, Spring 1991

O'Rourke, D. 46(4):118–125, Fall 1995

Orozco-Segovia, Alma 43(4):114–18, Fall 1992; 43(4):119–124, Fall 1992

Orr, David B. 44(4):154–156, Fall 1993

Ostry, M.E. 44(3):128–131, Summer 1993

Outcalt, Kenneth W. 42(1):22–6, Winter 1991

Owston, Peyton W. 41(1):3–, Winter 1990

Palmer, C. Lynn 42(2):49–51, Spring 1991

Palmer, M.A. 41(1):29–33, Winter 1990

Palmer, Marguerita A. 38(1):22–23, Winter 1987

Papadopol, C.S. 41(4):22–27, Fall 1990

Pawuk, William H. 44(1):21–24, Winter 1993

Pezeshki, S.R. 38(4):27–30, Fall 1987

Phelps, Marcus 42(1):6–, Winter 1991

Philippe, Gwenaël 44(4):141–45, Fall 1993

Phillips, R. 46(4):126–129, Fall 1995; 47(3):105–109, Summer 1996

Piesch, Richard F. 38(3):3–8, Summer 1987

Piotto, Beti 45(2):58–62, Spring 1994

Pogge, Franz L. 40(1):34–37, Winter 1989

Polonenko, D.R. 47(2):48–57, Spring 1996

Porterfield, J.D. 44(4):149–153., Fall 1993

Quick, Kenneth E. 41(4):28–32, Fall 1990

Racey, Gerald 42(3):13–15, Summer 1991

Raffa, Kenneth F. 47(2):76–80, Spring 1996

Randall, W.K. 44(3):125–127, Summer 1993; 46(4):118–125, Fall 1995

Regelbrugge, Jon C. 39(3):5–8, Summer 1988

Rhodenbaugh, E.J. 45(4):116–120, Fall 1994

Rietveld, W.J. 38(2):16–18, Spring 1987; 40(1):3–10, Winter 1989; 40(2):12–17, Spring 1989; 41(1):3–7, Winter 1990; 43(3):55–57, Summer 1992

Ritchey, J. 41(3):7–11, Summer 1990

Ritchie, Gary A. 38(2):11–15, Spring 1987

Robidas, Line 47(3):88–93, Summer 1996

Robison, Daniel J. 47(2):76–80, Spring 1996

Rogers, Bill 44(1):38–42, Winter 1993

Rose, Robin 43(4):153–158, Fall 1992; 44(2):53–57, Spring 1993; 46(3):97–101, Summer 1995

Roth, A. 44(1):33–37, Winter 1993

Roze, B. 47(2):58–61, Spring 1996

Ryker, Russell A. 40(1):3–10, Winter 1989

Salonius, P. 47(2):58–61, Spring 1996
Sarantila, Riitta 45(1):5–9, Winter 1994
Scarratt, J.B. 40(2):18–21, Spring 1989
Schaap, Wieger 38(3):22–25, Summer 1987
Schmidtling, R.C. 47(1):11–15, Winter 1996
Schroeder, W.R. 42(1):36–39, Winter 1991
Schultz, R.C. 41(3):21–32, Summer 1990
Schumacher, Robert W. 39(4):30–32, Fall 1988
Schwartz, James D. 44(4):146–148, Fall 1993
Schwartz, Marla 44(1):19–20, Winter 1993; 44(4):146–148, Fall 1993
Scowcroft, Paul G. 39(3):17–25, Summer 1988
Seiler, John R. 38(2):19–21, Spring 1987; 39(3):5–8, Summer 1988
Sharp, Douglas J. 39(4):36–38, Fall 1988
Sharp, Ruth A. 40(2):12–17, Spring 1989
Simpson, David G. 41(4):13–16, Fall 1990; 43(1):4–6, Winter 1992
Simpson, D.G. 46(3):102–106, Summer 1995
Simpson, James A. 45(4):142–146, Fall 1994
Singh, D.P. 43(3):72–75, Summer 1992
Sirmon, Jeff M. 43(4):109–111, Fall 1992
Skakel, Susan 40(4):14–17, Fall 1989
Skeates, D.A. 40(3):5–8, Summer 1989
Sloan, John P. 39(2):3–9, Spring 1988; 40(3):20–24, Summer 1989; 45(1):26–31, Winter 1994
Sluder, Earl R. 42(3):23–27, Summer 1991; 47(1):6–10, Winter 1996
Smith, Michael L. 41(3):33–34, Summer 1990
Smith, Richard S., Jr. 44(3):87–90, Summer 1993; 45(2):43–47, Spring 1994
Smith, Thomas 43(3):87–88, Summer 1992
Smith, Thomas F. 43(1):14–16, Winter 1992
Smith, Vincent A. 44(4):154–156, Fall 1993
Snow, G.A. 47(1):11–15, Winter 1996
Solomon, J.D. 38(2):28–30, Spring 1987
South, David B. 38(4):19–22, Fall 1987; 39(3):13–16, Summer 1988; 39(4):36–38, Fall 1988; 40(1):19–22, Winter 1989; 44(2):63–67, Spring 1993; 46(1):7–10, Winter 1995; 46(3):73–75, Summer 1995; 47(1):1–2, Winter 1996; 47(1):34–40, Winter 1996
Stanton, John 41(3):18–20, Summer 1990
Steele, S. 40(2):8–11, Spring 1989
Stein, John D. 41(4):8–12, Fall 1990
Steiner, K.C. 40(3):3–4, Summer 1989
Stone, Douglas M. 39(3):9–12, Summer 1988
Stover, Lee R. 43(3):81–86, Summer 1992
Straka, Thomas J. 43(3):89–92, Summer 1992
Strauss, Charles H. 43(3):81–86, Summer 1992
Stringer, Jeffrey W. 45(3):101–103, Summer 1994; 45(3):95–100, Summer 1994
Stringfield, Donald A. 40(2):3–4, Spring 1989
Stroempl, George 41(4):17–21, Fall 1990
Summerville, K.O. 45(4):125–127, Fall 1994
Sun, D. 45(2):72–75, Spring 1994; 47(3):110–115, Summer 1996

Tauer, C.G. 44(2):78–82, Spring 1993
Tecklin, Jerry 44(2):73–77, Spring 1993
Tervo, Leo 45(1):5–9, Winter 1994
Thatcher, Richard H. 39(2):3–9, Spring 1988
Thompson, Gale 41(3):12–17, Summer 1990; 46(1):15–18, Winter 1995
Thompson, J.R. 41(3):21–32, Summer 1990
Tiarks, Allan E. 44(4):166–171, Fall 1993
Tidwell, T. 41(3):7–11, Summer 1990
Tinus, Richard W. 38(1):11–13, Winter 1987; 38(2):16–18, Spring 1987; 46(1):11–14, Winter 1995; 47(1):16–23, Winter 1996; 47(2):45–46, Spring 1996; 47(2):62–67, Spring 1996
Toliver, John R. 38(3):26–29, Summer 1987
Torbert, J.L. 41(2):3–5, Spring 1990
Tóth, József 40(3):9–12, Summer 1989
Townsend, Edwin C. 45(4):137–141, Fall 1994
TPN Editorial Board 44(1):5, Winter 1993
Trencia, Jacques 47(2):68–75, Spring 1996

Vançon, Sandrine 44(2):68–72, Spring 1993
Vázquez-Yanes, Carlos 43(4):114–118, Fall 1992; 43(4):119–124, Fall 1992
Vidrine, C.G. 46(1):28–31, Winter 1995
Vora, Robin S. 39(4):30–32, Fall 1988
Vorwerk, M.P. 38(2):28–30, Spring 1987
Vozzo, J.A. 39(2):19–21, Spring 1988
Walker, D.S. 42(1):36–39, Winter 1991
Walker, Roger F. 41(2):27–30, Spring 1990; 42(1):27–33, Winter 1991
Walters, Gerald A. 40(1):27–30, Winter 1989; 41(1):8–14, Winter 1990
Wang, B.S.P. 38(4):6–9, Fall 1987; 40(4):34–36, Fall 1989
Wang, Xui Qi 40(3):13–5, Summer 1989
Wann, S.R. 39(3):28–30, Summer 1988
Washburn, James 40(4):14–17, Fall 1989
Watson, William F. 43(3):89–92, Summer 1992;
Weatherly, Howard G. 44(3):122–124, Summer 1993
Weaver, T. 42(2):45–48, Spring 1991
Wells, H. 41(3):7–11, Summer 1990
Wenny, David L. 38(3):18–21, Summer 1987; 40(2):5–7, Spring 1989; 41(3):12–17, Summer 1990; 41(4):28–32, Fall 1990; 42(2):52–55, Spring 1991; 42(2):56–61, Spring 1991; 42(3):4–8, Summer 1991; 43(2):30–32, Spring 1992; 44(2):49–52, Spring 1993; 44(4):161–165, Fall 1993; 46(2):48–53, Spring 1995; 46(2):58–63, Spring 1995; 47(3):94–99, Summer 1996
West, Allan J. 43(4):109–111, Fall 1992
Whaley, Robert E. 45(2):47–52, Spring 1994
White, Gordon 38(3):33–35, Summer 1987

Wiensczyk, Alan M. 42(3):13–15, Summer 1991
Williams, Peter A. 41(1):34–38, Winter 1990
Willingdon, T. 42(4):14–16, Fall 1991
Willis, Raymond B. 42(1):34–35, Winter 1991
Wittwer, Robert F. 43(2):48–51, Spring 1992
Wolosiewicz, Marilyn 38(1):22–23, Winter 1987
Worley, W. Leray 45(3):86–87, Summer 1994
Wright, J.A. 38(3):33–35, Summer 1987
Wyckoff, G.W. 39(3):28–30, Summer 1988
Wyckoff, J.L. 39(3):28–30, Summer 1988

Yeiser, J.L. 44(1):25–32, Winter 1993; 45(4):116–120, Fall 1994
Young, Chris 46(1):7–10, Winter 1995
Youngquist, John A. 42(3):32–35, Summer 1991
Yuyitung, Ipi 45(4):142–46, Fall 1994
Zimmermann, George L. 46(3):78–85, Summer 1995
Zsuffa, Louis 42(2):49–51, Spring 1991
Zwolinski, Janusz B. 44(2):63–67, Spring 1993

Cumulative Contents (1987-1996)

Volume 38, Number 1 (Winter 1987)

3 Mechanizing Site Preparation—Spot Scarification
Ben Lowman and Lowell E. Birch

6 Cable-Scarification—A Site Preparation Alternative
Ben Lowman

11 Modification of Seed Covering Material Yields More and Large Pine Seedlings
Richard W. Tinus

14 Stratification and Temperature Requirements for Germination of Autumn Olive (*Elaeagnus umbellata*) Seed
Linda J. Fowler and Dale K. Fowler

18 Growth Response of Five Rocky Mountain Conifers to Different Ectomycorrhizal Inocula
Raymond C. France and Michael L. Cline

22 Stunting of White Spruce (*Picea glauca* (Moench) Voss) Associated With Ectomycorrhizal Deficiency
Catherine F. Croghan, Marguerita A. Palmer, and Marilyn Wolosiewicz

24 Commercially Produced Superabsorbent Material Increases Water-Holding Capacity of Soil Medium
J. C. Adams and B. G. Lockaby

26 Chemical Treatments Increase First-Year Height Growth and Reduce Dieback in Cold-Stored Sycamore (*Platanus occidentalis* L.) Seedlings
T. H. Filer and E. A. Nelson

Volume 38, Number 2 (Spring 1987)

3 More Custom-Built Nursery Equipment
Jim Lott

7 Freezer Storage Practices at Weyerhaeuser Nurseries
Stephen M. Hee

11 Some Effects of Cold Storage on Seedling Physiology
Gary A. Ritchie

16 A Simple Method for Evaluating Whole-Plant Cold Hardiness
W. J. Rietveld and Richard W. Tinus

19 The Effect of Chilling and Seed Source on the Growth of Containerized Fraser Fir (*Abies fraseri* (Pursh) Poir.) Seedlings
John R. Seiler and Richard E. Kreh

22 Nursery and Field Evaluation of Compost-Grown Conifer Seedlings
Mark Coleman, Joan Dunlap, David Dutton, and Caroline Bledsoe

28 Damage and Mortality to Pecan (*Carya illinoensis* (Wangenh.) K. Koch) Seedlings by Subterranean Termites (*Reticulitermes flavipes* (Kollar)) in an Oklahoma Forest Nursery
C. E. Affeltranger, J. D. Solomon, and M. P. Vorwerk

Volume 38, Number 3 (Summer 1987)

3 Tree Improvement Comes of Age in the Pacific Northwest—Implications for the Nursery Manager
Richard F. Piesch

9 Improving Seed-Use Efficiency and Seedling Quality Through the Use of History Plots
Thomas D. Landis and Robert P. Karrfalt

16 Seedling Size Influences Early Growth of Longleaf Pine
Dwight K. Lauer

18 Germination of Conifer Seeds Surface-Sterilized With Bleach
David L. Wenny and R. Kasten Dumroese

22 Effectiveness of New Formulations of Deer Repellants Tested in Douglas-Fir Plantations in the Pacific Northwest
David DeYoe and Wieger Schaap

26 Vexar Seedling Protectors Did Not Reduce Nutria Damage to Planted Baldcypress Seedlings
William H. Conner and John R. Toliver

30 Drastic Temperature Fluctuation—The Key to Efficient Germination of Pin Cherry
T. F. Laidlaw

33 Wire Girdles Increase Male Flower Production on Young Loblolly Pine Grafts
Gordon White and J. A. Wright

Volume 38, Number 4 (Fall 1987)

3 Increased Seed Yields With a Mist Blower That Distributes Pollen in Loblolly Pine Seed Orchards
R. A. Brown

6 Effects of Extended Prechilling on Laboratory Germination and Fungal Infection in Seeds of White Spruce and Eastern White Pine
R. K. Mittal, B. S. P. Wang, and D. Harmsworth

10 Field-Testing the Propagation of Yellow-Poplar Seedlings by Longitudinal Splitting
Richard R. Braham

14 Effects of Rootstock Age on Leader Growth, Plagiotropism, and Union Formation in Douglas-fir Grafts
Donald L. Copes

19 Excessive Seedling Height, High Shoot-to-Root Ratio, and Benomyl Root Dip Reduce Survival of Stored Loblolly Pine Seedlings
James N. Boyer and David B. South

23 The Effect of Three Film-Forming Antitranspirants on Moisture Stress of Outplanted Black Spruce Seedlings
K. D. Odlum and S. J. Colombo

27 Survival and Early Growth of *Alnus rubra, Eucalyptus macarthurii, E. viminalis,* and *Populus trichocarpa* in the Pacific Northwest
S. R. Pezeshki

31 Adaptability of Black Walnut, Black Cherry, and Northern Red Oak to Northern California
Philip M. McDonald

37 Management of Phytophthora Root Rot in Conifer Nurseries of the Pacific Northwest
Sally J. Cooley

Volume 39, Number 1 (Winter 1988)

3 *Tree Planters' Notes,* 10-Year Index for Volumes 28-37 (1977–1986)

Volume 39, Number 2 (Spring 1988)

3 Oxyfluorfen Shows Promise in Lodgepole Pine Seedbeds
John P. Sloan and Richard H. Thatcher

10 Survival of Loblolly Pine Seedlings Planted on Areas Fall-Sprayed With Soil-Active Herbicides
B. F. McLemore

13 Screening of Three Pre-emergence Herbicides for Intensive Plantation Management in Michigan
Raymond O. Miller, Paul D. Bloese, and James W. Hanover

19 Seed Collection From Loblolly Pine Cones After Tree Shaking
J. A. Vozzo, James L. McConnell, Jerry L. Edwards, and Eli Milodragovich

22 Principles of Fungicide Usage in Container Tree Seedling Nurseries
R. L. James

26 Fungicide Trials for Control of Phomopsis Canker of Douglas-Fir at a Northern California Nursery
John Kliejunas

30 Growth and Survival of Slash Pine Seedlings in a Florida Nursery
Robert A. Haack

37 Vegetative Propagation of Yellow Birch From Stem Cuttings
Peter R. Hannah

Volume 39, Number 3 (Summer 1988)

3 Increasing Speed, Accuracy, and Safety of Pressure Chamber Determinations of Plant Moisture Stress
John M. McGilvray and James P. Barnett

5 Hydraulic Conductance of Roots Present at the Time of Lifting and Newly Regenerated Roots of 2 + 0 Eastern White Pine Seedlings
Kurt H. Johnsen, Steven P. McDonnell, Jon C. Regelbrugge, and John R. Seiler

9 A BASIC Computer Program to Calculate Daily Potential Evapotranspiration
Douglas M. Stone

13 Loblolly Pine Seedling Morphology and Production at 53 Southern Forest Nurseries
James N. Boyer and David B. South

17 Germinability of Cook Pine (*Araucaria columnaris*) Seeds Under Different Storage Conditions
Paul G. Scowcroft

26 Hybrid Pines (Pitch Pine × Loblolly Pine) Studied in the Appalachian Region of Maryland
John G. Genys

28 A Tissue Culture Solution to a Forestry Problem—The Propagation of a Tetraploid European Aspen
S. R. Wann, G. W. Wyckoff, and J. L. Wyckoff

31 Effects of Soil Media on the Growth and Survival of Micropropagated Black Cherry
Kimala L. Dills and Richard R. Braham

Volume 39, Number 4 (Fall 1988)

3 *Tree Planters' Notes* Index for Volume 38 (1987)

16 Comparison of Three Soil Fumigants in a Bareroot Conifer Nursery
Sally J. Campbell and Bruce R. Kelpsas

23 Use of the Inventory-Monitoring System for Shortleaf and Eastern White Pine Cone and Seed Crops at the Beech Creek Seed Orchard
Gregory R. Huffman

30 Propagating Black Willow From Cuttings in the Lower Rio Grande Valley, Texas
Robin S. Vora, Robert W. Schumacher, and Chestley L. Miller

33 Graded Northern Red Oak Planting Stock: Dimensions and Outplanting Performance
Andrew M. Gordon

36 Pregermination Treatment Hastens Emergence of Loblolly Pine Seedlings
James N. Boyer, David B. South, Raymond C. France, and Douglas J. Sharp

Volume 40, Number 1 (Winter 1989)

3 Application of Portable Data Recorders in Nursery Management and Research
W. J. Rietveld and Russell A. Ryker

11 Changes in the Rate of Return Caused by Increased Cost of Red Pine Nursery Stock in Wisconsin
Michael C. Luedeke and John E. Borkenhagen

15 Susceptibility of Pacific Northwest Conifers to Phytophthora Root Rot
Sally J. Campbell and Philip B. Hamm

19 "Fall Mosaic" of Loblolly Pine in a Forest Tree Nursery
David B. South, Walter D. Kelley, and Walter Chapman

23 Shading Reduces Growth of Longleaf and Loblolly Pine Seedlings in Containers
James P. Barnett

27 Cleaning, Pelletizing, and Sowing Eucalyptus Seed
Gerald A. Walters and Thomas F. Geary

31 The Long-Term Effect of a Single Application of Horse Manure o[n] Soil pH
Donald H. Bickelhaupt

34 Germinating Common and Cat Greenbrier
Franz L. Pogge and Bradford C. Bearce

Volume 40, Number 2 (Spring 1989)

3 Geotech® at Westvaco.
Donald A. Stringfield

5 LOTUS 123® Template for Nutrient Calculation
David L. Wenny

8 Plant Nutrients Removed by Nursery Stock
J. G. Iyer, S. Steele, and R. F. Camp

12 Development of Ectomycorrhizae on Container-Grown European Larch
W. J. Rietveld, Ruth A. Sharp, Mariann F. Kienzler, and R. K. Dixon

18 Intermediate Transplanting of Black Spruce Mini-plug Seedlings into Paperpots
J. B. Scarratt

22 Comparison of Planting Tools for Containerized Seedlings—Two-Year Results
Brad Jones and Alvin A. Alm

25 Catkin Growth, Seed Production, and Development of Seed Germinability in Quaking Aspen in Central Alberta
Kevin R. Brown

30 Fungicides for Control of Sirococcus Tip Blight of Pine at a Northern California Nursery
John Kliejunas

33 Conditioning Three Boreal Conifers by Root Pruning and Wrenching
Lisa J. Buse and Robert J. Day

Volume 40, Number 3 (Summer 1989)

3 Spacing Effects on Seedlings of Northern Red Oak and Yellow-Poplar
T. E. Kolb and K. C. Steiner

5 Deterioration of Black Spruce Seed During In-Situ Storage and Processing
D. A. Skeates, D. E. Irving, and V. F. Haavisto

9 Optimum Temperatures for Stratification of Several Maple Species
József Tóth and Peter W. Garrett

13 Effect of Container Type and Watering Regime on Early Growth of Western Larch Seedlings
John H. Bassman, R. Alan Black, and Xui Qi Wang

16 Causes of Mortality in Outplanted Ponderosa Pine Container Seedlings in the Southwest
L. J. Heidmann and Sally M. Haase

20 Fall-Lifted Douglas-Fir Outperforming Spring-Lifted Stock 13 Years After Planting
John P. Sloan

25 Field Grafting of Sweet Pecan to Bitter Pecan Rootstock in Seasonally Flooded Bottomlands
James M. Dyer and B. G. Cantrell

29 Growth Differences Among Patented Grafts, Seed Orchard Seedlings, and Nursery-Run Seedlings of Black Walnut
William E. Hammitt

Volume 40, Number 4 (Fall 1989)

3 *Tree Planters' Notes* Index for Volume 39 (1988)

14 Mechanized Application of Bird Netting to Protect Germinating Seedlings
Susan Skakel and James Washburn

18 A Storage Method for Pollen Using Freeze Drying
John Fiveash and James L. McConnell

20 Planting Western Larch: A Comparison of Stocktypes and Season of Planting in Northeast Washington
Hollis W. Barber, Jr.

25 The Forest Service Laboratory for the Genetic Analyses of Trees
Richard G. Miller, M. Thompson Conkle, and Sharon T. Friedman

30 Control of the Tarnished Plant Bug at the Carters Nursery
Harry Bryan

34 Fungi on Eastern White Pine Seeds With High Moisture Content Can Survive Ultralow Temperatures
R. K. Mittal and B. S. P. Wang

Volume 41, Number 1 (Winter 1990)

3 A Quality-Control System for Improving Conifer Nursery Stock
Peyton W. Owston, Richard G. Miller, W. J. Rietveld, and Stephen E. McDonald

8 Container Hybrid Pines Survive on a Harsh Dam Site
Gerald A. Walters and George Medlicott

15 Epigeous Ectomycorrhizal Fungi of Oaks and Pines in Forests and on Surface Mines of Western Maryland
Peter R. Beckjord, John L. Melhuish, Jr., Jerry T. Crews, and David F. Farr

24 Pregermination Treatment and Stratification of Silverberry Seed
Greg Morgenson

26 New Techniques for Tree Shaking in Older Seed Orchards
James L. McConnell, Jerry L. Edwards, and Oliver Buckles

29 Comparison of Disease Management Strategies for Control of Soil-Borne Pathogens in a Forest Tree Nursery
S. A. Enebak, M. A. Palmer, and R. A. Blanchette

34 Effects of Five Antitranspirants on White Spruce and White Pine Seedlings Subjected to Greenhouse Drought
Peter A. Williams, Andrew M. Gordon, and Art W. Moeller

39 Dicloran Fungicides Causes Stem Injury to Container Spruce Seedlings
James W. Fischer and Thomas D. Landis

Volume 41, Number 2 (Spring 1990)

3 Tree Survival and Growth on Graded and Ungraded Minesoil
J. L. Torbert and J. A. Burger

6 Acorn Sowing Date Affects Field Performance on Blue and Valley Oaks
Douglas D. McCreary

10 Stratification Not Required for Tree-of-Heaven Seed Germination
William R. Graves

13 Dry Site Survival of Bareroot and Container Seedlings of Southern Pines From Different Genetic Sources Given Root Dip and Ectomycorrhizal Treatments
R. J. Echols, C. E. Meier, A. W. Ezell, and C. R. McKinley

22 Cone Maturation and Seed Yield of Ocala Sand Pine
James P. Barnett and Frank A. Brandt

27 Micropropagation of Valley Oak Shoots
Kim R. Johnson and Roger F. Walker

31 Preliminary Evidence of Genetic Variation in Winter Injury and Seedling Height of Paulownia Trees in New Jersey
John E. Kuser and Robert A. Fimbel

Volume 41, Number 3 (Summer 1990)

3 Vegetative Propagation of Rocky Mountain Douglas-Fir by Stem Cuttings
Joseph F. Myers and George E. Howe

7 Effect of Nursery-Produced Endomycorrhizal Inoculum on Growth of Redwood Seedlings in Fumigated Soil
D. Adams, T. Tidwell, J. Ritchey, and H. Wells

12 Lime-Amended Growing Medium Causes Seedling Growth Distortions
R. Kasten Dumroese, Gale Thompson, and David L. Wenny

18 Field Trials of Root Dipping Treatments for Red Pine, Jack Pine, and White Spruce Nursery Stock in Minnesota
Alvin Alm and John Stanton

21 Nursery Practices That Improve Hardwood Seedling Root Morphology
R. C. Schultz and J. R. Thompson

33 Water-Soluble Extracts from Leaves of Shining Sumac Inhibit Germination and Radicle Growth of Loblolly Pine
Michael L. Smith

Volume 41, Number 4 (Fall 1990)

3 Managing Seedborne Disease in Western Forest Nurseries
Sally J. Campbell and Thomas D. Landis

8 Insecticides Effectively Control an Aphid Pest of White Fir Seedlings
John D. Stein and Michael I. Haverty

13 Seedbed Coverings Affect Germination, Growth, and Frost Heaving in Bareroot Nurseries
David G. Simpson

17 Deeper Planting of Seedlings and Transplants Increases Plantation Survival
George Stroempl

22 Irrigation Rate Calculation for Nursery Crops
C. S. Papadopol

28 Reducing Pesticide Use Without Reducing Yield
R. Kasten Dumroese, David L. Wenny, and Kenneth E. Quick

33 A Precision Seed Sower for Longleaf Pine Bareroot Nursery Seedlings
Charles E. Cordell, Charles Gramling, Ben Lowman, and David Brown

39 Short-Term Effect of Three Mechanical Site Preparation Methods on Species Diversity
Robert Jobidon

Volume 42, Number 1 (Winter 1991)

3 The America the Beautiful Tree Planting Program—The National Perspective
Robert Mangold

6 The America the Beautiful Tree Planting Program—Implementation in the Northeast and Midwest
Marcus Phelps

10 The America the Beautiful Tree Planting Program—Implementation in the Pacific Northwest
Ray Abriel and Thomas D. Landis

15 The America the Beautiful Tree Planting Program—Implementation in the South
Bruce Baldwin

18 Lifting Windows for Ponderosa Pine Seedlings Raised at Albuquerque, New Mexico
L. J. Heidmann and Sally M. Haase

22 Aerated Stratification Improves Germination of Ocala Sand Pine Seed
Kenneth W. Outcalt

27 Growth and Mineral Nutrition of Containerized Jeffrey Pine and Singleleaf Pinyon as Affected by Controlled-Release Fertilization
Caryn D. Huntt and Roger F. Walker

34 Preliminary Spacing Trials of *Paulownia tomentosa*
Peter R. Beckjord, John H. Melhuish, Jr., and Raymond B. Willis

36 The Relationship of Root Collar Diameter to Survival and Growth of Caragana and Green Ash in Field Shelterbelts
W. R. Schroeder and D. S. Walker

Volume 42, Number 2 (Spring 1991)

41 Leachate Conductivity: A Rapid Nondestructive Test for Pine Seed Quality
F. T. Bonner

45 Seedling Submergence Tolerance of Four Western Conifers
Ward W. McCaughey and T. Weaver

49 Nine-Year Outplanting Test of Cottonwood and Hybrid Poplar Clones in Northwestern Ontario
Robert E. Farmer, Jr., C. Lynn Palmer, Harvey W. Anderson, Louis Zsuffa, and Gweneth O'Reilly

52 Effect of Fall Planting Date on Survival and Growth of Three Coniferous Species of Container Seedlings in Northern Idaho
David L. Adams, Russell T. Graham, David L. Wenny, and Mohamed Daa

56 Building a Hand-Held Dispenser for Top-Dressing Containers
R. Kasten Dumroese, David L. Wenny, and Thomas Gisselberg

62 Modification of Gravity Seed Separator Allows Adjustment During Operation
Richard Felden

Volume 42, Number 3 (Summer 1991)

1 Welcome to the New *Tree Planters' Notes*
Robert D. Mangold

4 Improved Container Sowing With an Electronically Controlled Optical Seeder
David L. Wenny and John L. Edson

9 The Progeny Seeder
Diane Herzberg

13 Economics of Mechanical Bulk Lifting at an Ontario Bareroot Tree Nursery
Gerald Racey and Alan M. Wiensczyk

16 New Style Acorn Seeder
Gary Dinkel and Roy Kangas

18 Phenotypic Variation in Cone and Seed Characteristics of Tamarack in Northwestern Ontario
Gwennoth J. O'Reilly and Robert E. Farmer, Jr.

23 Seed and Seedling Size Grading of Slash Pine Has Little Effect on Long-Term Growth of Trees
Earl R. Sluder

28 Seedbed Densities and Sowing and Lifting Dates Affect Nursery Development and Field Survival of Longleaf Pine Seedlings
James P. Barnett

32 Mulching Effects of Plant Fiber and Plant Fiber-Polyester Mats Combined With Fertilizer on Loblolly Pine Seedlings
James D. Haywood and John A. Youngquist

Volume 42, Number 4 (Fall 1991)

1 Status of the Stewardship Incentive Program
Robert D. Mangold

4 Pollen Equipment for Seed Orchards
Tony Jasumback

6 Seedling Box Lifter
Dick Karsky

7 New Planting Tools
Dick Hallman

9 Bareroot Seedling Inventory: Estimation of Optimal Sample Size
Carl Mize and Dave Hansen

14 Growth and Colonization of Western Redcedar by Vesicular-Arbuscular Mycorrhizae in Fumigated and Nonfumigated Nursery Beds
S. M. Berch, E. Deom, and T. Willingdon

17 Carry-Over of Loblolly Pine Seeds on Cutover Forest Sites
James P. Barnett and John M. McGilvray

Volume 43, Number 1 (Winter 1992)

1 Don't Forget About Seed Sources!
Clark W. Lantz

4 Root Pruning of Bareroot White Spruce Planting Stock Does Not Affect Growth or Survival After Six Years.
David G. Simpson

7 Triadimefon Controls White Pine Blister Rust on Sugar Pine in a Greenhouse Test
David R. Johnson, Bohun B. Kinloch, Jr., and Arthur H. McCain

11 Priming Black Spruce Seeds Accelerates Container Stocking in Techniculture Single-Seed Sowing System
Ladislav Malek

14 A Pest Survey System for Forest Nurseries
Thomas F. Smith and Coleman A. Doggett

17 *Tree Planters' Notes* Index for Volumes 40 (1989) and 41 (1990)

Volume 43, Number 2 (Spring 1992)

25 Forest Nurseries and Biodiversity
Thomas D. Landis

30 Reducing *Botrytis* in Container-Grown Western Larch by Vacuuming Dead Needles.
R. Kasten Dumroese and David L. Wenny

33 Increasing Hardwood Seed Quality With Brush Machines
Robert P. Karrfalt

36 Comparing a Spray Boom to a Roller-Wiper System for a Single-Passenger Four-Wheeler
James D. Haywood and Richard Hallman

39 Soil Texture Influences Seedling Water Stress in More Ways Than One
Pierre Y. Bernier

43 Comparative Growth of Black Spruce Container Seedlings Grown in Worm-Casting-Amended Soilless Media
P. A. Menes and S. J. Colombo

48 Comparison of Seeding Versus Planting Loblolly Pine in Rips
Michael M. Huebschmann and Robert F. Wittwer

52 Seedcoat Removal Increases Speed and Completeness of Germination of Water Oak
J. C. Adams and K. W. Farrish

Volume 43, Number 3 (Summer 1992)

55 Conservation Forestry—An Idea Whose Time Has Come, Again
W. J. Rietveld

60 Survival and Growth of Planted Alaska-cedar Seedlings in Southeast Alaska
Paul E. Hennon

67 Propagation of Loblolly, Slash, and Longleaf Pine from Needle Fascicles
C. Dana Nelson, Zeng Linghai, and James M. Hamaker

72 Moisture Determination on Seeds of Honeylocust and Mimosa
F. T. Bonner, M. S. Hooda, and D. P. Singh

76 Performance of Himalayan Blue Pine in the Northeastern United States
Peter W. Garrett

81 Advantages of an Effective Weed Control Program for *Populus* Hybrids
Todd W. Bowersox, Lee R. Stover, Charles H. Strauss, and Paul R. Blankenhorn

87 Pales Weevil: A Serious Threat to Longleaf Pine Production
Coleman A. Doggett and Thomas Smith

89 Costs and Cost Component Trends of Hand and Machine Tree Planting in the Southern United States (1952 to 1990)
Thomas J. Straka, Mark R. Dubois, and William F. Watson

93 Comparison of a Drill-type Seeder and a Vacuum-Drum Precision Seeder in a Virginia Loblolly Pine Nursery
Laurie A. Chandler

97 Missoula Technology and Development Center's Nursery and Reforestation Programs
Dick Hallman

Volume 43, Number 4 (Fall 1992)

107 Tropical Reforestation—A Hot Topic for *Tree Planters' Notes*
Robert Mangold

109 The Role of the USDA Forest Service in Tropical Forestry
Jeff M. Sirmon and Allan J. West

114 The Rain Forest in Tropical America: Forest Dynamics, Reforestation, Seed Handling, and Problems of Management
Carlos Vázquez-Yanes and Alma Orozco-Segovia

119 El Bosque Lluvioso en América Tropical: Dinámica Forestal, Reforestación, Manipulación de las Semillas y Problemas de Manejo
Carlos Vázquez-Yanes and Alma Orozco-Segovia

125 Plantation Establishment Techniques in Tropical America
William E. Ladrach

133 Técnicas Para el Establecimiento de Plantaciones Forestales en la América Tropical
William E. Ladrach

142 Seed Technology—A Challenge for Tropical Forestry
F. T. Bonner

146 The ISSA System for Production of Container Tree Seedlings
Emilio Amorini and Gianfranco Fabbio

150 Scarification of Limba Seeds With Hot Water, Bleach, and Acid
P. D. Khasa

153 Nursery Morphology and Preliminary Comparison of 3-Year Field Performance of 1+0 and 2+0 Bareroot Ponderosa Pine Seedlings
Robin Rose, Mary Atkinson, John Gleason, and Diane Haase

159 Root Dipping of Seedlings With Water-Absorbent Gel Improves Survival on Surface Mine Sites in West Virginia
Ray R. Hicks, Jr.

Volume 44, Number 1 (Winter 1993)

3 Methyl Bromide—We Can Learn to Live Without It!
Clark W. Lantz

5 Thanks to Our Reviewers
TPN Editorial Board

8 Seedling Counter Field Tests
Dave Gasvoda and Diane Herzberg

13 Scarifiers for Shelterwoods
Dick Karsky

16 Mobile Tree Seedling Coolers
Diane Herzberg

19 Germination Math—Calculating the Number of Seeds Necessary per Cavity for a Given Number of Live Seedlings
Marla Schwartz

21 Germination of Alaska-Cedar Seed
William H. Pawuk

25 First-Year Survival and Growth of Loblolly Pine Seedlings Released From Perennial Weeds in Old Fields of Northeastern Arkansas
E. S. Gardiner and J. L. Yeiser

33 Vesicular-Arbuscular Mycorrhizae of Western Redcedar in Container Nurseries and on Field Sites After Slash Burning
S. M. Berch, E. Deom, A. Roth, and W. J. Beese

38 Hardwood Species Trials in Oregon
Peter A. Giordano, David E. Hibbs, Rick Fletcher, Chal Landgren, Paul Oester, and Bill Rogers

Volume 44, Number 2 (Spring 1993)

45 Our New Editorial Policy Is Working!
Robert Mangold

49 Calculating Filled and Empty Cells Based On Number of Seeds Sown per Cell—A Microcomputer Application
David L. Wenny

53 Effect of Root Form on 10-Year Survival and Growth of Planted Douglas-fir Trees
Diane L. Haase, James H. Batdorff, and Robin Rose

58 Presowing Treatments Affect Shortleaf Pine Seed Germination and Seedling Development
James P. Barnett

63 *Taylorilygus pallidulus* (Blanchard): A Potential Pest of Pine Seedlings
David B. South, Janusz B. Zwolinski, and Harry W. Bryan

68 Fertilization Affects Growth and Incidence of Grey Mold on Container-Grown Giant Sequoia
Sandrine Vançon

73 Top Pruning Improves Field Performance of Blue Oak Seedlings
Douglas McCreary and Jerry Tecklin

78 Hackberry Seed Sources for Planting in the Southern Great Plains
Steven Anderson and C. G. Tauer

Volume 44, Number 3 (Summer 1993)

87 Back to the Future—Pest Management Without Methyl Bromide
Richard S. Smith, Jr. and Stephen W. Fraedrich

93 Using a Constructed Wetland to Treat Waste Water and Propagate Wetland Species
Glenn Beagle and John Justin

98 Aspen Seed Collection and Extraction
Martin Y. P. Fung and Barbara A. Hamel

101 Loblolly Tree Seed Collection System
Dick Hallman

105 Photoperiod Extension With Two Types of Light Sources: Effects on Growth and Development of Conifer Species
Steven K. Omi and Kent L. Eggleston

113 Stock Quality Assessment: Forecasting Survival or Performance on a Reforestation Site
Steven C. Grossnickle and Raymund S. Folk

122 Sowing at 1.5-cm (0.6-inch) Depth Produces Heaviest Douglas-Fir Roots in Small Containers
Don Minore, Howard G. Weatherly, and Patrick G. Cunningham

125 Rooting Baldcypress Stem Cuttings
D. L. Copes and W. K. Randall

128 Selecting Hybrid Poplars to Reduce Disease Risk May Also Reduce Biomass Yield
M. E. Ostry and W. E. Berguson

Volume 44, Number 4 (Fall 1993)

137 International Nursery and Reforestation Exchanges
Robert Mangold

141 Mechanized Pollen Harvesting in Larch Seed Orchards
Patrick Baldet and Gwenaël Philippe

146 Greenhouse Heated With Waste Oil—A True Story
James D. Schwartz and Marla Schwartz

149 Effects of a DCPA/Napropamide Herbicide Tank Mix on Germinants of Seven Hardwood Species in Tree Nursery Beds
J. D. Porterfield, J. D. Odell, and G. R. Huffman

154 Economic Analysis of Two-Spotted Spider Mite Management on Greenhouse-Grown Poplars
Vincent A. Smith, David B. Orr, and Elwood R. Hart

157 Genotyping of Longleaf Pine Ramets After Hurricane Hugo by Using DNA and Isozyme Markers
K. D. Jermstad, P. A. Guge, E. R. Carroll, S. T. Friedman, and D. B. Neale

161 Sodium Metabisulfite Reduces Fungal Inoculum in Containers Used for Conifer Nursery Crops
R. Kasten Dumroese, Robert L. James, and David L. Wenny

166 Survival and Growth of Trees and Shrubs on Different Lignite Minesoils in Louisiana
James D. Haywood, Allan E. Tiarks, and James P. Barnett

Volume 45, Number 1 (Winter 1994)

1 Reforestation Technical Assistance for the Nonindustrial Private Forestland Owner—Opportunity Knocks
Robert Mangold

5 Treatment of Container Seedlings in the Nursery Against Large Pine Weevil
Leo Tervo, Juhani Kangas, Martti Kuikka, and Riitta Sarantila

10 Simple and Inexpensive Method for Extracting Wood Density Samples From Tropical Hardwoods
John K. Francis

13 Tree Shelters Improve Establishment on Dry Sites
David A. Bainbridge

17 Nursery Drawings Available From the Missoula Technology and Development Center
Dick Hallman

21 Aerial Lifts for Working in Tree Tops
Tony Jasumback

26 The Use of Rootdips on North American Conifer Seedlings—A Review of the Literature
John P. Sloan

32 Spin-Drying Soaked Tree Seed Before Prechilling Improves Seed Handling
P. G. Gosling, S. K. Jones, and A. S. Gardiner

Volume 45, Number 2 (Spring 1994)

39 *Tree Planters' Notes* Expands and Modernizes
Robert Mangold and Rebecca Nisley

43 Alternatives to Methyl Bromide: Assessment of Research Needs and Priorities for Forestry, Nursery, and Ornamental Crops
Robert Linderman, Wayne Dixon, Stephen Fraedrich, and Richard S. Smith, Jr.

47 Overwintering Black Spruce Container Stock Under a Styrofoam® SM Insulating Blanket
Robert E. Whaley and Lisa J. Buse

53 Influence of Mechanical Incorporation Method on Dazomet Distribution in Conifer Nursery Soil
Bruce R. Kelpsas and Sally J. Campbell

58 Sowing of Pelletized Seed—A Technique To Simplify Eucalypt Raising in Tropical Nurseries
Beti Piotto

63 Comparing Methods of Artificially Regenerating Loblolly and Slash Pines: Container Planting, Bareroot Planting, and Spot Seeding
James D. Haywood and James P. Barnett

68 Nursery-to-Field Carryover and Post-Outplanting Impact of *Macrophomina phaseolina* on Loblolly Pine on a Cutover Forest Site in North Central Florida
E. L. Barnard

72 Wind Effect on Windbreak Establishment in Northern Australia
D. Sun and G. R. Dickinson

Volume 45, Number 3 (Summer 1994)

79 Let's Hear From You!
Robert Mangold

82 The Effect of Containerless Transport on Desert Shrubs
Matthew W. Fidelibus and David A. Bainbridge

86 Nantucket Pine Tip Moth Infests Longleaf Pine Seedlings in a North Carolina Nursery
Coleman Doggett, F. Wayne Langston, and W. Leray Worley

88 Insects and Diseases of Oak Seedlings Grown in Tree Shelters
Kurt Allen

91 An Evaluation of Dazomet and Metam-Sodium Soil Fumigants for Control of *Macrophomina phaseolina* in a Florida Forest Nursery
E. L. Barnard, S. P. Gilly, and E. C. Ash

95 Sprouting and Growth of *Paulownia tomentosa* Root Cuttings
Jeffrey W. Stringer

101 Fungicide Treatment Increases Sprouting Percentage and Sprout Growth for *Paulownia tomentosa* Root Cuttings
Jeffrey W. Stringer

104 Atlantic White-Cedar Propagation by Seed and Cuttings in New Jersey
Eileen D. Boyle and John E. Kuser

Volume 45, Number 4 (Fall 1994)

113 Reinvention Hits *TPN*
Robert Mangold

116 Early Survival and Growth of Loblolly Pine Seedlings Treated With Sulfometuron or Hexazinone Plus Sulfometuron in Southwest Arkansas
J. L. Yeiser and E. J. Rhodenbaugh

121 Volume Displacement Provides a Quick and Accurate Way to Quantify New Root Production
John T. Harrington, John G. Mexal, and James T. Fisher

125 Substrate and Temperature Tests for Germination of Atlantic White-Cedar Seeds
A. Bianchetti, R. C. Kellison, and K. O. Summerville

128 Importance of Release for Naturally Seeded and Planted Container Loblolly Pines on a Cutover Site
Michael D. Cain and James P. Barnett

137 Treatments for Enhancing Early Survival and Growth of Northern Red Oak Seedlings
David M. Hix, Charles A. McNeel, and Edwin C. Townsend

142 Effects of Rough Handling on Early Performance of White Pine and White Spruce Seedlings
Ipi Yuyitung, James A. Simpson, and Andrew M. Gordon

Volume 46, Number 1 (Winter 1995)

1 Will We Run Out of Wood in the South?
Clark Lantz

4 Effectiveness of BGR-P and Garlic in Inhibiting Browsing of Western Redcedar by Black-Tailed Deer
Dale L. Nolte, James P. Farley, and Sandi Holbrook

7 Germinant Sowing in South Africa
David B. South and Chris Young

11A New Greenhouse Photoperiod Lighting System for Prevention of Seedling Dormancy
Richard W. Tinus

15 Nitrogen Fertilization Requirements of Douglas-fir Container Seedlings Vary by Seed Source
Gale Thompson

19 Legume Seeding Trials in a Forested Area of North-Central Washington
B. Java, R. Everett, T. O'Dell, and S. Lambert

28 Survival and Growth of Planted Loblolly Pine Seedlings on a Severely Rutted Site
K. W. Farrish, J. C. Adams, and C. G. Vidrine

Volume 46, Number 2 (Spring 1995)

33 Certified Seed and Artificial Forest Regeneration
Robert Karrfalt

36 Missoula Technology and Development Center's 1995 Nursery and Reforestation Programs
Ben Lowman

46 Trees Grow Better With Water
Warrick R. Nelson

48 *Botrytis cinerea* Carried by Adult Fungus Gnats (Diptera: Sciaridae) in Container Nurseries
Robert L. James, R. Kasten Dumroese, and David L. Wenny

54 Oak Seedling Root and Shoot Growth on Restored Topsoil
W. Clark Ashby

58 Improved Vegetative Propagation of Scouler Willow
John L. Edson, Annette D. Leege-Brusven, and David L. Wenny

64 Estimating Pollen Yield From Western White Pine: Preliminary Studies
M. D. Meagher

Volume 46, Number 3 (Summer 1995)

73 Establish Plantations on Pastureland Now To Protect Native Forests in the Future
David B. South

76 A New Feature
Rebecca Nisley

78 Restoring Atlantic White-Cedar Swamps—Techniques for Propagation and Establishment
John E. Kuser and George L. Zimmermann

86 Seed Production of *Pinus greggii* Engelm. in Natural Stands in Mexico
J. Lopez-Upton and J. K. Donahue

93 Benomyl Root Dip and Scalping Improve Early Performance of Longleaf Pine on Pest-Infested Agricultural Croplands
E. L. Barnard, E. C. Ash, and W. N. Dixon

97 Effect of the Antidesiccant Moisturin® on Conifer Seedling Field Performance
Robin Rose and Diane L. Haase

102 Shoot:Root Ratio Is of Limited Use in Evaluating the Quality of Container Conifer Stock
P. Y. Bernier, M. S. Lamhamedi, and D. G. Simpson

107 Variable Chlorophyll *a* Fluorescence as a Potential Indicator of Black Spruce Seedling Freezing Tolerance Under Nursery Conditions
Garry Devisscher, Norman P. A. Huner, and Ladislav Malek

Volume 46, Number 4 (Fall 1995)

113 Bringing *TPN*'s Mission Into Focus; Our New, Expanded Board of Advisory Editors
Rebecca Nisley

115 The Responsibility To Publish
Thomas D. Landis

118 Field Testing a Modified Duster for Supplemental Mass Pollination in Douglas-Fir Seed Orchards
D. L. Copes, D. O'Rourke, and W. K. Randall

126 Mexican Conifers' Response to Fertilizer Type Indicates Difference Between Value and Cost
J. G. Mexal, R. Phillips, and R. Neumann

130 Effect of Seed Size on Seedling Growth of a Shade-Tolerant Tropical Tree (*Hymanea stilbocarpa* Haynes)
Marlene de Matos Malavasi and Ubirajara Contro Malavasi

134 Germination of Carolina Silverbell Seed
G. R. Johnson

139 Effect of Seed Condition, Stratification, and Germination Temperature on the Laboratory Germination of Loblolly Pine Seed
Earl W. Belcher

143 Test of the Float Method of Assessing Northern Red Oak Acorn Condition
Linda S. Gribko and William E. Jones

Volume 47, Number 1 (Winter 1996)

1 Adapting JIT Principles to Nursery Production
David B. South

3 What the Future Holds for *Tree Planters' Notes*: Getting *TPN* Back on Schedule
Rebecca G. Nisley

6 Fifth-Year Results From a Test of Longleaf Pine Seed Sources on the Francis Marion National Forest and in Central Georgia
Earl R. Sluder

11 Susceptibility to Brown-Spot Needle Blight and Fusiform Rust in Selected Longleaf Pine and Hybrids
L. H. Lott, R. C. Schmidtling, and G. A. Snow

16 The Effects of Seedling Quality and Forest Site Weather on Field Survival of Ponderosa Pine
John Paul McTague and Richard W. Tinus

24 Growth of Hardwoods and Conifers after 47 Years on Coal Mine Soils in Southern Illinois
W. Clark Ashby

30 Effect of Initial Root Collar Diameter On Survival and Growth of Yellow-Poplar Seedlings Over 17 Years
Thomas A. Dierauf and James W. Garner

34 Top-Pruning Bareroot Hardwoods—A Review of the Literature
David B. South

Volume 47, Number 2 (Spring 1996)

45 The Value of Seedling Quality Testing
Richard W. Tinus

46 Welcome Additional Members to the Editorial Board
Rebecca G. Nisley

48 Somatic Embryogenesis Tissue Culture for the Propagation of Conifer Seedlings—A Technology Comes of Age
S. C. Grossnickle, D. Cyr, and D. R. Polonenko

58 Container Seedling Planting With Manual Microsite Preparation for Species Restoration
P. Salonius, K. Beaton, and B. Roze

62 Cold Hardiness Testing to Time Lifting and Packing of Container Stock—A Case History
Richard W. Tinus

68 Influence of Seed Position on First-Year Survival and Growth of Directly Seeded Northern Red Oak
Jacques Trencia

76 Importance of Cutting Diameter and Method of Production on Early Growth of Hybrid Poplar
Daniel J. Robison and Kenneth F. Raffa

Volume 47, Number 3 (Summer 1996)

85 Methyl Bromide in Forest Tree Nurseries—Imperative or Opiate?
E. L. Barnard

88 Measurement of Soil Water Content in a Peat-Vermiculite Medium Using Time Domain Reflectometry (TDR)—A Laboratory and Field Evaluation
Gill Lambany, Line Robidas, and Pierre Ballester

94 Mass Propagation of Rocky Mountain Juniper From Shoot Tip Cuttings
John L. Edson, David L. Wenny, R. Kasten Dumroese, and Annette Leege-Brusven

100 Effects of Crown Position and Plant Age on Rooting of Jack Pine Long Shoot Cuttings
R. D. Browne, C. G. Davidson, and S. M. Gobin

105 "Jellyrolling" May Reduce Media Use and Transportation Costs of Polybag-Grown Seedlings
J. G. Mexal, R. Phillips, and T. D. Landis

110 Windbreak Benefit to Potato Yield in Tropical North Australia
D. Sun and G. R. Dickinson

Volume 47, Number 4 (Fall 1996)

117 Ten Years of *TPN* Indexed in This Issue; Going Electronic—The SNTI Homepage Will Soon Include *TPN*
Rebecca G. Nisley

120 CONIFERS: A Computer Program for Liquid Fertilization in Container Nurseries
John T. Harrington and Patrick A. Glass

126 Preliminary Aerial Application Trial for Control of Southern Cone Rust in a Slash Pine Seed Orchard Using Triadimefon Fungicide
E.L. Barnard

133 *Tree Planters' Notes* 10-Year Index for Volumes 38-47 (1987 to 1996)
Donna Loucks

Notes

Instructions for Authors

Every reader is a potential author for ***Tree Planters' Notes***. Those of you who are practitioners—nursery managers and restoration specialists, etc.—please write to us if you have developed or successfully used a new piece of equipment; a new or improved nursery operation; a new technique or method for packing seedlings, improving seedling growth, or preparing sites; new techniques in applied tree planting, tree improvement, plantation culture, and other topics related to nurseries, tree improvement, and reforestation; or any other information you wish to share with nursery managers. We are also interested in short notes on practical applications of scientific findings. These papers will be reviewed by a tech transfer specialist and a scientist on our advisory board and published in a section called "Practical Tips."

For scientists and engineers working in nursery-related research, including plant physiology and pathology, seed technology, outplanting, habitat restoation, and tree improvement, we publish several sections of peer-reviewed, refereed papers—"Research Reports," "Technical Updates," "Species Spotlights," and "Technical Background Papers." These articles will be anonymously peer-reviewed by 2 outside referees. If you have a topic for one of the latter three article types that you would like to write about, please call and discuss your ideas.

We also encourage you to consider writing for the "Comments" section. Our concept of this section is that it should be a place to publish opinions and ideas relating to the reforestation profession. We invite you to submit ideas for commentaries you wish to write. The views expressed in the "Comments" section are solely those of the author(s) and do not necessarily reflect those of the ***Tree Planters' Notes*** editorial staff, the Forest Service, or the U.S. Department of Agriculture.

Send us a 3-$^{1}/_{2}$ inch high-density disk (preferably IBM-PC-compatible, in WordPerfect for Windows or Microsoft Word) plus one hard copy of your article with EVERYTHING, including references, printed out DOUBLED-SPACED (except the bodies of tables, which may be single-spaced). We also would find a Mac disk of any charts, graphs, and artwork very useful. **If you have access to the Data General (DG) computer system of the USDA Forest Service, we are happy to accept electronically submitted copies.** If you have any questions, please call and discuss things.

Mail articles to Rebecca Nisley, USDA Forest Service, 51 Mill Pond Road, Hamden, CT 06514; telephone (203) 230-4304; FAX (203) 230-4315; DG:S24L07A; e-mail: rnisley@ct2.nai.net. Identify your article clearly with the corresponding author's name, professional titles (please remember this!), business address, and telephone number so that we may communicate with you if needed. We will make every effort to publish your article, if accepted, within 6 months of its receipt.

The article should be accompanied by a brief abstract (100 words or less) summarizing its conclusions. For research reports, we encourage the use of separate sections for Results and Discussion as well, and also a Conclusions section that summarizes the usefulness of the findings to practical nursery operations. References should be listed alphabetically by author(s) and cited in the text by author and date. Follow the style of this issue. We follow the general style of the 1984 *Government Printing Office Style Manual* and the technical style of the Council of Biology Editor's sixth edition of the *CBE Style Manual*; for nomenclature of trees, we follow the *Checklist of United States Trees*, Agriculture Handbook 541, by Elbert L. Little, Jr. Use common names of trees in the title and in the text; at first mention in the abstract and in the text, provide the scientific name in parentheses. Binomials for long lists of trees may be presented in a table. Numeral values should be presented in both metric and U.S.-style units.

Send clear, glossy black and white photographs, original color slides (we will convert them to black and white prints), or black ink drawings and graphs.

Authors will be furnished with 5 copies of the issue in which their article appears; please feel free to make photocopies. Information in this publication is public property and may be reproduced without permission. We ask, however, that you include a credit line providing the name of the author(s) and the volume and issue of ***Tree Planters' Notes***. There are no page charges.

Subscriptions ($8 per year domestic, $10 per year foreign) are available from New Orders, Superintendent of Documents, PO Box 371954, Pittsburgh, PA 15250-7954. A subscription blank is available on the back cover.

Printed on recycled paper.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice or TDD). USDA is an equal opportunity provider and employer..