USDA United States Department of Agriculture

Forest Service

Pacific Northwest Region

State and Private Forestry

Cooperative Programs

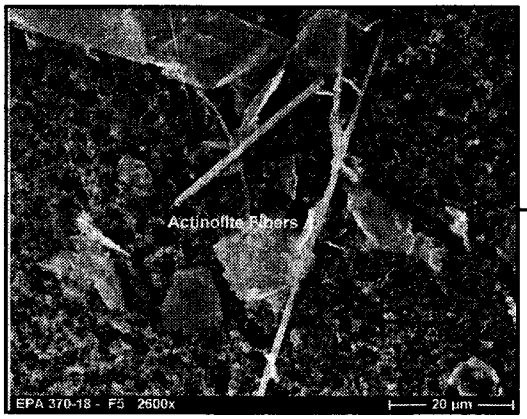
R6-CP-TP-01-01

Forest Nursery Notes

Winter 2001

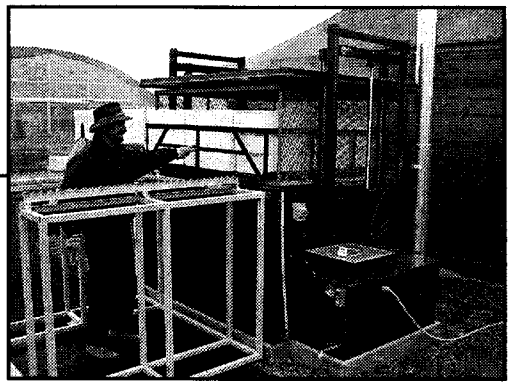
Integrated Pest Management

Holistic Nursery Pest Management



Health and Safety

Update On the Potential Hazards of Vermiculite



Equipment, Products, and Services

Growers Hot Vats Container Sterilization Equipment

Forest Nursery Notes Team

Tom D. Landis, Author and Editor
USDA Forest Service
Cooperative Programs
2606 Old Stage Road
Central Point, OR 97502
TEL: 541.858.6166
FAX: 541.858.6110
E-Mail: tdlandis@fs.fed.us

David Steinfeld, Author and Editor
USDA Forest Service
2606 Old Stage Road
Central Point, OR 97502
TEL: 541.858.6105
FAX: 541.858.6110
E-Mail: dsteinfeld@fs.fed.us

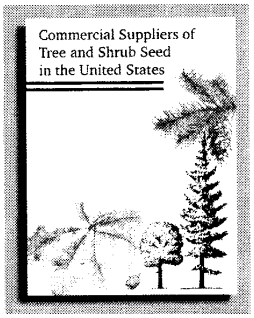
Rae Watson, Layout
USDA Forest Service
2606 Old Stage Road
Central Point, OR 97502
TEL: 541.858.6131
FAX: 541.858.6110
E-Mail: rewatson@fs.fed.us

This technology transfer service is funded by:
USDA Forest Service, State and Private Forestry

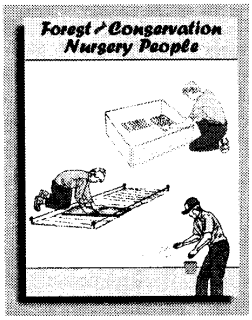
Nursery Networks

Directories on the Reforestation, Nurseries, and Genetic Resources (RNGR) home page - One of the objectives of Forest Nursery Notes is to promote networking and so we maintain several different directories on our website. ***Note the new address:***

< http://www.na.fs.fed.us/spfo/rngr >



Commercial Suppliers of Tree and Shrub Seed in the United States - This directory provides a list of vendors of tree and shrub seed for the US. The directory starts with some basic information on seed quality and other considerations and then is followed by addresses and telephone and fax numbers. Services supplied by each vendor is also included along with an alphabetical list of all the tree and shrub seed sold in the US and common plant names. Again, much of this information is already out-of-date so please let us know if there are changes or additions.



Forest and Conservation Nursery People - This is an MS Excel spreadsheet of people who work in the forest and conservation nursery field from around the world. It is composed of the mailing list for FNN so, if you'd like to be added to the directory or update your listing just fill out and return the Literature Order Form in the back of this issue.

Directory of Forest and Conservation Nurseries -This directory is organized by state and contains the latest addresses and production information for forest and conservation nurseries on a state-by-state basis. For those nurseries that have them, links to E-mail addresses and WWW home pages are also provided. Ownership category, type of nursery (container or bareroot), and current and potential seedling distribution are included. We will be updating this directory in the coming months so nurseries will be receiving an E-mail, FAX, or letter with their current listings.

Directory of Native **Plant Nurseries** (<http://nativeplants.for.uidaho.edu>) An on-line directory of native plant nurseries is being developed on the Native Plants Journal / Native Plants Network Internet site. The site will include a free state-by-state listing of nurseries that grow native plants, sell native plant seeds, or perform other related services. For a nominal fee, nurseries and companies will be able to upload species/service availability lists, keywords, and hyperlinks to their websites - the lists and keywords will reside in a searchable database to facilitate use by native plant users. Over the next several months we will be verifying existing information in the Directory of Forest and Conservation Nurseries (www.na.fs.fed.us/spfo/rngr/pubs/direchp.htm), and the directory from the now defunct HortusWest magazine. This Native Plant Directory is sure to be widely used so contact Kas Dumroese to make sure you are included: E-mail: <dumroese@uidaho.edu>, or TEL: 208.885.3509.

New Woody Plant Seed Manual: <http://www.wpsm.net/>

The Woody Plant Seed Manual (1941) was the first comprehensive handbook on the seeds of trees and shrubs. An updated and expanded manual, Seeds of Woody Plants in the United States (USDA Agric. Handbk. 450) was published in 1974. This volume contained data for approximately 800 taxa in 188 genera with many helpful illustrations (Figure 1). Its popularity led to multiple printings, and portions of it were translated into several other languages. The numerous advances in tree seed technology in the last quarter-century have now dictated the publication of a new revision, again named the Woody Plant Seed Manual. The revision process by a team of Forest Service scientists and cooperators from universities and other government agencies has now been underway for over 6 years. The book will contain almost 1,300 taxa in 230 genera, a considerable increase in the scope of the 1974 handbook. Because such a large undertaking requires so much time and effort by so many people, the finished product is still many months away from release. In order to make the new technology available as soon as possible, a decision was made to post completed portions of the book on this interim website. Chapters for completed genera contain tables with some graphics are presented in preliminary html format (See text box).

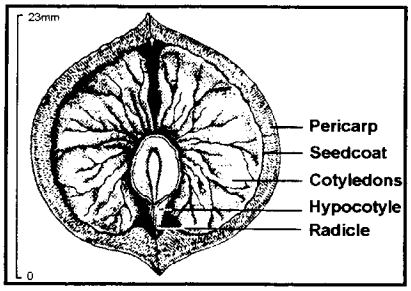


Figure 1 - Seed cross-section for shagbark hickory (Carya ovata)

When the final editing is completed, the manual will be formatted and made available as a traditional printed book and electronically on a CD-ROM and the final website in Adobe PDF format. Of course, we will keep you informed of developments in future issues of FNN.

A Chapters*

Abies
Acacia
Acer
Adenanthera
Aesculus
Ailanthus
Albizia
Aleurites
Alnus
Amelanchier
Amorpha
Ambrosia
Aralia
Araucaria
Arbutus
Arctostaphylos
Aronia
Artemisia
Asimina
Atriplex

* Those in italics are completed

Western Forest and Conservation Nursery Association (WFCNA): <www.wfcna.net>

With the help of J.B. Jordin, we have just developed a new website for the WFCNA. The site contains 6 sections, each of which features a pull-down menu:

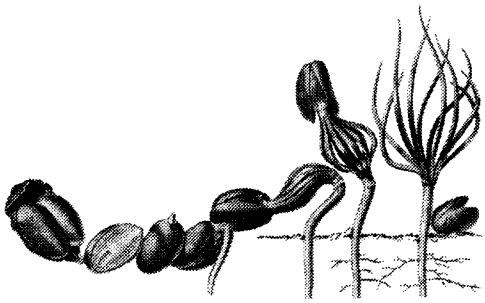
Proceedings - This section contains a list of future, current, and past meetings along with complete Proceedings for 1995 to 1998. The proceedings for the 1999 and 2000 meetings are being processed at the present time.

Conference Information - This section contains information on upcoming meetings and other related events.

Websites - This has hot links to the other forest nursery associations as well as Tree Planters' Notes and Native Plant Journal websites.

About WFCNA - This includes the official charter of the organization including a Mission Statement, Goals, and Membership.

We eventually plan to have similar websites for the other two forest nursery organizations in the United States: the Southern Forest Nursery Association which meets on even-numbered years, and the Northeastern Forest and Conservation Nursery Association which meets each year.



Forest Nursery Notes
Winter 2001

Please Update Your Address: The FNN mailing list is always out-of-date so we would like to make sure that we have your latest address. Please take the time to check the mailing label and note any additions or corrections on the Literature Order Form at the back of this issue. In particular, check your telephone and FAX numbers because area codes keep changing. Supply the country code if you are a foreign subscriber. Also list your E-mail and website addresses if you have them.

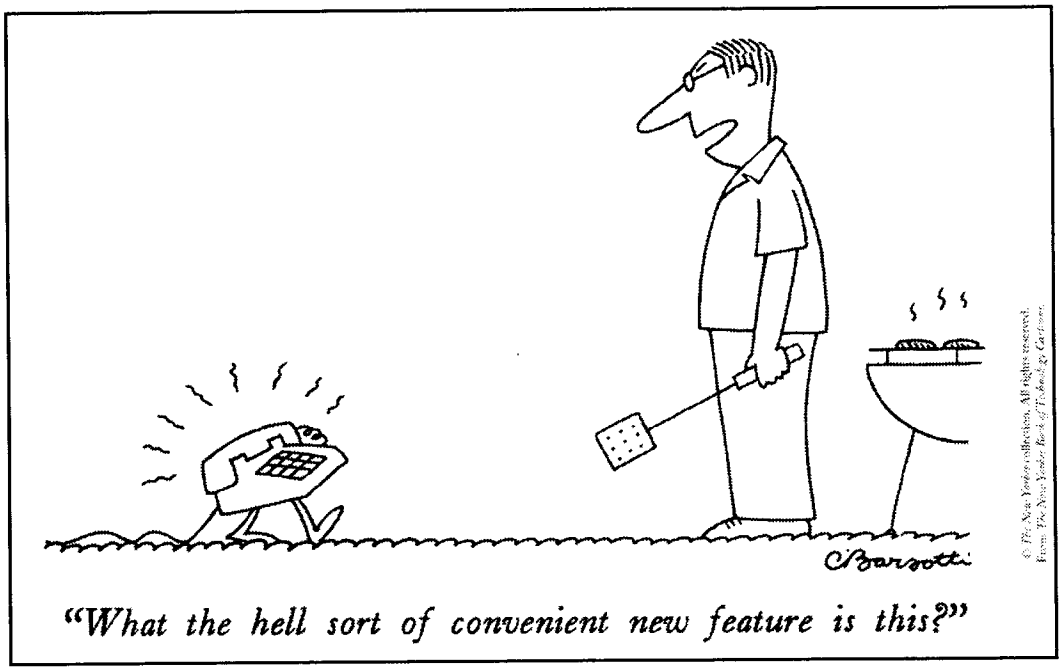
Technical Requests. Every day we receive letters, telephone calls, Faxes, and E-mail messages from around the world requesting publications or asking for technical assistance. Our technology transfer team prides itself on responding to all inquiries as soon as possible but we do have to set some priorities. Forest and conservation nurseries in the United States receive first priority and then we handle requests from foreign countries. Our contact information is listed on the inside cover of this issue. If Tom is not around, then contact David or Rae and we'll get back to you as soon as possible. You can make things easier if you will remember a few things when contacting us:

- Telephone calls are hard to understand sometimes, especially when the caller has an accent. If you leave a voice mail message, please speak slowly and give your full mailing address, phone, FAX, and E-mail numbers.

- FAX messages are easy to process but be sure to give your complete name, address, and return FAX number *including country code.*

- E-mail is the best option because it is non-invasive and accessible around the clock. If you are requesting publications, be sure and give us your full mailing address.

New E-mail and Website Addresses: Tom has a new "official" E-mail address (tdlandis@fs.fed.us), so please note it in your address book, and our website has also changed to: <http://www.na.fs.fed.us/spfo/mgr>



Nursery Meetings

This section lists upcoming meetings and conferences that would be of interest to nursery and reforestation personnel. Please send us arty additions or corrections as soon as possible and we will get them into the next issue.

The USDA Forest Service, University of Georgia Warnell School of Forest Resources and the Longleaf Alliance are organizing a second annual workshop focused on ***Growing Longleaf Pine Seedlings in Containers*** on **January 16 to 17, 2001.** The workshop will be held at the University of Georgia's Rural Development Center in Tifton, GA and will begin with a vendor reception on Tuesday evening January 16. Classroom sessions will run from 9 a.m. to 5 p.m. on Wednesday January 17 & from 9 a.m. to noon on Thursday January 18. The workshop will conclude with a field tour on Thursday afternoon. This year's workshop will focus on seedling standards, enhancing germination, media selection, irrigation & nutrition management, and integrated pest management. We will also provide ample time to interact with vendors & fellow growers.

For registration information, contact:
The University of Georgia
Rural Development Center Conference Office
TEL: 229.386.3416
FAX: 229.3 86.3 822

For program information, contact:
Dave Moorhead at TEL: 229.386.3418
E-mail: moorhead@uga.edu
Website: www.bugwood.org/container

Seeds for the Future, A National Native Wildflower and Grass Seed Production Conference
The demand for regionally adapted native wildflower and grass seed exceeds the supply, a gap that will widen given the growing interest in restoration of natural habitats, use of native plants, conservation, ecotourism, and recent policy directives at federal, state, and local levels. This conference will highlight the status and needs of the native wildflower seed industry as well as those of the government and private sectors. Issues to be addressed will be of interest to: those involved or interested in producing native wildflower seed; farmers seeking an alternative crop; federal, state, and local agencies affected by native plant policies; those involved with restoration or mitigation; and commercial and residential developers seeking natural aesthetic effects. Presented by:

Florida Department of Transportation
Federal Highway Administration
University of Florida/IFAS
Florida Federation of Garden Clubs, Inc.
Keep Florida Beautiful *Wildflower Advisory Council*
April 18 - 20, 2001
Orlando, Florida
Rosen Plaza Hotel

For registration and program information contact
Nancy Hummell
TEL: 850.922.7206
FAX: 850.922.7217

The International Union of Forestry Research Organizations (IUFRO) Working Groups 3.02.00, 3.02.01 and 3.02.02 are sponsoring a meeting on **Nursery Production and Stand Establishment of Broadleaves to Promote Sustainable Forest Management** in Rome, Italy on ***May 7 to 10, 2001***. The purpose of the meeting is to bring together researchers and foresters from all over the world to discuss state-of-the-art practices and future developments regarding nursery production and establishment of broad-leaved trees. The meeting announcement is on the following web pages:

http://iufro.boku.ac.at/iufro/iufronet/d3/wu30200/ev30200.htm
http://iufro.boku.ac.at/iufro/iufronet/d3/wu30201/ev30201.htm
http://iufro.boku.ac.at/iufro/iufronet/d3/wu30202/ev30202.htm

To indicate your interest and to receive further information, please send an E-mail message *as soon as possible to both of the following addresses.* Indicate whether you would like to just attend or if you would like to present a paper or poster:

<ciccarese@anpa.it>
<amn@du.se>
If you do not have E-mail service, send a letter to:
Lorenzo Ciccarese
ANPA
Via V Brancati 48
00144 Rome
ITALY

The **Southern Forest Nursery Association** will meet in Gainesville, FL in the ***Summer of 2002***. Steve Gilley is the hosting the meeting and more information will be forthcoming in future issues of FNN.

The **Northeastern Nursery Conference** will be held the week of ***July 23 to 26, 2001*** at Toftrees Conference Center and Resort, State College, PA. Toftrees is adjacent to the Penn State University campus, home of the Nittany Lions, aka Joe's Place. The agenda is still being developed so contact Alex Day if you want to give a paper or poster, or just want the latest information:

Penn Nursery
137 Penn Nursery Road
Spring Mills, PA 16875
TEL: 814.364.5150
FAX: 814.364.5152
E-mail: pennnursery@dcnr.state.pa.us

The **Western Forest and Conservation Nursery Association** will be meeting at Ft. Lewis College in Durango, CO on ***July 30 to August 3, 2001***. The college has excellent meeting facilities and attendees can stay right on campus at the Anasazi Apartment complex for a very reasonable rate. We are currently circulating a call for papers and posters so please contact me if you would like to give a talk. As usual, the meeting will consist of technical sessions and field trips. This year we will visit the BIA Southern Ute Forest Nursery and Mesa Verde National Park. For more information, give me a call:

Tom D. Landis
USDA Forest Service, J.H. Stone Nursery
2606 Old Stage Road
Central Point, OR 97502-1300
TEL: 541.858.6166
FAX: 541.858.6110
E-mail: tdlandis@fs.fed.us

The Eighth Workshop on **Seedling Physiology and Growth Problems in Oak Plantings** will be held at the Lake Chatuga Lodge in Hiawassee, GA on ***September 9 to 12, 2001***. The meeting will consist of technical papers, discussion periods, and field trip to oaks outplanting sites. If you would like to present a paper or poster or just want more information, you can contact:

Linda Watson or Paul Kormanik
Institute of Tree Root Biology
USDA Forest Service
320 Green Street
Athens, GA 30602
TEL: 706.559.4288
FAX: 706.559.4291
E-mail: lwatson01@fs.fed.us

Because the first meeting was so successful, a **Second Native Plants: Propagating and Planting** meeting is being planned for ***December 12 to 13, 2001*** in Eugene, OR. This conference is sponsored by the Oregon State University Nursery Technology Cooperative and the Western Forestry and Conservation Association. They are currently soliciting speakers for the conference so please send any ideas to Diane Haase as soon as possible. Contact Richard Zabel for general information on the meeting:

Diane Haase
Nursery Technology Cooperative
Oregon State University
Richardson Hall 301 C
Corvallis, OR 97331
TEL: 541. 737.6576
FAX: 541. 737.1393
E-mail: Diane.Haase@orst.edu
Website: www.fsl.orst.edu/coops/ntc/ntc.htm

Richard Zabel
Western Forestry and Conservation Assoc.
4033 SW Canyon Road
Portland, OR 97221
TEL: 503.226.4562
FAX: 503.226.2515
E-mail: richard@westernforestry.org

International Plant Propagators' Society (IPPS) meetings always cover a wide range of basic plant propagation concepts, techniques, and technologies, and are an excellent opportunity to expand your horticultural horizons. Currently, the Society has eight regions and one potential region. The IPPS home page (<http://www.ipps.org/>) contains a wealth of information on these meetings and how to join the organization. I heartily recommend it!

IPPS Region	Date	Location
Australian Region	May	Canberra
Eastern Region, North America	Sept. 30 - Oct. 3	Lexington, KY
Region of Great Britain & Ireland	Aug. 28 - 31	E. Midlands & E. Anglia
1PPS Japan	Autumn	Shizuoka
New Zealand Region	May 11-13	Hamilton
IPPS Scandinavia	Early Sept.	To Be Determined
Southern Region, North America	Oct. 18 - 21	Houston, TX
Western Region, (USA and Canada)	September	Seattle, WA
Southern African Potential Region	March	To Be Determined

Health and Safety

Update on the Potential Health Hazards of Vermiculite

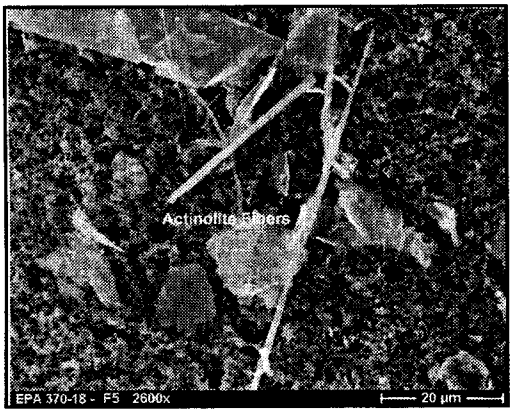
The July 2000 issue of Forest Nursery Notes contained an article on the potential hazards of handling vermiculite. In August, the Environmental Protection Agency (EPA) released the findings of a study they conducted on vermiculite products that they obtained from garden stores across the country. The survey found that "only 15% (8 products out of 54 sampled) of these products contained enough asbestos to allow EPA to reliably quantify a percentage of asbestos in the product ...further analysis of the likelihood of the asbestos becoming airborne, during routine use of these products, indicated that *this potential exposure poses a minimal health risk to consumers."* The low levels of asbestos were found primarily in those bags containing straight vermiculite.

The EPA recommends that consumers

- Use vermiculite outdoors or in a well-ventilated area.
- Keep it damp during use
- Avoid bringing vermiculite home on clothing
- Use premixed potting soil which has less vermiculite and more moisture
- Mix it with additives such as peat, sawdust, perlite or bark.

The risks associated with occupational exposures to vermiculite were not addressed in this report and according to EPA officials we contacted, follow-up work in this area is not expected at this time. We were advised that when employees are working around vermiculite or vermiculite products where dust can be seen in the air, they avoid potential inhalation through the use of respiratory protection equipment.

The *Sampling and Analysis of Consumer Garden Products that Contain Vermiculite* report is posted on the EPA's Asbestos website at: http://www.epa.gov/opptintr/asbestos/vermiculite.pdf. Other information on vermiculite and asbestos can be found at www.epa.gov/asbestos.



Courtesy EPA Region 10

Cultural Perspectives

The Target Seedling

Introduction

Nursery management and reforestation in North America have come a long way since the first large scale nurseries were established in the early 1900's. In the past, the entire process was very simple - nurseries produced the seedlings which were then shipped for outplanting. Seedling users took what they got and there wasn't much choice. Tree planting was a mechanical process of getting the seedlings in the ground in the quickest and least expensive manner. Not much thought was given to seedling quality or the possibility of using different stock types.

In the last 25 years, however, more science has been infused into the process. New research into seedling physiology and better-educated customers have revolutionized traditional concepts of reforestation. We now understand much more about how seedlings function-both in the nursery and after outplanting. In particular, the advent of the container seedling showed the importance of nursery cultural practices and vividly demonstrated important concepts like hardiness and dormancy. Today's seedling customers are very well educated, they know what they want, and they have many choices.

My objective in this paper is not to dictate what type of seedling to use but show how some basic concepts can be used to define the best seedling for any outplanting project - the "target seedling".

The Target Seedling Concept

The target seedling is a relatively new concept but the basic idea can be traced back to the late 1970's and early 1980's when new insights into seedling physiology were radically changing nursery management. A literature search of the Forest Nursery Notes database found nothing published on target seedlings before 1990. In that year, however, the Western Forest Nursery Association conducted a symposium to discuss all aspects of the target seedling, and the resultant proceedings are still a major source of information on the subject.

One of the basic tenets of the target seedling concept is that seedling quality is determined by outplanting performance. Although they might be the same species, forest and conservation seedlings are very different from ornamental nursery stock. For example, a Douglas-fir seedling outplanted in the relatively harsh forest environment will have different requirements from one that is outplanted in a city park. These differences are pivotal to the target seedling concept because seedling quality depends on the how the seedlings will be used—"fitness for purpose". This means that seedling quality cannot be merely described at the nursery, it can only be proven on the outplanting site. There is no such thing as an "all-purpose" tree seedling. A nice looking seedling at the nursery will not survive and grow well on all sites.

Defining the Target Seedling

Therefore, a target seedling is a plant that has been grown to survive and grow on a specific outplanting site. "One size fits all" does not apply to reforestation.

A target seedling can be defined in five sequential steps (Figure 1):

1. Objectives of Outplanting Project - The reason why seedlings are being planted will have a critical influence on the characteristics of the target seedling. In traditional reforestation, commercially valuable tree species that have been genetically-improved for fast growth are outplanted with the ultimate objective of producing saw logs or pulp. The target seedling for a restoration project will be radically different. A watershed protection project would require riparian trees, shrubs and wetland plants that will not be harvested for any commercial product. Conservation planting projects can have still different objectives. For example, to establish windbreaks in low rainfall areas with no native trees, exotic species may be required.

2. Proper seed source or vegetative plant material - All nursery managers and reforestation specialists are familiar with the idea of seed source. They know that plant species vary throughout their geographic range because they are adapted to local site conditions.

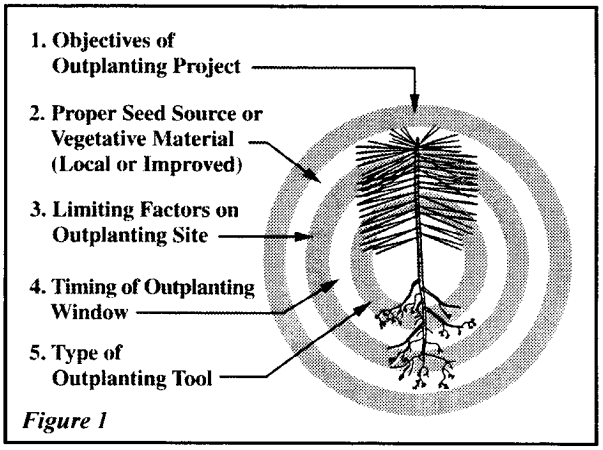


Figure 1

Using a local seed source and collecting from enough individuals to maintain genetic diversity are basic tenets of restoration ecology. The same principals apply to plants that must be propagated vegetatively. Cuttings must be collected from near the outplanting site to make sure that they are properly adapted. Proper seed source can be guaranteed through the use of seed zones, and so the location and elevation of seed is always recorded and included in the seed source identification code.

3. Site conditions - The next step is to identify the limiting factors on the outplanting site. The ecological "principle of limiting factors" can also be applied to reforestation. The specifications of the target seedling should be developed by identifying which environmental factors will be most limiting to survival and growth on that particular site. For example, a fire restoration site in Mexico might have shallow soils and competition for moisture and nutrients from grasses. On the Kenai peninsula in Alaska, however, cold soil temperatures are the limiting factor. Temperature measurements in the shallow rooting zone do not exceed SO °F (10 °C) during the summer and research has shown that root growth almost stops completely below this temperature threshold. After the seedling customer supplies this information, the nursery manager can produce a seedling that will survive and grow under these specific site conditions.

One outplanting site condition deserves special mention - mycorrhizal fungi. Reforestation sites typically have an adequate complement of mycorrhizal fungi that quickly infect outplanted seedlings whereas many restoration sites do not. For example, severe forest fires or mining operations eliminate all soil microorganisms including mycorrhizal fungi. Therefore, seedlings destined for these sites should receive inoculation with the appropriate fungal symbiont before outplanting.

4. Outplanting window - The timing of the outplanting project must also be considered. The outplanting window is the period of time in which environmental conditions on the outplanting site are most favorable for survival and growth. Soil moisture and temperature are the usual constraints. In the Pacific Northwest, seedlings are outplanted during the rains of winter or early spring. However, because winters in Mexico are sunny and dry, seedling outplanting is done early in the summer rainy season (Figure 2).

Soil temperature rather than moisture is the consideration at high elevations or latitudes. In Alaska, the outplanting window is later in the summer when temperatures are at their peak. Using this information

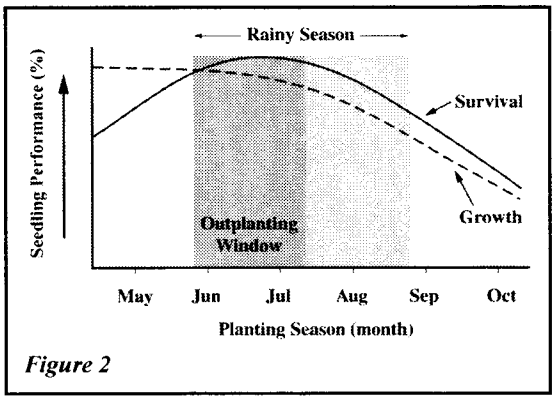


Figure 2

from the seedling customer, a growing schedule for the target seedling can be constructed. Starting at the date of delivery, the nursery manager plans backwards to determine how much time will be required to produce a seedling with the target specifications.

5. Planting Tools - There is an ideal planting tool for each outplanting site. All too often, foresters or other seedling customers will develop a preference for a particular implement because it has worked well in the past. However, no one tool will work under all site conditions. Special planting hoes called hoedads are popular in the steep terrain on the Pacific Northwest but shovels or planting bars are traditionally used in Mexico. The level terrain in the Southern Coastal Plain or on the Kenai peninsula in Alaska allows machine planting. Nursery manager must know the planting tools in advance so that they can grow target seedlings with the appropriate root length and volume.

Improving the Target Seedling

The target seedling is not a static concept but must be continually updated and improved. At the start of the project, the forester and the nursery manager must agree on certain seedling specifications. This prototype target seedling must be verified by outplanting trials in which survival and growth are monitored for up to five years. The first few months are critical because seedlings that die immediately after outplanting indicate a problem with stock quality. Plants that survive initially but gradually lose vigor indicate poor planting or drought conditions. Therefore, plots must be monitored during and at the end of the first year for initial survival. Subsequent checks after 3 or 5 years will give a good indication of seedling growth potential. This performance information is then used to give valuable feedback to the nursery manager who can fine tune the target seedling specifications for the next crop (Figure 3).

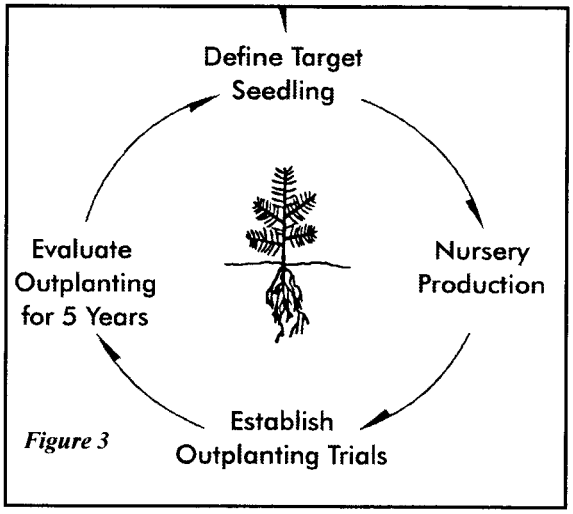


Figure 3

Summary

The target seedling concept emphasizes that successful outplanting projects require good communications between the seedling user and the nursery manager. Instead of the traditional linear process which begins in the nursery, the target seedling concept is viewed as a circular feedback system where information from the outplanting site is used to define and refine the best type of seedling.

Sources

Duryea, M.L. 1985. ed. Evaluating seedling quality: principles, procedures, and predictive abilities of major tests. Proceedings of 1984 Workshop. Corvallis, OR: Forest Research Lab. 143 p.

Ritchie, G.A. 1984. Assessing seedling quality. IN: Duryea, M.L.; Landis, T.D. eds. Forest Nursery Manual: Production of Bareroot Seedlings. Kluwer Academic Press. The Hague: 243-259.

Landis, T.D. 1999. Seedling Stock Types for Outplanting in Alaska. IN: Stocking Standards and Reforestation Methods for Alaska: Proceedings of the Alaska Reforestation Council; 1999 April 29; Anchorage, AK. Misc. Publication 99-8. Fairbanks, AK: University of Alaska, Agricultural and Forestry Experiment Station: 78-84.

Rose, R.; Campbell, S.J.; Landis, T.D. 1990. Target Seedling Symposium: Proceedings, Combined Meeting of the Western Forest Nursery Associations; 1990 August 13-17; Roseburg, OR. Gen. Tech. Rep. RM-200. Ft. Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. **286 p.**

Using A Spreadsheet To Simplify Bareroot Sowing Calculations

Spreadsheets are a great way of keeping lots of data in one place and a quick way of crunching numbers. The following example demonstrates how it can be used to perform sowing calculations. A Microsoft Excel spreadsheet is used in this demonstration, however there are other spreadsheets like Lotus 1-2-3 and Quattro-Pro that work similarly.

Step 1: Start off with a blank spreadsheet. On the first line, type the headings shown in the boxes in Figure I starting with "Lot ID". As you move from cell to cell with the tab key you will notice that the portions of the previous cell-have been written over. Don't worry; the information is just hidden from view.

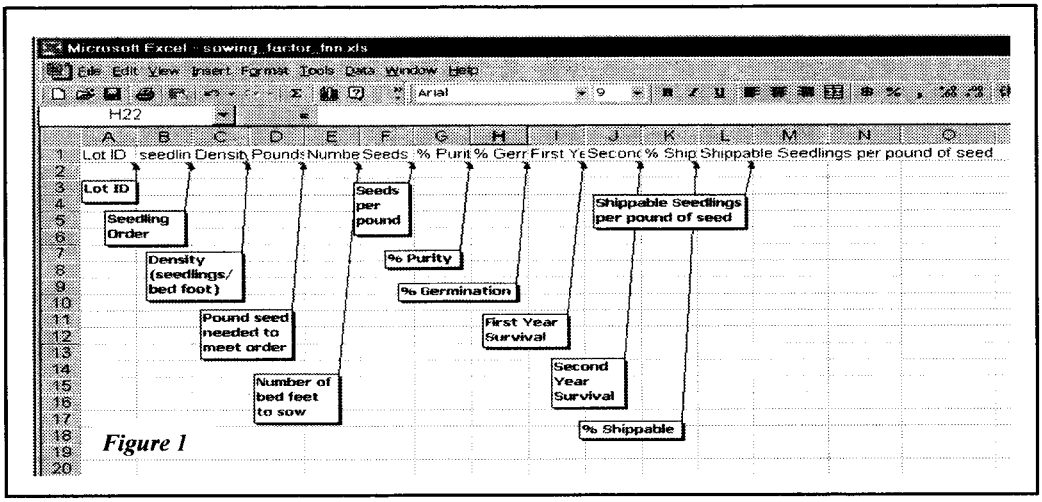


Figure 1

Step 2: Formatting the titles makes any spreadsheet easier to read. Highlight the filled cells by clicking on the first cell with the right mouse button and holding down as you move the curser to the last cell. Then click the left mouse button and a box will appear. Move your curser down to "Format Cells" and click. The "Format Cells" box will appear. Click the "alignment" tab at the top of the "Format Cells" box and change your screen so that it matches the "Text Alignment", "Orientation" and "Text control" shown in Figure 2. Then click "ok".

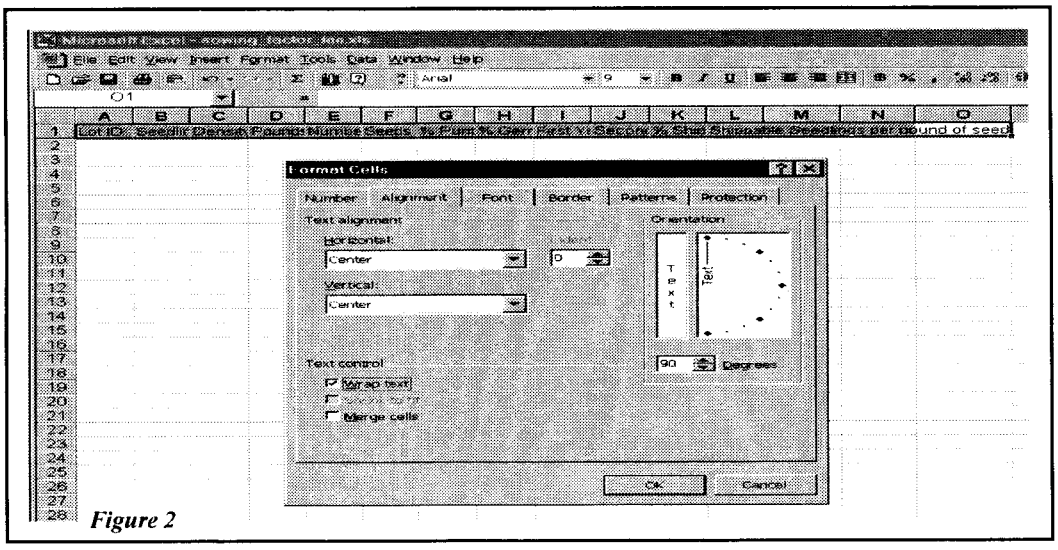


Figure 2

While you are in this box, you can click the "font" tab at the top of the box and change the font size, style, and color to your preference. Then move over to the "border" tab and create the border that you want. You will want to experiment with this.

Step 3: Write the three basic equations just as they are sown in the appropriate cells in Figure 3.

"Pounds of seed needed to meet order" = "Seedling Order" (B2) divided by "Shippable seedlings per pound of seed" (L2). Type =B2/L2 in cell D2.

"Number of bed feet to sow" = "Seedling Order" (B2) divided by "Density" (C2). Type =B2/C2 in cell E2

"Shippable seedlings per pound of seed" = "Seeds per pound" (F2) times "% Purity" (G2) times "% Germination" (H2) times "First year survival" (I2) times "Second year survival" (J2) times "% Shippable" (K2). Type =F2*G2*H2*I2*J2*K2 in cell L2.

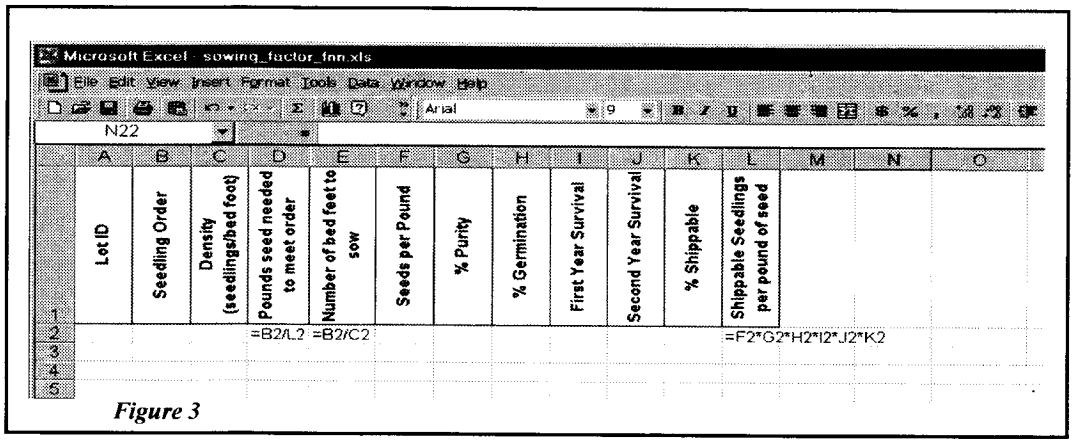


Figure 3

Step 4: Fill in the seed data as shown in Figure 4. As you fill in the values on the first line, you will notice that cells with equations are now calculated values.

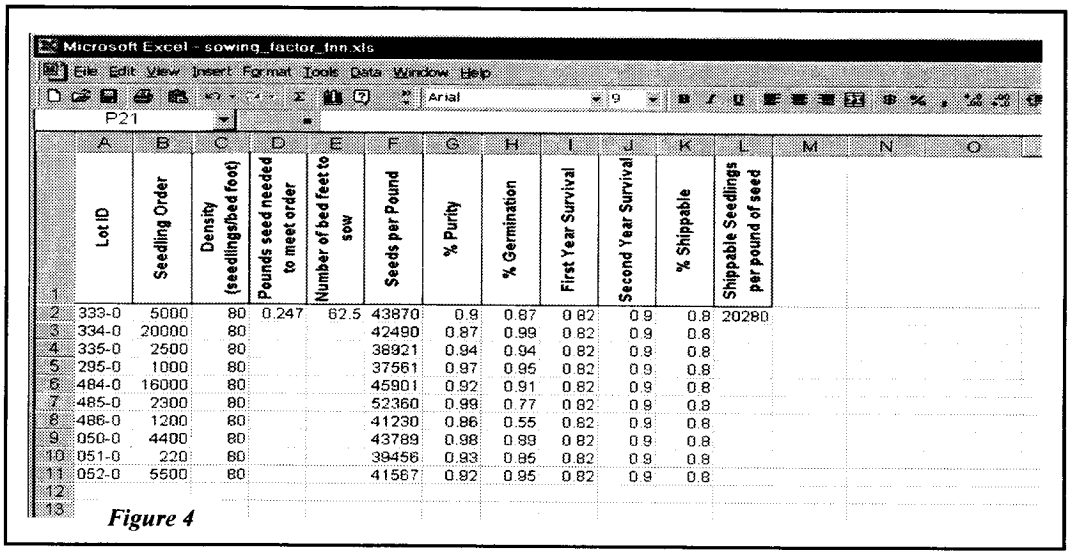
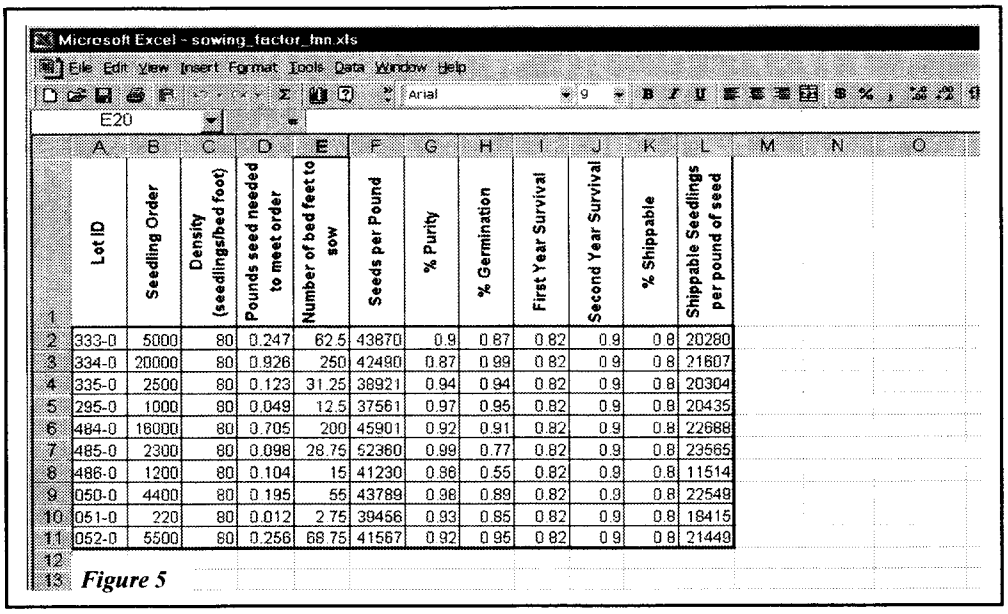


Figure 4

Step 5: To fill in the equations for the other cells in the columns, right click on cell L2 and bring the curser to the lower right side of the cell. The curser turns from an arrow into a cross. Hold down on the right mouse button as you pull down the curser to the bottom of the column. Let go and the calculation for the shippable seedlings per pound will appear for each row of data. Do the same for columns D and E. Format the table using the instructions in Step 2 and you have now created a table of sowing calculations shown in Figure 5.



	A	B	C	D	E	F	G	H	I	J	K	L
1	Lot ID	Seedling Order	Density (seedlings/bed foot)	Pounds seed needed to meet order	Number of bed feet to sow	Seeds per Pound	% Purity	% Germination	First Year Survival	Second Year Survival	% Shippable	Shippable Seedlings per pound of seed
2	333-0	5000	80	0.247	62.5	43870	0.9	0.87	0.82	0.9	0.8	20280
3	334-0	20000	80	0.926	250	42490	0.87	0.99	0.82	0.9	0.8	21607
4	335-0	2500	80	0.123	31.25	38921	0.94	0.94	0.82	0.9	0.8	20304
5	295-0	1000	80	0.049	12.5	37561	0.97	0.95	0.82	0.9	0.8	20435
6	484-0	18000	80	0.705	200	45901	0.92	0.91	0.82	0.9	0.8	22688
7	485-0	2300	80	0.098	28.75	52360	0.99	0.77	0.82	0.9	0.8	23565
8	486-0	1200	80	0.104	15	41230	0.98	0.55	0.82	0.9	0.8	11514
9	050-0	4400	80	0.195	55	43789	0.98	0.89	0.82	0.9	0.8	22549
10	051-0	220	80	0.012	2.75	39456	0.93	0.85	0.82	0.9	0.8	18415
11	052-0	5500	80	0.256	68.75	41567	0.92	0.95	0.82	0.9	0.8	21449
12												
13	***Figure 5***											

With this procedure you have quickly calculated the pounds of seed to draw from each lot to meet the clients order and number of bed feet to sow for each lot. Try this with your own sowing requests or modify it to meet your own sowing formulas.

Winter "Purpling" In Pine Seedlings

Most nursery workers are familiar with the rather dramatic change in foliar color that occurs in some pine seedlings. Over the years, I have received several inquiries as to the cause and developed the following explanation:

Species Affected:
Jack pine *(Pinus banksiana)*
Lodgepole pine *(Pinus contorta)*
Ponderosa pine *(Pinus ponderosa)*
Scots pine *(Pinus sylvestris)*

Physiological Basis: "Purpling results from cessation of normal primary metabolism, especially protein synthesis, with diversion of the amino acid phenylalanine into secondary metabolites such as the phenylpropanoid anthocyanins via the enzyme phenylalanine ammonia lyase".

Translation: Purpling is caused by the accumulation of anthocyanin pigments in needle tissue. Anthocyanins are normally red but, when combined with the green of chlorophyll pigments, are modified to a purple color.

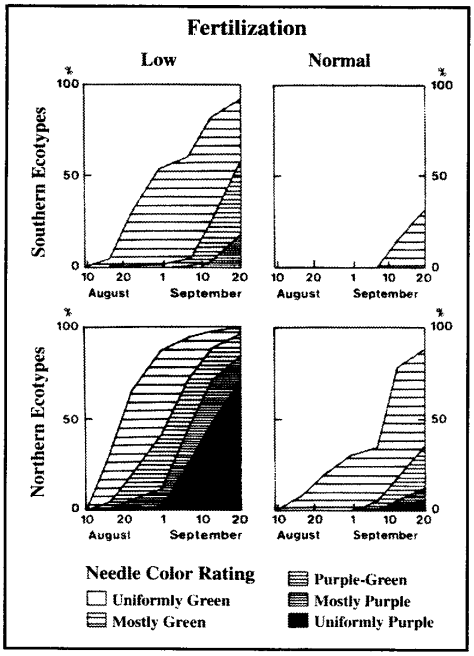


Figure 1 *- Winter purpling of Scots pine was related to both ecotype and fertilization level (Toivonen and others 1991)*

Implications:

1. Purpling is strongly controlled by seed source with northern sources turning purple earlier than those from further south (Figure 1).

2. Purpling is primarily induced by cold temperatures although a shortening photoperiod is also involved.

3. Mineral nutrient content is not a major factor because even healthy seedlings turn purple. However, low fertility, especially with nitrogen and phosphorus, will cause earlier and more intense coloration (Figure 1).

4. Although purpling is a visible indication of dormancy, it cannot be considered a direct indication of cold hardiness.

Conclusion: The ecological purpose of purpling in first-year pines is unknown but it remains an interesting phenomenon.

Sources:

Nozzolillo, C.; Isabelle, P.; Das, G. 1990. Seasonal changes in the phenolic constituents of jack pine seedlings *(Pinus banksiana)* in relation to the purpling phenomenon. Canadian Journal of Botany 68(9): 2010-

Toivonen, A.; Rikala, R.; Repo, T.; Smolander, H. 1991. Autumn coloration of first year *Pinus sylvestris* seedlings during frost hardening. Scandinavian Journal of Forest Research 6(1): 31-39.

Integrated Pest Management

Holistic Nursery Pest Management

An expanded version of this article has just been published in the Proceedings from the IUFRO-Diseases and Insects in Forest Nurseries meeting in Finland (see #98 in New Nursery Literature).

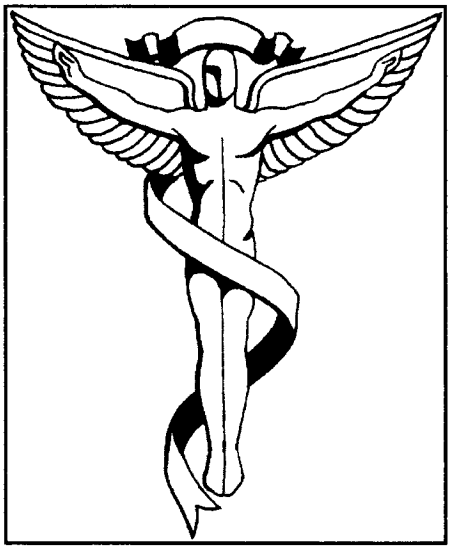


Figure 1 - *Holistic medicine views the patient as a whole person and considers the importance of the environment.*

Holistic medicine is a relatively recent movement that emphasizes the need to perceive patients as whole persons. It developed as a response to the increasing specialization in medical education that was producing physicians who treated organs rather than the body as a whole. Searching for a cure, patients were referred from doctor to doctor but each was a specialist in one narrav field. None could see the "big picture" or provide the patient with a comprehensive diagnosis. Another concern was the increasing dependence on drugs in the treatment of disease. Many patients felt that doctors were merely prescribing drugs to treat symptoms, rather than trying to find out the real cause of the disease. Holistic medicine developed as a response to these concerns.

Many of the principles of holistic medicine can be applied to nursery pest management:

Give as much attention to the environment as the pest.

One of the basic tenets of holistic medicine is to recognize how much environment contributes to disease. Everyone is aware of the "disease triangle" concept which emphasizes that a pest, a host, and a conducive environment are all necessary to cause disease. However, the environment often gets overlooked. Nursery workers, and especially pest specialists, tend to focus on specific pest organisms and fail to appreciate the critical importance of the environment in the nursery management. Following holistic principles, we should always consider environmental stresses instead of just working to control pest organisms.

For example, consider the greenhouse environment. The principal reason for raising seedlings in containers in a greenhouse is that all potentially growth-limiting factors can be controlled (Table I). Seedlings are sown at regular spacing in an artificial soil mix that is formulated for ideal pH and porosity. The atmospheric environment is automated to maintain ideal temperature and relative humidity both day and night.

The ideal propagation environment of a greenhouse has both advantages and disadvantages

	Advantages	**Disadvantages**	
	No growth-limiting factors in physical environment	Ideal conditions for some pests	No beneficial organisms
Edaphic Factors	1) Water 2) Mineral nutrients	Fungus gnats, *Bradysia spp.*	Mycorrhizal fungi
Atmospheric Factors	3) Light 4) Humidity 5) Carbon dioxide 6) Temperature	Botrytis blight, *Botrytis cinerea*	Insect parasites

Table 1

Even carbon dioxide is supplied to accelerate photosynthesis. Unfortunately, what is ideal for seedling growth is also ideal for nursery pests such as fungus gnats *(Bradysia* spp.) and Botrytis blight *(Botrytis cinerea).* The sterile greenhouse environment also excludes many beneficial organisms including mycorrhizal fungi and insect parasites that can keep pest populations in check (Table 1). The ideal growing environment also produces seedlings that are not as hardy as those grown under natural conditions. In particular, high fertilization rates designed to accelerate seedling growth rates also make them susceptible to abiotic stresses.

? ? Are we spending too much time looking for an organism with a "smoking gun"?

To borrow an analogy from detective novels, we should not become obsessed with trying to identify a "suspect" pest. Most common nursery pests, such as the fungi *Pythium* and *Fusarium,* are not aggressive pathogens but pest specialists have spent a considerable amount of time trying to implicate a particular fungal species or ecotype for a specific disease. These fungi are commonly found in both bareroot and container nurseries and the diseases they cause are usually triggered by environmental stresses. As an example, fungal damping-off is usually not a problem unless soils and growing media become compacted or waterlogged (Figure 2).

? ? Are we treating secondary conditions instead of the real problem?

Continuing with our root disease example, a great deal of research has been aimed at identifying root pathogens when it might make more sense to work towards creating a better root environment. For instance, we should attempt to create and maintain soils and growing media with the proper amount of aeration porosity. Air exchange only occurs in the relatively large macropores because the smaller micropores are typically filled with water. Excessive compaction during seedbed formation or when filling containers can destroy these macropores. During the growing season, aeration porosity fluctuates due to irrigation and rainfall when macropores become filled with water. Maintaining adequate porosity in containers is even more difficult because macropores are lost as roots grow. Aeration porosity is gradually reduced as roots expand throughout the container and, by the end of the growing season, is reduced to almost zero because roots have occupied every macropore. This may explain why root diseases often develop late in the growing season when opportunistic fungi attack the weakened roots. Returning to our holistic theme, the real problem behind these root diseases is poor aeration and not merely the presence of pathogenic fungi.

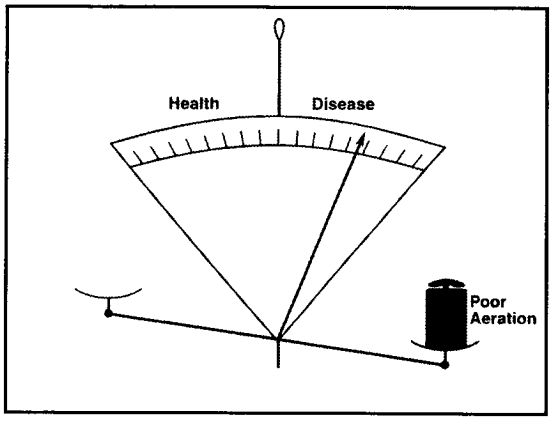


Figure 2 *- Most root diseases are triggered by environmental stresses in the soil, especially poor aeration.*

? ? Conclusions and Recommendations

The basic concepts of holistic medicine can be applied to forest and conservation nurseries in several different ways:

1. Get training in seedling physiology and horticulture -Most people only see what they know. The mystical poet William Blake said it well:

"A fool sees not the same tree that a wise man sees"

All nursery workers, and especially pest specialists, need a basic understanding of seedling physiology and horticultural practices so that they can better diagnose the true cause of seedling problems and design holistic control measures.

2. Put greater emphasis on prevention - Instead of just looking for diseases or insects, pest specialists should work with nursery managers to stress seedling health and modify propagation environments to discourage pests. Consider the example of fungus gnats in a greenhouse. These ubiquitous pests can never be completely eliminated in this wet, moist environment but their populations can be kept to manageable levels by employing holistic practices, especially careful water management.

3. Use pesticides only when necessary - This philosophy should be the cornerstone of nursery pest management: pesticides should be used only after all other environmental and cultural controls have been considered. In applying this concept, the Forest Research Nursery at the University of Idaho reduced the amount of pesticide solution they applied by 80% while still maintaining the same level of seedling production.

This dramatic example was achieved by employing a full range of holistic practices: vigorous sanitation to keep pests from entering the propagation environment, growing regimes that promote hardy seedlings, careful water management, and good ventilation to lower humidity.

4. Promote practical use of beneficial microorganisms -For example, mycorrhizal fungi have been a popular topic for many years and there seems to be a variety of opinions as to their value in forest and conservation nurseries. Some "true believers" feel that mycorrhizae are essential for all phases of nursery culture as well as outplanting, whereas many nursery managers are more skeptical. The holistic approach stresses that mycorrhizal inoculation can be worthwhile, but that the timing of inoculation and the species of fungus should be matched to nursery objectives. In particular, the fungal species should be selected for either the nursery or the outplanting site. There is no "all-purpose" fungus that will perform well under both conditions. Fungal species that are adapted to withstand outplanting conditions will not survive under the high moisture/high nutrient nursery environment and vice versa. Therefore, nursery pest specialists must work with the nursery personnel and seedling customers to explain that the species of fungus, the type of inoculum, and the timing of the inoculation will vary with the objectives of the treatment.

So, I think that you can see that taking a holistic approach to nursery management can create a better cultural environment and reduce the use of pesticides. It will be necessary to take small risks in order to test holistic principles but I think that you will be pleasantly surprised by what you learn.

Sources:

Dumroese RK, Wenny DL, Quick KE. 1990. Reducing pesticide use without reducing yield. Tree Planters' Notes 41(4): 28-32.

Heiskanen J. 1993. Favourable water and aeration conditions for growth media used in containerized tree seedling production: a review. Scandinavian Journal of Forest Research 8(3): 337-358.

James RL, Dumroese RK, Gilligan CJ, Wenny DL. 1989. Pathogenicity of Fusarium isolates from Douglas-fir seed and container-grown seedlings. University of Idaho, College of Forestry, Wildlife and Range Sciences, Bulletin 52. 10 p.

Landis TD. 1984. The critical role of environment in nursery pathology. IN: Dubreuil, S.H. ed. 31S` Western International Forest Disease Work Conference, proceedings: 27-31.

Lilja A, Lilja S, Kurkela T, Rikala R. 1997. Nursery practices and management of fungal diseases in forest nurseries in Finland: a review. Silva Fennica 31(1): 547-556.

Thornton, 1. 1996. A Holistic Approach to Pest Management. Nursery Management and Production. 12(6): 47 49.

Equipment, Products, and Services

Organic Matter - What You Should Know Before You Buy

Organic matter is an essential ingredient in growing a successful bareroot seedling crop and should play an important part in every nursery's soil management strategy. Here are a few things to think about when shopping for organic matter.

Consider Your Objectives

The type of organic matter you consider purchasing should be based on clear objectives specific to your site and needs. There are several reasons or objectives (see Table 1) for applying organic matter: 1) short term or long term tilth (improving soil physical and chemical properties); 2) addition of nutrients; 3) seedling disease control; 4) seedbed mulch; 5) frost protection and 6) erosion control. Some objectives overlap. For instance, organic matter for seedbed mulching will also provide erosion control and long-term soil tilth when incorporated into the soil between crop rotations. However, others do not - organic material that adds nutrients to soil or cover crops grown for erosion control can sometime promote seedling diseases. Understanding the characteristics of the available organic matter and how you intend to use it will help you determine which material to purchase.

Once you have settled on your objectives locating a source will be easier but nevertheless, still challenging. Paying attention to details will help you avoid the horror stories that some nursery managers have experienced over the years.

Here is a checklist of things to consider.

? **Composition**

Visit the site where the organic matter is being stockpiled. What you see in the pile is what you will eventually get. For instance, leaves obtained from municipal recycling programs can contain trash, including such items as shoes, oilcans, and toys. If this material is not removed before it is delivered to your nursery, you will have to have it removed when it arrives (Figure 1). Decide on the size range that is acceptable for your objectives. Sawdust material can range from dust to large chunks of scrap lumber (Figure 3). Both sizes can pose problems. Discuss your desired range with the seller. Often the unwanted material can be removed through screening.

Determine how much of the material is actually organic matter? It is not uncommon to have soil, gravel and even ash mixed into the material. While small amounts might be ok, your objective is to incorporate organic matter, not something else. There are several tests offered at soil testing facilities that can be used to determine percent organic matter but the most common is the LOI (loss on ignition). This is simply burning a known weight of material at very high temperatures and weighing the noncombustible remains. This test tends to report somewhat higher organic matter percentages than is actually present in the sample. Based on these results, you will have to decide how much inert material you will accept. There is no real guide for making this decision since every source and nursery circumstance is different. The best approach

	Objectives						
	Short-term tilth	Long-term tilth	Nutrient addition	Disease control	Seedbed mulch	Erosion control	Frost protection
Straw					+	+	+
Alfalfa cover crop	+		+	-		+	
Fresh sawdust	+	+		+	+	+	
Aged sawdust	+	+		+	+	+	
Sewage sludge	+	+	+		-	?	
Composted manure	+		+		-	+	
Pine needles	+	+		?	+	+	+

Table 1. Common Sources of Organic Matter and Objectives

is to revisit your original objectives for why you are applying organic matter and see if this extra material helps or hinders meeting these objectives.

Figure 1: *Leaves obtained from municipal recycling programs often include trash that must be removed at the nursery.*

? Weeds and toxic substances

There are many tales of woe of how weeds or toxic substances were brought into a nursery through the addition of organic matter purchased from an outside source. You don't want to add to these stories! One simple test can address both these concerns - sow seeds in a sample of the product and observe the results. Here's one way to do it. You will need seed that is stratified and ready for sowing, 3 mason jars with lids and a magic marker (Figure 2). It is advisable to use several species. Fill separate jars with 1) nursery soil (control), 2) organic material, and 3) organic material mixed with soil at the ratio that you plan to incorporate into your nursery beds. The jars should be a half to two thirds full and the material moist but not saturated. In each jar place 10 seeds on the surface and cover with the material normally used in your sowing operations. Screw on the lid and label with date, treatment and species used. Punch a few holes in the lids for aeration. Place jars in a germinator at the optimum temperature for that species or leave somewhere on a windowsill where it does not get direct sunlight. The jars make for great conversation pieces.

Observe these jars over the course of several weeks and note how many seeds have germinated. Compare germination rates and appearance of germinants with those of other jars. Is there much of a difference? Did the seedlings come up at different times? Are there differences in appearance? You might also see germination of seed that you did not sow. Make note of this. These will be the weeds that you introduce to your nursery if you purchase this material. If you see poorer germination and growth between materials and the control you should consider either not buying the material or conducting further testing. One test is to incorporate the material into your soil. This can be done in small plots that are established before sowing or transplanting. Seed germination and seedling growth can be evaluated over the first or second growing season to see what differences occur.

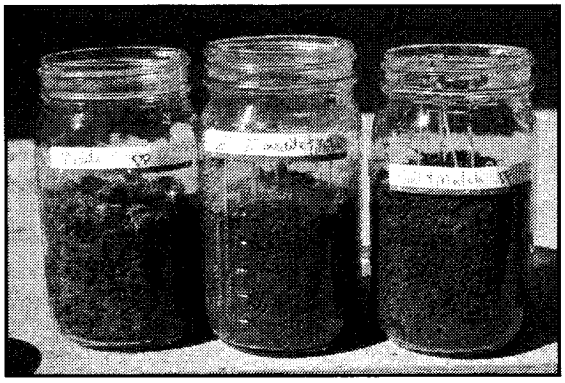


Figure 2: *Seeds grown on organic material can identify if it includes weeds or toxic substances*

? pH and Soluble Salts

pH and soluble salt tests are reasonably inexpensive to perform and will yield very basic information about the material. Both tests can be done at your nursery with the purchase of a pH and electrical conductivity meters. The optimum pH values for forest tree nurseries generally range from 5.5 to 6.0. Purchasing organic matter with values more than 1.0 outside of this range should be discussed with a nursery consultant to determine how the material will affect the overall soil pH.

Presence of salts is detected with an electrical conductivity meter. Incorporating material that is high in soluble salts can decrease germination and reduce survival and growth of most species.

Electrical conductivity values greater than 2 milliSeimens/cm^2 (mmhos/cm^2) are usually too high for good sources of organic matter.

? **Mineral Nutrients**

If you are considering buying organic matter that is high in nutrients, you must decide if these are nutrients you actually need for your soil. Reviewing recent soil test results for your nursery and your soil management plan will help you make this decision. In some instances, organic matter containing excessive nutrients can actually interfere with other macro or micro nutrients, making them less available to the plant.

? **Costs**

Maintaining or increasing the present organic matter in your nursery soil can be very expensive . Not only the purchase but also the transportation, spreading and incorporation in the soil, can be as expensive as the material itself. Costs however, should never prevent you from making organic matter an integral part of your soil management program, nor compromise your objectives. High costs might make you consider different sources and easier ways of applying and incorporating into the soil.

Figure 3: *Large wood scraps are common in sawdust piles and should be screened.*

Sampling & Lab Testing

As they say with computers, garbage in ...garbage out, the same goes with soil testing. Testing laboratories will only give you information on the samples that you send them, so it is important to collect enough samples and in the right areas to be representative of the material you are interested in purchasing.

Collect several composite samples representing different portions of the piles and locate where you collected them on a map. To collect a composite sample, randomly dig from one area at least a half dozen shovel-size scoops and mix into a bucket. Take your sample from that. Obtain samples from deep in the pile as well as on the surface. Keep in mind that the testing facilities will sieve out gravel-sized and larger material. Since sawdust, bark and other organics often contain material larger than this, it is important to notify the lab not to sieve your sample.

Look for a reputable lab that will process these samples quickly and use the same lab to maintain consistency from year to year. As a check for lab quality, take one sample and split it in half. Send each as a separate sample to see if the results that come back are the same. To check lab consistency from year to year, collect a large sample and keep in a cooler or freezer. Take a sample from this reference whenever a group of samples are sent to the lab. The results from these samples should be the same from year to year.

Sources

Bellamy, K.L., Chong, C., and Cline, R.A. Paper sludge utilization in agriculture and container nursery culture. 1995. Journal of Environmental Quality 24(6): 1074-1082.

Blumenthal, S. G. And Boyer, D.E. Organic amendments in forest nursery management in the Pacific Northwest. 1982. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Administrative Report. 73 p.

Bollen, W. B. and LU, K.C. Sour sawdust and bark - its origin, properties and effect on plants. 1970 USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Research Paper PNW-108, 13 p.

Davey, C.B. Nursery soil management - organic amendments. 1996. In: National proceedings, Forest and Conservation Nursery Associations, p.6-18. Landis, T.D. and South, D.B., tech. Cords. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-389.

Davey, C.B. Sawdust composts: their preparation and effect on plant growth. Soil Sci. Soc. Am. Proc. 17:59-60: 1953.

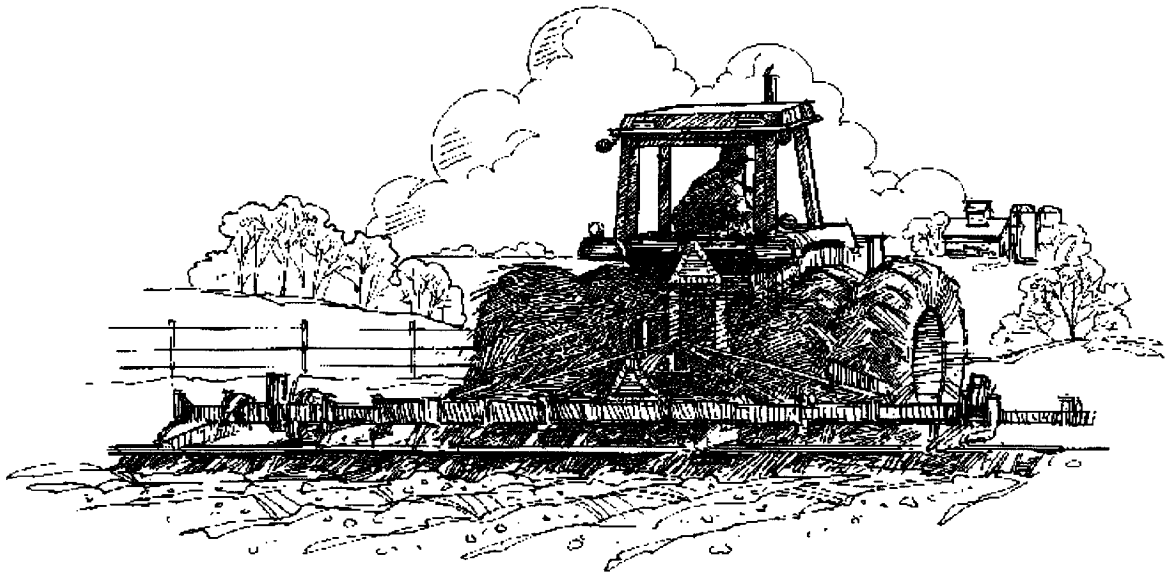
Dierauf, T.A. A five-year study of different sawdust and nitrogen rates in a loblolly pine nursery. 1991. Virginia Department of Forestry, Occasional Report 94. 19p.

Marquardt, D. Analyze This. 2000. American Nurseryman. 191(11): 40-42.

Rose, R. An overview of the role of organic amendments in forest nurseries. 1994. IN; USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-243, p 43-50. Landis, T.D., ed. Proceedings: Northeastern and Intermountain Forest and Conservation Nursery Associations.

Rose, R. and Haase, D.L. Managing organic matter in forest nurseries. 1996. IN: National proceedings, Forest and Conservation Nursery Associations, p 250-252. Landis, T.D. and South, D.B., tech. Cords. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-389.

Stone, J.K. and Hansen, E.M. Green manure effects on soilborne pathogens. Northeastern and intermountain Forest and Conservation Nursery Association Meeting, St. Louis Missouri, August 2-5, 1993.



The Growers Hot Vats - Container Sterilization Equipment

Hot water sterilization has been used to control pests that might be held over in used containers . Most pathogens and weed seeds are killed when containers are held at 70°C to 80°C (158-176°F) for 3 minutes (Figure 1).

Growers Hot Vats are designed to sterilize any type of container that will fit into them. Blocks or containers are stacked into a cage (Figure 2), which is hydraulically submerged into a hot water vat. This system uses a gas burner to maintain a constant temperature - there is no wait between cycles for the water to warm back up.

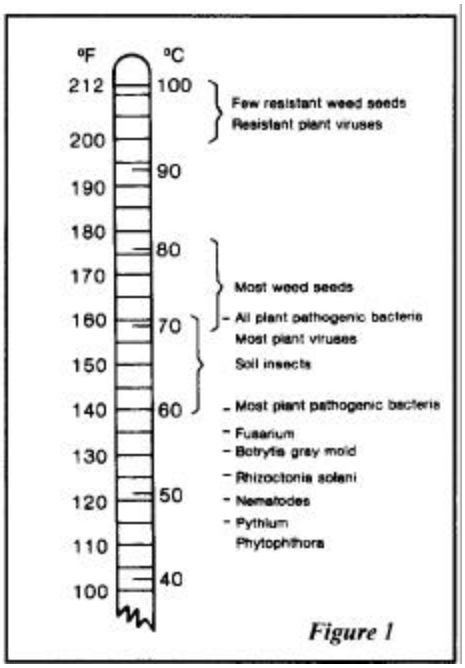


Figure 1

Production is only limited by the speed at which the blocks can be placed in and out of the cage. The manufacturer supplies baskets for stacking containers before lifting into the Hot Vat, however, this involves heavy lifting by hand. An alternative is to fabricate a stand with rollers that easily moves racks of containers into the Hot Vat (Figure 2). The rack can be loaded on the ground and then lifted with a forklift onto the stand. This speeds up the process and eliminates hand lifting.

The number of blocks that can be sterilized in one dip depends on the size and dimensions of the blocks and how they are arranged. Generally 50 Styroblocks can be dipped at one time. Using the system described above, two people can keep the vat in constant use, which equates to about 300 to 350 dips per hour.

This product has been on the market for about two years and since then the company has modified the vat based on consumer feedback. It costs $8250 without shipping. For more information call Northern at 1.800.328.8900 or E-mail at <northern@willmer.com>.

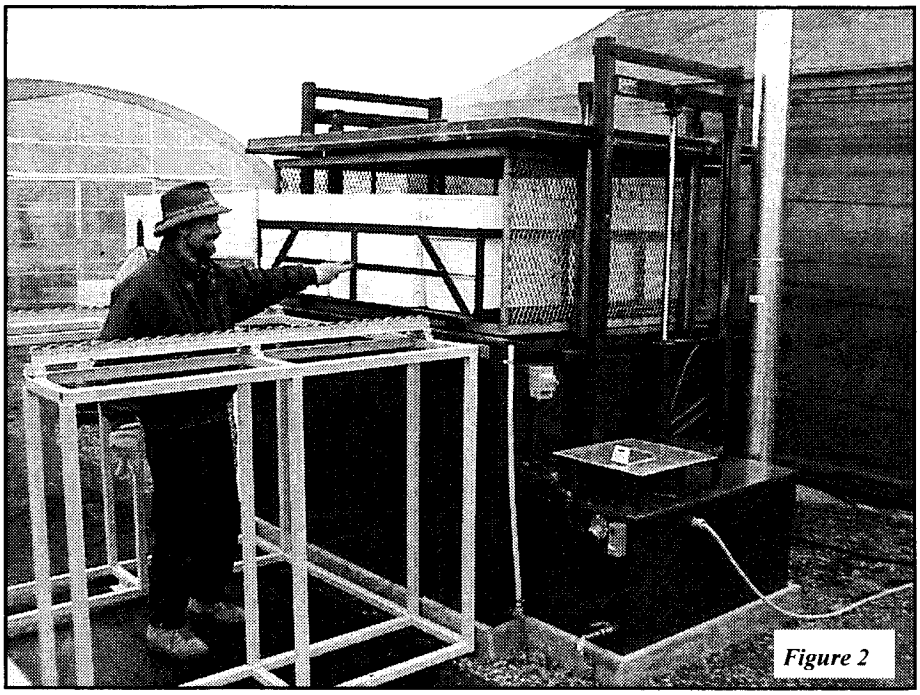


Figure 2

The Thermochron iButton - Miniaturized Temperature Recorders

Imagine a computer, clock and thermometer condensed into the size of a small battery, no larger than several nickels stuck together (Figure 1). Then, imagine that this object can record temperatures between -40°C to +85°C (-40°F to +185°F) for more than 10 years or up to 1 million temperature measurements, whichever comes first. Set the price at around $10 and you have the new DS 1921 Thermochron iButton. Since this single-chip recording device is submersible, and resistant to dirt and impact it can be used to monitor most temperatures encountered in the nursery.

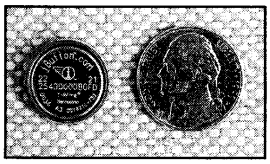


Figure 1

Placing an iButton into the Blue Dot receptor (a $25 attachment to a PC) will instantly call up its history and allow it to be reprogrammed for future missions. Data is displayed in a temperature over time chart and in a histogram (figure 2) showing how many minutes the temperatures where out of the target temperature range that you define. The data can also be downloaded into a spreadsheet or right onto it's own website (each button is web addressable).

One time period where reliable temperature data is critical for assessing stock quality is from harvesting to outplanting. For many seedlings this can be as long as 6 months. For example, an iButton could be placed into a tub of seedlings during lifting, remain with the seedlings through packing and then into long-term storage. Months later, after the seedlings have been moved from storage, transported to the outplanting site, a forester could remove the iButton. The temperature information could be downloaded on the spot or taken back to the office to print out a graph. The forester could immediately see how many total hours the seedlings were outside of a critical temperature range such as above 3°C (38°F) or below -3°C (27°F) and determine when this happened.

Another great aspect of this technology is that sensors can be quickly and easily downloaded at any point in time and then placed back into position for further recording. Any tampering with an iButton is recorded into its memory and detected electronically. The Thermochron iButton is priced at $10.00 each in quantities of 1,000. You might want to start with the Thermochron iButton Evaluation Kit, which is available for $25 from <www.iButton.com>. This kit includes an iButton, Blue Dot receptor, and mounting accessories. Downloadable evaluation software is available at no charge at that website.

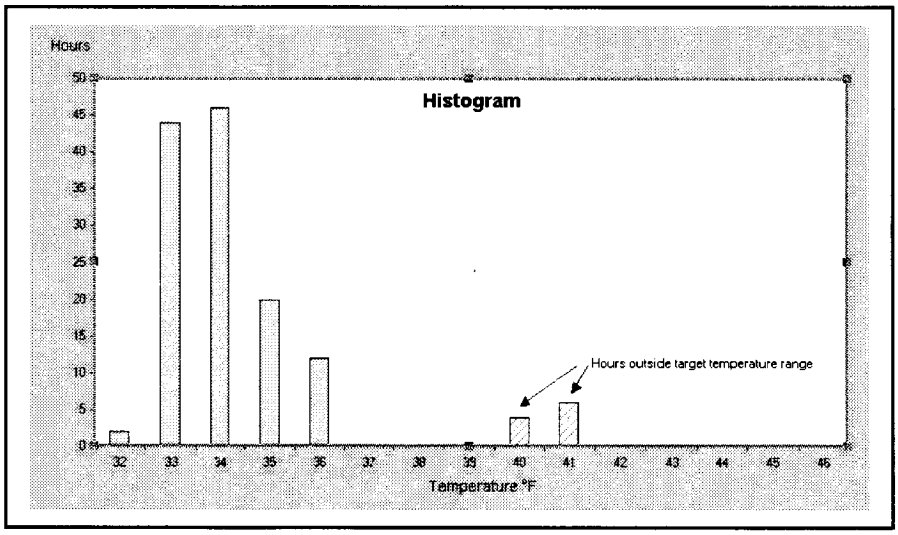
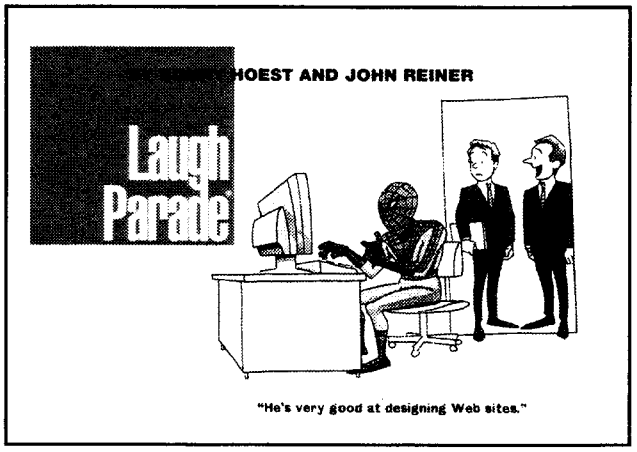
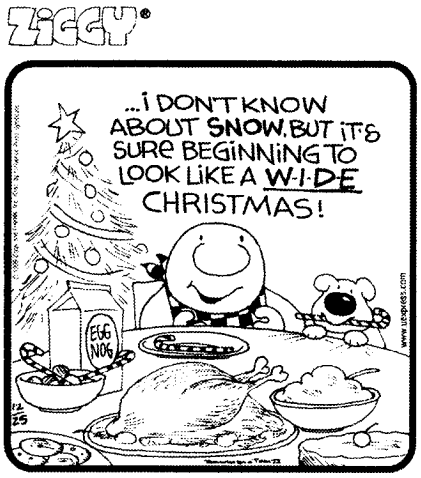


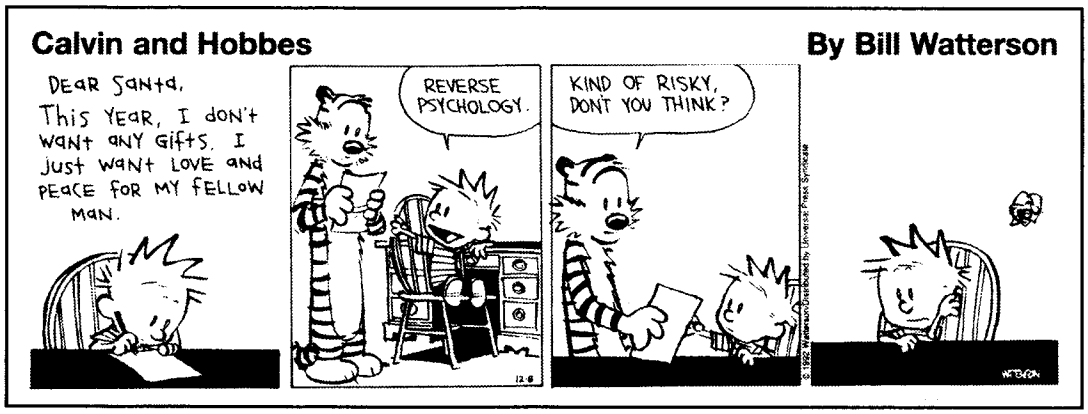
Figure 2

Horticultural Humor





ZIGGY, ZIGGY AND FRIENDS, INC. Reprinted with permission of UNIVERSAL PRESS SYNDICATE. All rights reserved



CALVIN AND HOBBES© Watterson. Reprinted with permission of UNIVERSAL PRESS SYNDICATE. All rights reserved.

CLOSE TO HOME JOHN McPHERSON

Christmas at Monty Hall's house.

CLOSE TO HOME© John McPherson. Reprinted with permission of UNIVERSAL PRESS SYNDICATE. All rights reserved.

New Nursery Literature

Copies of the following journal articles or publications are free and can be ordered using the Literature Order Form on the last page. Just write in the appropriate number or letter on the form and return it to us. Note that there are three restrictions:

1. Limit in the Number of Free Articles: In an effort to reduce mailing costs, we are limiting the number of free articles that can be ordered through the FNN literature service. All subscribers will be restricted to 25 free articles per issue. If you still want additional articles, then you will have to order them on a fee basis from Donna Loucks, the librarian who maintains the FNN database. Just fill in the number of the fee articles on the bottom half of the order form, return it to us, and we will forward it to Donna.

2. Copyrighted Material. Items with © are copyrighted and require a fee for each copy, so only the title page and abstract will be provided through this service. If you want the entire article, then you can order a copy from a library service or from Donna.

3. Special Orders (SO). Special orders are books or other publications that, because of their size or cost, require special handling. For some, the Forest Service has procured copies for free distribution, but others will have to be purchased. Prices and ordering instructions are given below or following each listing in the New Nursery Literature section.

Contenedores y Medios de Crecimiento: Manual de Viveros para la Producción de Especies Forestales en Contenedor, Volumen Dos.

Fertilización y Riego: Manual de Viveros para la Producción de Especies Forestales en Contenedor, Volumen Cuarto.

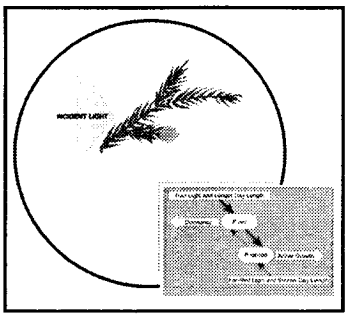
These two softbound publications are the Spanish translations of Volume Two: Containers and Growing Media, and Volume Four: Seedling Nutrition and Irrigation of the Container Tree Nursery Manual series. The translations were done by Dr. Dante Rodriguez of the University of Chapingo in Mexico and the layout and printing were processed and financed by Ricardo Sanchez of the National Program of Reforestation of the Secretary of Environment, Natural Resources, and Fisheries of the Government of Mexico.

COST: Call for Price

ORDER FROM:

Jose Ricardo Sanchez Velazquez
SEMARNAP/Dir. Gral. PRONARE, SIRE
Periferico Sur 5991 3er. Piso
Col. Arenal Tepepan
Mexico D.F. 16020
MEXICO
TEL: (52) 56.41.28.45 or 56.41.17.76
FAX: (52)55.55.74.05
E-MAIL: dqrapel@netmex.com

Ecophysiology of Northern Spruce Species: The Performance of Planted Seedlings by Steven C. Grossnickle. 2000. Ottawa, ON, CANADA: NRC Research Press. 409 p.



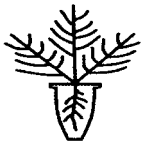
This hardbound books focuses on the physiological processes of northern spruce species at the whole plant level in response to the surrounding environment. Chapter topics include water relations, gas exchange, mineral nutrition, freezing tolerance, dormancy, and morphological development. It provides a good review of basic seedling physiology and contains many good color and black-and-white illustrations.

COST: $49.95.

ORDER FROM:
Monograph Orders, NRC Research Press
M-55, National Research Council Canada
Ottawa, Ontario K 1 A OR6
Canada
TEL: 613.990.2254
FAX: 613. 952.7656
WEBSITE: www.nrc.ca/cisti/joumals/mgraphs.html

Bareroot Production

1. © **Effects of root wrenching on leaf mineral content of *Prunus avium* and *Castanea sativa* seedlings.** Hipps, N. A.; Samuelson, T. J.; Farman, L. G. Canadian Journal of Forest Research 30:958-963. 2000.



Container Production

2. **Growing longleaf pine seedlings in containers.** Barnett, J. P.; McGilvray, J. M. Native Plants Journal 1(1):54-58. 2000.

3. **Stem development in young plants.** Whitcomb, C. Nursery Management and Production 16(5):67-68, 70-72. 2000. Spacing, removal of lower limbs, protection from wind, nitrogen, root branching play important roles.

Diverse Species

4. **Chilling requirements for seed germination of 10 Utah species of perennial wild buckwheat *(Eriogonum* Michx. [Polygonaceae]).** Meyer, S. E Paulsen, A. Native Plants Journal 1(1):18-24. 2000.

5. **Debunking native myths.** Anella, L. B. American Nurseryman 192(4):39-40, 42, 44. 2000. Native plants have seen a resurgence in popularity, but is this new-found acceptance for the right reasons?

6. © **Dormancy-breaking and germination requirements for seeds of *Diervilla lonicera* (Caprifoliaceae), a species with underdeveloped linear embryos.** Hidayati, S. N.; Baskin, J. M.; Baskin, C. C. Canadian Journal of Botany 78:11991205. 2000.

7. **Ecology and conservation biology of the endangered plant species *Solidago shortii* (Asteraceae).** Baskin, J. M.; Walck, J. L.; Baskin, C. C.; Buchele, D. E. Native Plants Journal 1(1):35-41. 2000.

8. **Effects of light and temperature on the germination and seedling vigour of *Atriplex cordobensis* (Gandoger et Stuckert) seeds harvested in autumn and winter.** Aiazzi, M. T.; Di Rienzo, J. A.; Arguello, J. A. Seed Science and Technology 28:477-484. 2000.

9. **Harvesting native seeds with a gas hedge trimmer.** van der Grinten, M.; Ayers, B. M. Native Plants Journal 1(2):120. 2000.

10. **IR-4 program: registering pesticides for specialty plants.** Frank, J. R. Native Plants Journal 1(2):106. 2000.

11 **The longleaf pine ecosystem of the south.** Outcalt, K. W. Native Plants Journal 1(1):42-44, 47-53. 2000.

12. **Mason State nursery: a model for prairie plant production.** Dumroese, R. K.; Pequignot, S.; Horvath, D. Native Plants Journal 1(1):10-12, 14-17. 2000.

13. **Mayapple's cancer-fighting precursor.** Canel, C. Agricultural Research 48(7):9. 2000.

14. ***Meehania cordata:* a great ground cover for the landscape.** Glick, B. Native Plants Journal 1 (1):30-31. 2000.

15. **Mystery solved on Spring Creek: *Trautvetteria caroliniensis.*** Glick, B. Native Plants Journal I (2):82-83. 2000.

16. **Native Americans and their plants: linking the past with the future.** Luna, T. Native Plants Journal 1(2):95-101 . 2000.

17. **Native fern propagation in Glacier National Park's native plant nursery.** Luna, T. Native Plants Journal 1(1):5-9. 2000.

18. **Native warm-season grass and forb establishment using imazapic and 2,4-D.** Washburn, B. E.; Barnes, T. G. Native Plants Journal 1(1):61-69. 2000.

19. **Planting cactus pear on raised beds versus planting on flat land.** Labib, S. Journal of the Professional Association for Cactus Development 3:37-39. 1998.

20. **Propagation of redhead grass *(Potamogeton perfoliatus L.)* transplants for restoration projects.** Kujawski, J.; Thompson, R. Native Plants Journal 1(2):124-127. 2000.

21. **Propagation protocol for *Hierochloe odorata,* sweetgrass.** Window, S. Native Plants Journal 1 (2): 102-103. 2000.

22. **Propagation protocol for wild rice *(Zizania palustria L.* [Poaceae]).** Luna, T. Native Plants Journal 1(2): 104-105. 2000.

23. **Propagation protocols on the Native Plant Network.** Landis, T. D.; Dumroese, R. K. Native Plants Journal 1(2):112-114. 2000.

24. **Protocol for growing Kankakee mallow *(Iliamna remota).*** Flood, R.; Horvath, D.; Blessman, G. Native Plants Journal I(1):13-14. 2000.

25. **Revegetating slag refuse areas with native warm season grasses.** Bush, T.; Koch, P. Native Plants Journal I (2):77-81. 2000.

26. **Saguaro cactus: cultural significance and propagation techniques in the Sonoran Desert.** Paten M. J.; Siquieros, B. Native Plants Journal 1 (2):90-94. 2000.

27. **Seed and seedling production of blue wild-rye *(Elymus glaucus).*** Archibald, C.; Feigner, S.; Visser, J. Native Plants Journal 1(1):32-34. 2000.

28. © **Seed coat dormancy in two species of *Grevillea* (Proteaceae).** Morris, E. C.; Tieu, A.; Dixon, K. Annals of Botany 86:771-775. 2000.

29. © **Seed germination response to cold stratification period and thermal regime in *Phacelia secunda* (Hydrophyllaceae).** Cavieres, L. A.; Arroyo, M. T. K. Plant Ecology 149:1-8. 2000.

30. **Sowing the seed: initiating a native plant restoration program (Michigan).** Schultz, J. L. Ecological Restoration 17(4):239. 1999.

31. **Users guide to description, propagation and establishment of native shrubs and trees for riparian areas in the intermountain west.** Ogle, D. G.; Hoag, J. C.; Scianna, J. D. USDA, Natural Resources Conservation Service, TN Plant Materials Technical Note 32. 22 p. 2000.

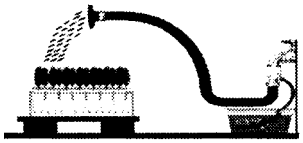
32. **Vegetated erosion control mats for site stabilization.** van der Grinten, M.; Gregory, L. L. Native Plants Journal I(2):121-122. 2000.

33. **Where there's smoke ... there's germination?** Landis, T. D. Native Plants Journal 1(1):25-29. 2000.

34. **Wiregrass propagation at the Andrews Nursery in Florida.** Pittman, T.; Karrfalt, R. P. Native Plants Journal 1(1):45-47. 2000.

35. **Writing woody plant specifications for restoration and mitigation projects.** Buffs, S. Native Plants Journal 1(2):116-119. 2000.

Fertilization and Nutrition



36. **Combined effect of slow release fertilizer and fertigation on nutrient use of *Cupressus glabra* grown in nursery conditions.** Eymar, E.; Cadahia, C.; Sanchez, A.; Lopez-Vela, A. Agrochimica 44(I -2):39-48. 2000.

37. **Controlling fertilizers in production.** Ferry, S.; Zablocki, J. Greenhouse Grower 18(8):50, 54-56. 2000. Water-soluble and controlled-release fertilizers combined can offer the most efficient control.

38. **Detection of mineral deficiencies in ornamentals.** Mathers, H. Nursery Management and Production 16(5):48-50, 52, 55-56. 2000. Schedule frequent tissue, water & soil tests.

39. © **Differences in nitrate and ammonium uptake between Scots pine and European larch.** Malagoli, M.; Dal Canal, A.; Quaggiotti, S.; Pegoraro, P.; Bottacin, A. Plant and Soil 221:1-3. 2000.

40. © **Effect of manganese on endomycorrhizal sugar maple seedlings.** Schier, G. A.; McQuattie, C. J. Journal of Plant Nutrition 23(10):1533-1545. 2000.

41. **How to correct nutritional problems.** Whipker, B. E.; Pitchay, D. S.; Gibson, J. L.; Nelson, P. V.; Campbell, C. R. Greenhouse Management and Production 20(6):38-40, 42-44, 46. 2000.

42. **Making sense of soluble salts.** Stamps, R. H. Greenhouse Grower 18(8):44, 49. 2000. Here are a few tips for interpreting the electrical conductivity (EC) levels of your crops.

43. **Nitrogen and carbon mineralization dynamics of manures and composts.** Hartz, T. K.; Mitchell, J. P.; Giannini, C. HortScience 35(2):209-212. 2000.

44. © **Physiological responses of black spruce layers and planted seedlings to nutrient addition.** Paquin, R.; Margolis, H. A.; Doucet, R.; Coyea, M. R. Tree Physiology 20:229-237. 2000.

45. **Saline solution.** Cabrera, R. I. American Nurseryman 191(11):32 -34, 336-38. 2000. Using the proper methods, growers can extract leachate to monitor and manage soluble salts in field and container operations.

46. © **Soluble proteins and dehydrins in nitrogen-fertilized Scots pine seedlings during deacclimation and the onset of growth.** Kontunen-Soppela, S.; Taulavuori, K.; Taulavuori, E.; Lahdesmaki, P.; Laine, K. Physiologia Plantarum 109:404-409. 2000.

47. © **Study of conifer nitrogen nutrition using hydroponic cultures: application to fertigation systems.** Sanchez, A.; Cadahia, C.; Eymar, E.; Masaguer, A. Journal of Plant Nutrition 23 (7):1007-1024. 2000.

48. **Supplements can reduce the fertilizer needs of loblolly pine.** Davenport, S. American Nurseryman 192(8):56-57. 2000.

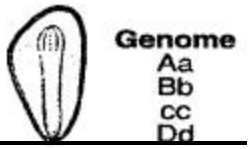
49. © **The use of different soil nitrogen sources by young Norway spruce plants.** George, E.; Stober, C.: Seith, B. Trees: Structure and Function 13:199205. 1999.

General and Miscellaneous

50. **Phytoremediation: using plants to clean up soils.** Becker, H. Agricultural Research 48(6):4-9. 2000.

51. **The role of planted forests in a "green certified" century.** Powers, R. F. IN: Forest Vegetation Management Conference, proceedings, 21st annual, p.1-17. 2000.

Genetics and Tree Improvement



52. © **Differences in growth and branch production by young plants of two provenances of *Quercus robur L.*** Harmer, R. Forestry 73(3):273-281. 2000.

53. © **Genetics of cold hardiness in a cloned full-sib family of coastal Douglas-fir.** Anekonda, T. S.; Adams, W. T.; Aitken, S. N.; Neale, D. B.; Jermstad, K. D.; Wheeler, N. C. Canadian Journal of Forest Research 30:837-840. 2000.

54. **New plant development: Part 3 - cold-resistance breeding.** Mathers, H. The Digger 44(7):59-60. 2000.

Mycorrhizae & Beneficial Microorganisms

55. © **Colonization and growth promotion of outplanted spruce seedlings pre-inoculated with plant growth-promoting rhizobacteria in the greenhouse.** Shishido, M.; Chanway, C. P. Canadian Journal of Forest Research 30:845-854. 2000.

56. **Ectomycorrhization of *Acacia holosericea* A. Cunn. ex G. Don by *Pisolithus* spp. in Senegal: effect on plant growth and on the root-knot nematode *Meloidogyne javanica.*** Duponnois, R.; Founoune, H.; Ba, A.; Plenchette, C.; El Jaafrari, S.; Neyra, M.; Ducousso, M. Annals of Forest Science 57:345-350. 2000.

57. © **Ectomycorrhization of six *Acacia auriculiformis* provenances from Australia, Papua New Guinea and Senegal in glasshouse conditions: effect on the plant growth and on the multiplication of plant parasitic nematodes.** Duponnois, R.; Founoune, H.; Lesueur, D.; Thioulouse, J.; Neyra, M. Australian Journal of Experimental Agriculture 40:443-450. 2000.

58. © **Effects of ectomycorrhizas and vesicular-arbuscular mycorrhizas, alone or in competition, on root colonization and growth of** *Eucalyptus globulus* and *E. uropltylla.* Chen, Y. L.; Brundrett, M. C.; Dell, B. New Phytologist 146:545-556. 2000.

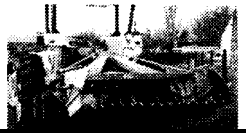
59. © **Effects of inoculation with *Frankia* on the growth and nutrition of alder species and interplanted Japanese larch on restored mineral workings.** Moffat, A. J. Forestry 73(3):215-223. 2000.

60. © **Endophytic colonization and field responses of hybrid spruce seedlings after inoculation with plant growth-promoting rhizobacteria.** Chanway, C. P.; Shishido, M.; Nairn, J.; Jungwirth, S.; Markham, J.; Xiao, G.; Holl, F. B. Forest Ecology and Management 133:81-88. 2000.

61. **Influence of the ectomycorrhizas formed by *Tuber melanosporum* Vitt. on hydraulic conductance and water relations of** *Quercus ilex* **L. seedlings.** Nardini, A.; Salleo, S.; Tyree, M. T.; Vertovec, M. Annals of Forest Science 57:305312. 2000.

62. © **Kinetics of phosphate absorption by mycorrhizal and non-mycorrhizal Scots pine seedlings.** Van Tichelen, K. K.; Colpaert, J. V. Physiologia Plantarum 110:96-103. 2000.

Nursery Structures & Equipment



63. **Diffusion confusion.** Svenson, S. E. Nursery Management and Production 16(8):39-42, 44. 2000. Comparing shade cloth and poly film for shading nursery crops.

64. **Don't skimp on materials for building greenhouse floors.** Bartok, J. W., Jr. Greenhouse Management and Production 20(6):80, 82. 2000.

65. **Equipment makes re-covering greenhouse glazing easy.** Bartok, J. W., Jr. Greenhouse Management and Production 20(9):85-86. 2000.

66. **Put a lid on heating costs with thermal screens.** Roberts, W. J. Greenhouse Management and Production 20(8):72, 74, 76, 81. 2000.

67. **Reduce your heating costs.** Bartok, J. W., Jr. Greenhouse Management and Production 20(8):9193. 2000.

68. **Using flat-roof retractables for spring frost protection.** Svenson, S.; Bell, N.; Henderson, A. The Digger, 44(9):25, 27, 29-31. 2000. Study shows considerable difference in crop protection among open exposure beds, poly-film-covered hoop houses and retractable-roof greenhouses.

Outplanting Performance

69. **Blue oak mini-plug transplants:** how they compare to standard bareroot and container stock. McCreary, D. D.; Lippitt, L. Native Plants Journal 1(2):84-89. 2000.

70. © **Delayed growth response of mountain birch seedlings to a decrease in fertilization and temperature.** Weih, M. Functional Ecology 14:566-572. 2000.

71. © **Early outplanting performance of nutrient-loaded containerized black spruce seedlings inoculated with *Laccaria bicolor:* a bioassay study.** Quoreshi, A. M.; Timmer, V. R. Canadian Journal of Forest Research 30:744-752. 2000.

72. © **Effect of uninucleate *Rhizoctonia* on the survival of outplanted Scots pine and Norway spruce seedlings.** Lilja, A.; Rikala, R. Forest Pathology 30:109-115. 2000.

73. © **Effect of ventilation on growth of *Prunus avium* seedlings grown in treeshelters.** Bergez, J. E.; Dupraz, C. Agricultural and Forest Meteorology 104:199-214. 2000.

74. © **Experimental studies of potential improvements in the forest regeneration capabilities of "seed-containing aerial darts".** Wood, A. D. Forestry Chronicle 76(3):406-418. 2000.

75. **Fall versus spring planting in the Sierra Cascade region.** Livingston, T. J. IN: Forest Vegetation Management Conference, proceedings, 21st annual, p.60-62. 2000.

76. © **Growth of mountain birch seedlings in early-successional patches: a year-round perspective.** Weih, M. Plant Biology 2:428-436. 2000.

77. **Homemade dibble facilitates planting willow and cottonwood cuttings.** McCreary, D. D.; Tecklin, J. Native Plants Journal 1(1):59-60. 2000.

78. **Interaction of initial seedling size, fertilization, and vegetation control.** Ketchum, J. S.; Rose, R. IN: Forest Vegetation Management Conference, proceedings, 21st annual, p.63-69. 2000.

79. **Management strategies and objectives for successful reforestation planning.** Newton, M. IN: Forest Vegetation Management Conference, proceedings, 21st annual, p.18-21. 2000.

80. © **Organic amendment and mycorrhizal inoculation as a practice in afforestation of soils with *Pinus halepensis* Miller: effect on their microbial activity.** Garcia, C.; Hernandez, T.; Roldan, A.; Albaladejo, J.; Castillo, V. Soil Biology and Biochemistry 32:1173-1181. 2000.

81. **Planting morphologically improved pine seedlings to increase survival and growth.** South, D. B. Alabama Agricultural Experiment Station, Forestry and Wildlife Research Series 1. 12 p. 2000.

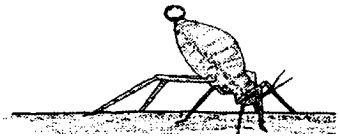
82. **Practical magic.** Marcus, L. American Nurseryman 192(7):46-49. 2000. Biostimulants claim to allow growers to safely transplant trees at any time of the year. Bio-Plex is an organic concentrate which helps the plant retain moisture.

83. © **Q*uercus rugosa* seedlings dynamics in relation to its re-introduction in a disturbed Mexican landscape.** Bonfil, C.; Soberon, J. Applied Vegetation Science 2:189-200. 1999.

84. **Reforesting dry sites with container stock.** Haywood-Farmer, S.; Kiiskila, S.; van Eerden, E. IN: Forest Vegetation Management Conference, proceedings, 21st annual, p.23-26. 2000.

85. © **Tree growth on rehabilitated skid roads in southeast British Columbia.** Dykstra, P. R.; Curran, M. P. Forest Ecology and Management 133:145-156. 2000.

SO. **Ecophysiology of northern spruce species: the performance of planted seedlings.** Grossnickle, S. C. NRC Research Press. 409 p. 2000. Focuses on the physiological processes of northern spruce species at the whole plant level in response to the surrounding environment. Discusses: water relations, gas exchange, mineral nutrition, freezing tolerance, dormancy, and morphological development. ORDER FROM: Monograph Orders, NRC Research Press, M-55, National Research Council Canada, Ottawa, Ontario K1A OR6 Canada. Phone: (613) 990-2254. Fax: (613) 952-7656. www.nrc.ca/cisti/joumals/mgraphs.htmi. Price: $49.95.



Pest Management

86. © **Combined soil treatments and sequence of application in improving the control of soilborne pathogens.** Eshel, D.; Gamliel, A.; Grinstein, A.; Di Primo, P.; Katan, J. Phytopathology 90:751-757. 2000.

87. **Common herbaceous perennial diseases.** Williams-Woodward, J. L. Greenhouse Management and Production 20(10):46-50, 52. 2000. Describes pathogens, susceptible plants, symptoms, cultural control and chemical control for fungal leaf spots and blights, powdery mildew, downy mildew, bacterial leaf spots, root rot, *Rhizoctonia* root rot and web blight, foliar nematode, virus, and southern blight.

88. **Contamination of pine seeds by *Fusarium circinatum.*** Dwinell, L. D.; Fraedrich, S. W. Finnish Forest Research Institute, Research Paper 781, p. 75-82. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

89. **Diseases and pests in forest nurseries in Croatia during 1998.** Glavas, M. Finnish Forest Research Institute, Research Paper 781, p. 247. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

90. **Doggone smart deer control.** Fogle, J. M. American Nurseryman 192(6):54-56. 2000. Employing an invisible-fence technology system, growers are calling out the dogs to keep deer at bay.

91. **Ectomycorrhizal fungi as biological control agents against *Rhizoctonia* root infection of container-grown Scots pine seedlings.** Niemi, K.; Lilja, A.; Kasurinen, A.; Heinonen-Tanski, H. Finnish Forest Research Institute, Research Paper 781, p. 151-162. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

92. **The effect of nursery applied fungicides on the growth and mycorrhiza abundance of Scots pine seedlings.** Laatikainen, T.; Juntunen, M. L.; Heinonen-Tanski, H. Finnish Forest Research Institute, Research Paper 781, p. 177-187. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

93. © **Effects on growth and comparison of root tissue colonization patterns of *Eucalyptus viminalis* by pathogenic and nonpathogenic strains of *Fusarium oxysporum.*** Salerno, M. L; Gianinazzi, S.; Gianinazzi-Pearson, V. New Phytologist 146:317-324. 2000.

94. **Epidemiology and integrated management of web blight in bamboo nurseries in India.** Mohanan, C. Finnish Forest Research Institute, Research Paper 781, p. 107-121. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 -Diseases and insects in forest nurseries. 2000.

95. **Experience with different diagnostic techniques to detect *Phytophthora* species in water.** Themann, K.; Werres, S. Finnish Forest Research Institute, Research Paper 781, p. 83-87. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

96. **Forest nursery extension - means for advisory in plant protection.** Poteri, M. Finnish Forest Research Institute, Research Paper 781, p. 33-37. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

97. **Genetic variation of *Pyrenopeziza betulicola,* the causative agent of birch leaf spot disease.** Paavolainen, L.; Hantula, J.; Kurkela, T. Finnish Forest Research Institute, Research Paper 781, p. 201-206. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

98. **Holistic nursery pest management: a new emphasis on seedling health.** Landis, T. D. Finnish Forest Research Institute, Research Paper 781, p. 5- I 5. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

99. **Introduction of rootrainer technology in forestry - impact on nursery disease management.** Mohanan, C. Finnish Forest Research Institute, Research Paper 781, p. 39-47. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

100. **Managing *Botrytis* diseases.** Powell, C. C. Nursery Management and Production 16(5):82, 84. 2000.

101. **Morphological, molecular and pathological characteristics of Rhizoctonia-like fungi from Spanish forest nurseries.** El Bakali, M. A.; Martin, M. P. Finnish Forest Research Institute, Research Paper 781, p. 139-149. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

102. © **Natural products with antifungal activity from *Pseudomonas b*iocontrol bacteria.** Ligon, J. M.; Hill, D. S.; Hammer, P. E.; Torkewitz, N. R.; Hofmann, D.; Kempf, H. J.; van Pee, K. H. Pest Management Science 56:688-695. 2000.

103. **New weapons in ornamental disease control: powerful tools for resistance management are available.** Mathers, H. Nursery Management and Production 16(9):43-50, 52-53. 2000.

104. **On the powdery mildew disease of some forest seedlings in Egypt: host range, seasonal variation and influence of light intensity on disease severity.** El-Settawy, A. A. A. Finnish Forest Research Institute, Research Paper 781, p. 207-213. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

105. © **Overwintering and comparative sampling of *Neoseiulus fallacis* (Acari: Phytoseiidae) on ornamental nursery plants.** Pratt, P. D.; Croft, B. A. Environmental Entomology 29(5):10341040. 2000.

106. **Pathogenicity of anamorph of *Ceratobasidium bicorne.*** Lilja, A.; Rikala, R.; Heiskanen, J.; Tervo, L.; Heinonen, R. Finnish Forest Research Institute, Research Paper 781, p. 123-137. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

107. © **Pathogenicity of *Bursaphelenchus sexdentati*, *Bursaphelenchus leoni* and *Bursaphelenchus hellenicus* on European pine seedlings.** Skarmoutsos, G.; Michalopoulos-Skarmoutsos, H. Forest Pathology 30:149-156. 2000.

108. **Pest problems and fumigation in pine nurseries in southern United States.** Fraedrich, S. W.; Dwinell, L. D. Finnish Forest Research Institute, Research Paper 781, p. 249. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 -Diseases and insects in forest nurseries. 2000.

109. **Possible use of mycorrhizas and host plant secondary metabolites for control of insect herbivores on Scots pine.** Manninen, A. M.; Holopainen, T.; Vuorinen, M.; Holopainen, J. K. Finnish Forest Research Institute, Research Paper 781, p. 163-175. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

110. **Preliminary report on root-knot nematode disease of *Acacia mangium* seedlings.** Chuo, M. Finnish Forest Research Institute, Research Paper 78 l , p. 243-246. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 -Diseases and insects in forest nurseries. 2000.

111. **Presence of *Fusarium* species in diseased *Pinus radiata* seedlings in forest nurseries in Argentina.** Lori, G.; Salerno, M. L; Wolcan. S. Finnish Forest Research Institute, Research Paper 781, p. 65-74. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

112. **A review of foliage disease, and their control, of nursery seedlings in Shimane Prefecture, Japan.** Suto, Y. Finnish Forest Research Institute, Research Paper 781, p. 215-223. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

113. © **Seedling inoculation distinguishes lodgepole pine families most and least susceptible to gall rust.** White, E. E.; Allen, E. A.; Ying, C. C.: Foord, B. M. Canadian Journal of Forest Research 30:841-843. 2000.

114. **Some new and rare forest tree seedling diseases in the Czech Republic.** Jancarik, V.; Prochazkova, Z. Finnish Forest Research Institute, Research Paper 781, p. 225-230. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

115. **Status of forest nursery diseases in India and emerging trends in seedling disease management.** Mohanan, C. Finnish Forest Research Institute, Research Paper 781, p. 231242. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

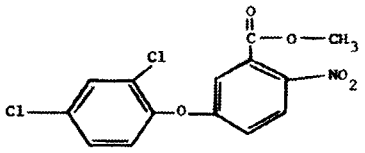
116. **Substitute creature.** Hayes, C. American Nurseryman 192(5):43-45. 2000. To prevent fungal infections on plants, growers can sometimes substitute a beneficial fungus for chemicals.

117. © **Survival of Sclerotium cepivorum Sclerotia and *Fusarium oxysporum* chlamydospores in soil amended with cruciferous residues.** Smolinska, U. Journal of Phytopathology 148:343-349. 2000.

118. **Timing fungicide applications for control of Scleroderris canker: efficacy of fungicides applied to spores, hyphae and diseased seedlings.** Petaisto, R. L.; Juntunen, J. L. Finnish Forest Research Institute, Research Paper 781, p.189-200. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

119. **Virulence of Fusarium oxysporum on Douglas fir germinants: comparison of isolates from nursery soil and roots of healthy and diseased seedlings.** James, R. L.; Perez, R.; Dumroese, R. K.; Wenny, D. L. Finnish Forest Research Institute, Research Paper 781, p. 49-64. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.

120. **Weeds, diseases, insects and mites and use of pesticides in Finnish forest nurseries - results of a survey study.** Juntunen, M. L. Finnish Forest Research Institute, Research Paper 781, p. 17-32. Proceedings of the 4th meeting of IUFRO Working Party 7.03.04 - Diseases and insects in forest nurseries. 2000.



Pesticides

121. © **The fate and mobility of copper from chemical root control barriers in soil and leachate.** Kosuta, S.; Hamel, C. Environmental Pollution 110:165-170. 2000.

122. **IR-4 registers success.** Aylsworth, J. D. Greenhouse Grower 18(8):138-140, 142. 2000. It's a program you may not be aware of, but it helps you almost every day.

123. **The latest on chlorpyrifos.** Nursery Management and Production 16(7):81. 2000. EPA's enforcement of FQPA claims first major victim.

124. **The latest on common pesticides for ornamentals.** Powell, C. C. Nursery Management and Production 16(9):74-76. 2000.

Seedling Harvesting and Storage

125. © **Effect of warm storage and date of lifting on the quality of Douglas-fir seedlings.** Harper, C. P.; O'Reilly, C. New Forests 20:1-13. 2000.

126. **Seedling lifting and storage and how they relate to outplanting.** Landis, T. D. IN: Forest Vegetation Management Conference, proceedings, 21st annual, p.27-32. 2000.

127. © **Species and seasonal variability in the sensitivity of seedling conifer roots to drying and rough handling.** McKay, H. M.; Milner, A. D. Forestry 73(3):259-270. 2000.

128. © **Storability and root freezing tolerance of Norway spruce (*Picea abies*) seedlings.** Stattin, E.; Hellqvist, C.; Lindstrom, A. Canadian Journal of Forest Research 30:964-970. 2000.

Seedling Physiology and Morphology

129. © **Accurate root length measurement by image analysis.** Kimura, K.; Kikuchi, S.; Yamasaki. S. Plant and Soil 216:117-127. 1999.

130. © **Annual dynamics of the content of nonstructural saccharides in the context of structural development of vegetative buds of Norway spruce.** Lipavska, H.; Svobodova, H.; Albrechtova, J. Journal of Plant Physiology 157:365-373. 2000.

131. © **Chlorophyll fluorescence and CO_2 assimilation of black spruce seedlings following frost in different temperature and light conditions.** Lamontagne, M.; Bigras, F. J.; Margolis, H. A. Tree Physiology 20:249-255. 2000.

132. © **Combined effects of shade and drought on tulip poplar seedlings: trade-off in tolerance or facilitation?** Holmgren, M. Oikos 90:67-78. 2000.

133. © **Container-grown tree seedling responses to sodium chloride applications in different substrates.** Fostad, O.; Pedersen, P. A. Environmental Pollution 109:203-210. 2000.

134. © **The effects of intermittent flooding on seedlings of three forest species.** Anderson, P. H.; Pezeshki, S. R. Photosynthetica 37(4):543-552. 1999.

135. © **Frost hardiness, height, and dormancy of 15 short-day, nursery-treated interior spruce seed lots.** Hawkins, C. D. B.; Shewan, K. B. Canadian Journal of Forest Research 30:1096-1105. 2000.

136. © **Growth responses of *Quercus petraea, Fraxinus excelsior* and Pinus sylvestris to elevated carbon dioxide, ozone and water supply.** Broadmeadow, M. S. J.; Jackson, S. B. New Phytologist 146:437-451. 2000.

137. © **The influence of temperature, daylength and calendar date on cold tolerance of *Rhododendron.*** Cameron, R. W. F.; Dixon, G. R. Journal of Horticultural Science and Biotechnology 75(4):481-487. 2000.

138. **Morphological and physiological responses of oak seedlings *(Quercus petraea* and *Q. robur)* to moderate drought.** Thomas, F. M.: Gausling, T. Annals of Forest Science 57:325-333. 2000.

139. © **Photosynthetic characteristics of 10 *Acacia* species grown under ambient and elevated atmospheric CO_2.** Evans, J. R.; Schortemeyer, M.; McFarlane, N.; Atkin, O. K. Australian Journal of Plant Physiology 27:13-25. 2000.

140. **Root electrolyte leakage and root growth potential as indicators of spruce and larch establishment.** McKay, H. M. Silva Fennica 32 (3):241-252. 1998.

141. **Water content is often not a good parameter for tree quality.** Joustra, M. K.; Kunneman, B. P. A. M.; Ravesloot, M. B. M. Acta Horticulturae 517:31-37. 2000.

SO. **Effects of light on root growth in the early establishment phase of western larch *(Larix occidentalis)* and Douglas-fir *(Pseudotsuga menziesii).*** Ovalle, P. M.S. thesis, University of Idaho. 27 p. 2000. OBTAIN VIA INTERLIBRARY LOAN through your local library.

Seed

142. © **Beneficial effects of moist chilling on the seeds of black spruce *(Picea mariana* [Mill.] B.S.P.** Wang, B. S. P.; Berjak, P. Annals of Botany 86:29-936. 2000.

143. **Dormancy of yellow cedar *(Chamaecyparis nootkatensis)* [D. Don] Spach) seeds is effectively terminated by treatment with 1-propanol or nitrate in combination with a warm water soak, gibberellin and moist chilling.** Xia, J. H.; Kermode, A. R. Seed Science and Technology 28:227-240. 2000.

144. **Dry after ripening does not stimulate the germination of shallowly dormant Sitka spruce (*Picea sitchensis* [Bong. Carr.) seeds.** Gosling, P. G. Seed Science and Technology 28:507-511. 2000.

145. **Effect of desiccation and temperature on germination and vigour of the seeds of *Hopea parviflora* Beddome and H. *ponga* (Dennst.) Mabb.** Rajeeswari Dayal, B.; Kaveriappa, K. M. Seed Science and Technology 28:497-506. 2000.

146. © **Germination response of seven east Australian *Grevillea* species (Proteaceae) to smoke, heat exposure and scarification.** Morris, E. C. Australian Journal of Botany 48:179-189. 2000.

147. © **Impact of *Leptoglossus occidentalis* (Hemiptera: Coreidae) on Douglas-fir seed production.** Bates, S. L.; Borden, J. H.; Kermode, A. R.; Bennett, R. B. Journal of Economic Entomology 93(5):1444-1451. 2000.

148. © **Soluble sugar content of white spruce (*Picea glauca*) seeds during and after germination.** Downie, B.; Bewley, J. D. Physiologia Plantarum 110:1-12. 2000.

149. **Using the *fluorescein diacetate* staining method to estimate seed viability of jack pine, black spruce, and white spruce.** Noland, T. L.; Mohammed, G. H.; Seymour, N. H. Ontario Forest Research Institute, Forest Research Note 58. 4 p. 1999.

Soil Management & Growing Media

150. **Comparison shopping.** Marquardt, D. American Nurseryman 192(7):50-52, 54, 56; 58-59. 2000. Growers need to shop around for media that result in optimal plant growth at minimal cost.

151. **Get the pHacts on fertilizer.** Steinkamp, R. Greenhouse Grower 18(8):28, 37, 40. 2000. To manage pH properly, growers need to know the factors that influence it. Here's the low-down on how fertilizer affects growing mix pH.

152. **Media moisture.** Henne, L. Greenhouse Grower 18(8):94. 2000. Growers can balance growing media's air and water ratio with Soax Concentrate wetting agent from Smithers-Oasis USA.

153. **Mixing media.** Davis T. Nursery Management and Production 16(7):16(7):45-46, 48. 2000. Tom Dodd Nurseries has the right recipe.

154. **The use of coir as a containerized growing medium for Douglas-fir fir seedlings.** Rose, R.; Haase, D. L. Native Plants Journal 1(2):107-111. 2000.

155. **What's the dirt on soilless media testing?** Miller, M. Farwest Magazine 44(8):69-72. 2000. An ongoing, regular examination of your media will help you maximize crop growth and hardiness and avoid any surprises.

Tropical Forestry & Agroforestry

156. © **Arbuscular mycorrhiza inoculum potential in natural and managed tropical montane soils in Costa Rica.** Maldonado, J. D.; Tainter, F. H.; Skipper, H. D.; Lacher, T. E. Tropical Agriculture 77(1):27-32. 2000.

157. © **Does proximity to conspecific adults influence the establishment of ectomycorrhizal trees in rain forest?** Newbery, D. M.; Alexander, I. J.; Rother, J. A. New Phytologist 147:401-409. 2000.

158. **Effect of plant growth regulators on seed germination of *Sapindus trifoliatus* Vahl.** Naidu. C. V.; Rajendrudu, G.; Swamy, P. M. Seed Science and Technology 28:249-252. 2000.

159. **Effect of *Rhizobium* inoculation on growth and physiology of Acacia auriculiformis seedlings under nursery conditions.** Kannan, D.; Paliwal, K. Winrock International Institute for Agricultural Development, Forest, Farm, and Community Tree Research Reports 4:48-51. 1999.

160. © **Enriching the rainforest with native fruit trees: an ecological and economic analysis in Los Tuxtlas (Veracruz, Mexico).** Ricker, M.; Mendelsohn, R. O.; Daly, D. C.; Angeles, G. Ecological Economics 31:439-448. 1999.

161. **Establishment options for *Gliricidia sepium* in a seasonally dry area of Bali, Indonesia: comparison of early performance between seedlings and cuttings.** Roshetko, J. M.; Nitis, M. I.; Lana, K.; Sukanten, W.; Puger, A. W. Winrock International Institute for Agricultural Development, Forest, Farm, and Community Tree Research Reports 4:78-82. 1999.

162. © **Forest protection and reforestation in Costa Rica: evaluation of a clean development mechanism prototype.** Subak, S. Environmental Management 26(3):283-297. 2000.

163. **Growth response of *Acacia angustissima* to vesicular-arbuscular mycorrhizal inoculation.** Costa, N. de Lucena; Paulino, V. T. Winrock International Institute for Agricultural Development, Forest, Farm, and Community Tree Research Reports 4:51-53. 1999.

164. **A possible pretreatment for seeds of tropical tree species.** Harsh, N. S. K.; Ojha, B. M. Seed Science and Technology 28:513-516. 2000.

165. **Propagating *Eucalyptus* species -recommendations for smallholders in the Philippines.** Bertomeu, M. G.; Sungkit, R. L. Winrock International Institute for Agricultural Development, Forest, Farm, and Community Tree Research Reports 4:68-72. 1999.

166. **Rapid viability loss in seeds of Palmilla *(Chamaedorea radicalis* Mart.) from El Cielo Biosphere Reserve.** Agil, M. R.; Jurado, E.; Sanchez-Ramos, G.; Trejo-Hernandez, L.; Rios, F. L. Southwestern Naturalist 45(3):373-375. 2000.

167. © **Seed size variation and its effects on germination, growth and seedling survival in *Acacia nilotica* subsp. *indica* (Benth.) Brenan.** Shaukat, S. S.; Siddiqui, Z. S.; Aziz, S. Pakistan Journal of Botany' 2(2):253-263. 1999.

168. © **Seedling indices of four tree species in nursery and their correlations with field growth in Tamil Nadu, India.** Rawat, J. S.; Singly T. P. Agroforestry Systems 49:289-300. 2000.

169. © **Sowing date, shade, and irrigation affect big-leaf mahogany *(Swietenia macrophylla* King).** Morris, M. H.; Negreros-Castillo, P.; Mize, C. Forest Ecology and Management 132:173-181. 2000.

170. **Sowing of botanical seeds and height at transplanting *Erythrina mysorensis* and its establishment.** Alonso, J.; Febles, G.; Ruiz, T. E.; Gutierrez, J. C. Cuban Journal of Agricultural Science 33:301-304. 1999.

171. **Use of humic acid in promoting growth of young *Coffee robusta* seedlings in Nigeria.** Obatolu, C. R. Colloq. Sci. Int. Cafe, 18th, 1999, p. 449451. 1999.

SO. **Agroforestry guides for Pacific Islands.** Elevitch, C. R.; Wilkinson, K. M. Permanent Agriculture Resources. 239 p. 2000. #1: Information resources; #2: Multipurpose trees for agroforestry; #3: Nontimber forest products; #4: Integrating understory crops with tree crops; #5: Introduction to integrating trees into Pacific Island farm systems; #6: Choosing timber species for Pacific Island agroforestry; #7: Economics of farm forestry; #8: Multipurpose windbreaks. ORDER FROM: Permanent Agriculture Resources, P.O. Box 428, Holualoa, HI 96725. Phone: (808) 324-4427. Fax: (808) 324-4129. www.agroforest.net.

Vegetative Propagation and Tissue Culture

172. **Clonal propagation of conifers by somatic embryogenesis.** Attree, S.; Kong, L.; Denchev, P. IN: Forest Vegetation Management Conference, proceedings, 21st annual, p.22. 2000.

173. **Propagation of *Alnus maritima* from softwood cuttings.** Schrader, J. A.; Graves, W. R. HortScience 35(2):293-295. 2000.

Water Management

174. © **Finite and nonrenewable.** Sakamoto, G. Environmental Protection 11(10):20-25. 2000. UV disinfection of reclaimed wastewater: The North American experience.

175. **Irrigation 101.** Haman, D. Z. American Nurseryman 192(7):90-93. 2000. Selecting the proper irrigation system for your operation is crucial.

176. **Strategic irrigation.** Tilt, K. American Nurseryman 192(3):30-32, 34-37. 2000. By modernizing irrigation systems, growers can promote container-plant growth, improve production and reduce runoff.

177. **Water quality: not a drop to lose.** Well, E. Greenhouse Grower 18(8):131-132, 134-136. 2000. Growers will need to adapt to the wave of changing water regulations.

178. **When should you water?** Ling, P. Greenhouse Management and Production 20(9):41-42, 44, 46. 2000. New sensor technologies developed for irrigation management can help growers detect plant water needs as early as possible.

Weed Control

179. **Controlling weeds in containers.** Mathers, H. Nursery Management and Production 16(7):35-38, 40, 42, 44. 2000. Some novel ways that may become standard treatments include GeoDiscs, a geotextile disk with a coating of Spinout, and 2 new mulching products - Wulpack and PennMulch.

180. © **Effect of adjuvants on control of nutsedge *(Cyperus esculentus* and *C rotundus)* by imazapic and imazethapyr.** Grichar, W. J.; Sestak, D. C. Crop Protection 19:461-465. 2000.

181. © **Establishment and growth in seedlings of *Fagus sylvatica* and *Quercus robur:* influence of interference from herbaceous vegetation.** Lof, M. Canadian Journal of Forest Research 30:855-864. 2000.

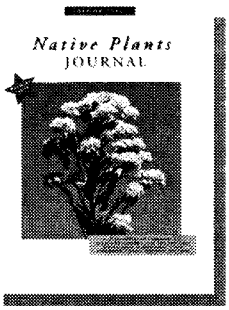
182. © **Growth inhibitory effects of nutgrass *(Cyperus rotundus)* on rice *(Oryza sativa)* seedlings.** Quayyum, H. A.; Mallik, A. U.; Leach, D. M.; Gottardo, C. Journal of Chemical Ecology 26 (9):2221-2231. 2000.

183. **Immortal combat.** Harvey, R. G.; Fischer, D. W. American Nurseryman 192(5):30-32. 2000. Some weeds have become resistant to herbicides, but growers can take the proper measures to combat this problem.

184. © **Modeling vertical and lateral seed bank movements during mouldboard ploughing.** Colbach, N.; Roger-Estrade, J.; Chauvel, B.; Caneill, J. European Journal of Agronomy 13 :11 1-124. 2000.

185. © **Selective uprooting by weed harrowing on sandy soils.** Kurstjens, D. A. G.; Perdok, U. D.; Goense, D. Weed Research 40(5):431-447. 2000.

186. **Using noxious weed lists to prioritize targets for developing weed management strategies.** Skinner, K.; Smith, L. Rice,. P. Weed Science 48:640-644. 2000.



Native Plants Journal :
Technical Information for Growers and Users of Native Plants

The Native Plants Journal (NPJ) is a cooperative effort of the USDA Forest Service and the University of Idaho, with assistance from the USDA Agricultural Research Service and the Natural Resource Conservation Service. Our goal is to provide technical, yet practical, information on the growing and use of native plants for restoration, conservation, reforestation, landscaping, and roadsides. Two full-color issues, each containing about a dozen articles, will be published yearly. The first issue of NPJ was released in January, 2000. A limited sup ply of complimentary copies of the premier issue are available from the address below.

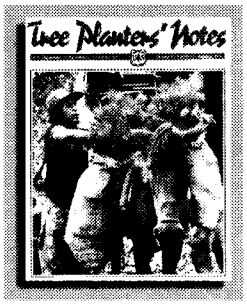
Submit a paper to NPJ: We need contributions from scientists, academics, field personnel, nursery managers, and others concerning all aspects of growing and using native plants.

Papers are published in two categories: refereed or general technical. Please contact the editor-in-chief if you have an idea for a paper or just want more information:

Kas Dumroese
Forest Research Nursery
University of Idaho
Moscow, ID 83844-1137
USA
TEL: 800.885.3509
FAX: 208.885.6226
E-MAIL: Dumroese@uidaho.edu

Please subscribe: We hope to be able to make NPJ self sufficient from subscriptions and advertising fees, but need your help. The annual subscription is $30 for individuals and $60 for libraries. Online subscriptions will be possible soon but for the present, send payment to:

Native Plants Journal
University of Idaho Press
PO Box 441107
Moscow, Idaho 83844-1107
Toll-free: 800.885.9059



Superintendent of Documents Subscriptions Order Form

Order Processing Code:
*6135

Charge your order
It's Easy!
MasterCard VISA

To fax your orders (202) 512-2233
To phone your orders (202) 512-1800

☐ **YES**, enter my subscription as follows:

____subscriptions to **TREE PLANTERS' NOTES (TPN)** for $8.00 per year ($10.00 foreign).

The total cost of my order is $_____.
Price includes regular shipping and handling and is subject to change.

International customers please add 25%.

For privacy protection, check the box below:
☐ Do not make my name available to other mailiers

Please Choose Method of Payment:

☐ Check Payable to the Superintendent of Documents
☐ GPO Deposit Account ☐☐☐☐☐☐☐–☐
☐ Visa or MasterCard Account
☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
☐☐☐☐ (expiration date)

Thank you for your order!

Company or personal name (Please type or print)

Additional address/attention line

Street address

City, State, ZIP Code

Daytime phone including area code

Purchase Order Number (optional)

Authorizing Signature 11/96

Mail To: New Orders, Superintendent of Documents
P.O. Box 371954, Pittsburgh, PA 15250-7954

Literature Order Form

Winter 2001

Please fill out a separate order form for each person ordering literature. Write in the number or letter of the articles in which you are interested in the spaces at the bottom of this page. Note that we will only provided free copies of the first 25! For items that require a copyright fee, you will receive the title page with abstract and ordering instructions if you want the entire article. Fax or mail this form to:

Tom D. Landis
J.H. Stone Nursery
2606 Old Stage Rd.
Central Point, OR 97502
TEL: 541.858.6166
FAX: 541.858.6110
E-mail: tdlandis@fs.fed.us

Name: _____ Position: _____

Department: _____ Nursery/Company: _____

Mailing address: _____

Street Address: _____

City: _____ State/Province: _____

Country: _____ Zip/Postal Code: _____

Telephone: _____ FAX: _____

E-mail: _____ Website: _____

In order to keep costs reasonable we will provide free copies of the first 25 articles. Fill in the number or letter each article from the New Nursery Literature section in the following spaces:

_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____

Copies of additional articles can be provided for $15.00 each. F ill in the numbers for the articles from the New Nursery Literature section in the spaces below, and we will forward your order to Donna Loucks for processing.

_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

Nursery Directory

The Reforestation, Nurseries, and Genetic Resources (RNGR) Home Page (http://www.mgr.net) contains a state-by-state directory of forest and conservation nurseries. There is also a list of nurseries that specialize in native plants in the Native Plant Network section. Use the following form to add your nursery to the directory, or update your listing. Note that we can list your E-mail and WWW home page address so that customers can contact you directly. Send this form back with your literature order form or fax it to: 541.858.6110.

Example:

Utah	**Updated: December, 1999**			
Nursery Name & Address	Ownership Type	Stock Type	Current Season Seedling Distribution	Potential Seedling Distribution
WWW: http://www.nr.state.ut.us/slf/lonepeak/home.htm Lone Peak Conservation Center 271 West Bitterbrush Lane Draper, UT 87020-9599 TEL:801.571.0900 FAX: 801.571.0468 E-mail: nrslf.szeidler@state.ut.us		Bareroot	400,000	800,000
		Container	2000,000	210,000

☒ = **Yes, list my nursery in the Native Plant section**

Your Nursery:

Your State	**Updated:**			
Nursery Name & Address	Ownership Type	Stock Type	Current Season Seedling Distribution	Potential Seedling Distribution

☐ **= Yes, list my nursery in the Native Plant section**

RNGR Contacts
Contact Information for Reforestation, Nurseries, and Genetic Resources (RNGR) Team

Technology Transfer Services	Region of Responsibility	Who To Contact
Technical Assistance about Forest and Conservation Nurseries Forest Nurseries Container Tree Nursery Manual Proceedings of Nursery Meetings	US and International	Tom D. Landis USDA Forest Service Cooperative Programs 2606 Old Stage Rd. Central Point, OR 97502 TEL: 541.858.6166 FAX:541.858.6110 E-MAIL: tdlandis@fs.fed.us
Editor - Tree Planters' Notes	US and International	George Hernandez USDA Forest Service Cooperative Forestry 1720 Peachtree Road NW, Suite 811N Atlanta, GA 30367 TEL: 404.347.3554 FAX: 404.347.2776 E-MAIL: ghernandez@fs.fed.us
Technical Assistance bout Tree Improvement and Genetic Resources Technical Assistance about Forest and Conservation Nurseries	Southeastern US	
Technical Assistance about Forest and Conservation Nurseries	Northeastern US	Ron Overton Regeneration Specialist USDA Forest Service, S&PF Purdue University 1159 Forestry Building West Lafayette, IN 47907-I 159 TEL: 765.496.6417 FAX: 765.496.2422 E-MAIL: roverton@fs.fed.us
Technical Assistance bout Tree Improvement and Genetic Resources	US and International	
Technical Assistance about Tree and Shrub Seed	US and International	Bob Karrfalt Purdue University 1159 Forestry Building West Lafayette, IN 47907-1159 TEL: 765.494.3607 FAX: 765.496.2422 E-MAIL: rkarrfalt@fs.fed.us