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Pacific Northwest Region

State and Private Forestry

Cooperative Programs

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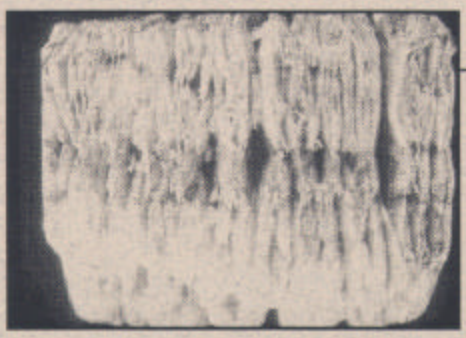
Forest Nursery Notes

July 2000



Health and Safety:
EPA Warning About Handling Vermiculite

Cultural Perspectives:
Propagating Riparian Plants

Equipment, Products, and Services:
Repellents for Controlling Animal Browsing

Forest Nursery Notes

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Nursery Meetings

The **Southern Forest Nursery Association (SFNA) Conference** will be held on ***June 26 to 29, 2000*** at the Adam's Mark Hotel in the historic district of Mobile. Alabama. The technical agenda will feature a variety of technical subjects including the Food Quality Protection Act, herbicides, mycorrhizae, nursery software and longleaf pine culture. Besides the technical sessions, we will be touring the E.A. Hauss Nursery in Atmore and the Nielson Seed Processing Company in Evergreen, AL. A dinner party aboard the paddleboat Cotton Blossom in Mobile Bay is also planned. Registration packets have already been mailed but, if you'd still like to register, you should contact:

Mildred Owens, Registration Coordinator
PO Box 82
Samson, AL 36477
USA
TEL: 334.898.7013
FAX: 334.898.1 149
E-mail: genevasf@forestry.state.al.us

"Nurseries for the Future" will be the theme for the **Northeastern Nursery Conference** that will be held on ***July 5 to 8, 2000*** at the House on the Rock Resort in Spring Green, Wisconsin. The agenda features expert panels on red oak propagation, planting site preparation, and hardwood seed collection as well as technical updates on reforestation cost share programs, methyl bromide fumigation, and slow release fertilizers. A tour of the Wilson State Nursery and direct seedling sites are also scheduled. Registration packets were mailed out last month but contact Joe Vande Hey or Linda Evans if you didn't receive one:

Joe Vande Hey
Wilson State Nursery
PO Box 305
Boscobel, WI 53805
USA
TEL: 608.375.4123
FAX: 608.375.4126
E-mail: vandejx@dnr.state.wi.us

The **Western Forest and Conservation Nursery Association** (WFCNA) meeting will be held at the King Kamehameha Hotel in Kona, HI on ***August 21-25, 2000***. The agenda will begin with a look at nursery topics and issues from Hawaii and the Pacific Islands, and then continue a discussion of nursery practice s from around the world. So far, we have presentations from Russia, Mongolia, Chile, Venezuela, Brazil, Mexico, Cuba, Canada and more are expected. Two field trips are planned: one around the South Side of the island to Volcanoes National Park, and another by the northerly route to visit the Forest Solutions eucalyptus nursery, the Kamuela State Forest Nursery, and some plantations. If you want a registration form, you can contact me (see inside front cover for address) or download one from the coming events section of our website:

www.wfcna.net

The 20th Annual Meeting of the **Forest Nursery Association of British Columbia** (FNABC) is scheduled for ***September 18-21, 2000*** at the Civic Center in Prince George, BC. This year's theme is "2000 and Beyond: Partnerships for Success" and there will be three focus sessions on nursery issues, forest health, and nursery-customer interactions. The technical sessions will be supported by field trips that will illustrate successes in these areas. The final agenda and registration materials will be posted on the FNABC website by early July: Or, you can contact Julie Hart for more specifics:

Julie Hart
TEL: 250.963.9199
FAX: 250.963.9230
E-mail: jhart@prtgroup.com
Website: www.for.gov.bc.ca/nursery/fnabc/fnabc.htm

The **Western Region of the International Plant Propagators' Society (IPPS**) will be meeting in Modesto. CA on ***October 11-14, 2000***. The technical sessions at IPPS meetings always cover a wide range of basic plant propagation concepts and techniques. These meetings are an excellent opportunity to expand your horticultural horizons. Additional information on any of the Regional IPPS meetings can be obtained from the website. For specifics on the Western Region Meeting, contact:

Art Olney
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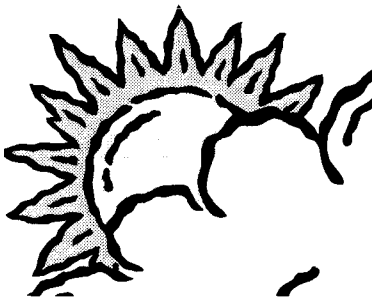
E-mail: arthur_olney@csufresno.edu
Website: http://www.ipps.org

The **2000 International Research Conference on Methyl Bromide Alternatives and Emissions Reduction** will be held at the Clarion Plaza Hotel in Orlando, FL on ***November 6-9, 2000***. A first call for papers will commence in July, but you can contact the following for additional information:

Rosemary Obenauf
MBAO
144 W. Peace River Drive
Fresno, CA 9371 1-6953
USA
TEL: 559.447.2127
E-mail: robenauf@agrc.cnchost.com

Health and Safety

Is the Sun Coming Out? Better Get the Sunscreen!



Do you know everything about sunscreen that you need to know so you are using it effectively? Well, here are some common questions about sunscreen to help you better protect your skin.

When should I use sunscreen? Sunscreens should be used every day if you are going to be in the sun for more than 20 minutes. They can be applied under makeup. There are many cosmetic products available today that contain sunscreens for daily use because skin protection is the principle means of preventing premature aging and skin cancer. Sunscreens used on a regular basis actually allow some repair of damaged skin. And don't reserve sunscreens just for sunny days! Use them when the sun's reflective power is great, like after a snowfall or near the sand. Even on a cloudy day, 80 percent of the sun's ultraviolet light rays pass through the clouds.

How do I choose a sunscreen? There are so many types of sunscreens, that selecting the right ones can be quite confusing. The type of sunscreen you choose is a matter of choice. Sunscreens are available in many different forms including ointments, creams, gels, lotions, and wax sticks. PABA or para-aminobenzoic acid, was the original compound which was the basic ingredient of sunscreens. However, it stained clothes. Today's PABA has been refined. The newer ingredient called PABA esters include glycerol PABA, padimate A (pentyl dimethyl PABA) and padimate O (octyl dimethyl PABA). These rarely stain clothing as the original PABA once did.

What is an SPF? SPF stands for Sun Protection Factor. Sunscreens are rated or classified by the strength of their SPF. The SPF numbers on the packaging can range from as low as 2 to as high as 60. These numbers refer to the product's ability to screen or block out the sun's burning rays. The sunscreen SPF rating is calculated by comparing the amount of time needed to produce a sunburn on protected skin to the amount of time needed to cause a sunburn on the unprotected skin. For example, if a sunscreen is rated SPF-? and a fair skinned person who would normally turn red after 10 minutes of exposure in the sun, it would take 20 minutes of exposure for the skin to turn red. A sunscreen with an SPF of 15 would allow that person to multiply that initial burning time by 15, which means it would take 15 times longer to burn, or 150 minutes. with a designated SPF number. In higher SPF's such as 39, around 97 percent of sun burning rays are absorbed, while an SPF of 15 indicates 93 percent absorption and an SPF of 2 equals 50 percent absorption.

ULTRAVIOLET RADIATION

UVA rays constitute 90-95% of the ultraviolet light reaching the earth. They have a relatively long wavelength (320-400 nm) and are not absorbed by the ozone layer. UVA light penetrates the furthest into the skin and is involved in the initial stages of suntanning. UVA tends to suppress the immune function and is implicated in premature aging of the skin.

UVB rays are partially absorbed by the ozone layer and have a medium wavelength (290-320 nm). They do not penetrate the skin as far as the UVA rays do and are the primary cause of sunburn. They are also responsible for most of the tissue damage which results in wrinkles and aging of the skin and are implicated in cataract formation.

UVC rays have the shortest wavelength (below 290 nm) and are almost totally absorbed by the ozone layer. As the ozone layer thins UVC rays may begin to contribute to sunburning and premature aging of the skin.

All forms of ultraviolet radiation are believed to contribute to the development of skin cancer.

SUNSCREENS

Sunscreens are designed to protect against sunburn (UVB rays) and generally provide little protection against UVA rays. They come in two forms:

CHEMICAL SUNSCREENS contain chemicals such as benzophenone or oxybenzone (benzophenone-3) as the active ingredient. They prevent sunburn by *absorbing* the ultraviolet (UVB) rays.

PHYSICAL SUNSCREENS contain inert minerals such as titanium dioxide, zinc oxide, or talc and work by *reflecting* the ultraviolet (UVA and UVB) rays away from the skin.

Does SPF 30 have twice as much sun protection as SPF 15? SPF protection does not actually increase proportionately with a designated SPF number. In higher SPF's such as 39, around 97 percent of sun burning rays are absorbed, while an SPF of 15 indicates 93 percent absorption and an SPF of 2 equals 50 percent absorption.

Does the SPF tell how well a sunscreen blocks ultraviolet A (UVA) or ultraviolet B (UVB)rays? No the SPF number only reflects the screening ability for UVB rays. At present, there is no FDA-approved rating system that identifies UVA protection.

How much sunscreen should be used, and how often would it be applied? Sunscreens should be applied to dry skin 15 to 30 minutes **BEFORE** going outdoors. When applying sunscreen, pay particular attention to the face, hands, and arms, and coat the skin liberally. One ounce, or enough to fill a shot glass, is considered the amount needed to cover the exposed areas of the body properly. Be careful to cover exposed areas completely. A missed spot could mean a sunburn in that area. All sunscreens need to be reapplied. Water resistant sunscreens need to be reapplied about every 2 hours or immediately after swimming or strenuous activities. Gels need to be reapplied frequently (as they sweat off and wash off most easily), but may be preferable for acne-prone skin.

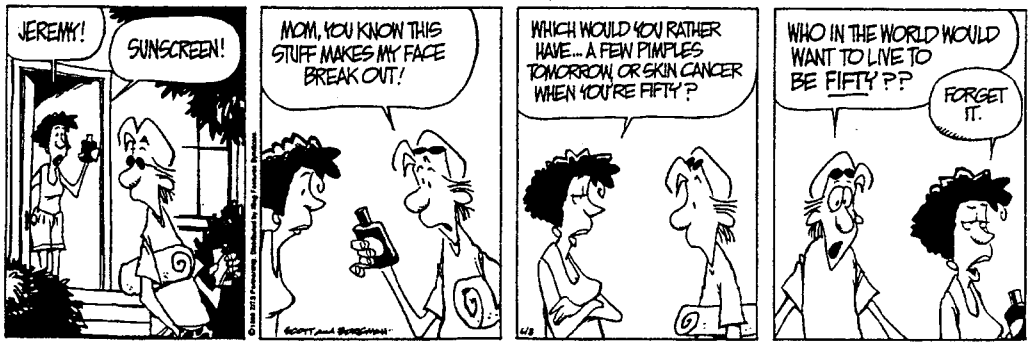
Is there a difference between sunscreen and sun block? Sunscreens chemically absorb UV rays. Sun blocks physically deflect them.

Are sunscreens all I need to protect myself from the sun? No. Although sunscreens are a very important part of maximum sun protection, wide brimmed hats, protective clothing and sun avoidance (between the hours of 10 a.m. and 4 p.m.) are also important. Sunscreens should be viewed as back-up to primary means of sun protection.

Sources:

The Wellness Institute

Larsen, H.R. *Sunscreens: Do They Cause Skin Cancer?* (http://vvv.com/HealthNews/sunscreens.html)



The Headline: "EPA warns gardeners about handling vermiculite".

Quote: *"The U.S. Environmental Protection Agency is warning consumers not to handle one specific garden product containing vermiculite, and to treat all .similar products as if they are contaminated with cancer-causing asbestos "*

The Details: One vermiculite product called Zonolite which was used for building insulation has been found to contain fibrous actinolite and tremolite which are both classified as carcinogens. A vermiculite mine in Libby, MT was closed because workers exposed to tremolite asbestos fibers developed several fatal diseases. A class-action lawsuit is currently pending against the company. The Seattle Post-Intelligencer newspaper reported that the EPA has found "asbestos in several brands of garden products." Testing also showed that "using these products caused asbestos fibers to be released into the air where they could be inhaled."

Zonolite brand attic insulation was sometimes used in growing media in the past because of its coarse texture. It was never intended to be sold for that purpose, however, but the Seattle paper found that bags were still for sale in garden and hardware stores in the Puget Sound area.

Commercial growing media producers have been using a completely different source of vermiculite for many years that has been shown to be free of asbestos contaminants (Figure 1). If you or your workers are concerned, contact your supplier, who will be happy to provide safety information (see sidebar).

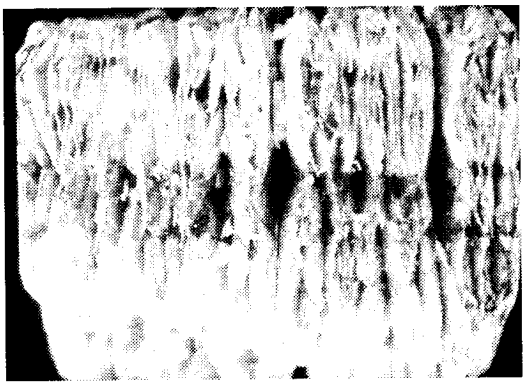


Figure 1 - Vermiculite is a common component of growing media.

The latest newspaper article states that asbestos particles have been found in children's coloring crayons. We'll keep you informed as more facts become known.

Statement on Vermiculite
by the Scotts Company

Consumers may be receiving erroneous and misleading information regarding the safety of gardening products that contain vermiculite. Allegations have been made that some products containing vermiculite may contain asbestos.

We want you to be assured that the Scotts Company's products meet the highest standards of safety and effectiveness.

All Scotts products, including those containing vermiculite, are subjected to thorough testing by government regulatory agencies, raw material suppliers, internal quality control and independent testing services before they are placed on the market. These include tests by the EPA and OSHA.

The Scotts Company is built on a 132-year reputation of product integrity, and consumer trust. Our products containing vermiculite meet all safety standards. Based on extensive testing, there are no detectable levels of asbestos in Scotts products containing vermiculite.

Should you have further questions or concerns, please contact:
Kerry Bierman, Vice President,
Corporate Communications
The Scotts Company
TEL: 614.719.5604
E-mail: kerry.bierman@scottsco.com

Cultural Perspectives

Propagating Riparian Plants

As I'm sure you've noticed, riparian restoration projects have become increasingly more common in natural resource management. Here in the Western US, the vegetation along streams and rivers has been severely depleted by years of overgrazing, and concerns about water quality have become an environmental issue all over the world. Filter strips are being recommended to treat agricultural runoff, urban storm water, and mining wastewater before it enters our rivers and streams. All these issues will increase the demand for riparian plant materials, so nurseries must become proactive to meet this new market.

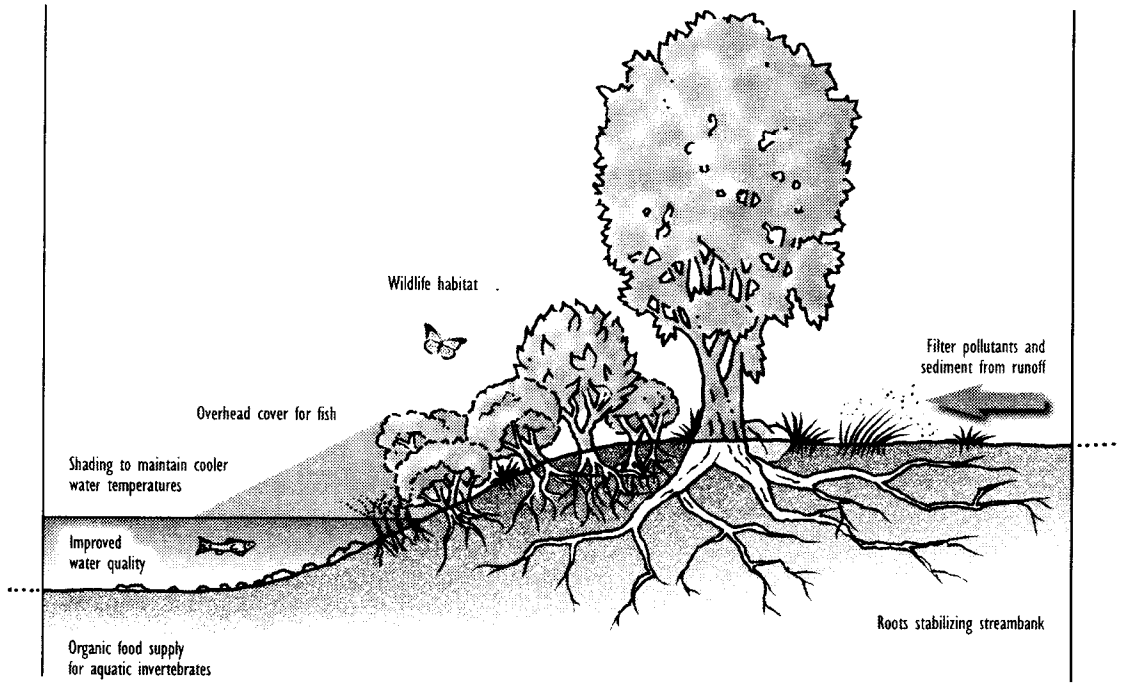


Figure 1 - Benefits of riparian restoration

Riparian revegetation produces many benefits (Figure 1), including:

?? Reducing stream bank erosion by reestablishing the root matrix
?? Reestablishing the riparian plant community
?? Improving fish and wildlife habitat
?? Providing shade on the water to maintain lower water temperatures
?? Increasing biodiversity of plants and animals
?? Improving water quality

There are two different types of plant materials used in riparian restoration: 1) dormant, unrooted hardwood cuttings used in bioengineering applications and 2) live plants used for filters, biodiversity and a variety of other purposes.

Dormant Unrooted Hardwood Cuttings

The plant materials most widely used in bioengineering treatments are dormant uprooted hardwood cuttings that are used in bundles, fascines, and other bioengineering structures (Fig. 2). Cuttings are preferred because of their availability, ease of harvest, ease of planting, and their ability to root. Willow, cottonwood, and red-osier dogwood are the most common species used because of their ease of rooting and planting as well as tolerance to saturated soils and even periodic inundation. Few other riparian woody plants easily root from hardwood cuttings and so must be propagated by seed. For a list of suitable species for stream bank bioengineering refer to Carlson (1992).

For restoration projects that will require a large amount of plant material over several years, cuttings from donor plants can be brought back to a nursery for multiplication. This is particularly useful for remote projects, such as high elevations, where field collections would be difficult. Mother plants are established in nurseries to provide a source of cuttings. Stooling beds are hedge-like rows of mother plants that are established in bareroot nurseries. Single mother plants can also be established in large containers. Besides the convenience, cuttings collected at the nursery often perform better than wild collections. For example, over 90% of narrowleaf cottonwood (*Populus angustifolia*) cuttings collected from stooling beds rooted whereas wild cuttings had only 62 to 85% rooting success (Dreesen and Harrington 1999).

There are three size classes of cuttings that are used in riparian bioengineering structures (Table 1):

Propagation cuttings - These cuttings are relatively small (Table 1) and are used only in nursery propagation. Dormant hardwood cuttings are most commonly used although softwood cuttings from tips of actively growing plants are necessary to propagate some species. Although propagation cuttings can be collected from donor plants near the project site, it is more efficient to establish stooling beds or mother plants at a nursery. Another option is serial propagation where cuttings can be harvested from the current year's crop.

Stem cuttings have an inherent polarity and will always produce shoots at the distal end (nearest the bud) and roots at the proximal end (nearest the main stem or root system). To distinguish between the top and bottom of hardwood cuttings, the bottoms are cut at an angle, which not only ensures that the cuttings are planted right side up but makes them easier to stick into containers or nursery beds. In nursery stooling beds, willow and poplar are collected as long cuttings or whips that are then cut into the proper length. If collected by hand, the basal cut is typically made just below a node where roots form more readily. When large numbers of cuttings have to be made, then bundles of whips are cut with a band saw. Bundles of cuttings are then secured with a rubber band and stored under refrigeration at 32 to 40 °F (0 to 4.5 °C) to keep them dormant until they are planted.

Table 1 - Type of cuttings used in riparian restoration				
Type of Cutting	**Diameter**	**Type of Wood**	**Pre-Rooted**	**Use**
Propagation	0.2 to 0.8 in. (0.5 to 2 cm)	Softwood or Hardwood	Yes	Live plants: Grown in bareroot beds or containers at nurseries
Branched	0.5 to 2 in. (1.3 to 5.1 cm)	Hardwood	No	Bioengineering: brush mattresses, fascines, vertical bundles at the project site
Pole	0.75 to 8 in. (1.9 to 20.3 cm)	Hardwood	No	Bioengineering: Individual placement at the project site

Branched cuttings - This class includes branches and stems that are relatively large (Table 1). Branched cuttings can be collected near the project site or from stooling beds in a nursery. If the project area is far from the nursery, the large volume of plant material needed may make it more practical to collect on-site. Branched cuttings often have the tops and flowering parts cut off before they can be used for some of the bioengineering treatments. They differ from propagation cuttings and poles in that side branches are left in place during processing (Carlson and others 1992).

Branched cuttings are very effective for stream bank erosion control when collectively used in brush mattresses, fascines, and vertical bundles (Fig. 2). Although branched cuttings typically have lower establishment rates than propagation cuttings, bioengineering structures made with branched cuttings are essential to initial stream stabilization.

Poles - Many riparian restoration projects fail because high water velocities rip the plants out before they have a chance to establish an extensive root system, or they die when soils dry out later in the summer and fall. Pole plantings provide a means to overcome both of these problems (Table 1). The basic idea is to plant long cuttings of dormant willow and cottonwood to a sufficient depth that they will stay in the water table throughout the year. These species have dormant root primordia underneath their bark so that roots will sprout along the entire buried section and the poles will establish quickly after outplanting. The other benefit is that these large diameter pole cuttings will remain anchored during floods.

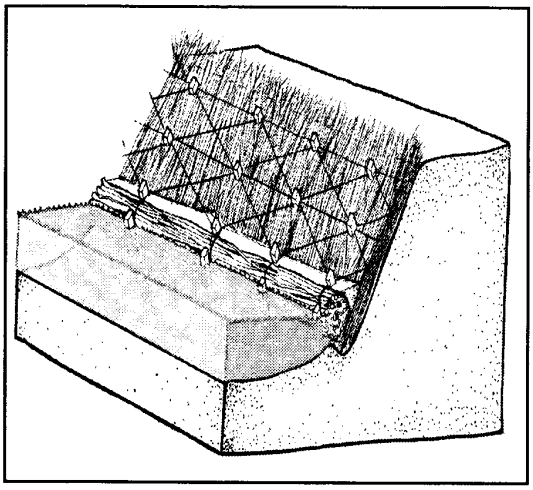


Figure 2 - Vertical bundles are one type of bioengineering structure that uses dormant unrooted hardwood cuttings.

Because of the large size of the plant material, mother plants can be established in the nursery to produce poles. Carlson (1992) concluded that establishing and managing "orchards" for producing poles should be a top priority for forest and conservation nurseries. Much of the research in this area has been done in the Southwestern US. At the Los Lunas Plant Materials Center in New Mexico, pole cuttings are grown in production blocks that yield large poles after 3 growing seasons (Dreesen and Harrington 1999). Another possibility that is being tried at the J. Herbert Stone Nursery in Oregon is to convert existing willow stooling beds over to pole production.

Nursery Plants

Container or bareroot plants add diversity to the riparian restoration area by ensuring the establishment of species that do not root readily from woody cuttings. Many people just assume than all willows or cottonwoods will root easily and so stick hardwood cuttings directly into the stream bank. Although many of these cuttings will sprout shoots initially, some will tend to dieback later in the season due to poor root egress or pathogenic cankers.

Propagation method - The choice of propagation method is important and both the biology of the species and the objectives of the restoration project must be considered. Many keystone riparian trees and shrubs including cottonwood and willow can be produced vegetatively, but some species or ecotypes are recalcitrant. For example, standard hardwood cuttings of Scouler willow do not root well, even in the nursery, and so this species must be propagated by other means (Dumroese and others 1997).

If it is possible to propagate a plant either by seed or vegetatively, then the amount of genetic variability that is desired in the crop must be considered. Sexual reproduction results in a mixture of genetic characteristics in the offspring, so each plant will appear slightly different from its parents and each other (Fig. 3). Because maintenance of genetic diversity is so important in ecosystem management, seed propagation is encouraged whenever possible because it is easier to capture and preserve biodiversity with seeds than with vegetative propagation. When harvesting seeds or cuttings, collections should be made from as many individual plants as possible to maximize genetic diversity. A general guideline is 50 to 100 donor plants.

Because of the higher cost of establishment and longer production times, bareroot seedlings are less commonly used for riparian restoration. However, bareroot plants are usually less expensive to produce, handle and transport than large container stock.

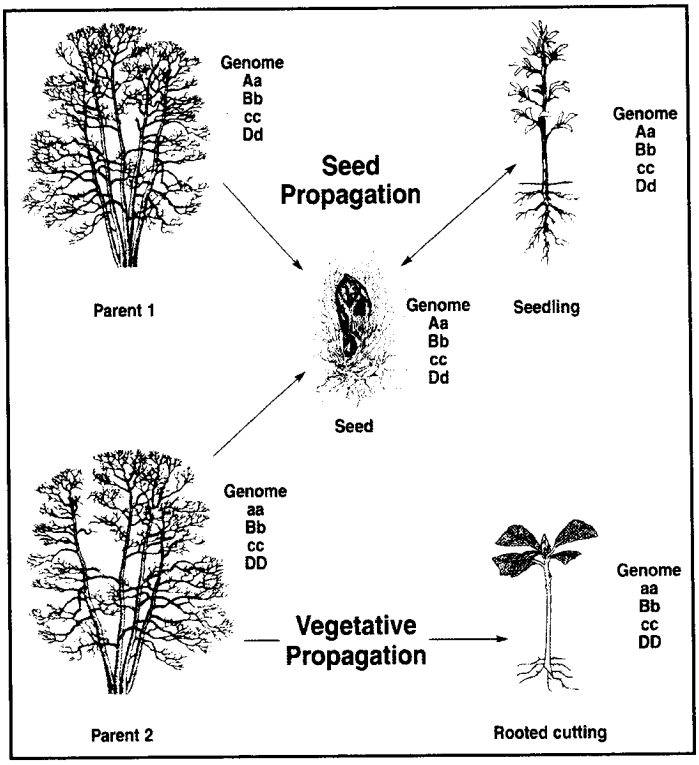


Figure 3 – Plants propagated from seed look different from their parents and each other because they contain a mixture of the genetic characteristics of the two parent plants. Vegetative propagation, on the other hand, produces exact duplicates of the parents.

Seedlings - Few riparian plants are grown as bareroot seedlings because often the seeds are difficult to handle or they have complicated dormancy. For example, cottonwoods and willows have very small seeds that are shoe lived and they are covered with fine hairs that resist water imbibitions making them difficult to propagate in bareroot seedbeds. Some nurseries do produce bareroot seedlings of riparian trees such as ash and oaks, and other species could be grown if the markets existed.

Rooted cuttings - Several riparian species are routinely propagated from short hardwood cuttings, especially cottonwoods and willows. Because they root easily and require less cultural attention than seedlings, rooted cuttings of these species grow rapidly and shippable plants can easily be produced in one season. Planting and cultural techniques for propagating poplars and willows are provided by Morgenson (1992).

Transplants - "Plug+Ones" are an economical way to grow large stock types for riparian restoration projects. In the last few years, container-to-container transplants are becoming more popular.

Container plants are preferred for riparian restoration projects because they are quick to produce, easy to handle, and often have better outplanting performance on tough sites than bareroot stock. For riparian projects, container stock can be divided into two categories: small and large. Most project managers prefer large plants because they have more expansive and aggressive roots and can better withstand water erosion.

Small Containers ("Plugs') - Woody shrubs, grasses and wetland plants are often grown in small containers (volumes less than 15 in' or 245 cm'). Plugs are used in bioengineering designs when the water is too deep or persistent to get woody plants established in other ways. Wetland plant plugs also promote the trapping of sediments that will rebuild the stream bank and will also increase the natural establishment of woody plant species. The fine root hairs of grasses or wetland plants, when combined with the larger deeper roots of woody plants, help bind the soil particles together and reduce stream bank erosion. Sedges *(Carex spp.*), spikerush *(Eleocharis spp.),* bulrush *(Scirpus spp*.) and rushes *(Juncus spp.)* are used extensively in riparian and wetland restoration because of their aggressive root systems.

Large containers- Container stock ranging in volume from 15 in 3 (245 CM) to 5 gallons (18.9 1) is becoming more popular in riparian restoration because they handle the changing water table and erosive effects of floods better than smaller plants. Large container plants have faster growth rates and produce immediate shade on the water, and allow sedimentation on the floodplain. Besides, when they die and fall over, they provide large woody debris in the stream to create fish habitat. This is particularly critical for salmon restoration efforts. In addition to improving the physical structure of the riparian zone, large container stock increases biodiversity and provides quick food and habitat for a wide variety of wildlife. The major limitations to plant size are the higher cost and difficulty in handling but the desire for "instant results" will continue to favor large stock.

Conclusions and Recommendations:

Assuming you are convinced that there is an increasing demand for riparian plants species, what should you do?

1. Pursue new markets. Time is critical as markets for native riparian plant material are developing rapidly. Therefore, nurseries must be aggressive and seek out new customers to introduce their products and services. Attend meetings of potential customers and use new marketing techniques like establishing a website on the internet.

2. Practice "Show and Tell". Many customers have no understanding of nursery procedures or potential so be sure to show potential customers what you can produce - both species and stock types. Invite potential customers to an open house at your nursery to show what types of plant materials you can grow. Showing is always better than telling, so try to grow some typical riparian plants, or establish stooling beds or mother plants ahead of time.

3. Emphasize "source-identified" and "locally-adapted". Many project managers, especially engineers and even other biologists, do not understand that revegetation projects have different objectives than other types of plantings. Explain the importance of using native plant material that is collected at their project area and adapted to the local environment. When growing sample plants, make sure that you have the proper sources for a specific project.

This section was taken from Plant Materials for Riparian Restoration by J. Chris Hoag and Thomas D. Landis. The full *paper will be published in the Native Plants Journal 2(!) in January 2001.*

Sources:

Carlson, J. R. 1992. *Selection, production, and use of riparian plant materials for the western United States.* IN: Intermountain Forest Nursery Association, proceedings, 1991, p. 55-67. Landis, T.D., ed. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-21 1.

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Dumroese, R. K., K. M. Hutton, and D. L. Wenny. 1997. *Propagating woody riparian plants in nurseries.* IN: 1997 National proceedings, Forest and Conservation Nursery Associations, p. 71-76. T.D. Landis and J.R. Thompson, tech. coords. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PN W-419.

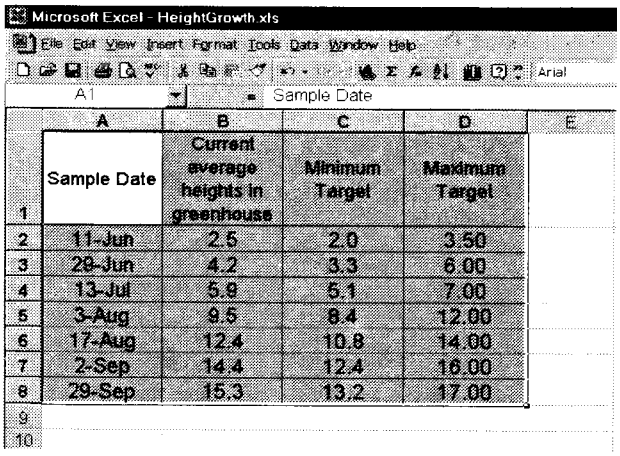
Morgenson, G. 1992. *Vegetative propagation of poplar and willow.* USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-21 1, p. 84-86. Landis, T.D., ed. Proceedings, Intermountain Forest Nursery Association, 1991.

Graphing Seedling Monitoring Data

Learning how to graph your seedling monitoring data can be quick, easy and, most of all, the information can tell you instantly if you are on target with your seedling growing regime. Here is an example of graphing walling height growth in a greenhouse over a growing season using the Microsoft Excel spreadsheet program. This is not the only spreadsheet on the market - Lotus 1-2-3 and QuatroPro are good spreadsheets and work similarly to Excel. If you can learn one spreadsheet, you can easily use the others. Give it a try. It should take you no longer than ten minutes to create the graph shown in Step 9.

Step 1: Open a new spreadsheet in the Excel program by clicking "Start"/"Programs"/Microsoft Excel.
Step 2: Enter your data as shown below.

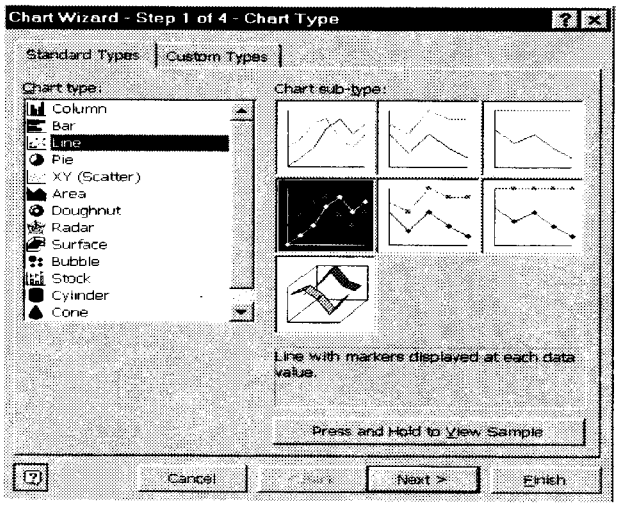
Step 2:



	A	B	C	D	E
1	Sample Date	Current average heights in greenhouse	Minimum Target	Maximum Target	
2	11-Jun	2.5	2.0	3.50	
3	28-Jun	4.2	3.3	6.00	
4	13-Jul	5.9	5.1	7.00	
5	3-Aug	9.5	8.4	12.00	
6	17-Aug	12.4	10.8	14.00	
7	2-Sep	14.4	12.4	16.00	
8	29-Sep	15.3	13.2	17.00	
9					
10					

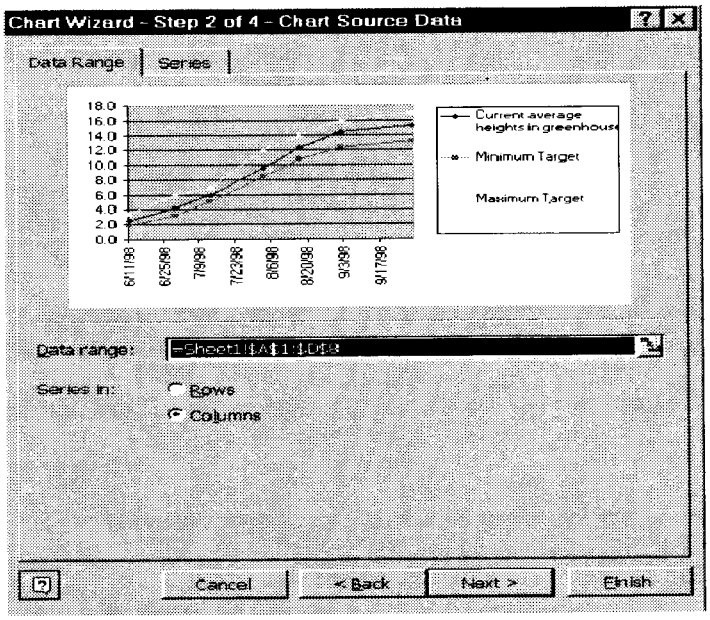
Step 3: Highlight the entire area.
Step 4: Choose Insert/Chart on the toolbar or click the Chart Wizard button (it's the one with red and yellow bar chart) on the standard toolbar. You will see the following dialog box.

Step 4:



Step 5: Under "Chart type:" select "Line" and click "Next>" at the bottom of the box. You are given many options for charting your data once you get the hang of this program, you can come back and try other graphing styles. Your data will be displayed on the next screen and should look like this.

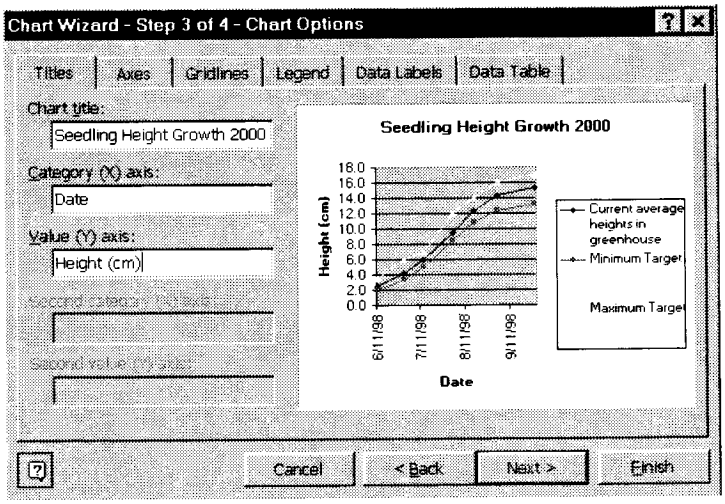
Step 5:



Step 6: Click "Next>"

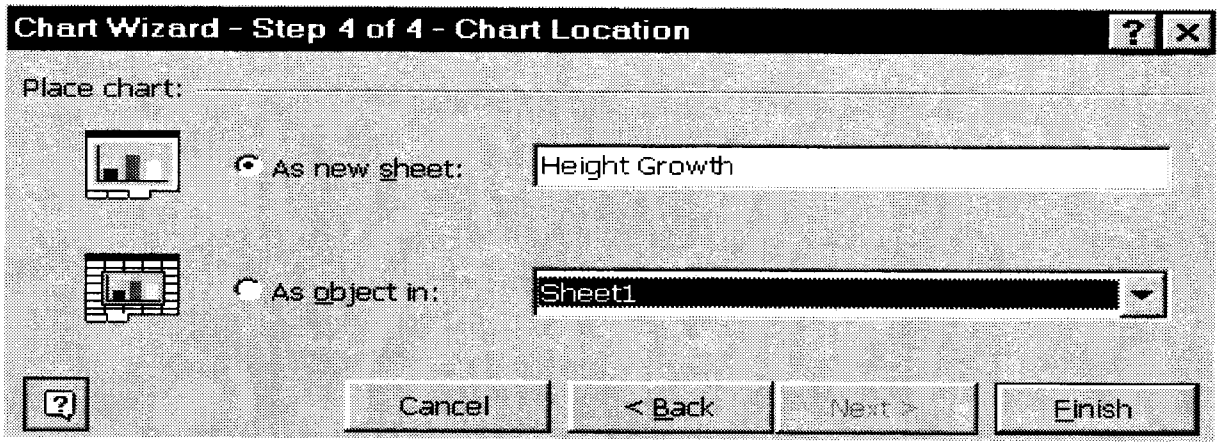
Step 7: On this screen put the titles of the chart and x and y axis as it is displayed. Click "Next>".

Step 7:



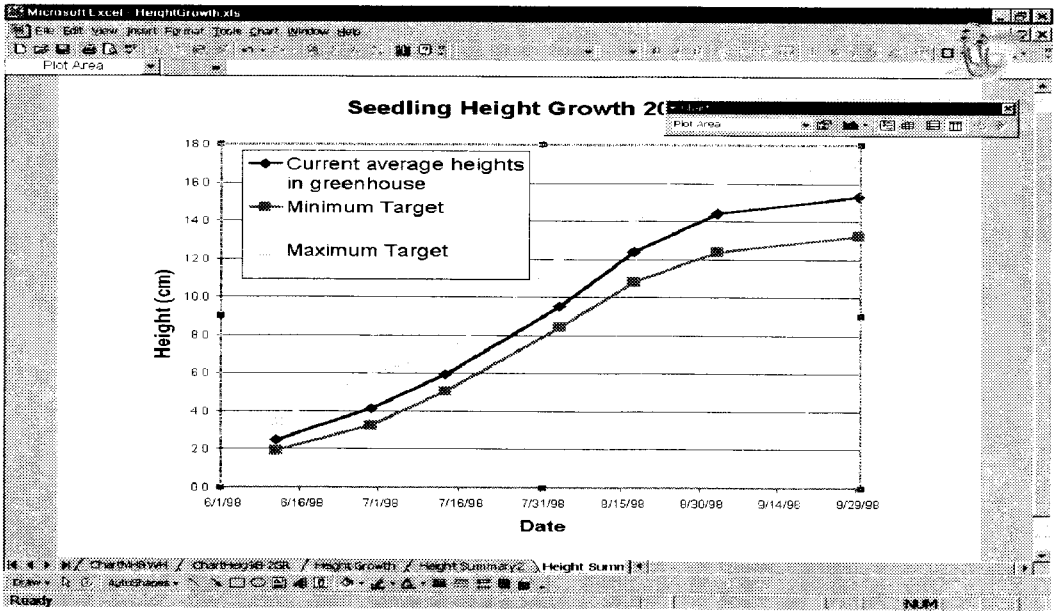
Step 8: Click the button "As new sheet:" and type "Height Growth".

Step 8:



Step 9: Click "Finish". You will see your data displayed in a graph that will look like this.

Step 9:



Print this and save the document. The graph can also be exported as a .tiff file for use in PowerPoint or other presentation software.

Sources:

Wang, W., Parker, R. Microsoft Office 2000 for Windows for dummies. IDG Books World. 1999. P. 464.

Equipment, Products, and Services

The purpose of this section is to make readers aware of new nursery equipment, products, or services that will help them in their work. All trade names mentioned are used for the information and convenience of the reader, and do not imply endorsement or preferential treatment by the author or the USDA Forest Service.

Repellents for Controlling Animal Browsing

Feeding damage by animals is an increasing problem both in nurseries and after outplanting. Deer, in particular, are a serious pest. A recent survey of nurseries and orchards in the northeastern US showed that 65 % of respondents had a problem with deer browsing. Another study found that deer damage to woody plants exceeds $50 million in New York state alone. The most common control treatment was chemical repellents but users reported that they were only "somewhat effective".

How do you know you have a problem? Deer predation is usually easy to diagnose by tracks or actual sightings in the early morning or at dusk. The type of feeding injury is diagnostic, however. Seedling foliage damaged by deer typically has a rough, shredded edge whereas rodents leave a neat, sharp edge at a 45° angle. Mice and voles leave teeth marks on the wood of the stem.

A variety of different repellent chemicals have been used to deter deer from feeding on seedlings (Table 1). Many have been around for years but new products are continually being developed. For instance, the Horticultural Research Institute is sponsoring a study evaluating the natural chemical compounds in daffodils which are known to escape deer feeding. One of the newest deer repellents is called Plantskydd® Animal Repellent which mimics the marking scent of predatory animals and so deters by odor as well as taste (Table 1). Because it is composed of specially processed animal protein, vegetable fats, and salt, Plantskydd© has been exempted from Federal Insecticide, Fungicide and Rodenticide requirements by the US Environmental Protection Agency. Plantskydd® is applied as a soluble powder in the nursery or in the field. A major advantage is that it has no odor to humans and does not harm nursery workers or tree planters. One caution is that it can be difficult to mix and so a slurry should be made before the application solution. Field trials have been very promising, even with species like western redcedar which are preferred by deer. Registration is pending in Canada but Plantskydd© can be acquired under the auspices of an efficacy trial. Contact Tree World® for more information: TEL: 604.885.3535; FAX: 604.885.3522; E-mail: treeworld@sunshine.net ; Website: www.treeworld.com .

Table 1 - Chemical repellents used to prevent deer damage to seedlings

Product	Mode of Action	Active Ingredients	Application Method	Source
Deer-Away Big Game Repellent	Odor Taste	37% Putrescent Egg Solids	Spray	Int Agra Minneapolis. MN Wilbur-Ellis: 800.452.5625
Hinder	Odor Taste	13.8% Ammonium soaps	Spray, Brush	Pace International Kirkland. WA
Chew-Not	Taste	20% Thiram	Spray, Brush	Nott Manufacturing Pleasant Valley, NY
Bonide Rabbit-Deer Repellent	Taste	11% Thiram 11% Acrylic Polymer resins	Spray, Brush, Dip	Bonide Chemical Company Yorkville, NY
Hot Sauce Animal Repellent	Taste	2.5% Capsaicin	Spray	Miller Chemical Corp. Hanover, PA Wilbur-Ellis: 800.452.5625
Nortech Tree Guard®	Taste	Bitter substance: Bitrex®	Spray	ReForestation Technologies International 800.784.4769 Wilbur-Ellis: 800.452.5625
Plantskydd? Animal Repellent	Odor Taste	Animal protein, vegetable fats and salt	Spray	Wilbur-Ellis: 800.452.5625 Terra Tech: 800.321.1037 Ben Meadows: 800.241.6401 Forestry Suppliers: 800.647.5638

Source: Modified from Curtis (1997)

Sources:

Anonymous. 1997. Researchers examine daffodil compounds to deter deer feeding. American Nurseryman 186(3): 10.

Anonymous. 2000. Are your trees being nibbled to nubbins? Forest Vegetation Management Bulletin, April 2000. Portland. OR: Wilbur Ellis Company. 2 p.

Curbs, P.D. 1997. Reduce wildlife munching. Nursery Management & Production 13(11): 28.

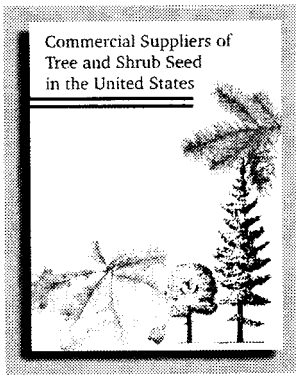
Krahmer, R.W. 1993. Reducing deer damage to conifer seedlings. Hortus Northwest 4: 31-33.

Lemieux, N.; Maynard, B.K.; Johnson, W.A. 2000. A regional survey of deer damage throughout northeast nurseries and orchards. J. Environ. Hort. 18 (1): 1-4.

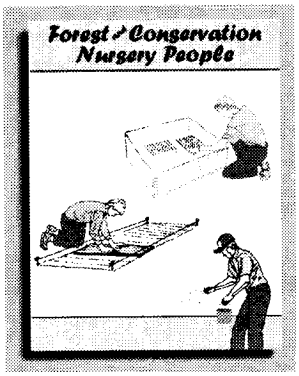
Nursery Directories

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 that you do not have to use the "www " prefix!*

<< http://willow.ncfes.umn.edu/snti/pubs/direchp.htm >>



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 followed by addresses and telephone and fax numbers of the seed companies. Services supplied by each vendor are included along with an alphabetical list of all the tree and shrub seed sold in the US. 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 directory 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 are not on the FNN mailing list or need to update your listing, 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 Email addresses and WWW home pages are also provided. Ownership category, type of nursery (container or bareroot), and current and potential seedling distribution are included. One recent addition is a link to the web site for nurseries in Canada. By its very nature, directory information is constantly changing and keeping them current is a challenge so we need your help. Telephone area codes change frequently so send us your latest address and production information.

Forest Nursery Notes
July, 2000

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, FAX messages, and E-mail 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:

1. 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.

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

3. 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. Note our new E-mail addresses!

New E-mail Address: Tom has a new "official" E-mail address (tdlandis@fs.fed.us), so please note it in your address book. We hope to have a new address for FNN (nurseries@fs.fed.us) in the near future and will let you know as soon as it is operative.

Nursery Directory Form

The Reforestation, Nurseries, and Genetic Resources (RNGR) Home Page (willow.ncfes.umn.edu/snti/snti.htm) 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 addresses so that customers can contact you directly. Send this form back with your literature order form or fax it to: 541.85 8.6110.

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

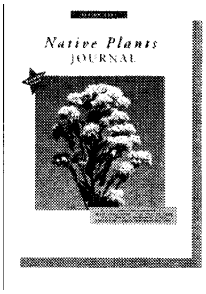
☒ = **Yes, list my nursery in the Native Plant section**

Your Nursery:

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

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

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 and the second will be ready in July of this year. A limited supply 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:

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Forest Research Nursery
University of Idaho
Moscow, ID 83844-1137
USA
TEL: 208.885.3509
FAX: 208.885.6226
E-MAIL: Dumroese@uidaho.edu
http://nativeplants.for.uidaho.edu/

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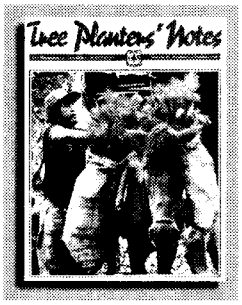

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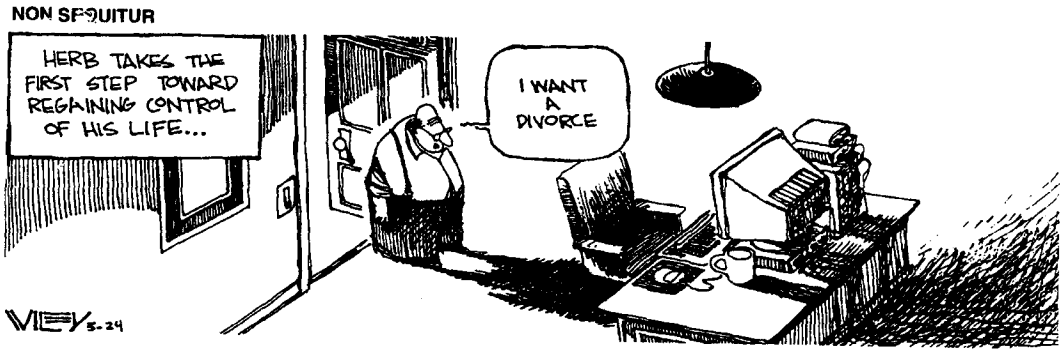

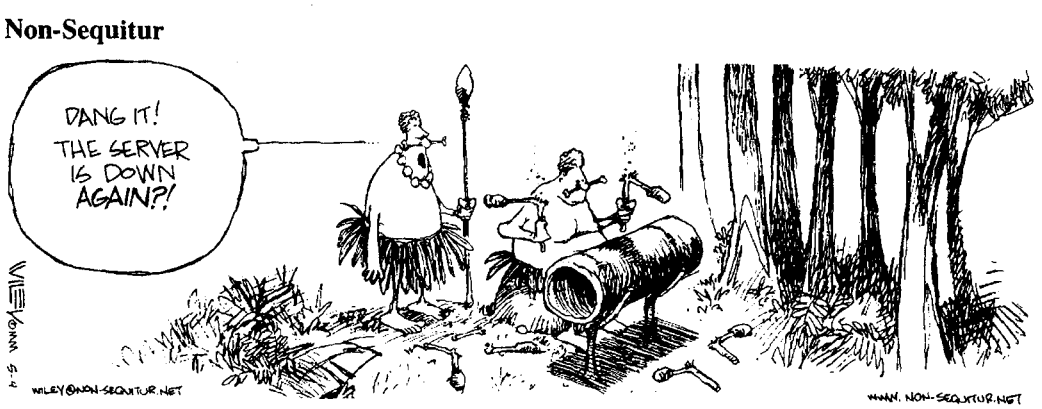

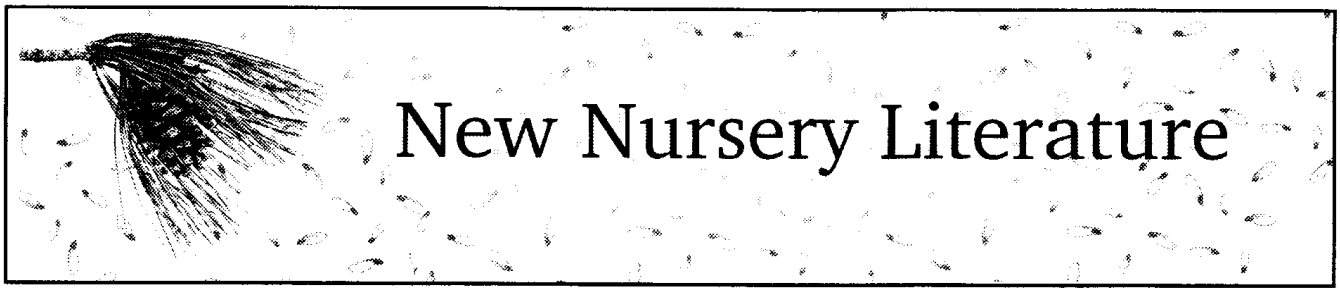

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3. Special Orders (SO). Special orders are books or other publications that, because of their size or cost, require special handling. For some, the Forest Service has procured copies for free distribution, but others will have to be purchased. Prices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

Bareroot Production

1. ©Effects of leguminous ground cover competition on red birch and soil nutrient status in the nursery. Hanninen, K.; Ohtonen, R.; Huttunen, S. Plant and Soil 216:129-13 8. 1999.

Business Management

2. Determining shipping labor costs. Bartok, J. W., Jr. Greenhouse Management and Production 20(4):5354. 2000.

3. Improve shipping efficiency. Bartok, J. W., Jr. Greenhouse Management and Production 20(3):72-73. 2000.

4. Levels of growing stock and economic returns. Kerr, C. L. IN: Stocking standards and reforestation methods for Alaska, p.19-23. University of Alaska Fairbanks, Agricultural and Forestry Experiment Station, Misc. Publication 99-8. 1999. Lutz spruce killed by spruce bark beetle is being harvested in the Kenai Peninsula of Alaska, but returns are not sufficient to make artificial regeneration a prudent business decision.

5 ©The responses of worker effort to piece rates: evidence from the British Columbia tree-planting industry. Paarsch, H. J.; Shearer, B. S. Journal of Human Resources 34(4):643-667. 1999.

Container Production

6. Accelerator containers alter plant growth and the root-zone environment. Arnold, M. A.; McDonald, G. V. Journal of Environmental Horticulture 17(4):168-173. 1999.

7. *Alternantbera nana* R. Br. nursery sowing-time influences *Santalum album L.* growth following field planting. Radomiljac. A. M.; McComb. J. A. IN: Sandal and its products, p.50-53. Proceedings of a seminar held Dec. 18-19, 1997, Bangalore, India. Australian Centre for International Research. 1998. Use of *Alternanthera narra* as a pot-host increases field survival and growth.

8. Cross-country containers. Ruter, J. M. American Nurseryman 191(3):26-28, 30-31.2000. Copper treated fiber pots can withstand the rigors of shipping and provide a viable alternative to black plastic containers.

9. Flood irrigation of container-grown *Euonymus* and *Thuja* as affected by fertilizer rate and substrate. Lumis, G.; Purvis, P.; Taurins, L. Journal of Environmental Horticulture 18(1):13-17. 2000.

10. Getting back to the roots. Schlossberg, M. American Nurseryman 191(3):32-34, 36-37. 2000. A Florida nursery has developed a container system that emphasizes hardy, fibrous roots.

11. ©Recirculation of nutrients in container nursery production. Purvis, P.; Chong, C.: Lumis, G. P. Canadian Journal of Plant Science 80:39-45. 2000.

Diverse Species

12. Anatomy of two mechanisms of breaking physical dormancy by experimental treatments in seeds of two North American *Rhus* species (Anacardiaceae). Li, X.: Baskin, J. M.; Baskin, C. C. American Journal of Botany 86(11): I 505-1511. 1999.

13. ©Effects of nursery pre-conditioning on *Panicum hemitomon* and *Sagittaria lancifolia* used for wetland restoration. Pezeshki. S. R.; Anderson, P. H.; DeLaune, R. D. Restoration Ecology 8(1):57-64. 2000.

14. ©Effects of resource-island soils, competition, and inoculation with *Azospirillunt* on survival and growth of *Pachycereus pringlei,* the giant cactus of the Sonoran Desert. Carrillo-Garcia, A.: Bashan, Y.; Rivera. E. D.; Bethlenfalvay, G. J. Restoration Ecology 8(1):65-73. 2000.

15. ©Effects of salinity and temperature on seed germination in a Japanese endangered halophyte *Triglochin maritimunt* (Juncaginaceae). Masuda, M.; Maki, M.; Yahara, T. Journal of Plant Research 1 12:457-461. 1999.

16. Germination ecology of a federally threatened endemic thistle, *Cirsiunt pitclteri,* of the Great Lakes. Hamze, S.; Jolls. C. American Midland Naturalist 143 (1):141-153. 2000.

17. Honey plant propagation by seed. Part I: Procurement and seed biology. Ward, T.; Alexander, J.; Ayers, G. S. American Bee Journal Sept. 1999, p. 700-706. 1999. Raising plants for bees can be an interesting, rewarding, even exciting endeavor.

18. Honey plant propagation by seed. Part II: The practical practice of propagating honey plants by seed. Alexander, J.; Ward, T.; Ayers, G. S. American Bee Journal Nov. 1999, p. 857-865. 1999.

19. Improved germination of American ginseng seeds under controlled environments. Li, T. S. C.; Bedford, K. E.; Sholberg, P. L. HortTechnology 10(1):131-135. 2000.

20. Industry inspection. Davis, G. A.; Kitto, S. L.; Ilvento, T. L. American Nurseryman 191(4):111-112, 1 14-115. 2000. A survey of eastern North American native plant nurseries reveals problems with plant production and cultivation.

21. ©Interdependence of *Myrica cerifera* seedlings and the nodule forming actinomycete, *Frankia,* in a coastal environment. Wijnholds, A. E.; Young, D. R. Journal of Coastal Research 16(1):139-144.2000.

22. Pericarp removal has little effect on sagebrush seeds. Bai, Y.; Hardegree, S. P.; Booth, T.: Roos, E. E. Journal of Range Management 52:384-386. 1999.

23. ©Regulation of the germination of *Rbus coriaria,* a post-fire pioneer, by heat, ash, pH, water potential and ethylene. Ne'eman, G.; Henig-Sever, N.; Eshel, A. Physiologia Plantarum 106(1):47-52. 1999.

24. Response of blackbrush *(Coleotyne ramosissima)* seedlings to inoculation with arbuscular mycorrhizal fungi. Pendleton, R. L.; Pendleton. B. K.; Warren, S. D. IN: USDA Forest Service, Rocky Mountain Research Station, Proceedings RMRS-P-11, p. 245-251. Proceedings: shrubland ecotones. 1999.

25. Responses of winterfat seeds and seedlings to desiccation. Hou, J. Q.; Romo, J. T.; Bai, Y.; Booth. D. T. Journal of Range Management 52(4):387-393. 1999.

26. The role of endophytic fungi in the survival and establishment of fourwing saltbush *(Atriplex canescens* [Purshl Nutt.) in an arid environment. Barrow, J. R.; Feder, L; Monger, H. C. IN: USDA Forest Service, Rocky Mountain Research Station, Proceedings RMRS-P-11, p. 252-255. Proceedings: shrubland ecotones. 1999.

27. Seed germination and seedling growth of *Alnus maritima* from its three disjunct populations. Schrader, J. A.; Graves, W. R. Journal of the American Society for Horticultural Science 125(1):128-134. 2000.

28. Seed germination ecology of *Lesquerella lyrata* Rollins (Brassicaceae), a federally threatened winter annual. Baskin, C. C.; Baskin, J. M. Natural Areas Journal 20(2):159-165. 2000.

29. Seed germination in Genisteae (Fabaceae) from south-west Spain. Lopez, J.; Devesa, J. A.; Ruiz, T.; Omega-Olivencia, A. Phyton 39(1):107-129. 1999.

30. Seed germination of *Rhododendron chapmanii:* influence of light and temperature. Arocha, L. O.; Blazich, F. A.; Warren, S. L.; Thetford, M.; Berry, J. B. Journal of Environmental Horticulture 17(4):193-196. 1999.

31. Seed germination patterns in green dragon *(Arisaema dracontium,* Araceae). Yang, J.; Lovett-Doust, J.; Lovett-Doust, L. American Journal of Botany 86(8):1 160-1167. 1999.

32. ©Seed germination, seedling emergence, and seed bank ecology of sweet fern *(Comptonia peregrina* (L.) Coult.). Dow, M. A.; Schwintzer, C. R. Canadian Journal of Botany 77(9):1378-1386. 1999.

33. ©Seed yield of three *Bromus* species native to western Canada. May, K. W.; Willms, W. D.; Stout, D. G.; Coulman, B.; Fairey, N. A.; Hall, J. W. Canadian Journal of Plant Science 79:551-555. 1999.

34. ©Seeds of *Thalictrum mirabile* (Ranunculaceae) require cold stratification for loss of nondeep simple morphophysiological dormancy. Walck. J. L.; Baskin, C. C.; Baskin, J. M. Canadian Journal of Botany 77 (12):1769-1776. 1999.

35. Timing is everything. Beattie, D. J. American Nurseryman 191(4):28-30, 32-34. 2000. Understanding propagation timing of perennials can help growers get their plants to customers within the desired sales window.

36. Volunteers and planting techniques for restoring southwestern Idaho riparian habitats. Dudley, M. IN: USDA Forest Service, Rocky Mountain Research Station, Proceedings RMRS-P-11, p.266-273. 1999.

37. ©Woody plant restoration and natural regeneration in wet meadow at Coomonderry Swamp on the south coast of New South Wales. de Jong, N. H. Marine and Freshwater Research 51:81-89. 2000.

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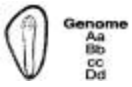

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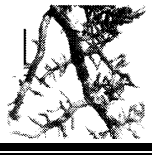

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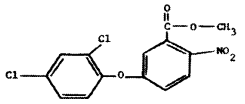

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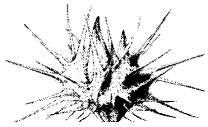

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