

Conifer Quarterly

Vol. 20 No. 3

Summer 2003



Miniature hemlock cultivars, suitable for rock gardens or troughs, include *Tsuga canadensis* 'Jervis' (top) and 'Abbott's Pygmy' (below). Both plants are 14 years old.

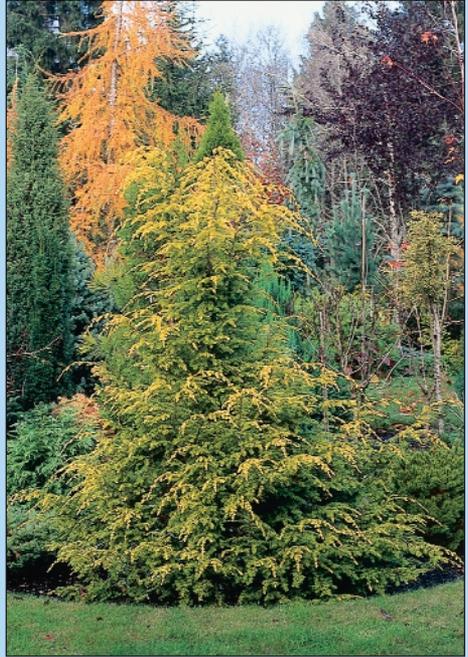


Brita Johansson



Brita Johansson

The golden yellow highlights of *Tsuga canadensis* 'Aurea' stand up to other strong colors in this late autumn garden.



Brita Johansson



The Morton Arboretum

Several large *Tsuga canadensis* 'Sargentii' can be found at public gardens across the United States, including this tree at the Morton Arboretum in Lisle, Illinois.

Contents

Featured conifer genus: *Tsuga* (*hemlocks*)

- 6 The Hemlock Woolly Adelgid**
By Robert M. Jetton and Fred P. Hain
- 13 *Tsuga* Tidbits**
Also see hemlock photos on our covers

More features

- 14 A Swedish Perspective on Winter Damage to Conifers**
By Brita Johansson
- 17 Sulfur Reduces Chlorosis on Dwarf White Pine**
By Justin C. "Chub" Harper
- 18 Pining for the Release of *Wollemia nobilis* – Part 1**
By Sally McGeoch
- 24 Book Review: *The Wollemi Pine* by James Woodford**
By Jane Frampton
- 28 Some Problems in the Establishment of Hardiness Ratings**
By Joe B. Parks
- 36 Conifers in Cuba**
By Karen A. Vagts

Conifer Society voices

- 2 President's Message**
- 4 Editor's Memo**
- 42 News from the Northeast and Southeast Regions**

DON'T FORGET
TO VISIT THE
CONIFER SOCIETY'S
WEBSITE!

www.conifersociety.org

Cover photo: *Tsuga canadensis* 'Pendula' at Chanticleer in Wayne, Pennsylvania. Photo by Anne M. Brennan.

Conifer Quarterly

Summer 2003
Volume 20, No. 3

The *Conifer Quarterly* (ISSN 8755-0490) is published quarterly by the American Conifer Society. The Society is a non-profit organization incorporated under the laws of the Commonwealth of Pennsylvania and is tax exempt under section 501(c)3 of the Internal Revenue Service Code.

You are invited to join our Society. Please address membership and other inquires to the Conifer Society National Office, P.O. Box 3422, Crofton, MD 21114-0422. Membership: US\$25 (individual), \$35 (joint), \$30 (institutional) \$50 (sustaining), \$100 (patron and corporate/business). If you are moving, please notify the National Office 4 weeks in advance.

Editorial and advertising matters should be sent to the Editor: Anne Brennan, 145 Cedar St., Jenkintown, PA 19046.



Editor

Anne Brennan

Technical Editors

Ethan Johnson

Susan Martin

R. William Thomas

Advisory Committee

Don Wild, Committee Chair

Jane Frampton

Charlene Harris

Tom Schlereth

ex officio: Marvin Snyder

ex officio: John Martin



Copyright © 2003, American Conifer Society. All rights reserved. No material contained herein may be reproduced in any form without prior written permission of the publisher. Opinions expressed by authors and advertisers are not necessarily those of the Society.

Note: Hardiness Zone references in the *Conifer Quarterly* are USDA classifications unless otherwise specified.

PRESIDENT'S MESSAGE

By the time you read this message, you will have had the opportunity to vote for three new members of the Board of Directors, and the Board will have met in Denver.

This will be the last meeting for two Board members: Orlan Gaeddert served the maximum of two consecutive terms, and Bill Wells graciously came back to serve for one term. Both of these gentlemen have served the interests of the Conifer Society well during their terms of duty. Please let them know you appreciate their service when you see them. Thanks Bill and Orlan – your dedication, wisdom and experience will be missed.

The challenge is finding qualified individuals who are willing and able to allocate a portion of their precious time to serve as a Director. An added challenge in our organization is to try to

GUIDELINES FOR AUTHORS AND PHOTOGRAPHERS

We welcome your contribution!

Check our Website at

www.conifersociety.org

and click on "Conifer Quarterly"

for complete guidelines,

or contact the Editor.

The Conifer Society may reprint or adapt materials submitted for publication unless instructed otherwise by the author. Refer to our Website or contact the Editor for details.

keep balance on the board between growers and hobbyists, as well as between the various regions of the country.

One of the obstacles to participation may be a lack of understanding of a Director's responsibilities. A Director is required to attend two Board meetings per year: the winter Board Meeting, traditionally held in February in St. Louis, Missouri, and the summer Board meeting held the day before the National Meeting.

Directors are expected to be informed and to read and understand the advance reading material before the meetings. A Director must exercise his or her best judgement on behalf of the Conifer Society and avoid conflicts of interest.

There are a total of nine Directors, three of whom are elected each year to serve three-year terms. From time to

time, a Director might also be asked to chair a specific task force or committee.

If you are interested in serving as a Director, please feel free to discuss this opportunity with any of the Board or officers listed in the Directorate on the last page of the *Conifer Quarterly*. These individuals can answer your specific questions about policies and time commitments.

It would be most helpful if the Society could develop a list of individuals who are both qualified and willing to serve, so we wouldn't solicit qualified individuals who are unable or unwilling to serve. The Society could then draw on this group of qualified and willing candidates to maintain talent and diversity on the Conifer Society's Board of Directors. Please give this matter some serious consideration and indicate your willingness to serve. ▲

Publication Dates

Issue	Calendar Quarter	Deadline to submit articles	Publication Date (approx. mailing)
Winter	Jan/Feb/Mar	Oct 31	Jan 15
Spring	Apr/May/Jun	Jan 31	Apr 15
Summer	Jul/Aug/Sept	Apr 30	July 15
Fall	Oct/Nov/Dec 31	July 31	Oct 15

Submit articles/photos to:

Anne Brennan, *Conifer Quarterly* Editor

145 Cedar St., Jenkintown, PA 19046 • PH (215) 376-0231

FAX (215) 827-5926 • E-mail: ConiferQuarterly@contextcomm.com

EDITOR'S MEMO

Longtime readers of the Conifer Society's publication will remember Charles Jenkins. His *Bulletin*, detailing the plants and people associated with his "Far Country" Hemlock Arboretum between 1932 and 1951, was partially reprinted in our own *Bulletin* between 1983 and 1996. In April, I had the pleasure of visiting the site to find out what was left of Jenkins' collection.

Jenkins often wrote fondly of his location in the wooded Wissahickon Valley and of the public parklands that bordered his property. At some point after his widow died in 1972, according to an article that appeared in the *Philadelphia Inquirer Magazine* in June

of 2002, the property became part of the City of Philadelphia's Fairmount Park, a very large system of 65 parks throughout the city that now covers 8,900 acres.

Unfortunately, said current owner Deenah Loeb on the day we visited, it seems that no provision was made for the property's care. The 10,000 square foot house sat empty for over 20 years, serving as a convenient shelter for squatters. The article describes how Deenah's architect husband, Walter Crimm, came upon the house while jogging in the park. Despite its boarded up windows and clinging vines, the place had potential. They bought it from the city in 1997 and set to work reclaiming



Deenah Loeb (left) describes how the boundaries, vistas and vegetation have changed since Charles Jenkins established his Hemlock Arboretum here. Tony Aiello and Elinor Goff of the Morris Arboretum toured the site with me in April.

While relatively few hemlocks survived the decades of neglect, several large conifers remain from Jenkins' day. This China fir (*Cunninghamia lanceolata*) is the largest I'd ever seen.

both house and gardens from Mother Nature. Neighbors occupy approximately one half of the house, since it and the property were officially subdivided after Deenah and Walter bought it.

Jenkins and his gardeners had created a network of stone-edged paths through his Arboretum, and Deenah has found and cleared several of them during the last three years. A landscape architect, she frequently reminded us how the views and vistas would have looked in Jenkins' time.

And what about the hemlocks? Alas, most of them have disappeared. Some may have been stolen in the early years after the Jenkins' deaths, and others were likely outcompeted by the advancing woodland tree line. However, some noteworthy conifers and other mature trees still reign here.

A large Chinese hemlock (*Tsuga chinensis*), from which many cuttings have been taken for propagation by the Morris Arboretum, thrives on the property. Other notable large trees include *Cryptomeria japonica*, *Larix* and *Taxodium*, as well as the huge *Cunninghamia lanceolata* pictured at left.

Deenah is dedicated to uncovering more of her property's past as time allows, though she knows its role has changed since Jenkins built his arboretum here. "I'm trying to create a balance between the extraordinary specimens, the dynamic living landscape, and the people living in it," she says.

"I consider it a gift to be here."

Anne

The Editor has moved!

Anne M. Brennan
145 Cedar St.
Jenkintown, PA 19046

Phone: (215) 376-0231
Fax: (215) 827-5926

Deciduous conifers will be the focus of a special section in the Fall issue, featuring your favorite cultivars and photos of these plants in your garden.

Share your story about *Larix*, *Pseudolarix*, *Taxodium*, or *Metasequoia*!

Contact the Editor with questions, or send in your photo or comment by August 15th.

The Winter 2004 issue will feature the genus ***Cedrus***, the true cedars. Plan now to share your experiences in growing these plants.



The Hemlock Woolly Adelgid

Robert M. Jetton and Fred P. Hain

The Problem

The hemlock woolly adelgid (HWA), *Adelges tsugae* Annand, is an exotic pest that has the potential to cause the extinction of ornamental and forest hemlock in eastern North America. First reported in western North America (British Columbia, California, Oregon) in the 1920's (Annand 1924), its widespread distribution and innocuous habit throughout central Japan and China suggest Asia as its origin (McClure et al. 2001).

HWA was introduced from Asia into Richmond, Virginia, in the early 1950s (Gouger 1971) and spread into natural stands by the 1980s. Since then, HWA has spread north and south into 12 eastern states causing widespread mortality of both eastern hemlock, *Tsuga canadensis* (L.) Carr., and Carolina hemlock, *T. caroliniana* Engelm., killing trees in as little as four years.

HWA now infests approximately one-third of the eastern hemlock ecosystem with some stands in the northeast suffering 100% mortality. In 1992, 95% of eastern hemlocks growing in the Shenandoah National Park were considered in good health. As of 2002, only 5% are considered healthy with the remaining 95% dead or dying as a result of HWA attack. To date, 19 counties in western North Carolina report HWA infestations with mortality evident in Hanging Rock State Park (Stokes County) and on the Grandfather District of the Pisgah National Forest (Burke County). Until this most recent invasion

into the United States, the biology of HWA remained largely unstudied.

The history of HWA in the eastern U.S. is similar to that of another exotic pest, the balsam woolly adelgid (BWA) on Fraser fir (*Abies fraseri*). This pest was discovered in natural fir stands at

HWA now infests approximately one-third of the eastern hemlock ecosystem with some stands in the northeast suffering 100% mortality.

Mt. Mitchell, NC, in the 1950's and has spread to all natural stands in the southern Appalachians, virtually eliminating mature Fraser firs. Because Fraser fir is a prolific seed producer and because BWA prefers to infest larger trees, many young stands of Fraser firs still exist. Unfortunately, HWA will infest and kill all sizes of hemlock and, thus, prevent hemlock from re-colonizing the site.

The Importance of Hemlock

The eastern hemlocks are species valued for their economic, ecological, and aesthetic importance. Historically, hemlock wood has been utilized for framing, sheathing, sub-flooring, and crating. The most common use during early settlement was for the leather tanning industry that took advantage of the high tannin concentration in hemlock bark

(Godman and Lancaster 1990).

Economic impacts associated with the extinction of the eastern hemlocks include the loss of important timber species harvested throughout the north-eastern United States and eastern Canada, the loss of tourist dollars in state and national recreation areas dominated by hemlock, and the loss of two species planted widely in the ornamental landscape (Swartley 1984; Quimby 1996; Howard et al. 2000).

The loss of the eastern hemlock ecosystem in the southern Appalachians will be more ecologically devastating than that of the American chestnut. Oaks, hickories, and poplars have readily filled the void left by the chestnut, but there are no other conifers that can fill the role of eastern hemlocks as climax and riparian species.

The loss of the eastern hemlocks means the loss of important winter forage and cover for deer, ruffed grouse, turkey, snowshoe hare, and rabbit; primary food sources, roosting, and nesting sites for over 90 species of birds; and stream habitat for native fishes, particularly the already threatened native brook trout (Lapin 1994; Evans et al. 1996; Quimby 1996). Left unchecked, HWA will eliminate two ecologically vital, economically valuable, and irreplaceable species from our forests.

HWA Biology, Host Effects and Population Dynamics

HWA has a complex polymorphic life cycle that includes three generations per year, each developing through an egg stage, four nymphal instars, and an adult stage. Two generations are wingless, parthenogenetic forms called the sistens

and progrediens, each completing their life cycle on the secondary hemlock host. The third is a wingless sexual generation called the sexuparae that leaves hemlock in search of a suitable primary spruce (*Picea* sp.) host, of which there is none in the eastern United States.

The sistens reach maturity in February and produce cottony white eggsacs containing up to 300 eggs in March. Approximately 50 percent of these eggs will hatch into progrediens with the remaining becoming sexuparae, although the actual ratio varies depending on hemlock health and adelgid density. The progrediens remain on hemlock and feed from April through late June when they mature and produce cottony ovisacs containing eggs of the sistens generation. The sistens crawlers (first nymphal instar) hatch, settle on hemlock and feed for a few days before

There are no other conifers that can fill the role of eastern hemlocks as climax and riparian species.

entering aestivation for the duration of the summer. In October, they begin feeding again until maturation in February (McClure et al. 2001).

HWA crawlers of both the sistens and progrediens generations settle at the base of hemlock needles, insert their piercing-sucking mouth parts, and feed from parenchyma or storage cells located in the xylem tissue (Young et al. 1995). Feeding depletes stored nutrients causing needles to desiccate, premature

needle drop, and bud abortion leaving the tree with a gray cast. Heavy infestations can kill trees in as little as four years although some trees have survived for more than ten.

The impacts vary greatly for individual trees and may be related to predisposing factors of site condition (drought, nutrient deficiencies, old age) and secondary mortality agents (hemlock borer, hemlock looper, elongate hemlock scale, gypsy moth) (Souto et al. 1996; McClure et al. 2001).

Adelgid population densities are subject to drastic fluctuations from year to year in response to density-dependent

Since it is relatively easy to control HWA in cultivated settings with safe and environmentally friendly insecticides, gardeners and landscape designers should not be discouraged from continuing to plant and grow hemlock

changes in the nutritional quality of hemlock, creating a population dynamic characterized by bimodal peaks of abundance. During the first year of an infestation, HWA populations increase rapidly and attain peak densities when trees are producing abundant new growth.

Populations decline quickly the second year when very little new growth is produced and adelgids are forced to feed on less nutritious older growth, negatively affecting survival and fecundity

and increasing the percentage of sexuparae eggs produced by the sistens generation (up to 93%). This generation is unsuccessful in reproducing due to the lack of a suitable spruce host in the eastern United States.

During the third year of the infestation, a very small percentage of buds produce new, stunted growth that is quickly colonized by HWA. This represents a second, smaller peak in adelgid abundance. Again populations decline during the fourth year with 100 percent of sistens eggs becoming sexuparae. Trees continue to decline and die during the fourth year or may survive for several more years in a severely weakened condition (McClure et al. 2001).

HWA Control

The speed with which this pest can kill and the economic, ecological, and aesthetic value of hemlock in the eastern forest ecosystem highlight the need for a defense against this invader. Chemical controls (foliar sprays and implanted and injected pesticides) have been successful in controlling HWA in ornamental settings, but their use in the forest setting is limited by the scattered nature and sensitivity of these ecosystems (McClure 1995; Steward and Horner 1994; McClure et al. 2001).

Since it is relatively easy to control HWA in cultivated settings with safe and environmentally friendly insecticides, gardeners and landscape designers should not be discouraged from continuing to plant and grow hemlock. Hemlocks protected by insecticides may be the only survivors from HWA. Biological control by natural enemies native to the eastern United States has been ex-

plored, but the few predators that have been found do not control HWA populations (Montgomery and Lyon 1996; Wallace and Hain 2000; McClure 2001).

Therefore, biological control by exotic (non-native) coccinellid and derodontid beetles has become the focus of

It is unclear at this time whether P. tsugae alone or even a complex of predators will be enough to save eastern and Carolina hemlocks.

control efforts against this pest (McClure 2001). One of these exotic beetles, *Pseudoscymnus tsugae* Sasaji and McClure, has shown potential for controlling HWA in both laboratory and caged field trials, and it is now being mass reared and released into infested hemlock stands in the eastern United States (Cheah and McClure 1998, 2000).

While mass releases of *P. tsugae* have occurred for 4 or more years, to date there has been no clear example of HWA being controlled. In fact, in many cases it is uncertain if *P. tsugae* became established. Concern over the method of release has arisen. In the past, thousands of adult beetles were released from gallon containers. The high density rearing, storage and transport of these beetles may have stimulated them to disperse once released. Thus, it is possible that despite the high numbers, most of the beetles may have flown away from the infested site. Currently, new release methods are being investigated such as releasing eggs rather than adults (the

immature stages of the predator can't fly), or releasing adults on caged infested branches. In the later case the cage would be removed after the adults have mated and laid eggs. In essence, both of these strategies would force the immature stages to become established in the infested area before the adults develop.

It is unclear at this time whether *P. tsugae* alone or even a complex of predators will be enough to save eastern and Carolina hemlocks. Aside from chemical and biological control is the ability of hemlocks to resist attack by HWA. In Asia and western North America, where HWA is an innocuous pest, it is believed that host resistance coupled with native natural enemies prevent this pest from killing the *Tsuga* species that grow in these regions (McClure 1992; McClure and Cheah 1999). If biological control is to be effective in controlling HWA in eastern North America, there will need to exist some level of host resistance in order for trees survive long enough for introduced natural enemies to become established. To date there has been little investigation into potential host resistance mechanisms in eastern or Carolina hemlock. *Tsuga* spp. from Asia and western North America may provide a good starting point from which to identify such characteristics.

In comparing the early efforts to control balsam wooly adelgid (BWA) to the current efforts to control HWA, it is interesting to note that in both cases, much emphasis has been placed on biological control. While the efforts on BWA did result in some predators becoming established, none of them were able to control the infestations, and mature Fraser firs were decimated.

Basically, a research program on an invasive pest should:

- 1) evaluate impacts on hosts and ecosystems
- 2) expand the knowledge of biology, host interactions, and associated biotic and abiotic factors
- 3) develop integrated management strategies
- 4) transfer technology and educate resource managers
- 5) conserve the host gene pool.

While no one disputes the logic of this concept, the temptation to look for a silver bullet has been overwhelming, and a disproportionate amount of the resources have gone into one basket (biological control). Research on invasive

species should be a broad approach that guarantees a substantial effort in all five areas. ▲

About the authors: Robert Jetton is a graduate research assistant, N.C. State University Department of Entomology. He is a 1997 graduate of Furman University (B.S. Biology) and a 2002 graduate of N.C. State University (M.S. Forestry).

Dr. Fred P. Hain, has been a professor of forest entomology at N.C. State University, Dept. of Entomology for almost 30 years. During that time he has done research on the balsam woolly adelgid and, more recently, the hemlock woolly adelgid.

References

- Annand, P.N. 1924. A new species of *Adelges* (Hemiptera, Phyloxeridae). Pan-Pac. Entomol. 1: 79-82.
- Cheah, C.A.S.-J. and M.S. McClure 1998. Life history and development of *Pseudoscymnus tsugae* (Coleoptera: Coccinellidae), a new predator of the hemlock woolly adelgid (Homoptera: Adelgidae). Environ. Entomol. 27(6): 1531-1536.
- Cheah, C.A.S.-J. and M.S. McClure 2000. Seasonal synchrony of life cycles between the exotic predator, *Pseudoscymnus tsugae* (Coleoptera: Coccinellidae) and its prey, the hemlock woolly adelgid *Adelges tsugae* (Homoptera: Adelgidae). Agricultural and Forest Entomology 2: 241-251.
- Evans, R.A., E. Johnson, J. Shreiner, A. Ambler, J. Battles, N. Cleavitt, T. Fahey, J. Sciascia, and E. Pehek 1996. Potential impacts of hemlock woolly adelgid (*Adelges tsugae*) on eastern hemlock (*Tsuga canadensis*) ecosystems. pp. 42-57 In Proceedings: The First Hemlock Woolly Adelgid Review, Charlottesville, VA. S.M. Salom, T.C. Tigner, and R.C. Reardon (eds). United States Department of Agriculture, Forest Service, Forest Health Technology Enterprise Team, Morgantown, WV.
- Godman, R.M. and K. Lancaster. 1990. *Tsuga canadensis* (L.) Carr. Eastern Hemlock. In Silvics of North America Vol. 1. Conifers. R.M. B. and B.H. Honkala. (eds). United States Department of Agriculture, Forest Service. Agricultural Handbook 654. Washington, DC. 675p.
- Gouger, R.J. 1971. Control of *Adelges tsugae* on hemlock in Pennsylvania. Sci. Tree Topics 3(1): 1-9.
- Howard, T., P. Sendak, and C. Codrescu. 2000. Eastern hemlock: a market perspec-

- tive. pp. 161-167 In Proceedings: Symposium on Sustainable Management of Hemlock Ecosystems in Eastern North America, Durham, NH. K.A. McManus, K.S. Shields, and D.R. Souto (eds). United States Department of Agriculture, Forest Service.
- Lapin, B. 1994. The impact of hemlock woolly adelgid on resources in the Lower Connecticut River Valley. Report for the NE Center for Forest Health Research, United States Department of Agriculture, Forest Service. 45pp.
- McClure, M.S. 1992. Hemlock Woolly Adelgid. *American Nurseryman* (March 15): 82-86.
- McClure, M. S. 1995. Managing hemlock woolly adelgid in ornamental landscapes. *Bulletin of the Connecticut Agricultural Experiment Station*. 925.
- McClure, M.S. 2001. Biological control of hemlock woolly adelgid in the eastern United States. U.S. Department of Agriculture, Forest Service, Forest Health Technology Enterprise Team, Morgantown, West Virginia. FHTET-2000-08.
- McClure, M.S. and C.A.S.-J. Cheah. 1999. Reshaping the ecology of invading populations of hemlock woolly adelgid, *Adelges tsugae* (Homoptera: Adelgidae), in eastern North America. *Biological Invasions* 1: 247-254.
- McClure, M.S., S.M. Salom, and K.S. Shields 2001. Hemlock Woolly Adelgid. U.S. Department of Agriculture, Forest Service, Forest Health Technology Enterprise Team, Morgantown, West Virginia. FHTET-2001-03.
- Montgomery, M.E. and S.M. Lyon. 1996. Natural enemies of adelgids in North America: their prospect for biological control of *Adelges tsugae* (Homoptera: Adelgidae). pp. 89-102 In Proceedings: The First Hemlock Woolly Adelgid Review, Charlottesville, VA. S.M. Salom, T.C. Tigner, and R.C. Reardon (eds). United States Department of Agriculture, Forest Service, Forest Health Technology Enterprise Team, Morgantown, WV.
- Quimby, J.W. 1996. Value and importance of hemlock ecosystems in the eastern United States. pp. 1-8 In Proceedings: The First Hemlock Woolly Adelgid Review, Charlottesville, VA. S.M. Salom, T.C. Tigner, and R.C. Reardon (eds). United States Department of Agriculture, Forest Service, Forest Health Technology Enterprise Team, Morgantown, WV.
- Souto, D., T. Luther, and B. Chianese. 1996. Past and current status of HWA in eastern and Carolina hemlock stands. pp. 9-15 In Proceedings: The First Hemlock Woolly Adelgid Review, Charlottesville, VA. S.M. Salom, T.C. Tigner, and R.C. Reardon. United States Department of Agriculture, Forest Service, Forest Health Technology Enterprise Team, Morgantown, WV.
- Steward, V.B. and T.A. Horner. 1994. Control of hemlock woolly adelgid using soil injections of systemic insecticides. *Journal of Arboriculture* 20(5): 287-288.
- Swartley, J.C. 1984. *The Cultivated Hemlocks*. Timber Press, Portland, OR.
- Wallace, M.S. and F.P. Hain. 2000. Field surveys and evaluation of native and established predators of the hemlock woolly adelgid (Homoptera: Adelgidae) in the southeastern United States. *Environ. Entomol.* 29(3): 638-644.
- Young, R.F., K.S. Shields, and G.P. Berlyn 1995. Hemlock woolly adelgid (Homoptera: Adelgidae): stylet bundle insertion and feeding sites. *Ann. Entomol. Soc. Am.* 88(6): 827-835.

SUNCREST GARDENS

2003 will be our 57th year in business. We offer dwarf and unusual conifers and Japanese maples from small to specimen sizes. When the snow flies, we make custom plant labels by order.

816 Holly Pike
Mt. Holly Springs, PA 17065
(717) 486-5142
www.suncrest-gardens.com

Girard NURSERIES 2002 Color Catalog

Producers of rare and unusual conifers, Shrubs, and Trees. Originators of the Girard Line of Azaleas, Rhododendrons, and Juniper 'Saybrook Gold' (Pat.#5014). Visit our nursery and conifer gardens.

Send for free catalog to:
Girard Nurseries
P.O. Box 428
Geneva, OH 44041
(440) 466-2881
Fax (440) 466-3999

www.girardnurseries.com



Edmond Boissier's Life of Plant Exploration: A Correction

After reading Don Howse's article, "Lost and Found," in the Spring 2003 *Conifer Quarterly*, a member emailed:

Edmond Boissier lived from 1810-1885, not 1835. He lived a full life, and his *Flora Orientalis* (southwest Asia) remains one of the most ambitious floras ever completed.

However, his young wife Lucille (1822-1849) tragically died while accompanying him on a botanical expedition to Spain. He memorialized her in two delicate plants with blue flowers (her eye color) – *Chionodoxa luciliae* and *Omphalodes luciliae*.

COLLECTOR'S NURSERY

*dwarf and rare conifers
uncommon perennials*

16804 NE 102nd Ave.,
Battle Ground, WA 98604

catalog \$2.00

360-574-3832 fax 360-571-8540
e-mail dianar@collectorsnursery.com
<http://www.collectorsnursery.com>



Oak Leaves, Bushel Baskets Protect Overwintering Dwarf Hemlocks



Charlene Harris

Tsuga canadensis 'Betty Rose'

In late March, I took the bushel baskets off of my two *Tsuga canadensis* 'Betty Rose.' Next year they will have to be protected by fence surrounds filled with oak leaves, since

they just barely fit under the big bushel baskets this year.

Last week, I spent a day removing the oak leaves and wire surrounds from some of my other hemlocks. The leaves are lightweight and they stay crispy, so they don't mat down like maple and other leaves, while protecting the plants from winter sun. The wire fencing keeps the rabbits out.

These two plants now grow on the north side of my house along with my most treasured small hemlocks and *Chamaecyparis*. About half of those plants fit under full size bushel baskets, and the rest get the wire surrounds with oak leaves.

– Charlene Harris

Hemlock Hedge



The Morton Arboretum

Tsuga canadensis is one of the few conifers that readily accepts the shearing and close spacing required for use as a low, dense hedge. This example grows at the Morton Arboretum in Lisle, Illinois.

A Swedish Perspective on Winter Damage to Conifers

by Brita Johansson

Slender junipers are best for snowy climates

I am writing on January 31, 2003, exactly two years after the devastating ice storm that Dennis Groh described in the Winter 2003 issue (page 12). The problems with ice and heavy snow loads are familiar to us in Sweden, and we welcome suggestions for handling it.

In the north of our country, the snow's light and airy texture provides good protection against cold. But in the south and southwest regions, we get lots of heavy, wet snow, causing broken branches and trees as well as interruption to electrical distribution. In March 2001 we had the worst snowfall I can remember.

Our experiences are very similar to those Dennis describes. Five-needle pines are the most vulnerable; the entire top of our 35-year-old *Pinus wallichiana* was broken off completely. Since it occupies a prominent position in our garden, we kept the tree and luckily a new leader developed very quickly. A *Pinus sylvestris* 'Watererii' of similar age, gradually pruned to expose the red stems, was totally destroyed and must be removed. I am ashamed to admit that this tree had endured just the sort of improper pruning Dennis described; it created dense foliage in the periphery of the crown, which is unsuitable for snowy conditions.

The importance of one single stem can't be stressed enough. I've told peo-

ple buying an arborvitae or a cypress, "Don't choose the biggest plant, choose the narrowest one. And if it has more than one stem, remove all but the

"Don't choose the biggest plant, choose the narrowest one."

strongest. Don't wait!" If in due time you want to cut the lower branches to expose the trunk and let in light, it is easily done if there is only one stem.

I have observed from pictures that *Thuja occidentalis* 'Degroot's Spire' is a narrow, attractive tree. I have never managed to obtain it, as it is not sold in Europe. I was surprised to learn that it has multiple leaders. That made me think about an interesting *T. occidentalis* I know of, which appears to have a single leader.

A conifer collector and friend of ours, Anders Brobeck, found the plant as a seedling in a nursery. The owner can't remember where he bought the seeds or from what cultivar they originated, though we suspect that 'Spiralis' is involved. This plant has grown into a slim, slightly conical pillar at 18 years of age. (It was 15 years old when the picture at right was taken.) We believe that this plant has a commercial future, and it is

under propagation in Holland with the name *Thuja occidentalis* 'Brobeck's Tower'. The winter color is a bit dull, but that is the only drawback.

Junipers

Dennis did not mention junipers in his article. Here in Sweden they cause much trouble in the winter. The pillars and the funnel-shaped forms are particularly problematic. I refuse to grow the latter, but the pillars are too valuable to exclude. We continue to look for cultivars that can stand a snowstorm.

The beautiful *Juniperus communis* 'Hibernica' is comprised of many thin, upright branches. Even if we wind rope around it to preserve its shape, the whole plant often lies flat on the ground after a snowfall. All pillar junipers in our nurs-

eries are more or less of the same type.

The two cultivars which are the most suitable for our conditions are not for sale in the nursery trade. This is understandable due to their uninteresting growth habit when young. *Juniperus communis* 'Örsgänge' is a fairly loose plant for the first eight to 10 years, though with time, it becomes a slim, elegantly pointed pillar with a single, straight stem. Our oldest specimen, now about 30 years old and 23 feet (7m) high, has never been harmed by snow. The photo below depicts an 18-year-old plant.

Juniperus communis 'Urshult' is another good pillar with a single leader, but it is broader and has a blunt top.

Left: *Thuja occidentalis* 'Brobeck's Tower'
Below: *Juniperus communis* 'Örsgänge'



'Örsgänge' has an interesting story. The mother tree was growing in the wild, known and admired by many people. In the early 1940s, a nurseryman and conifer lover in southern Sweden read in

When snow bends a lateral branch over a long period of time, as it does in our north, it causes increased cell growth at the curve, thus strengthening the branch, which will be less vulnerable to future snow loads.

his paper that a road was to be built in the area where the juniper grew. He drove many miles to the place, only to find the tree already cut, but still fresh.

He collected lots of cuttings, and we are in great debt to him. 'Örsgänge' is distributed among conifer lovers in our country and is only being propagated by private growers. There is an impressive group of this cultivar in the Botanical Garden of Gothenburg. It is sad that the

best juniper we can grow is not commercially available.

Pines and Spruces

Trees with branches directed downward fare best in snowy areas. That is why spruces are seldom seriously damaged, as Dennis pointed out in his article. When snow bends a lateral branch over a long period of time, as it does in our north, it causes increased cell growth at the curve, thus strengthening the branch, which will be less vulnerable to future snow loads.

We have found fastigiate forms of pines like *P. sylvestris* 'Fastigiata' and 'Sentinel' unsuitable here. Pictures of these attractive, narrow trees can seduce us, but under our conditions they never grow as narrow as we want, because of repeated snow damage.

I agree with Dennis that it is important to avoid using plants susceptible to snow damage as focal points. The trees which underpin the structure of a garden must come through all local weather conditions safely. We can take chances with small plants that are easily replaced, but not so with specimens meant to provide stability and character to our gardens. ▲

Rare And Dwarf Conifers For Serious Collectors

Featuring "the collection that never stops growing."



PORTERHOWSE FARMS®

41370 SE Thomas Road • Sandy, OR 97055
503.668.5834 phone/fax

EMAIL: don@porterhowse.com
www.porterhowse.com

About the author: Brita Johansson, a retired designer with a lifelong interest in botany, lives and gardens in Sweden. Conifers and heathers are two of her favorite subjects, and she is a frequent contributor to the *Conifer Quarterly*.

Sulfur Reduces Chlorosis on Dwarf White Pine

by Justin C. "Chub" Harper

Much as been written and published about the problems of chlorosis, especially concerning the Eastern white pines, and particularly the dwarf forms. Having dealt with this phenomenon in the two conifer collections I support, I feel confident that the treatment I am proposing – granular sulfur – can profoundly reduce the problem.

My experiment is still in its early stages, but I'm already seeing results, as shown in the "before" and "after" photos of the *Pinus strobus* 'Trautmann Broom' in my yard (see inside back cover). Both photos were taken from about the same angle and position. This plant is a graft from a witches' broom found by long-time Conifer Society member Chris Trautmann of Amelia, OH.

The original photo was taken on May 23, 2002, when over half of the plant was severely chlorotic. The second photo was taken one year later on May 14, 2003, showing a much healthier overall plant producing new candles. There is still a small area in the center of the plant that shows some light yellowing of a few needles. In my opinion, this plant has recovered 95% and will recover completely with time.

Lower the soil pH

All I have done is spread liberal amounts of **granular agricultural sulfur** under the plant twice, covering the entire root area. Over time, this sulfur has dissolved and presumably shifted the soil pH to the acid side of the pH scale. I did a lot of

soil pH tests but they are not reliable. These results, however, are what I was looking for! This type of treatment could benefit chlorotic conifers growing in similar alkaline soils in the Midwest and elsewhere.

If you try it, be patient and remember it takes time for the soil pH to change, since the soil pH is highly

This type of treatment could benefit chlorotic conifers growing in similar alkaline soils in the Midwest and elsewhere.

buffered. I personally do not think you can overdo soil sulfur applications, within reason. Use 1 to 2 pounds per 50 ft² a couple of times a year, and error on the heavy side.

During my recent visit to Hidden Lake Gardens and the Harper Collection, I found that Jack Wikle has been trying this treatment on several pines, with very good results..

I would love to hear from anyone with a similar problem who has comments about my analysis or other ideas for treating chlorosis in conifers. You can contact me at chubh@qcom.net or send your response for publication to the *Conifer Quarterly* Editor. ▲

Pining for the Release of *Wollemia nobilis* – Part 1

by Sally McGeoch

Distribution will be the key to preservation of the Wollemi pine

“Jurassic bark,” “dinosaur tree,” “pino-saur,” “prehistoric pine,” “old wood,” and “living fossil” are just a few nicknames the ancient and mysterious Wollemi pine has inherited since capturing the world’s attention almost 10 years ago. Belonging to a family that dates back to the Jurassic period, the Wollemi pine is one of the world’s oldest and rarest plant species. Its chance discovery in a deep rainforest gorge in the Wollemi National Park, just 93 miles (150km) northwest of Sydney, is a major botanical find – akin to finding a dinosaur alive today.

Identified as the only known living plant link between present day conifers and those that were prolific in the Jurassic period, the Wollemi pine has generated immense interest from horticulturists, ecologists, and conservationists keen to research and protect the species. With less than 100 mature Wollemi pines known to exist in an undisturbed site, it is essential that they are protected to ensure their continued survival.

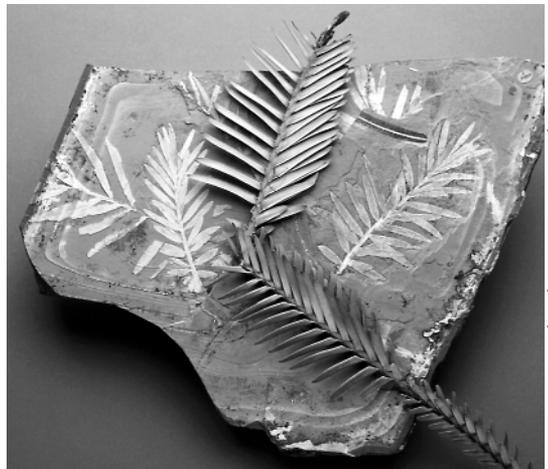
The History of the Wollemi

The Wollemi belongs to the conifer family Araucariaceae, which is believed to be up to 200 million years old and to have been widespread at the time of Gondwanaland, a hypothetical

super-continent in the southern hemisphere that included Australia, South America, Africa, peninsular India, and Antarctica. This landmass supposedly began to separate in the late Triassic Period (245 to 208 million years ago) with the ensuing climatic changes causing the gradual disappearance of the Wollemi pine.

Seeds, cone scales and pollen of the Wollemi appeared widespread from about 90 million years ago to 40-20 million years ago, with the most recent fossil evidence found in two million-year-old sediment extracted from Bass Strait, between the states of Victoria and Tasmania in Australia.

The Wollemi pine’s closest living relatives include the Kauri (*Agathis* sp.), Norfolk Island, Hoop, Bunya and



Jaime Plaza / Royal Botanic Gardens Sydney

monkey puzzle pines (*Araucaria* sp.). Morphological, wood anatomy and DNA analysis suggest that the Wollemi is a new genus, falling between these two previously known living genera. Although it shares similar features with these relatives, the Wollemi pine's dis-

*The root systems
of the wild trees
may be thousands
of years old*

tinctive “bubbling chocolate” textured bark and dark waxy leaves make it stand out.

It is difficult to determine the exact age of the Wollemi pines found in the Wollemi National Park. Scientists estimate that they may be between 500 and 1000 years old. However, as the Wollemi pines have a habit of coppicing (growing multiple trunks), it is possible that rockfall, age, winds or weather have destroyed the original trunk, so the age cannot be determined accurately. The

Left: A living Wollemi pine branch alongside its fossilized ancestor from the mid-Jurassic period.

Below: A female cone.



Jaime Plaza / Royal Bot. Gdns. Sydney

root systems of the wild trees may be thousands of years old, especially those belonging to “King Billy” – the largest and tallest of the Wollemi pines in the Blue Mountains. Named for the helicopter pilot who took scientists safely into the rainforest gorge to study the trees, “King Billy” towers above the rest of the Wollemi grove at around 130 feet (40m) in height.

How it Was Discovered

It was a New South Wales (NSW) National Parks and Wildlife Service officer and avid bushwalker, David Noble, who made the miraculous discovery in September 1994. David was hiking and descended into a deep rainforest gorge when he stumbled upon a group of ancient looking trees. The largest trees had 3-foot (1m) diameter trunks and featured unusual fern-like, dark green foliage with a unique pattern of branching. The bark looked like bubbling chocolate. Curious about the unusual tree, David collected a fallen branch and continued his hike.

Returning to Sydney, David sought help to identify the tree. He approached the NSW National Parks and Wildlife Service and the Royal Botanic Gardens Sydney for assistance. His report that the sample came not from a fern but from a conifer-like tree intrigued scientists Wyn Jones from NSW National Parks and Wildlife and Jan Allan from Mount Tomah Botanical Gardens.

Moved by scientific curiosity, they returned to the site to gather more specimens. They were astounded by the find. The trees looked like nothing any of them had ever seen. Jan and Wyn gave the tree the working title “Wollemi

pine,” named after the Wollemi National Park where the species was first discovered. The scientific name *Wollemia nobilis* honors the Pine’s majestic qualities and the man who discovered them, David Noble.

Protecting the Species

Since its discovery in September 1994, the NSW National Parks & Wildlife Service and the Royal Botanic Gardens Sydney have been busy putting measures in place to ensure the survival of the fragile Wollemi pine population. The species is now protected by the NSW Threatened Species Conservation Act 1995. It is listed as endangered at a national level under the Environmental Protection & Biodiversity Conservation Act 1999 and is on the directory of Rare or Threatened Australian Plants (RoTAP). As of December 2000, the

Wollemi National Park (where the Wollemi pines are located) was added to the World Heritage list as part of The Greater Blue Mountains Area.

In addition to these legislative safeguards, a dedicated Recovery Plan was developed to protect the wild population and ensure the ongoing survival of the species. Specific recommendations of the Recovery Plan include maintaining secrecy around the exact location of the wild Wollemi pine and monitoring the sites to guard against unwanted visits. Should the location be revealed, there are fears of damage to roots and seedlings as visitors walk around the site. There is also a concern that visitors could introduce weeds or pathogens that may destroy the trees.

Developing a program to cultivate and release the Wollemi pines worldwide is also a key strategy of the Wollemi Pine Recovery Plan. Having Wollemi pines in homes, gardens and parks worldwide is one of the best forms of insurance against loss in the wild. Due to past incidences where the natural environments of rare and threatened species have been disturbed and harmed by unauthorized visits, the commercialization of the Wollemi pine will allow any one to take part in the conservation effort.

As royalties from the sale of Wollemi pine are invested in the conservation of this and other rare or threatened species, buying your own plant in two to three years will assist in the ongoing protection of the wild population.

Currently, the Wollemi pine is being

Harvesters are lowered from helicopters to treetop level to access propagation material.



Jaime Plaza / Royal Botanic Gardens Sydney

propagated in a controlled and safe environment and will be available for purchase in 2005-2006. The date has been set to allow sufficient time for comprehensive research and development into the best propagation methods and to build up sufficient quantities of trees to meet international demand. Results to date are very promising, indicating that the Wollemi pine thrives in cultivation and is adaptable to both garden and indoor settings.

Wollemi Science

Scientists currently involved in Wollemi pine research feel that it is some of the most important work of their careers. Projects include studies of wood anatomy, fungal associations, and growth habits in cultivation and in the wild.

One of the most notable research findings so far is that no detectible genetic variation exists within or between the wild Wollemi pine populations. In fact, there is very low genetic variation within the whole family of Araucariaceae. The Wollemi pines in the wild appear to be cloning themselves by sending out shoots from the base of the tree that eventually become adults in their own right. This means that many of the Wollemi pine trunks might really be part of just one plant. Scientists believe that this may prove it is possible to have exceptionally low variability and yet survive the ravages of fires, the ice age, dinosaurs, and the movement of continents.

There is evidence, however, that new trees can and do arise from seedlings, so we are fairly certain that they are able to reproduce sexually. Like its closest living relatives, the Wollemi pine is bisexual with both female and male reproductive

cones on the same tree. The round female cones produce seeds and the long male cones produce pollen. The male and female cones appear on separate branches at the very tips. The female and male cones start growing in mid-summer, and in late spring the male cones release a mass of pollen which is carried by the wind to fertilize the egg cells in the female cones.

It is believed that the Wollemi pine must be 15 years of age before it will produce seed cones, but none of the Wollemi pines in cultivation have produced seed yet.

Seeds produced in the female cones ripen within 18 months; the cones then fall apart and release the winged seeds onto the canyon floor. At this stage, it is believed that the Wollemi pine must be 15 years of age before it will produce seed cones, but none of the Wollemi pines in cultivation have produced seed yet.

Wollemi in Cultivation

Significant research attention is also focused on how the Wollemi pine will perform in cultivation and in different climatic regions around the world. It is expected that the Wollemi pine could survive a range of climates outside Australia.

The plants in cultivation have been able to withstand temperatures ranging from 32-113 °F (0-45 °C), even down to 23°F (-5 °C) for a short period of time. There are about 30 plants in botanic gardens in varying climates around Aus-

tralia, and all are doing well. Further trialing will establish whether the pines could withstand temperatures below 32 °F (0° C) for extended periods. Research has confirmed that it can also be grown as an indoor specimen.

On average, the cultivated Wollemi pines are growing around 1.5 feet (0.5m) per year, although growth in the wild is much slower. For about two months in early spring, new growth contributes to each plant's height, but the remaining annual growth occurs on lateral branches.

The species favors acid soil – pH can be as low as 4 in their native habitat, and in potted cultivation they favor a pH of 6 or below. Although their habitat soil is naturally low in nutrients, the Wollemi

pinus respond well to fertilizer. A range of potting mix requirements and fertilizer types is being tested. Young plants in cultivation need some protection from strong light provided by shade cloth or the shelter of other trees.

Wollemi pines will be offered in a range of sizes and available through distributors in key areas such as the U.S., Canada, Europe, Japan, China and New Zealand. The Pine will be available for purchase online through the Web site www.wollemipine.com and distributed for sale to other destinations around the world.

For more information on the Wollemi pine, to join the Wollemi Pine Conservation Club, or to register your interest

GEE FARMS

Nursery & Landscaping

10 Acres of Container Plants

Conifers, Hosta, Ornamental Grasses, Perennials

We invite you to visit our display gardens and new water garden featuring many unusual and hard to find plants.

Family Owned since 1849

8:00 am till Dark – 7 days

Gary & Kaye Gee

14928 Bunkerhill Rd., Stockbridge, MI 49285

PH: (517) 769-6772 or 1-800-860-BUSH

FAX (517) 769-6204

Visit our Web site @ www.geefarms.com for our plant list

in purchasing a Wollemi pine, visit www.wollemipine.com.

Most importantly, every Wollemi pine sold will return royalties to be invested in the conservation of the Wollemi pine and other rare and threatened species. The Wollemi pine will therefore act as a flagship species to promote conservation and related issues such as plant biodiversity. Future custodians of a

Wollemi pine will not only be helping conserve this ancient species but will also be leaving a legacy of plant conservation and protection for generations to come. ▲

Part two of this article, describing more about Wollemi pine production and its worldwide release, will appear in the Fall 2003 issue of the *Conifer Quarterly*.

About the author: Sally McGeoch has been involved in horticulture through her family's nursery business for over 20 years. Birkdale Nursery, based in Brisbane, Queensland (Australia) is a specialist exporter of Australian ornamental plants. Birkdale Nursery and the Queensland Government Department of Primary Industries Forestry secured the exclusive rights for the propagation and marketing of the Wollemi Pine on behalf of the Royal Botanic Gardens Sydney.

In a Rare Mood ...

- try our • Japanese Maples
• Dwarf Conifers
• Bonsai
• Bonsai Supplies



1451 Pleasant Hill Road
Harrisburg, PA 17112
(717) 545-4555

www.natureswaybonsai.com



WOLF-RUN NURSERY LANDSCAPES

Rare and Unusual Plant Material
Exotic Conifers

Karen & Mark Priebe

Toll Free 877-779-5715

Fax 610-779-0555

E-mail: landscapes@wolfrunnursery.com

wolfrunnursery.com

610-779-5717

29 Klappenthal Road

Reading, PA 19606

Rich's
Foxwillow
Pines
Nursery
Inc.



Rich and Susan Eyre
11618 McConnell Rd
Woodstock IL 60098

*Rare & Garden Conifers
Ginkgos, Beeches, Perennials
Hostas, Daylilies, Irises,
Alpine Plants*

815-338-7442 (phone)

815-338-7446 (fax)

coniflora@richsfoxwillowpines.com

www.richsfoxwillowpines.com

Book Review:

The Wollemi Pine by James Woodford

by Jane Frampton

Two years ago, while traveling in Australia, my husband, John, and I came across *The Wollemi Pine* in a museum bookshop in Perth. We were winding down our nearly three-week trip and needed some entertainment to help fill the twenty-five or so hours of flying time back to North Carolina. Almost as soon as we boarded the flight from Perth to Sydney I began reading the book, and by the time we neared Sydney four hours later, I was gazing out the window at the Blue Mountains below, wondering where, amidst all the green and gullies, was that tiny stand of Wollemi pine.

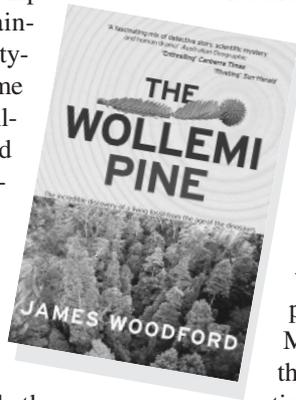
It has been nearly nine years since David Noble, a field officer for the National Parks and Wildlife Service (NPWS) and two friends rappelled, or as they say Down Under, abseiled, into a canyon in the Wollemi wilderness on their way to discovering the previously unknown tree. The brief but tantalizing description of the actual discovery beginning Chapter 1 quickly reveals James Woodford's engaging style of introducing a fascinating morsel of the giant jigsaw puzzle, only to divert the reader's attention to another, even more fascinating. While many authors use this formula to keep you reading to the end, you won't be disappointed or feel cheated in

the least by Woodford.

The author actually begins the book with A Warning, a one page preemptive reprimand about the secrecy of the trees' location as well as punishment by fines and imprisonment for harming the trees. It also serves to explain that details in the book have been changed to conceal the exact location of the trees.

Once that is out of the way, the author backtracks through the history of European discovery of the Blue Mountains in the late 1780s through to its becoming a national park in 1979. It is also in Chapter 1 that the main players are introduced, with David Noble's background presented as well as that of Wyn Jones – one of Noble's mentors, a naturalist with the NPWS, and the first person with whom Noble shared Wollemi pine plant material in an effort to find out what it was. Also enter Jan Allan, a botanist from New Zealand, who, along with Jones and Ken Hill, senior botanist at the Royal Botanic Gardens, was given credit for the plant's identification.

Chapter 2, Are You My Mother, delves into the origins of plant life on earth, conifers, and the eventual placing of the Wollemi pine's origin during the Cretaceous period. By the conclusion of the chapter, a new genus has been added to the plant kingdom, and by Chapter 3



the name *Wollemia nobilis* has been born, but not without controversy.

In 200 pages, Woodford meters out just the right amounts of science, history, mystery, politics and human behavior to keep readers interested. He pulls together the information from a wide range of sources both directly and remotely related to *Wollemia nobilis*. One of the most fascinating tales is the long-standing mystery of *Dilwynites*, fossil pollen first found in the 1960s by a young palynologist (fossil-pollen scientist) working for the Australian Geological Survey. Over the years no one could figure out what this ubiquitous pollen arose from, but by Chapter 4 we know it is from an extinct species of *Wollemia*.

Chapter 6 provides a great explanation of the browning of a once green Australia over the last several ice ages. All of this information puts the existence and continual survival of this tiny population of Wollemi pines into perspective and provides the reader with a reason to admire its tenacity. As Woodford says, "Life will go to unimaginably dogged lengths to ensure that whatever soup of chemicals it has chosen to animate sees just one more sunrise. But very few organisms on earth can claim to have done this as stubbornly as the Wollemi pine."

Chapter 9 may hold the most intriguing and puzzling tale of all – that of the DNA tests on the Wollemi pines. A second small population of Wollemi pines was discovered after the first. Tests done on both revealed that there was no genetic diversity either among individuals or between populations. This ran contrary to normal findings of at least some genetic diversity in small isolated populations of plants and blasted the conventional theory that genetic diversity ensures survival.

In the final chapter of the book, Woodford describes his own humble visit to the Wollemi pines, complete with a harrowing helicopter ride.

I found myself completely entranced by subjects I previously knew nothing about, and I think most readers will have a similar experience. *The Wollemi Pine* ties together many disciplines in a wonderful adventure story. You don't have to be wild about conifers to enjoy this book, but it does enhance the pleasure.

The book is sprinkled throughout with 16 black and white photos, mostly of the key people involved in the study of the tree; 14 color plates, primarily of the Wollemi pine in its natural environment; and several illustrations including a sketch of a map of the Blue Mountains, Wollemi National Park and surrounding areas, maps depicting continental drift and the positions of the continents when *Wollemia* flourished, and DNA profiles of Wollemi pine.

The Wollemi Pine does not have a US publisher or distributor so it must be purchased directly through the publisher (see contact information below). ▲

Publication Date: 2000

Price: A\$22.95 plus S&H.

Softcover, 6 x 9 inches, 200 pages, plus acknowledgements, bibliography, index. 14 color photos, 16 B&W photos, 6 charts and illus. ISBN: 1-876485-48-5.

Available via e-mail by contacting Michael Williams, Michael.Williams@mel.textmedia.com.au, or from The Text Publishing Company, 171 La Trobe Street, Melbourne, Victoria, 3000, Australia.

THUJA X 'GREEN GIANT'



Replacement Tree For New England's Dying Hemlocks

- ← Original Tree Planted 1967 U.S.N.A.
Washington D.C. 50'x11'
- New US National Arboretum Plant
- Pennsylvania Gold Medal Plant Award 1998
- Tough, Fragrant, Tall, Narrow Pyramidal Evergreen
- Deer, Bagworm & Disease Resistant
- Fast Growing, 3'-5' / Year
- Zone 5-8
- Excellent Alternative to Leyland Cypress
- Also Valley Forge American Elm
- We Ship All Year

www.botanyshop.com

90 pictures on our website!

Plants 8in. - 3 1/2ft. tall, \$3.00 to \$45.00 each

Botany Shop - Joplin, Missouri

PHONE: (888) 855-3300

The above 3 pictures were taken at the National Arboretum in Washington D.C. in August of 2001. When planted in the fall of 1998, they were 3 feet tall and planted on 6 1/2 foot centers. They grew 3 feet in the first year (1999), and are now 10-12 feet tall. It can be trimmed to any height or width to create the ultimate natural or formal hedge.

"The Thuja Green Giants are the toughest, disease, insect, deer and ice resistant evergreen I have ever used. I am 6' tall with a 6' arm span, so you can see the height to width ratio of these trees." - Mike Shade

(For faster solid screen, plant 5 feet apart.)

Valley Forge American Elm

Many pictures and information on our website
www.botanyshop.com
or call 888-855-3300 for prices and information.

- The Most D.E.D. (Dutch Elm Disease) Resistant American Elm Ever Tested
- New U.S.D.A. Release
- No Secrets Or Patents
- Anyone Can Easily Propagate, Grow Or Re-Sell This Great American Tree
- We Give A 15 Year D.E.D. Guarantee



Morton Arboretum Weathers Harsh Winter and A Few Conifer Losses

by Kunso Kim, Curator of Living Collections, The Morton Arboretum

Our Pinetum, which was started 1930s and expanded over the years, contains diverse conifer species and cultivars totalling over 334 taxa and 570 accessions. Main groups represented in the Pinetum include Cupressaceae (started 1934), Ginkgoaceae (1924), Larix (1950), Pinaceae (1936), and Taxaceae (1941). Our Pinetum offers rare opportunities for public to see and study many fine specimens that have reached their maturity.

Our region is classified as USDA Hardiness Zone 5a. Contrary to what this hardiness zone may suggest, we have been able to successfully grow some conifers that may not be considered reliably hardy in our region. These include *Cryptomeria japonica* (Zone 6-

7), *Cephalotaxus sinensis* (Zone 7-8), *Torreya nucifera* (Zone 6-8), and *Taxus wallichiana* (Zone 8).

Encouraged by these plants' performance, we added in 2001 *Sequoiadendron giganteum* (251-98, MSU 93N026). We acquired this plant from the Beal Botanical Garden at Michigan State University, Michigan. It survived the winter of 2001-2002 without any damage when the lowest temperature recorded was 5 °F (-15 °C). However, it did not come through this past winter. We may have been a little ambitious in trying to grow this species, but had we sited it in a more protected, north facing location, it might have been fine.

The pattern of weather this past winter was quite unusual and may explain the severe injury on *Sequoiadendron*. It was quite dry and cold throughout January and February. In fact, the temperature remained below freezing throughout January except January 8th and 9th, when the maximum temperatures recorded in both days were 56 °F and 55 °F (13 °C) respectively. The lowest temperature recorded this winter was -11 °F (-24 °C) January 15th. Basically, the snowless and prolonged low temperature in January and February killed the plant. ▲

Sequoiadendron giganteum at the Morton Arboretum, killed by the unusual 2002-2003 winter weather pattern.



The Morton Arboretum

Some Problems in the Establishment of Hardiness Ratings

by Joe B. Parks

Editor's Note: The following article was previously published in *The Rosebay*, the publication of the Massachusetts Chapter of the American Rhododendron Society, so many of the plant examples refer to rhododendron cultivars. Several Conifer Society members recognized the article's relevance to all types of woody plants and recommended that we share it with our members, so we obtained the author's permission to do so.

The Problem

It is commonly assumed that hardiness to some minimum temperature is a characteristic of all plants. This is overly simplistic.

True, there is some minimum temperature below which a given plant cannot survive. But, above that minimum, a number of complex factors influence hardiness response. The problem is that dormancy (hardiness) is only the last step in a complex annual growth cycle.

It is well understood that there are many different climates in North America, i.e., New England maritime, mountain, continental, etc. It is seldom considered (and often not understood) that each climate provides different growth cues to a plant. Even though minimum temperature may be identical, plant behavior and thus plant hardiness in each climate is affected by the differences in the growth cues received.

These growth cues include day length, light intensity, season length, maximum temperatures, moisture, etc. Cues vary from climate to climate, latitude to latitude and altitude to altitude. Thus the growth cycle is also a variable

depending on location. Clearly, then, dormancy (hardiness) being the last step in the growth cycle, is also a variable depending on location.

The failure of hardiness standards to consider the effect of climatic differences on hardiness results in a commonly heard complaint. "It's rated hardy for such-and-such winter temperature, and my garden's warmer than that, but it won't grow for me."

The Climate Factor

It is accepted that if summer growth is poor because of poor care, then the level of winter hardiness is reduced. The same applies if growth is poor because *the plant is poorly adjusted to the climate*. The problem is that we often fail to perceive the poor adjustment.

The Growth Cycle

We all know that a spring frost can damage new growth. As the season progresses, however, new growth becomes more and more able to survive cold damage until finally, sometime at the end of the growing season, it matures, becomes dormant and reaches maximum hardi-

ness. But achievement of that maturity depends on the growth cues the plant receives during the growing season and on its ability to accept those cues.

There is not necessarily a relationship between the length of the growing season and USDA Zones. Season length and the rate at which it progresses is dependent on the climate, the latitude and the altitude. The further north (or higher up) a plant grows, the less time it has in which to flower, produce seeds and reach maturity – regardless of the USDA Zone. For a plant that requires a long season to mature, the end of a short growing season will find new growth still immature. For a short season plant, the opposite is true.

Researchers have reported that, even though Helsinki, Finland, and Minneapolis, Minnesota, are both in USDA Zone 3, woody plants that were moved from Minneapolis did not survive in Helsinki.ⁱ This research concluded that, even though Helsinki winters average about four degrees (F) warmer, the shorter growing season at 60° north latitude simply did not offer enough time for the Minnesota plants from 45° north latitude to mature and harden off properly.

Raulston and Trippⁱⁱ report that although crape myrtle (*Lagerstroemia*) is hardy in North Carolina, it does not survive in England with its warmer winters. They conclude that English summers with cooler temperatures and a lower light intensity do not allow crepe myrtle to mature and harden off properly. Thus it dies from the stresses of an English winter that is actually warmer than North Carolina.

The reverse is also true. A plant adapted to maturing in a short season

will tend to continue growth in a long growing season. The days continuing to be warm and the sun high, it receives the wrong growth cues. Consequently, its genetic program may become confused and it fails to mature properly. With rhododendrons, the result is plants that survive and flower well after bitter New England winters but often do poorly after much warmer winters in more southern climates. For example, *R.*

There is not necessarily a relationship between the length of the growing season and USDA Zones.

tigerstedtii hybrids, developed for the short, cool growing season of Finland (60° north latitude and USDA Zone 3), sometimes do poorly when grown in warmer New England (44° north latitude, USDA Zones 6 & 6).

Altitude has much the same effect on growing season length as does latitude. “Further north” and “higher on the mountain” both create a shorter growing season. Unknown factors are the increase in light intensity and the change in the light spectrum caused by the more rarified atmosphere of higher altitudes. The fact that a plant survives at high altitude does not necessarily mean that it will prove hardy in climates humans find more comfortable.

Prof. Tigerstedt of the University of Helsinki states the situation succinctly.ⁱⁱⁱ He says, “Frost (cold) hardiness is a complex trait. There is always strong interaction between genotypes and environments in the hardiness performance.

Average annual minimum temperatures, as given in USDA hardiness zones, may be convenient for zoning but many other climatic factors play a considerable role.”

To sum up, even though winter temperatures are identical for two locations, a plant grown in a northern “short grow-

The minimum winter temperature a specimen can survive is closely related to how well the plant is able to mature and harden off as summer wanes and colder weather takes over.

ing season” climate exhibits a different winter hardiness than if grown in a more southerly “long growing season” climate. It follows then that hardiness in northern latitudes is not necessarily the same as that in southern latitudes.

Temperature

Minimum winter temperatures are usually considered to be the measure of plant hardiness. Actually, according to Raulston and Tripp,ⁱⁱ both temperature range and *cumulative* temperatures need to be considered. For example, it is well known that many plants that grow well in USDA Zones 4, 5 and 6 do not perform equally well in Zones 8 and 9 which are warmer.^{iv, v, vi}

The minimum winter temperature a specimen can survive is closely related to how well the plant is able to mature

and harden off as summer wanes and colder weather takes over. Plant growth and maturation is a water-based, temperature dependent, photochemical process. For the plant to mature and properly enter dormancy, it must be exquisitely attuned to the temperatures (both cumulative and the extremes) which allow the process to go forward. A plant that is programmed genetically to respond to a certain rate of temperature change will perform differently^h if it is placed in a different situation.

Fall temperatures are particularly important to the hardening off process. It is often noted in New England that plants need a gradual cooling off period in order to survive our severe winter cold without damage. Thus a warm November followed by a severe cold snap in early December has been noted to cause considerable flower bud damage. Yet if the plant has had an opportunity to harden off gradually throughout the fall, even lower temperatures often cause no damage at all.

The rate at which fall cooling proceeds is more rapid (and fall weather the coldest) in the north. Fall moves south at about 100 miles (166 km) per week. The result is a cooler, shorter fall season the further north you go.

The rate at which a given species matures and hardens off is thus different at different latitudes. A plant in Tennessee, having had a longer, warmer fall (a slower rate of cooling down) and less of a temperature change, does not mature and harden off the same as it would in New Hampshire. Therefore, low winter temperatures that may not affect a New Hampshire plant at all can have a devastating effect on the same plant in

Tennessee. Dr. Russell Gilkey reported^{vii} severe damage to plants at -6 °F (-21 °C) that are rock hardy at temperatures of -17 °F or -18 °F (-27 °C) in New England. Clearly hardiness ratings that are correct for a New England plant do not have the same validity in Tennessee!

The fact that a species is hardy at New Hampshire temperatures may offer guidance. But its actual hardiness in Tennessee can be known only if hardiness has been determined at similar temperatures *in a similar climatic area*. It is not just a question of minimums or temperature ranges; it is also one of differing growing seasons and climates. As Prof. Tigerstedt points out, “Frost (cold) hardiness is a complex trait.”ⁱⁱⁱ

The Hardiness Rating Problem

The hardiness rating system commonly in use in the United States today is based on the lowest temperature at which a plant is expected to perform “normally.” It has been found that the actual hardiness response of a plant often differs from that indicated by the rating.

To avoid the problems of a “single temperature” standard, the American Rhododendron Society (ARS) has adopted a different standard. This new standard is based on a “range of hardiness” with a minimum and maximum temperature. It consists of 1) a minimum temperature, defined as “the lowest reported temperature at which the plant performed,” and 2) a maximum temperature defined as “the highest reported (winter) temperature at which the plant was damaged.” Both systems are assumed to be applicable wherever a particular rhododendron is grown.

The ARS says that use of a “range of

hardiness” rating will eliminate the problems of the “single” temperature rating. It is reasoned that, by including the lowest temperature at which a plant performed and the highest winter temperature at which it was damaged, the full range of hardiness will be covered. In other words, it is expected that a rhododendron’s actual hardiness will be somewhere within this range – regardless of where it is grown.

Data is currently being collected from whomever is willing to collect and

*Plant fanciers everywhere
tend to push the
“hardiness envelope”
as much as possible.*

report it. The data therefore can be expected to reflect the winter temperature extremes of the various locations in which rhododendrons are grown. For example, the “lowest temperature of performance” for a plant will be based on reports from cold, short season climates such as New England. Similarly, the plant’s “highest (winter) temperature of non-performance” will be based on reports from warm, long season climates such as the Carolinas.

Plant fanciers everywhere tend to push the “hardiness envelope” as much as possible. It is common to find that rhododendrons being grown in the eastern US and Canada are also being grown in warmer climates further south. Thus a particular rhododendron can often be found to be growing in as many as four different USDA Zones.

This means that the range of mini-

imum winter temperatures in which a particular cultivar or species is being grown can often vary by some 30 or more degrees (F). This also means that the length of its growing season will vary as much as three or more months. This is a wide spectrum of growing conditions. Here in New England where the temperature spectrum is somewhat less than na-

tional in scope, the Hardiness Reporting Program has received grower reports ranging from a low of -32 °F (-36 °C) to a high of +5 °F (-15 °C) – a range of 37 degrees F (or 20 degrees C).

It is a given in data collection activities that, up to some limit, the larger the population collected from, the greater the range of data collected. The

Figure 1.

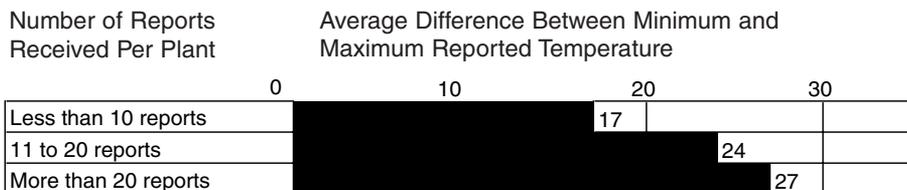
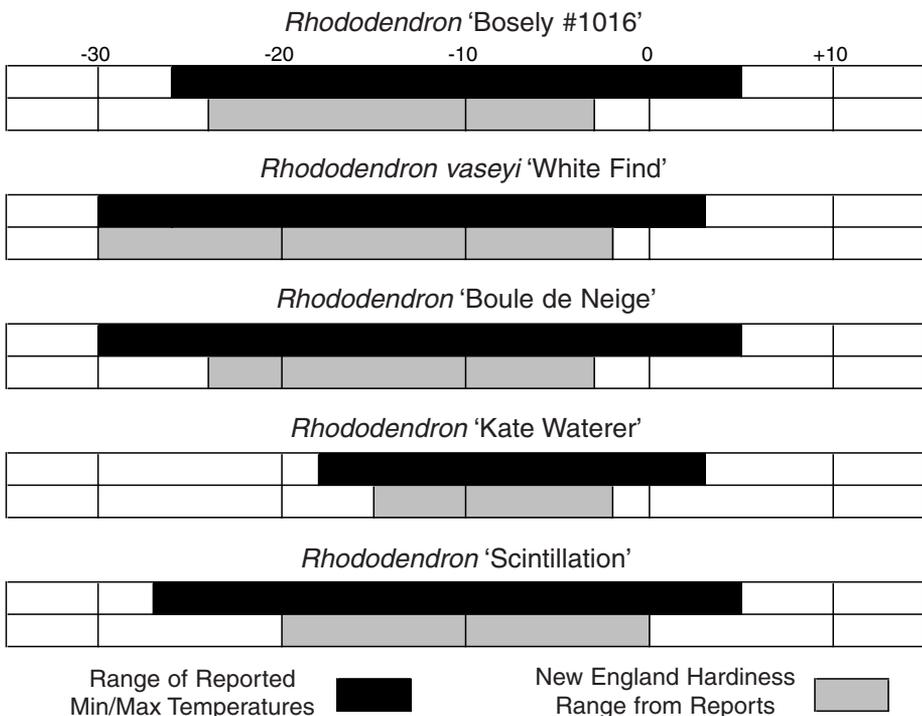


Figure 2.



experience of the New England Hardiness Reporting Program is that the more locations from which reports are received, the wider the range of reported temperatures. That is, as shown by the charts on these pages, the more persons reporting and the greater the variety of reporting locations, the larger is the difference between the minimum and maximum winter temperatures reported. (See Figure 1.)

The New England Program's experience is that the "lowest temperature at which a plant performs normally" tends to approach the lowest temperature reported for the location. Similarly, the "highest temperature at which damage occurs" tends to approach the highest winter temperature reported for the location. This experience is illustrated by Figure 2.

In every case, reports indicate that the plants in warmer locations performed normally some years and were damaged in other years *even though growing in the warmer location*. The same plants growing in colder locations also performed normally some years and suffered damage in other years. Experience thus shows that, if a wide range

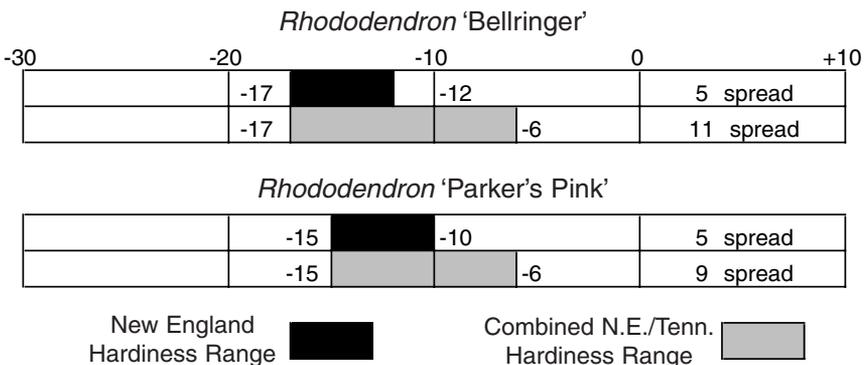
of winter temperatures is reported, then the "range of hardiness" rating for a given plant will also tend to be wide.

It is obvious that data collected by the ARS on a nationwide basis will have at least as wide a temperature range as that collected in New England. This is a conservative assumption since data is collected from both New England and a wide variety of other climates.

In the New England Program (using the ARS definition), a substantial number (33%) of the reported rhododendrons have a min/max rating spread of ten degrees (F); some (4%) exceed twenty degrees. It is therefore reasonable to assume that the "rating spread" for many rhododendrons (probably over 50%) will also be ten degrees or more. This is not just a guess. Gilky's^{vii} Tennessee data (the only available non-New England data) shows the validity of this assumption. Figure 3 shows examples of the increase in "rating spread" that occurs when data from multiple climates is added together.

There is reason for considering a spread of ten degrees (one USDA zone) as the practical limit of usefulness for a rating. Use of any hardiness rating re-

Figure 3.



quires an evaluation by the user. The question always is, “Can this particular plant be expected to do well for me?” Now if the plant has a hardiness rating range of only four or five degrees, the answer is easy: “Go ahead and try the plant. More than likely it will do well – particularly if your climate is similar to the one where the data was collected.”

Typically, however, a five- or six-degree range is about the reasonable limit of certainty. Plant a rhododendron rated as hardy to -10 °F (-23 °C) in a New England location that has winter temperatures around -15 °F or -16 °F (-26 °C) and, as everyone knows, you’re asking for trouble.

If the rating spread for a plant exceeds about ten degrees F, then the rating is unlikely to have any more certainty than the current “single temperature” rating. As the min/max temperature spread becomes larger, the rating becomes less valid and divining the hardiness answer becomes more and more difficult. Trying to determine whether a species with a “wide rating spread” will perform well in a particular location then becomes not a matter of standards but a matter of judgement. The validity of this judgement can be determined only by experiment – plant the rhododendron and see if it will survive and grow. That’s exactly the situation we’re in today.

Conclusion

Many species are grown in a multiplicity of climates with a wide variety of temperatures and growing conditions. Thus data collected for the new hardiness standards will, for many rhododendrons, have an excessive range between the

minimum and maximum temperatures. Attempting to apply a standard with a wide temperature range will be as problematic as it is with the present “single” temperature hardiness standard.

It is clear that a hardiness rating system based on temperature alone can have reasonable validity *only in similar climates, and then only if the min/max temperature spread is fairly small*. Hardiness ratings with a wide spread of temperatures from a variety of climates simply create a more complex hardiness guessing game for the prospective grower.

The question has to be asked, “Is it likely that a temperature-based hardiness rating system can be developed that will reasonably indicate the expected hardiness of a particular species *regardless* of where it is grown?” The answer has to be, “Unlikely.” ▲

© Joe B. Parks 2001
Used by permission.

References

- ⁱ Vainola, Anu and Antti Autio. “Experiences in Applying Hardiness Ratings from the 'Far-North' Perspective.” *Land-scape Plant News* 8(4):6, 1997.
- ⁱⁱ Raulston, J.C. and Kim E. Tripp. “Exploring the Complexities of Plant Hardiness.” *Arnoldia* (Fall 1994, p. 54).
- ⁱⁱⁱ Tigerstedt, Peter M.A. and Marjatta Uösukainen. “Breeding Cold-Hardy Rhododendrons.” *Journal, American Rhododendron Society*, 50(4):185-193. 1996.
- ^{iv} Thornton, John T. “Growing Rhododendrons in the Gulf South.” *Journal, American Rhododendron Society*, 43(4):200-201. Fall 1989.
- ^v *Journal, American Rhododendron Society*,

44(2):91-93, 105. Spring 1990.

vi Moynier, William. "Vireyas: Rhododendrons for Warmer Climates." *Journal*, American Rhododendron Society, 46(1):26-29, 41. Winter 1992.

vii Gilkey, Russell. "Cold Hardiness Ranking of Rhododendrons by Means of Flower Bud Damage." *Journal*, American Rhododendron Society, 50(2): 100-101. Spring 1996.



About the author: Conifer Society member Joe Parks has retired from "four or five different careers," but his interest in plants is a lifelong passion. He has traveled extensively in the High Arctic region of Canada, calling it "the world's biggest rock garden." Searching for cold-tolerant rhododendrons, he began hybridizing them more than 50 years ago. His many experiments, shared in this article, expand our understanding of hardiness.

1983-2001 Conifer Society Bulletin comprehensive index now available

- Author index
- Subject index
- Plant name index

This spiral-bound, 160-page index organizes each reference to the conifer cultivars, gardens and people mentioned within the first 18 volumes of the *Bulletin*, which became the *Conifer Quarterly* in 2002.

You can purchase your copy of the index for \$29, which includes shipping and handling charges.

Mail a check, money order or credit card information (number, expiration date and signature) to:

ACS National Office • P.O. Box 3422
Crofton, MD 21114-0422



It's just a conifer like the latest Paris fashion is just a dress.

ISELI NURSERY®

Iseli Nursery, Inc.
30590 SE Kelso Road
Boring, Oregon 97009
800-777-6202
Fax 503-663-0202

Conifers in Cuba

by Karen A. Vagts

Tropical conifers enrich the botanical diversity of this not-so-distant ecosystem

The Caribbean island nation of Cuba lies a mere 110 miles (177 km) off the coast of Florida. Yet for the past 40-odd years, politics have made this country seem distant to most Americans. Diplomatic strains and the United States' government's ban on travel to, and trade with, Cuba has reduced opportunities for communication and information exchange. Recently, however, more Americans have been traveling to this fascinating neighbor and learning about its rich history and resources.¹

In January 2003, I participated in a tour of Cuba organized by the Boston Architectural Center.² The purpose of the trip was to explore the architecture and historic preservation efforts in Havana, as well as in two smaller Colonial cities, Cienfuegos and Trinidad de Cuba, on the southern coast. As a gardener and Conifer Society member, however, I also kept an eye out for evidence of conifers in Cuba.

Background on Cuba

Cuba is the largest island in the Greater Antilles with a land mass of approximately 42,800 square miles (110,900 sq. km), spread over a large main island (Isla Grande) as well as five archipelagos comprising thousands of tiny islands (*cayos*). Lying just below the Tropic of Cancer, with an average temperature of 77 °F (25 °C) and a humidity level of 80%, Cuba has a subtropical climate (warmer than USDA Planting Hardiness Zone 11).

There are two seasons: the dry season (November through April), which is the preferable time to visit,

and the rainy season (May through October). Mean rainfall is about 50 inches per year, although local amounts vary according to the terrain, and the island is vulnerable to severe flooding and hurricanes.

We observed much building decay, caused by heavy rain and humidity, damage that at present Cuba does not

By some estimates, approximately 50% of Cuba's 7,000 or more plant species are endemic

¹ As of this writing, the only way most American Citizens can travel legally to Cuba is under a specific license granted by the United States Department of Treasury Office of Foreign Assets. Many educational and religious groups offer licensed tours; a source for a comprehensive list of such programs is Marazul Charters Inc. (www.marazulcharters.com).

² Founded in 1889, the Boston Architectural Center (BAC) offers the only degree-granting, concurrent Practice and Academic curriculum in architecture and interior design in the United States. It also offers a range of certificate programs and continuing education courses. The Cuba trip provided an opportunity for BAC students to participate in a joint field studies project with architecture students from the University of Havana.

have the financial resources to address.

Among the Caribbean countries, Cuba is noteworthy for its diverse landscape and unique natural life. By some estimates, approximately 50% of Cuba's 7,000 or more plant species are endemic; these provide shelter and food for indigenous species of birds, butterflies, and other fauna. The island's varied terrain includes beautiful beaches, coral reefs, savannahs, swamps, rainforests, plains, and mountains.

The ecology on the western end of the island bears many similarities to Florida and the Yucatan, while the eastern end resembles Haiti and the Dominican Republic. Cuba supports many protected ecosystem reserves, with flora and fauna precious enough that the United Nations Educational, Scientific and Cultural Organization (UNESCO) has declared six of them World Biosphere Reserves. For the architecture or history buff, there also are ample cultural sites to visit, ranging from the Spanish colonial fortresses to 19th-century mansions and plantations to hotels and

nightclubs built during the decades when Havana ranked as a favorite recreation spot for Americans.

Although tourism once again is becoming a major economic sector (as it was before Castro assumed power in 1959) and the Cuban government is attempting to diversify into areas like biotechnology, agriculture remains a primary focus of the Cuban economy. Sugar, tobacco, and their attendant products of rum and cigars are among their major exports. When the Soviet Union collapsed in the 1990s, Cuba lost a major trading partner and that, combined with the US embargo, requires that the government ration basics and that the Cubans be resourceful in production and just plain living. Nonetheless, despite these deprivations, the Cubans have made impressive gains in healthcare, education, and literacy.

Cuban Flora

As a sub-tropical island, Cuba offers the ubiquitous palm trees (the tall Cuban Royal Palm, *Reistonea regia*, is the national tree), vivid-colored flowering vines, orchids, and bromeliads, among other tropical plants. In this climate, many of these plants function as year-round foundation plants in the same way that conifers and other evergreens are used in the colder zones of the United States.

Among the deciduous trees that grow in Cuba are rainforest species like ebony (*Diospyros*) and mahogany (*Swietenia mahagoni*). In some of the often decaying but nonetheless distinguished townhouses and other buildings we visited, we saw these woods used for millwork trim and furniture, perfect foils for



Karen A. Vaglis

the beautiful tiles and stained-glass half-moon windows that are common in traditional Cuban architecture.

The Jardín Botánico Soledad de Cienfuegos, one of several botanical gardens in Cuba, is a must-see for any plant lover traveling through the central southern area of Cuba.

Located 11 miles (17 km) east of Cienfuegos, this garden was founded in 1899 by the American sugar magnate Edwin Farnsworth Atkins. Atkins' initial focus was on researching and developing better strains of sugar cane, but he eventually accumulated other plant species. Early on, he involved Harvard University, which eventually ran it as a tropical botanical research institute; since 1961, it has been run by the Cuban government's Instituto de Ecología y Sistemática.

The Jardín features over 2,000 plant species from all over the world – almost any plant that would grow naturally in a climate like Cuba's, including an amazing banyan tree consisting of a huge circular clump of trunks. In addition to allowing tourists to view its treasures, the Jardín continues a century-long tradition of welcoming botanical researchers from around the world.

A major challenge facing Cuba is deforestation. This has been a constant phenomenon since the Spanish settlers first arrived in the 1500s and cleared forests for plantations and for wood products, such as lumber and resin, but it has accelerated during the past two centuries; forests as a percentage of land

cover decreased from 90% in 1812 to 14% in 1959. It was aggravated when Cuba lost support from the Soviets during the 1990s, leaving the Cubans with limited fuel options; thus trees provide a major source of fuel. Forest fires and tourism development further aggravate

deforestation. Among the problems caused by aggressive deforestation are soil erosion, climatic changes, and loss of habitat for fauna. The Cubans are aware of the need to replenish their forests and have developed programs for refor-

estation and conservation. Until alternative sources of fuel are developed, however, Cuban forests remain at risk.

Cuban Conifers

As is typical throughout most of the Caribbean, Cuba has only a small number of conifer species but those it has are very important. While Cuban conifers play a valuable role as the source of wood products and, in some areas, to prevent soil erosion, they are also important aesthetically. Combined with palms and other tropical plants, they provide a lovely framework along Cuba's roadways and enhance the colonial-era town squares and buildings we visited.

Although American and European naturalists have studied Cuban conifers since at least the early 19th century, the available information on them seems limited and the taxonomy confusing.³ What is certain, however, is that Cuba does have indigenous species, which occur in the sub-climates that best suit them.

The Cubans are aware of the need to replenish their forests and have developed programs for reforestation and conservation.

The most important Cuban conifers are pines. Cuba's foremost western province, the Pinar del Rio ("pinewood of the river"), is named after a grove of pines near the river Guamá, and graceful pines dot the areas of central Cuba that we traveled through (between Havana on the north shore and Cienfuegos and Trinidad on the south shore). Pines play a vital role in producing important wood products, such as lumber and resins. They also grow rapidly on poor soils, which helps in reforestation.

Parallel to the dichotomy between the eastern and western parts of the Island, separate pine species occur in different sections of the island. In eastern Cuba (near the US Naval Station at Guantánamo), the species *Pinus occidentalis* (sometimes called *Pinus cubensis*) is found, mainly in "fresh forests" (*bosques frescos*) – tall, closed forests located in valleys. In the west, the major indigenous pines are *Pinus caribaea* Morelet var. *caribaea*, a variant on the Caribbean pine that also grows in the Bahamas and Central America (and is often confused with species of pine growing in Florida), and

Cuba's foremost western province, the Pinar del Rio – "pinewood of the river" – is named after a grove of pines near the river Guamá

Pinus tropicalis.

Other conifers native to Cuba include two junipers, *Juniperus barbadensis* var. *lucayana* and *Juniperus saxicola*, as well as two species of podocarpus, *Podocarpus angustifolius* and *Podocarpus aristulatus*. And, while not typically classified as a conifer, the gymnosperm division Cycadophyta is represented by a unique Cuban cycad, *Micocycas calocoma*.

Conclusion

Many of us on the BAC tour felt we'd

only seen the tip of the iceberg when it came to Cuba – not just geographically but in terms of understanding this fascinating, complex, and rather mysterious country. For a conifer fan like me, it provoked an interest in learning more about Caribbean conifers. Upon returning home, however, I found that information about them is difficult to obtain. Even the major databases, such as the Conifer Society's Conifer Database, offer limited information about these plants that are so valuable in Caribbean countries and worthy of documentation. Some of them are classified as endangered. Caribbean conifers warrant more

³ Many of the various names of, and references for, Cuban conifers include the names Grisebach and Morelet. These are two of the 19th-century naturalists who found Cuba a fascinating place to explore. The German August Grisebach (1814-1879), a pioneer in plant systematics at the University of Goettingen, recorded his observations in the classic work, *Flora of the British West Indian Islands* (1864). The Frenchman Pierre Arthur Morelet (1809-1892), discoverer of Morelet's Crocodile, described Cuba in his book, *Travels to Central America* (1871). These works formed the basis of much subsequent research on natural life in Central America and the Caribbean.

**The Conifer Society's
Seed Exchange is seeking
additional donors for 2004**

If you donated seed to the Seed Exchange program last year, the coordinator will be contacting you.

Members interested in donating for the first time should contact:

Charles Fooks
c_fooks@hotmail.com
Ph: (410) 543-4365
Fax: (410) 749-7575

J. Carlson Growers, Inc.
CONIFERS & ORNAMENTALS

*Specializing in
fine garden plants*

20 Years

*of growing Rockford's finest selection
of trees, shrubs and ground covers.*

*Including native plants, ornamental and
dwarf conifers, japanese maples, perennials,
mushroom compost, oak and cedar mulch.*

8938 Newburg Road Rockford, IL 61108
Phone: (815) 332-5610 Fax: (815) 332-7495
E-mail: sciadopity@msn.com

investigation, and Conifer Society members might assist in this. Perhaps the Caribbean will be the focus of a future Conifer Society tour! ▲

About the Author: A graduate of the Boston Architectural Center, Karen A. Vagts is an Information Design and Delivery professional who, when not growing dwarf conifers in her tiny garden in Arlington Heights, Massachusetts, enjoys participating in architectural and nature tours around the world.

References

- Beltrami, Carla et al, editors. *DK Eyewitness Guides: Cuba*. New York, NY: Dorling Kindersley Publishing, Inc., 2002.
- Farjon, Aljos. *World Checklist and Bibliography of Conifers*. 2nd Edition. Kew, England: The Royal Botanic Gardens, 2001.
- Jardin Botánico de Cienfuegos. *Catálogo de Plantas*. Havana, Cuba: Instituto de Ecología y Sistemática Academia de Ciencias de Cuba, 1993.
- Stanley, David. *Cuba*. 2nd Edition. Victoria, Australia: Lonely Planet Guides, Inc., 2000.
- Various. *Revista: Harvard Review of Latin America* (formerly *DRCLAS News*), various issues. Cambridge, MA: David Rockefeller Center for Latin American Studies, Harvard University (<http://drclas.fas.harvard.edu/publications/revista.html>)

The official Cuba Tourism Website is Cuba Travel (<http://www.cubatravel.cu/>).

Dawes Arboretum's *Cryptomeria*, *Chamaecyparis* Damaged this Winter

This winter was the coldest in close to a decade. We'd become accustomed to low temperatures between zero and -5 °F (-20 °C), but this winter's cold was accompanied by sunny periods with considerable wind. This led to a significant increase in winter burn with some plant losses. However, many plants survived unscathed.

We had begun to broaden our collection of *Cryptomeria japonica* cultivars. Those burned included *Cryptomeria japonica* 'Knaptonensis' and 'Elegans Aurea.' One of our *C. japonica* 'Tansu' died.

Some of our *Chamaecyparis* cultivars were damaged as well. A *C. thyoides* 'Rubicon' (syn. *C. thyoides* 'Red Star') died from the exposure. All in all, while the unusual conditions damaged some plants, the majority came through admirably.

— Gregory A. Payton,
Plant Records Specialist

Conifer Society Slide Sets Available to Members for Local Presentations



Would you like to talk to your garden club or social organization about gardening with conifers?

Two slide sets featuring attractive plant combinations and design ideas are available to Conifer Society members. Many of the images come from the collection of Charlene Harris.

Contact coordinator Byron Richards to borrow the slides:

Byron Richards
barhr@cytechcis.net
Phone: (828) 696-0801

Bethlehem Nursery

66 Jackson Lane, Bethlehem, CT 06751

Propagators and growers of rare dwarf and miniature conifers, witches' brooms and rare *Sciadopitys* cultivars. Catering to the most serious collectors and gardeners.

Owners: Dennis and Mary Lou Dodge

www.bethlehemnursery.com

Phone/Fax 203.266.7783

Goodwin Home and Gardens Will Delight Visitors on Northeast Region Fall Tour

by Kevin Hasney

The second stop of the garden tour of the September 19-20 meeting of the Northeast Region will be the home of Ridge and JoAnn Goodwin in Bucks County, Pennsylvania. Their old, stone farm house is surrounded by 28 acres of beautiful and fascinating plants.

The Goodwins were fortunate that their property came with old boxwood hedges and mature shade trees, including an enormous *Pinus nigra* that must be one of the oldest in this country. Ridge brought his favorite conifer specimens to begin his conifer garden, which has evolved over the years into a collection of fascinating specimens displayed in beautifully designed beds.

After a recent reorganization of the garden, the major plants now are large examples of dwarf conifers, with newer, smaller cultivars in between. Ridge is now confident that he has given everything sufficient space to grow for twenty years without crowding.

Ridge says he likes to think of his garden as honoring the works of Rudolph Kluis, the nurseryman who taught him to graft. The garden contains several cultivars of the *Pinus thunbergii* x *densiflora* cross that bore 'Jane Kluis,' as well as one of the largest examples of 'Jane Kluis' and Kluis cultivars of *Picea pungens*, *Picea glauca* and *Picea abies*.

The garden also has a wonderful collection of Japanese maples, including some of the newest cultivars. There are grand sweeps of shade perennials like hostas and epimediums. There is a large planting of *Colchicum* that should be in bloom for the tour. And there are cutting gardens for JoAnn's floral design business.

The outlying fields of the property are filled with unusual conifers, because Ridge has a sideline business called Half Moon Nursery. In addition to cash crops of boxwood and hollies, the nursery sells rare conifers at specimen size.

So, mark your calendars for September 19-20. Ridge promises to have his garden thoroughly labeled by then!



Kevin Hasney

Northeast Region News

We are excited about our upcoming meeting to be held September 19th and 20th which will be headquartered at the Best Western Hotel in Fort Washington, PA!

The festivities begin on Friday evening with a buffet dinner and a lively round of speakers. The next day we'll start with a visit to a jewel of an arboretum, the Morris, in Philadelphia's Chestnut Hill section, and then we'll continue on to picturesque Bucks County for a tour through two extensive conifer collections belonging to two charter members of the Society. If conifers are what tickles your fancy, the range and breadth of what you will see won't disappoint! Everyone should plan on coming if only to view that rare conifer animal – Marty Brooks – in his native habitat!

That evening, join us for a banquet of interesting Indian-American cuisine, and of course, our famous plant auctions where you can bid on conifer rarities that can be found nowhere else. Everyone is welcome to join the fun! For registration information, please contact Byron or Hazel Richards at (828) 696-0801, or e-mail them at barhr@cytechcis.net.

Recruiting

In other Northeast news, we held an executive meeting in Philadelphia this past February. The principal topic of discussion was how to raise

the awareness of our Society with the gardening public, and by doing so, attract more members. One idea that has provoked considerable conversation was that of sponsoring a conifer garden in one of the area's public gardens. We have since written letters and received responses from the Scott Arboretum, Morris Arboretum and New York Botanical Garden, and we are evaluating these for possible future action. We are also trying to develop an idea of creating scripts for garden writers on the subject of gardening with conifers; these would include accompanying pictures of some of our members' conifer gardens from across the region as a local tie-in for hometown newspapers.

Finally, in this same vein, we are exploring the various plant expositions within the region, such as the Philadelphia Flower Show, where we could have a presence to distribute our literature and perhaps even sell some plants as we are presently doing successfully in the Boston area.

We need new leadership in the Northeast! We are looking for thinkers, planners, rainmakers and paradigm shifters. If you are any of these and want to lend a hand, please step forward and identify yourself!

– **Ridge Goodwin**
Northeast Region president

Southeast Region to Meet This Fall in Charleston, West Virginia,

by Jordan Jack

Dates: October 10-12, 2003
Hotel: **Elk River Town Center Inn**
2 Kanawha Blvd East
Charleston, WV 25301
Reservations: (304) 343-4521
Room rate: \$53.50 plus tax.
Includes a full continental
breakfast.

This year's Southeastern Region Annual Meeting will convene in the mountains of West Virginia during the fall foliage season. The region is famous for its native craftsmen, many state parks and historical sites to visit, and two unique horticultural sites – Cranberry Glades and Dolly Sod. The Southeastern Region cordially invites all ACS members to come and enjoy this meeting.



Courtesy of Zeb and Sarah Sue Wright

The weekend begins with registration and Happy Hour at 5:00 PM Friday afternoon, with hors d'oeuvres provided by the Region. Then, a light buffet is followed by a speaker with a conifer-related topic. Bring along a few of your favorite garden slides to show afterwards. Auction plants will be on display.

Saturday morning starts with a visit to three gardens on a steep wooded hillside, all within 300 yards of each other in one of the oldest residential areas of Charleston. The first will be Jim and Clara Thomas's old Tudor home surrounded by diverse mature conifer species, named conifers, large "brain coral" trimmed boxwoods and an excellent perennial garden.

The next stop is John and Ruth McGee's well-tended gardens, containing one of the largest stone statuary collections from Zimbabwe in America. Beyond their hedges are the shade gardens of Newt and Nancy Thomas's home with extensive ground covers, mature trees and elegant perennial gardens.

The home and gardens of garden designer and retired garden writer Zeb and Sarah Sue Wright display over 1,800 species and cultivars of shrubs, conifers, orchids, perennials and wildflowers, rock gardens and bog plants – all accessible by creative bridges and paths. Over 240 garden conifers are beautifully sited among companion plants. This comprehensive garden is the backdrop for Saturday's catered luncheon.

Garden of Zeb and Sarah Sue Wright.

Next, we head down off the mountain to visit the riverside gardens of Dr. and Mrs. Ali AbuRhama, with its newly landscaped gardens and Kanawha River bank which look straight across to the famous Daniel Boone State Park. On the way back to the hotel, we will end the day high up at the home and gardens of Troy and Charlotte Stallard. A spectacular view down the Kanawha Valley gives a fine perspective on the river and the golden-domed West Virginia Capital Building in Charleston. An acre of gardens, wildflowers and ground covers surround their home.

The silent auction and Happy Hour begin at 5:00 PM at the hotel, followed

by the banquet and live auction. Why don't you bring along a few plants?

Sunday morning after breakfast is a Tailgate Plant Sale followed by a range of "do it on your own" tours, including a most innovative plant nursery located on top of a mountain stripped for coal. Directions to the Sunday tours will be provided at the meeting.

Meeting details and registration forms will be sent out in July to all Southeastern Region members, as well as ACS members within 400 miles of Charleston, WV. All ACS members are cordially invited. For further information, contact Jordon Jack at (828) 683-4518 or Maude Henne at (434) 296-6051.

Southeast Region News

Greetings from the Southeastern Region!

In late April we participated in a Green & Grow Show, "Growing in the Mountains." Over 100 Membership Brochures were picked up by attendees interested in the world of dwarf conifers. My son, Ryan, and I manned the booth for the two-day show.

Before I forget, I would like to thank Ryan, my wife Kathleen, and all the folks who helped with the Regional Meeting in Asheville last August. I know this comes a little late, and I'll try to be better about keeping track of names in the future!

Flo Chaffin in Watkinsville, Georgia, has been busy drumming up new members and had planned another get together in June. Go, Flo!

Again, Jordan Jack stepped up to

the plate and saved the day. Not having a clue which way to go or what to do, I turned to Jordan regarding the Southeastern Region Meeting, and he has put together this Fall's event in Charleston, West Virginia. The location is meant to encourage member participation from areas outside of our own region. Having been to Charleston in the Fall several years ago, I can highly recommend it!

We have had so much rain this year that between January and May, we've got Portland and Seattle beat. Springs which haven't sprung for the past 3 or 4 years are running again.

I look forward to seeing everyone in Denver!

- Michael Balough
Southeast Region president

Nominations Sought for 2004 Conifer Society Awards of Merit

Every year the Conifer Society honors its members with Awards of Merit. Nominations for next year's recipients must be received by November 31, 2002.

Award of Merit for Development in the Field of Conifers

The criteria for this award include the collecting and displaying of conifers, a willingness to share knowledge of plants, and the enthusiasm and drive to discover and develop noteworthy cultivars.

Also taken into consideration are published articles, books, or texts as well as new or improved propagation techniques and designs for the use of conifers.

Award of Merit for Dedicated Support of the ACS

This award recognizes those who have made outstanding contributions to the Conifer Society through their service, enthusiasm,

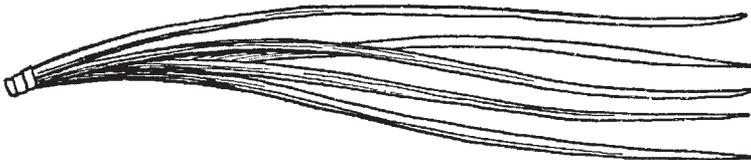
commitment and promotion of membership in the Society.

Also, this award acknowledges those who have been deeply involved in the activities of the Conifer Society, organizationally or otherwise.

To be considered, your nomination *must be accompanied with an outline of the nominee's contributions in the appropriate category.* If you wish to nominate a member for either of these awards please include your candidate's name, address, and phone number as well as a brief description of why the person is deserving of the award.

Please send your nominations to:

Don Howse
41370 SE Thomas Road
Sandy, OR 97055
Phone/FAX: 503-668-5834
Email: don@porterhowse.com



Dave's Nursery

*Propagator of Rare,
Dwarf and
Miniature Plants*



234 Willow Avenue
Pompton Lakes, NJ 07442

973-839-6390 OFFICE

973-831-7777 FAX

davesnursery@prodigy.net E-mail

Visit us online at
www.davesnursery.com

*"Start Small And Watch
Your Investment Grow"*

**Call Or Write For
Complete Price List
And Inventory.**



Shepherd Hill Farm

RHODODENDRONS

www.shepherdhillfarm.com

**Growers of
Rhododendrons
Azaleas
Dwarf Conifers**

write for our catalog

**Shepherd Hill Farm
200 Peekskill Hollow Road
Putnam Valley, NY 10579**

2003 Conifer Quarterly Advertising Rates

Ad Type	Dimensions (W x H)	Cost per issue	Cost per 4 issues (10% discount)
Full page	5 x 7-7/8 in.	\$195	\$702
Half page horizontal	5 x 3-7/8 in.	\$135	\$486
Half page vertical	2-3/8 x 7-7/8 in.	\$135	\$486
Quarter page horizontal	5 x 1-7/8 in.	\$85	\$306
Quarter page vertical	2-3/8 x 3-7/8 in.	\$85	\$306
Eighth page	2-3/8 x 1-7/8 in.	\$55	\$198

Submit inquiries, ad material and payments to:

Anne Brennan, Conifer Quarterly Advertising

145 Cedar St., Jenkintown, PA 19046 • PH (215) 376-0231

FAX (215) 827-5926 • E-mail: ConiferQuarterly@contextcomm.com

The Conifer Society welcomes advertising from companies and individuals selling conifers, companion plants, gardening supplies and other plant-related products and services.

Directorate

Officers

<i>President</i>	Dennis Groh , 160 S. Evangeline, Dearborn Heights, MI 48125 PH (313) 561-2315 E-mail: dgroh118380MI@comcast.net
<i>Vice President/ Treasurer</i>	Don Wild , 3058 Cross Creek Ct., Ann Arbor, MI 48108 PH (734) 662-6461 E-mail: louwild@aol.com
<i>Secretary</i>	Kathleen Pottratz , 10978 SW Durham Rd. #65, Tigard OR 97224 PH (503) 620-1617 E-mail: kpottz@highstream.net
<i>Past President</i>	Marvin Snyder , 9107 Outlook Dr., Overland Park, KS 66207 PH (913) 648-4009 FAX (913) 648-1024 E-mail: mksnyder@juno.com

Directors

<i>Term expires 2003</i>	Orlan Gaeddert , P.O. Box 25, Canaan, NY 12029 PH/FAX (518) 781-4662 E-mail: orlag@taconic.net Dennis Groh , (see President above) Bill Wells , 290 Woodcrest Rd., West Grove, PA 19390 PH (610) 869-3883 FAX (610) 869-4288 E-mail: wdwells@wdwells.com
<i>Term expires 2004</i>	Bill Barger , 3200 Rohrer Rd., Wadsworth, OH 44281 PH (330) 336-9695 E-mail: bbarger@saberlogic.com Ridge Goodwin , P.O. Box 310, Holicong, PA 18928 PH (215) 794-3216 FAX (215) 794-7104 E-mail: ridgegoodwin@rcn.com Sam Jones , 1971 Whipoorwill Rd., Bishop, GA 30621 PH (706) 769-6516
<i>Term expires 2005</i>	Flo Chaffin , 3650 Colham Ferry Rd., Watkinsville, GA 30677 PH (706) 310-0143 FAX (706) 310-0562 E-mail: flomosr@att.net Don Wild , (see Vice President/Treasurer above) Lester Wyman , 86 Tavern Waye, Hanson, MA 02341 PH (781) 447-3579 FAX (781) 447-3758 E-mail: hansplts@attbi.com

Regional Presidents

<i>Northeastern Region</i>	Ridge Goodwin , PO Box 310, Holicong, PA 18928 PH (215) 794-3216 FAX (215) 794-7104 E-mail: ridgegoodwin@rcn.com
<i>Central Region</i>	Gary Whittenbaugh , 625 3rd Ave. SW, Oelwein, IA 50662 PH (319) 283-3050 FAX (319) 283-4773 E-mail: franmara@trxinc.com
<i>Western Region</i>	Randy Oster , 29600 Kowall Rd., Estacada, OR 97023 PH (503) 630-7975 FAX (503) 630-7955 E-mail: sales@r-r-nursery.com
<i>Southeastern Region</i>	Michael Balogh , 40 Elkins Branch Rd., Weaverville, NC 28787 PH (828) 626-2695 E-mail: tsugahead@aol.com

American Conifer Society Staff

<i>ACS Office</i>	John Martin , P.O. Box 3422, Crofton, MD 21114-0422 PH (410) 721-6611 FAX (410) 721-9636 E-mail: conifersociety@aol.com
<i>Editor, Conifer Quarterly</i>	Anne Brennan , 145 Cedar St., Jenkintown, PA 19046 PH (215) 376-0231 FAX (215) 827-5926 E-mail: ConiferQuarterly@contextcomm.com
<i>National Meeting Coordinator</i>	Charlene Harris , P.O. Box 519, Chelsea, MI 48118-0519 PH (734) 433-9773 FAX (734) 433-5442 E-mail: charris@provide.net

www.conifersociety.org

The Dawes Arboretum

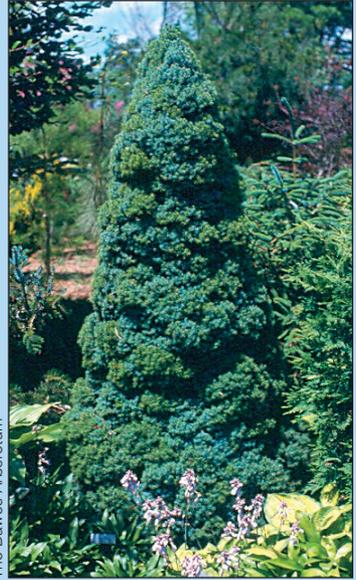


A grouping of *Picea glauca* 'Sander's Blue' with *P. glauca* var. *albertiana* 'Conica.'

A single specimen of *Picea glauca* 'Sander's Blue.'

The Dawes Arboretum will host next year's Conifer Society National Meeting, Aug. 5-7, 2004.

The Dawes Arboretum



Chub Harper



Granulated sulfur can help conifers overcome chlorosis caused by alkaline soils. See the article on page 17.

Chub Harper





A young Chinese hemlock (*Tsuga chinensis*) teams up with other conifers to shield the parking area from view at Chanticleer in Wayne, Pennsylvania.