



# U. S. National Arboretum ***News and Notes***

Spring 2003

## About USNA News and Notes

U. S. National Arboretum (USNA) News and Notes will be produced three times a year, in January, May, and September. Our goal is to better inform our many stakeholder organizations about recent advances, accomplishments, programs, construction updates, and other items of interest. This is intended to complement, not duplicate, our *Calendar of Events*, which lists our various classes, events, and educationally oriented programs for the public, or the Friends of the National Arboretum's (FONA) *Arbor Friends*, a newsletter for members of FONA.

We discovered that many of our stakeholder groups are not fully aware of the arboretum's programs or accomplishments and that we have not taken full advantage of all opportunities to communicate with the people who have an interest in the U. S. National Arboretum. The *USNA News and Notes* is part of our new plan for a more effective, efficient USNA that is addressing our national audience. Stakeholders are encouraged to use material from this document in their newsletters and reports to their members. We also encourage you to send us your comments and ideas for additional information that you'd like to see included.

## USNA Named to Top Ten

The April 2003 issue of *Country Living Gardener*, one of the leading gardening magazines in the United States, named the top ten botanical gardens in America to visit. The U. S. National Arboretum was one of the 10 gardens on the list, which also included the Missouri Botanical Garden, The New York Botanical Garden, and others. The staff of the USNA has worked diligently over the last several years to improve the quality and appearance of our many display gardens and collections. All that hard work is paying off. Over 12,000 different kinds of plants can be seen on the 446-acre campus in Northeast Washington D.C. The arboretum will continue to improve as the individual components of a relatively new master plan are implemented.

## Budget for FY 2003

Congress recently passed an omnibus appropriations bill that not only restored the planned cuts in the arboretum's budget, but added an additional \$250,000 in program funds for the Education and Visitor Services Unit. An additional 1.7 million dollars in construction or modernization funds were provided to help address the pollution abatement issues in Hickey Run, a small stream that crosses the arboretum. This action came about due to the concerted efforts of the Friends of the National Arboretum and other support groups who effectively presented the arboretum's need for financial support to Congress. In the last three years, the arboretum has been successful in obtaining approximately 10 million dollars for physical improvements. Many of these funds are being used for infrastructure improvements needed to implement the arboretum's master plan and remaining funds are being used to implement the components of the plan.

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## Arbor Café Opens at the Arboretum

A limited food concession was operated on the grounds by Guest Services, Inc. beginning in Spring 2002. Sandwiches, salads, and other food and beverages were available at the Arbor Café. Tables and chairs were arranged in an attractive setting adjacent to the National Herb Garden. This service will return in Spring 2003 with new items on the menu. Guest Services will also provide box lunches for special meetings; however, these must be arranged prior to the event. This is another step in providing better visitor services at the arboretum.

## **Education and Visitor Services Unit**

### 77 Educational Programs Offered in 2002

The Education and Visitor Services Unit offered 77 educational programs in 2002 in an effort to provide more educational opportunities to the public. A three-day International Scholarly Symposium on Bonsai and Viewing Stones attracted 137 participants from several countries. This collaborative project with the National Bonsai Foundation and the Potomac Bonsai Association was held at the arboretum and featured nine nationally and internationally recognized experts in the field, including two from Japan. Funded in part through a generous donation to the National Bonsai Foundation, the symposium established the benchmark for future educational collaborations and enhanced the National Bonsai and Penjing Museum's reputation as one of the most important international centers for the study of bonsai and related arts.

Other programs consisted of one-day events or shorter classes. The most popular program offered in 2002 was our Full Moon Hike. Sixteen of these evening hikes were held. A *Calendar of Events* is mailed or sent electronically three times a year to publicize programs. This calendar can also be seen on the USNA Web Site at [www.usna.usda.gov/Education/events.html](http://www.usna.usda.gov/Education/events.html).

## Essential Volunteer Services

Many visitors remark about the high level of maintenance of the grounds and our beautiful gardens and collections. This is due in part to a cadre of wonderful volunteers who work in all aspects of the Arboretum's operations. Volunteers work in the library, herbarium, and research laboratories, but the majority work with our curators in the display gardens and collections. In 2002, 170 volunteers donated 21,107 hours of service. This translates into the equivalent of 9.5 full-time positions with an estimated value to the arboretum of \$321,684. Thirteen new volunteers graduated from the spring 2003 volunteer gardener training program.

### The USNA Internship Program

Each year, interns arrive to work alongside our curators and scientists. In 2002, 12 interns from 11 different colleges and universities were hired for positions ranging from 3 months to 1 year. The positions were funded through generous donations from the Friends of the National Arboretum, The Woman's Farm and Garden Association, The Herb Society of America, and other private donations.

### New Exhibit in Bonsai Museum

A new interactive exhibit that answers 10 frequently asked questions about the art of bonsai is featured in the International Pavilion of the National Bonsai and Penjing Museum. This exhibit coincided with the informal opening of the museum after it was closed for nearly a year for renovation. A new wall-sized orientation map in this pavilion helps to orient visitors. This was a joint effort between the Gardens and Education and Visitor Services Units and the National Bonsai Foundation with support from the Friends of the National Arboretum. The museum is the largest and most comprehensive museum of its kind in the western world.



## Gardens Unit

### International Field Trips

Two Gardens Unit staff members participated in international plant exploration and collecting trips in 2002. In June, Lynn Batdorf took part in a collecting trip with staff members of Longwood Gardens and Woodland Nursery in Delaware to Azerbaijan and the Republic of Georgia in search of documented, wild-collected boxwood germplasm. Eighty-eight accessions of eight taxa were collected and brought to the arboretum for the collections.

In October, as a participant of the North American China Plant Exploration Consortium, Carole Bordelon traveled to Shanxi Province in China with fellow members from the Morton Arboretum and Chicago Botanic Garden in Illinois and the Morris Arboretum in Pennsylvania. The team targeted three sites, selecting mostly woody plant material known for cold and drought tolerance. Seventy-three species of seed were accessioned—sixty-nine of them woody, four herbaceous. Six herbarium specimens were taken of each seed accession as well as for four species for which no seed was available. Oaks were a priority genus for this collecting trip, and five species were collected, including *Quercus baronii*, a shrubby, evergreen species not yet introduced in North America. Seeds from this collecting trip were distributed to ten institutions and the extra seed went to collection holders in the Ornamental Plant Germplasm Repository Network.



### Martin Evaluates NYBG

Sue Martin, Curator of the Gotelli Dwarf and Slow-Growing Conifer Collection, served as a member on an international team of experts to evaluate the conifer collections of the New York Botanic Garden. Sue reviewed and evaluated the accession information and records of three sections of the collection—the Montgomery Collection of Dwarf Conifers, the Species Collection from the turn of the twentieth century, and the species groupings.

### Fern Valley Records

Fern Valley Native Plants Collection made improvements to the collection accessibility in different ways. Curator Joan Feely, along with FONAsponsored Plant Records Intern Huyen Nguyen, mapped the location of all of the ferns—approximately one hundred fifty—in Fern Valley. This was done using BG-Map in conjunction with the BG-Base plant records database.

### New accessions in 2002

A total of 520 accessioned plants representing 142 genera and 202 species were planted out in the collections. Twenty of these plants were arboretum introductions representing sixteen taxa. In the National Herb Garden, the Culinary and Dioscorides Theme Gardens were renovated and redesigned to display the plant material to its full potential. Across the street in the pool surrounding the visitor center, both species of Victoria water lilies were displayed along with all four of their hybrids. In all, 15 of these fascinating plants were grown in the pool for visitor education and enjoyment. Curator Mark McGuinness successfully grew these plants from seed on-site and, after selecting those to be used by the arboretum, distributed excess plants to three local gardens: the Smithsonian Institution Zoological Park, Brookside Gardens, and Kenilworth Aquatic Gardens. He also distributed seedlings to gardens in Colorado, California, and North Carolina.



## New Bonsai Museum Staff

In January, the National Bonsai and Penjing Museum hired a new Supervisory Curator, Jack Sustic. Later in the year, two assistant curators were hired:



Jackson Tanner for artifacts and Jim Hughes for plants. In July, Jack traveled to the Montreal Botanic Garden to research penjing styles. Construction started in 2001 to improve the museum courtyard and improve accessibility. In 2002 all bonsai and penjing plants maintained excellent health and vigor.

## IPM Pesticide Manual Adopted

IPM Specialist Scott Aker completed a revision of the USNA Pesticide Policy Manual. This policy will streamline the pesticide application programs at the arboretum and will result in increased efficiency in management of pesticide application. Since the inception of the IPM Program in 1994, the arboretum has reduced its pesticide applications by 75%. Of the remaining 25%, the use of soap, oil, and other biorational products has gone from 12% to 70%.

## Washington Post Column

Scott Aker, IPM specialist, completed the second year of *Digging In*, his weekly column in *The Washington Post* that answers the public's gardening questions. About 800,000 people read *The Washington Post* each day. The column is also carried on *The Washington Post's* web site and in *Post* newspapers throughout North America.

## New Cooperative Effort

The Association of Specialty Cut Flower Growers embarked on a new cooperation with the USNA. Scott Aker is trialing potential new crops for the specialty cut flowers industry. Germplasm for this project is coming from arboretum plant explorations and collections.

## Lahr Native Plant Symposium

In March 2002, 160 people gathered at the arboretum for the 16th annual Lahr Symposium on Native Plants. Coordinated by Joan Feely with the Education and Visitor Services Unit and FONA, this symposium focuses on the most important issues dealing with native plants and ecosystems in the Mid-Atlantic region. A plant sale, including 12 vendors, helped to make a diverse selection of plants available to home gardeners.

## Batdorf Authors New Book

Lynn Batdorf completed a comprehensive encyclopedia on boxwood (*Buxus*) which will be published by the American Boxwood Society in early summer 2003. Batdorf is the Curator of the National Boxwood Collection and International Cultivar Registration Authority for *Buxus*.

## Gardens Unit Leader Search

A national search is underway to hire a new leader for the Gardens Unit. Elizabeth Ley, who served as unit leader for 8 years, resigned from the position in early spring to pursue other interests. Prior to that, she was in charge of the plant records office within the Gardens Unit. We thank Liz for her many years of service to the U.S. National Arboretum and wish her great success in her new endeavors.

## Casey Tree Endowment Fund

Several staff members worked with Casey Trees Endowment Fund in 2002. Scott Aker, Kevin Tunison, and John Hammond served on the advisory board and Jim Adams recruited and helped train volunteers from the arboretum and local community to inventory the street trees of DC Ward 5 with Casey Tree interns. Scott also worked with USNA Research Unit Leader John Hammond, DC Forester Mark Buscano, and Casey Trees to secure a \$5,000.00 Forest Service grant to study and display pot-in-pot culture of street trees for Washington, DC.

## **Floral & Nursery Plants Research Unit**

### **2002 Publications from the Research Unit**

The 15 permanent scientists and their support staff published 27 peer-reviewed articles, 12 popular science articles, and 11 abstracts for professional meetings last year. An additional 44 manuscripts were submitted for publication during this time. The manuscripts covered a broad range of topics from breeding trees, shrubs, and floral plants, to plant viruses and included conservation of living genetic material of plants, insect pests of ornamental plants, and improved methods of growing trees and shrubs in nursery conditions. To learn more, visit our web site at [www.usna.usda.gov/research](http://www.usna.usda.gov/research).

### **Dr. Donna Fare Honored**

Plant Physiologist Donna Fare was awarded the Porter Henegar Memorial Award from the Southern Nursery Association (SNA) at their annual meeting in Atlanta, Georgia, in recognition of her outstanding contribution to ornamental horticulture research and to the SNA. Dr. Fare works closely with the nursery industry in Tennessee and the Southeast and has developed new production protocols for this region and has authored or co-authored many consumer oriented publications for the public.

### **Cooperative Agreements**

Research is often a collaborative effort, not only among staff members, but often with scientists at other institutions. Last year, several new cooperative agreements were signed. Three agreements for collaborative work on virus detection in plants were signed with the University of California at Riverside, Ohio State University, and Oregon State University. The Floral & Nursery Plants Research Unit is one of the leading centers for the study of plant viruses. Two other cooperative agreements were signed with Tennessee State University (TSU) in support of our work in ornamental nursery production. The USNA has two PhD level scientists and their support staff located at TSU's Nursery Crop Research Station in McMinnville, Tennessee.

### **Five New Plant Patents**

Five new plant patents were obtained for Star of Bethlehem, *Ornithogalum*, cultivars that were bred and released in cooperation with New World Plants, a commercial nursery located in California. The genus *Ornithogalum* contains nearly 80 species of perennial bulbous herbs. They have been used as cut flowers and pot plants for many years. The new superior cultivars released last year are: 'Chesapeake Starlight', 'Chesapeake Sunset', 'Chesapeake Snowflake', 'Sunburst', and 'Chesapeake Blaze'. Detailed descriptions and photographs of these five new cultivars can be found at [www.usna.usda.gov/Newintro/orno.pdf](http://www.usna.usda.gov/Newintro/orno.pdf).



### **Featured Scientists**

We are featuring five of our permanent PhD level scientists in this issue of USNA News and Notes, so that readers can learn about current arboretum research activities. Readers may refer to our web site for more detailed information about the scope of the research activities at the USNA.

#### *Jo-Ann Bentz, Research Entomologist*

Feeding injury, abundance, and performance of the potato leafhopper were measured on different red maple clones, Freeman maple cultivars, two elm cultivars and an American elm clonal selection. While none of the elms showed any evidence of feeding injury, the maple trees varied from tolerant (i.e., Freeman maples) to susceptible (i.e., red maple 56026). More eggs were laid and more nymphs became adults on American and Patriot elms than on red maple clones and Freeman maple cultivars. Red maples were more suitable for oviposition and nymphal survival and development than the Freeman maples.

*Jo-Ann Bentz, Research Entomologist (continued)*

Abundance of leafhoppers among trees varied from many insects collected from elms to very few from the Freeman maples. Our data show that resistance against feeding injury by the potato leafhopper among maples and elms is influenced, in part, by the degree of leaf flushing early in the season. Resistance against the insect's performance is related to the nutritional content of the leaves during this season. The ecological and economic impact of elm as a breeding host should be considered when growing maples and elms in nurseries and when used in the diversification of the urbanscape. Elms could present a problem as populations of the potato leafhopper could build up on these to such an extent that they become a problem on other non tolerant hosts, such as red maple.

*Robert Griesbach, Research Geneticist (Floral)*

Floral crop sales comprise one of the fastest growing segments of US agriculture. Further growth of this industry requires the introduction of new types of plants, while market share is maintained by introduction of genetically improved varieties with resistance to pests, diseases, and environmental stresses. *Petunia* species were used in breeding to develop enhanced germplasm that is drought tolerant. New cultivars released this year by Goldsmith Seed have this enhanced germplasm in their background. Currently, wild germplasm is being characterized by genetic distance and not by the more meaningful evolutionary distance. We are using the DNA sequence of the chalcone synthase gene intron as a measure of evolutionary distance. Sequence data suggests that an unknown taxon with succulent, glabrous leaves is more closely related to *Petunia integrifolia* ssp. *depauperata* than *P. altiplana* or *P. littoralis* and that *P. altiplana* and *P. littoralis* are more closely related to *P. integrifolia* ssp. *depauperata* than to each other. This information will be used to develop an evolutionary tree of *Petunia*.



Box huckleberry, *Gaylussacia brachycera*, is a MD state endangered species with landscape potential as a drought-tolerant, evergreen ground cover. In cooperation with Margaret Pooler, we have collected several plants from each of five different sites in the Jefferson National Forest in Virginia with the collaboration of the US Forest Service. These plants will be used in breeding with plants previously obtained from Maryland, Pennsylvania, Tennessee, Kentucky, and West Virginia to develop commercial cultivars and to develop a genetic rescue plan for the species.

Trillium is a native US perennial with commercial potential if suitable cultivars could be developed with longer lasting flowers and foliage. In collaboration with the University of Delaware, the Mt. Cuba Center for Piedmont Flora, Bluemount Nursery of Maryland, Carolina Nursery of South Carolina, and Atlantic Botanic Garden of Georgia, we have obtained viable seedlings from in vitro rescued ovules of *Trillium luteum* x *Trillium cernuum*. This cooperation will result in the more efficient use of limited resources in developing trillium as a new landscape plant.

Five Plant Patents were issued in 2002 for the *Ornithogalum* 'Chesapeake' Series of cultivars bred and released in cooperation with New World Plants. See Page 5 for more information.

*Kathryn Kamo, Research Plant Physiologist*

Viruses are a major economical problem in bulb crops. Transgenic plants of *Gladiolus* were developed in collaboration with Sanford Scientific, Inc. (Waterloo, NY) using either the bean yellow mosaic virus coat protein gene or its antisense RNA sequence, along with a selectable marker gene. After 8 years, most of the plant lines continue to express their respective antiviral genes. Numerous flower crops are propagated vegetatively requiring long-term expression of the introduced genes for successful genetic engineering. This research has shown that this should be possible.

*Kathryn Kamo, Research Plant Physiologist (continued)*

Our paper entitled “Maturation and conversion of somatic embryos of three genetically diverse rose cultivars” by J. Castillon and K. Kamo (HortScience 37:973-977. 2002), showed that an increased number of plants were regenerated from embryogenic rose callus by manipulating the primary carbon source and adding an osmoticum. The increased frequencies of plant regeneration from callus will contribute to an increased frequency when transforming rose plants from callus. Presented a talk and poster in Korea at the Rural Development Administration on “Regeneration and transformation of lilies and roses” because of Korea’s interest in floral crops.

*Sandra Reed, Research Geneticist (Shrubs/Trees)*

Five plants were selected during 2002 for evaluation by cooperators as possible cultivars. One selection is a hybrid between *Clethra alnifolia* ‘Hokie Pink’ and *C. pringlei*, a Mexican species with glossy, evergreen reddish-colored foliage. The hybrid is intermediate in appearance to its parents, with fragrant pale pink flowers and foliage that flushes red. The other four plants were selected from open-pollinated *Styrax japonicus* populations based on resistance to damage from late-spring freezes. Two of the selections are upright forms. One has a compact habit with a dense round head, and one has foliage that flushes red. All four develop leaves 2 to 3 weeks later in the spring than standard cultivars, thereby often escaping damage from late spring freezes. We propagated the selections in 2002 and will be sending them to approximately 50 cooperators in 23 states in early 2003 for evaluation.

Self-incompatibility was documented in *Cornus florida*, *Hydrangea paniculata* and *H. quercifolia*. The rate of growth of pollen tubes through styles following self- and cross-pollination was studied using fluorescence microscopy. In all three species, self-pollen was found to grow much slower than cross-pollen. This finding has significance for breeding studies in which it is important to limit the production of self-progeny.

Projects to develop a cold-hardy hydrangea with brightly colored flowers and compact oakleaf hydrangea cultivars have continued. Hybrids between *H. macrophylla* and *H. paniculata*, which were produced using embryo rescue techniques, have been propagated. Efforts are currently in process to induce flowering in these hybrids. We are also evaluating second-generation progeny derived from open-pollinated seedlings of the compact cultivars ‘Pee Wee’ and ‘Sikes Dwarf’ and from controlled pollinations between these two cultivars and ‘Snow Queen’. Several compact plants with good flowering characteristics are present in these populations. We expect to begin selecting plants for the cooperative evaluation program during summer 2003. [S. M. Reed. 2002. Flowering performance of 21 *Hydrangea macrophylla* cultivars. J. Environ. Hort. 20:155-160]. [S. M. Reed, Y. K. Joung and M. S. Roh. 2002. Interspecific hybridization in *Clethra*. HortScience 37:393-397]. [Invited Presentation: S.M. Reed. The Genus *Hydrangea* – Current Status and Breeding Opportunities. Presented at “Hydrangeas – Beginning to End,” a symposium sponsored by the Center for Applied Nursery Research, Thomson, Georgia, May 2002].

*Scott Warnke, Research Geneticist/Physiologist (Turfgrass)*

Conducts research on germplasm evaluation, plant genetics, plant physiology and germplasm enhancement of turfgrasses. Research is focused on an improved understanding of genetic processes underlying stress responses of turfgrasses, which will also lead to improved techniques for plant selection and breeding through the use of molecular marker techniques in germplasm enhancement. Research to identify superior stress-tolerant cultivars of turfgrass was conducted at cooperating universities in 40 US states and five Canadian provinces. In 2002, the National Turfgrass Evaluation Program produced and mailed annual summary reports for Kentucky bluegrass, perennial ryegrass, tall fescue, fineleaf fescue, bentgrass and bermudagrass to approximately 1400 individuals and companies. The impact of this research is to help turfgrass managers choose stress-tolerant, low input turfgrasses to reduce input costs and maximize environmental benefits.

*Scott Warnke, Research Geneticist/Physiologist (Turfgrass)*  
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The addition of RFLP markers to a genetic map of ryegrass developed using AFLP, Isozyme and RAPD markers has allowed the numbering of chromosomes relative to that used in the Triticeae. A Quantitative Trait Locus (QTL) analysis of genome regions influencing flowering time resulted in two regions having a significant influence on this character. These regions correspond to regions of the Triticeae genome known to carry photoperiodic control of flowering loci. Most notable is the region on chromosome 2 which corresponds to a region on Triticeae chromosome 2 carrying the *ppd-H1* locus, the major flowering control locus in wheat and barley.

*Alan Whittemore, Research Plant Molecular Taxonomist*

As the Research Scientist for the taxonomy program, and Supervisory Botanist for the herbarium of the U.S. National Arboretum, my research program investigates the classification, systematic relationships, and genetic relationships of plants with current or potential importance for landscape and nursery use. Current research concentrates on trees and shrubs, especially plants in the elm and oak families.



*Alan Whittemore, Research Plant Molecular Taxonomist*  
(continued)

We preserve many horticultural standards, which are critical for ensuring that names are used consistently. Since an herbarium specimen consists of the plant itself, prepared and stored so that much of its original form and structure is permanently preserved, herbarium specimens are by far the most detailed and reliable records of plant material grown or collected in the past. Our extensive collections of important horticultural material from more than a century of work make the National Arboretum Herbarium a unique and valuable resource documenting the history of American horticulture and botanical research. We are currently preparing digital images of many of our most important collections. These will soon be posted on the Web, where they can be viewed by users all over the world.

The National Arboretum Herbarium serves as a record of past cultivation and breeding work, a reference collection for identifying plants accurately, and a resource for our taxonomic research. We constantly work to document plants that are in cultivation today, concentrating on nursery and landscape plants of the United States. We regularly collect specimens from living collections all over the country that contain accurately named cultivars, recent introductions, and material that is being used actively for breeding. We will be working with David Tay to document significant collections at the Ornamental Plant Germplasm Center in Ohio, for instance.