

## Trees: Coping Beautifully with Seasonal Changes

Here in the eastern deciduous forest, the cycle of the seasons is familiar, marked most dramatically in the woody plants by leaf fall in autumn and new growth in the spring following a winter of dormancy. But how, and why, do these plants accomplish this? The why is perhaps more easily explained. Outside the tropics, green plants must make accommodation to winter with its freezing temperatures, shorter day length, and reduced solar radiation.

One strategy is that adopted by deciduous woody plants. Plant tissues, especially those of the leaves, are susceptible to damage from freezing as the formation of ice crystals inside the cells can puncture cell membranes, so these plants just lose their leaves for the duration. And they have developed a method of "forecasting" the coming of winter so they can do this in a timely fashion.

The date of leaf fall is a subject of much discussion in the popular press. The shortening of day length stimulates the production of hormones within the leaf which result in leaf fall. Temperature and moisture are also important in determining this date, but they are not as predictable as day length. The hormonal changes bring about changes in the abscission layer, a layer of cells at the base of the leaf stem or petiole. These cells form a corky layer on the stem which will cause the leaf to fall, at the same time protecting the stem from desiccation.

Cells in the remaining plant tissues must also be protected from the damage of freezing. They respond to the first cold days of autumn by developing frost hardiness, getting rid of most of their water, which concentrates the remaining solution so that it freezes at lower temperatures. In addition, they rearrange their structure so that if ice crystals do form they will be very small. Ice crystals may also form between the

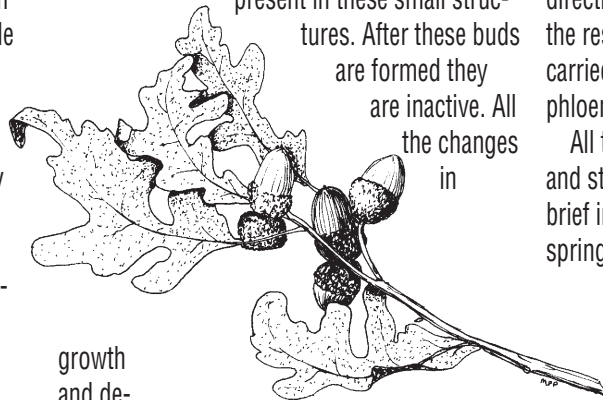


cells, drawing even more water out of

them, but not causing them damage.

So, what happens in the spring? First, it is important to note the somewhat obvious fact that all the new growth must come from buds that were formed the previous summer. A look at a tree or shrub will reveal these terminal buds at the tips of twigs and axillary buds at the axis of last year's leaves. Everything needed for the new season's leaves, flowers, and shoots is

present in these small structures. After these buds are formed they are inactive. All the changes in



growth and development are regulated by plant hormones, which are in turn regulated by temperature, day length, and moisture, but the exact nature of this bud break in the spring is not fully understood.

What is known is that bud break will not occur until the buds are exposed to a certain amount of winter chilling. The duration and severity of chilling necessary varies greatly among species and even within species and within the different buds on an individual plant. After dormancy is broken, the buds must then be exposed to a certain amount of warmer temperatures, also variable, and day length must also reach a certain level before growth begins. This is well known to anyone who has brought

branches of flowering trees and shrubs indoors to force blooming.

When the buds begin to grow, they of course need water and food for this rapid expansion. The plant again has made preparation for this over the summer by storing sugars and starches, produced through photosynthesis, mostly in the twigs and roots. These provide energy for the plant until the new leaves are mature enough to take over. Stored sugars rise through the phloem to the developing shoots and leaves. This is the reverse of the usual direction of transportation that occurs through the rest of the growing season, when food is carried from the leaves to the roots through the phloem tissue.

All these processes are amazingly complex and still only partially understood. Perhaps this brief introduction will add to the wonder as spring unfolds in the forest again this year.

—Yolande Gottfried

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# The Rare Plant Protection and Conservation Act of 1985 Celebrates 20 Years

Twenty years ago on April 25, 1985, Governor Lamar Alexander signed into law Tennessee's Rare Plant Protection and Conservation Act. The Act charges the Department of Environment and Conservation (TDEC), through its Division of Natural Heritage (DNH), with maintaining and enhancing the number of rare plants in the state, but without infringing upon private property rights, or interfering with, delaying or impeding any public works project. Most rare plant populations are found on private property within the state. So despite having a good law to protect and conserve rare plants, the task at hand remains a great challenge.

There are currently 536 plants on our state rare plant list. Nine of these species are endemic to Tennessee (found nowhere else in the world). The Rare Plant Scientific Advisory Committee reviews this list every three years and suggests amendments. This list is formalized through the public rule-making process, including a public review and approval by the



commissioners of TDEC and the Department of Agriculture. The list serves as the focal point for rare plant conservation within the state.

At this time we also have 21 federally listed plant species (13 Endangered and 8 Threatened), and 3 Candidates for federal listing. So far in Tennessee we have had one species, *Scutellaria montana*, down-listed from Endangered to Threatened; and one species, *Helianthus eggerii*, proposed for removal from federal listing. There remains ahead a significant challenge to achieve the recovery of our federal listed plants species.

The Act also charges TDEC with establishing regulations under which the state can issue a free license for the commercial sale or export of any endangered species by nursery farmers. This license, available from DNH, ensures that the propagation and trade of these endangered species is done in a responsible way, thereby preventing harm to native populations.

Over the last 20 years much has been accomplished to conserve the state's rare plants. However, there remain significant challenges ahead to continue to identify, maintain, and enhance our state's rare plant species.

—David Lincicome

Rare Species Protection Program Administrator

Editor's note: Herbarium Director emeritus George Ramseur serves on Tennessee's Rare Plant Scientific Advisory Committee.

## THE PLANT PRESS

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Drawings by Mary Priestley are of white oak and some of the rare plants found on the Domain: Canada lily, elf orpine, ginseng, pink lady's-slipper, and slender blazing star.

## 18th-Century Botanist to Visit Herbarium

The Herbarium is making plans to welcome famed French botanist and explorer André Michaux for a visit on April 25.

Actually, Michaux died more than 200 years ago, so this will be an interpretive presentation by Charlie Williams, a librarian from Charlotte, NC, and expert on

Michaux. Dressed in period costume, he adopts Michaux's persona as he tells the story of his travels and exploits.

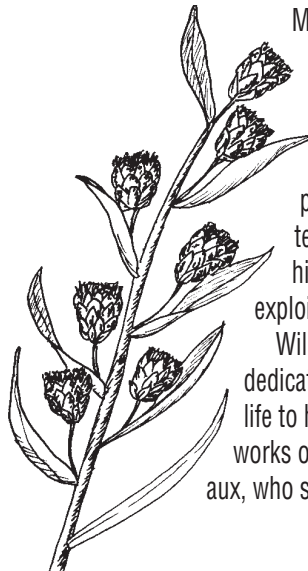
Williams has dedicated much of his life to highlighting the works of André Michaux, who spent 11 years in

the late 18th century exploring North America, much of it in the Southeast, on foot and horseback. Michaux is credited with naming and documenting 283 new species of plants. Few people know the extent of his travels and how important his discoveries were to the history of botany in America.

Williams is the Chairman of the André Michaux International Symposium, and just last year headed a delegation to Rambouillet, France, to participate in a celebration for Michaux. In addition to the interpretive presentation, he will talk about Michaux's explorations in Tennessee, and about Williams's own recent discovery of a controversial plant specimen collected by Michaux more than 200 years ago.

The talk will be for the general audience, anyone interested in botany or the history of science. Look for details on our website, [www.sewanee.edu/biology/herbarium](http://www.sewanee.edu/biology/herbarium).

— Mary Priestley



# Spring Calendar of Events

## Sat., March 26, 8 AM — Waterfall Tour

The South Cumberland State Park presents the 1st Annual Waterfall Tour to visit some of the more spectacular falls in the area, including Monteagle and Bridal Veil Falls, Greeter/Boardtree Falls, Sewanee Bridal Veil (led by Mary Priestley), and others. The tour lasts all day and will involve 5 miles of moderate hiking, so be sure to bring good boots and plenty of drinking water. Please call the South Cumberland State Park Visitors' Center at (931-924-2980) for schedule details and to sign up for the tour.

## Sat., March 26, 10 AM — Bluebell Island

Join the South Cumberland Regional Land Trust for their annual Bluebell Island Ramble to see an outstanding display of bluebells with trout lilies and other early bloomers. Meet at the Tyson Food Co. plant on Highway 50 in Decherd. Easy except for crossing the Elk River on a log, but ropes or something else will be set up to make it accessible.

## Sat., April 2, 9 AM & Sun., April 3, 12 NOON — Shakerag Hollow

The Sewanee Herbarium staff is leading walks for the 10th Annual Spring Wildflower Celebration presented by the Tennessee Aquarium and The Tennessee Wildflower Society. Sat's hike will be led by George Ramseur and Mary Priestley; Sun's by Jon Evans and Brett Scheffers. These walks are open to the local public. Meet at Green's View parking lot (past the golf course). 2 miles, moderate, with one fairly steep incline.

## Sat., April 9, 10 AM — Collins Gulf. Mary Priestley

This section of the South Cumberland State Park is the only other local spot that rivals Shakerag Hollow for numbers and diversity of spring wildflowers. Meet at the Collins West trailhead, just beyond the Swiss Memorial School in Gruetli-Laager. Bring lunch and extra water. 5 miles, strenuous. For directions to Collins Gulf call the South Cumberland State Park Visitors' Center (931.924.2980).

## Sun., April 10, 1:30 PM — Shakerag Hollow. Harry & Jean Yeatman

This is Sewanee's Mecca for wildflower lovers and these leaders are the experts. Meet at Green's View parking lot (past the golf course). 2 miles, moderate, with one fairly steep incline.

## Sat., April 16, 10 AM to 4 AM — Trails & Trilliums

St. Andrew's-Sewanee School is sponsoring a day of wildflower sales, walks, and workshops. For more information see [trails.sasweb.org](http://trails.sasweb.org). Among the events will be walks led by Herbarium staff and friends, as follows:

10:30 AM Shakerag Hollow — Harry & Jean Yeatman and Jon Evans

11:30 PM Nature Trail — George Ramseur

2:00 PM Shakerag Hollow — Mary Priestley & Yolande Gottfried

## Sat., April 23, 10 AM — Collins Gulf. Mary Priestley (See details above.)

## Sun., April 24, 1:30 PM — Shakerag Hollow. Mary Priestley (See details above.)

## Mon., April 25, 4:30 PM — "Andre Michaux Visits the Herbarium." Charlie Williams

Woods Lab room 103

## April 25-May 1 is the week of the Spring Wildflower Pilgrimage in the Great Smoky Mountains National Park.

Members of the Herbarium staff will be participating as walk leaders. For more information and registration visit the website at <http://www.springwildflowerpilgrimage.org/>.

## Sat., April 30, 8 a.m. — Birdwatching at Morgan's Steep. David Haskell

This is a good time and place to spot spring migrants on their way through and Sewanee's summer birds newly arrived, with a professor of ornithology. Canceled in the event of rain or strong winds.

All times are CST or CDT. Wear appropriate shoes on all of these walks. Risks involved in hiking include physical exertion, rough terrain, forces of nature, and other hazards not present in everyday life. Picking flowers and digging plants are prohibited in all of the above-mentioned natural areas.

For more information on these events contact Yolande Gottfried at the Herbarium (931.598.1798) during regular business hours or by e-mail at [ygottfri@sewanee.edu](mailto:ygottfri@sewanee.edu).

## Membership Application/Renewal

The Friends of the Sewanee Herbarium support the work of the Herbarium: education, research, and conservation. A \$10.00 annual contribution would be very much appreciated. The date of your most recent contribution is printed on your address label.

Name and Address (if different from that on the mailing label on the back):

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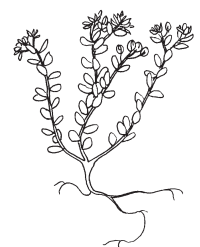
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Amount Enclosed:  \$10.00  Other: \$ \_\_\_\_\_

Please make check payable to The University of the South. Gifts are fully tax deductible. Send to:

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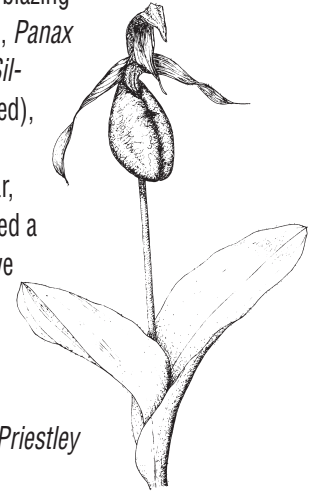
## From the Editor

Spearheaded by Dr's John Herr at the University of South Carolina, Michael Woods at Troy University, and Dan Evans at Marshall University, the new Society of Herbarium Curators was formally organized this past July. The Society, an expansion of the Herbarium Curators Committee of the Association of Southeastern Biologists, is currently developing a network of plant collections and botanical expertise in the Southeast.

According to Zack Murrell at Appalachian State University, "The Southeast is known as a botanically diverse region, and the rate of species description indicates that the region is still providing botanical surprises. The Society of Herbarium Curators is committed to making this rich natural history available to the global scientific community and will work to broaden our scientific knowledge of this amazing region of the earth."

Closer to home, we are so pleased to have a wonderful new volunteer in the herbarium. Ann Bradley, newly transplanted from Idaho, is taking a central role in updating our collection database. We hope to have the database in good shape as we go into the 2005 plant collecting season.

To date, the Herbarium has identified on the Sewanee Domain seven plant species that are listed as threatened or endangered under Tennessee's Rare Plant Protection and Conservation Act: *Cypripedium acaule* Ait. (pink lady's-slipper), *Diamorpha smallii* Britt. ex Small (elf orpine), *Liatris spicata* Michx. (slender blazing star), *Lilium canadense* L. (Canada lily), *Panax quinquefolius* L. (American ginseng), *Silphium pinnatifidum* Ell. (tansy rosinweed), and *Trichomanes boschianum* Strum (Appalachian bristle fern). Just this year, herbarium director Jon Evans discovered a new population of the bristle fern. As we update the Domain flora this summer, we hope to have even more of these exciting finds.



—Mary Priestley

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