

CHINQUAPIN

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SOUTHERN APPALACHIAN BOTANICAL SOCIETY

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EARL CORE STUDENT REPORT

Biogeographic Study and Taxonomic Evaluation of *Platanthera*, Section *Limnorchis* (Orchidaceae) Based on Molecular Phylogeny

By Eranga Wettewa, Mississippi State University

Platanthera is one of the largest genera of temperate orchids, with more than 200 species occurring in North America, Asia, Europe, and North Africa, as well as Borneo and Sarawak. North America is a hot spot for *Platanthera* diversity, specifically for its one of the five sections, *Limnorchis*. The species in this section show a disjunct distribution in the regions of Pacific North Western America, North Eastern America and Eastern Asia. *Platanthera* has undergone a tremendous radiation in floral form and pollination syndromes and has been used as a model for understanding the role of pollinators in driving orchid speciation. Despite its diversity, a thorough phylogenetic hypothesis for the genus is lacking because no studies have yet sampled taxa exhaustively.

For my research project, I will be constructing a molecular phylogeny for the section *Limnorchis*, and I will be using that phylogeny to address the unresolved issues in the taxonomy of this group and to test hypotheses on biogeographic patterns and convergent evolution of floral morphological traits. Section *Limnorchis* is primarily a North American group and largely boreal and montane. Species comprising the section have a wide distribution from western cordillera of North America to the East and Southwest, with species likely extending into Mexico, Iceland, and possibly to Japan. Understanding the biogeographic history and morphological diversification of taxa in section *Limnorchis* within a phylogenetic context is key to understanding the radiation of species and will contribute to taxonomic revision and future studies aimed at exploring the drivers of orchid diversification in temperate ecosystems. I started my project with collecting sequence data using EPIC (Exon primed intron crossing) markers and I was able to develop six variable loci for the section *Limnorchis*, with the financial support given by the Earl Core Research Award. These data were combined with the ITS sequence data to see the congruence of the results. The preliminary results of this analysis were presented last summer at the Botany meeting. The phylogenies based on ITS and the EPIC loci exhibit some incongruence, although this may be influenced by the fewer number of samples used in the EPIC data sets and the presence of missing data for some individuals due to indel heterozygosity. In the ITS phylogeny, section *Limnorchis* was monophyletic with respect to other *Platanthera* species. Additionally, the white flowered taxa were distinct from green-flowered forms, with the exception of *P. huronensis*, an allopolyploid of *P. dilatata*



and *P. aquilonis*. To resolve this further, NextGen sequencing based on targeted capture sequencing methods will be used to collect high throughput sequence data in the summer of 2017. I am currently incorporating additional taxa into the analyses to better resolve relationships among the green-flowered taxa.

Preliminary results using these phylogenies demonstrate that among the green flowered taxa, variation in spur length appears to be evolutionarily labile in section *Limnorchis*. However, variation in spur length among the white flowered taxa does not appear to be phylogenetically structured. To further characterize morphological variation currently I am collecting morphological data from flowers on herbarium specimens of species in section *Limnorchis*. I am using Scanning Electron Microscopy (SEM) to study the micro-morphological traits, mainly in the spur and the gynostemium structures. This data set will be examined in the context of the phylogeny for the section to evaluate whether floral morphological traits are phylogenetically conserved among species and to aid in revising the taxonomy of this group.

I envision that the data I collect from this project will greatly assist me in drawing conclusions about the evolution and taxonomy of section *Limnorchis*. The phylogeny for the section is underway

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From The Editor's Desk:

Joe Pollard, Newsletter Editor

I can anticipate the questions. What happened to my recent issues of *Chinquapin*? The answer is that your editor has finally bitten off more than he can chew. Several people have expressed concern about health or personal crises, but it's nothing like that. But several things like moving into a new house and getting ready for a full-year sabbatical have combined to create a never-ending stream of urgent deadlines. And – oh yeah – I do still have a day job, and students who expect to get their grades on time. The newsletter deadline is always the one that can be put off (because I'm the only one who sets that deadline). In the end, there were only three issues in 2016, and the first issue of 2017 is late. I sincerely apologize to the membership of SABS for not delivering the four issues per year that I promised to do when I accepted this appointment.

So, the "Editor's Desk" will be moving, as that reference to a sabbatical implied. For the next year, I will be based at Oxford University in the UK. Most of the *Chinquapin* production is done electronically anyway, so I don't think this will be a technical challenge. I do plan to keep busy with research and other endeavors, but I am hopeful that a more flexible schedule will allow me to get caught up with delivering the high-quality newsletter that our membership deserves. As usual, contributions are most welcome! You can contact me via e-mail at joe.pollard@furman.edu.

Changes in *Castanea* Print Schedule

Beginning in 2017, the print version our journal *Castanea* will be issued just twice a year, in May and October. The SABS Council has been in negotiation with Allen Press, and have taken this step to contain rising costs and avoid the necessity for a dues increase. This change will not affect the number of pages or number of articles in *Castanea*, only the print production schedule. Members who access the journal online will now find that each article will be available on the *Castanea* website (<http://castaneajournal.org>) as soon as it has been accepted and formatted.

An email providing additional detail on these changes was distributed to all SABS members with a valid email address by Membership Secretary Michael Held, on April 18. (If you did not receive that email, please contact Mike at the address shown in the side-bar, to make sure we have your contact information correctly.)

SABS Welcomes Our New Members

- Alexander Allman
- Kendall Beals
- Drew Chaney
- Yolande Del Buono
- Guy Denny
- Taly Drezner
- Kassandra Fernandez
- Steve Fluett
- Jennifer Francis
- Brandon Fuller
- Linda Fuselier
- Catherine Garner
- Shannon Grover
- Jennifer Hastings
- Nikolai Hay

- Ellen Honeycutt
- Katie Horton
- Robbie Juel
- Jayne Lampley
- Mason Lee
- Tesa Madsen - McQueen
- Kendall McDonald
- Marianne Mooney
- Brandy Purdy
- Joel Schlaut
- Greg Short
- Andrew Suddith
- Andrea Thompson
- Shannon Walker

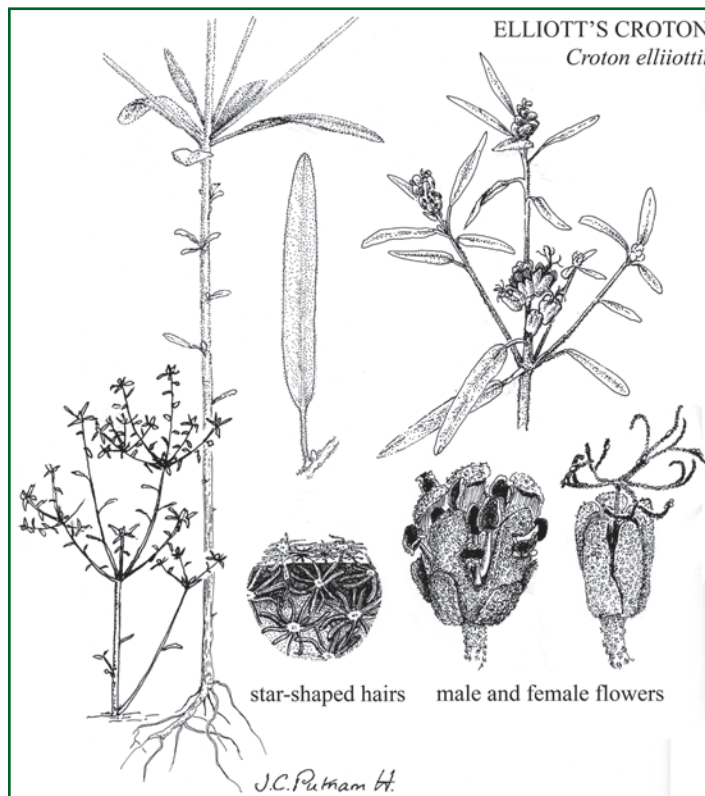
Here Today, Gone Tomorrow... then Back Again: The Disappearing Act of *Croton elliotii*

By Linda Chafin, State Botanical Garden of Georgia, University of Georgia, Athens

The Spurge Family – Euphorbiaceae – is large, with about 7500 species worldwide and is one of the most varied in terms of flower type, habit, phytotoxins, and other defense mechanisms. Globally, between 500 and 700 species in this family are threatened or endangered, and in the U.S., about 40 species are state- or federally listed. In this column, I want to introduce one of the rare *Crotons* found in the southeast, the only one with the habit of disappearing and then re-appearing, often in huge numbers, after a long interval.

Croton elliotii ranges across the Coastal Plain in four Deep South states: Alabama, Florida, Georgia, and South Carolina. It occurs on the exposed shores and bottoms of the shallow ponds that form in limestone sinkholes and clay-based Carolina Bays. NatureServe ranks it as G2G3, meaning that its conservation status is uncertain – possibly imperiled or maybe only vulnerable – not surprising for a group of plants that is often impossible to find, much less count.

Elliott's *Croton* may appear by the hundreds or even thousands when water levels in a pond drop, exposing saturated but rapidly drying soil. If the pond remains flooded, plants may not be seen for years. Ideal conditions occur when heavy winter rains are followed by a dry spring and summer; water levels drop and seeds that have lain dormant in the seed bank have the chance to germinate. Dr.



Robert Kral, dean of southeastern botanists for many decades, noted in 1983 that, under these conditions, *Croton elliotii* was found "around nearly every limesink pond in southwestern Georgia, adjacent northwestern Florida, and in southeastern Alabama. Where found, it forms nearly pure stands, and is also often locally abundant in those crop fields and pine plantations [and roadside ditches] adjacent to the ponds." Although no one has studied its seed bank, it seems likely that *Croton elliotii* seeds can survive long dormant periods in flooded soils.

But ideal hydrologic conditions may be occurring less and less frequently. In Florida, *Croton elliotii* has not been documented since 1977 and, in South Carolina's Carolina bays, since the late nineties. Only three populations have been seen recently in Alabama. The only large, recently documented populations occur in dozens of limesink ponds on the Jones Ecological Research Center (Ichauway) in southwest Georgia, where they are protected and managed with fire.

In the 35 years since Dr. Kral's observations, suitable habitats have become increasingly rare in the region due to intensified irrigation, water table drawdown, agricultural and silvicultural conversion, and removal of legal protection from isolated wetlands. Fire suppression and abnormally long droughts have led to the invasion of ponds by woody and invasive species. As pond edges dry, they are more likely to be used for roads and firebreaks or converted to agriculture. Climate change is likely to lead to more drought, more fire suppression, and more crop irrigation, worsening this problem.



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BOTANICAL EXCURSIONS

Wretched Sedge: Taxonomic VerseBy George Ellison (www.georgeellison.com)Artwork by Elizabeth Ellison (www.elizabethellisongallery.com)

Wretched Sedge (*Carex miser* Buckley 1843; *C. misera* Small 1903); endemic to 13 counties in the Blue Ridge (TN, GA, NC); clumps of narrow pale-green grass-like leaves up to 16 inches droop forlornly from crevices in shaded seepage cliffs underlain by dry pale-brownish hair-like tussocks of older leaves resembling the headpiece a Cherokee woman in mourning ... of a certain disposition ... might have deemed suitable to mark the occasion as she danced and whirled around the funeral pyre ... alone at last after all those years ... bare feet hovering above the indifferent soil ... forlorn leaves masking her dull cold eyes.

[Editor's note: This poem was taken from an as yet unpublished collection by George Ellison, with the working title Dark Mountains & Shining Rivers. When I told George I'd like to use it here, his tongue-in-cheek response was: "I'm really pleased that you're going to include 'Wretched Sedge' as I believe I have perhaps invented a new species of verse that recognizes the inherent beauty, balance and resonance of not a few taxonomic entries; and, if so, we may well in the near future observe English majors toting copies of the Manual of the Vascular Flora of the Carolinas to class."]

Here Today continued from Page 3

This “here today, gone tomorrow” life history creates problems for rare species listing agencies. Field botanists are usually working on contracts and under deadlines; waiting for just the right confluence of weather events before they conduct surveys and write reports is usually not an option. As a result, no one knows for sure the status of Elliott’s Croton. It has languished on the federal candidate list since at least 1990 and is again being considered as the Fish and Wildlife Service responds to a court order to evaluate its backlog of candidate species. But how to evaluate a species that may appear only every few decades? Elliott’s Croton may be a case where listing should be based on the status of a species’ habitat rather than its populations.

Croton elliotii is an annual, monoecious herb 20 - 40 inches (50 - 100 cm) tall with a repeatedly forking stem. Its stems, leaves, leaf stalks, sepals, and fruit are covered with branched hairs. The leaves are 1½ - 2 inches (4 - 6 cm) long and about ½ inch (1 - 1.5 cm) wide, alternate, and narrowly oblong with smooth margins. The compact flower clusters are held at the tips of branches, each containing several small, whitish flowers. The fruit is about ¼ inch (5 mm) wide, with three rounded lobes, each lobe containing one seed. Deep South botanists, keep an eye out for *Croton elliotii* and let your state’s heritage program know if you find it.

News from the Annual Meeting

Student Presentation Awards

For 2017, awards were presented for the best student poster presentation and for best oral presentation. The award includes an honorarium of \$500.

Oral presentation – **Lauren Whitehurst** (Columbus State University):

Implementing a DNA barcoding pipeline to prevent the introduction of invasive species into the Port of Savannah.

Poster presentation – **Carolina Siniscalchi & Jennifer Mandel**

(University of Memphis):

Development of SSR markers for *Chresta* (Asteraceae: Vernoniaeae) using genomic data.

Earl Core Student Research Award

This year two proposals were funded. The maximum grant is now \$750.

Jennifer Hastings (Ohio University - advisor Dr. Harvey Ballard):

Comparative Ecology and Niche Differentiation of Three New Mid-Appalachian Acaulescent Blue Violets. \$737.55

Adam Ramsey (University of Tennessee, Memphis - advisor Dr.

Jennifer Mandel): The Effects of Mitochondrial Heteroplasmy on Individual Fitness in Wild Carrot. \$639.60

Student Conference Support Awards

The following students were awarded \$300 to offset the costs of attending the annual meeting:

Cameron Byrd (Troy University), **Nikolai Hay** (Appalachian State University), **Anna Nichole Long-Aragon** (University of Southern Mississippi), **Adam Ramsey** (University of Memphis), **Eranga Wettewa** (Mississippi State University), and **James Wood** (University of Georgia)

References

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- Edwards, L., J. Ambrose, and L.K. Kirkman. 2013. The Natural Communities of Georgia. University of Georgia Press, Athens.
- IUCN. 2016. International Union for the Conservation of Nature: the IUCN Red List of Threatened Species. <http://www.iucnredlist.org>
- Kirkman, L.K. and R.R. Sharitz. 1994. Vegetation disturbance and maintenance of diversity in intermittently flooded Carolina bays in South Carolina. *Ecological Applications* 4(1): 177-188.
- Kral, R. 1983. A Report on Some Rare, Threatened, or Endangered Forest-related Vascular Plants of the South. U.S. Dept. of Agriculture Forest Service Technical Publication R8-TP2.

Richard and Minnie Windler Award

Two awards are presented annually; first to the author or authors of the best systematic botany paper and second for the best ecology or floristic paper, both published in *Castanea* during the previous year. Each award comes with a check for \$500.

The 2016 Richard and Minnie Windler Award winners were:

Ecology: **Varma-Rose J. Williams and Heather F. Sahli**,

A comparison of herbivore damage on three invasive plants and their native congeners: implications for the enemy release hypothesis. *Castanea* 81(2): 128-137.

Systematics: **Jonathan P. Evans, Callie A. Oldfield, Mary P.**

Priestley, Yolande M. Gottfried, L. Dwayne Estes, Alfire Sidik, and George S. Ramseur, The Vascular Flora of the University of the South, Sewanee, Tennessee. *Castanea* 81(3): 206-236.

Elizabeth Ann Bartholomew Award

The society annually presents the award in memory of Elizabeth Ann Bartholomew’s untiring service to the public, to plant systematics, and to the organization. The award is presented to individuals who have also distinguished themselves in professional and public service that advances our knowledge and appreciation of the world of plants and their scientific, cultural, and aesthetic values, or exceptional service to the society.

The recipient of the 2016 Elizabeth Ann Bartholomew Award is **Dr. Conley K. McMullen** of James Madison University.

Election Results

The SABS Council will be joined by the following newly-elected officers and members:

President-Elect: **Brian Keener**

Members-at-large to Council: **Jonathan Horton**

Amendments to the Constitution and By-Laws were also passed.

The Treasurer’s Report and the Minutes of the Annual Business Meeting will be distributed in *Chinquapin* 25(2).

Botanical Brainteasers

By Joe Pollard and Janie Marlow

Our fall Brainteasers [*Chinquapin* 24(3)] were (1) *Chamerion* (formerly *Epilobium*) *angustifolium*, (2) *Zephyranthes atamasco*, (3) *Tragia urticifolia*, (4) *Rhododendron calendulaceum* and (5) *Silene virginica*. Perhaps you remember the horrible wildfires that were scorching the Southern Appalachians during the severe drought we had last fall. Four of these species have common names that relate to fire. (1) fireweed, (3) noseburn, (4) flame azalea, and (5) fire pink. But one of the common names for *Z. atamasco* is rain lily, and rain was the much-needed antidote to all those fires, flames, and burns. So we intended picture #2 to be the odd one out.

We received just three responses to this Brainteaser. Some of the identifications were pretty tough, and nobody got all five of them. And therein lies the problem, because a mistaken identity probably ruins the whole “fire and rain” theme. So none of the players correctly guessed the puzzle answer that we had in mind. The first response we received was from Elizabeth Pullman of Austin, Texas. She had most of the ID’s correct and some pretty good ideas about plants that didn’t belong, so we declare her the winner of the fall competition.

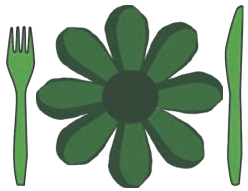
As explained earlier (see “From the Editor’s Desk”), the winter 2016

issue of *Chinquapin* was cancelled. That means the winner for Volume 24 will be based on just three Brainteaser competitions. There was only one person who submitted entries for all three issues, and since the annual standings are based on the sum of accumulated points, playing regularly gives a huge advantage. SO... the winner for 2016 is Sam Pratt of Inman, SC. There’s a pattern here! Sam was our 2015 winner as well. His answers are accurate and perceptive, and he almost always plays the game. Congratulations Sam! We’ll be sending you a copy of George Ellison’s recently published book of essays “Literary Excursions in the Southern Highlands.”

We will start volume 25 with what we hope will be an obvious one. Five very common plants. Identify by scientific and common name, and then explain which is the odd one out and why it doesn’t belong. Take advantage of this easy start, so that you too can have multiple entries this year.

Please address all correspondence regarding Botanical Brainteasers to joe_pollard@att.net. (That’s an underscore character between first and last names.) Email is strongly preferred, as I’ll be out of the office a lot. Color photos will be posted online at <http://sabs.us/publications/chinquapin-issues>





Edible Wild Plants: Grain Fed

by Lytton John Musselman, Old Dominion University

Wild food foragers often dine on such wild edibles as berries, starches from various species, nuts, and greens. Grains, on the other hand are less familiar as a source of food—and with good reason. There just aren't many suitable wild grasses to eat.

Based on my limited knowledge and experience, toxicity from eating grasses is rare in humans, especially when small quantities are ingested. Immediately I hear the botanist acquainted with the Bible mention tares (*Lolium temulentum*) that are, indeed, toxic. Actually, it is not the grass that is toxic but an endophytic fungus, perhaps ergot (*Claviceps purpurea*), that parasitizes the tares and produces toxins. Other grasses have endophytic fungi as well. Some grasses contain high concentrations of tannins that if ingested over a long period of time are pre-carcinogenic. And some grasses have concentrations of silica that can be irritating. But for a huge plant family there are few bad actors.

For a truly once-in-a-lifetime experience, try eating the tasty, nutritious grains of common cane (*Arundinaria tecta*), our only native bamboo. The reason it is not widely appreciated as a wild food is the simple fact that it does not produce fruits during the average life span of a wild food forager, maybe only every hundred years or so. Like other bamboos, cane is semelparous—fruits once then dies. But what a way to go.

In June 2005 a former student called to tell me that he found cane in fruit. Never expecting to see such in my lifetime, I heard “flowering”, a common occurrence (both my mis-hearing and the flowering are common). When it hit me, I went immediately to the site where culms (stems) of cane were bent over loaded with grains. Further search showed that the Dismal Swamp National Wildlife roads had miles of fruiting cane (Fig. 1). And in many other wetlands in southeast Virginia cane was fruiting. Then it died on a massive scale.



Figure 1. Fruiting cane lining a road in the Great Dismal Swamp Wildlife Refuge in June 2005. Fruiting branch upper right, grains enclosed in chaff lower left.

The grains of cane are perhaps the largest of any of our native grasses. Fresh grains are soft, chewy, and tasty. Certainly my favorite wild grain. I dried some, ground them, and used them in bread.

While waiting for another fruiting of cane there are other less spectacular but more reliable native grasses to eat. River oats, *Chasmanthium latifolium*, often forms large fruiting stands along rivers in the early fall (Fig. 2). To harvest, cut the fruiting heads and put them in a paper bag for a week, then thresh. Many of the florets do not produce grain so you need many bags of the fruiting culms to yield a usable amount of grain. My Field Ethnobotany class made pasta from river oats. It was tasty and chewy, and a tremendous amount of work.

Edible Wild Plants continued on Page 8



Figure 2. River oats fruiting along Nottoway River, Sussex County, Virginia in September. Fruiting spikelet upper right has only one mature grain, a common feature. Lower left threshed grains.

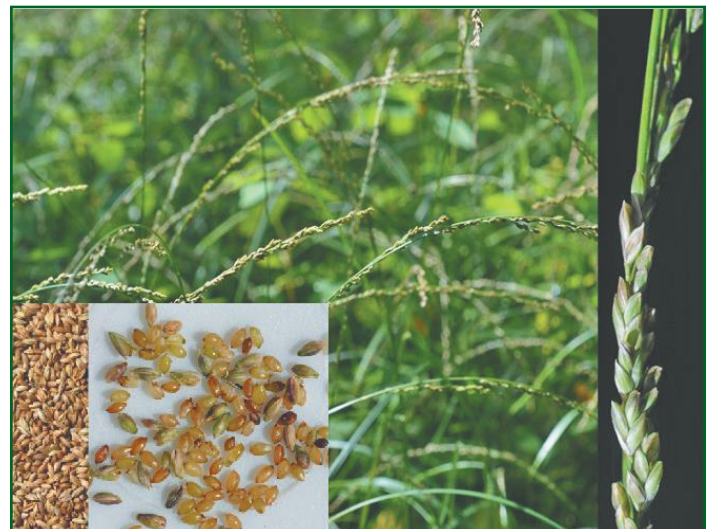


Figure 3. Manna grass in marsh at Cranberry Lake Biological Station in the Adirondacks, New York July. Fruiting stem on right, threshed grain extreme lower left, winnowed grain adjacent.

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preliminary data for further studies.

Eranga Wettewa is a PhD candidate in the Department of Biological Sciences at Mississippi State University. Her major professor is Dr. Lisa Wallace.

and I plan to give a presentation at the ASB meeting this spring, and this will include preliminary results from the morphological work.

I am very grateful for the Southern Appalachian Botanical Society for selecting me for the Earl Core Student Research Award, which allowed me to cover the cost of collecting DNA sequencing data which are also my

Edible Wild Plants continued from Page 1

Perhaps the most dependable source of a good quantity of grain is from manna grass, *Glyceria melicaria* (Fig. 3) and its relatives. Several species in this genus are called manna grass and it is likely that all are suitable. The grains are small but easy to thresh even when the culms are fresh. Prepared like rice, it has a pleasant flavor.

Grains of these three grasses can be dried and stored for later use. Bear in mind that these grains have not been artificially selected to be free threshing like wheat and barley so it takes a great deal of effort to get grain that is relatively free of the various bracts that surround the grains (chaff). After threshing, the grains need to be winnowed to remove the chaff. With some grains it is easier to winnow after drying, this seems to aid in removal of chaff.

Read Lytton Musselman's Edible Wild Plant blog at <http://fs.wp.odu.edu/lmusselm/>

"It is a false goal to think we can and should transform our landscapes into ones resembling a PreColumbian primeval wilderness... The vegetation that European pioneer settlers encountered then was not wilderness untouched by human activity.... It was a dynamic mosaic of species still adjusting to late Holocene climate change...."

Hazel Delcourt, 2002, *Forests in Peril*,
The McDonald and Woodward Publishing Co., p. 212.