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The Canadian Botanical Association Bulletin



Bulletin de l'Association Botanique du Canada

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1. The Canadian Botanical Association/L'Association Botanique du Canada (CBA/ABC), and the Botanical Society of America (BSA), and the American Fern Society (AFS), and American Society of Plant Taxonomists (ASPT) are jointly organizing the Botany 2008 meeting on the campus of University of British Columbia (UBC) from July 26 to July 30, 2008. The theme for BOTANY 2008 is Botany Without Borders. The detailed information about the BOTANY 2008 conference can be found at the conference website (<http://www.botanyconference.org/>). More information will be posted on the conference website soon.
2. Abstract Submission: The deadline date for abstract submission is **April 7th***. Please submit your abstracts online **on or before April 7th***.
3. Student Awards: The details about the CBA/ABC student awards for the BOTANY 2008 conference are available on the conference website (<http://www.botanyconference.org/Info/English.pdf>) and the CBA/ABC website (<http://www.cba-abc.ca/cbahome.htm>). Students must check the appropriate boxes for the awards while submitting their abstracts online in order to be considered for the Lionel Cinq-Mars award for the best oral presentation and Iain and Sylvia Taylor award for the best poster.
4. Conference Registration: The online conference registration is now open. Please register early (March – June 28th) to avail the reduced registration rates.
5. Accommodation: The registration for on campus accommodation for the BOTANY 2008 conference is now open. The conference accommodation reservation can be made online <http://www.botanyconference.org/Housing/index.php>

Canadian Botanical Association Bulletin

The CBA Bulletin is issued three times a year (in theory in March, September and December) and is available to all CBA members in electronic format or for an additional fee, in hard copy.

Information for submitting texts

All members are welcome to submit texts in the form of papers, reviews, comments, essays, requests, or anything related to botany or botanists. Any medium is acceptable for submission but electronic documents are likely to speed up the publication. For detailed directives on text submission please contact the Editor (see below). For general information about the CBA, go to the web site: <http://www.cba-abc.ca>

Association botanique du Canada Bulletin

Le Bulletin de l'ABC paraît trois fois par année, normalement en mars, septembre et décembre. Il est envoyé à tous les membres de l'ABC.

Soumission de textes

Tous les membres de l'Association sont invités à envoyer des textes de toute nature concernant la botanique et les botanistes (articles, revues de publication, commentaires, requêtes, essais, etc.). Tous les supports de texte sont acceptés. L'utilisation de documents électroniques peut accélérer la publication. Pour des renseignements détaillés sur la soumission de textes, veuillez consulter le rédacteur (voir ci-dessous). Infos générales sur l'ABC à l'URL suivant: <http://www.cba-abc.ca>

Editor / Rédacteur

Christine D. Maxwell
924 Cassandra Place
Nanaimo BC
V9V 1C1

Téléphone / Phone (250) 390 9240
Télécopieur / Fax NA
Courriel / E-mail :
cba.abc.bulletin@gmail.com

Next issue / Prochain numéro

Texts for the next issue, 41(2), must be received before **September 10th 2008**

La date de tombée des textes du prochain numéro, le no 41(2), est le **10 septembre 2008**

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6. Field Trips: A comprehensive list of Pre-conference and Post-conference Scientific Field Trips can be found at:

<http://www.botanyconference.org/FieldTrips/index.php>. Field Trips are open to all registered attendees of Botany 2008 including spouses/companions and family members. You need to register for these Field Trips.

7. Education and Scientific Workshops: A number of complimentary workshops are planned for Sunday, July 27th. These Education and Scientific Workshops are open to all conference attendees. Pre-registration is required for all workshops and forum sessions. More information about these Workshops can be found at:

<http://www.2008.botanyconference.org/Workshops/>

8. For any questions/comments/suggestions regarding BOTANY 2008, please contact Santokh Singh (santokh@interchange.ubc.ca) or Christian Lacroix (lcroix@upei.ca).

* Deadline for Abstract submission extended to April 7th 2008



Association News / Nouvelles de l'association

The CBA/ABC Board and Section Meetings at the BOTANY 2008 meeting in Vancouver (July 26-30, 2008)

The proposed schedule for the CBA/ABC Board and Section meetings, AGM and Combined BSA/CBA (ABC) Banquet is as follows:

I. The CBA/ABC Section Meetings:

July 27, 2008 Sunday, 12:00-13:00.

**Development
Conservation
Ecology**

July 28, 2008, Monday 12:00-13:00.

**Mycology
Systematics and Phytogeography
Teaching**

II. The CBA/ABC Board Meetings

CBA/ABC Board meeting: Saturday, July 26, 2008.
18:00-20:00;

Luncheon, Annual General Meeting, awards:

Wednesday; July 30, 2008.

12:00-14:30

Most CBA/ABC awards will be presented at this meeting.

CBA/ABC Board meeting: Wednesday; July 30, 2008.
16:00-17:30

III. BSA CBA (ABC) Combined Banquet:

The CBA/ABC will join with the BSA for a combined banquet on July 30, 2008. Some CBA/ABC awards will be presented at the banquet.
18:00-22:00

Congratulations to Kate Frego, long time member of the CBA/ABC and active participant in the Teaching and Ecology sections has been announced as a winner of a 3M teaching fellowship this year.



Dr. Kate Frego.

Kate, from the *Department of Biology, University of New Brunswick SJ*, is "a gardener, not a farmer." Students call her "the heart and soul of teaching and learning at UNB Saint John."

Kate was one of 52 nominees from 33 universities for the award this year. The Association of Atlantic Universities had nominated her twice before but this time the nomination was successful..

In addition to her commitment to her students, Kate has been involved in helping teachers to improve their own teaching techniques. She is in favour of having awards for excellence in teaching as it encourages and motivates people to improve their teaching skills.

This is the 7th award she has won for excellence or leadership in teaching.

Other awards won by Kate are: the Dr. Allan P. Stewart Memorial Award from the UNBSJ in 1997; the inaugural University Teaching Scholar Award covering a period from 2000 to 2003; Association of Atlantic Universities Distinguished Teacher Award in 2002 and AAU's Instructional Leadership award in 2007; inaugural Neil Scott Educational Leadership Award in 2006 and departmental award for teaching excellence in 2007.

Thinking of bringing a deserving undergraduate to Botany 2008 in Vancouver? Nominate him/her for the Keith Winterhalder travel award. For details see the CBA/ABC website.



News from the Sections/ Nouvelles des sections.

Mycology Section news

A gentle reminder! Students of mycology and their professors are reminded to submit nominations for the Luella K. Weresub Memorial Award. This award was established in the memory of Dr. Luella Kayla Weresub (1919-1979), a well-known Canadian mycologist who had worked at the Biosystematics Research Institute of Agriculture Canada since 1957. Dr Weresub was a very active member of CBA/ABC, serving as a Director from 1971 to 1973. The award is open to all undergraduate or graduate students working with fungi. For more information or to submit nominations by the April 11, 2008 deadline, contact Dr. Hugues Massicotte, Ecosystem Science and Management Program, College of Science and Management, University of Northern British Columbia, Prince George, at hugues@unbc.ca.

A symposium co-organized by Darlene Southworth (BSA) and Hugues Massicotte (CBA), and co-sponsored by BSA/CBA is as follows: Symposium on Plant-Fungal Interactions at Botanical society of America/Canadian Botanical Association meeting in Vancouver, BC this summer. We are planning 6 talks by the following authors

1-Tom Taylor and Michael Kring, 2-Regina Redman, 3-Suzanne Simard
4-Rusty Rodriguez, 5-Hugues Massicotte, 6-Larry Peterson



Photo: C Maxwell

Nouvelles du département de Mycologie :

Un rappel amical..Nous rappelons les étudiants en mycologie et leurs professeurs de soumettre les candidatures pour le prix Luella K. Weresub Memorial Award. Cette récompense a été créée à la mémoire de Luella Kayla Weresub, PhD (1919-1979), une mycologue canadienne bien connue qui a travaillé au Biosystematics Research Institute of Agriculture Canada depuis 1957. Luella Weresub, PhD était une participante active du CBA/ABC, en tant que Directrice de 1971 à 1973. Le prix est ouvert à tous les étudiants qui étudient la mycologie. Pour de plus amples renseignements ou pour soumettre des candidatures avant la date butoir du 11 avril 2008, communiquez avec Hugues Massicotte, PhD du programme Ecosystem Science and Management Program, du College of Science and Management, du University of Northern British Columbia, Prince George, au hugues@unbc.ca.

Symposium sur les interactions fongiques et végétales à la conférence du Botanical society of America et de l'Association Botanique du Canada à Vancouver, Colombie-Britannique, cet été. Le symposium est organisé conjointement par Darlene Southworth (BSA) et Hugues Massicotte (ABC), et co-commandité par BSA/ABC. Les conférenciers suivants présenteront des articles. Leurs sujets seront affichés sur le site Web de la conférence.

1-Tom Taylor and Michael Kring, 2-Regina Redman, 3-Suzanne Simard, 4-Rusty Rodriguez
5-Hugues Massicotte, 6-Larry Peterson

Ecology Section The Stan Rowe Award

This award was established to celebrate the life and work of Stan Rowe, eminent Canadian Plant Ecologist. Applications from students who published a paper in plant ecology in 2005 or 2006 are encouraged. They should be sent by email to the current Co-Chairs of the Ecology Section of the Canadian Botanical Association, Dr. Paul Catling (catlingp@agr.gc.ca) and Dr. Adrienne Sinclair (adrienne.sinclair@ec.gc.ca) **before May 1, 2008. For more details please see the CBA/ABC website.**

Congratulations to Adrienne, section co-chair on the birth of Cooper Edward Doornbos on December 20th 2007!

Botany 2008 : Lichens and Bryophytes Symposium (update)

We, along with the **Ecology Sections** of the Canadian Botanical Association and the Botanical Society of America, are organizing a symposium entitled: "**Lichens and Bryophytes of North America: Diversity, Function and Importance**", for Botany 2008 in Vancouver, Canada, in the week of July 25 to 31.

The half-day symposium will highlight our latest understanding of the various functional roles and significance of non-vascular plants and lichens to North American ecosystems. The eight invited speakers will range from systematists (updating us on the latest crustose lichen species discoveries in the central interior of British Columbia), to forest ecologists (profiling the way in which lichens and bryophytes and their consortiums drive forest decomposition, productivity, and diversity). For more details, please contact the Symposium organizers and we hope to see you at the symposium in July 2008.

Sincerely, Symposium organizers - Kate Frego & Art Fredeen

Botanique 2008 : Symposium sur les lichens et les bryophytes (mise à jour)

De concert avec les départements d'écologie de l'Association Botanique du Canada et de la Botanical Society of America, nous organisons un symposium intitulé : « Lichens et Bryophytes de l'Amérique du Nord : diversité, fonction et importance », dans le cadre de la semaine Botanique 2008 qui aura lieu à Vancouver, Canada, du 25 au 31 juillet.

Ce symposium d'une demie-journée aura pour but de mettre en lumière nos dernières études et découvertes sur les divers rôles fonctionnels et sur l'importance des plantes avasculaires et lichens dans les écosystèmes de l'Amérique du Nord. Huit conférenciers seront de la partie, incluant des taxinomistes (qui nous mettront à jour sur les découvertes de nouvelles espèces de lichens crustacés dans la partie intérieure centrale de la Colombie-britannique) ainsi que des écologistes des forêts (qui expliqueront la façon dont les lichens et les bryophytes et leur consortium promeuvent la décomposition, la productivité et la diversité des forêts). Pour de plus amples renseignements, veuillez communiquer avec les organisateurs du Symposium et nous espérons que vous soyez des nôtres en juillet 2008.

Cordialement, les organisateurs du Symposium - Kate Frego & Art Fredeen

Plant development Section

A reminder for students of structure and development and their professors to submit applications or nominations for the Taylor A. Steeves Award before **April 18, 2008**. This award was established to honour Taylor Steeves for his numerous contributions to the CBA and to botany. For more information or to submit applications or nominations, please contact Dr. Jane Young, Ecosystem Science and Management Program, University of Northern British Columbia, 3333 University Way, Prince George, BC, V2N 4Z9 or at youngj@unbc.ca.

Systematics and Phytogeography

The section is organizing a symposium for Botany 2008 in Vancouver.

Title*: Phylogeography of northern North America with insights from paleontological, geological, and molecular data
Sponsored by: Canadian Botanical Association, Systematics and phytogeographical section AND American Society of Plant Taxonomists AND Botanical Society of America.

Organiser*: Anne Bruneau, Institut de recherche en biologie végétale, Université de Montréal, 4101 Sherbrooke est, Montréal, Québec H1X 2B2 Canada

Objectives and focus*: Recent analytical, methodological and technological advances have brought new insights to our interpretation of the phylogeographic patterns of plant taxa. This symposium will focus not just on the use of molecular data to reveal biogeographic relationships in closely related taxa, but also on the integration of paleontological, palynological, geological and climatic modeling data as a means of better interpreting recurrent patterns in northern North America. The symposium focuses phylogeographic patterns of plant species from glaciated areas of North America, a geographic region that has been relatively neglected until recently in phylogeographic analyses.

The first three speakers will present new methods which incorporate spatio-geographic and paleoclimatic modeling (Carstens), palynological and macro-fossil data (McLachlan), and paleoecology and paleoclimatology studies (Gavin). The second half of the symposium will focus on three plant case studies, one from western North America (Bain), eastern North America (Joly) and the third from arctic regions (Alsos).
 Dr. Bryan Carstens, Louisiana State University Ecological niche modeling and a hypothesis-testing approach to comparative phylogeography.
 Dr. Jason McLachlan, Notre-Dame University Linking phylogeographic patterns to demographic process in post-glacial range expansions using ancient DNA.
 Dr. Dan Gavin, University of Oregon The history of disjunct species distributions: insights from paleoecology and paleoclimatology in the interior wet belt of British Columbia.
 Dr. John Bain, University of Lethbridge, Alberta Phylogeography, haplotype diversity and reticulate evolution in western North American *Packera* (Asteraceae).
 Dr. Simon Joly, Allan Wilson Centre, New Zealand Application of principal coordinates of neighbour matrices for investigating phylogeographic patterns in eastern North American roses.
 Dr. Inger Alsos, University of Oslo, Norway Phylogeography of circumpolar plant species .

Teaching section.

Members may be interested in a number of free workshops taking place on Sunday July 27th 2008. Information is given below.

Educational and Scientific Workshops

A list of complimentary workshops are planned for Sunday, July 27th. Workshops are sponsored by the Botanical Society of America in conjunction with the workshop providers and are open to all conference attendees.

Registration for workshops will be available after April 15th, and will be presented as part of the Education Forum.

Pre-registration is required for all workshops and forum sessions as there are a limited number of seats available.

1. Applying Modern Genomic Tools to the Management and Characterization of Plant Genetic Resources.
2. Helping Students use a HOT Skills Wheel to enhance Higher Order Thinking on Botany (and other science) Topics.
3. Growing Sustainability through Undergraduate and Graduate Research-UBC Social, Ecological, Economic Development Studies (SEEDS).
4. Virtual herbaria: Regional progress in organizing, fundraising, and delivering content.
5. The Encyclopedia of Life and Plant Species Pages.
6. Now that I have my data what do I do with it? Detecting diagnosing and editing data problems after data collection.
7. Quantitative investigation with GFP expressing plants.
8. Woody Plants of the Southeastern United States: Teaching Plant Identification on the Computer.
9. Using digital photography to analyze wood porosity.
10. Undergraduate Research at UBC: Plant Science Students in Action.
11. Teaching Plant Anatomy through Creative Laboratory Exercises. Larry Peterson.
12. Mentoring: What does it look like in the Science Community, the Planting Science Online Community?
13. A renewed focus on species concepts in the Rosaceae.

A symposium also of interest to teachers is on the future of botany teaching. The National Academy of Sciences 'report, BIO 2010, warned us that "The ways in which most future research biologists are educated are geared to the biology of the past, rather than to the biology of the present or future. Like research in the life sciences, undergraduate education must be transformed to prepare students effectively for the biology that lies ahead....Schools, PROFESSIONAL SOCIETIES [emphasis added] and funding agencies should develop new teaching materials and facilitate faculty collaboration" (2003). BSA's 20th-century blueprint for the future, Botany for the Next Millenium (1998), underscores the BSA Teaching Section's stance that "Science does not sit in a vacuum nor is plant science separate from the other sciences. We must develop and maintain bridges among the disciplines and work to make botanical instruction relevant...." The proposed symposium aims to identify some 21st-century approaches to botany instruction that bridge disciplines, heighten botany's relevancy to undergraduates, and reflect faculty collaboration. In so doing, it also will also pose the question: What traditional botany content has become less useful and may now be de-emphasized to make time for teaching the NEW BOTANY?

What's New in Botany? Graduate Student Research Quoi de neuf en Botanique? Travaux de recherche des Étudiants de cycles supérieurs

This is a new item for the CBA/ABC Bulletin! This is called "What's New in Botany? Graduate Student Research" and will profile a graduate student and his/her research. If you would like to submit a profile, please send a photo of yourself, the name of your supervisor, where you are studying, and a summary of your research. Please keep within 250 words. It will be wonderful to hear from students and their exciting research! Please forward your profile to Dr. Jane Young (Ecosystem Science and Management, University Of Northern British Columbia, 3333 University Way, Prince George, BC, V2N 4Z9) at youngj@unbc.ca. Thank you to those who sent the following profiles!



Leona Shaw



My name is Leona Shaw and I am a Masters of Natural Resources and Environmental Studies candidate in the Ecosystem Science and Management Program at the University of Northern British Columbia. My supervisor is Dr. Jane Young. I am studying the ecology of food and medicine plant gathering sites as defined by Tl'azt'en Nation. In recent years, the important role that indigenous people and their knowledge plays in conservation and management of natural resources has been recognized (Ghimire et al. 2004). The desire to understand the connection between ecological and socioeconomic systems has resulted in an interest to combine the knowledge gained from Traditional Ecological Knowledge (TEK) and western science (Naidoo and Hill 2006). A melding of the two sources of information can lead to a broader understanding of a forest as a whole, a benefit that has been noted for other ecological and cultural systems (Berkes et al. 2000). The people of Tl'azt'en Nation belong to the Carrier (Dakelh) First Nations and inhabit approximately 6500 km² of land in north-central B.C. The knowledge being collected will include TEK information relating to both the ecology of food and medicine plant gathering sites and the criteria for gathering of individual plants for specific uses by Tl'azt'en Nation. In order to further describe the site characteristics (e.g., soil types, plant community composition), western science methods will be employed. The intent of this study is to consolidate information relevant to protection of traditional gathering sites which can be formulated into policy for Tl'azt'en Nation's continued management of their traditional lands. Correlation of gathering sites with BEC (biogeoclimatic ecological classification) will provide working tools for local land managers towards the protection and preservation of current sites and the restoration of sites that have been lost.



Leona Shaw

References:

- Berkes, F., J. Colding, and C. Folke. 2000. Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications* 10: 121-1262.
- Ghimire, S.K., D. McKey, and Y. Aumeeruddy-Thomas. 2004. Heterogeneity in ethnoecological knowledge and management of medicinal plants in the Himalayas of Nepal: Implications for conservation. *Ecology and Society* 9(3): 6.
- Naidoo, R., and K. Hill. 2006. Emergence of Indigenous vegetation classifications through integration of traditional ecological knowledge and remote sensing analyses. *Environmental Management* 38(3): 377-387.



Allison Hayward

My name is Allison Hayward and I am a Masters of Science candidate in the Watershed Ecosystem Graduate Program at Trent University. The project I am currently developing is co-supervised by Dr. Tom Hutchinson and Dr. Neil Emery. My research focuses on phytochelatin production in the heavy metal tolerant grass *Deschampsia cespitosa*. This tufted hair grass that has managed to populate heavy metal contaminated soils in Sudbury, Ontario. This region has undergone heavy metal deposition due to nickel and copper extraction. To grow in this area, *D. cespitosa* has developed varying degrees of tolerance to a variety of heavy metals, including nickel, copper, zinc, and cobalt. The physiological mechanisms that allow for these metal tolerances in plants are unclear. Some evidence indicates phytochelatin allow for cadmium tolerance but their role in tolerances to other heavy metal is lacking. Phytochelatin are polypeptides that bind and sequester metal in cells.

My research will use a Liquid Chromatography Electrospray Ionization Tandem Mass Spectrometer (LC-ES-MS/MS) to determine if *D. cespitosa* produces phytochelatins and then ascertain the concentrations and forms of the phytochelatins. Much of my work involves developing protocols to extract and analyze phytochelatins using a LC-ES-MS/MS. Due to its high sensitivity, this machine will give a more accurate assessment of phytochelatin production than the current techniques used. This work will lead to an improved understanding of phytochelatins and their role as a heavy metal tolerance mechanism. The results of my study have the potential to advance our use of hyper-tolerant and hyper-accumulating plants species in site remediation.

Allison at work with her plants



Martha Coleman

Martha Coleman, M.Sc.

Ph.D. Candidate, University of Hawaii at Manoa, 3190 Maile Way, Honolulu, HI 96822

Advisor: Dr. Ania M. Wiecezorek, Assistant Professor

We are currently investigating the possible roles evolutionary mechanisms may play in the invasion success of non-native plant species with the use of microsatellite markers. The focal species, Turkeyberry (*Solanum torvum* Sw.) and Silverleaf Nightshade (*S. elaeagnifolium* Cav.), are members of *Leptostemonum* (Dunal) Bitter (*Solanum* L.: Solanaceae), a subgenus well known for its sharp epidermal prickles and informally referred to as "spiny solanums". *S. torvum* was, and continues to be, intentionally moved and cultivated for its edible fruits. Having escaped cultivation and spread throughout the tropics this plant is now considered a pantropical weed (Schippers 2004). Conversely, *S. elaeagnifolium* was unintentionally transported within fodder and contaminated crop seeds (Wassermann et al. 1988), over time becoming a non-native plant pest as well. Having similar points of origin and comparable reproductive strategies, these closely related species provide an excellent framework to consider evolutionary mechanisms in invasion success. A better understanding of these evolutionary forces may demonstrate applicability in future risk assessments.

Additionally, we are in the process of developing a molecular diagnostic tool that will provide invaluable support to the Hawaii Department of Agriculture to distinguish between known noxious weeds and their closest relatives. Traditionally, Identification of plant species has relied heavily on various morphological characteristics such as flowers and fruits. However, many plants arrive at Hawaii's ports without these distinguishing features making identification impossible. The unreliability of this method is evident and poses serious threats to the Earth's most isolated and fragile archipelago. Our objective is to provide a reliable, time and cost effective means for inspectors to differentiate between *Solanum* species listed on the Hawaii Noxious Weed List and those that are not.

This research is funded by a grant from the CSREES-USDA T-STAR program awarded to Dr. Ania Wiecezorek.



Martha with Diamond Head in the background

References

Schippers, R.R. 2004. *Solanum torvum*. In PROTA (Plant Resources of Tropical Africa). G.J.H. Grubben and O.A. Denton Eds. Wageningen, Netherlands: [Internet Record].

Wassermann, V.D., Zimmermann, H.G. and S. Naser. 1988. The weed silver leaf bitter apple ('Satanbos') (*Solanum elaeagnifolium* Cav.) with special reference to its status in South Africa. Technical communication. Department of Agriculture and Water Supply, Pretoria (ZA): no. 214

Ecology in Canada: What's New and Who's Doing It?
Lundholm's Lab.
St. Mary's University, Halifax.
Nova Scotia.

The collage shown at the right was prepared by Jeremy's graduate students on the occasion of his birthday. Jeremy is the central figure in the collage. Photos taken in the fall of 2007

Jeremy Lundholm
 Assistant professor
 Department of Biology/Environmental
 Studies Program
 Saint Mary's University
 Halifax, Nova Scotia
 B3H 3C3
Jeremy.lundholm@smu.ca
 902-420-5506



Research

Our main interest in the plant ecology lab at Saint Mary's University is in community- and ecosystem-level processes, with an emphasis on coexistence mechanisms and diversity patterns. Since joining the faculty at Saint Mary's University in 2004, I have expanded my fundamental research program into two applied sciences: urban ecology and restoration ecology. All my training was in Ontario. I completed my honours research with Lonnie Aarssen at Queen's, where I looked at gender variation in ragweed, and got my first taste of urban plant diversity in a vacant lot in "downtown" Kingston. I took a Master of Environmental Studies at York and focused on ecological restoration, gaining experience on various restoration projects in Hamilton, Ontario. Following my M.E.S., a field botanist position at the Royal Botanical Gardens in Burlington kept me busy for two years. My main work there was on the ecological restoration of Cootes Paradise Marsh, a large freshwater coastal wetland. I began my PhD with Doug Larson in the late, great Department of Botany at the University of Guelph in 1998. At Guelph, I studied alvars (limestone pavements) on the Bruce Peninsula, and endured the epithet "flatlander" from my cliff-obsessed colleagues. While I started my PhD with the intention of avoiding academia as a long-term career choice, I had a great time at Guelph and somehow convinced myself that I could be happy and successful as a professor. I started my position at Saint Mary's in January 2004.

The focus of my PhD research was on the role of both temporal and spatial resource heterogeneity in plant species coexistence and diversity patterns on alvars. The main findings of this work were that temporal variability in water supply generally promotes lower levels of diversity in unproductive ecosystems compared with more homogeneous water supply; that the responses of plant species to temporal resource variability are both governed by species-specific differential responses to soil moisture and by general, species independent responses; and that spatial variability is correlated with diversity at both adult and seedling life stages. My current research uses the coastal barrens vegetation in Nova Scotia with a view toward understanding processes of diversity maintenance. There were no published studies on this type of ecosystem before my arrival in Nova Scotia, so I was unable to directly continue the research I began in my PhD. Instead, we did the first quantitative descriptions of coastal barrens vegetation and environmental correlates of vegetation patterns. We are beginning studies related to the spatial scaling of diversity-heterogeneity relationships, temporal partitioning of the growing season, and relationships between below-ground processes such as mycorrhizal colonization of plant roots and above-ground vegetation diversity.

These "barrens" are home to a surprising diversity of plants and lichens.



A Coastal Barren in the fall

Generally distributed along the Atlantic coast of Nova Scotia, these places resemble arctic tundra and are dominated by dwarf shrubs and open rock. These sites are extremely beautiful and the almost constant wind keeps the biting insects at bay (in theory). We are also interested in the landscape context of these habitats, which includes trying to figure out how these habitats remain open (free of forest cover) in the long term. The work of several students has contributed to our understanding of the long-term dynamics of the barrens ecosystem. Scott Burley (MSc student) is trying to determine whether environmental features such as topography, proximity to the coast and soil characteristics can predict whether a particular area of the barrens will undergo succession into forest or will remain a barren. We are working with Dr. Karen Harper (Dalhousie University), an expert on tree-line ecotones, on this project. To date, it appears that many forest patches in the barrens are expanding, with a gradient in tree age from the centre of the patch to the edge of the barren, and that areas more distant from the coast are more likely to become afforested. This is important because many of the rare species on the barrens are associated with low, open vegetation and will be lost if tree encroachment proceeds. Kat Dillon (MSc student) is investigating whether tree colonization in the barrens is limited by the availability of mycorrhizal inoculum (with Dr. Gavin Kernaghan, Mt. St. Vincent University).



Coastal barrens vegetation, featuring *Empetrum nigrum*, *Sibbaldiopsis tridentata* and *Gaylussacia dumosa*.

With knowledge of some of the important environmental gradients in Nova Scotia coastal barrens we have begun testing mechanistic hypotheses related to species coexistence. One of the central concerns of modern community ecology is to differentiate between neutral (or dispersal-based) and niche-based processes, both of which can promote species coexistence in theory. On the coastal barrens, we are testing the idea that niche differentiation is important in maintaining species diversity at relatively large spatial scales, whereas at relatively fine scales, including the competitive neighborhoods of plant individuals, neutral processes are more important for coexistence. We are using transplant experiments, spatial analysis, and plant traits to get at these questions. Dr. Tyler Smith, who recently completed his PhD at McGill, has joined my lab as a post-doc and is working on these questions.

This research has applied significance as well: models that predict higher rates of ecosystem processes such as biomass production with greater species diversity rely on niche differentiation among species within competitive neighborhoods. We are using plant species from the coastal barrens in our urban ecology studies, and hope that knowledge of coexistence mechanisms will help us improve the functions of urban ecosystems such as green roofs. Green roofs involve layers of vegetation and growing medium over regular roof membranes. These 'built habitats' are usually constructed for energy conservation (the soil and vegetation lead to reduced building energy costs) and to reduce storm water outputs from urban systems. Our lab is trying to determine whether native plant species outperform non-natives on green roofs in Atlantic Canada. We are also interested in determining the role of species- and trophic- level diversity on green roof performance (MSc student Melissa Ranalli). This project also includes basic horticultural research into the propagation of native species for use in restoration and urban greening projects.



An extensive green roof. Shallow soil requires plant species adapted to extremes of moisture and temperature.

As part of the Cliff Ecology Research group at the University of Guelph, I was involved with an interdisciplinary project on the evolutionary origins of urban species and habitats. The main research questions we asked were: what are the original habitats of current-day urban species of plants and animals? What is the role of rock outcrop habitats in human evolution and ecology? The theoretical framework we proposed is that although humans are a generalist species, they tend to replicate a particular kind of habitat that was formerly rare in most landscapes. Modern-day urban habitats still replicate a hard-surfaced environment that is similar to but not identical to natural rock outcrops. The interlinked components and corollary hypotheses of our "Urban Cliff Hypothesis" are outlined in a book, published in 2004. My role since then has been to undertake the testing of some of the fundamental hypotheses underpinning our theoretical approach. Work in our lab has shown that the patterns of habitat replication described in the book apply at the local level too: plant species from several distinct urban habitats are disproportionately derived from unproductive rock outcrop habitats. I have also begun to apply these ideas in the context of urban greening, especially green roofs. We have conducted greenhouse trials that suggest that some of our native rock outcrop plant species perform as well as industry-standard non-native species with regard to drought tolerance and transpirative water-loss, important traits for green roof plants. **Green roofs are potentially a potential model system for testing the relationships between plant taxonomic and functional diversity and ecosystem processes. The ecosystem functions provided by green roofs include roof cooling, stormwater retention and habitat provision, and have direct environmental and economic benefits. My ultimate goal is to link my research in natural habitats such as coastal barrens (the origin of the plant species we are testing on green roofs) with the functioning of urban ecosystems.**

Other current projects:

Forest restoration in Kejimikujik National Park (MSc student: Christa Brittain)

Ecosystem functions of spontaneous urban vegetation (MSc student: Sarah Robinson)

Morphological and genetic differentiation of forest understory species growing in open barrens (MSc student: Jennifer Lau, Dr. Tyler Smith)

Salt marsh restoration (Collaborators: Dr. Danika van Proosdij, CBWES & Associates)

Spatial patterns in urban forest recovery from disturbance (Collaborator: Dr. Andrew Millward)

Quarry floor restoration (Collaborators: Paul Richardson, Dr. Doug Larson)

Forest ecology in Shaanxi Province, China (Collaborators: Dr. Zhu Zhihong, Dr. Wang Xiaolan, Dr. Ren Yi)

We address applied and theoretical questions in a variety of habitats. If you are interested in graduate study in any of the areas listed below, please contact me at: jlundholm@smu.ca.

Selected Publications

Burley, S., Robinson, S.L., and Lundholm, J.T. 2008. **Post-hurricane vegetation recovery in an urban forest. Landscape and Urban Planning (in press)**

Oberndorfer, E.C., Lundholm, J.T., Bass, B., Coffman, R., Doshi, H., Dunnett, N., Gaffin, S., Köhler, M., Liu, K., and Rowe, B. 2007. Green roofs as urban ecosystems: ecological structures, functions and services. *BioScience* 57(10): 823-833.

Lundholm, J.T. and Stark, K.E. 2007. Alvar seed bank germination responses to variable soil moisture. *Canadian Journal of Botany* 85(10): 986-993.

Lundholm, J.T. 2006. Green roofs and facades: a habitat template approach. *Urban Habitats* 4:87-101

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Stark, K.E., J.T. Lundholm and D.W. Larson. 2003. Relationships between seed banks and spatial heterogeneity of North American alvar vegetation. *Journal of Vegetation Science* 14(2):205-212.



NATIVE PLANT EMBLEMS OF CANADA

- 6. QUEBEC

E. Small and P.M. Catling,

National Environmental Program, Biodiversity Section,
Agriculture and Agri-Food Canada, Saunders Bldg.,
Central Experimental Farm, Ottawa ON K1A 0C6



FLORAL EMBLEM : BLUE FLAG



Fig. 1. Blue flag (*Iris versicolor*), by Lavonia R. Stockelbach (1874-1966). A collection of her paintings of Canadian provincial flowers is associated with the herbarium of Agriculture and Agri-Food Canada in Ottawa.

SYMBOLISM

Irises have represented important figures and sentiments for millennia. Dating back 4,000 years in Crete, the iris was the symbol of royalty and priests. To the early Egyptians, the iris represented power and majesty. The flower was depicted on the brow of the Sphinx and on regal sceptres. In ancient Greece, irises were planted on the tombs of women. By Islamic tradition, white-flowered irises were planted on the graves of soldiers. In Christianity, it has been claimed that many Biblical "lilies" were actually irises. Irises have represented the birth of Christ in several well-known paintings, including Dürer's *Madonna with the Iris*, and da Vinci's *Madonna of the Rocks*. The three-part flower has been interpreted as reflecting the three virtues of faith, wisdom, and courage.



Fig. 2. The flag of Quebec, showing four images of the fleur-de-lis and a white cross. Image courtesy of the Government of Quebec.

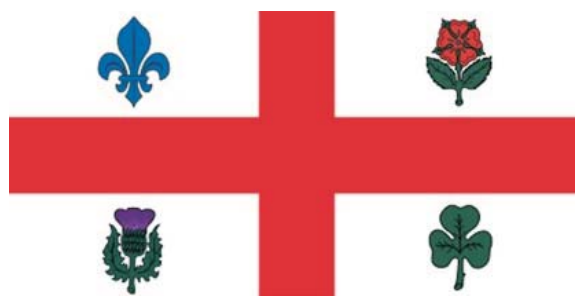


Fig. 3. The flag of Montreal, one of Canada's most important and diverse cities, contains four floral emblems, and a bold red heraldic cross. The cross is said to represent either the Christian motives and principles which governed the founders of the city, or St. George's Cross, commemorating a visit to Montreal by King George VI. The four floral emblems represent the four main European ethnic groups that initially settled the city. Clockwise from top left: the fleur-de-lis of the Royal House of Bourbon, representing the French; a Lancastrian rose, representing the English; a shamrock, representing the Irish; a thistle, representing the Scottish.



Fig. 4. European yellow iris (*I. pseudacorus*), often interpreted as the basis of the fleur-de-lis. As noted in the text, this species is commonly cultivated in North America, and in some regions is displacing *I. versicolor*. Source of illustration: Thomé, O.W. 1903. Prof. Dr. Thomé's Flora von Deutschland, Österreich und der Schweiz. Band 1, Fig. 139. H.V. Verlag, Berlin-Lichterfelde, Germany.

The fleur-de-lis symbol of heraldry is probably the iris, but its identity has been the subject of considerable controversy. The symbol has been said to be based on a spearhead (indeed, as the famous French author Voltaire pointed out, the shape is strikingly like the obsolete halberd or halbert), but it has also been claimed that the fleur-de-lis was modelled on crowns, bees, and even toads. In France, "fleur-de-lis" has been applied to the European yellow iris (*I. pseudacorus*), a species which occurs along the Lys River, suggesting the fleur-de-lis is based on "flower of the Lys [River]." French Royalty adopted the fleur-de-lis as a symbol (Charles the Bald about 840 used it on his sceptre; Louis VII chose it in 1147 as the national emblem of France), but it had previously been used in other European nations and perhaps even in ancient Egypt, so the symbol is not of French origin. Nevertheless, French explorers, missionaries, and pioneers in North America employed flags bearing the fleur-de-lis, which adorns the flag of Quebec and other official artifacts of the province. In recent times, the fleur-de-lis has been adopted as the almost universal symbol of scouting, and the logo of the New Orleans Saints professional football team.

Because many have interpreted the fleur-de-lis symbol as based on an iris flower (the resemblance is striking), and the fleur-de-lis flag and emblematic of Quebec, and indeed reflects the relationship of Quebec to France, it is natural that an iris be chosen as the floral emblem of the province. Quite aside from the relationship of the blue the fleur-de-lis, the blue flag is a very beautiful flowering plant that is native to Quebec and widespread in the most populated and



The fleur-de-lis is the symbol of world scouting that was developed by Lord Baden-Powell and has been worn proudly by over 200 million scouts since that time. Scouting is for boys and girls of all ages and includes beavers, cubs, scouts, senior scouts and rovers, and teaches sensitivity and cooperation that has benefited communities throughout the world. The three tips of the fleur-de-lis represent the three main parts of the scout promise: duty to God, obedience to law and service to others. The two five-point stars are for truth and knowledge and the total of ten points is a reminder of the ten points of the scout law. The circular rope and reef knot represents the bond of brotherhood.

developed areas, and so is an excellent floral emblem choice for the province. The different colours of the flower have been said to signify a multicultural province. It has been pointed out that *I. versicolor* flowers on St. Jean Baptiste Day, June 24, Quebec's national holiday.

LATIN NAMES

Iris versicolor L.

The genus name *Iris* is based on *iris*, Latin and Greek names meaning "a sweet smelling plant" and "rainbow." Sometimes the name is explained as a reference to the many attractive colours of the flowers of the species being reminiscent of the colours of a rainbow. The epithet *versicolor* in the scientific name is Latin for "variously coloured," likely a reference to the colour varying in different parts of the flower.

ENGLISH NAMES

The blue flag has also been called harlequin blue flag, blue iris, great blue flag, larger blue flag, northern blue flag, and poison flag. Still additional names sometimes attributed to the species are American blue flag, dagger flower, dragon flower, flag lily, fleur-de-lis, flower-de-luce, liver lily, purple flag, snake lily, water flag, water iris, wild blue flag, and wild iris. As well as being the scientific name, iris is also very widely used as a common name and refers to all *Iris* species, and sometimes also species in related genera.

FRENCH NAMES

Iris versicolore, *iris sauvage*. The name *clajeux* is occasionally used, but is also a name applied to other species, including *I. pseudacorus*, introduced into Canada.

Continued



Fig. 5. Painting of the former official flower of Quebec, the white garden lily (*Lilium candidum*), from the Walter Coucill Canadian Centennial official flowers of Canada series (see Coucill 1966 cited in #1 of this series). Reproduced with the permission of the copyright holders, the Coucill family

HISTORY

a. Canada

The white lily (*Lilium candidum*) was designated as the floral emblem of Quebec on 23 Jan. 1963. This species was chosen by interpreting the fleur-de-lis emblem (discussed above) as a lily (*lis* is French for lily). However, botanists and others found this interpretation to be without merit, and the choice of the lily as highly inappropriate. Indeed, it was pointed out that not only is the white lily not indigenous to Quebec, it is apparently not even indigenous to France. The blue flag was selected as the new floral emblem of Quebec, so recognized by the Flag and Emblems of Quebec Act assented to on Nov. 5, 1999. For a detailed history of events leading to the replacement of the white lily with the blue flag as the floral symbol of Quebec, see Lamoureux, (2002) and Catling and Mitrow (2004).

b. Foreign

Iris species are fairly widely afforded official symbolic status. *Iris giganteaerulea* (giant blue iris or giant blue flag), a native of the southeastern US, was declared to be the official state wildflower of Louisiana in 1990. *Iris lacustris* (dwarf lake iris), a tiny plant endemic to the northern shores of Lake Michigan and Lake Huron, was designated the state wildflower of Michigan in 1998. It occurs in the Bruce Peninsula and Manitoulin Island in Ontario, and has been designated a threatened species in the US and Canada. Iris (no particular species) was recognized as the "state cultivated flower" of Tennessee in 1933. *Iris nigricans* (black iris) is the national flower of Jordan. *Iris croatica* is the national flower of Croatia. The "iris" is often claimed to be the national flower of France. Several cities have designated the iris as their official flower, including Kansas City, Brussels, and Athens.

APPEARANCE

Blue flag arises from a stout, creeping, branching, cylindrical rhizome 1-2.5 cm (0.4 -1 inch) in diameter, dark brown externally, with long slender roots and leaves borne on the



Fig. 6. Blue flag (*Iris versicolor*) flower. Photograph courtesy of the Government of Quebec.

currently growing terminal ends of the rhizomes. The rhizomes produce an annual joint. The leaves are basal, sword-like (long, narrow, rigid and lanceolate), folded on the midribs, (10)60-90 cm ((4)-24-36 inches) long, 1-3 cm (0.4-1.2 inches) wide, projecting upwards from the rhizomes in two-ranked flat fans. Large showy flowers, usually violet-blue or rarely white, are borne on vertical, branching flower stalks that appear in the spring, the inflorescence usually with only 2-4 flowers. The flower stalks are 20-80 cm (8-32 inches) long, typically overtopping the leaves. Superficially, the flowers appear to have nine petals, but actually these are sets of three large sepals, small petals, and petal-like style lobes. The flowers are divided into three sections, each with a sepal (called a "fall" by iris enthusiasts), petal ("standard"), stamen, and style branch (also commonly called a "style arm"). Each of the three sections functions as a separate flower. The showy sepals are light to deep blue or blue-purple with yellow and whitish markings at their base. Rarely, white or reddish-purple flowers are encountered. The sepals and style branches tend to be similar in colour to the petals, but see the information presented below on colour of cultivated varieties. The sepals hang down, while the much smaller petals are erect. The petal-like style branches split at their upper ends into

two decorative horns called crests, and attached to the bottom of each style branch is a stigma flap ("stigmatic lip"). A stamen is pressed against the bottom of each style branch, its long anther terminating close to the stigma flap. A diagram of this rather complicated floral anatomy is given in the discussion of pollination presented below. Small, dark-brown seeds are produced in three-celled capsules 1.5-6 cm (0.6-2.4 inches) long, with two rows of densely packed brown seeds in each cell. The fruits dry out and shatter in the fall, scattering the seeds, but the fruits often persist on the plants over the winter.

CLASSIFICATION

Family: Iridaceae (iris family).

The genus *Iris* has close to 300 species of perennial herbs, which occur primarily in the Northern Hemisphere, with the greatest diversity in Eurasia. In North America 34 species have been recognized north of Mexico. Some infra-specific groups have been recognized in *I. versicolor*, none of these having received much recognition by botanists. They include forma *murrayana* (with somewhat yellowish flowers), and forma *albocaerulea* (with white and blue flowers). More than 25,000 cultivars of *I. versicolor* have been named.

Iris versicolor is known to have evolved as a hybrid between *I. virginica* and *I. hookeri* (*I. setosa* var. *canadensis*). The research that revealed the hybrid origin of blue flag was carried out by a rather famous botanist, Edgar Anderson, at the Missouri Botanical Garden. *Iris versicolor* inherited the sets of chromosomes of both its parental species, and has a total of 108, the most of any *Iris* species. The parental species do not grow together now, but did in the past, when ancient glaciers advancing southward forced the northerly *I. setosa* into the range of *I. virginica*. [In another major scientific contribution, Anderson collected measurements of various floral features of *I. versicolor*, *I. setosa*, and *I. virginica*. The famous statistician R.A. Fisher used the data (called "Anderson's Iris Data" and "Fisher's Iris Data") to invent a mathematical model (linear discriminant analysis) that is now commonly used to aid in species identification.] *Iris versicolor* hybridizes with both *I. virginica* and *I. hookeri*. *Iris versicolor* x *I. hookeri* produces *I. x sancti-cyri*. The hybrid of *I. versicolor* and *I. virginica* is *I. x robusta*.

GEOGRAPHY

Iris versicolor is native in Canada from Manitoba to Newfoundland, and extends south in the US to Minnesota, Illinois, Ohio, Maryland, and Virginia.

ECOLOGY

Habitat

The blue flag is a "subaquatic" or "emergent aquatic" plant that occupies shallow water or wet substrates, including bog mats, flood plains, wet pastures and meadows, forested wetlands, marshes, swamps, ditches, streambanks and shorelines. The plants grow naturally in full sun to part shade.

Inter-species Relationships

Iris versicolor provides shoreline habitat for an array of wildlife, particularly furnishing cover for marsh birds, fish, and amphibians. The seeds are eaten by waterfowl and

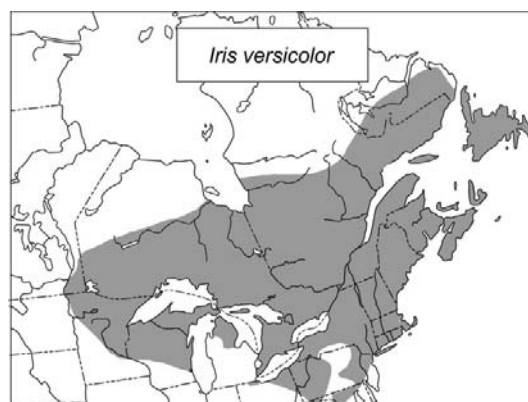


Fig. 7. Canadian distribution of blue flag (*Iris versicolor*).

marsh birds, and the rhizomes (poisonous to humans) are consumed by moose and aquatic rodents, especially muskrats.

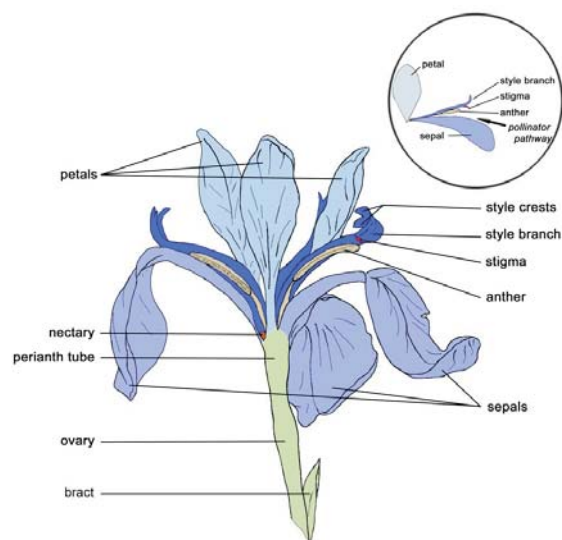


Fig. 8. Diagram of the parts of a flower of *Iris versicolor*. As explained in the text, pollinators land on the large sepal and are guided, to the basal nectary, down a tunnel formed by the base of the sepal and the overhead style branch. During the inward trip, the pollinator deposits previously collected pollen on the upper (receptive) part of the stigma flap, and then picks up pollen from the anther; during the outward trip it brushes against the lower part of the stigma flap, but this is non-receptive to prevent self-fertilization. Prepared by B. Brookes.

Pollination & Dispersal

Iris versicolor spreads vegetatively by rhizomes, often producing large clones. The species also produces seeds. A cavity in the seeds makes them buoyant, so they can be distributed by floating on water.

The large, nectar-producing flowers attract various pollinators as well as nectar robbers. Like the flowers of many insect-pollinated plant species, the stigma of *Iris* flowers receives pollen from visiting pollinators (especially

bees) and the anthers provide a fresh load of pollen to the visitors to fertilize other flowers. However, the *Iris* flower is peculiar in the architectural way it separates these two events. The large petal-like sepals of the iris flower function as a landing platform for flying insects, and markings (guides) direct the visitors to the nectary at the base of the flower. The petal-like style branch (above) and the petal-like sepal (below) provide a channel towards the basal nectary. However, this channel is partially blocked by the stigma, in the form of a flap, which is cleverly arranged so that the receptive side faces the incoming pollinator. As the pollinator pushes against the stigma flap, the receptive surface removes pollen that was acquired by the insect from previous floral visits. The insect next contacts an anther, and acquires a new load of pollen grains, before reaching the nectary. Finally, while backing out of the flower, the insect comes in contact only with the non-receptive face of the stigma flap. Thus the insect is prevented from depositing its newly collected batch of pollen on the stigma of the same flower. Despite this elaborate way of promoting outcrossing, self-pollination is very common in *I. versicolor*.



Fig. 9. Flowers of blue flag (*Iris versicolor*). Source: Canadian Heritage. 2002. Symbols of Canada (revised). Canadian Heritage, Ottawa, ON. Reproduced with permission of Canadian Heritage, Public works, and Government Services Canada.

USES

Iris species are extensively used as ornamentals. *Iris versicolor* is not one of the principal garden species, but is often employed in water gardens (so are several other species adapted to standing water). Cultivars include Kermesina (with red-purple flowers, probably the most popular variety), Candy Striper (white flowers with bright reddish veins), Mysterious Monique (with deep violet flowers), Rosea (with pink flowers), and Bridesmaid (flowers creamy yellow and lilac). *Iris versicolor* has been hybridized with other species to produce ornamental varieties. Gerald Darby (a hybrid of *I. versicolor* and *I. virginica*) is particularly popular. It may be noted that cultivars of *I. versicolor* can only be maintained by vegetative propagation; some unscrupulous dealers have sold seedlings as the true

cultivars, although they do not match the expected quality.

“Orrisroot powder,” prepared by drying and pulverizing the rhizomes of certain *Iris* species (especially the closely related *I. florentina*, *I. pallida*, and *I. germanica*), has been used in spices, perfumes (to produce a violet odour), and medicine since the eras of the classical Greeks and Romans. Much of orrisroot today is produced in Italy. The juice of steeped *Iris* rhizomes has been employed to impart a flowery bouquet to Chianti wine.

North American Indians used *I. versicolor* “root” for a variety of medicinal purposes, especially topically to treat wounds, sores, and burns, and internally as a purgative, and to treat rheumatism, as well as disorders of the kidney and liver. The Potawatomi employed the leaves to weave baskets, mats, rugs, and bedding. Iridin (irisin) is a bitter extract of *I. versicolor* that has been used in herbal medicine for its diuretic (urine-stimulating), laxative, and blood-cleansing properties. Blue flag has been planted to stabilize and protect shorelines from erosion.

TOXICITY

Iris species are well known for their toxicity. Small amounts of the rhizomes or large amounts of the leaves, even if dried, are quite purgative, and can also cause depression and respiratory problems. The juice of the plant can cause dermatitis in sensitive individuals. Livestock avoid eating iris foliage. Cases of death of humans have been recorded, and ornamental rhizomes that are stored for planting are a potential risk to dogs. Irisin (mentioned above) may be responsible for some of the poisonous effects, but other compounds are suspected of being more toxic.

CULTIVATION

Iris species are among the most commonly grown ornamental plants, and there are numerous books dedicated to horticultural aspects. A number of species are grown in damp soil or standing water, and are often displayed in water gardens. Blue flag is one of these, although other *Iris* species are more often cultivated. Seeds used to grow *I. versicolor* are best stratified (stored at about 5 °C in wet paper towelling or moist peat moss for 3 months) to promote good germination. Seeds can be sown outdoors, spring planting preferred to fall. Young seedlings are best grown for a year in pots, then transplanted to their permanent positions. To reproduce by division, clumps of rhizomes should be replanted directly into their new positions, preferably in early autumn (mid-spring is also possible). Alternatively, smaller clumps can be potted and grown until well-rooted before final transplantation. This species may be grown in 4-10 cm (2-4 inches) of shallow, standing water in containers or artificial ponds, or in moist shoreline soils, or in constantly moist humus-rich soils of a garden border. *Iris versicolor* generally does not tolerate strong fluctuations in water level, and indeed can survive better than several more popular aquatic irises in soil that is merely damp. The plants should not be placed near aggressive, tall emergent aquatics like cattails, which will easily over-top them. After frost, the leaves may be trimmed back to about 2.5 cm (1 inch) above the crown.

Continued

CONSERVATION STATUS

Iris versicolor is a widespread species, not considered in need of conservation protection. The species is rare in Manitoba. It quickly colonizes newly available moist soils in New Brunswick, Prince Edward Island, and Nova Scotia, and has been listed as a noxious introduction in Nevada. Depending on location, it may be advisable to construct barriers to prevent the spread of *I. versicolor* where it is cultivated as an ornamental. The European *I. pseudacorus*, often grown in gardens, has escaped and is regarded as invasive in some areas of the US. It is displacing *I. versicolor* in some regions.



Fig. 10. The Quebec blue flag coin issued in 2006. This is part of the provincial and territorial symbols gold coin series (0.99999% gold), initiated in 1998, and continuing. Earlier coins were shown in the first part of this series. This coin has a face value of \$350.00 but, reflective of its value to collectors, the purchase price is about \$1,300.00. Only 2006 coins were made, matching the year of mintage. Coin image © courtesy of the Royal Canadian Mint.

MYTHS, LEGENDS, TALES, FOLKLORE, AND INTERESTING FACTS

- In ancient Greece, Iris was the Greek goddess of the rainbow, daughter of the ocean spirit Electra, and a messenger of the gods. Always depicted with rainbow wings, she is said to have used the rainbow as a pathway through the sky, and wherever her feet touched earth there appeared iris flowers in a rainbow of colours.
- The oldest-known illustrations of irises are stylized flowers that appeared nearly 4,000 years ago on a wall fresco of the Priest-King in the palace of Minos at Knossos, Greece.
- Shah Jihan had the world-famous Taj Mahal erected in India after the death of his favourite wife in 1631. Some of the rooms are decorated with stone inlay based on an iris motif.
- The Ojibwa carried a piece of blue flag as a charm against snakes. The Arizona Indians are believed to have chewed blue flag before holding rattlesnakes in their mouths during snake dances, the odour said to be protective against bites.
- A solution of the flowers of blue flag produces a blue dye that has been employed like litmus paper to test for pH.
- The leaves of *I. florentina* yield iris green, a natural colouring once popular with artists. Curiously, irises have also been popular subjects for artists, particularly Vincent Van Gogh.



Fig. 11. One of Vincent van Gogh's several paintings entitled *Irises*, currently owned by the Getty Museum in Los Angeles. In 1987 this painting sold for \$53,900,000.00 (equivalent to \$100,000,000.00 in value adjusted to 2008).

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Continued overleaf

TREE: YELLOW BIRCH



Fig. 12. Silhouette of yellow birch (*Betula alleghaniensis*). Source: J.L. Farrar 1995. Trees in Canada. Canadian Forest Service and Fitzhenry and Whiteside, Markham, ON, Canada. Reproduced with permission.

SYMBOLISM

The forests of southern Quebec, which are highly productive and cover a large portion of the main areas of habitation, contain some of the largest concentrations of yellow birch in the world. It has been estimated that about 50% of the commercial stock of the species is in Quebec. Moreover, the tree has been of considerable use historically in the province, making its choice as the provincial arboreal emblem particularly appropriate.



Fig. 13. Yellow birch (*Betula alleghaniensis*). Photo courtesy of the Government of Quebec.

LATIN NAMES

Betula alleghaniensis Britton (*B. lutea* Michx. f.)

The genus name *Betula* is based on *betulla*, the Latin name for birch. *Alleghaniensis* in the scientific name is Latin for “of the Allegheny Mountains,” that border the Appalachian plateau from Pennsylvania to Virginia. [The spelling of the epithet *alleghaniensis* in contrast to the spelling in “Allegheny Mountains” reflects past differences in usage in the literature.]

ENGLISH NAMES

Yellow birch has also been called black, cherry, curly, gold, gray, hard, Quebec, red, silver, swamp, sweet, and tall birch, and Newfoundland oak. All of these alternative names are undesirable, and most of them have been applied to other species. The “yellow” in the name yellow birch refers to the golden yellow colour of the bark of mature trees. (*Lutea* in the old name *B. lutea*, Latin for yellow, is also a reference to bark colour. The name gold birch is similarly explained.)

FRENCH NAMES

Bouleau jaune. Other French names include bouleau des Alléghany, bouleau frisé, bouleau merisier, merisier (a name used in France for the “wild cherry,” and also used in Quebec for the pin cherry, *Prunus pensylvanica*), merisier blanc, merisier jaune, and merisier ondé.

HISTORY

a. Canada

Yellow birch was adopted in November 1993 as the provincial tree of Quebec. A related species, the white or paper birch (*B. papyrifera*), was adopted as the official tree of Saskatchewan in 1988.

b. Foreign

Some other birch species have been recognized as symbols in other countries. The white birch was designated the New Hampshire state tree in 1947. The silver birch (*B. pendula*) is the national tree of Finland. The “birch” is the national tree of Russia.



Fig. 14. Bark of yellow birch (*Betula alleghaniensis*). Photo courtesy of the Government of Quebec.

APPEARANCE

This birch is the tallest of the native birch species in Canada, growing to heights of 15-25 m (49-82 feet) and developing trunks 60-100 cm (24-39 inches) in diameter (record trees 30 m (98 feet) high and 1.4 m (54 inches) wide have been recorded). In the forest the trunk is long and straight, supporting a relatively narrow crown. In the open, the branch system is wide, but usually with a well-developed central axis. Birches are known for their characteristic bark that usually separates readily into thin, papery sheets and has conspicuous, horizontal lenticels. (Lenticels are areas of the bark with numerous intercellular spaces that allow gas exchange through the cork cells of the bark which otherwise prevent the passage of water and gases.) The bark of yellow birch is thin (on small trunks), shiny, produces thin papery shreds but does not peel easily, and is initially reddish, gradually turning yellowish or bronze. On mature trunks the bark is dark and broken into large, ragged-edged plates. The leaves are alternate, 6-12 cm (2.4-4.7 inches) long and 4-9 cm (1.6-3.5 inches) broad, oval, and taper gradually from the middle to a slender, sharp point at the end and to a narrow, rounded or slightly heart-shaped base. The margin is finely double-toothed. The root system is wide-spreading and may also be quite deep on well-drained loam and sandy loam soils (shallow roots are developed on shallow or poorly drained soils). When seeds germinate on rotting logs or decaying stumps, the roots may grow for some length down to the soil, and a curious "octopus-rooted habit," sometimes termed prop-rooted, may develop, the trunk supported by large roots the upper portions of which are above-ground.

Birch flowers occur in many-flowered catkins (cones), with male and female catkins on the same trees. The male catkins are pendulous while the female catkins are erect. The male catkins develop during the summer but remain fairly small, and the following spring they expand and shed their pollen before or during leaf expansion. In yellow birch the male catkins are about 2 cm long overwinter, but expand to about 8 cm in length at pollination time in the spring. The female catkins develop in the fall, overwinter, and the next season they reveal stigmas in the spring and later produce fruits (often called seeds) that are single-seeded with two wings, each in the axil of a 3-lobed scale. In yellow birch the female catkins grow to 2.5-4 cm (1-1.6 inches) in length when the seeds are mature. The seeds ripen in September, the nutlets shedding in subsequent months, leaving behind the catkin axis and its scales that may remain on the tree over the winter. Vegetative reproduction from stumps also occurs to some extent.

CLASSIFICATION

Family: Betulaceae (birch family).

There are about 35 species of *Betula*, distributed in north temperate regions of the world. About 18 species are native to North America north of Mexico, most of these occurring in Canada.

Betula alleghaniensis var. *macrolepis* (Fern.) Brayshaw, once called witch-hazel in Newfoundland, is said to have relatively long cone bracts (8 mm or more long). *Betula alleghaniensis* var. *fallax* (Fassett) Brayshaw is said to have dark brown bark that typically does not exfoliate into shreds



Fig. 15. Yellow birch (*Betula alleghaniensis*). 1, Branch with mature male catkins. 2, Branch with immature male catkins during the winter. 3, Scale of a male flower. 4, Branch with mature female catkins. 5, Single-seeded fruit with two wings. 6, Scale of a female fruit. Source: Sargent, C.S. 1896. The silva of North America. Houghton, Mifflin and Company, Boston, MA. Vol. 9, plate 449.

or curly flakes at the surface. The unusual bark of var. *fallax* has led to confusion with cherry birch, *B. lenta*, and is the basis for reports of the latter north of its very restricted Canadian range.

Yellow birch has been hybridized with a dozen other species of *Betula*. A natural hybrid of *B. alleghaniensis* and *B. pumila* (bog birch), named purpus birch (*B. □purpusii*), occurs occasionally in Canada. Natural hybrids of yellow birch and paper birch have rarely been reported but are suspected to occur with some frequency. Some researchers have considered *B. papyrifera* var. *cordifolia* to be this hybrid. Studies have shown that these hybrids are best recognized by their intermediate leaf characters. *Betula alleghaniensis* may also hybridize with *B. lenta*, but the hybrids are difficult to recognize. *Betula lenta* differs from both *B. alleghaniensis* and such hybrids by increased numbers of hairs on bracts and fruiting catkins. Murray's Birch (*Betula murrayana*) is believed to have originated from a hybrid of purpus birch and yellow birch. It is intermediate in most characters and best distinguished from *B. alleghaniensis* by its acute instead of acuminate leaf tips, and leaves with 7-10 instead of 12-18 pairs of veins.

GEOGRAPHY

Yellow birch ranges from southeastern Manitoba through the Atlantic provinces to southern Newfoundland, and southwards over the northeastern US, as far south as South Carolina, Tennessee, and the Appalachian Mountains of northern Georgia. The main concentrations of the species occur in Quebec, Ontario, New Brunswick, Maine, upper Michigan, and New York. Continued

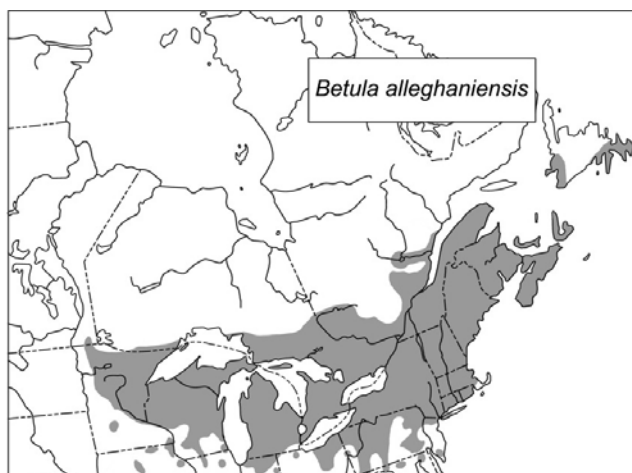


Fig. 16. Canadian distribution of yellow birch (*Betula alleghaniensis*).

ECOLOGY

This species is a member of Canada's southern hardwood forests in the Deciduous, Great Lakes St. Lawrence, and Acadian forest regions, and is also found in the southeastern part of the Boreal Forest. Yellow birch occasionally occurs in nearly pure stands or as a dominant tree, but is usually a co-dominant or minor species. Its most common and important associates are spruce, balsam, hemlock, beech, and maple. It is more resistance to ice damage than other birches.

Yellow birch is one of the slowest growing trees in northern hardwood forests, typically increasing in trunk diameter less than 2.5 cm (1 inch) in 10 years. Average longevity is about 150 years, and the trees can live to 400 years of age. However, several factors limit the life of yellow birch. The bark is flammable and the tree is highly vulnerable to fire. Yellow birch does not do well in hot dry sites, and it is suspected that "birch dieback," a condition that widely affected the species in Canada from the 1930s to the 1950s, is the result of hot spells.

Habitat

Yellow birch grows in cool areas well supplied with precipitation. The species grows on a variety of soils, but achieves its best development on rich, moist, well-drained soils. The tree is tolerant of a range of soil pH. It is often found along stream banks, swampy woods, and forested slopes. *Betula alleghaniensis* cannot reproduce under a closed canopy, but is moderately shade tolerant (the most tolerant of eastern Canadian birches), although not as much so as the sugar maple and beech. It is able to occupy stands dominated by sugar maple. The seeds develop best in places free of leaf litter, such as stumps, and seeds may remain alive in the soil for several years. It has been shown that the roots of sugar maple seedlings produce a chemical that inhibits the growth of yellow birch seedlings.

Inter-species Relationships

As a large and frequent species, yellow birch plays an important role in the biodiversity of northeastern forests.

Moose, snowshoe hare and (especially) white-tailed deer browse on the twigs of yellow birch. The seeds are consumed by a variety of birds, squirrels, mice, and voles. Ruffed grouse feed so frequently on catkins and buds that in northern Maine and Canada the bird is often called the "birch partridge." Yellow-bellied sapsuckers feed on the sap by drilling rows in the bark, and commonly feed on the same birch trees for years (occasionally the many individual wounds combine to girdle the tree, and mortality of the trees is sometimes a problem for logging companies). Red squirrels have been observed feeding on the sap of young plants. Beaver and porcupine consume the bark and wood (actually the cambium is the desired part). Like sapsuckers, porcupine can cause significant losses and may tend to return to the same trees.

Birches, like most trees, are fed on by an almost endless variety of insects, but usually only one or a few cause serious damage. The bronze birch borer (*Agrilus anxius*) is considered to be the most serious pest of yellow birch by the logging industry. Adults of this beetle deposit eggs in bark crevices of upper branches, the larvae bore tunnels under the bark causing dying of the tree top, and over 2 or 3 years the insects kill the rest of the tree. Numerous other insects feed on yellow birch. These in turn provide food for other insects, birds and mammals. Different insects are adapted to different parts of the tree. The larvae of a tiny fly, the birch seed midge (*Oligotrophus betheli*) live in the developing seeds. Other insects feed only on the leaves or only on the flowers.



Fig. 17. Bronze birch borer (*Agrilus anxius*). Left, adult (photo courtesy of Barry Lyons, Natural Resources Canada). Centre, gallery bored by larvae (photo by Thérèse Arcand, Ressources naturelles Canada, Service canadien des forêts, Centre de foresterie des Laurentides). Right, larva (photo courtesy of Canadian Forest Service, reproduced by permission).

Pollination & Dispersal

Birches are wind-pollinated. The light seeds are also spread by wind, usually within a few hundred metres of the parent trees. Most seeds are distributed no farther than 2 to 4 times the height of the tree. Because the fruits ("seeds") are sometimes held into winter and gradually dispersed from the cones, they are sometimes blown over glazed snow, occasionally as far as 400 m (1300 feet). As with most trees, there are "mast years" marked by very large seed production with intervening relatively poor years. It has been estimated that out of every 10 years, yellow birch averages one heavy seed year, 3.5 medium years, 4.5 light or very light years, and 1 year of seed failure.

USES

Yellow birch is an important timber hardwood of eastern Canada, and indeed most wood sold as “birch” in North America is from this tree. The wood is very hard (comparable to white oak), strong, heavy, fine-grained, and takes stain well. Yellow birch wood is slightly harder and stronger than paper birch, and is considered superior to if for manufacture of furniture. It is employed for fine furniture, cabinets, panelling, interior trim, doors, plywood, veneer, parquet flooring, tool handles and woodenware. Lower quality logs have been used for railroad ties, pulpwood, and boxes. Birch is a preferred wood in the manufacture of toothpicks. The wood of yellow birch is very resistant to decay, and in the 18th century it was used in preference to oak for constructing the underwater parts of ships.

The tree has several very minor culinary uses. As with other birches, the sap can be tapped to yield a sugar or syrup but, compared to sugar maple, the amount produced is much less and it is more expensive. Between 80 and 100 litres of birch sap are required to make just 1 litre of syrup (30-40 litres are needed for maple syrup), which sells for about \$80.00 wholesale. Birch syrup is a very minor commodity in Europe and Alaska. There are only a handful of producers of birch syrup in Canada, and paper birch is the main source. Birch syrup is darker and slightly more bitter than maple syrup, and is sometimes encountered as a glaze or flavouring used on very fancy meals in high-end restaurants. “Birch beer” is usually a carbonated soft drink made with birch twigs or bark from various *Betula* species, but may also be alcoholic, prepared by fermenting the sap or adding honey or sugar to promote fermentation. Very recently the Manitoba Liquor Control Commission allowed birch wine to be sold. Birch leaves and twigs have been employed to make tea.

Yellow birch is quite aromatic, the bark, twigs, buds, and leaves smelling and tasting of wintergreen when broken or bruised. The tree was once used as a commercial source of oil of wintergreen, which is added to medicines to mask their objectionable flavour. Oil of wintergreen formerly was also obtained from wintergreen (*Gaultheria procumbens*) and cherry birch (*B. lenta*). Today, this volatile oil is usually produced synthetically.

Yellow birch is one of the hardwood species that is most commonly employed to prepare wood alcohol, acetate of lime, charcoal, and essential oils. “Birch tar” (“Russian oil” when obtained from Russian species), extracted from the bark, was once used as a glue, lubricant, and medicine.

The oily bark of yellow birch is often used as kindling by campers and hunters in the north woods, because it can be used to start cooking or warming fires even when wet.

CULTIVATION

The literature cited below can be used to find information on forestry management of yellow birch, and the following remarks are oriented to growing the tree as an ornamental. Birch seeds do not require stratification if sown outdoors in the fall. To condition the seeds for spring planting, stratification can be accomplished by soaking the seeds in tap water for 24 hours, draining off excess water and storing the seeds in a plastic bag a few degrees above freezing for



Fig. 18. Collecting and preparing Canadian birch syrup. Photos courtesy of Dave Challen and Beth Kuiper, Boreal Birch Syrup Company (Thunder Bay).

a month. Alternatively, nursery-grown saplings can simply be purchased. Seedlings may require protection from mice, and saplings from deer and rabbits. Birch trees are not easily excavated and transplanted, but well-grown younger trees that are balled or container-grown can be planted, preferably in early spring. Although somewhat tolerant of adverse conditions, yellow birch is best provided with moderately deep, well-drained loam soil, and a sunny or at least only partly-shaded location, preferably with some protection from wind. Because yellow birch is long-lived and potentially will grow into a moderately large tree, care should be exercised that this will not cause problems in the future. The species is tolerant of roadside salt and was judged to be moderately resistant to the Ice Storm of 1998. White-barked birches (especially paper birch) are usually preferred for home planting (because of the attractive white bark, the tendency to develop a clump of trunks, and a somewhat hardier nature), although the yellow birch provides extremely attractive yellow foliage in the fall, and is somewhat less prone to the bronze birch borer than are white-barked birches.

CONSERVATION STATUS

Yellow birch is not threatened over the major portion of its range.

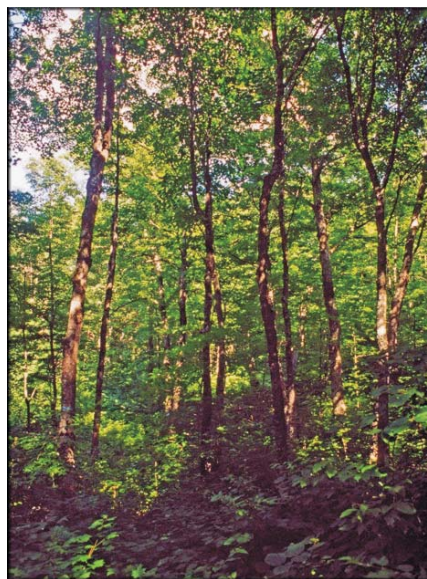


Fig. 19. Maple (*Acer saccharum*) yellow birch (*Betula alleghaniensis*) forest. Photo courtesy of the Government of Quebec.

MYTHS, LEGENDS, TALES, FOLKLORE, AND INTERESTING FACTS

- Witches are said to have preferred birch twigs to make the ends of their broom sticks.
- Cradles were once made of birch wood in the belief that this would protect babies.
- Birch twigs bound in a bundle (called a birch) were once widely employed as a whip to "birch" (punish) people. Sapling branches from birch trees were a favourite disciplinary tool of stern schoolmasters in early colonial North America.
- In Finland, Scandinavia, Estonia, Latvia, and Russia, birch twigs with the foliage left on are traditionally employed to slap one's body in the sauna as a form of massage and to open the pores and increase blood circulation.
- At the end of their life cycle, yellow birch trees frequently decay extensively under the bark (which is extremely resistant to decay), and the rotten, spongy wood is often referred to as "punkwood." Aboriginal Peoples in eastern Canada dried punkwood and carried it with them as tinder for starting fires by friction.
- It takes about 100,000 seeds of yellow birch to weigh 1 kg (there are about 45,000 seeds in a pound). In bumper seed years a yellow birch forest may shed about 90 million seeds per hectare (36 million/acre).
- Yellow birch wood is very heavy, so much so that freshly fallen birch logs tend to sink. Loggers determined to float yellow birch logs downriver to a sawmill once resorted to lashing birch logs to other logs (particularly pine) that would float. Another technique was to dry the logs out for a period until their specific gravity was less than that of water. This was accomplished either by not removing the branches for several weeks, so that the leaves would suck water out, or scoring the trunks longitudinally to encourage desiccation.

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Henning S. Heide-Jørgensen

Expected: June 2008

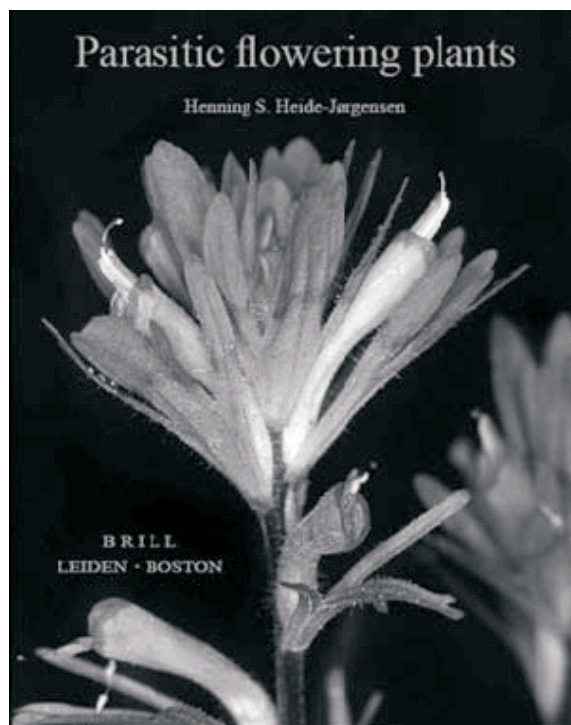
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CBA/ABC Bulletins from the Past

The complete set of Bulletins is available on a CD produced by the former Editor, Martin Dubé . They run from 1968 up to 2006 and make for some interesting reading. The CD is available from the present Editor at a cost of \$5.00. Archived issues from 39(2) to the present are available on the CBA Website. Log in using the same username and password (CBA and Guest) to access these issues. In the near future each member will have their own username and password.



Canadian Botanical Association L' Association Botanique du Canada

Regional Undergraduate Awards at the APICS Conference

The APICS (The Atlantic Provinces Council on the Sciences) conference was held at Memorial University, St Johns Newfoundland on March 7th-9th 2008.

The CBA/ABC awards were given to two students for the best poster and best oral presentation for research on a botanical topic.

The winners are shown below, receiving their awards.



Anna Elliott, Dalhousie University, receiving her award for the best botanical oral presentation from Lois Bateman of Sir Wilfred Grenfell College. Anna's paper was titled " Inhibition of programmed cell death by a calcium channel blocker in the lace plant."



Bethany Thurber, Acadia University, won the CBA/ABC award for her poster "The breeding system of *Amelanchier bartramiana*: the role of fragmentation, sexuality and gametophytic self-incompatibility" She received her award from Todd Smith of Acadia University.

Terms of Reference for Student Paper Awards

- A. All students who have graduated from, or are currently enrolled in, a Canadian university or Canadian students who have studied abroad are eligible.
- B. The award is for work published while the author is still a student, or based on work done while a student, and published **within two years of graduation**. This makes allowance for students who do not write until after thesis (graduate or undergraduate) completion and normal publication delays.
- C. Students **do not have to be CBA members** to be eligible.
- D. No candidate may submit a paper for more than one CBA award..
- E. The paper must have been published during 2006 or 2007. Papers published in late 2007 but not available as a reprint for the 2008 deadline will be considered eligible.
- F. Joint papers must be accompanied by a statement on university letterhead, signed by all the authors, estimating responsibility of each author for:
 - o the ideas that lead to the initiation of the project
 - o the actual research skill demonstrated
 - o the writing of the manuscript.
- G. Student award winners receive a one year membership in the Canadian Botanical Association.
- H. The Judging Committee reserves the right to make no award if submissions are not considered of sufficiently high quality, or to share the award between two applicants if their papers appear to be of equal merit. The winner will be notified, and the award will be presented during the Annual Meeting of the CBA.
- I. The Treasurer of the CBA will be pleased to accept donations (tax-deductible) to the fund which finances these awards. Please publicize these awards as widely as possible and contribute to the capital fund if you can afford to do so.
- J. Applications and supporting documents must be received, **before April 11 2008** by the appropriate section chairs. **Please note, some sections have different deadlines. Check with the section chair or on the CBA/ABC website**

Application Checklist

Please send each of the following electronically to the appropriate section chair (s)



A reprint of the paper (or proof of the paper plus a letter from the editor of the journal stating that the paper is in press with a 2006 or 2007 publication date)



The candidate's curriculum vitae including current address and email information
A statement indicating that the student is currently enrolled in a degree program, or has completed such program during the calendar year for which the award is to be made (except for extenuating circumstances with respect to timing of publication as outlined above in B).



A statement from the supervisor, the student, and any co-author establishing responsibility for the paper as outlined above in F