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The Canadian Botanical Association Bulletin

Bulletin de l'Association Botanique du Canada

December/Decembre 2014. Volume 47 Nº3

Dear CBA/ABC members,

John Markham

Planning for next year's annual meeting is well underway. Eleven different societies will be attending Botany 2015 in Edmonton, including our Plant Canada siblings. Obviously this will create some organizational problems but it is also a wonderful chance for each of us to connect with new colleagues. To encourage integration of the different groups, a number of joint symposia and social events are in the works. There are also quite a few field trips and community service activities starting to take shape. With all that will be going it will be easy for CBA/ABC members to loose track of one another. I would therefore encourage you to attend the CBA/ABC section meetings and the AGM. Because the number of awards handed out by all the societies attending the conference are too large to be given out at the closing reception, we will be giving out awards at the AGM.

The call for award nominations and applications is now out (see the announcement in this Bulletin and the web site for more details). Please consider nominating colleagues for the Lawson, Elliott, or Magister awards. This year the terms of reference for the Magister teaching award have changed. Deadlines for student awards are a little later this year, to reflect the later date of the annual meeting. Please encourage your students to apply for these awards. Our finances are in good shape, thanks in part to a healthy profit made from this year's meeting. It would be nice to see some of that money going into deserving student's hands.

Now that the Association's Continuance Process has been completed and all paper work has been filed we will be working on updating the policy manual to be in line with government regulations and traditions that have developed within the CBA/ABC over the years. One of the changes will be a shift in our financial year end, so that the past year's Review Engagements (or Audits) can be presented at each AGM.

John Markham, CBA President

The Canadian Botanical Association Bulletin

The CBA Bulletin is issued three times a year (March, September and December) and is freely availble on the CBA website. Hardcopy subscriptions are available for a fee.

Information for Contributors

All members are welcome to submit texts in the form of papers, reviews, comments, essays, requests, or anything related to botany or botanists. 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

Bulletin de l'Association Botanique du Canada

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 natureconcernant la botanique et les botanistes (articles, revues de publication, commentaires,requêtes, essais, etc.). Tous les supports de texte sont acceptés. Pour des renseignements détaillés sur la soumission de textes, veuillez consulter le rédacteur (voir ci-dessous). Infos générales sur l'ABCà l'url suivant: http://www.cba-abc.ca

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Next issue / Prochain numéro

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The organizing committe for the 2015 CBA Congress in Montreal

CBA Bulletin back issues are now online

If you're missing any issues, or want to know what the association was up to in decades past, (almost) our entire catalog is now online. The few missing volumes will be up shortly. Check it out at http://www.cba-abc.ca/bulletin.htm

Plant Development Section

Twenty-one section members, guests and visitors attended a busy lunchtime meeting of the CBA/ABC Plant Development section on June 16 in the Biodiversity Centre at the Jardin botanique de Montréal. This is up from the dozen or so who attended the previous section meetings in Columbus, OH, and Kamloops, BC. The section meeting began after a well-attended tribute to Alan Charlton (1938-2013), presented by Professor Emeritus Dr. Usher Posluszny (University of Guelph) and Professor Emerita Anne Charlton (University of Manchester). For a published version, see "Remembering W. Alan Charlton: a great friend and supporter of Canadian botany" in Botany, 2014, 92(5): iii-iv, 10.1139/cjb-2014-0064 (also published in the CBA Bulletin, 2014, 47(1):13-15). Section Chair Moira Galway is indebted to Co-Chair Simon Chuong (Waterloo) for his notes on the section meeting that followed, as hers went astray, probably at the Annual General Meeting. Increasing section membership is a perennial issue. Section members and their students are encouraged to submit short profiles on their research, life, and career, to Tyler Smith, editor of the Bulletin, and to reach out to anyone working in this field who is not a member of the CBA/ABC or the Development Section. Possible symposia for Botany 2015 in Edmonton were discussed, with a focus on controversial or interdisciplinary topics, including mathematical modelling in plant development. With much encouragement and advice from BSA Developmental and Structural Section officers Amy Litt, Joe William and Nicholas Tipperary, CBA/ABC president John Markham, past-president Frédèrique Guinel, Development Section co-chair Simon Chuong and section members, a proposal entitled "Advances in Modelling Plant Development" was submitted for consideration on October 30. At the time of writing (December 7) the status of this proposal remains to be determined.

Under the umbrella of plant organogenesis, the 2014 symposium on "Plant Development in Canada" presented three researchers at different stages in their careers using different experimental approaches. Dr. Ed Yeung (Calgary) positioned his research on somatic embryogenesis in relation to two 20th century pillars of plant developmental biology: R.H. Wetmore (Harvard) and C.W. Wardlaw (Manchester). Francois Ouellet (Université du Québec a Montréal) turned to the whole plant and the role of carotenoid-derived regulators in mediating temperature-regulated shoot branching in the context of global climate change, while Shelly Hepworth (Carleton) placed her own research on the molecular genetics of plant inflorescence regulation within the long history of humans manipulating plant architecture. The following day, developmental biologists enjoyed the diversity of six additional contributed talks on plant development from laboratories across the country.

The 2014 Taylor A. Steeves Award for the best student paper in plant development, structure or morphology published in the previous year was awarded for the second time to Erin Zimmerman (Institut de recherche en biologie végétale, Université de Montréal) for her paper "Floral ontogeny in Dialiinae (Caesalpinioideae: Cassieae), a study in organ loss and instability" published in the South African Journal of Botany in 2013 (89:188-209). Students conducting research in plant development, structure or morphology are encouraged to submit applications for this award. The award honours Taylor A. Steeves (1926-2011), whose many research and teaching accomplishments and contributions to the CBA were remembered in the December 2011 CBA Bulletin (Vol. 44, No. 3). For further information, or to submit applications or nominations, please contact Moira Galway or Simon Chuong, current Co-Chairs of the Development Section. Complete applications should be received by March 1st, 2015. A complete application consists of a copy of the published research (undertaken while the candidate was a student), the candidate's curriculum vitae, a statement indicating that the candidate is enrolled in a degree program, or has completed the relevant degree program, as well as separate statements from the candidate, supervisor and any co-authors indicating the contributions made by each to the final publication. It should be noted that terms of this award require eligible students have graduated from or are currently enrolled in a Canadian University. The judging committee considers originality, scientific significance, presentation and use of language. The judging committee consists of the Chair of the Plant Development section and two others. Any members interested in serving as judges should contact: Moira Galway at mgalway@stfx.ca, Department of Biology, St. Francis Xavier University.

Moira Galway, Chair of the Development Section

Mycology Section

In 2015, the annual meeting of CBA/ABC will be held in conjunction with Botany 2015 in Edmonton; Mycology Section members are doubtless excited by the opportunity to mingle with members of the Mycological Society of America who will also be part of Botany 2015. We are very pleased to share with the membership the delightful news that our Weresub Lecturer at Botany 2015 will be Dr. Lynne Sigler, a professor-scientist, at the University of Alberta and the Devonian Botanical Garden, who has recently retired after 44 years of mycological exploration! Dr. Sigler is a world-renowned fungal taxonomist in the arenas of medical mycology and soil biology. We are sure that she will use her talk (tentatively titled: Past, present and future of the University of Alberta Microfungus Collection and Herbarium (UAMH) - a North American Fungal Biodiversity Centre) to relate her insights into mycological history with a dash of wishful thinking as a bonus! The Weresub Lecture is open to the general public and promises to be a great journey. It was well attended in Montreal and we hope to repeat this outcome in 2015.

On another front, Dr. Mary Berbee, UBC, is working with Martin Osis, of the Alberta Mycological Society, to organize a mycological foray as part of Botany 2015. Picking permits are being arranged for Elk Island National Park (the last and biggest piece of protected Aspen Parkland in North America, we hear).

Stay tuned for more mycological news from Botany 2015 as it develops.

Hugues Massicotte and Shannon Berch, Co-Chairs of the Mycology Section

Winter fungi, ©Hugues Massicotte

Announcements

Plant Molecular Physiologist Position, University of Manitoba

The Department of Biological Sciences at the University of Manitoba invites applications for a full-time probationary (tenure-track) appointment in plant molecular physiology at the rank of Assistant Professor to begin July 1, 2015. The ideal candidate will have a strong publication record in the areas of plant, algal or fungal physiology and uses molecular or other powerful, innovative techniques. The successful applicant must hold a PhD and postdoctoral or relevant employment experience. Applicants should demonstrate their ability to establish an active, independent, externally funded research program, and promote research synergies within the department and across campus. This position includes responsibilities for teaching, research, and service. Teaching experience would be a strong asset; the position entails graduate and undergraduate instruction in introductory biology and higher-level courses in areas appropriate to the candidate's expertise.

This is an exciting opportunity to join a dynamic and integrative Biological Sciences department. The department has 38 full-time faculty including a CRC Tier 2 Chair, over 80 graduate students and over 200 Major and Honours students, and enjoys research strengths across the spectrum of biology and its sub-disciplines (www.umanitoba.ca/science/biologicalsciences).

The department is located on the Fort Garry Campus of the University of Manitoba in Winnipeg, a city with a rich cultural environment and abundant outdoor recreational venues (www.winnipeg.ca). The Faculty of Science offers excellent opportunities for research, collaboration, and teaching in a broad range of biological systems, and access to outstanding resources comprising a comprehensive range of microscopy and imaging, laser-capture microdissection, GC-MS, next-generation sequencing, high-performance computing, culturing, and analytical, molecular and cell biology, animal and plant-rearing (greenhouses, and growth and controlled-environment chambers), and biological-collection facilities. A wide variety of additional infrastructure is available across campus.

Applications, in a single pdf file, should include: a covering letter outlining specific interests in the position, a CV, a 2-page research plan with short and long-term goals, a 1-page statement of teaching experience and philosophy, 3 representative publications, and the name and contact information of 3 referees. Applications must be sent electronically by January 20, 2015 to Dr. Judy Anderson, Head, Department of Biological Sciences at Judy_Anderson@umanitoba.ca. Please refer to position #18795.

The University of Manitoba is committed to creating a diverse and inclusive workplace. Applications are encouraged from qualified applicants including members of visible minorities, Aboriginal peoples, people with disabilities, people of all sexual orientations and genders, and others who may contribute to the further diversification of the university. All qualified candidates are encouraged to apply; however, Canadian citizens and permanent residents will be given priority.

Application materials, including letters of reference, will be handled in accordance with the "Freedom of Information and Protection of Privacy Act" (Manitoba). Please note that CVs will be provided to participating members of the search committee and department.

Atlantic Undergraduate Conference

This year, the Atlantic Undergraduate Conference was held at Mount Saint-Vincent Universityon March 14-16th, 2014. Two students were awarded for their presentations on a botanical topic.

Mike Ogden won for his oral presentation entitled "A comparative analysis of leaf development in two species of *Cecropia* with contrasting leaf morphology" which was considered the best among his group. The presentation was well delivered and well received by the audience.

Nakia Cullain won for her poster presentation which was entitled "Seasonality of eelgrass *Zostera marina* and associated community in Nova-Scotia, Canada". It was considered interesting and was delivered with lots of enthusiasm. Congratulations to both of them!

Mike Ogden and Nadia Cullain at the Atlantic Undergraduate Conference

Announcements

Prairie Pollination Virtual Museum

Two-thirds of our crop species worldwide depend on wild pollinators to some degree! Those pollinators need more than just crop plants to survive — they need wild plants too.

Staff at The Manitoba Museum have been quietly studying pollinators for over ten years. The Museum's Curator of Botany, Dr. Diana Bizecki Robson notes that "we really don't know much about how wild plants and pollinators interact with each other or whether their populations are declining. One of the interesting things I've discovered during my field work is that pollinators of crop plants like canola and sunflower also need to feed on prairie wildflowers to survive."

Unfortunately, many of The Manitoba Museum's plant and insect specimens are difficult to display in regular gallery exhibits and can only been seen during special behind-the-scenes tours or in temporary exhibits. But now thanks to a virtual exhibit you can learn more about these amazing creatures. The exhibit is called Prairie Pollination (www.prairiepollination.ca)

Beautiful photographs of endangered and common prairie plants, and their insect and bird pollinators, are shown in this exhibit. Watercolour illustrations of wild plants from the Museums' famous Norman Criddle collection, and virtual tours of wild prairies with pollination scientists add depth and context to the specimens. "The great thing about the Prairie Pollination exhibit is that people can find out exactly which plants are attractive to the different kinds of pollinators. This

A bee fly (*Anastoechus* sp.) pollinating the rare Western Silvery Aster (*Symphyotrichum sericeum*) ©D.Bizecki Robson

information will be of great use to nature lovers, gardeners, farmers, students and beekeepers" says Dr. Bizecki Robson. Further, the resources page of the website lists all of the national, provincial urban and private parks in the Prairie Provinces where people can go see wild prairies.

Teachers will be able to help their students learn more about pollination through the lesson plans in the Virtual Museum of Canada's Teacher's Learning Centre. Dr. Robson notes that "using the multimedia resources provided, students will be able to learn about the life cycles and habitats of plants and pollinators, and evaluate human impacts on prairie ecosystems and endangered species."

The Manitoba Museum gratefully acknowledges our project sponsors, The Virtual Museum of Canada (VMC, www.virtualmuseum.ca); and the Manitoba Museum Foundation.

The Cota-Sanchez lab at the CBA Congress in Montreal: Carinna Gutierrez-Flores, Denver Falconer, and Hugo Cota-Sanchez

Conference report: Canadian fossil plants feature at Geological Society of America annual meeting 2014, Vancouver, BC

David R. Greenwood, Dept. of Biology, Brandon University, Brandon, Manitoba

Approximately 6000 geoscientists, and even some botanists, from across North America and the world attended the GSA 2014 conference held in Vancouver, October 18-23, at the Vancouver Convention Centre. Of interest to CBA/ABC members was a symposium featuring current research on fossil plants from the Eocene Epoch fossil sites in interior British Columbia, as well as from similar age fossil sites in the Canadian Arctic, Alaska and Colorado.

Topical Session T201. Eocene Northern North America: Biotic Change and Environmental Context was co-organized by David Greenwood (Brandon University, Manitoba), Bruce Archibald (Simon Fraser University, BC), Melanie DeVore (Georgia State University, GA), and Kathleen Pigg (Arizona State University, AZ). https://gsa.confex.com/gsa/2014AM/webprogram/Session35299.html

This session was well attended and featured 14 talks focused on paleontological studies of Eocene fossil-rich sites in British Columbia. This includes the McAbee heritage site near Kamloops, as well as the Princeton Chert and Horsefly Lake. The keynote speaker was Selena Smith (University of Michigan, MI), a University of Alberta alumna, who presented an overview of our knowledge of the British Columbia Eocene record of monocots. Selena spoke about the improved ability to recognize in the fossil record key monocot groups using phytoliths, focused on Poales (grasses and sedges), Alismatales (water plantains), Arecaceae (palms), and Liliales (lilies). Also presented were talks on the paleoecology and paleoclimatology of Eocene fossil sites from Alaska (David Sunderlin, Lafayette College, PA), Ellesmere Island in Nunavut (Christopher West, University of Saskatchewan), and Florissant Fossil Beds National Monument in Colorado (Kyrie Baumgartner and Herb Meyer, National Park Service, CO; Bret Buskirk, University of Washington, WA). David Greenwood (Brandon University) and Patrick Moss (University of Queensland, Australia) presented new palynological analyses of varve-scale sampling from the Falkland and Horsefly early Eocene lake shales, demonstrating decadal-scale records of vegetation change reflected in the fossil pollen. Kathleen Pigg et al. presented an historical overview of paleobotanical study of early to middle Eocene fossil sites (AKA the 'Okanagan Highlands') in central British Columbia. Her talk began with Canadian scientists C.M. and J.W. Dawson, Glenn Rouse and Len Hills, and included more recent researchers such as Ruth Stockey and some of the presenters at the session. Several talks were presented focused on insects and the geology of some of the BC fossil sites.

This session highlighted the enormous potential for paleobotanical work in the Eocene of British Columbia. The symposium organisers are planning to publish papers from the session as a special volume.

Fossil leaf of *Sassafras hesperia* (Berry) Wolfe & Wehr from the McAbee heritage listed fossil site near Kamloops, BC. ©David Greenwood. Specimen collected by Bruce Archibald.

2015 CBA/ABC Awards
Call for Nominations and Applications

Student Awards for Published Papers
Application deadline: April 1, 2015

These awards are available to any student studying at a Canadian University or Canadian students studying abroad, for a paper published since March 1, 2014. Awards include a cash prize and a one-year free membership in the CBA/ABC. There are four awards covering different areas of botanical research:

Porsild-Consaul Memorial Award. Value: $1000

This award honors two eminent Arctic botanists: Alf Erling Porsild and Laurie Lynn Consaul. This award recognizes the best paper published in the field of plant systematics and phytogeography. Nominations should be sent to the chair of the Systematics and Phyogeography Section: Dr. Julian Starr. Email: jstarr@uottawa.ca

Stan Rowe Memorial Award. Value: $500

This award celebrates the life and work of J. Stan Rowe, eminent plant ecologist and writer. The award recognizes the best paper published by a student in the field of plant ecology. Nominations should be sent to the chair of the Ecology section: Dr. André Arsenault. Email: Andre.J.Arsenault@NRCan-RNCan.gc.ca

Taylor Steeves Memorial Award. Value: $500

This award honors the numerous contributions of Taylor A. Steeves to the CBA and botany in Canada. The award recognizes the best paper in plant development, structure or morphology. Nominations should be sent to the chair of the Plant Development Section: Dr. Moira Galway. Email: mgalway@stfx.ca

Luella Weresub Memorial Award. Value: $1000

This award was established in memory of Luella Kayla Weresub, who worked at the Biosystematics Research Institute of Agriculture Canada. The award recognizes the best paper in mycology or lichenology. Nominations should be sent to the chair of the Mycology Section: Shannon Berch. Email: Shannon.Berch@gov.bc.ca

Application procedure

Applications should include:

1. A reprint of the paper (or proof of the paper plus a letter from the editor of the journal stating that this paper is in press).
2. The candidate's curriculum vitae.
3. A statement indicating that the student is currently enrolled in a degree program, or has completed such a program during the calendar year for which the award is to be made (except for extenuating circumstances).
4. A statement from the supervisor, the student and any co-author outlining each author's contribution to the paper.

Applications should be sent to the appropriate section chair listed above.

Student Awards for best presentations at the CBA/ABC Annual Meeting
Application deadline: April 1, 2015

Both of these awards have a value of $500.

- **Lionel Cinq-Mars Award** is given for best oral presentation.
- **Iain and Sylvia Taylor Award** is given for the best poster.

Application procedure

Students ask to be considered for these awards when they register for the annual meeting.

2015 CBA/ABC Awards
Call for Nominations and Applications

Student Travel Awards to Attend the CBA/ABC Annual Meeting
Application deadline: April 1, 2015.

These awards provide funds ($200-$600) for travel to the CBA/ABC annual meeting for graduate students (the **Macoun Award**) or undergraduate students (the **Winterhalder Award**) who will be presenting talks or posters at the meeting. Students must be CBA members and will also be eligible for the **Cinq-Mars** or **Taylor Awards**.

Application procedure

Applications should include:

1. An abstract of the presentation to be given.
2. A brief curriculum vitae from the student.
3. A letter of support from the student's supervisor.
4. A letter of support from another member of the student's advisory committee.

Applications should be sent to the President of the CBA: john.markham@umanitoba.ca

Student Travel Awards for Research

Laurie Consaul Northern Research Scholarship
Value: $1000
Application deadline: February 28, 2015.

This award was established in the memory of Laurie Consaul and supports graduate and undergraduate student CBA members conductng botanical research in Canada's north.

Application Procedure

Students submit an application form along with a supporting letter from their supervisor. See the CBA/ABC website for the application form and instructions.

CBA/ABC Major Awards

The Mary Elliott Service Award
Nomination deadline: March 1, 2015.

This award is given to an individual for meritorious service to the CBA/ABC. It was first awarded in 1978 in memory of Mary E. Elliott, a plant pathologist and mycologist who served as the CBA/ABC's Secretary, Vice President and President.

Application procedure

Nominations should include:

1. A statement of the contributions which the nominee has made to the Association in any capacity (e.g. Board of Directors, Executive Member, Editor, Committee member, etc.).

Nominations should be sent to the current President of the Association: john.markham@umanitoba.ca

The Magister Teaching Award
Nomination deadline: March 1, 2015.

To commemorate 50 years of the CBA/ABC's existence, the Magister Teaching award is intended to recognize CBA/ABC members who have demonstrated a consistently high level of teaching excellence and teaching-related activities over at least 10 years as a faculty member.

Nominations should be sent to the current President of the Association: john.markham@umanitoba.ca

The Lawson Medal
Nomination deadline: March 1, 2015.

This is the most prestigious award of the CBA/ABC. It was established to provide a collective, formal expression of the admiration and respect of botanists in Canada for excellence in the contribution by an individual to Canadian botany. Lawson Medals may be awarded each year in two categories of eligibility:

(A) Recognition of a single outstanding contribution to botanical knowledge (monograph, book or series of papers) by a Canadian botanist at any stage of his or her career, or

(B) Recognition of cumulative, lifetime contributions to Canadian botany by a senior researcher, teacher or administrator.

Application procedure

Nominations may be in either category and should include:

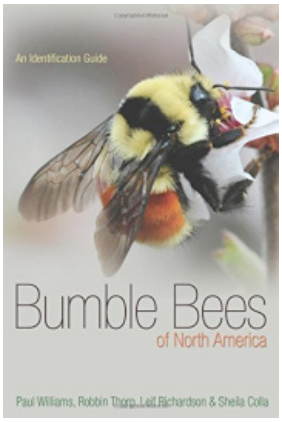
1. The Curriculum Vitae of the nominee.
2. At least three supporting letters from botanists who are familiar with the achievements of the nominee.
3. A statement by the nominator concerning the nominee's contribution's to Canadian Botany.

Nominations should be sent to the current President of the Association: john.markham@umanitoba.ca

Book Reviews

Bumble bees of North America: an identification guide

Williams, P.H., Thorp, R.W., Richardson, L.L. and Colla, S.R. 2014. Princeton (NJ): Princeton University Press. 208 pp. ISBN 0691152225



Bumble bees are super-generalists, responsible for pollinating a great diversity of plants in North America. As ecologists know, being a jack of all trades really can mean being a master of none; there are times when generalists do better than specialists, but sometimes the reverse is true. Although the generalist lifestyle has worked well for bumble bees—there are 250 species globally, 46 in North America, and most are common and well integrated into communities—this little book, in attempting to be a jack of all trades, is actually paying a cost by not being master for any of the audiences it might be appropriate for.

Of course, there is still quite a bit to like about the book. But depending on who you are and what you want the book for, you may or may not want to add it to your collection. Although meant primarily for identification (as the subtitle attests), there are three sections to the book and we review each in turn.

1. The Introduction and Overview.

The introductory section is clearly aimed at a general reader—perhaps even the general public. There is lots of information about bumble bee life history, how to observe and collect them, their interactions with plants, and why some species are in decline. There is also very interesting information about key areas of research and conservation challenges, and a helpful section on identification challenges that may face the non-entomologist. The photos are fantastic, and the lists of plants to attract bumble bees (by eco-region) are outstanding. Although this part of the book is clearly written for the non-practitioner, for botanists considering getting into pollination and bumble bees it will be a useful introduction to these interesting and important pollinators. As experienced pollination biologists (with one of us having specific expertise on bumble bees) we did learn a few things, such as their evolutionary relationships and the new thinking about species limits.

2. Species Accounts.

The second section includes species descriptions and is the bulk of the book. There is a ton of useful information here; the maps and phenology data are fantastic. Information about nest location and host plants is also quite welcome, and the suggestions of which species to compare and contrast are very helpful. Though we might wish for more ecological detail, we also know it's just not readily available even for these incredibly well-studied bees, so it is a real positive of the book that so much information is collected in one place.

The challenges with this section are several, however. The bees are separated into four artificial groups with a key at the end of the introduction, but these do not map perfectly onto the 9 subgenera from North America (as listed in Table 1), which has no apparent relationship to the grouping and subsequent order of the species accounts. Why not arrange species alphabetically in this section? The listing appears almost random, as the first species account (for *Bombus vosnesenskii*) is for a species in the sixth subgenus listed, and it is the fifth species in the list for subgenus *Pyrobombus*. The utility of the book is greatly compromised by this lack of organization.

There is a list of morphological characters within each species description that could be helpful for identification. But, these characters are idiosyncratic to the key (more on the key later), and without experience with this particular key the lists won't be helpful. As there are no associated diagrams of the microscopic characters, to make the descriptions useful one needs to check the key. But, neither the species account nor the index have the page or couplet number where species are resolved in the key, so it is not possible to do this. A small change that would make the book more user-friendly would be to direct readers to the page or (better) couplet of the key where the species is resolved, as otherwise it's just not clear what the characters in the species account are referring to—this would be great to consider if the book is ever revised. For the hand characters and ecological information, the species we know are done well, however.

A strength of the guide is that it recognizes the variation in color patterns as well as the convergence in pattern; so much of bumble bee ID has traditionally been by color. Unfortunately even with this recognition the species accounts focus on color patterns, using the sort of 'cartoons' that have become typical usage for these authors. But how are these cartoons useful? For one they perpetuate the myth that color forms are useful for ID, given the prominence of the diagrams in the text. And a second issue is that there isn't a diagram explaining them, as one sometimes sees in bird guides. It would have been beneficial if information in the text (e.g. gray = mixed black and yellow hairs) and an explanation of what each quadrant means (e.g. what are the areas on the side of the thorax? are they still visible from the top or is the pleural area meant?) was included somewhere. Coupled with this, of course, is that the described characters in the text rarely actually include the color forms, and all color forms aren't even included.

Other general comments on this section—how would non-practitioners know queens from workers? How

would a non-practitioner manage to pull out the genitalia and make them stay out? What does 'medium' tongue length actually mean? All of these things will limit the utility of the guide for people not already working with bumble bees, despite the benefits of the excellent species-level information provided.

3. Identification keys.

Finally, there is a third section with keys to species. We like that the diagrams were co-located with the relevant couplet, which is hugely helpful. However, photos are poor; they are rather small and so zoomed-in that it is not always obvious what is meant to be illustrated. We believe better orientation to the photos, for both novices and people experienced with other pollinators, would have helped. The light reflection on the photos is especially challenging, in some cases for key features (e.g. 'face length'), where it is difficult to see important sutures to match with specimens. In addition, thin white lines used to illustrate characters get lost in the shine of the light reflection. Basically, even though we are experienced with identification we had trouble figuring out what the photos were meant to draw our attention to. Once we got past these issues, however, we found that someone new to our fauna could reliably key bumble bees to species using this reference.

In our opinion, the key will be quite useful when the fauna of interest includes the majority of the continent. However, non-experts working on local fauna might prefer to use a more regional key. Color patterns could then be used, and there are fewer couplets and less chance of winding up at a species not from the region of interest (as is typical for keys, geographic information is not included within the key itself; more problematic is that there isn't a page reference to the species account, so figuring out whether the species is even a possibility for one's region is cumbersome).

To conclude, our general recommendation is positive, but the book is not for your average botanist. Rather, it will be most useful for those attempting to build a research program including bumblebees, and needing the technical information the book provides. For these more experience pollination biologists, "Bumble Bees of North America" will be a worthwhile addition to a reference library.

Elizabeth Elle and Sandra Gillespie, Department of Biological Sciences, Simon Fraser University

Bee visiting geranium, Thompson Rivers University Campus 2014. ©Tyler Smith CC-SA.

2014 CBA/ABC Awards
The Lawson Medal: Dr. Edward Yeung

First awarded at the 1969 Annual Meeting, the Lawson Medal, the most prestigious award of the CBA/ABC, was established to provide a collective formal expression of the admiration and respect of botanists in Canada for excellence in the contribution of individuals to Canadian Botany. It is named in honor of Dr. George Lawson, who is generally regarded as Canada's first professional botanist. Lawson Medals may be awarded each year in two categories of eligibility:

(A) Recognition of a single outstanding contribution to botanical knowledge

(B) Recognition of cumulative, lifetime contributions to Canadian botany

This year, the Canadian Botanical Association is immensely pleased to award the Lawson Medal Category B to Dr. Edward Yeung of the Department of Biological Sciences of the University of Calgary for the work he performed, among many other things, in plant embryogenesis, and for all the light he shed on the reproductive biology of orchids.

Cette année, j'ai l'immense plaisir de vous annoncer que la Médaille Lawson Catégorie B est décernée au Dr. Edward Yeung pour le travail considérable qu'il a accompli dans les domaines de l'embryologie végétale et de la reproduction des orchidées.

I would like to point out that Dr. Yeung illustrates beautifully George Lawson's memory as he too was an avid botanist and an avid microscopist who believed in the benefits of experimentation and observation. Lawson was also much interested in many groups of plants.

Before delving on the accomplishments of Dr. Yeung, I would like to mention that writing this citation was a very humbling exercise as I discovered that Dr. Yeung is a truly outstanding person. His nomination was supported by no less than 10 letters coming from a wide array of persons (from one of his supervisors to one of his former students) and places (Canada, the US, and also Taiwan). As one of his supporters summarizes, Dr. Yeung has shown himself to be an exceptionally accomplished teacher and graduate supervisor, a prolific scientist, and a fine administrator. As such he has gained the respect and recognition of many of his colleagues nationally and internationally. I will quickly review in this citation Dr. Yeung's feats under the three pillars of academic life: Research, Teaching, and Services.

Dr. Edward Yeung (left), his undergraduate supervisor Dr. Larry Peterson, and Dr. Vipen Sawhney, former CBA president

The Lawson Medal, the most prestigious award of the Canadian botanical Association, was established "to provide a collective, formal expression of the admiration and respect of botanists in Canada for excellence in the contribution of an individual to Canadian botany".

Dr. George Lawson (1827–1895) was born in Scotland. He obtained his Ph.D. from the University of Giessen in Germany in 1857. The following year, he accepted an appointment as Professor of Chemistry and Natural History at Queen's College (now University) in Kingston, Ontario. He was instrumental in the foundation of the Botanical Society of Canada, which met from 1860 until 1862. In 1863 Lawson abruptly left Queen's for Dalhousie. At Dalhousie he was active in the Nova Scotia Institute of Science and was a founding fellow of the Royal Society of Canada. From 1885-1895 he was Secretary of Agriculture for Nova Scotia. In 1891 he helped to establish the Botanical Club of Canada (1891-1910), and was its President until his death.

La Médaille Lawson, le prix le plus prestigieux de l'Association botanique du Canada, fut établi pour «fournir une expression formelle et collective de l'admiration et du respect des botanistes au Canada pour l'excellence de la contribution d'un individu à la botanique canadienne».

Le Dr. George Lawson (1827-1895). Lawson est né en 1827, en Écosse. Il a obtenu son doctorat à l'université de Giessen en Allemagne, en 1857. L'année suivante, il accepta un poste de professeur de chimie et d'histoire naturelle au Collège Queen (maintenant université) à Kingston, Ontario. Il a joué un rôle primordial dans la fondation de la Société botanique du Canada, qui a tenu des rencontres de 1860 à 1862. En 1863, il quitte subitement Queen pour Dalhousie. À Dalhousie, il était actif à l'Institut scientifique de la Nouvelle Écosse et fut un membre fondateur de la Société Royale du Canada. De 1885 à 1895, il fut Secrétaire de l'Agriculture pour la Nouvelle Écosse. En 1891, il a aidé à établir le Club Botanique du Canada (1891-1910), et en a assuré la présidence jusqu'en 1895.

2014 CBA/ABC Awards
The Lawson Medal: Dr. Edward Yeung

Research

Dr. Yeung's scientific career began in 1969, and as one would say in French elle a démarré "sur les chapeaux de roues" (that is he got off to a flying start). During his undergraduate years, Ed wrote no less than 6 papers with his supervisor Larry Peterson. As one of the Award Committee members wrote, this may be a record for Botany in Canada. Dr. Yeung did not rest on his laurels as he went to publish more than 150 other papers on an incredibly large range of topics, from the aerial root cap structure of the orchid *Epidendrum*, to the culture of radiata pine in vitro, to the seed detachment of wild oats, to techniques of serial sectioning for a Historesin; and this covers only references 12 to 34. I knew Dr. Yeung for his work on plant hormones, but was surprised to learn that he had been a co-author on a paper on *Rhizobium*!

The researchers who wrote letters of support for this nomination all acknowledge that Dr. Yeung's publications are of the utmost quality, nothing short of impressive. One supporter notes that his anatomical photographic plates are typically as beautiful and elegant as they are informative, and thus are very pleasing to the readers' eyes. He is known as an accomplished experimentalist because of his creative mind, high standards of performance, and tenacity to develop methodologies for advancement in the field; and also because of his integrative approach and imaginative and efficient use of many technologies (molecular biology, biochemistry, plant hormone analysis, genetics, etc...) to address specific biological questions.

Maybe more remarkable than his list of publications in this day and age of granting uncertainty is the fact that Ed has been funded by NSERC continuously from 1979 (actually up to 2017), with a total of $1.27 million in awards. His expertise is sought-after, as demonstrated by his close scientific link to Japan, with several research awards over the years, and by his prestigious Honorary Professorship at the University of Hong-Kong.

Teaching

Dr. Yeung has always shown a tremendous commitment to teaching at both the undergraduate and the graduate levels. He truly cares for the success of his students and many of his students are now professors themselves. Dr. Yeung's training does not stop when the students leave his lab, but as any good mentor, he continues to give them advice and words of encouragement during their scientific careers. One of his supporters mentioned that the graduate students coming from his lab are of very high quality, and that these students speak highly of Ed's guidance and supervision. Dr. Yeung is known to ask excellence and the finest quality of work from his students, but in return he has earned their highest respect for his unfailing support. Dr. Yeung received in 2002 a Teaching Award from the Faculty of Science of the University of Calgary.

Services

Dr. Yeung has proved himself to be a talented, willing, and efficient force on many committees as he has taken any task very seriously. His services include serving as a Chair of the Gold Medal Award Committee of the Canadian Society of Plant Physiologists, and as a Director of our Association. He has also served as a member of one of the NSERC Grant Selection committees. He has sat on many Editorial Boards and as mentioned in one of his letter of support he is recognized as a "way above average" peer-reviewer for his fast but thorough analysis of manuscripts, for his breadth of expertise on botany, and for the objective and helpful assessment he offers. He always assists authors by clearly pointing out weaknesses in approaches or in data supplied. In his service work, Dr. Yeung has demonstrated a high level of dedication to the field of Botany and Anatomy and as such he has continuously helped to promote Plant Sciences in Canada and internationally.

I would like to close this citation by bringing up Dr. Yeung's humanity and generosity. Not only does he not count his time: his office door is known to be always open so that students can stop by at any time to ask for clarifications, he is also known for never refusing to peer-review a manuscript, but he also does not count his advice that he offers to any students, his own as well as those of others: this was mentioned several times in the supporting letters. With Dr. Yeung's permission, I would like to mention two of these advices because they will likely be useful to young researchers in this room: 1). When discussing the difficulties of obtaining funds to support anatomy-related projects with one of his young colleagues, Dr. Yeung commented that the only things needed to answer scientific questions were some plant material and razor blades; and 2). For Dr. Yeung, the secret to a good career is to do many things at once. As he is known to have said: "One is happily surprised to discover which lines of inquiry are successful in 5 or 10 years' time. It is never predictable, and it does keep one fresh."

I am extremely honored this evening to offer Dr. Yeung the prestigious Lawson Medal as he truly embodies the spirit of the award. Congratulations on your impressive career, Ed!

2014 CBA/ABC Awards
The Lawson Medal: Past Recipients

2013 Yolande Dalpe, Agriculture Canada, Ottawa
2012 Paul Catling, Agriculture Canada, Ottawa
2011 Carol Peterson, Larry Peterson and Lewis Melville
2010 Paul B. Cavers, University of Western Ontario
2009 Nancy G. Dengler, University of Toronto
2008 Vipen Sawhney, University of Saskatchewan
2007 Scott Redhead, Agriculture Canada, Ottawa
2006 Gerald A. Mulligan, Agriculture Canada, Ottawa
2006 Spencer C. H. Barrett, University of Toronto
2005 Denis Barabé, University of Montreal
2004 C.C. Chinnappa, University of Calgary
2003 Irwin Brodo, Canadian Museum of Nature
2002 Nancy Turner, University of Victoria
2001 Bryce Kendrick, University of Waterloo
2000 David Richardson, St. Mary's University
1999 André Fortin, Université de Montréal
1998 Kathleen Cole, University of British Columbia
1997 Bill Cody, Agriculture Canada, Ottawa
1997 Anward Maun, University of Western Ontario
1996 Margaret McCully, Carleton University
1995 T. R. Nag Raj, University of Waterloo
1995 Ernie Small, Agriculture Canada, Ottawa
1994 Richard I. Greyson, University of Western Ontario
1994 George L. Barron, University of Guelph
1993 R. Larry Peterson, University of Guelph
1992 Paul A. Keddy, University of Ottawa
1992 Jack L. McLachlan, NRC Halifax
1991 George F. Argus, Canadian Museum of Nature
1991 Donald M. Britton, University of Guelph
1990 Robert J. Bandoni
1989 William F. Grant
1988 Paul R. Gorham
1987 Clayton O. Person
1986 Wilfred B. Schofield
1986 Pierre Dansereau
1985 James C. Ritchie
1984 E. C. Pielou
1983 Thomas C. Hutchinson
1982 Leslie Laking
1981 Stanley J. Hughes
1980 No Medal Awarded
1979 Bernard A. Baum
1979 Ibra Lockwood Connors
1978 R. Darnley Gibbs
1978 Taylor A. Steeves
1977 Harold J. Brodie
1976 Douglas B. O. Savile
1975 Roy F. Cain
1974 Rolf Sattler
1974 John G. Coulson
1973 Marvin William Bannan
1973 Clarence Frankton
1972 Mildred Noble
1972 Vladimir Krajina
1971 Job Kujit
1971 Erling Porsild
1970 Rollo Otho Earl
1969 Jacques Rousseau

Recipients of the Lawson Medal (from left): Denis Barabé (2005), Irwin Brodo (2003), C.C. Chinnappa (2004), Edward Yeung (2014), Larry Peterson (2011), Nancy Dengler (2009), Vipen Sawhney (2008), Yolande Dalpe (2013).

Edward Yeung, 2014 Recipient of the Lawson Medal

2014 CBA/ABC Awards
The Mary E. Elliott Service Award: Dr. Jane Young

Mary E. Elliott Service Award
Dr. Jane Young

The Mary Elliott Service Award is given to an individual for meritorious service to the CBA/ABC. It was first awarded in 1978 in memory of Mary E. Elliott. Before her untimely death in 1976, she had just completed four consecutive years of service on the Board of Directors (as Secretary, President-Elect and President), and was just beginning her term as Past President. Mary Elliott was a plant pathologist and mycologist who spent 28 years with Agriculture Canada at the Central Experimental Farm in Ottawa. She was well known for her work on the taxonomy and biology of the Sclerotiniaceae. In 1975, she became Curator of the National Mycological Herbarium.

This year, the Canadian Botanical Association is delighted to present the Mary Elliott award to Dr. Jane Young, Assistant-Professor in the Department of Biology at The University of Northern British Columbia, for her numerous contributions to the Association in many different roles. Jane has served as Chair of the Plant Development Section from 2007 to 2009, is an active Member of the Teaching Section, and has been the Treasurer from 2008 to today.

Il est donc mon privilège de vous annoncer que le lauréat 2014 du prix Elliott est Docteur Jane Young, Professeur-Assistant dans le Département de Biologie de l'Université du Nord de la Colombie-Britannique pour ses nombreuses contributions à l'Association. Jane a été Présidente de la Section du Développement des Plantes, est un membre actif de la Section Enseignement, et a été Trésorière de 2008 à aujourd'hui.

Dr. Jane Young (left) with Dr. Hugues Massicotte, Co-Chair of the Mycology section and CBA photographer

Dr. Young has been a quiet but major contributor to the Association over the past several years and as one of the supporters mentioned her service to the Association clearly reflects the spirit of the contributions made by Mary Elliott herself. First and foremost, she has proven to be an excellent Treasurer. One of her supporters mentioned that being a treasurer implies numerous hours of tedious work and Jane has never counted her time to strengthen the CBA's finances. The Treasurer's job is extremely demanding and requires special skills.

This award, named in memory of Mary E. Elliott, recognizes the meritorious service of an individual to the CBA/ABC.

Mary Elizabeth Elliott (1923-1976) was a plant pathologist and mycologist who spent 28 years with Agriculture and Agri-Food Canada Ottawa first as student, then research technician and research scientist. Well-known for her work on the taxonomy and physiology of the Sclerotiniaceae, she was also knowledgeable in the identification of mushrooms, a service she offered regularly to the public. In 1975, she became Curator of the National Mycological Herbarium (DAOM). An active member of several mycology and phytopathology societies, she was successively Secretary (1972), Vice-President (1974) and President (1975) of CBA/ABC. She was just at the beginning her term as Past President at the time of her death.

Ce prix, nommé en mémoire de Mary E. Elliott, souligne le dévouement d'un individu envers l'ABC/CBA.

Mary Elliott (1923-1976), pathologiste végétale et mycologue, a œuvré 28 ans à Agriculture et agroalimentaire Canada, Ottawa, d'abord comme étudiante, puis technicienne de recherche et chercheure scientifique. Reconnue principalement pour ses travaux en taxonomie et physiologie des Sclérotiniacées, sa connaissance des champignons toxiques et comestibles en faisait également la personne ressource pour l'identification de champignons auprès du public. En 1975, elle devint curatrice de l'Herbier national de mycologie (DAOM). Membre active de nombreuses sociétés mycologiques et phytopathologiques, elle fut successivement secrétaire (1972), vice-présidente (1974) et présidente (1975) de l'ABC. Elle débutait son mandat de présidente sortante au moment de son décès.

2014 CBA/ABC Awards
The Mary E. Elliott Service Award: Dr. Jane Young

As such, Jane has demonstrated excellent financial savviness and amazing team work. She has organized the reimbursements for countless speakers, awardees and students over the years, and she has done all of this with great patience, diligence, humility and integrity.

Furthermore, Dr. Young has always exhibited a great dedication to the students of the Association. She has participated actively to the Teaching section, and has presented at Teaching symposia some of the works she has accomplished with her students in her class. She has volunteered enthusiastically many times to judge student posters and student paper awards, a task one of her supporters mentioned she enjoys. She was the person behind the inclusion of Graduate Student Profiles in the Bulletin, whereby students write short summaries of their research topics. In the opinion of many members, myself included, this has been a valuable addition as it has brought graduate students into close contact with the members and has resulted in increased enthusiasm amongst out student members.

In all the letters I received, supporters have highlighted Jane's competence, patience, her evident commitment to everyone she works with, and her pleasant and friendly demeanor. As President, I can attest that Jane possesses all these qualities. It has truly been a delight to work with her and her partner in crime, Vanda Wutzke.

Felicitations Jane and thank you for all the work you have done for us and the Association!

An Undergraduate Perspective
The "Algals" in Montreal

Walking into the 50th annual Canadian Botanical Conference as undergraduates, the first word that came to mind was daunting. We, both undergraduate students from St. Francis Xavier University, have been conducting research for 3 years, and it was time to finally showcase our work. It was definitely nerve-wracking to present our research alongside the high caliber presenters, mainly working on their Masters or PhD degrees.

However, once we arrived, it became much less about our individual presentations, and instead about the amazing interactions and social events planned by the CBA. It only took a stroll around the beautiful, serene Botanical Gardens to calm our nerves. Coming from a primarily phycological research background, listening to other talks gave us an appreciation for the diversity of plant biology. The conference was an excellent opportunity for networking, as we both plan to pursue graduate studies in the following year. We have been, and will continue to encourage our peers to attend conferences and gain these valuable experiences.

Ultimately, the conference was a huge success and made the 14 hour drive back to Nova Scotia much more enjoyable.

-The Algals, Sara Gitto and Laryssa Halat, St. Francis Xavier University, Antigonish, Nova Scotia.

Biology Honours students Laryssa Halat and Sara Gitto both gave oral presentations at the 50th Annual Meeting of the Canadian Botanical Association (CBA), held at the Montreal Botanical Garden. Laryssa was awarded the Lionel Cinq-Mars award for the best oral presentation. Both students are conducting research on rockweed (*Ascophyllum nodosum*), a commercially harvested brown seaweed, under the supervision of Dr. David Garbary. This win followed Ms. Halat's second place prize for her oral presentation at the Science Atlantic Aquaculture & Fisheries and Biology Conference held at Mount Saint Vincent University in March 2014.

-Moira Galway, co-supervisor for L. Halat, St. Francis Xavier University.

2014 CBA/ABC Awards
Porsild-Consaul Award

This award, named in memory of the eminent botanists Alf Erling Porsild (1901-1977) and Laurie Consaul (1960-2012), recognizes the best paper in systematics and phytogeography published by a student in the year preceding the CBA/ABC annual meeting.

Dr. Porsild was born in Copenhagen, and worked at the Danish biological research station in Godhavn (Greenland), before coming to Canada to pursue his remarkable taxonomic and biogeographic work in the Northwest Territories. He was Curator (1936-1945) and Chief Botanist (1946-1967) of the National Museum of Canada.

Originally known as the "Alf Erling Porsild Award", this prize was renamed in 2013, to also commemorate the widely respected and loved Dr. Laurie Consaul. After 22 years as Botany Research Assistant at the Canadian Museum of Nature, she passed away before being able to begin the next stage of her inspiring career, as Assistant Professor in the Biology Department at Memorial University.

2014 Recipient: Claire Gilmour

C.N. Gilmour, J. R. Starr and R. F. C. Naczi. 2013. *Calliscirpus*, a new genus for two narrow endemics of the California Floristic Province, *C. criniger* and *C. brachythrix* sp. nov. (Cyperaceae). Kew Bulletin 68: 85-105

Ce prix, nommé nommé en mémoire de deux éminents botanistes, Alf Erling Porsild (1901-1977) et Laurie Consaul (1960-2012), récompense le meilleur article en systématique et taxonomie publié par un étudiant durant l'année precedent le congrès annuel de l'ABC/CBA.

Le Dr Porsild est né à Copenhague, et a travaillé dans une station de biologie danoise à Godhavn (Groenland), avant de venir au Canada poursuivre son remarquable travail de taxonomie et de biogeography dans les Territories du Nord-West. Il a été conservateur (1936-1945) et botaniste en chef (1946-1967) au Musée National du Canada.

À l'origine connu sous le nom de «Prix Alf Erling Porsild» la nom a été change, en 2013, pour commémorer aussi la respectée et appréciée Dr Laurie Consaul. Après avoir travaillé 22 ans comme assistance de recherché en botanique, au Musée Canadien de la Nature, elle nous quitta, avant de commencer une autre étape de sa carrière inspirante, comme professeur adjoint au Département de biologie de la Memorial University.

Consaul Northern Research Award

This award, named in memory of Laurie Consaul supports undergraduate or graduate students doing field research in Botany in the northern regions of Canada.

Laurie Consaul (1960-2012) was an internationally recognized plant systematist, and an expert in Arctic plants. During her 22 year career as Research Assistant in the Botany section at the Canadian Museum of Nature, she spent many summers undertaking botanical fieldwork in the Canadian Arctic. Laurie obtained her PhD in 2008 with her research focused on the systematics of Canadian Arctic Puccinellia. In 2011 Laurie accepted a position as Assistant Professor in the Biology Department at Memorial University, St. John's, Newfoundland and Labrador. Just prior to moving to St. John's, Laurie became ill and she lost her battle with cancer on December 18, 2012.

2014 Recipient: Maxime Tremblay, Melanie Jean

See Maxime's research report in the previous Bulletin, and Melanie's report in this issue:

Tremblay, M. 2014. Studying vegetation ecology in the Arctic. CBA/ABC Bulletin 47(2): 47-48.

Jean, M. 2014. Studying vegetation ecology in the last frontier. CBA/ABC Bulletin 47(3):XX-XX

2014 CBA/ABC Awards
Rowe Award

This award, named in memory of John Stanley Rowe, recognizes the best scientific paper recently published by a student in the field of Ecology or Conservation.

John Stanley Rowe was a botanist and ecologist (1918-2004). He worked as a forest labourer and school teacher in British Columbia, and then as a research officer on the Prairies with the federal Department of Forestry from 1948 to 1967, when he became professor of plant ecology at the University of Saskatchewan. In his work on the ecology of the boreal forest, tundra and peatlands, Rowe insisted on long-term conceptual approaches to issues related to natural resources His treatise, Forest Regions of Canada (1959, 1972) is a key reference for foresters, biologists and land managers. He also wrote two popular books, *Home Place: Essays on Ecology* (1990) and *Earth Alive: Essays on Ecology* (2006).

2014 Recipient: Andrew Trant

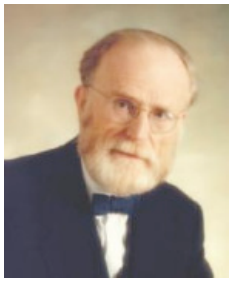
Trant, A.J. and Hermanutz, L. 2014. Advancing toward novel tree lines: a multispecies approach to tree line dynamics in the subarctic alpine Labrador. Journal of Biogeography 41: 1115-1125.

Ce prix, nommé en mémoire de John Stanley Rowe, récompense le meilleur article scientifique publié récemment par un étudiant dans le domaine de l'écologie ou de la conservation.

John Stanley Rowe fut un botaniste et écologiste (1918-2004). Il travailla d'abord comme forestier et enseignant en Colombie Britannique, puis comme chercheur sur les prairies pour le département fédéral des forêts de 1948 à 1967. C'est alors qu'il devient professeur en écologie végétale à l'Université de la Saskatchewan. Au cours de ses recherches sur l'écologie de la forêt boréale, la toundra et les tourbières, Rowe insista sur l'importance d'une approche à long terme en ce qui concerne les enjeux liés aux ressources naturelles. Son traité «Les régions forestières du Canada» (1959, 1972) est une référence clé pour les forestiers, les biologistes et les gestionnaires. Il a aussi publié deux livres scientifiques pour le grand public. Home Place: Essays on Ecology (1990) and Earth Alive: Essays on Ecology (2006).

The Mt. St. Hilaire field trip at the CBA Congress in Montreal ©Moira Galway

2014 CBA/ABC Awards
Taylor Steeves Award



This award, named in memory of Taylor A. Steeves, recognizes the best scientific article published by a student in the field of plant structure and development.

Professor Taylor Steeves (1926-2011) was a plant morphologist, anatomist and developmental botanist. He was a faculty member at Harvard University from 1954 to 1959, and then joined the University of Saskatchewan in Saskatoon where he was Professor, Department Head, and retired in 1994. Prof. Steeves worked exte nsively in the areas of shoot development and vascular tissue differentiation. He was a co-author of two textbooks on Botany and Plant Development, and was Editor of Botanical Gazette (now International Journal of Plant Sciences) and Canadian Journal of Botany (now Botany). Prof. Steeves was a Founding member of CBA/ABC, served as its President, and received the Mary E. Elliott award and the Lawson Medal from CBA/ABC. He was a Fellow of the Royal Society of Canada.

2014 Recipient: Erin Zimmerman

Zimmerman, E., Prenner, G. and A. Bruneau (2013). Floral ontogeny in Dialiinae s.l. (Caesalpinioideae: Cassieae), a study in organ loss and instability. South African Journal of Botany. 89: 188-209.

Ce prix, nommé en mémoire de Taylor Steeves, récompense le meilleur article scientifique publié par un étudiant dans le domaine de la structure et du développement des plantes.

Le professeur Taylor Steeves (1926-2011) est un spécialiste de la morphologie, de l'anatomie et du développement des plantes. Il travailla d'abord à l'Université Harvard de 1954 à 1959, avant de devenir professeur à l'Université de Saskatchewan (Sakatoon), où il prit sa retraite en 1994. Le professeur Steeves s'est intéressé particulièrement au développement de la tige et à la différentiation des tissues. Il est co-auteur de deux manuels importants en botanique (Botany and Plant Development). Il fut directeur des revues Botanical Gazette (aujourd'hui International Journal of plant Sciences) et Canadian Journal of Botany (aujourd'hui Botany). Le Prof. Steeves est un membre fondateur de la CBA/ABC dont il fut président. Il a reçu le prix Mary E. Elliott et la médaille Lawson, décernés par la CBA/ABC. Il fut aussi élu membre de la Société Royale du Canada.

2014 CBA/ABC Awards
Weresub Award

This award, named in memory of Luella K. Weresub, recognizes the best paper in mycology published by a student in the year preceding the CBA/ABC annual meeting.

Luella Kayla Weresub (1918-1979), mycologist renowned for her works on resupinate hymenomycetes, pursued her career as a research scientist at Agriculture and Agri-Food Canada Ottawa from 1957 to 1979 after three years as professor at the University of Manitoba Winnipeg. Her mastery of the International Code of Botanical Nomenclature, especially fungal nomenclature of pleomorphic fungi, led her to serve as an expert on committees such as the International Association for Plant Taxonomy's Nomenclature and the International Mycological Associations' Nomenclature. Her entire career was devoted to the study of pleomorphic fungi, mainly Ascomycetes, for which she applied the anamorph-teleomorph concept in a bio-geographical and taxonomic context. An active member of CBA/ABC, she served on the board of directors from 1971 to 1973.

2014 Recipients: Agathe Vialle and Hai Nguyen

Vialle A, Feau N, Frey P, Bernier L, and Hamelin RC. 2013. Phylogenetic species recognition reveals host-specific lineages among poplar rust fungi. Mol Phylogenet Evol. 66: 628-44

Nguyen, H. Nickerson, N. L. and Seifert, K.A. 2013. Basidioascus and Geminibasidium: a new lineage of heat resistant and xerotolerant basidiomycetes. Mycologia 105: 1231-1250

Ce prix, en mémoire de Luella K. Weresub, récompense le meilleur article en mycologie publié par un étudiant durant l'année précédant le congrès annuel de l'ABC/CBA.

Luella Kayla Weresub (1918-1979) est une mycologue renommée pour ses travaux sur les hyménomycètes résupinés. Elle fit carrière comme chercheure scientifique à Agriculture et agroalimentaire Canada (Ottawa), de 1957 à 1979, après trois années comme professeure à l'Université du Manitoba (Winnipeg). Sa maîtrise du Code international de nomenclature botanique et plus précisément de la nomenclature fongique l'amène à siéger en tant qu'experte sur les comités de l'Association Internationale de nomenclature botanique et de l'Association internationale de nomenclature mycologique. Ses recherches portèrent exclusivement sur la taxonomie et l'étude du pléiomorphisme fongique, notamment des Ascomycètes pour lesquels elle applique son concept d'anamorphes-téléomorphes dans un contexte biogéographique et taxonomique. Membre active de l'ABC/CBA, elle fut directrice de 1971 à 1973.

2014 CBA/ABC Awards
Cinq-Mars Award

This award, named in memory of Lionel Cinq-Mars, recognizes the best oral presentation by a student at the Canadian Botanical Association annual meeting.

Lionel Cinq-Mars (1919-1973) was a phytopathologist, botanist and naturalist. He worked as a phytopathologist for the Federal Department of Agriculture for many years (1948-62). In 1962, he was appointed Professor of Botany in the Faculty of Agriculture at Laval University. He immediately became responsible for the reorganization of the herbarium, which was officially established as the Louis-Marie Herbarium in 1968. His research focused particularly on the systematics of the genera Viola and Amelanchier. He published numerous scientific articles throughout his career, and founded Provancheria, a Quebec publication devoted to systematic botany. He was a member of the first executive committee of the CBA (1965-66). An ecological reserve near Quebec City was named in his honor, the Réserve écologique Lionel-Cinq-Mars.

2014 Recipients:

Laryssa Halat

Carinna Gutierrez-Flores

Ce prix, nommé en mémoire de Lionel Cinq-Mars, récompense la meilleure présentation orale par un étudiant lors du congrès annuel de l'Association botanique du Canada.

Lionel Cinq-Mars (1919-1973) est un phytopathologiste, botaniste et naturaliste. Il a travaillé pendant plusieurs années (1948-62) comme phytopathologiste pour le Département Fédéral de l'Agriculture. En 1962, il devint professeur agrégé à la Faculté d'agriculture de l'Université Laval; il s'activa dès lors à la réorganisation d'un herbier qui devint, en 1968, l'Herbier Louis-Marie. Il s'intéressa particulièrement à la systématique des genres Viola et Amelanchier. Il publia de nombreux articles scientifiques tout au long de sa carrière et fonda Provancheria, une publication québécoise de botanique systématique. Il fut membre du premier comité exécutif (1965-66) de l'Association. Une réserve écologique, située près de la ville de Québec, fut nommée en son honneur, la Réserve écologique Lionel-Cinq-Mars.

CBA President John Markham presenting Carinna Gutierrez-Flores (left) and Laryssa Harat with the Cinq-Mars Awards

2014 CBA/ABC Awards
Iain and Sylvia Taylor Award

This award, named in honor of Iain and Sylvia Taylor, recognizes the best poster presented by a student at the Canadian Botanical Association annual meeting.

Iain and Sylvia met at the University of Liverpool. Both taught in high schools in England until Iain went to the University of Texas in 1967. Sylvia joined him later that year. Iain joined University of British Colombia in 1968, while Sylvia was a Research Technician at the UBC Botanical Garden from 1969. Both have been active in CBA/ABC since 1969 (Iain) and 1972 (Sylvia). Both have an overriding interest in students and student achievements. Iain served as Director, Secretary and President of CBA/ABC, while Sylvia served as Bulletin Editor and Secretary. Iain was also Associate Editor and Editor-in-Chief of Canadian Journal of Botany, and Assistant Editor-in-Chief of NRC Journals. Iain looks for clear concise statements, while Sylvia looks at clear presentation of posters.

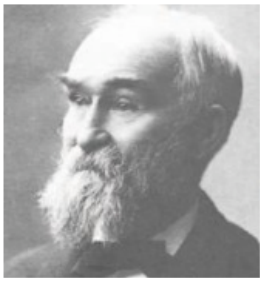
2014 Recipient: Courtney Clayson

Ce prix, nommé en l'honneur de Iain et Sylvia Taylor, récompense la meilleure affiche présentée par un étudiant lors du congrès annuel de l'Association botanique du Canada.

Iain et Sylvia se sont rencontrés à l'Université de Liverpool. Les deux enseignaient dans des écoles secondaires en Angleterre, jusqu'à ce que Iain aille à l'Université du Texas en 1967. Sylvia le rejoignit l'année suivante. Iain fut engagé à l'université de Colombie Britanique en 1968, alors que Sylvia devint technicienne de recherche au Jardin botanique de l'université en 1969. Ils sont actifs dans l'ABC respectivement depuis 1969 (Iain) et 1972 (Sylvia). Ils partagent un immense interêt pour les étudiants et leurs réalisations. Iain a déjà été directeur, secrétaire et président de la CBA/ABC, alors que Sylvia en fut secrétaire et directrice du bulletin de l'association. Iain fut aussi rédacteur associé et rédacteur en chef du Canadian Journal of Botany, de même que assistant-rédacteur en chef des revues du NRC. Dans les affiches, Iain regarde particulièrement la concision des énoncés alors que Sylvia s'intéresse à la clarté de l'ensemble de la présentation.

Left to right: Christopher Deduke, Dustin Sigurdson (Winterhalder), Catherine Weiner (Winterhalder), Courtney Clayson (Taylor), Iain Taylor, Syvlia Taylor, Christine Maxwell

2014 CBA/ABC Awards
Macoun Travel Bursary



The John Macoun Travel Bursary provides financial assistance to a student presenting a paper or a poster at the annual meeting of the CBA/ABC.

An explorer and naturalist, John Macoun (1831-1920) was actively involved in the development of the Canadian Northwest. From 1868 to 1879, he was a professor of natural history at Albert College in Belleville, Ontario. The year following his departure, he accepted a position at the Ministry of the Interior. In 1881, he was appointed Botanist to the Geological and Natural History Survey of Canada. A passionate botanist, he contributed over 100,000 specimens to the herbarium of the National Museum of Canada. In 1882, he published the volume Manitoba and the Great North-West, in which he wrote enthusiastically about the agricultural potential of the Prairies. He was a founding fellow of the Royal Society of Canada. More than 50 plant and animal species have been named in his honor.

2014 Recipients:

Ibrahim Abouelsaaf
Adrian Dauphinee
Behrang Behdarvandi
Denver Falconer
Kirsten Kilde

La bourse de voyage John Macoun fournit de l'aide financière à un étudiant présentant une communication orale ou une affiche à un congrès annuel de l'ABC.

John Macoun (1831-1920) est un explorateur et naturaliste qui a fortement soutenu le développement du Nord-Ouest canadien. De 1868 à 1879, il fut professeur d'histoire naturelle au Albert College de Belleville, en Ontario. L'année de son départ, il accepta un poste au Ministère de l'intérieur avant d'être nommé, en 1881, botaniste à la Commission géologique et d'histoire naturelle du Canada. Botaniste passionné, il enrichit l'herbier du Museum national du Canada de près de 100,000 spécimens. En 1882, il publia Manitoba and the Great North-West dans lequel il fait l'éloge des possibilités agricoles des Prairies. Il fut l'un des membres fondateurs de la Société Royale du Canada. Près de 50 espèces de plantes et animaux ont été nommées en son honneur.

Behrang Behdarvandi, Denver Falconer and Kirsten Kilde receiving the Macoun Award from CBA Past-President Frédérique Guinel

2014 CBA/ABC Awards
Winterhalder Travel Bursary

This bursary, named in memory of Keith Winterhalder, is given to individuals presenting their undergraduate research project completed in a Canadian university at the upcoming annual meeting of the CBA/ABC.

Keith Winterhalder (1935-2005) studied plant ecology at the University of Wales and the University of New England (Australia, MSc 1970). In 1965 (retired 1999), he became professor at Laurentian University and curator of the university's herbarium. His research centred on the ecology of nutrient-poor soils and the restoration of contaminated sites. He relentlessly collected plant specimens in northern Ontario, on Manitoulin Island and in other parts of the world. He helped fund the Canadian Land Reclamation Association, the American Society for Surface Mining and Reclamation and the Society for Ecological Restoration. He was President of the Canadian Botanical Association and the Canadian Land Reclamation Association. He received the Canadian Parks Service Heritage Award and the Noranda Mines Land Reclamation Award.

2014 Recipients:
Dustin Sigurdson
Catherine Weiner
Francesco Janzen

Cette bourse, nommée en mémoire de Keith Winterhalder, est décerné à des personnes présentant leurs projets de recherche de premier cycle, réalisé dans une université canadienne, lors de la prochaine réunion annuelle de l'ABC/CBA.

Keith Winterhalder (1935-2005) étudia l'écologie végétale aux Universités de Wales et de la Nouvelle Angleterre (Australie, MSC 1970). En 1965 (retraité en 1999), il devient professeur à l'Université Laurentienne et le conservateur de l'herbier. Sa recherche porta sur l'écologie des sols pauvres et la réhabilitation des sites contaminés. Il récolta de nombreux spécimens végétaux dans le nord de l'Ontario, sur l'Ile Manitoulin et dans d'autres régions du monde. Il aida à fonder l'Association canadienne de la réhabilitation des terres, l'American Society for Surface Mining and Reclamation et la Society for Ecological Restoration. Il fut président de l'Association de botanique du Canada et de l'Association canadienne de la réhabilitation des terres. Il reçut le Prix du patrimoine du Service des parcs du Canada et le prix Noranda de la réhabilitation des terres minières.

Dustin Sigurdson, Catherine Weiner and Francesco Janzen receiving the Winterhalder Award from CBA Past-President Frédérique Guinel

"Martian" Botany in the American Southwest: plant collecting at the Mars Desert Research Station

Paul C. Sokoloff – Research Assistant, Canadian Museum of Nature.

Every botanist has a story about challenging collecting trips. Maybe you've had to dangle off a cliff-face to grab that one elusive fern. Or maybe you've been collecting lichens in the rain, hammer and chisel shaking under shivering gloved hands. Wild animals eating your study species? I feel your pain. In fact, I've lived many of those scenarios. The things we do for science (and our herbaria!). Still, I don't think I found any previous field experience quite as challenging as collecting plants in the middle of the southern Utah desert while wearing a simulated space suit. If you could have been there, seeing me struggle to grasp stems using ineffectual gloved hands, helmet perpetually fogging with condensation, you may have wondered to yourself: what exactly is a botanist doing on "Mars"?

Since long before I knew I wanted to work with plants, I have been utterly fascinated by space. Not sure if that was due to the amazing night skies you can see in many parts of Canada, or because I'm at just the right age to have caught Star Trek: The Next Generation in syndication during my formative years. In either case, when I saw a call for applicants for a yearlong simulated mission to Mars taking place on Devon Island, Nunavut, I jumped at the chance to apply. Wouldn't you?

Nearly three hundred applicants, two rounds of cuts for aspiring simulation-astronaut candidates, and one year later, I found myself pulling up to the Mars Desert Research Station as one of the 19 finalists for the Mars Society's Mars Arctic 365 mission. To test our fitness for the yearlong Arctic mission, each finalist had been assigned to a two-week rotation alongside five or six other finalists at MDRS, situated in the Mars-red sandstone foothills of Utah's Henry Mountains. The three groups would compete for the yearlong mission through demonstrating capacity, teamwork, and original research during the rotation – may the best team of simulated astronauts win!

So that's how I found myself assigned the position of crew biologist on MDRS crew 143. Our international crew: three Canadians, one Frenchman, one Russian, and one American, had only met the night before, and were just starting to get to know each other as we entered "sim".

An astronaut exploring the flora of San Rafael Swell

Paul Sokoloff suited-up for extra-vehicular activity at the Mars Desert Research Station

"Sim" is short for simulation, and is the overriding philosophy behind all activities at MDRS and the society's High Arctic research station on Devon Island – FMARS. In fact, the location of these two stations was selected with sim in mind. Analog research like this is best conducted in extreme conditions; the closer to Mars' cold deserts the better, so the high UV, low temperatures, and paucity of water at both locations reinforce and add fidelity to the simulation. Practically, sim is what allows research crews to collect data and develop techniques that would be useful to future Martian explorers. If we cheated on the rules of the simulation and removed our helmet when the going got tough, we would lose the opportunity to learn how future Martians would overcome difficulties in an environment where removing your suit mean certain death. In short, sim is the dress rehearsal for future missions to Mars.

This translated into a living and working conditions straight out of some of NASA's most ambitious mission designs. For instance, the Habitat (hab for short), a squat two-story white cylinder with a design lineage clearly straight out of NASA, is constructed to Martian specifications, complete with airlocks, a workshop/lab, a dining area and crew bunks—all within a shell eight metres in diameter – just the right size to be transported on a rocket!

Each day all of our activities were carefully planned –everything from hab water use (cooking, showering,

Endolithic cyanobacteria collected at the MDRS

flushing the toilet), to our science and engineering projects. Mission control had the final say in all hab activities, and we could only communicate with them during a two hour window each night (after all, communications with Earth would be delayed at the best of times, and blocked when Earth and Mars are opposite the sun from each other). Each "extra-vehicular activity" (EVA), was limited in both number of crew members permitted outside and distance from the hab – ATV fuel would be limited on Mars after all. Most importantly, we had to wear simulated spacesuits, simulating fieldwork in the encumbering gear that would sustain actual Martian astronauts. Each walk was a treat to savour though, time outside was strictly limited. Mars' conspicuously missing magnetosphere means that surface time equals high radiation exposure for surface crew—so we kept an artificially imposed rem limit in keeping with "sim".

Add all these factors together, and I had 5 precious EVAs in which I could complete my research project: to complete a floristic inventory of MDRS (surprise, surprise). Happily, given the restrictions of the simulation, our crew made 68 collections from the site, including 46 vascular plants, 18 lichens, 4 endolithic cyanobacteria, and one fungus. Keeping in mind that any comprehensive overview of the species present here will require multiple focussed collecting trips during the spring, summer, and fall, this collection will be identified and used to draft a preliminary species list for MDRS, treating the vascular plants, lichens, and cyanobacteria that would be most commonly encountered by crews.

While the vascular plant flora was gradually dying off in the buildup to Utah's brief winter, we were able to collect many species characteristic of the "desert salt shrub community" of the San Rafael Swell, where the hab is located (Harris 1983). Typical species included *Opuntia polyacantha*, *Opuntia basilaris*, *Chrysothamnus nauseosus*, *Atriplex confertifolia*, *Halogeton glomeratus*, and many species of *Astragalus* – with the highest local diversity contained within the Asteraceae, Polygonaceae, Chenopodiaceae, and Poaceae. These specimens, along with the lichens, cyanobacteria, and fungi, will be deposited at the National Herbarium of Canada (CAN), and the Intermountain Herbarium in Utah (USU), marking some of the first "Martian" flora to be deposited at these institutions.

Regardless of how well each of our research projects are going, extended space missions owe much more to a thorough understanding of the psychology of isolation than to simply the technology of getting us there. The MA365 finalist crew best able to cope with two weeks of intense close quarters is likely best suited for a year in the Arctic, regardless of their other qualifications. I'm happy to report that our crew worked together beautifully. We first met just before arrived at MDRS, but something about throwing a bunch of highly motivated individuals into an isolated hab, while on a simulated space mission, has a way of turning out a batch of very fast friends. If we are selected to participate in MA365, our entire crew will be ready, willing, and able to undertake this next step toward getting humanity to the red planet. Tagalong botanists included.

Reference Cited

Harris, JG. 1983. A vascular flora of the San Rafael Swell, Utah. Western North American Naturalist, 43: 79-87.

Acknowledments

I would like to thank the Mars Society and its dedicated team, particularly Dr. Robert Zubrin, Shannon Rupert, Chuck Killian, and the entire volunteer support team for making this research possible. I would like to thanks Dr. Mary Barkworth with assisting with specimen recovery. I would like to thank the rest of MDRS Crew 143: Paul Knightly, Alexandre Mangeot, Claude-Michel Laroche, Anastasiya Stepanova, and Ian Silversides, for their enthusiasm and assistance throughout our stay at MDRS.

The MDRS under the stars

Studying Vegetation Ecology in the Last Frontier

Mélanie Jean, Recipient of the Laurie Consaul Arctic Research Award

This summer and fall, I had the opportunity to conduct field work in interior Alaska for my PhD research. Most of the work conducted was around Fairbanks, but the sites sampled cover an area of about 250 x 400 km. Interior Alaska has a very dry climate (usually[1]). The fire return interval in this area is of about 100 years, which creates a mosaic of fire scars that make it an incredible playground for scientist who study fire ecology and forest succession.

My PhD research focuses on how canopy processes affect moss community development across the pan-Boreal region, and how mosses communities can in turn influence forest succession. Recent increases in fire severity throughout the boreal forest of western Canada and Alaska could result in a long-term shift from conifer to deciduous dominated stands, which is likely to decrease moss abundance. Mosses are dominant components of the boreal forest understory, yet their importance has often been overlooked because of their taxonomic challenge. Taking a closer look at moss is like diving into a grand and tiny forest, a whole universe within the larger ecosystem.

I left Saskatoon on June 2nd, and started the four days' drive that would bring our field crew out of the prairies, through the mountains of northern British Columbia and the Yukon, into the boreal forest surrounding Fairbanks, Alaska, where most of our work would be focused. That early in the season, the peaks of the southern Alaska Range were covered in snow blankets. Once in a while throughout the summer, we'd get a glance at them and could witness the passing of the season as the snow slowly retreated.

I have been working with another PhD student from my lab (Alix Conway), who is studying the impacts of herbivory on post-fire forest succession, and a field assistant. Our summer has been extremely busy with collection of tree samples for dendrochronological analyses, vegetation and moss cover surveys along a 20 year-old chronosequence, maintaining a set of moose and hare exclosures, measuring individual moss shoots in a moss transplant experiment, measuring nitrogen fixation within the moss carpet, and the list could keep going for a while. Working on different projects and seeing lots of different ecosystems has been extremely stimulating and inspiring.

Location of the study area in interior Alaska. The inset map represents Fairbanks and the major highways (red). Grey polygons represent all fire scars recorded since the 1940s. Fire scars from 1940-1950 are in light grey, from 1950-1990 are in medium grey, and from 1990 to present are in dark grey.

But Northern field work, just like any field work really, also has its load of challenges and character building anecdotes. This summer was the rainiest summer recorded in Fairbanks over the past century, which caused a few planning issues when roads, sites, and our apartment flooded. Alaska is vast, and after driving very close to 20,000 km (often on dirt roads), we were lucky to have had only one flat tire! But field work in the rain sometimes has its perks (at least that's what we tried to convince ourselves). On our last summer day up there, we were able to spend a day off to visit Denali National Park and Preserve, an astounding wilderness preserve

[1]The summer of 2014 has been the wettest in nearly a century in Fairbanks (http://www.newsminer.com/news/local_news/it-s-official-wettest-summer-in-a-nearly-a-century/article_7e15ada0-2fcc-11e4-a250-0017a43b2370.html)

surrounding Mount McKinley (Denali), the highest point of North America, on probably the nicest day of the summer.

I came back to Alaska in mid-September to complete the fall portion of the fieldwork, which involved leaf litter manipulations in a moss transplant experiment. In the distance, the Alaska Range started recovering its snow blanket. With two inches of snow on the ground, it was time to come back home on October 5th. I came back with amazing memories, and more ideas than ever regarding my research.

I have only been back for a couple days, and I already miss the North. I cannot wait for the next field season!

Now that I am back in the office, it is time to get all that data analysed. I hope that my results will enhance the knowledge of the processes that stabilize compositional patterns of boreal forests, which is critical for predicting ecosystem responses to a changing fire regime, and that I will have raised some interest into the amazing world of bryophytes.

Field crew after 8 hours of rain in the field, and happier field crew in front of Denali to celebrate the end of the summer field work.

Polytrichum commune (left) and *Marchantia polymorpha*, growing in a black spruce stand regenerating 10 years after a fire.

Top Canadian Ornamental Plants. 9. Lilac

Ernest Small[1,2]

Of all of Canada's woody ornamentals, lilacs are the most attractive combination of eye candy and nose candy, the result of their spectacular colourful flower clusters and exquisite fragrance. Although they are Old World species, lilacs are fortuitously pre-adapted to most of Canada because they must have a period of cold weather to induce good flowering. Lilacs are low-maintenance, easily grown, durable shrubs and small trees which are excellent for a range of landscaping applications, including hedges, foundation plantings, small and large gardens, and street trees. There may be no other common woody plant that is so ideal for regularly producing cut flower bouquets. Next to roses, no other woody ornamental is as celebrated by great public gardens and festivals.

Names

Scientific names: The genus name *Syringa* is based on the Greek syrinx, meaning hollow tube or pipe, a reference to the pithy stems of lilac, which are easily hollowed out and were once used as primitive musical instruments. Ancient Greek legend holds that the nymph Syrinx, pursued by the god Pan, was transformed into a hollow reed which Pan used as his first flute or pan-pipe. The common name "syringa" is sometimes applied in western North America to the genus *Philadelphus* (more appropriately termed mock-orange). The "syringa tree" is *Melia azedarach* (also known as Chinaberry, Persian lilac and many other names), and is known for producing quite poisonous berries.

English names: lilac (from the Persian *nilak*, blue, a reference to the flower colour). Lilac almost always refers to *Syringa*, but some species of *Callicarpa*, *Ceanothus* and *Melia* are also called lilac. Butterfly bush (*Buddleja davidii*) is also known as summer lilac.

French names: lilas.

Wild *Syringa* species

The genus *Syringa* consists of about 20 Eurasian species of deciduous shrubs or small trees, most native in eastern Asia (16 in China, a few in Japan and Korea), some extending west to Afghanistan, Pakistan, Kashmir, Himalayan India and Nepal, and two disjunctly in southeastern Europe. The species grow naturally in woodland and scrub, almost always in cool-temperate climates.

Figure 1. Butterfly on lilac flowers. ©Spangles 44 (CC BY 2.0).

Figure 2. Vintage greeting card featuring lilac (public domain)

The relationships of *Syringa* and *Ligustrum* (privet) are unsettled. *Ligustrum* until recently has been considered to comprise 40–50 species of Asia, Europe, Malaysia and Australia. Their flowers are not as showy or fragrant as those of *Syringa*, but some of the species are commonly employed as hedge plants. Recent phylogenetic evidence (Li et al. 2012) has suggested that *Ligustrum* is nested within *Syringa*.

The evolution of cultivated lilacs

Lilacs appear to have been known for more than 500 years. Several spontaneous interspecific hybrids (i.e., not deliberately created) became established before modern breeding began. One of these, the Persian lilac (*S.* ×*persica*), was recorded over 400 years ago. In the 16th century, the common lilac (*S. vulgaris*) was transported to Istanbul, centre of the Ottoman Empire at the time. Although the common lilac is native to Europe, cultivars were transported from Istanbul to Europe (as early as 1563). By the mid-1600s, common lilac was growing in the colonies. Today there are more than 2,000 cultivars of *Syringa*, mostly of the common lilac.

[1]Science and Technology Branch, Agriculture and Agri-Food Canada, Saunders Bldg., Central Experimental Farm, Ottawa ON, K1A 0C6

Figure 3. Victor Lemoine (1823–1911), extraordinary French hybridizer, who along with his descendants created about 200 cultivars, greatly popularizing lilac cultivation. His influence is reflected in the use of the phrases "French hybrid lilac" to mean cultivars of the common lilac; and "French lilac" to denote cultivars of the common lilac with doubled flowers. (Public domain photo)

Figure 4. James S. Pringle of the Royal Botanical Gardens, Burlington. Jim has published numerous papers on the taxonomy of lilacs, among his many contributions (see http://fieldbotanistsofontario.blogspot.ca/2012/01/2011-goldie-award-winner-jim-pringle.html).

The common lilac, *S. vulgaris*, is the dominant cultivated lilac species. The earliest cultivars mostly have purple or white flowers, and are quite hardy and drought tolerant. They propagate readily by suckers (also sometimes called offshoots and runners), and so are often encountered persisting on abandoned homesteads. Suckers are the plant's method of rejuvenating itself, indeed potentially for centuries. The Lemoine family of Nancy, France was instrumental in breeding (mainly by hybridization) over 200 cultivars (so-called "French hybrids") with a wide spectrum of plant size and shape, and flower colour, fragrance and doubling. Modern cultivars are often (artificially) classified by colour (blue, lilac, magenta, pink, purple, violet and white) and whether single or double. Many modern cultivars tend to sucker less frequently than the older cultivars, and although more attractive they are often less hardy.

Canadian contributions to lilac science and breeding

Canadians have been particularly prominent in the scientific study of the lilac genus *Syringa*, and in the breeding of beautiful, hardy varieties. World-famous public lilac collections are present at the Royal Botanical Gardens (Burlington), the Central Experimental Farm (Ottawa), and the Montreal Botanical Gardens, and there are many other public, private, and commercial lilac gardens in Canada. "The international register of cultivar names in the genus *Syringa*" is maintained by the Royal Botanical Gardens.

Recent Canadian lilac breeders have particularly employed *S.* ×*josiflexa* Preston ex J.S. Pringle (*S. josikaea* × *S. reflexa*, originated by Preston), *S.* ×*hyacinthiflora*, *S.* ×*prestoniae*, and *S. villosa*, all of which are cold-hardy and bloom somewhat later than common lilac. They are slightly less fragrant than common lilac, and are mostly resistant to powdery mildew. Pink and pale lavender have predominated, but newer cultivars include white and intense purple.

Cultivated *Syringa* species

Most species of lilacs are cultivated (perhaps half of these only in special collections), and a dozen or so have given rise to cultivars, either directly or in hybrids. Information for the most frequently cultivated species is given in Table 1, and for commonly cultivated hybrid species in Table 2. *Syringa* species are naturally adapted to continental cool-temperate regions, and usually do not thrive in humid coastal areas or in hot climates. However, some recent cultivars are relatively tolerant of high humidity and/or warmer temperatures.

Tree lilacs

After the common lilac (*S. vulgaris*), tree lilac (*S. reticulata*) is the second most frequently cultivated lilac species. It is divided into Japanese tree lilac (subsp.

Figure 5. Isabella Preston (1881–1964) with one of her lilac crosses. Known as "the Dean of Canadian Hybridists," she was employed in the Horticultural Division of the Central Experimental Farm in Ottawa from 1920 to 1946. Preston introduced dozens of attractive, cold-hardy hybrid lilac cultivars, the descendants of which are now widely known as the "Preston hybrids." Photographed about 1950. (Source: Library and Archives Canada/Department of Agriculture fonds/PA-136942; ©Government of Canada.)

Table 1. Commonly cultivated lilac species

Syringa taxon	Common name(s)	Origin	Height[1]	Flower colours	Hardiness zone[2]
S. meyeri C.K. Schneid.	Meyer lilac (often inappropriately called “Korean lilac”)	China (found only in cultivation)	1.2–2.4 m (4–8 feet; (compact garden forms are often 1.2–1.5 m or 4–5 feet)	Lilac, pink	5
S. oblata Lindl. subsp. *oblata*	Early-blooming lilac, large-leaf lilac	China, Korea	To 5 m (16 feet), but mostly 2.4–3.6 m (8–12 feet)	Lilac, white	3
S. pekinensis Rupr.	Peking lilac, Chinese tree lilac	China	2–5 (10) m (6.6–16 feet, occasionally to 30 feet)	Yellow, white, yellowish-white	5/4
S. pubescens subsp. *microphylla* (Diels) M.C. Chang & X.L. Chen var. *microphylla*	Littleleaf lilac	Northwestern China	1.5–2.4 m (5–8 feet)	Pink	4
S. pubescens Turcz. subsp. *patula* (Palibin) M.C. Chang & X.L. Chen	Korean lilac, Manchurian lilac (also applied to *S. reticulata* subsp. *amurensis* (Ruprecht) P.S. Green & M.-C. Chang)	Northern China, Korea	1.8–3.6 m (6–12 feet; (‘Miss Kim’, the most popular cultivar, is usually not higher than 2 m or 6.6 feet)	Lilac	4
S. reticulata subsp. *reticulata*	Japanese tree lilac	Japan, China, Korea	6–9 m (20–30 feet)	Yellowish-white	3
S. villosa Vahl	Late lilac	China	To 6 m (6–20 feet)	Lilac, pinkish-white, yellow	2
S. vulgaris L.	Lilac, common lilac, French lilac	Balkans, southeastern Europe	1.5–6 m (5–20 feet)	Lilac, white, yellow, pink, burgundy	4

[1]Height in colder areas tends to be smaller. For several of the taxa, dwarf forms are available which are much smaller than the indicated range.
[2]Depending on species and cultivar, lilacs grow best in U.S. Department of Agriculture hardiness zones 3-5 (average lowest winter temperatures between -40°C to -23°C), but can survive in zone 2 (where average lowest temperatures can go down to -46°C), and in zones 6 and 7 (-23°C to -12°C). Particular cultivars may survive but not flower in regions that are either too cold or too warm. Examples of Canadian city zones: 10: Vancouver; 6: St. John’s; 5: Charlottetown, Halifax, Hamilton; 5/4: Fredericton, Toronto; 4: Ottawa, Montreal; 3: Calgary, Regina, Edmonton, Saskatoon, Winnipeg. For comparison of the USDA and Canadian climate maps (for which information for *Syringa* is limited), see http://planthardiness.gc.ca/index.pl?m=17&lang=en.

reticulata, native of Japan), Amur tree lilac (subsp. *amurensis*, native or northeastern China, Korea, and southeastern Russia) and Peking tree lilac (subsp. *pekinensis*; native of north-central China). Japanese tree lilac is the most widely cultivated of these. The most widespread cultivar is ‘Ivory Silk’, an early-flowering form which was bred by Sheridan Nurseries (Toronto) and released in 1973. Tree lilacs are often shrubs, but some cultivars develop into short trees, sometimes as tall as 9 m (30 feet). Tree lilacs are late-blooming (often into mid-summer), developing creamy-white or yellowish, fragrant flowers, and the bark, reminiscent of cherry trees, has horizontal lenticels. Japanese tree lilacs are resistant to most pests and diseases, grow well in a wide range of soil conditions (including clay and infertile soils), transplant well, are not invasive, and are moderately resistant to pollution, drought and de-icing salt. Their relatively short stature makes them ideal as urban (street and lawn) trees.

Dwarf lilacs

Most lilacs are large shrubs, which are unsuitable for small yards and gardens. To address this limitation, small shrub cultivars have been selected, particularly of *S. meyeri* (Meyer lilac) and *S. pubescens* subsp. *patula* (Manchurian lilac). These are particularly useful as foundation specimens, and develop relatively small but very abundant floral clusters. Both of the preceding species do not require pruning and are resistant to powdery mildew. ‘Charisma’ (identified as a cultivar of *S.* ×*prestoniae*) and ‘Prairie Petite’ (a cultivar of *S. vulgaris*) grow only to about a metre in height, and have been

Table 2. Popular lilac hybrid species

Syringa taxon	Common name(s)	Origin	Height[1]	Flower colours	Hardiness zone[1]
S. ×*chinensis* Schmidt ex Willdenow	Chinese lilac	*S. protolaciniata* P.S. Green & M.-C Chang × *S. vulgaris*	3.6–4.5 m (12–15 feet), mostly 2.4–3.6 m (8–12 feet)	Lilac, red, white	3
S. ×*hyacinthiflora* (hort., Lemoine) Rehd.	Hyacinth lilac, early flowering lilac, American hybrid lilac	*S. oblata* × *S. vulgaris*	2–3.6 m (7–12 feet)	Lilac, blue, red, pink, white	4/3
S. ×laciniata Miller	Cut-leaf lilac, cut-leafed lilac	A hybrid lilac of unknown, old origin, often cited as from China, but possibly southwestern Asia	1.5–3.6 m (5–12 feet)	Lilac	4
S. ×*persica* L.	Persian lilac	*S.* ×*laciniata* × *S. afghanica* C.K. Schneid.	1.2–2.4 (3) m; 4–8 (10) feet	Lilac, red, white	4
S. ×*prestoniae* McKelvey	Preston lilac, Canadian lilac	*S. villosa* × *S. komarowii* C.K. Schneid. subsp. *reflexa* (C.K. Schneider) P.S. Green & M.-C. Chang	1.8–3.6 m (6–12 feet)	Violet, pink, pinkish-violet	2

[1]See notes under Table 1.

distributed in Canada.

"Witches Broom" is a condition in which plants form thick, twiggy growths at the ends of branches. This is an occasional disease of lilacs, usually caused by a phytoplasma (formerly called a mycoplasma-like organism), although sometimes the response is due to environmental stresses, pollution or invertebrates. Some dwarf lilac cultivars may simply be phytoplasma-infected plants (i.e., dwarfing is due to the disease). This was found to be the case for 'Charisma', which accordingly was withdrawn from the market. Since the disease can be transferred by insects to other lilacs, dwarf lilacs that are the result of phytoplasmas should not be propagated.

Flower characteristics

Lilacs are grown mostly for their display of flowers, complemented by attractive odour. It is said that lilac colours are most intense during cool, damp springs, and that the colour of given cultivars sometimes is altered by the soil in which the plant is grown. Flowers have been selected for different colours, size, variegation and doubling. The common lilac is in good flower for only about 10 days, but cultivars are available with different flowering periods, and it is possible to establish a lilac garden with staggered blooming times so at least some plants will be in flower over a 6 week period, usually from April through June in North America. A few re-blooming cultivars are available, which have the usual main blooming season in the spring, and a less pronounced second flowering period in the summer. The cultivar 'Bloomerang', advertised as "continuously blooming,"

Figure 6. Three of the commonly grown hybrid species of *Syringa*. Left: Cut-leaf lilac (*S.* ×*laciniata*). ©Liné1 (CC BY 3.0). Centre: Chinese lilac (*S.* ×*chinensis*). ©A. Barra (CC BY 3.0). Right: Hyacinth lilac (*S.* ×*hyacinthiflora*), cultivar 'Esther Stanley'. Photo by Patche99z (released into the public domain).

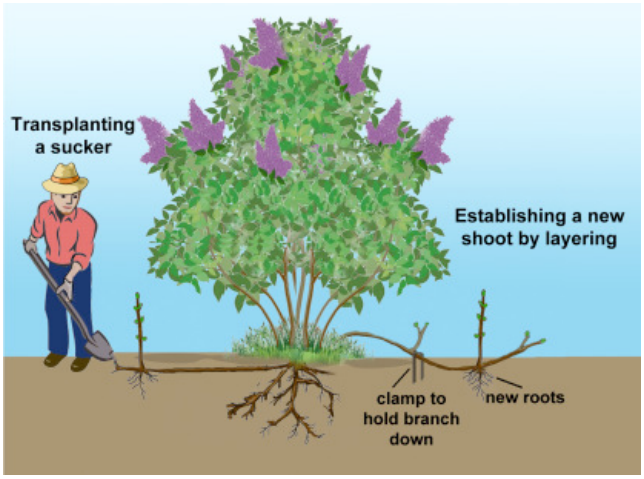


Figure 7. Simple methods of propagating lilacs vegetatively. Left: Digging out a sucker for replanting. Right: Layering. Prepared by B. Brookes.

produces the usual large flush of flowers in the spring, sporadically flowers during the summer, and develops a second flush of flowers in the autumn.

Most lilacs are scented. It is claimed that lilacs are most fragrant on a warm, sunny afternoon when the flowers are completely open. The common lilac (*S. vulgaris*) is generally considered to have the most pleasant odour, although cultivars differ in smell, and some recently bred cultivars with large florets are quite deficient in odour. The tree lilacs (*S. reticulata*) have a different, musk-like scent, which is unpleasant to some noses. Doubled flowers of lilac (as is frequently the case for ornamentals) tend to have less scent than normal flowers.

Economic status

Lilacs are versatile ornamentals, serving in both home and public gardens as border and foundation plants, streetside and highway median specimens, and flowering hedges. They have also found application as windscreens, notably on the Canadian prairies. Several lilacs are either so naturally small or capable of being dwarfed that they can be raised as bonsai, or grown as container (patio) plants or in rock gardens. In Europe, lilacs are forced in greenhouses and are harvested for a substantial cut-flower market at Christmas.

Cultivation

PROPAGATING

Almost all cultivated lilacs are of hybrid origin and have been maintained vegetatively, so seeds (if generated) will not reliably reproduce the mother plant's characteristics. Professional lilac producers employ several reproductive methods: root sprouts, layering, cuttings, and cleft and bud grafts. Grafts, sometimes to root systems of different cultivars or different species of *Syringa* and *Ligustrum*, are the chief commercial way of propagating lilacs, but this requires knowledge, skill and greenhouse resources. (Grafts to foreign rootstocks are often intended to be short-term, in which case they are discarded after the cutting develops its own roots.) The easiest way for home gardeners to reproduce an attractive plant is by cutting off and establishing root sprouts (i.e. suckers, if produced; this won't work if the plant is grafted and the suckers originate from the foreign root system), and by layering (bending over a lower stem, fastening part of it underground, wounding it below a leaf bud and dusting the wound with rooting hormone to stimulate root formation; this may take a year or more, and is only advisable if suckers are unavailable).

Powdery Mildew

©Sarah Pethybridge (CC BY 2.0)

Whitish, dusty, powdery mildew on a leaf. This is the most common disease of lilacs, causing infected leaves to turn yellow and fall off, and often stunting new growth. Although unsightly, it usually develops in late season, and so does little permanent harm to the plants. Fungicides can be applied as a preventative, before the grayish-white powdery mat appears on the foliage, but this is rarely recommended. Affected tissues should be pruned away and burned, sterilizing the sheers with rubbing alcohol or diluted bleach. Powdery mildew is promoted by high-humidity, poor air circulation, low light (due to shady sites or overcast skies), and warm days coupled with cool nights. Most cultivars of common lilac are susceptible, although some resistant cultivars are available. Japanese tree lilacs, Manchurian lilacs and Meyer lilacs are quite resistant.

'Betsy Ross', a new cultivar of common lilac which is resistant to powdery mildew. ©Margaret Pooler, Bugwood.org (CC BY 3.0)

Figure 8. Four frequently grown species of Syringa. Upper left: Korean lilac (*S. pubescens* subsp. *patula*), cultivar 'Miss Kim'. ©TownePost Network (CC BY 2.0). Upper right: Meyer lilac (*S. meyeri*). Photo by Daderot (public domain). Lower left: Japanese tree lilac (*S. reticulata*). ©TheKohser – Gregory Kohs (CC BY 3.0). Lower right: Littleleaf lilac (*S. pubescens* subsp. *microphylla*). ©Sten Porse (CC BY 3.0).

Purchasing

Because lilacs can be life-long companions, the characteristics of a desired lilac cultivar (size, tendency to sucker, colour, flowering period, tolerance of diseases, cold hardiness, requirements for pruning) should be appreciated before purchase. Lilacs are usually bought as containerized or bare-root plants, 0.6–1.2 m (2–4 feet) in height, although larger, balled and burlapped plants are also available.

Planting

Container-grown plants should be planted in early spring or in the fall, while bare-root plants need to be put in the ground in early spring before bud break. Spacing lilacs depends on the natural size of the cultivar: 3–5 m (10–16 feet) for large specimens and trees, 2–2.4 m (6–8 feet) for informal hedges. Inter-plant distances for clipped hedges depends on anticipated (clipped) height: 1–1.2 m (3–4 feet) tall: 45–60 cm (18–24 inches) on centre; 2–2.4 m (6–8 feet) tall: 0.6–1 m (2–3 feet) on centre. Most lilacs spread by suckers, so it is important not to establish specimen plants too close together. When transplanting a lilac, re-plant at the original soil depth.

Water

Although lilacs require a regular supply of water (especially while they are establishing), the substrate should be well-drained. Raised beds or mounds may be employed to avoid naturally damp ground, or lilacs can be located on the upper part of a hill where natural drainage occurs. Mulch will aid in conserving soil moisture.

Substrate

Loam soils that are not overly rich are best. Heavy (clay) soils should be amended. A soil pH of 6.5–7.5 (circumneutral or slightly alkaline) has been recommended, but 6.5 to 8.5 is tolerated. Compost and well-decomposed manure may be added to the soil. Light chemical fertilization (high in phosphorus) may be applied in the early spring, but some authorities recommend that if plants are growing well, they should not be fertilized. Excessive application of high-nitrogen fertilizers can reduce or even prevent formation of flowers.

Sun

An open location (In Canada, at least 6 hours of direct sun) is strongly recommended. Lilacs can tolerate considerable shade but at the cost of suppressed flowering. Sometimes, after lilacs are established, tall trees grow or buildings arise which produce too much shade for good lilac growth. Some of the dwarf shrub cultivars are relatively tolerant of semi-shade, but generally lilacs and shade are incompatible.

Frost avoidance

In poorly drained sites, roots may be frozen to death in ice during the winter. Planting in "frost pockets" (areas where cold air accumulates) is inadvisable. Reflection of sunlight from light-coloured buildings can force the buds of foundation plantings to open early and be damaged by frost. Cultivars of *S.* ×*hyacinthiflora* are among the earliest-flowering lilacs (usually 1–2 weeks before the common lilac), and so are relatively susceptible to early spring frosts.

Mammalian herbivores

In rural areas, deer commonly browse the tips of young branches, and rutting bucks use their antlers to strip trunks of their bark. Some cultivars are resistant to browsing, but in areas where the problem develops, fences and hunting need to be considered. Rabbits will damage canes that are less than 3 years old, and where

Figure 9. Floral evolution in domesticated common lilac (*Syringa vulgaris*). Left: variegated flowers, ©Angel Caboodle (CC BY 3.0). Right: doubled flowers, photo by Rex (released into the public domain).

Figure 10. Lilac in great art paintings. Left: "The Time of The Lilacs" by Sophie Gengembre Anderson (French-born British artist, 1823–1903). Right: "Lilac" by Edmund Leighton (English artist, 1853–1922). (Public domain illustrations.)

snow accumulates they will also consume young twigs. Field mice and moles can girdle canes below snow level. Canes can be protected with wire and other barriers, although most lilacs seem to survive with no protection.

Pruning

Normally, the only care needed is pruning. This is recommended to maintain vigour of most cultivars, to allow sunlight to reach leaves in the lower and central parts of the plant, to control size, and to promote symmetrical shape. Pruning is also desirable so that vigorous growing stems and flowers occur at different heights, resulting in flowers all over the bush, not just at the top. Pruning is usually unnecessary for the first 3 to 5 years of growth. As with all woody plants, pruning away misshapen, broken, diseased, declining and undesirably oriented stems should be routinely practiced (branches should not be allowed to cross). Some cultivars of some species (especially dwarf forms) do not require much, if any pruning, and this information should be available (either from the nursery where purchased, or on literature accompanying the plant). Two kinds of pruning or "thinning" need to be distinguished: removing entire canes of shrubs down to the base, and clipping off side branches or the tops of main branches. Removing main canes is best done during the dormant period (winter or early spring), preferably from the centre of the bush. A second mode of pruning is the annual removal of selected branches. Thinning away some of the youngest branches promotes air circulation, discouraging diseases. Such pruning is best done immediately after flowering, for the following reason. Flower buds for the next year are formed after the early-season flush of flowering, so pruning lilacs in the autumn, winter, or early spring could reduce stems that would have produced flowers. (Although sometimes a second blooming period occurs in the same season, most cultivars flower just once.) Spent flower clusters should be removed as soon as they wither, to prevent the plant from directing its energy into seed formation (some hybrids will not produce seeds); moreover, persisting clusters reduce the attractiveness of the plant. Such deadheading of younger lilacs does seem desirable, but doing so for large, tall specimens can be very labour-intensive, and some authorities contend it does not improve flowering significantly. Suckers can be removed at any time.

Probably most cultivated lilacs never receive any care whatsoever, and still manage to produce impressive floral displays for decades. Nevertheless, the uncontrolled rampant growth of old bushes reduces their overall attractiveness and flower clusters. It has been recommended that such plants be renovated by removing one-third of the major (largest diameter) canes for three consecutive years. This will of course completely eliminate the old above-ground plant, allowing new canes to develop from the ground. Cutting away so much old wood will reduce flowering for a period, but will eventually produce many more flowers.

To establish lilac cuttings, professional gardeners may graft cuttings to the roots of different species or even genera (especially *Ligustrum* and *Fraxinus*), but this should be temporary, allowing the cutting to develop its own roots by burying the graft juncture below the level of the substrate to encourage rooting. Sometimes young grafted lilacs are marketed with the warning to plant the graft juncture below the ground line to encourage development of the desired cultivar's own root system. Lilacs are usually more cold-tolerant on their own roots, so it is inadvisable to purchase grafted lilacs (indeed, in cold climates they should not be marketed). Moreover, should the root system of a grafted lilac survive so that the canes of the desired cultivar are growing on it rather than on their own roots, it is almost impossible to successfully prune the plant (pruning the canes will kill them and new suckers arise only from the undesirable foreign root system).

Curiosities of Science and Technology

- Allegedly, hollow lilac stems were used in ancient times as primitive hypodermic devices to inject medicine or to bleed patients.
- Colour definitions are often based on well-known plants (e.g. lemon, orange, peach and plum are accepted colour names), and variations of purplish flowers illustrate this well: heliotrope, lilac, mauve (for the

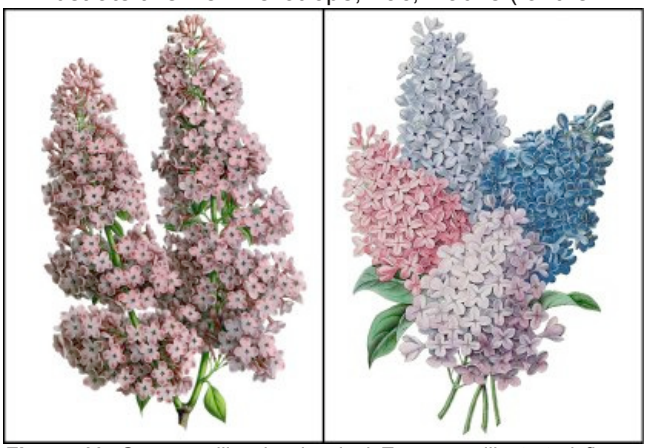


Figure 11. Common lilac in classical European illustrated flower encyclopedia. Left, from: Houtte, L. van. 1845. Flores des serres et des jardin de l'Europe, vol. 14. Right, from: Charles François Antoine Morren, C.F.A. and Moren, C.J.É. 1854. La Belgique horticole, journal des jardins et des vergers, vol. 4. (Public domain illustrations.)

Figure 12. Artistic modification of lilacs. Left: An old common lilac trained into a tree. Notice the spirally contorting bark, characteristic of very old lilac stems. (Public domain photo.) Right: lilac bonsai. ©Ryan Somman (CC BY 2.0).

mallow flower), phlox, "orchid" and thistle are all employed as colour shades.

- Cloned lilac cultivars have been employed in an American program to examine how flowering dates have varied in response to climate change since the 1950s (see http://npnweb-dev.npn.arizona.edu/nn/cloned-lilacs?q=node/30; http://budburst.org/science-whatsnew_lilacphenology). Cloned plants of course control for possible ecogeographical adaptation which could influence phenology, and the popularity of lilacs facilitated distribution of the lilacs to volunteer participants over a wide geographical range.
- Trunks of very old common lilacs (*S. vulgaris*) have been measured at 60 cm (2 feet) at ground level.
- Although bouquets of cut lilac flowers are very widely displayed in houses, many in in the midland counties of England feared bringing cut lilacs (especially white ones) indoors in the belief that it would result in death or misfortune. On the other hand in England, finding a five-petalled lilac flower was thought to produce good luck.
- It is well established that blue is the most preferred colour, regardless of cultural background. However, there is evidence that toward the red end of the spectrum (such as pink and lilac), women exhibit greater preferences than men. It has been contended that this is genetically intrinsic, not learned (http://people.howstuffworks.com/gender-color.htm).
- The larvae of several Lepidopteran species employ lilacs as food plants, and lilacs are excellent as attractors of butterflies such as swallowtails to a garden.
- Lilac flowers (at least the petals) are edible. They can be candied, added to dishes as a decoration, or incorporated in salads or yogurt.

Figure 13. Edible lilac flower dishes. Left: sugared lilac corollas on a cupcake. Right: Toast with lilac petal jelly, along with decorative garnishes of lilac flowers. See www.acanadianfoodie.com for information on preparation. ©Valerie Lugonja, all rights reserved.

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Acknowledgements

Brenda Brookes skillfully assembled and enhanced the illustrations for publication.

Figure 14. Canadian postage stamps featuring lilac. Left: Paired stamps issued in 2007; upper left: the mauve-flowered cultivar *S.* ×*prestoniae* 'Isabella' (originated by Isabella Preston); lower left: the white-flowered *S. vulgaris* 'Princess Alexandra' (originated in 1874, commemorating the Queen-consort of King Edward VII). Right: A view of the rock garden at the Royal Botanical Gardens (Burlington), with lilac branches in the lower foreground (issued in 1991).

Major Invasive Alien Plants of Natural Habitats in Canada. 10. Purple Loosestrife, salicaire commune: *Lythrum salicaria* L.

Paul M. Catling[1,2], Gisèle Mitrow[1] and Amanda Ward[1]

Purple Loosestrife was listed as number 2 in the prioritized list of 81 major invasive aliens of natural habitats across Canada. It is also on the IUCN Invasive Species Specialist Group's list of the 100 worst invasive species in the world. This list includes all forms of life. Purple Loosestrife is of particular interest for four reasons: (1) it is a very conspicuous species that invades the high priority habitat of wetlands; (2) it has done more than any other plant in Canada to draw the attention of the public to the problems created by invasive alien plants; (3) it has values in horticulture, apiculture and assisting pollinators resulting in occasional hesitation in implementing control; and (4) it has provided an outstanding indication of the value of biocontrol.

Classification and Identification

Purple Loosestrife is a member of the Loosestrife Family, Lythraceae, which is mostly tropical and includes 620 species in 31 genera. Although Purple Loosestrife is a distinctive taxon, infraspecific classification is complex and requires more study. The problems are best resolved in the native range where taxonomic characters can be more reliably associated with geography than in the Canadian introduced range. Varieties are recognized by some recent European authors (see below).

Species of *Lythrum* (and particularly *L. salicaria*) are sometimes confused with Blazing Star (species of *Liatris*). The inflorescences of the latter bloom from the top down and the heads have several individual flowers. Fireweed (*Chamerion angustifolium*) is also sometimes confused with Purple Loosestrife but it differs in having flowers with long stalks that elongate to become narrow capsules when the flower has fallen. The Marsh Hedge-Nettle (*Stachys palustris*) and Canada Germander (*Teucrium canadense*) both have serrated leaves. Swamp Loosestrife (*Decodon verticillatus*) has flowers in axils of larger leaves on recurved stems and the stems are not terminated by an upright dense inflorescence. The young plants and lower branches of Purple Loosestrife have leaves without the characteristic hair and they are rounded at each end giving the appearance of *Hypericum*. The stems are more or less squared as in members of the Mint Family.

North American species of *Lythrum* have leaves narrowed at the base, or broad and more or less heart-shaped (cordate) at the base. Purple Loosestrife is in the latter group. Wand Lythrum (*Lythrum virgatum*), a garden plant, is in the former group.

Key to Canadian species of *Lythrum*

1a. Leaves acute at the base … *Lythrum virgatum* L. (and other species)

1b. Leaves cordate or rounded at the base … 2

2a. Flowers showy, in clusters of 1-several; petals 7-11 mm long; bracts and floral tube pubescent … 3

Figure 1. Inflorescence of Purple Loosestrife. ©Linda Wilson. (CC-BY-NC 3.0)

2b. Flowers not showy, in clusters of 1-2; petals 2-6.5(7) mm long; bracts and floral tube smooth … 4

3a. Plants mostly glabrous in the upper parts but with ciliolate bracts and leaves … [*Lythrum intermedium* Ldb.]

3b. Plants mostly pubescent in the upper parts … *Lythrum salicaria* L.

4a. Petals 4-6.5(7) mm long, perennial … *Lythrum alatum* Pursh

4b. Petals 1-3 mm long, annuals …5

5a. Leaves linear to oblong; petals none or 2-3 mm long … *Lythrum hyssopifolia* L.

5b. Leaves spoon-shaped; petals 1 mm long … *Lythrum portula* (L.) D.A. Webb

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Figure 2. *Lythrum salicaria* from Bilder ur Nordens Flora by Carl Axel Magnus Lindman (1856-1928). Note the characteristic lanceolate leaves with heart-shaped or rounded and stalkless bases.

Purple Loosestrife (*Lythrum salicaria*): Plants in many North American populations have 1-2 flowers per leaf axil and alternate leaves. These features are not necessarily the result of introgression with *L. alatum* but they have sometimes been used to separate *L. alatum* from *L. salicaria*. The leaves are lanceolate. We have seen one specimen with dusty pale pink, almost white flowers (TRTE 054221). In parts of Eurasia where *Lythrum salicaria* and *L. virgatum* grow together, hybrids are produced. If *Lythrum salicaria* and *L. alatum* have hybridized, it is only to a very limited extent, and it has been concluded that crossing among genotypes of *L. salicaria* is what has provided, and continues to provide, the variability for new adaptations to arise.

Intermediate Loosestrife (*Lythrum intermedium*): This has often been treated as a variety or synonym of *L. salicaria* but is recognized in parts of Europe and in the USSR as distinct. Its native range is reported to be southeastern Asia. Synonyms include *L. salicaria* var. *gracilior* Turcz. and *L. salicaria* var. *glabrum* Ldb. This taxon is reported from Otterburne, south of Winnipeg, Manitoba (sub. *L. salicaria* var. *gracilior*, Scoggan 1979). Its status in Canada requires more study. Young plants of *L. salicaria*, which are more or less glabrous, may be confused with this taxon. Mature plants of *L. salicaria* may also be glabrous below the inflorescence.

Winged Loosestrife (*Lythrum alatum*): In Canada this species is known only from Ontario and British Columbia. The upper branches and the calyx have wing-margined angles and the calyx is smooth and narrowly oblong. The leaves are linear-lanceolate to oblong.

Wand Loosestrife (*Lythrum virgatum*): Although not known to occur outside of cultivation in Canada, this species may be encountered in gardens and may yet spread.

Hyssopleaf Loosestrife (*Lythrum hyssopifolia*): This small annual is not likely to be mistaken for Purple Loosestrife. In Canada it has been recorded growing without cultivation in southwestern Ontario and British Columbia.

Spatulateleaf Loosestrife (*Lythrum portula*): This is quite different from Purple Loosestrife in its white or rose flowers with petals only 1-2 mm long and all leaves the same size and narrowing to the base. It is known from British Columbia.

KEY TO THE PRINCIPAL VARIETIES OF PURPLE LOOSESTRIFE IN CANADA

1a. Calyx and bracts white tomentose (densely covered with white hairs)
... var. *tomentosum* (Mill.) DC.

1c. Calyx and bracts green and lightly pubescent
… var. *salicaria*

Var. *salicaria* (var. *vulgare* DC., var. *genuinum* Gren. & Godr.): This is more common and widespread than the following in the native Eurasian range.

Var. *tomentosum*: Reported from southern British Columbia, Manitoba, Ontario and Quebec. In parts of Europe it is considered to be possibly a distinct race and is sometimes distinguished (in manuals where it is recognized) by the leaves being hairy over the entire under-surface whereas in the var. *salicaria* the hairs do not completely cover the undersurface. We have seen herbarium specimens so named from Ontario and Quebec and it has been reported from British Columbia, Manitoba, Ontario and Quebec. Its status in Canada requires clarification.

There is also a var. *roseum superbum* W. Miller which has larger, rose-colored flowers. Most North American authors have not mentioned any of these varieties and they have not been studied in depth; they are accepted by some European authors. There are also many horticultural varieties.

Figure 3. *Lythrum salicaria* drawing by Marcel Jomphe. AAFC image.

Description of Purple Loosestrife

Perennial herbs 0.5–2.7 m tall with 1-50 stems arising from a large perennial rootstock; stems smooth or hairy and more or less square; upper leaves are opposite in twos or threes or (less often) alternate or whorled in threes, 2–10 cm long, narrowly triangular or lanceolate and broad and more or less cordate at the base; lower leaves are often ovate or oblong with a rounded tip and rounded, truncate (flat) or somewhat tapered at the base and often less hairy than those above; flowers (5)7-13 mm long, with 5-7 sepals and petals, arranged in a terminal spike 2-100 cm long; petals 5-7, obovate, pinkish-purple or magenta, separate, (5)7-13 mm long; sepals forming a tube but free at the tip, green to reddish-purple, often hairy, 3.5-9 mm long; stamens 10-14, 1-14 mm long, in two whorls with the outer longer; flowers of three kinds with styles and stamen filaments of different lengths (tristylous) and the different kinds on different plants; (1) short styles and medium and long filaments. (2) medium styles with short and long filaments, (3) long styles with short and medium filaments; pollen grains with 3 apertures and 3 furrows, those on the long filaments are 30-38 µm long and green, whereas those from short and medium filaments are 20-26 µm and yellow; styles 2-14 mm long; fruit a rounded, oblong capsule 3-4 mm long with 80-130 seeds; seeds 0.4-1 mm long, 0.2-0.5 mm wide, light to dark brown, long-triangular, flat on one side and rounded on the other.

Distribution

Purple Loosestrife is cosmopolitan. Its native range includes the temperate and Mediterranean regions of Europe and Asia. It occurs throughout the United States and southern Canada but is less common in the prairies and central region of North America. The map illustrates where Purple Loosestrife has been recorded outside of cultivation in Canada. This map is based on collections from ACAD, ALTA, CAN, DAO, LKHD, MMMN, MT, MTMG, NFLD, NFM, NSAC, NSPM, OAC, PMAE, QFA, QK, QUE, SASK, TRT, UAC, UBC, UNB, UPEU, UWO, V, WAT and WIN.

Figure 4. Flower of Purple Loosestrife. ©Linda Wilson. (CC-BY-NC 3.0)

Figure 5. Left: Seeds of Purple Loosestrife from shore of Bull Lake, Frontenac County, Ontario, P.M. Catling et al., 18 Sept. 2003 (DAO 793838). Photo by G. Mitrow. **Right:** Pollen of Purple Loosestrife. ©GettyImages creative #128541756. All rights reserved, used with permission.

Purple Loosestrife occurred in wet meadows of southeastern Canada and New England by 1814 and probably arrived from France. It is believed that it was first introduced to North America with ship ballast since some of the earliest specimens were collected in ballast heaps around eastern North American harbours. Other means of entry are by seeds on wool, for gardens or honey plants, or for use in medicine. It was considered invasive in the 1930s when monospecific stands developed in floodplain pastures of the St. Lawrence River in Quebec. Following are the first collected specimens from each Canadian province that we have seen in Canadian herbaria with location and herbarium: Alberta in 1942 at St. George's Island, Bow River, Calgary (ALTA); British Columbia in 1916 at Vancouver Island (V); Manitoba in 1896 in Neepawa (DAO); New Brunswick in 1904 at Shediac (QK); Newfoundland in 1911 at Norris Arm (MT); Nova Scotia in 1883 at Louisburg (CAN); Ontario in 1888 in Ottawa (DAO); PEI in 1950 at 10 mi. NE of Charlottetown, No. 6 Highway (DAO); Quebec in 1894 at Montreal (MT); and Saskatchewan in 1971 at 1.5 mi. N of Sutherland & 1/4 mi. W (SASK). These first collections suggest a spread across Canada from east to west. It is still invading new

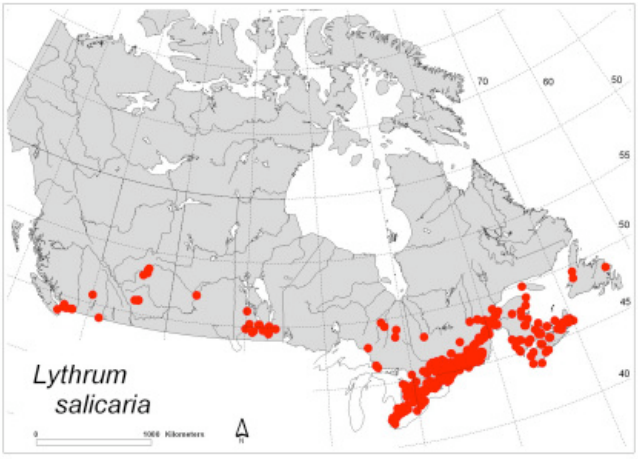

Figure 6. Distribution of *Lythrum salicaria* in Canada.

Figure 7. Wet meadow dominated by Purple Loosestrife at Concord, Massachusetts, USA. ©Liz West (CC-BY-2.0).

Although we need quantitative measurements of the effects of various stages of L. salicaria *invasion on the structure, function and productivity of North American wetland habitats, the replacement of a native wetland plant community by a monospecific stand of an exotic weed does not need a refined assessment to demonstrate that a local ecological disaster has occurred.*

— United States Geological Survey

habitats in the east as well as spreading into new geographic areas in the west. In a newly colonized region, it is often not a dominant for several to 20 years, then it suddenly becomes very abundant according to the classic "sleeper weed" model (see CBA/ABC Bulletin 44(2): 56).

Ecology

Purple Loosestrife usually occurs in wet or moist habitats including ditches, shorelines, wet meadows and marshes. The substrate can vary from organic to pure sand or gravel and it can be nutrient-rich or nutrient-poor. Disturbances such as draining or ditching facilitate colonization. Tolerance of a wide range of conditions, relatively tall growth, dense cover, and a large perennial root system facilitate dominance over many native species.

Sometimes it is suggested that Purple Loosestrife is disturbance-dependent and may simply be an indicator of anthropogenic disturbances, rather than a primary cause of extinction. However, it has invaded many areas without disturbance or with the aid of natural disturbances associated with natural flooding, drought or beaver activity, and there is a substantial body of evidence indicating its competitive ability. Of course disturbances are common naturally-occurring phenomena that many native species depend upon to a greater or lesser extent. There is always the question - "what would the wetland be like if Purple Loosestrife were not there?" If the answer is "a diverse native community," then the discussion of disturbance dependence seems less important.

Purple Loosestrife requires pollination for seed development. The primary pollinators are honey bees, leafcutter bees, carpenter bees, bumblebees, and various butterflies. Self-pollination is reduced by the different style and anther lengths with long–styled plants (without long stamens) only receiving pollen from medium or short-styled plants (with long stamens) and the short-styled plants (without short stamens) only receiving pollen from long- and medium-styled plants (with short stamens). The medium-styled plants (without medium-length stamens) receive pollen from long- or short-styled plants (with medium length stamens).

The genetic and evolutionary aspects of tristyly in this plant are a large and fascinating topic that has received

How much data do we need?

In the 1970s and 1980s there was a major effort in the community of North American wildlife biologists, teachers and scientists to draw attention to the serious decline of natural wetlands. It was then that concern over Purple Loosestrife dominating wetlands became widespread. The impact seemed sufficiently obvious that there were few "before and after" studies based on analysis of data to document it. Some articles appeared that drew attention to situations where Purple Loosestrife was not displacing native flora and fauna. That was ecologically interesting, but some of the authors went on to suggest that the problem was overrated. Management of Purple Loosestrife was criticized for insufficient evidence demonstrating negative impacts, and biocontrol was criticized for lack of evidence documenting the failure of conventional methods. It may not be necessary to dig too deeply for a response to the suggestions. Huge areas are dominated by Purple Loosestrife that might otherwise be occupied by a diversity of beneficial native species, and the plant is still turning up in new places and becoming dominant. These simple observations and history of control attempts suggest that it is a serious problem that has not been controlled by conventional methods. Now there are many research publications to support this view. The original development of the biocontrol program, based as it was to some extent on common sense, appears to have been a good decision that has probably already had huge conservation value as well as real monetary values in the millions of dollars.

extensive research attention. All three morphs occur in most eastern Ontario populations and a population of over 50 should become resistant to losing morphs over 100 years. The morphs vary in seed production with the medium-styled morph being most effective.

The plants spread by seeds which are dispersed by water current and adhesion to waterfowl, fur of aquatic mammals, boots and boats.

Detrimental Aspects

Significance is suggested by the number of asterisks, one being least- and five most-highly significant.

(1) Negative effects on biodiversity *****

Numerous studies have documented the decline in native biodiversity as a result of invasion of Purple Loosestrife in North America. The impact has been mainly a result of changes in wetland structure and displacement of native species and food resources. With regard to native plants, a few dozen articles from an extensive geographic area have analyzed data indicating a deleterious effect as a result of competition. Hundreds of articles have referred to such an effect without data analysis. The latter have been based largely on observations of sites before Purple Loosestrife invasion and after it.

Although competition may be a major factor, the effect of Purple Loosestrife on other flora is not confined to that. Decline in various native species such as Spotted Jewelweed (*Impatiens capensis*) in the presence of Purple Loosestrife is believed to be partly a result of the fact that there are both fewer visits to native plants requiring pollinators, and those visits are less effective as a result of pollen of the native flower being wasted on Purple Loosestrife. The latter has been referred to as "lower visitor quality" and has been shown to be statistically significant in Square-Stemmed Monkeyflower (*Mimulus ringens*) and several other species.

In Canada and elsewhere, there has been much concern over the replacement of native food plants of ducks and geese. Other waterfowl, such as Black Terns (*Childonius niger*) and Marsh Wrens (*Cistothorus palustris*) decline in the presence of Purple Loosestrife. The terns, which require open habitat, are subject to decline as a result of Purple Loosestrife because of it covering potential feeding and nesting sites. Clumps of Purple Loosestrife also restrict access to open water for waterfowl and provide hiding places for predators such as racoons and foxes.

It is not only the reduction of native food that is relevant, but there may also be a very negative effect on native species that feed on Purple Loosestrife. To be beneficial to a native species, that species should be shown to be abundant and healthy where the invasive food plant is used, and there are a number of cases of this. However, in the case of a native buckmoth (*Hemileuca* sp.) of conservation concern that feeds on Purple Loosestrife, there are disadvantages including lower larval survivorship, smaller pupae and high levels of parasitism compared to when the normal native plant, willow (*Salix* spp.), is used. A female's eggs laid on Purple Loosestrife are mostly wasted, and recruitment fails.

Elsewhere in North America, Purple Loosestrife has been implicated in the decline of many animal species. The reasons given are usually the same as that given for the endangered Bog Turtle (*Glyptemys muhlenbergii*) of the northeastern US: "plants grow thick and tall and are believed to hinder the movement of the turtles, … also out-compete the native species in the Bog Turtle's habitat, thus reducing the amount of food and protection available to the turtles."

As well as negatively affecting various species and species groups, Purple Loosestrife changes ecosystem processes including nutrient cycling and net transpiration. The relatively high level of transpiration in Purple Loosestrife could make wetlands dominated by it drier than they would be otherwise, and this could have serious consequences during dry periods.

Figure 8. Black Tern (Childonius niger). ©Maggie Smith. (CC-BY-CA 2.0).

Figure 9. Bog Turtle (*Glyptemys muhlenbergii*) has declined due to invasives changing its habitat, and a major culprit is Purple Loosestrife. Illustration from John Holbrook's American Herpetology published in 1836.

Figure 11. Native Monarch Butterflies (*Danaus plexippus*) taking nectar from Purple Loosestrife plants. Photo taken in eastern Ontario in late August by Seabrooke Leckie. Used with permission.

Figure 12. White-lined Sphinx Moth (*Hyles lineata*). The larvae of this native moth feed on Purple Loosestrife. ©Adrian Thysse.

(2) Damage to agricultural lands **

Purple Loosestrife is unpalatable to dairy cattle but it invades and dominates moist pasture and spring-flooded pasture, reducing pasture acreage and creating inaccessible areas. One of the earlier references to negative impacts on agriculture was in 1942 when it was said to "usurp pasturage from more than 800 cows" along a part of the St. Lawrence River in Quebec.

Losses also occur in hay meadows. Purple Loosestrife is considered a major potential problem in the North Central United States, but its significance in Canada is unclear. It is currently colonizing this region, and the extent of agricultural impact will be seen over the next 10-20 years.

Damage estimated at $2.6 million annually can occur when Purple Loosestrife invades irrigation systems as a result of blockage of drainage and irrigation ditches.

Beneficial Aspects

(1) Honey production **

The later-season flowers of Purple Loosestrife are important to beekeepers as a source of nectar and pollen for overwintering colonies of bees. An anticipated loss of $1.3 million in honey sales in 19 US states (over the next 20 years) is attributable to Purple Loosestrife control. However, if native wetland plants are allowed to re-establish, they would once again provide replacement forage for bees. Despite the losses of Purple Loosestrife control to honey production, The American Bee Journal acknowledges in publication and press releases, the threat to wetland habitats from Purple Loosestrife. Honey from Purple Loosestrife is said to be of marginal quality.

(2) Ornamental use **

Purple Loosestrife is widely known as a garden plant. Many larger-flowered varieties have been developed by hybridization or selected from wild plants for horticultural use. It is still seen in many Canadian gardens and is still available in Canada from some plant nurseries. Native species of Blazing Star (also called Gayfeather) have been suggested as an alternative for gardens since there is still some dispute over the extent to which garden cultivars of Purple Loosestrife are infertile and environmentally safe.

(3) Medicinal uses **

Purple Loosestrife has been employed as a medicinal herb since the first century. Astringent qualities have resulted in it being used to stop the flow of blood. Tonics have been applied for ailments such as dysentery, internal and external bleeding, and wounds and ulcers. It has potential for use in weight control and treatment of diabetes. Recent study has focused on antioxidant and ant-inflammatory uses. The plant is rich in flavonoids that may prove useful in treatment of cancer, Alzheimers and AIDS, due to a therapeutic effect on inflammation.

(4) Food and cover for wildlife **

Most authors have suggested that Purple Loosestrife "provides little of food value and offers relatively poor cover and nesting materials." Some authors have suggested that it is not eaten by animals (meaning livestock) because of the high tannin content. One of the principal ways in which Purple Loosestrife may be important to wildlife is as a provider of nectar to native pollinators including species of conservation concern such as the Monarch Butterfly (*Danaus plexippus*), but for the latter it may be a much better idea to grow milkweed and native wilflowers that bloom during the migration period. Many insects supported to a degree by Purple Loosestrife provide food for insectivorous birds.

Although nectar and pollen from Purple Loosestrife may help many animals, it may be disadvantageous to numerous native plants since Purple Loosestrife may dominate pollinator attention and create a pollinator deficit for native wild plants. These relationships require more study (see also above).

Larvae of the native White-lined Sphinx Moth (*Hyles lineata*) naturally feeds on Purple Loosestrife and has been studied from a biological control perspective. Experiments have shown a degree of preference for the introduced plant, but more study is needed (see also text on buckmoth above). There are probably many native insects that use the plant to some degree.

Some mammals may feed on it occasionally, including beavers, but it has not been reported as an important source of food.

Since Purple Loosestrife is often dominant, it stands to reason that many animals would use it as cover. There are some interesting relationships due to different uses. For example; Red-Winged Blackbirds nest in Purple Loosestrife stands but Long-billed Marsh Wrens do not. The wrens are a major factor in Red-Winged Blackbird nesting failure. Therefore avoidance of Purple Loosestrife by the wrens creates a safe nesting site for the blackbirds. Purple Loosestrife seeds are not considered part of the diet of the Red-Winged Blackbirds.

(5) Use as a bioindicator *

Experimental studies have reported on the potential to monitor polychlorobiphenyl and various heavy metals using Purple Loosestrife plant tissues.

(6) Use as a dye

A red dye that is reported to be edible can be obtained from the flowers. It is said to have once been used to colour candy.

Management

Biocontrol with beetles:

By far the most effective management of Purple Loosestrife has been the use of biocontrol. At least 15 insects are host-specific to Purple Loosestrife and several of these have been investigated and released. The most successful were released in 1992 and 1993 and include two leaf-feeding beetles, the Golden Loosestrife Beetle (*Galerucella pusilla*) and Black-Margined Loosestrife Beetle (*Galerucella calamariensis*). Two weevils were also released in both the US and Canada, one feeding on roots (*Hylobius transversovittatus*) and the other feeding on flowers (*Nanophyes marmoratus*). Effectiveness of reduction of Purple Loosestrife by these insects has varied among sites, with it being very effective in some places, and not at all in others, such as tidal marshes in British Columbia. Overall, post-introduction studies over several years in many areas have indicated that the introduced beetles have been very successful in reducing Purple Loosestrife and aiding in the re-establishment of native species communities. Quoting from a Manitoba study: "Beetle herbivory significantly reduced stem height by up to 70% within two years, and by the second year the number of inflorescences on tagged plants was reduced to zero. Importantly, young seedlings emerging from the seed bank were also grazed by the beetles." Apart from reports and personal observations in Canada, there are many before and after treatment photos on the web to attest to the effectiveness of biocontrol.

In many situations beetles have been introduced to new sites to compensate for the relatively slow initial spread. This has been done for example in eastern Ontario by Ducks Unlimited and the Ontario Ministry of Natural Resources. Releases of wild or field-reared beetles have been found to be more effective than those reared in the lab. A combination of beetle releases and introduction of seed of native plants has proven effective at some sites.

Throughout Canada and the United States there are biocontrol programs for Purple Loosestrife. Some of these are easily found on the web.

Other Biocontrol Methods:

There is a possibility of using fungal pathogens to control Purple Loosestrife. Thirty-one fungal taxa have been found on plants in Minnesota. These may disperse naturally to new colonies of the plant or be introduced.

The native parasitic vascular plant, Swamp Dodder

Figure 13. A mating pair of the Golden Loosestrife Beetle (*Galerucella pusilla*). Photo by Garry Kessler taken Westborough, Massachusetts, 12 May 2013. Used with permission.

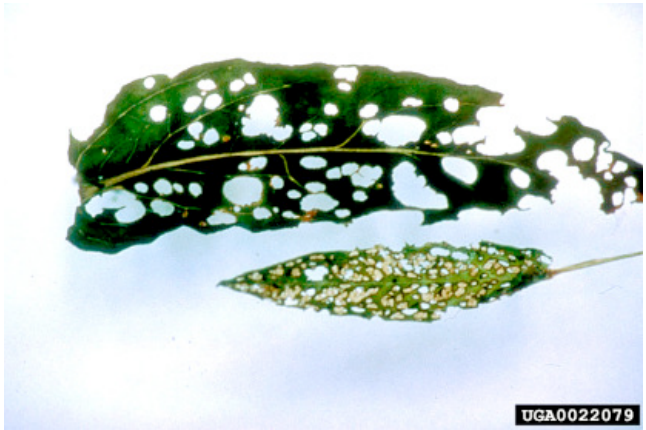

Figure 14. Leaf damage by *Galerucella* beetles has been used to monitor beetle populations and the effectiveness of control. ©Bernd Blossey (CC-NC-3.0)

The remarkable success of biological control

Conventional methods such as physical, mechanical or chemical, have continuously failed to curb the spread of Lythrum salicaria *or to provide satisfactory control. State and federal agencies as well as private citizens and schools now participate in rearing, release and monitoring of* Galerucella *beetle species which have been released in 33 states and >1500 wetlands nationwide. Large populations of* G. calmariensis *have developed in many of the monitored release sites and have caused up to 100% defoliation of* L. salicaria.

— the Global Invasive Species Database

(*Cuscuta gronovii*) occasionally grows on Purple Loosestrife (e.g. QUE 54552), but the parasite is not common enough to be a significant control agent.

Chemical Methods:
The control of aquatics is difficult because the aquatic environment is particularly sensitive and all species may be affected by any chemicals that disperse in the water. In the past, glyphosate has been used and numerous publications indicate appropriate levels of application and timing for best results. Results from a Manitoba study suggested that an integrated strategy using herbicides (glyphosate and triclopyramine), combined with biological control by *G. calmariensis* outperformed both herbicide alone and the beetle alone. It has been said that "once it becomes firmly established, Purple Loosestrife is virtually impossible to control by herbicides." The use of chemical methods has declined because of the effectiveness of biocontrol, but in certain situations chemicals may still be useful.

Manual and Mechanical Methods
Since young plants of Purple Loosestrife are readily identified by leaf shape, venation (veins not reaching the leaf edge but turning toward the tip), square stems, etc, hand-pulling young plants can be very effective in small areas to reduce competition for rare and endangered native flora.

Fire
Experiments with control with fire and flame torches have done insufficient damage to root crowns to have much effect. This is because the substrate is wet or moist.

Cutting
Cutting may be most effective in late summer but is said not to give reliable control. However, when followed by flooding it is more effective.

Flooding
Flooding may be most effective during the active growth period. Complete mortality of mature plants has been achieved by raising water levels 0.3-1 m for 5 weeks or by raising water levels a variety of depths over more than one growing season. Several weeks of flooding by 10 cm can eliminate all seedlings. Flooding is not always easy to implement and it may change community composition or have a negative impact on high priority species.

Replacement
Some work on the idea of replacing Purple Loosestrife with a less detrimental plant has not yet resulted in broad scale application. Few plants are as aggressive and competitive as Purple Loosestrife and some of those suggested (e.g. *Phalaris arundinacea*) are already damaging invasives. Any replacement species may become a nuisance.

Grazing
Purple Loosestrife is not favoured by cattle, sheep, or deer but experiments with sheep at a high stocking level resulted in reduction of loosestrife and an increase in species species richness. One article indicated that cattle grazing reduced Purple Loosestrife cover in a fen by 40% and shrub cover by 33%, thus improving the habitat for Bog Turtles. The loss of grazing in some areas due to urban expansion and a corresponding release of Purple Loosestrife and shrubs has been implicated in the decline of Bog Turtles. One of the problems with use of grazing is that the more palatable species are removed first (if there is choice) making more space for Purple Loosestrife.

Prospects
Some studies have suggested that the biocontrol beetles have spread slowly, and increased human-aided dispersal has been recommended by several researchers. There are now some extensive areas where Purple Loosestrife is present but not dominant, and there are many success stories relating to effective biocontrol. Although Purple Loosestrife is itself still spreading, particularly in the prairie region, so are the control agents, often with help. In many places we can expect that the impact of Purple Loosestrife will decline or be lessened after an initial period of dominance, but some active management may be necessary to protect biodiversity until natural controls are well established. The biggest news is that Purple Loosestrife is now invading the Canadian prairies, and impacts on wildlife and agriculture (especially irrigation) may be substantial.

Believe it or not
- Purple Loosestrife produces monocultures with stem densities ranging from 10,000 – 20,000 stems/m^2, and a single plant produces up to 3 million seeds.
- Honey made from Purple Loosestrife may have a greenish tint similar to motor oil.

- The name '*Lythrum*' is from the Greek '*luthron*' meaning blood and may refer to either the color of the plant's flowers or its medicinal use as an astringent to stop the flow of blood.
- During the Cholera epidemic of 1848, the healing power of Purple Loosestrife first became known to the inhabitants Lancashire, England, and it saved hundreds of people from death. Cholera is a bacterial infection of the small intestine. It caused over 100,000 deaths in 2010 and today it affects over 3 million people.
- Not all garden varieties of Purple Loosestrife are safe. Although they are sometimes considered to be sterile (do not produce seed), some can cross with other garden varieties or wild plants. In the latter case new variation can enter the wild population increasing fitness. Some garden plants from nurseries have been planted near infested wetlands and produced abundant seed.
- Purple loosestrife is the only tristylous plant found growing wild over most of Canada and it was a favourite plant of Charles Darwin who used it to study evolution.
- Some assessments have estimated that Purple Loosestrife has destroyed more wetland biodiversity in North America than humans have. In 1987 the annual loss of diverse wetland to Purple Loosestrife was 190,000 ha per year.
- The benefits of control of Purple Loosestrife in the northeastern United States were estimated to be at least $27 million each year over the 10 year period of a biocontrol development program that had a total cost of less than $1 million.
- Although Purple Loosestrife may form dense monospecific stands in its native range, these soon become invaded by other species, unlike the situation in North America.

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