Contents
Table des matières

President's message
Page 29

CBA-ABC 2010
Page 31

Association News
Page 32

News from the sections
Page 34

Obituary for William(Bill) Cody
Page 37

Association Awards
Page 39

Book Reviews
Page 42

The Monograph Program
Page 43

What's new in Botany?
Page 48

Current research in Canada
Page 49



Native Plant Emblems of Canada
10. Alberta
E. Small and P.M.Catling
Page 51

Photos from Acadia
Page 71

CBA/ABC Board for 2009-10
Page 72

The Canadian Botanical Association Bulletin

Bulletin de l'Association Botanique du Canada

September/Septembre 2009. Volume 42 No.2/N°2



Dear CBA/ABC Members,

Being President and Vice-President this past year affords me the opportunity to compile the thoughts of "two" into one article. It was a great pleasure to host CBA-ABC 2009 at Acadia University. The task of dual service was made very easy by an incredibly organized and willing local organizing committee. Our final number of attendees was just shy of 100, with more than half being students (both undergraduate and graduate). I hope to see this trend continue at future meetings.

This was the first meeting since CBA-ABC 2006 at Concordia that we did not meet jointly with other societies. It was great to have a small, intimate meeting that allowed all in attendance to take in the plethora of great botanical science taking place across Canada. I would like to thank Dr. Chris Eckert for launching the meeting with his keynote address, as well as all the invited plenary speakers whose research musings and reflections helped kick off each paper session.

I would also like to congratulate this year's many award winners. This was the first year in recent memory that every CBA-ABC award was handed out. This not only demonstrates the high caliber of research taking place in Canada, but also the extent of participation from senior scientists down through undergraduates. Please remember this in 2010 when it comes time to honour your peers and students for either their lifetime of achievement, or their first peer-reviewed, published manuscript in 2009.

The continued strength of Canadian Botany is also not going unnoticed by other societies. For the second year in a row CBA-ABC was invited to a meeting of all society presidents at the 2009 BSA meetings in Snowbird Utah. Hughes Massicotte and I were asked how CBA-ABC would like to contribute to a multiple society membership plan. One proposal is to have a highly reduced student rate that would allow students access to all societies. The CBA-ABC Executive will continue these discussions with a goal of presenting a motion at the 2010 AGM in Ottawa. Please feel free to send us your ideas concerning this proposal, as well as any other CBA-ABC business.

I also urge you to voice your concerns regarding the Canadian government's shortsightedness regarding NRC press. This year two NRC published journals, Botany and the Canadian Journal of Forestry Research, were recognized as two of the top 100 journals in Biology and Medicine in the past century. However, publication of the Journal Botany is changing hands in 2010, and the Monograph and Book publishing programs are being terminated. Please see the details included in Paul Cavers' article in this issue of the Bulletin.

Sincerely,

Rodger Evans, President

Canadian Botanical Association Bulletin

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

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

Association botanique du Canada Bulletin

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

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

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

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

Next issue / Prochain numéro
Texts for the next issue, **42(3)**, must be received **before November 9th 2009**

La date de tombée des textes du prochain numero, le no **42(3)**, **est le 9 novembre 2009**

Published in Peterborough, September 30th 2009
Publié à Peterborough, le 30 Septembre 2009
ISSN 0008-3046 (paper/version papier)
ISSN 1718-8164 (electronic format/version électronic.)

Chers membres du CBA/ABC,

À titre de président et vice-président cette année, j'ai eu la chance de réunir deux perspectives dans un seul article. C'était un réel plaisir d'animer la réunion CBA-ABC 2009 au Acadia University. La tâche de ma double fonction a été facilitée grandement par un comité organisateur local organisé et dynamique. Le nombre total de participants était près de 100 personnes, plus de la moitié étant des étudiants (du premier cycle et des cycles supérieurs). J'espère voir cette tendance se maintenir au cours des réunions futures.
C'était la première fois depuis la réunion 2006 du CBA-ABC à Concordia que nous avons tenu une séance sans la présence d'autres sociétés. Ce fut un réel plaisir de présider une réunion intimiste qui a permis à tous les participants d'avoir une vue d'ensemble de la pléthore de recherches scientifiques portant sur la botanique au Canada. Je voudrais remercier Dr Chris Eckert d'avoir entamé la réunion avec son discours-programme, ainsi que tous les conférenciers de la plénière qui ont aidé à démarrer chaque session avec leurs réflexions de recherche.
J'aimerais également féliciter les nombreux récipiendaires des prix de cette année. Cette année, chaque récompense CBA-ABC a été décernée; une première depuis plusieurs années. Cela démontre non seulement le calibre supérieur des recherches s'effectuant au Canada, mais également l'étendue de la participation, allant des scientifiques chevronnés aux étudiants de premier cycle. Gardez leurs noms en tête jusqu'en 2010 lorsqu'il sera temps d'honorer vos pairs et étudiants pour l'ensemble de leurs réalisations ou pour leur premier manuscrit révisé par un comité de lecture et publié en 2009.
L'importance de la Botanique canadienne a également été saluée par les autres sociétés. Pour la deuxième année de file, le CBA-ABC a été invité à une rencontre de tous les présidents de société à la conférence BSA 2009 tenue à Snowbird, Utah. Hughes Massicotte et moi avons été questionnés sur la façon dont le CBA-ABC aimerait contribuer à un plan d'adhésion comprenant des sociétés multiples. Une des propositions suggérées est d'avoir un tarif étudiant réduit de façon considérable afin de permettre l'accès des étudiants à toutes les sociétés. Le comité exécutif du CBA-ABC continuera ces discussions dans le but de présenter une requête à la conférence AGM 2010 à Ottawa. Soyez libre de nous envoyer vos idées concernant cette proposition ainsi que toute autre question relative au CBA-ABC.
Je vous demande également de faire entendre vos inquiétudes par rapport à la politique à courte vue du gouvernement canadien concernant les presses scientifiques du CNRC. Cette année, deux des presses publiées par le CNRC, la revue Botanique et la revue canadienne de recherche forestière, ont été reconnues comme deux des 100 plus importantes revues du siècle dernier dans les domaines de la biologie et de la médecine. Toutefois, l'édition de la revue botanique change de mains en 2010 et le programme d'édition des monographies et des livres a été arrêté définitivement. Veuillez lire les détails inclus dans l'article de Paul Cavers publié dans la présente édition du bulletin.

Cordialement,
Rodger Evans, Président

Editor's comments

I must apologize for producing so much reading material for you in this issue. I wanted to give due credit to the award winners in this past year, as well as include some of our regular features, however, I also thought it important to include, in both languages, the letter and article by Paul Cavers, about the termination of the NRC Monograph Program. I urge you to take some appropriate action on this issue.
My thanks to Larissa Nituch, a busy graduate student at Trent University, who took the time to translate Paul's article.
The next issue of the Bulletin will return to the more normal size!

Christine D. Maxwell
Editor.

30 42(2) CBA/ABC Bulletin

Biodiversity
2010 and Beyond
Science and Collections

SPNHC & CBA-ABC Joint Conference
Ottawa, Ontario Canada
May 31 to June 5, 2010

CANADIAN BOTANICAL ASSOCIATION–
L'ASSOCIATION BOTANIQUE DU CANADA (CBA-ABC)

AND

THE SOCIETY FOR THE PRESERVATION OF
NATURAL HISTORY COLLECTIONS (SPNHC)

May 31 – June 5, 2010

University of Ottawa, Ottawa, Ontario, Canada

KEYNOTE SPEAKER
Dr. Paul Hebert (University of Guelph)
iBOL – The International Barcode of Life Project

PLENARY SYMPOSIUM
Global Biodiversity Mega Initiatives

CALL FOR SYMPOSIA
If you are interested in organizing a symposium on a particular topic, please contact Jeff Saarela (jsaarela@mus-nature.ca) ASAP

Stay tuned to the conference website for emerging details
www.spnhc-cba2010.org

Hosted by the
Canadian Museum of
Musée canadien de la
NATURE

Association News

Dr. Nancy Turner is awarded the Order of Canada.



Dr Nancy Turner at Hartley Bay. Photo: Val Shore

Dr Nancy Turner, a professor in the University of Victoria's School of Environmental Studies, was awarded the Order of Canada on Canada Day 2009, for her contributions to the field of ethnobotany and for her leadership in documenting the botanical and ecological traditions of Aboriginal peoples.

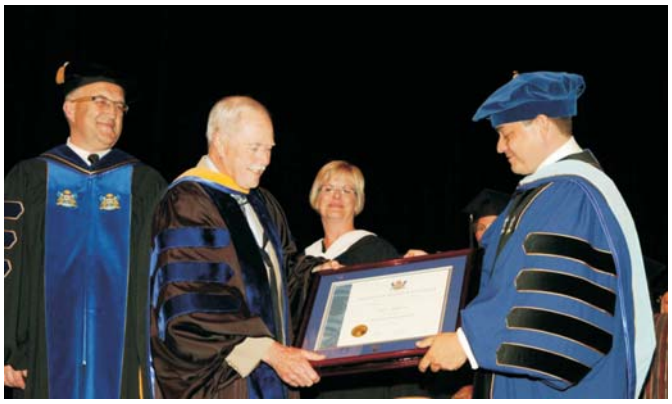
Dr Turner is a world leader in the field of plant knowledge and traditional plant use by First Nations in western North America. Over the past 40 years, she has worked closely with BC First Nations elders to document their knowledge and understanding of plants, ecology and use of natural resources. The work is helping to perpetuate traditional knowledge and customs that have been threatened by cultural and lifestyle changes.

Dr Turner was born in Berkeley, California and lived in Montana before arriving in Victoria at age 5. An honours biology undergraduate degree at the University of Victoria was followed by a doctorate at the University of British Columbia. As part of her honours thesis, she collaborated with Saanich and other coast salish First Nations elders to learn about the significance of plants to their culture. in her PhD research, she concentrated on plant classification systems and botanical nomenclature among the Haida, Nuxalk (Bella Coola) and Stl`atl`imx (Lillooet) peoples.

Her major research contributions have been in demonstrating the pivotal role of plant resources in past and contemporary aboriginal cultures and languages, as an integral component of traditional knowledge systems, and how traditional management of plant resources has shaped the landscapes and habitats of western Canada.

Amongst her other awards : a Killam Research Fellowship (2007); the UVic Craigdarroch Gold Medal for Career Achievement in Research (2006); the UVic Distinguished Alumni Award (2003); the Lawson Medal from the Canadian Botanical Association (2002); Academic of the Year from the Confederation of University Faculty Associations of B.C. (2002); the Order of British Columbia and election to the Royal Society of Canada (1999); the R.E. Schultes Award (1997) from the U.S.-based Healing Forest Conservancy, and the YWCA Women of Distinction Award for Science, Technology and the Environment. She is also a fellow of the Linnean Society of London and the Royal Society of Canada.

Dr Roy Taylor receives Honorary Degree at Vancouver Island University.



Dr Roy Taylor receiving his Honorary Doctorate from the Chancellor of VIU, Shawn Atleo at the convocation ceremony in June. Photo: John Gardiner, courtesy of Vancouver Island University

Dr Roy Taylor, a founding member of the Canadian Botanical Association, who also served as Vice President and President, was awarded an Honorary Doctor of Science degree at the convocation ceremony at the newly formed Vancouver Island University in June of this year. The president of the University, Dr Ralph Nilson, stated “During his long and illustrious career, Dr. Taylor has demonstrated a commitment to excellence and innovation that is an inspiration. He has been instrumental in guiding and supporting the development of VIU's Milner Gardens & Woodland Society, and has made a remarkable contribution to the field of botany regionally, nationally and internationally”.

Roy began his career as an elementary school teacher near Olds, Alberta, before graduating with a Biology degree from Sir George Williams University in Montreal, followed by two years of graduate study at McGill before transferring to California where he graduatedwith a PhD in Botany from University of California Berkeley.

Roy held several appointments with Agriculture Canada Before becoming Chief of the Taxonomy and Economic Botany Section. In 1968 he moved to Vancouver to be the Director of the UBC Botanical Garden. This was followed in 1985 by a move to Chicago to become the President and CEO of the Chicago Horticultural Society and Executive Director of Chicago Botanic Garden until October 1994.He then moved and was appointed the Director of Rancho Santo Ana Botanic Garden, Claremont, California from 1994 to 1999. He also served as professor and chair of the graduate botany program for Claremont Graduate University.

The Taylors retired to Lantzville on Vancouver Island in 1999. He has an impressive record of over 150 papers, technical reports, reviews and books, as well as recognition for his work from the University of British Columbia, the American Association of Botanical Gardens & Arboreta, (Award of Merit), and the Chicago Horticultural Society Medal. In addition, in 2006, he was inducted into the American Association of Museums Centennial Honour Roll recognizing 100 of the most important contributors to the Association since it was formed. He is also an honorary life member of the American Public Gardens Association, which is the key Association for all public gardens in North America.

Roy was also appointed as the founding director of Botanic Garden Conservation International, based in London, England.

Roy also received an honorary membership in the Linnean Society of London, UK.during this period.
Upon retirement, Roy was appointed to the founding board of Milner Gardens & Woodland Society located in Qualicum Beach, BC, and served as Chair for five years. The gardens have recently been named as one of the top ten public gardens in Canada, with the impressive goals of(amongst others), providing learning opportunities in both the art and science of horticulture, as a venue for research in horticulture and related fields in the garden and forest, and for the management of the forest as an example of a coastal Douglas-fir biogeoclimatic zone for the benefit of future generations.

Editor's Note: Just by coincidence Nancy Turner was the first graduate student of Roy Taylor. In her words, "He was the best supervisor ever!"

Art Davis wins Teaching Excellence Award for 2007-8


Art Davis

The Students' Union Teaching Excellence Awards program recognizes professors who demonstrate teaching excellence at the University of Saskatchewan. "An excellent teacher not only gives us access to knowledge, but also gives us the tools with which to turn that knowledge into wisdom. Students evaluate teachers and their environment in a number of ways; three important areas include enthusiasm, organization, and fairness of evaluation. The culmination of these aspects leads to an environment where students feel free to explore, critique, grow, and become leaders". Belated congratulations Art! Sorry we missed this before.

Chlorofilms Arunika Gunawardena (Dalhousie University) has honourable mention.

Check the Chlorofilms website (*http://www.chlorofilms.org/*) to see the winning videos in the spring competition, including the video by Arunika "Dying to live: programmed cell death in lace plant cells," which has an honorable mention.
Arunika reports that the first Chlorofilm video contest, started by Dr. Daniel Cosgrove at Penn StateUniversity, was a great success. This competition is open to anyone in the world and participating individuals have the opportunity to present their research in an engaging and interesting way. Harrison Wright (PhD student) and I greatly enjoyed the interactive nature of this contest and now look forward to the next. I also enjoyed judging some of the videos and was impressed with the work carried out.

ANNUAL REPORT FOR BOTANY (FORMERLY CANADIAN JOURNAL OF BOTANY) (July 2008 - June 2009)

By Barry J. Shelp, Co-Editor and R. Larry Peterson FRSC, Co-Editor.

1. Changes to Editorial Board:
Completion of term as Associate Editor: Matt Daws, Lynn Gillespie, Sean Graham and Gary Saunders
Associate Editors Appointed: Saša Stefanović and Tim Xing

2. Theme Papers Published:
Papers from the *Stem and Shoot Fungal Pathogens and Parasitic Plants: the "Values of Biological Diversity"*session of the XXII International Union of Forestry Research Organization World Congress meeting held in Brisbane, Queensland, Australia, in 2005. Guest Editor: Simon Shamoun - January 2009

3. Special Issues Published:
Systematics research in Canada. Guest editors: Anne Bruneau and Sean Graham - July & August - 2008
PBI (NRC). Guest Editors: Faouzi Bekkaoui, Raju Datla and Joan Krochko - June 2009

4. Special Issues In Progress:
CSPP 2008. Guest Editors: John T. Arnason, A. Johnson, Christiane Charest, Susan Aitken, Tim Xing, Leonid Savitch, Brian Miki - scheduled for July 2009
Schofield Festschrift. Guest Editors: René Belland and Iain Taylor

5. Reviews/Minireviews/Commentaries Published: = 4

6. Reviews/Minireviews in progress = 8

7. General Information:
Prize awarded in 2009 for most cited paper: "Engineering nitrogen use efficiency with alanine aminotransferase" Allen G. Good, Susan J. Johnson, Mary De Pauw, Rebecka T. Carroll, Nic Savidov, John Vidmar, Zhongjin Lu, Gregory Taylor, and Virginia Stroeher Volume 85 Issue 3, 252-262

- *Botany* was selected as one of the DBIO 100, the 100 most influential journals in biology and medicine over the last 100 years as voted by the BioMedical & Life Sciences Division of the Special Libraries Association on the occasion of its Centennial

(Continued)

TABLE 1. GENERAL INFORMATION ON MANUSCRIPTS SUBMITTED

Category	Calendar year				
	2004	2005	2006	2007	2008
No. manuscripts handled	372	424	405	424	383
No. manuscripts accepted	172	173	149	124	137
No. manuscripts rejected or withdrawn	202	251	256	300	246
% rejected or withdrawn	54	59	63	71	64
2-Yr Impact factor	1.194	1.058	1.193	0.985	1.078
5-yr Impact factor					1.415

TABLE 2. MANUSCRIPTS PUBLISHED BY CATEGORY (July–June)

Category	Number of manuscripts			% Distribution		
	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Cell & Molecular Biology	4	6	7	3	5	5
Ecology	45	47	44	32	38	34
Mycology and Plant-microbe Interactions	30	17	14	21	14	11
Paleobotany	4	0	1	3	0	.5
Physiology & Biochemistry	17	10	11	12	8	9
Structure & Development	18	20	14	13	16	11
Genetics	8	13	8	6	10	6
Systematics	13	10	30	9	8	23
Phycology	2	1	1	1	1	.5
TOTAL	141	124	130	-	-	-

News From the Sections

Mycology

A small (9 persons present) but enthusiastic group of mycologists met during the CBA meeting in May 2009 at Acadia. Much of our discussion centered on selecting a speaker for next year's Weresub Lecture as well as the possibility of organizing a joint symposium between the Mycology and Systematics and Phytogeography sections (in collaboration with Tim Dickinson) for CBA-SPNHC in Ottawa (May 31 - June 5, 2010). The suggested theme, focusing on 'dispersal', was explored as well as a list of possible symposium speakers.

We are currently delighted to announce that Dr. Irwin Brodo, Research Lichenologist Emeritus at the Canadian Museum of Nature, has accepted our invitation to be the Weresub Lecturer for the 2010 Ottawa meeting. Section members also agreed that having the Weresub Lecture during the day as part of the meeting proceedings was a success this year and that this should be continued at future meetings.

This year, the winner of the Luella K. Weresub Memorial Award was Marie Davey (U of Alberta) for the best published paper on fungal biology (ML Davey, A Tsuneda & RS Currah 2008 Evidence that the gemmae of *Papulaspora sepedonioides* are neotenous perithecia in the Melanosporales, Mycologia 100: 626-635). Congratulations Marie!

And lastly, a reminder to members (faculty and students) to please consider forwarding names of those who may be eligible for the next Luella K. Weresub Memorial Award for best published paper of the year authored by a student. As always, we welcome anyone interested in joining the Mycology section, as well as all myco-comments/thoughts!

Shannon Berch and Hugues Massicotte



Photo: Carrol Harlan

Systematics and Phytogeography Section

The CBA/ABC Systematics and Phytogeography Section met in Wolfville NS on 20 May 2009 during the Association's AGM there. Thirteen members were present, including the Chair. Discussion centered on planning the Section's activities at the 2010 AGM in Ottawa that will be held jointly with the Society for the Preservation of Natural History Collections. We agreed to propose a Symposium on the Roles and Status of Canadian Herbaria. In view of the overlap of this topic with the interests of the Mycology Section, discussions with Mycology co-chairs Shannon Berch and Hugues Massicotte led to agreement to have the two sections co-sponsor two symposia: the one on Canadian herbaria and another on dispersal. Anyone interested in helping to organize the herbarium symposium should contact Tim Dickinson (tim.dickinson@utoronto.ca) as soon as possible.

The high point of the Section's activities at the AGM was having CBA/ABC President Rodger Evans make the Section's Alf Erling Porsild Award to Tyler W. Smith for his 2008 paper with Marcia J. Waterway titled, "Evaluating species limits and hybridization in the *Carex complanata* complex using morphology, amplified fragment length polymorphisms, and restriction fragment analysis," published in Botany 86: 809-826. In addition, Richard T. McMullin was given honourable mention for his paper, "Lichens of coniferous old-growth forests of southwestern Nova Scotia, Canada: diversity and present status," co-authored with P. N. Duinker, R. P. Cameron, D. H. S. Richardson, and I. M. Brodo, and published in The Bryologist 111: 620–637.

Our judges, Mihai Costea, Marian Munro, and Suzanne Warwick noted that all four of the papers submitted for the Award "…were a joy to read…," and offered their services for this task again next year. Nominations are now open (and will be through spring 2010) for the 2010 Porsild Award. Details of eligibility for this award and how authors can either apply for it themselves, or be nominated for it, are published on the CBA/ABC website.

Tim Dickinson, Chair.

The Teaching section

1. The teaching section Chair is now Cindy Ross Friedman. The section will assume responsibility for judging posters for the Iain and Sylvia Taylor Poster Award. In Ottawa the judges will be Frédérique Guinel, Christine Maxwell, John Markham and Marian Munro.

The Association offers awards at Regional Undergraduate Conferences. Greater effort will be made to ensure CBA-ABC involvement in these. Christian Lacroix will represent us in Atlantic Canada, Cindy Ross Friedman will cover BC (see point 2 below) and Frédérique Guinel will cover Ontario.

In Ottawa, the section would like to see Kate Frego 3M Award winner invited to speak, and we are pleased that she has accepted an invitation from the organizers The section is also soliciting papers on teaching and a panel discussion was suggested. Vipen Sawhney and Frédérique will take the lead.

The Teaching Section has set up a teaching discussion forum on a web-friendly group management tool called "Moodle". To join the "MyMoodle" group, simply e-mail Doug Baleshta a colleague of Cindy's at her institution) at dbaleshta@tru.ca and then sign in to the http://mymoodle.tru.ca

Marian Munro has been updating the Teaching Website: its new home is http://sites.google.com/a/teachingbotany.org/teaching-section---canadian-botanical-association/

2. As per the Teaching Section's broadened mandate to ensure our undergraduate awards are distributed, Cindy Ross Friedman coordinated the presentation of the Best Undergraduate Poster in the Field of Botany at the "Rising Stars of Research National Undergraduate Science and Engineering Research Poster Competition" held at the University of British Columbia in Vancouver, BC on August 20, 2009. The winner, Laura Southcott of the University of Toronto, was awarded a $250.00 prize for her winning poster entitled, "Phylogeography and population genetic structure of *Sagittaria latifolia* in western North America" (co-authors Sarah B. Yakimowski and Spencer C. H. Barrett, both of U of T; Spencer Barrett was Laura's supervisor for the project). Cindy was particularly pleased to receive help from Alex Ardila Garcia, a Ph.D. student in Dr. Naomi Fast's Lab at UBC; Alex played a key role in organizing the delivery of the award, and he was on hand to present the award to Laura! The CBA/ABC also thanks Jenny Phelps (Assistant Dean and Director of Graduate Enrollment Services, UBC) who ensured theCBA/ABC had great presence at the conference. See photo below.

3. Members are encouraged to think about contributing an oral paper to the Teaching Section, and if anyone knows of any regional undergraduate conferences in the Prairies or Quebec, they should contact Cindy (cross@tru.ca).

Cindy Ross Friedman



Laura Southcott receiving herCBA/ABC award from Alex Garcia

Ecology Section

In May 2009, the joint Ecology and Conservation committee met in an original fashion. The normal annual meeting of the committee was made short in order to invite more participants and discuss “life after graduation”. This round table discussion aimed to expose the various ways that professionals took to become what they are: that is a faculty member in a university, an officer in a ministry, etc. It was interesting to discover the number of paths participants took to get where they were. While some were able to go through the academic training in a linear way, many discussed the advantage they had by having work experience between their degrees. The main lessons learned are: love what you're doing, keep doors open since you never know where new opportunities can come from, make sure that you maintain good management and presentation skills, especially if you have to go through interviews and many applications. Motivation for all participants was certainly key. In terms of business, it was decided that the joint committee will continue since it is more dynamic at this point. The next years meeting will continue to focus on the species at risk act.

Critical habitats and conservation of species at risk in Canada
Panel discussion, May 20, 2009

At the last annual meeting of the CBA in Acadia University, the joint Ecology Section and Conservation Committee organized a panel discussion on critical habitats for species at risk under the Species at Risk Act (SARA). More than twenty members participated in this discussion which was quite animated and interesting. The following notes represent a summary of the discussion. It was clear that the subject remains of great interest for the group and many actions and discussions are still needed considering the importance of this issue in Canada.

The discussion started with the items that are needed in defining critical habitats and in fact during the assessment of a species at risk, such as the need to understand the ecology of the plants using appropriate temporal and spatial scales. It was mentioned that it is important to invest in knowledge at the beginning when a species is designated, in order to get the right framework for the critical habitats. In addition, genetics is now becoming a paramount when we discuss plant critical habitat and the ways in which to manage the species. This has become important especially for relict species because of long distances between populations. The ecosystem approach is mostly used and multi-species designation and management are more common, although quite challenging. While endemic plant species may be less common than the peripheral species that comprise most of the endangered plant species in Canada, they present, however, different challenges. In many cases, disturbance regimes may have significant impacts of the level of threat to the species.

It was noted during the discussion that the main challenge when researchers prepare the information and complete research into a species at risk, is the hesitation from the governments in some circumstances to designate and agree to list a species. This is especially true for species that have very little economic use or value to the general public. It becomes an issue of where do science and research stop, and where does advocacy becomes necessary to ensure that a species is listed.

Another challenge that was noted for listed species at risk is the development of the conservation management plan which includes the definition of “critical habitat”. This is another area where there is some hesitancy from the governments to approve the documents prepared by recovery teams. While those committees may be willing and knowledgeable, they often face limitations in the implementation. There also seems to be a breakdown between provincial and federal governments in terms of defining critical habitat, leading to some complications when plans must be implemented.

When discussing critical habitat, there are a few issues to consider, as noted by some representatives of national parks: critical habitat definition is a collaborative and cooperative process (within and with governments and others); trying to encourage the definition of critical habitat in function of the recovery objectives; not all suitable habitats are critical habitat; to the extent possible the plan should be drafted with data available at the time but flexible enough to be changed over time.

The discussion focused on three points: the need for CBA to continue the discussion and request for a second workshop/session at the next annual meeting, the need to draft letters to some governmental agencies to express concerns regarding the hesitancy in approving some conservation plans, and the initiating of the drafting at least one position paper on issues regarding critical habitats definition process for plants and the distinction between *in situ* and *ex situ* protection and introduction. As it was mentioned, the State of Nature in Canada report gave a lot of Ds and Fs to our governments for species at risk protection due to lack of resources, lack of stewardship and lack of scientific knowledge translation in citizen science. While it may be true when considering scientific research, few options exist since even NSERC tends not to support such projects. The CBA cannot remain silent on these issues and must continue to explore ways to improve the protection of species at risk in Canada while ensuring that scientific research excellence is maintained.

Liette Vasseur and Adrianne Sinclair

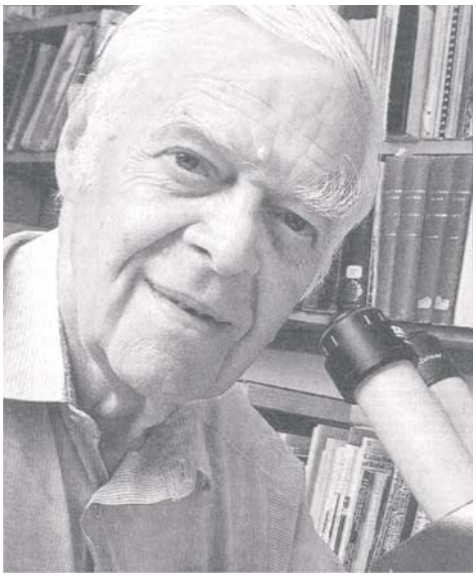


Participants in the Critical Habitat discussion.
Photos C. Maxwell



Obituary

William James (Bill) Cody (1922-2009)



William (Bill) Cody

With the passing of Bill Cody on March 23, 2009, following a stroke, we have lost a wonderful friend, a very valuable research colleague, and an outstanding Canadian. Although he had suffered some loss of memory over the few years prior to his death, Bill was always very happy to be with his friends. His predictably pleasant disposition, which frequently inspired him to sing or to tell a joke, was something about him that we will never forget. Bill is known around the world for his work on boreal flora and as curator of the largest dried plant collection in Canada for 29 years. He was an exceptional public servant with 41 years of paid service, retiring in 1987, and an additional 21 years of voluntary service as an Honorary Research Associate (Catling 2003).

Bill was born in Hamilton on 2 December 1922. His father was a doctor and his mother a nurse at Hamilton General Hospital. He grew up in Hamilton and it was here that he worked as a young man and made his first botanical collections which are now in the Royal Botanical Gardens where he worked under the supervision of Dr. Lulu Gaiser. He received his B.A. from McMaster University in 1946 joining Agriculture and Agri-Food Canada (AAFC), then simply “the Department of Agriculture”, the same year. Bill married Lois Jean Wright in 1950 (deceased March 1997). They had 5 children, David, Margaret, Leslie, Douglas and Gordon. His family was always a major focus, and many of Bill's closest friends find inspiration in the way he put his life together.

In 1967 and twenty-one years after starting with AAFC, Bill was made a Research Scientist. This classification was generally reserved for people who had a Ph.D., but Bill's outstanding accomplishments at that time were judged by his colleagues and the science arm of the federal civil service to warrant treatment at the Ph.D. level. Federal Departments do not confer degrees, - only universities do that, - and his university (McMaster) was sufficiently impressed with his achievements after 38 years as a scientist, that they made him Dr. Bill Cody *honoris causa* (for the sake of honour) in 2006 (Anon. 2008).

To the botanical community Bill is most well known for his many scientific papers and books concerning the flora of northern Canada and as the curator of the herbarium. However, he published the results of phytogeographic studies in many other parts of Canada and was also an expert on ferns, as illustrated by many articles and his books; “Plants of Riding Mountain National Park”, “Ferns of the Ottawa District” and “Ferns of Canada”. His research publications, reports and reviews number over 346. He reviewed and proof-read hundreds of articles, and made an important contribution as a regional reviewer for the Flora of North America series. He collected 40,000 specimens himself and identified and processed the same number.

Bill's work in the north resulted in 60 research publications, but perhaps the most important of these were his two books; “Vascular Plants of the Continental Northwest Territories, Canada” , co-authored with A.E. Porsild (in whose honour the CBA Porsild Award is named), and “Flora of the Yukon Territory”. These texts, with information on distribution, ecology, and classification were essential, not only as a basis for the protection of plant biodiversity, but also for biological research and ongoing work relating to forestry, sustainable resource management, and wildlife management in the north (Catling 1997). They included much new information and many discoveries as well as a thorough compilations and novel analyses of published taxonomic research. They are masterpieces of botanical science. A collective formal expression of admiration and respect for excellence from the botanical science community across the country and internationally came to Bill in 1997 when he received CBA's most prestigious award; The Lawson Medal for his 643 page text on the Yukon plants (Chinnappa 1997). Bill had actually received the award in 1973 on behalf of Clarence Frankton (photo in CBA Bulletin 6(3): 5. 1973.

Bill served as curator of the largest dried plant collection in Canada from 1959 to 1988 and was largely responsible for its growth and development. This collection of now over 1 million specimens has become a major tool of Agriculture and Agri-Food Canada for plant identification. It provides a wealth of information that is needed to implement Agriculture and Agri-Food Canada's Biodiversity Strategy and to respond to the International Convention on Biodiversity, not to mention its value as a tool of plant classification studies worldwide. It is also important in protecting Canada's borders and enforcing federal regulations. Many thousands of specimens that Bill collected in the northern wilderness under extreme and dangerous conditions are part of this collection and serve as vouchers for his numerous publications and books.

Bill received a number of other awards and recognition including the Queen's Golden Jubilee Commemorative Award (Anon. 2003), the Yukon Biodiversity Awareness Award (Anon. 2004). Distinguished Technical Communication Award, and Honorary Membership in the Ottawa Field-Naturalist's Club. His merit and service awards were numerous (Darbyshire 1998).

Bill had many other major accomplishments such as his more than 50 years of service as business manager of the Canadian Field-Naturalist (Cook 1987, Brunton 2004), one of Canada's premier biodiversity and field biology journals. He also served CBA as a founding member and as the first treasurer (Taylor 1969). He was a member of CBA since 1968 and always looked forward to receiving the Bulletin.

(Continued)

Bill had a deep respect for colleagues, recognized the accomplishments of others and wrote a number of tributes. He was also co-author of an important historical document “Systematics in Agriculture Canada at Ottawa, 1888- 1986”.

Bill always spent much of his time helping others. He was always ready to assist visitors, to proofread, to find and provide information and he did hundreds of plant identifications for people each year. He did it all with a smile. Bill Cody has left us a lot to remember. A more extensive tribute with a list of publications will appear in “Canadian Field-Naturalist”.

Anonymous. 2003. A Golden Jubilee Medal to Bill Cody. Canadian Botanical Association Bulletin 36(1): 1.
Anonymous. 2004. Bill Cody receives Yukon biodiversity awareness Award. Canadian Field-Naturalist 120(2): 258-259.
Anonymous. 2008. Mr. Bill Cody, honorary doctorate of science, June 2, 2007. Trail and Landscape 42(1): 4-5.
Britton, D.M. 1979. Review of “Ferns of the Ottawa district”. Canadian Field-Naturalist 93(3): 345.
Brunton, D.F. 2004. Origins and history of the Ottawa Field Naturalists' Club. Canadian Field Naturalist 118(1):1-38.
Catling, P.M. 1997. Review of “Flora of the Yukon Territory”. Canadian Botanical Association Bulletin 30(2): 27-30.
Catling, P. M. 2003. Three remarkable volunteers at the DAO vascular plant herbarium, Agriculture and Agri-Food Canada. Botanical Electronic News 310: 3-4.
Chinnappa, C.C. 1997. Awards at Montreal. Canadian Botanical Association Bulletin 30(4): 58-59.
Cook, F. 1987. A continuing salute: William James Cody: Managing the Canadian Field Naturalist. Canadian Field-Naturalist 101(2): 159-160.
Darbyshire, S. 1998. Yet another milestone for William James Cody. Canadian Field-Naturalist 112(4): 719-720. [also Trail and Landscape 33(1): 3-5.
Taylor, R.L. 1969. Founding of CBA - ABC - a review. Canadian Botanical Association Bulletin 2(2): 5, 8.

Paul Catling, G. Mitrow, J. Cayouette, AAFC Vascular Plant Herbarium

Two eminent plant ecologists have passed away this year. **Bob Jeffries** of the University of Toronto, passed away on July 8th 2009 after suffering a cerebral hemorrhage. He was 73. Bob was one of the world's leading Arctic ecologists and most of us are familiar with his work on the impact of snow geese on vegetation at La Pérouse Bay near Churchill, Manitoba. He also shared in the 2007 Nobel Peace Prize. The obituary that appeared in the Globe and Mail will be sent out with the electronic version of the Bulletin. Please contact the Editor if you would like to write an obituary for the Bulletin.

John Landers Harper, the well known British weed ecologist passed away on March 22nd 2009 at the age of 83. He was credited with the establishment of plant population ecology as a field of research . Harper's monumental work “Population Biology of Plants” was published in 1977 , and followed by several books, including the highly successful textbooks, “Ecology: from Individuals to Ecosystems” and “Essentials of Ecology” in collaboration with Michael Begon and Colin Townsend. Although he was a British ecologist, his work had a number of impacts on ecology in Canada. Many ecologists studied with Harper and had their careers in Canada, or were part of an undergraduate exchange between Bangor and the University of Western Ontario. In the next issue of the Bulletin, Paul Cavers, who was supervised by Harper for his PhD, will explore the impacts of John Harper on ecology in Canada.



Cape Split Field trip, lunch break



Marian Munro, centre with field trip leaders SamVanderkloet (left) and Ruth Newell (right)

Association awards for 2009

The Lawson Medal


Dr. Nancy Dengler receiving her award from Rodger Evans.

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 an individual to Canadian botany". It is named in honour of Dr. George Lawson, who is generally regarded as Canada's first professional botanist.
This year, the Lawson medal was awarded to Dr. Nancy Dengler in recognition of lifetime contributions to Canadian botany. Nancy loved California!!! Nancy received three degrees, BA, MSc, and PhD from the Universities of California at Santa Barbara and Davis. Her PhD, “Ontogeny of the vegetative and floral apices of *Calycanthus occidentalis*”, under the supervision of Dr. E. M. Gifford Jr. at Davis. In 1969 Nancy made the cross continental voyage to the University of Toronto where she spent the next four decades.
A record number of letters of support were submitted on Nancy's behalf and all of them were consistent on two main themes, her tremendous list of accomplishments, as well as her service to North American Botany - Nancy is the only person to ever serve as President of both CBA-/ABC (1979-1980) and BSA (1997-1998); an incredible accomplishment in itself!! Comments from Nancy's peers and past students were numerous, and I choose but a few to share with you:
“She is one of the most outstanding plant anatomists of our time, based on her research, teaching and service to her university and profession... Dr. Dengler has a worldwide reputation based in part on her breakthroughs connecting form and function... Her publication record is long and impressive, [in particular] ... her beautifully explained and illustrated publications on the anatomical basis of palm leaf plication, dorsiventral shoot symmetry, leaf dimorphism, and leaf morphogenesis.”

“I want to say that she was really a pioneer in equal opportunity. In the 1970's...there were few female faculty role models - actually none in Botany... Nancy really 'broke the ice' for those of us who came after her and did so, in a seemingly effortless manner. Her career achievements are so much more remarkable in this context.”

“For our part, we have known and admired Nancy as a colleague and a friend... She was one of those people who made the old Botany Department at the University of Toronto such a wonderful place to work and live plant biology, helping keep the departmental environment friendly and productive for undergraduate and graduate students, post-docs, technicians, office staff, and fellow faculty alike. She was a mentor to many in the department at all these levels, always excelling as well in her total commitment to both teaching and research.”

“Without ever asking or seeking, Nancy Dengler commands the respect, admiration and gratitude of her colleagues throughout the world. It would give me and many others great pleasure to learn the Canadian Botanical Association has recognized one of its finest and most dedicated scholars, Dr. Nancy G. Dengler, with the Lawson Medal. She is most deserving of the honor.”
Nancy, on behalf of the Canadian Botanical Association / L'association botanique du Canada congratulation on your award!

The Mary Elliott Award



Liette Vasseur receiving her award from Rodger Evans

The Mary Elliott Service Award is given to an individual for meritorious service to CBA/ABC. It was first awarded in 1978 in memory of Mary E. Elliott. Before her death in 1976, she had just completed four consecutive years of service on the Board of Directors (as Secretary, Vice President and President), and was just at the beginning her term as Past President at the time of her death.
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. Mary was also very active in identifying fungi for the public and in contributing to and editing (1970-71) a publication of the Biosystematics Research Institute for public information called Greenhouse-Garden-Grass.
This year's recipient of the Mary Elliot Service Award is Liette Vaseur.
Liette has made considerable contributions to the Association. These include serving as director (1996-1998), secretary (1998-2000), president-elect through past president (2000-2006), as well as a member of the organizing committee for the International Botanical Congress in St Louis in 1999.
Liette has also written book reviews for the Bulletin, and taken part in many Lionel Cinq Mars judging committees, helped re-write the Association By-laws, arrange French translations of association documents, and helped establish Regional

Undergraduate Awards. More recently, Liette has stepped in to take over the co-chair of the Ecology and the ailing Conservation Committee.
Liette has always been a very enthusiastic member of the Association, always making time for the graduate and undergraduate members, and stepping in wherever help was needed at a moment's notice.
Liette, on behalf of the Canadian Botanical Association / L'association botanique du Canada congratulation on your award!

Student awards for papers

Luella K. Weresub Award This award was established in the memory of Dr. Luella Kayla Weresub (1919-1979), a well-known Canadian mycologist who had worked at the Biosystematics Research Institute of Agriculture Canada since 1957. Dr Weresub was a very active member of CBA/ABC, serving as a Director from 1971 to 1973
This year, the winner of the Luella K. Weresub Memorial Award was **Marie Davey** (University of Alberta) for the best published paper on fungal biology. ML Davey, A Tsuneda & RS Currah 2008 Evidence that the gemmae of *Papulaspora sepedonioides* are neotenous perithecia in the Melanosporales, Mycologia 100: 626-635.

Taylor Steeves Award. This award was established to honour Taylor Steeves who has made numerous contributions to the CBA/ABC and to botany. It is awarded in recognition of the best paper published in the field of plant development by a graduate student. **Mr. Chris Meyer** (University of Waterloo) is the winner this year for his paper is entitled: "Environmental effects on the maturation of the endodermis and multiseriate exodermis of *Iris germanica* roots." It was published in 2009 in *Annals of Botany* (**103**:687-702).
Deserving of an honorable mention is **Mr. Tyler Wist**, (University of Saskatchewan)**f**or his paper entitled "Floral structure and dynamics of nectar production in *Echinacea pallida* var. *angustifolia* (Asteraceae)." It was published in 2008 in the International Journal of Plant Sciences (**169(6)**:708-722).

Alf Erling Porsild Award This award was established to honor the memory of the eminent Arctic botanist Alf Erling Porslid. It is awarded in recognition of the best paper published in the field of systematics and phytogeography by a graduate student. This year the award goes to **Tyler W. Smith** for his 2008 paper with Marcia J. Waterway titled, "Evaluating species limits and hybridization in the *Carex complanata* complex using morphology, amplified fragment length polymorphisms, and restriction fragment analysis," published in Botany 86: 809-826. In addition, **Richard T. McMullin** was given honorable mention for his paper, "Lichens of coniferous old-growth forests of southwestern Nova Scotia, Canada: diversity and present status," co-authored with P. N. Duinker, R. P. Cameron, D. H. S. Richardson, and I. M. Brodo, and published in The Bryologist 111: 620-637.

J S Rowe Award This award was established to celebrate the life and work of Stan Rowe, eminent Canadian Plant Ecologist. The winner this year is **Sean Michaletz** for his paper co-authored with Dr. Edward Johnson at the University of Calgary, entitled: "A biophysical process model of tree mortality in surface fires" published in the Canadian Journal of Forest Research 36(11): 2839-2851.


Sean Michaletz

Student Awards For Oral and Poster presentations

Lionel Cinq Mars Award.

Cinq-Mars (1919-1973) was an expert field botanist, amassing a personal herbarium of about 10,000 sheets. He was considered an expert on the genera *Viola* and *Amelanchier.*
Oral presentations were evaluated by a panel of judges chaired by the President-Elect,Hugues Massicotte and the award was presented by President Rodger Evans.
This year the winner was **Thomas Braukmann** for his paper co-authored with M. Kuzmina, and S. Stefanovic, Department of Biology, University of Toronto at Mississauga, titled "Concerted loss of all ndh genes from plastids of *Gnetales* and *Pinaceae* supports the "gnepine" hypothesis"
There were two Honourable mentions. **Paul Sokoloff** for his paper "Taxonomy and conservation of the narrow endemic *Astragalus robbinsii* var*. Fernaldii"* co-authored with L Gillespie*,* and **Emily Macdonald** for her paper "Construction of nodulation maps to study delayed nodulation in pea mutants" co-authored with S.B.Gallagher, and F.C Guinel.


Lionel Cinq Mars winners with Rodger Evans. Left to Right, Thomas Braukmann, Paul Sokoloff and Emily Macdonald.

Iain and Sylvia Taylor Award



Rodger Evans with Jennifer Smith to the right and Carissa Brown to the left

The Canadian Botanical Association gives an award for the best student poster presented at the annual meeting. The award is in made in honour of Iain and Sylvia Taylor, two members who have for many years actively contributed to the development of the CBA/ABC.
The posters are evaluated by a panel of judges, chaired this year by Christine Maxwell. The judges were Cindy Ross Friedman, Marian Munro and Moira Galway.
This year the winner was Jennifer Smith from Acadia University for her poster co-authored with E. and J. Reekie, titled
“Inhibiting Gibberellin Formation Suppresses Stolon Formation and Increases Fruit Yield in Strawberry Plants”.There was also an Honorable Mention for Carissa Brown of the University of Saskatchewan for her paper”Reproductive Limits to Treeline Expansion in Northern Yukon” co-authored with J.F.Johnstone

Student travel awards and bursaries

John Macoun Travel Bursary



Macoun winners with Rodger Evans. From left to right,Julia Nowak, Mark Welsh, Carissa Brown and R. Troy McMullin

This cash award, name in Honour of John Macoun in 1988 provides partial financial assistance for travel to the Annual Meeting to a student (or students) presenting a paper in the Lionel Cinq-Mars competition or a poster in the Taylor competition.
The winners this year were Julia Nowak(University of British Columbia), Carissa Brown (University of Saskatchewan),R. Troy McMullin(University of Guelph) and Mark Welsh (Wilfred Laurier University)

The Keith Winterhalder Undergraduate Travel Bursary



This award was established in 2006 and is in honor of Keith Winterhalder, a long time member and former president of the Association, for his outstanding contributions to the Association and for his never-failing interest and encouragement of the student members of the CBA/ABC.
This year the bursary was given to Shannon Kelly. (Thompson Rivers University)

Shannon Kelly receiving her award from Rodger Evans.

Regional Undergraduate Awards

The Ontario Honours Biology Conference.



Rachel White (on the right) receiving her award from Frédérique Guinel

The conference was held in Windsor this year on March 21st. Frédérique Guinel represented the CBA/ABC and reported that it was a good meeting with many interesting talks and posters. There were many attendees 143 talks and 17 posters) from Laurentian, Western, McMaster, Laurier, Windsor. There was a single student from Trent, Guelph and Toronto.

The winner of the CBA award was Rachel White who gave a talk entitled "Assessing the microhabitat and germination requirements for *Agalinis skinneriana* on Walpole Island First Nation"; she works with Dr. Jane Bowles, affiliated to both the Departments of Biology and of Geography at the University of Western Ontario.

The University of British Columbia-Okanagan (UBC-O) Irving K. Barber Regional Undergraduate Conference.

This was held on April 3rd in Kelowna.
Winner, Best Botany-Themed Oral Presentation ($100.00 prize): Carly Drought, for her talk entitled, "Regeneration of Subalpine Vegetation in Water-Repellent Soils Following Severe Wildfire." (UBC-O student; supervisor - Dr. Trudy Kavanagh).
Winner, Best Botany-Themed Poster ($100.00 prize):Michele Richard, for her poster entitled, "Biodegradation of PFOS by White-Rot Fungi." (Thompson Rivers University student; supervisor - Dr. Jonathan Van Hamme).



Left:Carly Drought winner of the oral presentation

Right. Michele Richard receiving her award from Cindy Ross Friedmann



Book Reviews by Iain Taylor

Book review editors face periods of feast or famine. While we complain of nothing to do during famine, we are often hard-pressed to find reviewers whose remarks may help readers to decide the value and/or relevance of a review. The two titles discussed here spent more than a year on my shelves without my finding colleagues who would assist me. Ironically both books turned out to be interesting and timely.

Plant growth and climate change. Edited by James I.L. Morison and Michael D. Morecroft
Blackwell Publishing Ltd, Oxford. pp. xiv +213. 2006
Plants have long been understood to reflect climate and to adapt to their location or produce propagules that by some chance or other 'migrate' to less challenging sites than those experienced by the parent. This book opens and closes with discussions of climate and plant response predictions, but includes the obvious topics of CO_2, temperature and water. From my perspective, the important contributions that these chapters make (especially the very thorough reference lists) are eclipsed by the short but very clear discussion of the challenges, assumptions and uncertainties that face the modelers of change and response. Since this chapter was prepared, we have much new information on actual changes and actual effects. The presentation of this chapter (chapter 8, by Wang, McMurtrie, Medlyn and Pepper) points to the need to ensure that the current models can accommodate new information.
As with most hard-backed books, cost may inhibit purchase, but it will be interesting for anyone with a copy on their shelves in 2016 or even 20 years after publication, to see just how robust the modeling presented here has proved to be.

Seed development, dormancy and germination. Edited by Kent Bradford and Hiro Nonagaki
Annual Plant Reviews, Volume 27 Blackwell Publishing Ltd, Oxford. pp xvii + 367. 2007
Fifty years after first doing experimental studies on seed germination, I was delighted to see a publisher commission an update on a topic that must be one of the essential topics of introductory botany, biology and plant physiology courses. 80 years have passed since J.B. Sumner heard the ridicule of the 'informed' enzymology community after he had suggested that not only could a seed protein be crystallized, but it could have catalytic function (urease).
Contributors to this volume include the front-runners in 21st century seed biology but also Russell Jones who was among the first to show a clear relationship between germination and plant growth regulators. The world of practical horticulture is replete with ways to break dormancy and enhance germination. The reality for many of those protocols is that they work, but I often wonder how anyone could have tried a particular method. We have known for decades, if not for centuries, that scratching a legume seed was an effective germination trigger, but dipping in concentrated sulphuric acid or subjecting it to a particular light regime still leaves me marveling at the ingenuity of researchers over the years. One senses that if there was a Nobel Prize for plant science, several of the pioneers of seed biology would have been so honored.
The book is not easy reading even for the expert, but germination seems to be one area where the model organism (*Arabidopsis thaliana*) has not pushed the research community away from a biological process that is so diverse even within species. If there is a criticism, it is that the editors have not set this amazingly effective update on a firmer historical foundation. The enormous progress of the last decade has only been possible because of the long history of rigorous research by individuals who stood so firmly on the shoulders of those giants who went before. The reviews in the Encyclopedia of Plant Physiology (published in the 1950s and 60s), the books by Bewley and Black, not to mention Evelyn's (1664) simple advice to store tree seeds in moist sand, give invaluable background and context for the 21st century student who may be inclined to the view that the models hold all the answers.
This is a valuable book brings us to the opening of the 21st century. No seed biologist should be without it, but those who teach basic botany would be advised to find and use a copy.

The Monograph Program

There follows a letter from Dr Paul Cavers to the President of the Association.

Dear Rodger

In the early 1990s, the Royal Society collaborated with several Canadian scientific societies, including the Canadian Botanical Association, to recommend that a Monograph Publishing Program be established in Canada. This Program, created in 1993 as part of the NRC Research Press, has published more than 100 monographs in a variety of scientific subject areas. Another 12 are currently in the process of publication. In addition, more than 200 of this nation's engineering and scientific specialists are engaged in the preparation of monographs that have been given preliminary approval by the Editorial Board of the Monograph Publishing Program.

More than 10% of our published monographs are completely botanical in content and many more have a strong botanical emphasis. Four of the manuscripts we are attempting to publish during the next 9 months also are in the area of Botany, as are at least 9 of the monographs in preparation. Unfortunately, none of the works in preparation will be published by the NRC Monograph Program because the National Research Council has decided to terminate the Program. At the same time, it will split off the Canadian Journals of Research as a private enterprise and reduce other activities of the Canadian Institute for Scientific and Technological Information. It is left to me to inform you of this decision and to solicit your help in efforts to maintain a monograph publishing capability in Canada.

I am enclosing a more detailed account of the events that have led to this situation. In addition, descriptions of the monographs published by the Program can be found on the Internet at “pubs.nrc.gc.ca”.

Please bring this situation to the attention of your Board and to the individual members of the Canadian Botanical Association. Any assistance that you can provide to help reverse this unfortunate decision will be greatly appreciated. I will also welcome suggestions that would assist in maintaining a monograph publishing organization in Canada. I can assure you that all members of the Editorial Board strongly support any efforts that can be made to this end.

Letters urging a reversal of the NRC decision to terminate the Monograph Program can be sent to the Prime Minister; the Minister of State for Science and Technology, the Hon. Gary Goodyear; the leaders of other federal parties; your local Member of Parliament; and the President of the National Research Council, Dr. Pierre Coulombe. I will appreciate receiving copies of all such letters.

Dr. Pierre Coulombe, President
National Research Council
NRC Executive Offices
Building M - 58, 1200 Montreal Road
Ottawa, ON K1A 0R6

Thank you for any assistance that you and your members can provide.

Yours sincerely

Dr. Paul B. Cavers, Editor
NRC Monograph Publishing Program
Department of Biology
University of Western Ontario
London, ON, N6A 5B7

Tel: (519) 661 2111 extension 86495
Fax: (519) 850 2343 E-mail: pcavers@uwo.ca

Termination of NRC Monograph Publishing Program

What is the Program?

Established in 1994, the National Research Council (NRC) Monograph Program has published high-quality specialized monographs (books) on topics in science and engineering, important to Canada. To date, nearly 80 monographs have been published and twelve more are in the process of publication. Moreover, more than 200 of the nation's engineering and scientific specialists have been engaged in preparing additional monographs, which they have been working on for months to years. These planned volumes, which will now be terminated, cover topics as diverse as aeronautical engineering, fisheries and important insect pests (e.g. the mountain pine beetle), former incidents of environmental change, mass extinction, and faunal and floral recovery and sustainability, to biographies of distinguished Canadian pure and applied scientists.

In the early 1990s, scientists in Canada recognized that specialized books on scientific and engineering topics were being published by some government departments, university presses, professional societies and even privately by some authors. Many were published outside of Canada and not marketed effectively in this country. An unknown number of book-length manuscripts were simply not being written because there was not seen to be an appropriate Canadian outlet for them; others were being written but never saw the light of publication because they were viewed as too regional in scope or to lack immediate economic significance. Their latent value and that which they offered to nurturing and strengthening the basic scientific foundation of the country as a mature civilized nation were ignored.

The Royal Society of Canada and a number of scientific societies established an *ad hoc* committee to recommend a procedure to overcome this problem. These people recommended that the NRC Research Press, well-known for its long-lived and successful Journals Program, should take on the responsibility for monograph publishing and that an Editorial Committee, composed of distinguished and experienced scientists in a wide range of fields should be established to oversee the new program to ensure that resulting works would be internationally competitive in the quality of their content and production.

When was Termination announced and Why is it Happening?

The employees of the NRC Press were informed of the decision in mid-February 2009. The members of the Editorial Board of the Monograph Publishing Program were informed that our program is being terminated through a conference call near the end of that month. The organizations involved in founding the NRC Monograph Program (e.g. the scientific societies, government departments at the federal and provincial levels, the Royal Society) still have not been told officially, and we were informed that NRC does not plan to tell them. In addition, members of the Monograph Publishing Program have been left the unenviable and embarrassing task of informing hundreds of engineers and scientists, who already have devoted months or years to preparation of their monographs and whose proposals the Editorial Board already had approved, that the Editorial Board would have to renege on its earlier acceptance in principle. Authors of monographs

already published will also suffer, since the marketing of their work by NRC will no longer take place. Co-publishing agreements will lapse, affecting hundreds of scientists.

In addition, the NRC Research Journals are being "spun off" into a not-for-profit Canadian company, which will not be part of the Federal Government. Assistance to enable the Journals to be transferred to this new company has been requested, but there will be financial challenges ahead. For example, electronic versions of all NRC Journals have been provided free to all Canadians by means of generous support from the Federal Depository Services Program. This support will not be available to the new company. Some of these journals have a history exceeding 80 years and several rank internationally among the best in their

NRC Press has been a component of the Canada Institute for Scientific and Technical Information (CISTI). The NRC, in response to directives from the Federal Government to cut 5% of overall costs, has made an overall cut to CISTI of 70%. Thus, in addition to the draconian measures applied to the Research Press, there will be large cuts to the operation of the National Science Library and the Information Intelligence Services, which are maintained for scientists across Canada. More than 300 employees of CISTI will lose their jobs. All of these changes will have negative effects on the work of Canadian scientists.

These decisions have been a result of a strategic review of NRC programs conducted by the Federal Government of Canada. We were told that the philosophy behind these decisions is that the Canadian Government believes that it should divest itself of publishing activities by privatizing or terminating its current programs as part of the policy to reduce the size of government.

Why Does Canada Need a Monograph Program?

First, we need information on living organisms and their environment in Canada. Unless we know where our fauna, flora, and other organisms can be found and what environmental conditions they require for survival, we cannot make intelligent decisions to combat the effects of climate change, habitat degradation, effects of invasive species and environmental pollution. To provide this information, we have published monographs in a wide variety of areas, several of which are listed below.

We have published floras [e.g. Flora of the Yukon Territory, Flora of the Hudson Bay Lowland and its Postglacial Origins, Flora of the Canadian Arctic Archipelago] that provide information on the plants that grow in various parts of the country.

Entomologists and the staff of the Monograph Program have established an agreement to work co-operatively to publish monographs on various groups of insects that are of importance to Canada. Most of these publications are in the "Insects and Arachnids of Canada Series". "Coleoptera, Curculionidae, Entiminae. Weevils of Canada and Alaska", Volume 2, published in 2008, is the twenty-fifth book in this important series.

We have published monographs on individual species of importance. Monographs on "Blue Grouse", "Sea Buckthorn" and "Les fourmis" have all received much favourable attention in Canada and abroad.

Publications on agricultural and related topics have been of prime importance. Titles include "Canadian Medicinal Crops", "Vegetables of Canada", "Culinary Herbs", "The Canadian System of Soil Classification", "Mycorrhizas: Anatomy and Cell Biology", and "Science, Agriculture and Food Security".

At its inception, The Monograph Program became responsible for the series entitled "Canadian Special Publications of Fisheries and Aquatic Sciences". We have published 16 books in this series. Among the most recent titles are: "The Quest for Sustainable International Fisheries", "Salmonine Introductions to the Laurentian Great Lakes", and "Marine Protected Areas and Fisheries Closures in British Columbia".

Our monographs in Forest Sciences are few but they are large and comprehensive in scope. They include "Towards Sustainable Management of the Boreal Forest", "Poplar Culture in North America", "Ecophysiology of Northern Spruce Species" and "Biology of *Populus* and its Implications for Management and Conservation".

Many titles in the Earth Science Series describe ancient animals (from giant dinosaurs to microscopic conodonts), many of which are used to date and correlate strata for purposes as diverse as establishing the ancient history of the Canadian landmass or investigating settings for petroleum and mineral concentration. Several examine major episodes of former climatic change, sea-level fluctuation and mass extinction. In another field of Earth Science, "Atlas of Migmatites" contains a description of some of the most highly deformed rocks from the roots of ancient mountain systems and found widely throughout the Canadian Shield. A key volume, now in an advanced state of preparation, summarizes final results of Project Lithoprobe the multi-year, multi-million dollar investigation of the Canadian landmass by teams of academic, governmental and industrial scientists, which has rewritten the story of North American continental evolution through some four billion years. Unfortunately, this is one of the many volumes that we shall be unable to publish.

A feature of NRC Press publications, supported by the Monograph Program, has been the biographies of world leaders from Canada in science and engineering. These have been in great demand by teachers anxious to satisfy students' requests for some national examples of outstanding accomplishments by such specialists. The first "biography", on Gerhard Herzberg, dealt with one of the greatest scientists of the last century, the 1971 Nobel Prize winner in chemistry and a founding member of the Editorial Board of the NRC Monograph Program. The second volume dealt with George Klein, the most productive inventor in Canada in the twentieth century. The third volume, "Her Daughter the Engineer", describes the life and accomplishments of Elsie MacGill, the world's first female aeronautical engineer.

NRC Monographs have earned a first-class reputation in Canada and around the world for their scientific merit and their attractive presentation. Several have won prestigious national and international awards.

Scientific monographs are an essential part of the scientific process and serve the public good. They constitute the documented record of much of a country's scientific foundation; one that can be drawn upon both as a reliable reference source and as a basic platform from which to launch advances designed to elevate the platform to new heights. With such a huge and physiographically diversified landmass with offshore extensions on three sides, Canada, more than many countries, needs a well-documented record of the remarkable natural variations that accompany its geographical extent and extremes. Knowledge of these is

obviously in the public interest, and in building the secure national foundation needed to meet that interest, this country currently lags well behind many of the world's advanced nations.

What Can Be Done to Reverse These Decisions?

Respectful letters to the Prime Minister, the Minister of State for Science & Technology (the Honorable Gary Goodyear), and your local MP, to explain the critical role that science publishing in Canada plays for Canadian scientists. Please mention that you believe that a Monograph Publishing Program is a public good that is essential for Canadian science and international competitiveness.
Letters to Presidents of the scientific societies of Canada and to individual scientists in Canada and abroad to inform them about this situation, urging that they write to the government, in their personal and organizational capacities, to explain the benefits of scientific publishing by the federal government, explaining that this is a core function of government. Please ask them to tell their members about this situation and to explain the importance of letters from individual scientists stressing the importance to Canadian science of a monograph publishing program.
Contact the media, particularly editorialists and science journalists, to bring this to the attention of the public.

Cessation du programme d'édition des monographies du CNRC

22 juin 2009
Cher Rodger,
Au début des années 90, The Royal Society a collaboré de concert avec de nombreuses sociétés scientifiques canadiennes, incluant l'Association botanique du Canada, afin de recommander qu'un Programme d'édition de monographies soit mis sur pied au Canada. Ce programme, créé en 1993 comme partie intégrante des Presses scientifiques du CNRC, a permis la publication de plus de 100 monographies dans une vaste gamme de domaines à caractère scientifique. Douze autres monographies sont en cours de publication. De plus, plus de 200 spécialistes scientifiques et en ingénierie de ce pays participent à la préparation de monographies qui ont reçu une approbation préliminaire par le Comité de rédaction du programme d'édition de monographies.
Plus de 10 % de nos monographies publiées traitent exclusivement de botanique et plusieurs autres ont une forte thématique botanique. Quatre des manuscrits que nous tentons de publier au cours des neuf prochains mois sont également dans le domaine de la botanique, comme le sont au moins neuf des monographies en préparation. Malheureusement, aucun des travaux en préparation ne sera publié par le Programme des monographies du CNRC, car le Conseil national de recherches Canada a décidé de mettre fin au programme d'édition de monographies. Le Conseil transformera les Presses scientifiques en société privée et réduira d'autres activités de l'Institut canadien de l'information scientifique et technique. Il est de mon devoir de vous informer de cette décision et de solliciter votre aide afin de conserver une capacité d'édition de monographies au Canada.
Je joins à cette lettre un compte rendu détaillé des événements qui ont mené à cette situation. De plus, des descriptions des monographies publiées par le Programme sont disponibles sur Internet à l'adresse suivante : http://pubs.nrc-cnrc.gc.ca/fra/accueil.html.
Veuillez appeler l'attention de votre Comité et des membres de l'Association botanique du Canada sur cette situation. Toute aide que vous pourrez fournir afin de révoquer cette décision malencontreuse sera grandement appréciée. Je serai également ouvert à toute suggestion qui aiderait à conserver une organisation d'édition de monographies au Canada. Je peux vous assurer que tous les membres du Comité de rédaction soutiennent tous les efforts entrepris à cet égard.
Les lettres demandant le rejet de la décision du CNRC de mettre fin au Programme d'édition des monographies peuvent être envoyées au premier ministre, à l'honorable Gary Goodyear, ministre d'État chargé des Sciences et de la Technologie, aux chefs des autres partis fédéraux; à votre député local et au président du Conseil national de recherches Canada, M. Pierre Coulombe. Je serais heureux de recevoir des copies de ces lettres.
Dr Pierre Coulombe, Président
Conseil national de recherches Canada
Bureau de la haute direction
Bâtiment M - 58, 1200 chemin de Montréal
Ottawa, Ontario K1A 0R6
Merci de toute l'aide que vous ou vos membres pourrez nous fournir.
Cordialement,
Paul B. Cavers, Ph. D. Éditeur
Programme d'édition des monographies du CNRC
Faculté de biologie
University of Western Ontario
London, ON, N6A 5B7
Tél. : (519) 661 2111 poste 86495 Téléc. : (519) 850 2343
Adresse électronique : pcavers@uwo.ca

Cessation du programme d'édition des monographies du CNRC
Qu'est-ce que le programme?

Établi en 1994, le programme des monographies du Conseil national de recherches du Canada (CNRC) a publié des monographies (livres) spécialisées de haute qualité sur des sujets touchant à la science et à l'ingénierie, qui sont d'une importance capitale pour le Canada. À ce jour, près de 80 monographies ont été publiées et douze autres sont en cours de publication. De plus, plus de 200 spécialistes de la science et de l'ingénierie du pays ont participé à la préparation de monographies supplémentaires, sur lesquels ils travaillent depuis des mois ou des années. Ces volumes préparés, qui seront dorénavant discontinués, englobent des sujets aussi variés que l'ingénierie aéronautique, les pêcheries et les insectes nuisibles importants (tels le dendroctone du pin argenté), les événements passés reliés aux changements climatiques, l'extinction massive, le rétablissement de la faune et de la flore et la viabilité de l'environnement ainsi que des biographies d'éminents scientifiques canadiens dans le domaine des sciences pures et appliquées.
Au début des années 1990, les scientifiques du Canada ont pris conscience que les livres spécialisés sur les sujets de science et d'ingénierie étaient publiés par d'autres ministères, presses universitaires, sociétés professionnelles et même, de façon privée, par certains auteurs. De nombreuses monographies étaient publiées à l'extérieur du Canada et n'étaient pas mises en marché efficacement dans

ce pays. Un nombre inconnu de manuscrits volumineux n'étaient tout simplement pas rédigés, car il ne semblait pas y avoir de débouchés canadiens appropriés pour eux. D'autres ont été rédigés mais n'ont jamais été publiés, car ils étaient perçus comme étant de portée trop régionale ou comme n'ayant pas d'avantage économique immédiat. Leur potentiel latent et tout ce qu'ils offrent en matière de consolidation et d'appui des fondements scientifiques de base du pays en tant que nation civilisée ont été ignorés.
La *Royal Society of Canada* et un nombre de sociétés scientifiques ont mis sur pied un comité d'étude afin de recommander une procédure qui viendra surmonter ce problème. Ces intervenants ont recommandé que la société des Presses scientifiques du CNRC, reconnue depuis longtemps pour son programme de Revues des Presses scientifiques bien établi, doit se charger de l'édition des monographies et qu'un comité de rédaction, composé de scientifiques distingués et chevronnés provenant d'une vaste gamme de domaines, doit être établi afin de superviser le nouveau programme pour que les travaux résultants soient compétitifs au niveau international quant à leur contenu et à la qualité de la production.

À quel moment la cessation a-t-elle été annoncée et quelle en est la cause?

Les employés des Presses scientifiques du CNRC ont été informés de la décision en mi-février 2009. Les membres du comité de rédaction du programme d'édition des monographies ont été informés de la cessation du programme lors d'une conférence téléphonique vers la fin de ce même mois de février. Les organisations qui ont participé à la création du programme d'édition des monographies (c.-à-d. les sociétés scientifiques, les ministères provinciaux et fédéraux, la Royal Society) n'ont pas encore été informées officiellement et nous avons appris que le CNRC ne prévoie pas leur annoncer. De plus, les membres du programme d'édition des monographies ont eu la tâche ingrate et embarrassante d'annoncer à des centaines d'ingénieurs et de scientifiques, qui avaient déjà dévoué des mois ou des années à la préparation de leurs monographies et dont les propositions avaient déjà été acceptées par le comité de rédaction, que celui-ci devait, en principe, reculer sur son acceptation ultérieure. Les auteurs des monographies déjà publiées seront également touchés par la décision, puisque le CNRC n'effectuera plus la commercialisation de leurs travaux publiés. Les ententes de copublication deviendront également caduques, ce qui touchera des centaines de scientifiques.
De surcroît, les Presses scientifiques du CNRC sont transformées en un organisme canadien sans but lucratif, qui ne fera pas partie du gouvernement fédéral. De l'aide a été demandée afin de permettre aux Revues d'être transférées vers ce nouvel organisme, mais des obstacles financiers sont à prévoir. Par exemple, des versions électroniques de toutes les Revues du CNRC ont été fournies gratuitement à tous les Canadiens grâce aux contributions généreuses du Programme des services de dépôt fédéral, mais ce soutien financier ne sera pas offert au nouvel organisme. Certaines de ces revues ont plus de 80 ans d'existence et plusieurs d'entre elles se classent au niveau international parmi les meilleures dans leurs domaines.
Les Presses scientifiques du CNRC font partie de l'Institut canadien de l'information scientifique et technique (ICIST). Le CNRC, en réponse aux directives du gouvernement fédéral de couper 5 % de ses frais généraux, a fait des coupures globales de 70 % à l'ICIST. Ainsi, en plus des mesures draconiennes imposées aux Presses scientifiques, de grosses coupures seront faites dans les opérations des services de la Bibliothèque scientifique nationale et des Services d'information et d'intelligence, qui sont administrés pour les scientifiques dans l'ensemble du pays. Plus de 300 employés de l'ICIST perdront leurs emplois. Tous ces changements auront un impact négatif sur le travail des scientifiques canadiens.
Ces décisions résultent d'un examen stratégique des programmes du CNRC mené par le gouvernement fédéral du Canada. Nous avons été informés que la raison derrière cette décision est que le gouvernement fédéral doit se départir des services de publication en privatisant ou mettant fin aux programmes actuels dans le cadre d'une politique de réduction de la taille du gouvernement.

Quelle est l'importance d'un programme d'édition des monographies pour le Canada?

A priori, nous avons besoin d'informations sur les organismes vivants et sur leurs environnements au Canada. Si nous ne savons pas où notre faune, flore et autres organismes vivent et quelles conditions environnementales ils nécessitent pour leur survie, nous ne pouvons prendre des décisions éclairées afin de combattre les effets des changements climatiques, de la dégradation de leurs habitats naturels, des effets des espèces nuisibles et de la pollution environnementale. Afin de nous donner ces informations, des monographies touchant à divers domaines scientifiques sont publiées, dont certaines sont répertoriées ci-dessous.
Nous avons publié des monographies sur différentes flores [p. ex. Flora of the Yukon Territory, Flora of the Hudson Bay Lowland and its Postglacial Origins, Flora of the Canadian Arctic Archipelago] qui nous donnent de l'information sur les végétaux qui poussent dans diverses parties du pays.
Des entomologistes et le personnel du programme d'édition des monographies ont créé une entente pour travailler de concert afin de publier des monographies sur divers groupes d'insectes qui sont d'une importance capitale au Canada. La plupart de ces publications se retrouvent dans la série « Insects and Arachnids of Canada Series ». Publié en 2008, « Coleoptera, Curculionidae, Entiminae. Weevils of Canada and Alaska », volume 2, est le vingt-cinquième livre de cette importante série.
Nous avons publié des monographies sur des espèces individuelles qui sont d'un intérêt vital. Des monographies sur le tétras sombre, l'argousier et les fourmis ont toutes reçu un accueil favorable au Canada et à l'étranger.
Des publications sur des sujets touchant l'agriculture et autres sujets connexes ont été d'une importance capitale. Certains titres comprennent « Canadian Medicinal Crops », « Vegetables of Canada », « Culinary Herbs », « The Canadian System of Soil Classification », « Mycorrhizas: Anatomy and Cell Biology », et « Science, Agriculture and Food Security ».
Dès sa conception, le programme d'édition de monographies a publié la série intitulée « Canadian Special Publications of Fisheries and Aquatic Sciences ». Nous avons publié 16 livres dans cette série. Parmi les titres les plus récents, on retrouve : « The Quest for Sustainable International Fisheries », « Salmonine Introductions to the Laurentian Great Lakes », et « Marine Protected Areas and Fisheries Closures in British Columbia ».

Nous avons publié peu de monographies sur les sciences forestières, mais leur portée est vaste et significative. Elles comprennent notamment : « Towards Sustainable Management of the Boreal Forest », « Poplar Culture in North America », « Ecophysiology of Northern Spruce Species » et « Biology of *Populus* and its Implications for Management and Conservation ».
Nombreux titres de la série des Sciences de la Terre décrivent des animaux préhistoriques (des dinosaures géants aux conodontes microscopiques), dont certains sont utilisés pour dater et mettre en corrélation des strates terrestres à des fins aussi diverses que d'établir l'histoire ancienne de la masse terrestre canadienne ou d'étudier les conditions de concentration des minéraux et du pétrole. Plusieurs monographies examinent des événements majeurs d'un ancien changement climatique, d'une fluctuation du niveau de la mer et de l'extinction massive. Dans un autre domaine des Sciences de la Terre, « Atlas of Migmatites » inclut une description de certaines des roches les plus déformées à partir des racines des anciennes chaînes montagneuses qui s'étendent à travers le Bouclier canadien. Un volume clé, maintenant dans un état avancé de préparation, résume les résultats finaux du Projet Lithoprobe, l'enquête sur la masse terrestre canadienne de plusieurs millions de dollars s'étendant sur plusieurs années menée par des équipes de scientifiques universitaires, gouvernementaux et industriels, qui a permis de réécrire l'histoire de l'évolution du continent nord-américain sur quatre milliards d'années. Malheureusement, c'est une des nombreuses monographies que nous ne serons pas en mesure de publier.
Les publications des Presses du CNRC, financées par le programme d'édition des monographies, ont pour sujet récurrent les biographies des chefs de file canadiens en science et en ingénierie. Celles-ci sont très populaires auprès des professeurs qui sont anxieux de satisfaire aux demandes des étudiants pour des exemples d'accomplissements nationaux par de tels spécialistes. La première « biographie » publiée portait sur Gerhard Herzberg, un des scientifiques les plus renommés du siècle dernier, récipiendaire du prix Nobel de chimie en 1971 et un membre fondateur du comité de rédaction du programme d'édition des monographies du CNRC. Le deuxième volume portait sur George Klein, l'inventeur le plus prolifique du Canada au vingtième siècle. Le troisième, intitulé « Her Daughter the Engineer », décrit la vie et les accomplissements d'Elsie MacGill, la première femme ingénieure aéronautique.

Les monographies du CNRC jouissent d'une solide réputation au Canada et au niveau international pour leur mérite scientifique et leur présentation attrayante et elles sont nombreuses à avoir gagné des prix nationaux et internationaux prestigieux.
Les monographies scientifiques sont essentielles au processus scientifique et sont un atout considérable pour le public. Elles constituent la base documentaire d'une grande partie des fondements scientifiques d'un pays; fondements qui peuvent être exploités comme référence fiable et comme tremplin de base à partir duquel les avancées scientifiques peuvent être propulsées afin d'élever ce tremplin vers de nouveaux horizons. Avec une telle masse terrestre diversifiée géographiquement et des étendues extracôtières sur trois côtés, le Canada, plus que tout autre pays, nécessite une base documentaire solide des extraordinaires variations naturelles qui sont tributaires de ses étendues et extrêmes géographiques. Ces connaissances sont évidemment d'intérêt public et dans l'établissement d'une base nationale sécuritaire afin de satisfaire ces intérêts, notre pays accuse un retard considérable par rapport à la plupart des pays industrialisés du monde.
Que pouvons-nous faire pour rejeter cette décision?
Des lettres respectueuses peuvent être envoyées au premier ministre, à l'honorable Gary Goodyear, ministre d'État chargé des Sciences et de la Technologie, à votre député local, pour expliquer le rôle prépondérant que jouent les publications scientifiques au Canada pour les scientifiques canadiens. Veuillez mentionner que vous êtes d'avis que le programme d'édition des monographies est un bien public essentiel à la science canadienne et à sa compétitivité internationale.
Des lettres aux présidents des sociétés scientifiques du Canada et aux scientifiques individuels au Canada et à l'étranger afin de les informer de cette situation, les invitant à écrire au gouvernement, en leur nom ou au nom de leurs organisations, afin d'expliquer les avantages de la publication scientifique par le gouvernement fédéral, expliquant que c'est une fonction essentielle du gouvernement. Veuillez les inviter à parler de cette situation avec leurs membres et à expliquer l'importance des lettres envoyées par les scientifiques qui attestent de l'importance du programme des monographies pour la science canadienne.
Communiquez avec les médias, surtout les éditorialistes et les journalistes scientifiques, afin de sensibiliser le public.

Paul Cavers

The Auction!

A very successful auction was held at the annual meeting at Acadia last May. A total of $767.00 was raised for the Macoun Travel Bursary. Many thanks to all who participated, contributed items and especially to the Auctioneer, Hugues Massicotte shown in action on the left, and to Christian Lacroix who acted as treasurer for the event.



What's New in Botany? Graduate Student Research

"Graduate Student Research" will profile a graduate student and his/her research. If you would like to submit a profile, please send a photo of yourself, the name of your supervisor, where you are studying, and a summary of your research. Please keep within 250 words. It will be wonderful to hear from students and their exciting research! Please forward your profile to Dr. Jane Young , Ecosystem Science and Management, University of Northern British Columbia, 3333 University Way, Prince George, BC, V2N 4Z9) at youngj@unbc.ca .

Heathyr Francis, B.Sc. B.Ed, MSc.Candidate

Studying under Neil Emery at Trent University, Ontario



Heathyr Francis

Savannas are rare and threatened ecosystems in mid-western North America and contain many species of interest, especially the indicator species, the wild blue lupine (*Lupinus perennis*). The wild blue lupine is also rare and is the host plant for three extirpated butterflies, the Karner Blue (*Lycaeides melissa samuelis*), the Frosted Elfin (*Callophrys irus*), and the Eastern Persius Duskywing (*Erynnis persius*). The primary study site for my research is located on the Rice Lake Plains, in Southern Ontario, where there is active restoration of wild blue lupine populations.

I am looking at aspects of wild blue lupine reproduction to determine how it is contributing to their rarity. By using both phenological and physiological approaches, I am evaluating the robustness of the wild blue lupine in the savanna ecosystem and establishing whether low seed production and hormone activity are factors contributing to their rarity. Comparisons of potential fecundity, both in the field and in the greenhouse, as well between similar lupine species, will help establish the amount of effort put into reproduction. Tissue and phloem samples collected throughout development will be used to determine the types and abundance of plant hormones in the plant during its reproductive phase, which play a large role in reproduction. By integrating the phenological and physiological findings, light will be shed onto why wild blue lupine are rare. This knowledge can then be used to help restore savanna ecosystems, wild lupine populations, and allow for reintroduction of the three extirpated butterfly species.

Megan A. House Supervisor: Dr. M.A. Fieldes

Current Location: Wilfrid Laurier University



Megan House

I first became hooked on research during the completion of an undergraduate project where I attempted to detect two flowering time genes in flax. This work led me to my current position as a Masters student, where I am assessing three main topics regarding a set of flax lines that were derived from plants treated with a DNA- demethylating agent. These lines have hypomethylated DNA, flower early, are shorter and have fewer leaves than the corresponding controls. Since it is known that methylation levels in flax vary with tissue type and throughout plant development, I first addressed the possibility that methylation levels in flax vary throughout a 24-hour day. Second, I characterized and compared the developmental responses of early flowering and control lines grown under normal and short-day conditions. Because little is known about the genes that regulate flowering in flax, and the potential role of DNA methylation in this, the third portion of my thesis has been to establish flax-specific primers for genes that regulate flowering time in other species. Developmental profiles for their expression in flax will be examined, and the profiles will be compared between control and early-flowering lines. This is the first step towards the overall goal of understanding the role of DNA methylation in the regulation of flowering time in flax. After the completion of my MSc, I will be pursuing a PhD during which I will be examining the potential role of DNA methylation in the response to water stress in maize.

Christina Lord

I am currently a PhD candidate in the Biology Department at Dalhousie University in Halifax Nova Scotia supervised by Dr. Arunika Gunawardena. As a member of the programmed cell death (PCD) laboratory, I am working with the lace plant (*Aponogeton madagascariensis*) in an effort to shed light on the process of PCD in plants. The lace plant is one of forty species in the family *Aponogetonaceae* and is the only species which produces perforations in its leaves through the PCD process. Although the hallmarks of PCD within the plants cells have been visualized, the precise order and triggers for events is still unclear. My research project focuses specifically on the genetic transformation of the lace plant in an effort to clarify these sub-cellular questions regarding PCD. In order to answer these questions, I am attempting both stable and transient transformation with proteins tagged with the fluorescent molecular markers GFP and YFP and targeted to the cytosol, plasma membrane, tonoplast, endoplasmic reticulum and microtubules. Stable transformation involves the use of *Agrobacterium tumefaciens* with whole tissues, while transient transformation involves the use of protoplasts and PEG/electroporation methods. Through this tagging, a more precise understanding of the order of events occurring within a live cell undergoing PCD can be determined. This tagging would also permit for the characterization of organelle origin, movement and fate.



Christina Lord

Current Botanical Research in Canada

Root Symbioses at Laurier - Frédérique Guinel



Frédérique's team. From left to right, Emily Macdonald, Frédérique, Scott Clemow and Chengli Long

The research in my lab at Wilfrid Laurier University in Waterloo, ON, centers on the fundamental question of how plant roots sense their environment. We are focusing on the studies of two structures, the nodules and the mycorrhizae, which form in response to the presence of beneficial soil microbes. While the nodules result from the interaction between a legume and a soil bacterium, the mycorrhizae form when a relationship is established between a plant and a soil fungus. Within the nodules, the bacteria are capable of fixing atmospheric nitrogen but they generally fix more than necessary; the extra nitrogen is taken by the legume and used for its own needs. In the fungal association, the mycelia mine the soil around the plant and bring to the roots mainly phosphorous and water; the site of exchange is principally at the arbuscules.

The mechanisms used by the plant to regulate entry to these beneficial microsymbionts are not entirely understood. In recent years, much molecular work has been done to dissect the many steps required for the organogenesis of the two symbiotic structures. The epidermis being the first root layer to be in contact with the microbes is of course important; it is capable of distinguishing beneficial symbionts from parasitic ones. However, it is not the only check-point for a successful colonization. For example, in nodulation, the pericycle, the outermost layer of the vascular tissue, also senses the chemical signals sent by the bacteria. The fact that the microsymbiont ultimately enters into the plant cells makes it possible for the plant to exert a tight control over the establishment and development of the symbioses; this control is likely to involve hormones.

Many years ago, when I was establishing my lab at Laurier, I was very fortunate to receive from Dr. Tom Larue, my previous post-doctoral supervisor at the Boyce Thompson Institute (Cornell University, Ithaca, NY), his collection of pea mutants. These mutants exhibit many phenotypic traits, one of which is low nodulation. Because of their pleiotropic character, it is thought that their mutation relates directly or indirectly to a hormone. This generous gift allowed me to develop one of the pillars of my research program: to understand the roles played by hormones in the two symbiotic interactions. In my lab, we are studying these pleiotropic pea mutants and attempting to determine the hormone which is behind their poor nodulation. At this point of time, all members of my lab are focusing their work on two mutants, R50 (sym16) and E151 (sym15).

A. <u>The R50 mutant</u>. R50 forms few nodules 21 days post inoculation as its nodule primordia develop abnormally. These are flat and the threads carrying the beneficial rhizobia are looping within the root cortex. A normal nodulation phenotype can be restored in R50 when the mutant is treated with ethylene inhibitors (Guinel and Sloetjes, 2000). R50 also exhibits a pale phenotype, a poorly developed root system, delayed germination and senescence. Many of its traits point to a deficient cytokinin homeostasis. R50 in fact accumulates cytokinins in its vegetative organs (Ferguson et al., 2005). Meanwhile the enzyme cytokinin oxidase (CKX) which degrades cytokinins has a low activity in R50; however, transcripts of the two known PsCKX genes (PsCKX1 and PsCKX2) do not correlate well with this low activity (Held et al., 2008).

Two senior M.Sc. students in my lab, Scott Clemow and Chengli Long, are spending much of their energy on R50 (sym 16). Scott is locating the CKX protein in the developing nodule via immunolocalization with an antibody made against PsCKX1. To determine the exact age of the nodules, Scott was patient enough to develop with success a tricky spot-inoculation technique for the pea system. He can now correlate amount and location of protein with stages of nodule organogenesis. We know that the coding region of PsCKX1 is not mutated in R50 (Held et al. 2008); however, the sequence of PsCKX2 is still unknown. Chengli is currently cloning this gene in the wild-type and she will compare it later to that of R50. She is also using physiological tools to comprehend better the role cytokinin plays in pea nodulation. She is exogenously treating the wild-type with synthetic compounds in order to alter its levels of cytokinins so that it mimics the R50 nodulation phenotype.

B. <u>The mutant E151</u>. At this time, we have not yet associated E151 phenotype to any hormone; before attempting to do so, we must characterize it as well as we can. We know that E151 responds normally to darkness and that it possesses normal levels of chlorophyll (Michael Chlup, 2008). Its nodulation is low and the process is apparently blocked at the nodule primordium-nodule meristem transition (Delanghe, 2007). A junior M.Sc. student in the lab, Emily Macdonald, determined that E151 exhibited a delayed nodulation, not only in time but also in space. Emily presented this work at the Annual CBA Meeting in Acadia (2009) and she received an honorable mention for her oral presentation. She is now measuring many physical parameters of E151, and soon will be treating this mutant with different hormones and their antagonists or inhibitors to determine if one induces an abnormal response.

And myself, what does she do, will you ask? Right now, I am interested in the formation of the vasculature within a developing nodule. This came up because one of my Honour's students, Andrew Morse, observed that R50 has an abnormal nodule vasculature (Pepper et al., 2007). Proper vasculature is essential for an efficient nodulation because the nutrients exchanged between the symbionts use this route for distribution. Vasculature development has furthermore been shown to be under hormonal control. This interest in vascular tissues pushed me to study the literature (old and new) and to write a review on their arrangement in nodule. This work is in press now in Botany (formerly Canadian Journal of Botany).

In conclusion, I would like to emphasize that in my lab we use many approaches to study two symbioses of prime importance for a sustainable agriculture. Students leaving my lab are well versed in plant physiology, especially hormones, in plant anatomy, and in microscopy. Furthermore, because I have nice colleagues, Matt Smith at Laurier and Barbara Moffatt at the University of Waterloo, my students who want to learn molecular techniques are able to do so. Finally, my group attempts to

follow the philosophy of the WLU Biology Department and that of our Master program in Integrative Biology. Rather than taking apart the complex interactions occurring within the symbioses and studying them separately, we try to assemble all the pieces we obtained and take a larger view so that we can propose models which explain the symbioses at the level of the whole plant organism. I must add that we enjoy doing so!

References

Chlup, M. 2007. Characterization of the phenotype of E151, a pea nodulation mutant of Sparkle. M.Sc. Thesis, University Of Waterloo

Delanghe, S. 2007. Investigation of the nodulation development in the low nodulating pea mutant E151 (sym15). Honour's Thesis, Wilfrid Laurier University.

Ferguson B.J., Wiebe E.M., Emery R.J.N., and **F.C. Guinel**. 2005. Cytokinin accumulation and an altered ethylene response mediate the pleiotropic phenotype of the pea nodulation mutant R50 (sym16). Canadian Journal of Botany, **83**: 989-1000.

Guinel, F.C., and L.L. Sloetjes, Ethylene is involved in the nodulation phenotype of *Pisum sativum* R50 (sym 16), a pleiotropic mutant which nodulates poorly and has pale green leaves. Journal of Experimental Botany, **51**: 885-894, 2000

Held M.A., Pepper A.N., Bozdarov J., Smith M.D., Emery R.J.N., and **F.C. Guinel**. 2008. The pea nodulation mutant R50 (sym16) displays altered activity and expression profiles for cytokinin dehydrogenase. Journal of Plant Growth Regulation, **27**: 170-180.

Pepper A.N., Morse A.P., and **F.C. Guinel**. 2007. Abnormal root and nodule vasculature in R50 (sym16), a pea nodulation mutant which accumulates cytokinins. Annals of Botany, **99**: 765-776.

Supported externally by NSERC (Natural Sciences and Engineering Research Council of Canada) Discovery grants and internally by WLU.

Phenology Information Available

I have been given a very large amount of carefully compiled data on the phenology of plants in Canada. This is the work of Dr. W. Harold Minshall who had a distinguished career with the Canadian Department of Agriculture, first in Ottawa and after 1951 in London, Ontario. The data was taken from the 1930s to 2003 and deals with trees, shrubs and herbaceous plants. There is also climate data to accompany the author's observations plus data from other phenologists who preceded Dr. Minshall.

If you could utilize this data and hopefully publish some (or all) of it, please contact Dr Paul Cavers, Department of Biology, University of Western Ontario, London, ON N6A 5B7; Tel: (519) 661 2111 ext 86492; E-mail: pcavers@uwo.ca





Sunny, warm weather was very welcome at the barbecue at Acadia

NATIVE PLANT EMBLEMS OF CANADA
10. Alberta

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

.



FLORAL EMBLEM : WILD ROSE



Fig. 1. Wild prickly rose (*Rosa acicularis*) in flower (left) and in fruit (right). Source: Plates 344 and 345 (respectively) from Walcott, M.V. 1925. North American wild flowers. Smithsonian Institution, Washington, D.C. 5 vols.

SYMBOLISM

The Alberta wild prickly rose has been applauded as an excellent choice for the floral emblem of Alberta because it is extraordinarily beautiful, widespread in the province, and exhibits hardiness in the northern climate of the province that reflects the spirit of the people. The thorniness of the plant has not generally been viewed as a virtue, but some have suggested that the prickliness is consistent with the tough nature of many Albertans.

LATIN NAMES

Rosa acicularis Lindl.

The genus name *Rosa* is based on the ancient Latin name for roses, *rosa*, which in turn originated from Akkadian (the ancient language of Mesopotamia) word *russu*, “red”. The epithet *acicularis* is Latin for needle-like, a reference to the prickles.

ENGLISH NAMES

Wild rose. Also: Alberta wild rose, Alberta wild prickly rose, arctic rose, bristly rose, circumpolar rose, northern prickly rose, prickly wild rose, wild prickly rose. The name “wild rose” is rather ambiguous; “prickly rose” is much more often used to refer to the species, and in the following we use “wild prickly rose”.

FRENCH NAMES

Rosier aciculaire; also: églantier, églantine, rosier arctique.

HISTORY

a. Canada

The designation of a floral emblem for Alberta appears to have been initiated by a suggestion of the editor of an Edmonton newspaper. Alberta Women's Institutes took up the suggestion and passed it on to the province's Department of Education. School children made the final choice of the wild rose as the province's floral emblem. The government adopted the wild rose officially in the Floral Emblem Act of 1930.

b. Foreign

Roses have been very popular choices as floral symbols of political regions, although often a particular species is not identified. Like Alberta, Iowa chose a “wild rose” as its emblem. The rose is the New York state flower. Georgia adopted the white Cherokee rose. The District of Columbia is associated with the American beauty rose. North Dakota chose the prairie rose. Roses have national significance in Bulgaria, England, Iran, Luxembourg, and the Maldive Islands in the Indian Ocean. The rose served as the national flower of Honduras from 1946 to 1969, but an orchid was adopted as the national flower in 1946. In 1986, the rose became the “national floral emblem” of the United States, when President Reagan signed the proclamation in the White House Rose Garden; according to one newspaper report, the president “rose to the occasion”.

APPEARANCE

Wild prickly rose is a deciduous, bushy shrub usually 0.5-1.5 m (20 inches - 5 feet), sometimes up to 2.5 m (8 feet). The stems are usually densely covered with slender, straight thorns. The leaves are borne alternately; they have five to nine leaflets that are 3-5 cm (1.2-2 inches) long and coarsely toothed. The leaf stalks and the margins of the leaflets bear tiny glands and there are conspicuous stipules (small leaf-like bracts) at the base of the leaf stalk. The flowers are fragrant, 5-7 cm (2-2.8 inches) across, and are borne singly (occasionally in groups of a few) at the ends of lateral branches; the petals are pink or rose (rarely white) on the outside but often white and hairy on the inside; numerous stamens are present.



Fig. 2. Painting of the official flower of Alberta, wild prickly rose (*Rosa acicularis*), from the Walter Coucill Canadian Centennial official flowers of Canada series (see Coucill 1966 cited in #1 of this series). Reproduced with the permission of the copyright holders, the Coucill family.

Wild prickly rose "fruits" (hips) are globose or pear-shaped, 1.5-2.5 cm (0.6-1 inch) long, fleshy, red or orange-red, and ripen in late summer and fall. They contain 10 to 30 small, hairy "seeds". Technically, rose hips are accessory or false fruits, not true fruits. The fleshy, outer portion that surrounds the "seeds" is a "hypanthium", developed from the top of the flower stalk; in contrast, the flesh of true fleshy fruits is developed from one or more ovary walls. The "seeds" of a rose are in fact the true fruits; these are categorized as "achenes", defined as single-seeded, dry, indehiscent fruits in which the seed coat is separate from the fruit wall (sunflower "seeds" are another example of achenes).

CLASSIFICATION

Family: Rose family (Rosaceae).

The genus *Rosa* consists of about 190 species of shrubs, distributed throughout the temperate and subtropical areas of the northern hemisphere. There are 14 native and 11 introduced species of the genus growing wild in Canada. Four species occur in the Prairie Provinces, three of these in Alberta: wild prickly rose (*R. acicularis*), prairie rose (*R. arkansana*) and common wild rose (*R. Woodsii*).

Unlike the wild prickly rose, the common wild rose has infrastipular prickles (paired prickles located below the stipules), and its fruit lacks a neck. Unlike the wild prickly rose, the prairie rose mostly dies back to ground level at the end of the season, and its leaves have 9-11 leaflets (compared to 3-7 in wild prickly rose). Hybridization between *R. acicularis* and other species of *Rosa* sometimes makes identification problematic.
Two subspecies of *R. acicularis* are widely recognized: subsp. *acicularis* occurs in Eurasia, extending into Alaska, and subsp. *sayi* (Schw.) Lewis is present in North America.

The following key is from Lewis (1959; percentage frequencies of occurrence are in parentheses):

1. Pedicels glandular (89%); leaflets commonly 5 per leaf (91%), rarely glandular (22%), singly serrated (86%), the serrations rarely gland-tipped (22%), usually 17 or fewer per half leaflet (88%); sepals at their bases occasionally 3 mm or more wide (41%); one auricle often 5 mm or more wide (62%).....subsp. *acicularis*

1. Pedicels rarely glandular (8%); leaflets 5 (47%) or 7 (53%) per leaf, commonly glandular (85%), usually biserrated (69%), the serrations usually glandular (67%), usually 18 or more per half leaflet (57%); sepals at their bases usually 3 mm or more wide (78%); one auricle occasionally 5 mm or more wide (42%)....subsp. *Sayi*

A white flowered form of *Rosa acicularis*, f. *alba*, occurs rarely throughout much of the range.

GEOGRAPHY

The circumpolar *R. acicularis* has the most extensive range of all species in the genus *Rosa*. In Eurasia, it occurs from Sweden across northern Eurasia to the Bering Strait, including Mongolia, northern China, Korea, and Japan. In North America, it extends in the north across Alaska, Yukon and Northwest Territories, from British Columbia to New Brunswick, and south to New Mexico and West Virginia. (see Fig 3 next page)

ECOLOGY

The wild prickly rose grows well in a considerable range of ecological conditions. The species is found in both fine-and

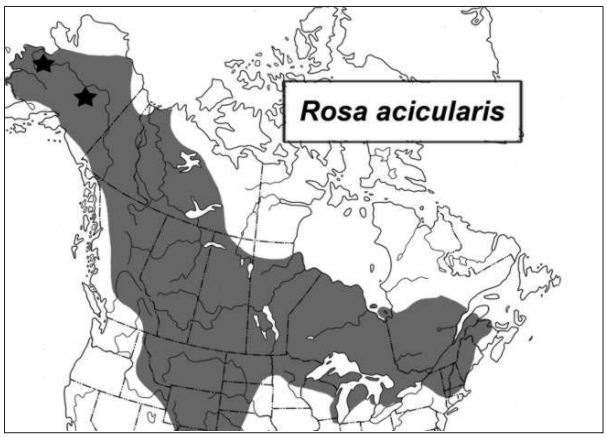


Fig. 3. Canadian and adjacent United States distribution of *Rosa acicularis*. subsp. *sayi* (shaded) and subsp. *acicularis* (stars in Alaska).

coarse-textured soils, although it does not do well in peat. It can grow on soils low in nutrients, but is generally not on the poorest soils. It occurs in both quite dry and quite moist locations, although it is not adapted to constantly wet substrates. *Rosa acicularis* is moderately shade tolerant, but fruits and seeds are produced more abundantly in sunnier locations. The species regenerates from its rhizomes following fires, and is often a colonizer of recently cleared sites. It is quite competitive in shrub associations and in young or open forests, but as forests mature it decreases markedly as shade increases.

Habitat

Rosa acicularis is a resident of habitats in the boreal forest, mixed forest, northern prairie, and western montane regions. The species typically occurs in the partial shade of open coniferous and hardwood associations. It is also found in more open circumstances, beside roads, in meadows, along streams and shores, on slopes, on rocky bluffs and ledges, and in swamps and floodplains.

Inter-species Relationships

Wild prickly rose is a significant food plant for wild vertebrate animals. Despite the presence of thorns that provide some protection for the plants, the twigs and leaves are browsed by deer, elk, moose, mountain sheep, grouse, hares, and rodents. Black and grizzly bears are fond of the fruits (bears are said to relish rose hips as a pre-hibernation food), which are also consumed by a variety of small mammals and birds. Insects, of course, also consume roses. Wild prickly rose thickets provide good nesting sites and cover for birds, and shelter for small mammals, as well as nectar and pollen for numerous insects. Because of numerous ecological interactions, *Rosa acicularis* is a “keystone species” (one upon which numerous other species depend).

Pollination & Dispersal

Rosa acicularis is an insect-pollinated species. In northern areas, it is a good source of nectar for bees maintained by beekeepers. The seeds are dispersed by birds and mammals. In addition to reproducing by seeds, *R. acicularis* propagates vigorously by rhizomes. Clones produced by rhizomes can live for hundreds of years.



Fig. 4. Wild prickly rose (*Rosa acicularis*). Source: a set of paintings of Canada's floral emblems by Lavonia R. Stockelbach (née Bonnie Hunter, 1874-1966), housed in the Saunders Building, Central Experimental Farm, Ottawa.

Entomologist Doug Larson from Saskatchewan was the first to report an introduced beetle called the rose stem girdler (*Agrilus aurchalceus*) in the southern prairie provinces. In 2003 he found patches of wild roses in the Maple Creek area that were being devastated by the alien insect which tunnels under the bark of older canes. Larson suggested that the beetle has the potential of greatly modifying the vegetational landscape of parts of the prairies. This is because the dense, prickly stems deter livestock from grazing in the area, and thereby protect other plants that are susceptible to grazing. The bushes also provide numerous animals with protection from predators. With the anticipated decline of the roses, prairie shrub patches (which serve as protective oases for biodiversity) will become more open and accessible to grazing animals and predators. Since the roses may resprout from roots and root crowns, they are likely to persist as short roses with young short canes that are not attacked by the beetle, but a substantial decline seems likely.

USES

Mostly in past times, wild prickly rose was among the roses used by Indigenous Peoples for medicinal purposes, both in the Old and New Worlds. In North America, roots, stems, bark, and hips of wild prickly rose were employed in medicinal preparations to treat a wide variety of problems, including cough, colds, fever, sore eyes, blindness, difficult birth, stomach difficulties, and diarrhea.

Roses are famous as ornamentals; at least 13000 cultivars have been recorded, of which at least 5000 are commercially available. Wild prickly rose is considered to be an attractive ornamental especially suited for cold areas. Its appearance is considerably enhanced by careful pruning. There are only a few North American cultivars of *R. acicularis*, including Aurora, a red-flowered selection; and Arctic Flame and Nearly Wild, which are pink-flowered forms. There are also Old World cultivars, including Dornrőschen (German) and Tove (Norwegian).

The use of rose "hips" (fruits) is minor, but nevertheless has a long history. A Neolithic archaeological site dated at 5000 BP shows evidence of humans intentionally collecting rose fruits for food, and they were also used as food by the Indians of North America. Rose hips are often covered with hooked, hairy outgrowths which should be removed before the fruits are cooked. In most species, the hairs on the outside are less troublesome than the fuzz on the inside. De-seeding the hips and removing the fuzz and hairs are tedious tasks. Rose hips should be picked when they are plump and red, but not softly over-ripe. They can be left on the bush until the first light frost, and picked when slightly soft to the touch. They should be processed quickly after harvest to prevent loss of vitamin C (in relation to its small amount of edible matter, the rose fruit is extraordinarily rich in this vitamin). The stem and blossom ends should be trimmed, the hips cut in half lengthwise, the seeds and fibres scooped out with a small spoon, and the halves dried on a screen in an airy, shaded room indoors. Alternatively, they can be dried by hot air from an electric heater, care being taken to prevent overheating and loss of natural color. The hips can be screened in a rough wire container to remove their hair (unless the hairs are strained away, they can be irritating in foods prepared with the hips). Storage should be in a cool place, and as vitamin C decreases gradually, the hips and their products should not be kept longer than a year.

Rose flowers have limited, but interesting culinary uses. Drinks have been perfumed with roses, and rose petal wines have been made since classical times. During the Elizabethan era (16th century), rose petals were extensively used to scent food and even washing water. Rose water for flavouring sweet dishes, rose petal jam, rose petal-flavoured honey, rose-flavoured candy and rose-flavoured vinegar are still marketed, albeit on a very limited scale.

Wild prickly rose has been recommended for revegetation and erosion control on moist to wet areas. It has moderate tolerance of oil-contaminated soil, a significant advantage in Alberta, one of the world's major oil producers.

CULTIVATION

Detailed instructions on how to grow wild prickly rose, from former Central Experimental Farm horticulturalist and co-worker Larry Sherk, are reproduced below from his popular but out-of-print (1967) guide to growing Canada's floral emblems (cited in #1 of this series).

"This shrub grows well in sandy, well-drained soil in full sun or part shade. You may either move a whole plant or take a sucker, preferably in the spring. The shrub spreads by underground suckers to form dense thickets, so plant it where it will not encroach on other plants.

"You may take semihard cuttings in July and root them in moist sand and peat moss in a closed frame. Powdery mildew is often a problem in a closed frame but it can be controlled with applications of dinocap or cycloheximide.

"To start plants from seeds, take the seeds from the hips as soon as they are ripe and sow them at once in flats of soil, sand, and peat moss or in raised beds in the garden. If, on the other hand, you want to delay sowing until winter or spring, simply store the seeds in a cool dry place and sow them later. Before you sow stored seeds, you must stratify them in sand and peat at 40 ºF [5 ºC] for 3 months."

CONSERVATION STATUS

In much of its native area, R*osa acicularis* is common and not in need of special conservation measures. However, it is mainly a western North American species, less common in the east, and is endangered in the states of Illinois, Iowa, Massachusetts, New Hampshire, New York, and Vermont. As noted above, it is also rapidly declining in a part of Saskatchewan due to recent range expansion of the rose stem girdler, with widespread declines anticipated.



Fig. 5. The Coat of Arms of Alberta. Wild roses are at the base, above the provincial motto, Fortis et Libre, "strong and free".

(*Continued*)

MYTHS, LEGENDS, TALES, FOLKLORE, AND INTERESTING FACTS

- Rose is translated as rose in Danish, French, German, and Norwegian; and as rosa in Italian, Portuguese, Russian, and Spanish.
- The Roman Emperor Nero (37-68) reputedly used up the equivalent in modern currency of $100,000.00 in cut roses to decorate a single night's feast. He is also believed to have had pipes installed under banquet plates to allow his guests to be spritzed with rose scent between dinner courses.
- Some privileged Romans slept on beds of rose petals, giving rise to the saying “It's not a bed of roses”.
- Since the time of the ancient Egyptians, roses have been associated with secrecy. According to Greek myth, Cupid, shocked by the conduct of his mother Venus, took her flower, the rose, to Harpocrates, god of silence, to keep her scandal confidential. This story is said to have brought about the expression “sub rosa”, referring to activities conducted confidentially. Roses were customarily suspended over the dinner-table as a sign that confidences revealed under the influence of wine were to be kept secret. For many years the ceilings of European dining rooms featured formed plaster roses, with the same symbolism. The plaster ornament in the centre of a ceiling is still known as “the rose” or “rosette,” even if it is no longer in the form of a rose. Beginning in the Middle Ages, a wood carving of a rose was placed in the space over confessional doors in Catholic churches, once again symbolizing confidentiality.
- Rosaries are used to count prayers to Our Lady (the Virgin Mary). The first “rosaries” were made out of pounded rose petals, moulded into beads and threaded (the word rosary is derived from the Latin *rosarium*, rose garden). Rosaries were later made out of rose hips, and eventually out of various materials. The scent of the beads was supposed to remind one of the roses in Mary's garden.
- Roses have been a heraldic emblem on the shields of soldiers since the time of the Romans. The War of the Roses was a series of battles (1455-1487) between two branches of the Royal Family Plantagenet in England. The House of Lancaster, represented by the red rose, defeated the House of York, represented by the white rose. The white rose is reputed to have been a form of *R. canina* (also said to be *R.* ×*alba* L., a hybrid involving *R. canina*). The two houses combined with the marriage of Henry VII of Lancaster to Elizabeth of York, Henry becoming the first Tudor king. He adopted a red and white Tudor rose as his symbol, and this is now the national flower of England. A rose cultivar called 'York and Lancaster' which develops both red and white flowers is currently marketed. This has been identified as a cultivar (named in 1551) of the briar rose, *R. rubiginosa*.
- Roses were important medicinal plants during the Middle Ages, used to reduce fever, inflammation, pain, and to stop any kind of excessive flow, be it tears, diarrhea, or hemorrhage. The popularity of the rose eventually resulted in its elevation to the status of a wonder drug, used even for epilepsy, tuberculosis, goiter, and gout; during plagues, rose fragrance was used to purify the air in public places. Apothecaries even used rose galls, employing them to induce urination.
- Roses are the most popular of gravestone-inscribed flowers. In Victorian cemeteries, where a husband and wife were buried next to each other, the gravestone of the wife often showed a hand holding a lily (symbolic of innocence and purity) while that of the husband showed a hand with a rose. Children's gravestones often showed rose buds as symbols of innocence, and sometimes the stem of the rosebud was carved as broken, suggesting their short lives.
- During World War II, rose hips were eaten for their content of vitamin C while supplies of foreign fruit were limited. The British Ministry of Health distributed “National Hip Syrup”. Similarly, German submarines and ships were supplied with rosehip syrup.
- In England, it was found that the vitamin C content of rose hips increases towards the north, with four times as much in plants grown in Scotland compared to those in southern England.
- In 1939 Frances Meilland, a rose specialist in France, found a rose with magnificent pale gold blossoms growing from one seed he had nurtured. He sent cuttings to a Pennsylvania rose grower, which were transported on the last American plane that got out of France in November 1940, a step ahead of the invading Nazis. The cuttings were used to propagate this rose which many experts consider the best ever developed, the Peace rose, which blooms on more than 30 million bushes throughout the world.
- The perforated nozzle on the end of the spout of a watering can, that produces a shower of water in order to minimize soil disturbance while watering potted plants, is called a “rose”. The word originated from the French *aroser*, to irrigate, and so has no connection with roses.
- “Rosarians” are devoted rose hobbyists.
- The naming of roses has become a commercial venture. Some companies offer clients the possibility of having new rose varieties named for them, for a price, sometimes ranging up to $75,000.00. New rose varieties are being named for corporations ('Barbie' for the doll; 'Weight Watcher's Success' rose), causes ('Arthritis' rose, 'Veterans' Honour' rose), and of course famous personalities (Billie Graham, Céline Dion, Chris Evert, Vidal Sassoon, Rosie O'Donnell, Barbra Streisand, George Burns).



Fig. 6. Wild prickly rose (*Rosa acicularis*) in flower. Courtesy of L. Hachey, Government of Alberta.

Rose Philosophy

The rose has thorns only for those who would gather it."
Chinese Proverb

Gather ye rose-buds while ye may,
Old Time is still a-flying:
And this same flower that smiles to-day,
To-morrow will be dying.
Robert Herrick (1591-1674, English poet and clergyman)

"One may live without bread, not without roses."
Jean Richepin (1849-1926, French writer)

"The question of common sense is 'what is it good for?' A question which would abolish the rose and be answered triumphantly by the cabbage."
James Russell Lowell (1819-1891, American poet, critic, and editor)

"I'd rather have roses on my table than diamonds on my neck."
Emma Goldman (1869-1940, Russian-born American philosopher, anarchist, and social activist)

"An idealist is one who, on noticing that a rose smells better than a cabbage, concludes that it will also make better soup."
H.L. (Henry Lewis) Mencken (1880-1956, American journalist and critic)

"Treaties are like roses and young girls. They last while they last."
Charles De Gaulle (1890-1970, President of France, in an interview in the July 12, 1963 issue of Time magazine)

"The rose represents love, magic, hope, and the mystery of life itself. Its name, ordinary enough, refers to its color …… But that is like saying the heart is a muscle situated on the left side of the rib cage."
Diana Wells, 100 flowers and how they get their names (1997), p. 187.

"Time is money but it's also for smelling the roses and the rain."
-Unattributed



Fig. 7. Wild prickly rose (*Rosa acicularis*) in flower. Courtesy of L. Hachey, Government of Alberta

SOURCES OF ADDITIONAL INFORMATION

Bruneau, A., Starr, J.R., and Joly, S. 2007. Phylogenetic relationship in the genus *Rosa*: new evidence from chloroplast DNA sequences and an appraisal of current knowledge. Syst. Bot. 32: 366-378.

Larson, D.J. 2003**.** The rose stem girdler (*Agrilus aurchalceus* Redtenbacher) (Insecta: Coleoptera: Buprestidae), a new threat to prairie roses. Blue Jay **61**: 176**-**178.

Lewis, W.H. 1959. A monograph of the genus *Rosa* in North America. 1. *R. acicularis*. Brittonia 1: 1-24.

Mazza, G. 1979. Development and consumer evaluation of a native fruit product: Saskatoon, chokecherry and rose hip. J. Can. Inst. Food Sci. Technol. 12(4): 166-169.

Richardson, J.E. 1996. *Rosa acicularis*: the Arctic or circumpolar rose. New Plantsman 3: 147-149.

(continued)



Fig. 8. Wild prickly rose (*Rosa acicularis*) in flower. Courtesy of L. Hachey, Government of Alberta.

TREE: LODGEPOLE PINE



Fig. 9. Silhouettes of the Canadian varieties of lodgepole pine (*Pinus contorta*). Left, var. *contorta*; right, var *latifolia*. Source: Farrar, J.L. 1995. Trees in Canada. Canadian Forest Service and Fitzhenry and Whiteside, Markham, ON, Canada. Reproduced with permission.

SYMBOLISM

The lodgepole pine is a suitable choice as the official tree of Alberta because (1) it is very prevalent in the province (it is the most common tree species at lower and middle altitudes of the eastern slopes of the Rocky Mountains of Alberta); and (2) it has been important in the economic development of the region, and continues to play a major role in Alberta's forest industry. The tree's impressive stature, exceptional hardiness, and ability to thrive in an extraordinary range of habitats are characteristics that make the species an admirable emblem.

Extensive information on the symbolism of pines is given in the section on white pine, the official tree of Ontario, presented in number 7 of this series.

LATIN NAMES

Pinus contorta Dougl. ex Loud.
West coast variety: var. *contorta*
Inland variety: var. *latifolia* Engelm.

The genus name *Pinus* is based on *pinus*, the Latin (ancient Roman) name for pine, derived from the Greek *pitus* or *pitys*, and the Sanskrit *pitu. Contorta* is from the Latin *con* (together) and *torquere* (to twist), a reference to the crooked appearance of the trunk of the west coast var. *contorta*. *Latifolia* is from the Latin *latus* (wide) and *folium* (leaf), referring to the needles, that are usually wider than those of the coastal variety.

ENGLISH NAMES

Lodgepole pine (the name is based on the use of the tree for poles to support the lodges or tepees of indigenous people). Also: Rocky Mountain lodgepole pine, interior lodgepole pine, tall lodgepole pine, black pine; jack pine, western jack pine (the preceding three local names are undesirable as they are usually used for other pines; the name jack pine reflects a historical confusion of migrants from the east who were familiar with jack pine and mistakenly applied the name to lodgepole pine).

Var. *latifolia*: lodgepole pine; also: cypress. (Cypress (also known by the French cyprès) is a local name in Alberta and Saskatchewan, likely to lead to confusion with true cypress, *Cupressus* species of the western US. Lodgepole pine east of the Rockies is confined to the Cypress Hills of southern Alberta and Saskatchewan. The Cypress Hills were named for the trees, not vice-versa.)

Var. *contorta*: shore pine; also beach pine, coast pine, scrub pine.

Var. *murrayana* (not native to Canada): Murray pine.

FRENCH NAMES

Pin lodgepole. Also: for var. *latifolia*: cypress, pin tordu latifolié; for var. *contorta*: pin tordu, pin á feuilles tordues; for var. *murrayana*: pin de Murray.

HISTORY

a. Canada

The Alberta Legislative Assembly designated the lodgepole pine as the provincial tree of the province in 1984, the result of efforts of the Junior Forest Warden Association of Alberta.

The eastern white pine (*Pinus strobus*) became the provincial tree of Ontario in 1984. The Northwest Territories named the jack pine (*Pinus banksiana*) as its official tree in 1989, but in 1999, after the new territory of Nunavut was carved away from the Northwest Territories, the jack pine was replaced with the tamarack.

B. Foreign

As detailed in number 7 of this series, pine species are official trees of 12 US states and two countries.

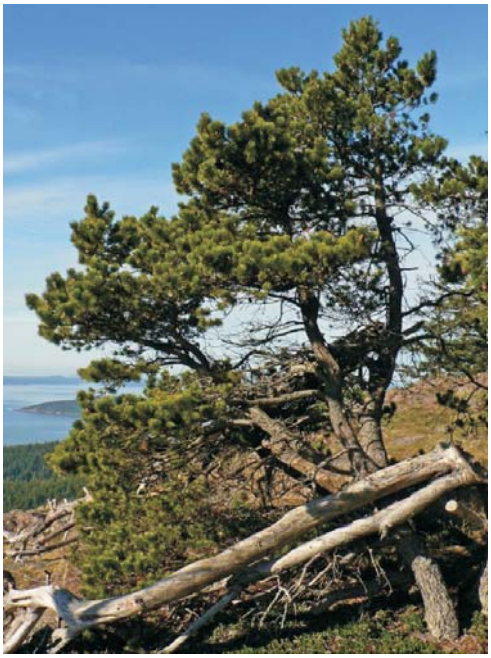


Fig. 10. Shore pine (*Pinus contorta* var. *contorta*). Photo taken on Fidalgo Island, Washington State on Oct 27, 2007. Reproduced by permission of the photographer, Walter Siegmund.



Fig. 11. A stand of lodgepole pine (*Pinus contorta* var. *latifolia*) in Idaho. Photo courtesy of Chris Schnepf, University of Idaho and Bugwood.org.

APPEARANCE

Variety *latifolia* is typically found in dense stands, in which case it develops tall, straight, clean trunks up to 46 m (151 feet) tall and 80 cm (32 inches) in diameter. Trees in open stands form broad crowns. The branches generally curve upward. Variety *contorta* develops into a short, scrubby tree, 6-15 m (20-50 feet) tall with the trunks up to 50 cm (20 inches) in diameter. The latter often has a twisted trunk and an irregular crown shape.

The leaves (needles) of lodgepole pine are evergreen, 2.5-8 cm (1-3 inches) long, stiff and sharply pointed, in bundles of two (rarely in fascicles of three), often spirally twisted and spread apart. The flowers occur in male and female clusters (cones, catkins). The male catkins are 8-14 mm (0.3-0.6 inch) long, with pale yellow to yellowish orange flowers, the catkins occurring in clusters. The female catkins have 2-5 reddish purple flowers, and are 10-12 mm (0.3-0.5 inch) long. The mature female seed cones are 3-6 cm (1.2-2.4 inches) long, often asymmetrical, the tips of the cone scales with prickles at their tips. Lodgepole pines usually live 15-200 years, occasionally as long as 400 years. Variety *latifolia* is comparatively long-lived compared to var. *contorta*; one tree in British Columbia was determined to be 497 years of age.

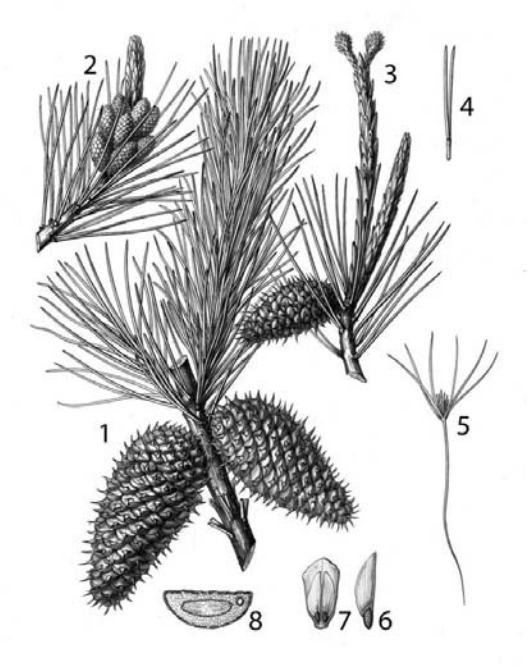


Fig. 12. Lodgepole pine (*Pinus contorta*). 1, branch with mature cones; 2, branch with male flowers; 3, branch with female flowers; 4, cluster of young leaves; 5, seedling; 6, a mature seed with attached wing; 7, a young cone scale with two developing seeds; 8, cross section of leaf. Source: Sargent, C.S. 1897. The silva of North America. Houghton, Mifflin and Company, Boston, MA. Vol. 11, plate 567.

CLASSIFICATION

Family: Pinaceae (pine family).

The Pinaceae is the largest family of conifers. There are about 100 species of *Pinus*, which includes trees or shrubs distributed in north temperate and mountainous, north tropical regions of the world. Thirty-eight species are native to North America north of Mexico, nine of these occurring in Canada, and three additional species are naturalized, including the mugo pine (*P. mugo*), which is a shrub. Almost all pines are in two major groups, subgenus *Pinus* (the hard pines) and subgenus *Strobus* (the soft pines). Lodgepole pine is a member of the hard pines, which have persistent (instead of deciduous) leaf sheaths and two, instead of a single vascular bundle, observable in a needle cross-

section. Other hard pine trees found in Canada include black pine (*P. nigra*), red pine (*P. resinosa*), Scots pine (*P. sylvestris*), jack pine (*P. banksiana*), pitch pine (*P. Rigida*), and ponderosa pine (*P. ponderosa*). There are only two other Canadian pines with two leaves in a cluster and needles of similar length. Introduced (and escaped) Scots pine always has cones that open and the cone scales are flat at the tip. Mature trees of lodgepole and jack pine (*P. banksiana*), on the other hand, often have cones that do not open. The cone scales of lodgepole pine have a short, curved spine at the tip that may or may not be present in jack pine. Jack pines also differ in having curved cones borne along the branches whereas lodgepole pines have straight cones borne at the branch tips. Lodgepole pine hybridizes extensively with the rather similar jack pine where the ranges of two species overlap, and the hybrids and their progeny may be difficult to identify.

In addition to *Pinus contorta* varieties *contorta* and *latifolia*, there is another variety, var. *murrayana* (Sierra lodgepole pine or tamarack pine), which occurs in the Sierra Nevada of California. Still another variety is sometimes recognized: var. *bolanderi* (Bolander pine) of Mendocino County, California. See table below.

GEOGRAPHY

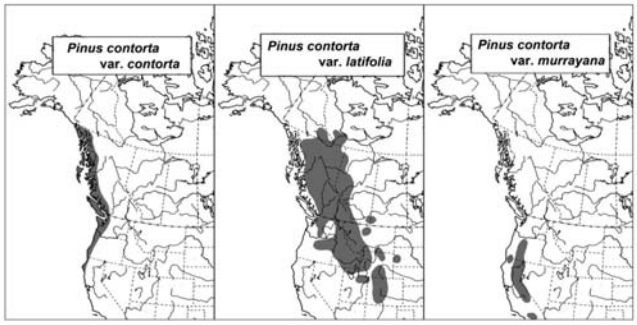


Fig. 13. Geographical distributions of varieties of lodgepole pine (*Pinus contorta*).

Pinus contorta is a widespread species native to North America. Forests dominated by lodgepole pine occur over 6 million ha (16 million acres) in the western US and on 20 million ha (50 million acres) in Canada. The species also occurs locally in the mountains of Mexico (*Pinus contorta* is the only pine species that occurs both in Alaska and Mexico).

Variety *contorta* is native to a relatively narrow strip of the Pacific coast of North America, including southern Alaska, British Columbia, and the states of Washington, Oregon, and California.

In its northernmost locations, variety *latifolia* is native to southeastern Alaska, Yukon, and Northwest Territories. It extends south through the western provinces, including interior British Columbia, much of western Alberta, part of southeastern Alberta and adjacent southwestern Saskatchewan. In its southernmost locations, it occurs in the states of Washington, Idaho, Montana, Oregon, Colorado, Wyoming, Utah, and South Dakota.



Fig. 14. Fire in a lodgepole pine forest, courtesy of the USDA Forest Service, Rocky Mountain Region, J.J. Witcosky, and Bugwood.org.

Key differences between varieties *contorta* and *latifolia*

Character	var. *contorta*	var *latifolia*
Height	Up to 15 m (49 feet); usually less than 10 m (33 feet)	Up to 46 m (151 feet)
Trunk shape	Typically crooked or deformed; with major trunk branches; tapering relatively abruptly upwards	Typically straight; with a single major trunk; tapering very gradually upwards
Crown	Often asymmetrical	Usually symmetrical
Bark of mature trunks	Evidently furrowed	Not evidently furrowed
Leaf (needle) colour	Dark green	Yellow-green

ECOLOGY

As described below, fire is extremely important in the ecology of *Pinus contorta* (much more so for var. *latifolia* than for var. *contorta*). Several factors make the trees quite susceptible to fire: they contain considerable pitch; the bark is often thin, providing limited protection; and the dead lower branches often remain on the trunk, providing "fire ladders" facilitating burning. However, the species is adapted to very rapid recolonization of areas cleared by fires or other catastrophic events. Lodgepole pine is a fire or "pioneer" species, adapted to full sunlight and almost any forest soil, and to rapid early growth so that it can colonize and establish quickly. The species has relatively low shade tolerance, and so does not establish well in regions where forests are already well developed.

Variety *latifolia* often forms large, sometimes quite dense, pure stands, but also grows in associations with other species. It is an aggressive colonizer, rapidly populating an area after it has been cleared by fire or logging. As a result, even-aged stands are common. By contrast, variety *contorta* grows in a maritime climate in most of its range. It is a dominant species in the northern part of its distribution, but is less prominent farther south, where it typically occurs in scrubby thickets and as a component of sparse vegetation. Shore pine is adapted to habitats that are relatively inhospitable to most other plants, giving it a competitive advantage.

Habitat

Variety *latifolia* occurs from 490-3660 m (1600-12000 feet). It is found on a wide variety of soils, including gravelly and stony ridges, and grows in an extensive range of moisture, including both dry areas and swamps. It is intolerant of saline soils, and grows best on well-drained loam soil.

Variety *contorta* occurs from sea level up to 610 m (2000 feet) in altitude, on coastal sand dunes, seaside bluffs, dry foothills, exposed rocky ridges and highlands, serpentine soils, muskeg, and in maritime fog forests and peat bogs. It is most common in poorly drained areas. The prevailing coastal winds often result in the crown of the tree becoming deformed and asymmetrical, developing best in the direction away from the wind. In very exposed areas, the plants may be reduced to shrubs by wind shear and salt spray.

Inter-species Relationships

Lodgepole pine furnishes food for a range of wildlife. Mule deer, moose, and elk browse the young trees, although the plants are not a preferred food. Mammals including snowshoe hares, pocket gophers, voles, squirrels, porcupines, and black bears eat the cambium, Grosbeaks, red crossbills, and nutcrackers extensively consume the seeds. Blue grouse and spruce grouse consume the seeds and also the needles. Lodgepole pine forests also provide shelter for many animals.

Serotiny (described in detail below) refers to the phenomenon of seed cones retaining their seeds for years. The pine or red squirrel (*Tamiasciurus hudsonicus*) is a major consumer of lodgepole pine seeds, and is particularly attracted to trees with serotinous cones, because they are where abundant seeds will be conveniently found. It has been discovered that in areas where the squirrel is absent, lodgepole pine cones are almost 100% serotinous, but in areas where the squirrel is present, the cones average less that 50% serotiny, indicating that the squirrels are causing local trees to produce cones that distribute their seeds quickly rather than retaining them. As noted below, serotiny is adaptive to regular occurrence of fire, but it appears that it is inadaptive to squirrel predation. (Reference: Benkman, C.W., and Siepielski, A.M. 2004. A keystone selective agent? Pine squirrels and the frequency of serotiny in lodgepole pine. Ecology 85: 2082-2087.)

Bark beetles of the genus *Dendroctonus* are serious pests of lodgepole pine, especially the mountain pine beetle (*D. ponderosae*) which is the most damaging agent of the tree. The beetles construct egg galleries in the phloem, and the larvae girdle the trees. As a result of both girdling and fungi introduced by the beetles, the trees die. The larvae infesting the trees are an important food for woodpeckers. The beetles and the trees share an intimate, historical ecological cycle: by periodically infesting and killing off lodgepole pine forests, the beetles produce large amounts of fuel, that is eventually consumed by fire caused by lightning and people. This creates favourable conditions for regeneration of the pine, which otherwise would be eliminated by trees that are more competitive in shady conditions. Forest managers today have adopted burning of lodgepole stands as a deliberate means of controlling the mountain pine beetle and developing good stands. Mountain pine beetle is only one of many insects that feed on lodgepole pine. Others include several beetles which feed on leaves, roots, or branches, as well as scale insects and various moth larvae that feed on the needles.



Fig. 15. Mountain pine beetle (*Dendroctonus ponderosae*). Photos by Klaus Bolte, AAFC.

Dwarf mistletoe (*Arceuthobium americanum*), a flowering plant parasite, is very common on lodgepole pine (a third of the trees of some populations may be infected), and can cause serious reduction in yield. Seeds of the mistletoe are forcibly ejected from the fruit for distances as great as 9 m (about 30 feet), the sticky seeds adhering to the foliage of the trees.

Oh No! Another Beetle!
Higher winter temperatures have allowed adult mountain pine beetles to survive over extensive areas where they could not previously. In many of these areas large amounts of mature woodland are available as a result of many years of fire control. The result is that the beetles have spread into higher elevation mature forests that were previously protected by cooler winters. Recently, huge areas of pine forests in south-central BC and in the Rocky Mountains have been turning brown in what some refer to as "the largest known insect infestation in North American history". Is it really that serious? In fact major catastrophic events like fire, wind, flooding, insect outbreaks and diseases are natural ecological processes that are a characteristic feature of many dynamic natural forests and contribute to the maintenance of high biodiversity. However, in a situation like this, where the insect may be invading new territory, the impact can be unusually severe, and not unlike that of an invasive alien. In these circumstances ecologically sound management is required and both economic and environmental aspects have to be considered carefully. In Banff National Park, fire is being restored to the ecosystem. This will not only increase biodiversityit will also reduce infestations of the beetle by thinning out mature trees. This in turn will reduce risk to commercial forestry operations outside the park. Parks Canada should be applauded for its management of this situation. See http://www.pc.gc.ca/canada/pn-tfn/itm2-/2005/2005-10-31_e.asp



Fig. 16. Dwarf mistletoe (*Arceuthobium americanum*) on lodgepole pine. Courtesy of Brytten Steed, USDA Forest Service and Bugwood.org.

Pollination & Dispersal

Pines are wind-pollinated plants, pollen shedding occurring in early spring. The winged pollen accumulates at the base of a cone scale where it adheres to a sticky, secreted microdrop. It then floats upward or is carried by the evaporating drop into the ovule. If pollen is taken into the ovule, fertilization can take place and no more drops are exuded; however, if no pollen is transported the drops continue to be exuded for up to several days until pollination is successful. In lodgepole pine, the seed cones tend to be found more often in the upper crown while the male cones are more frequently on the lower branches. Sometimes some trees bear mostly male cones and other trees mostly female cones. Both of the preceding phenomena serve to promote cross-fertilization and discourage self-pollination. The seed cones of lodgepole pine are often serotinous i.e. they are held closed by resin, which softens to release the seeds when exposed to the heat of a wildfire or from direct sunlight. Temperatures of 45-60 °C (113-140 °F) are required to melt the resin that binds the cone scales together; very severe fires may destroy most of the seed supply. Young trees tend to produce cones that open, releasing their seeds. Some trees produce non-serotinous cones for up to 60 years, and then transition to production of serotinous cones. On average, serotinous cones remain closed for 15 years (some do not open for 30 years), building up a large supply of seeds in an area. The seeds are long-lived, often viable for 80 years. Serotiny is an adaptation to areas in which fires often occur, and serves to repopulate an area in which the vegetation has been burned. The ash present as a result of fire is a natural fertilizer, encouraging rapid growth of seedlings. Individual trees in a population often differ with respect to serotiny, some with all or mostly serotinous cones, others with mostly cones that open at maturity. Most stands of var. *latifolia* are of fire origin, while var. *contorta* is less dependent on fire, and serotiny is much less evident, the cones more frequently releasing their seeds soon after maturing. Seed production may be as high as 2.43 million/ha (1 million/acre). The winged seeds are distributed mostly by wind, the majority falling within 60 m (200 feet) of the parental trees. Runoff from rain and small mammals also distribute some seeds. The seeds do not require stratification (i.e. a period of cold) in order to germinate, but do need light for optimum germination, and often germinate better in areas exposed to full sunlight.



Fig. 17. A trail going through an extremely dense lodgepole pine stand in southeast Washington. Source: U.S. Forest Service Historical Photo (date unknown).

USES

The trunks of var. *latifolia* are extensively harvested for timber, employed as lumber in general construction and especially important for wood pulp. The trunks are also treated with preservatives (because they are especially susceptible to decay) and used for poles, railway ties, and mine timbers. The trunks are also used for fence posts and log houses. The young trunks are especially useful as corral rails, because of their small diameter and lack of taper. Lodgepole pine is the most widely distributed, harvested, and planted pine in British Columbia, and one of the most commercially valuable trees in Alberta and the northwestern US. It has been used to revegetative mine sites. The species is used in reforestation in Europe, especially in Norway and Sweden. As with other major forest trees, the value of lodgepole pine forests is immeasurable as protective cover for watersheds, as a natural element for the long-term maintenance of the local environment and ecosystem, and as sites for local recreation.

Indigenous people used flexible trunks 12-14 cm (4.7-5.5 inches) in diameter to construct tepees; explorers Lewis and Clark were among the first Europeans to have observed this, and have been credited with naming the tree “lodgepole”. Indians also used the poles to make horse-drawn travois (drag sleds). Great Plains Indians journeyed to the Rocky Mountains to obtain slender trunks. Resin from the trees was employed to waterproof canoes and baskets, and as chewing gum. Roots were braided to make ropes. The inner bark was sometimes boiled and eaten. The resin was extensively employed to treat a wide variety of illnesses; it was consumed to reduce tuberculosis, stomach pain, burns, and colds; and applied externally for rheumatism, broken skin, heart problems, snow blindness, venereal diseases, muscle and joint aches, and facial blemishes. Boiled teas made with the bark or needles were used for these and other medical conditions.

Variety *contorta* is sometimes used locally as firewood, but because of its small size, limited trunk length, and relative infrequency, it is of negligible commercial value. The variety has been used to stabilize sand dunes. It is also considered to be useful for shelterbelts and for watershed stabilization (it grows well in moist soils).

TOXICITY

For most people, pines are not toxic. The pollen produced can contribute to hayfever. For some sensitive individuals, working with pine wood can cause dermatitis, allergic bronchial asthma, or rhinitis.

CULTIVATION

Lodgepole pine is a major North American forest tree, and there is a considerable literature on its commercial management. Several horticultural selections have been made, including Spaan's Dwarf (a short-needled shrub), Taylor's Sunburst (the young foliage is yellow, but matures to green), and Chief Joseph (the young foliage is green but matures to a bright gold). Other ornamental cultivars include Asher, Frisian Gold, Pendula, Randolph, and Twister.

CONSERVATION STATUS

Lodgepole pine is a common species, not in particular need of conservation measures over most of its range. The recent large-scale devastation of lodgepole pine forests by mountain pine beetles seems unlikely to threaten the species; new young stands will develop following fires which burn the dead trees. Several plant associations in which lodgepole pine occurs as a dominant species have been described as vulnerable, imperiled, or critically imperiled. In New Zealand, where the species has been called “contorta pine”, it has become a serious invasive alien

MYTHS, LEGENDS, TALES, FOLKLORE, AND INTERESTING FACTS

- In classical Greek mythology, Pitys was a beautiful nymph who was loved by Boreas (the north wind) and Pan (god of the forest, half goat half man, a fertility god believed to make goats pregnant, too ugly to make any of the nymphs fall in love with him, he contributed to elements of the Devil of Christianity). When she chose Pan, Boreas blew her over a cliff. Gaea (goddess of the Earth) took pity on her and turned her into a pine tree. It is said that when the north wind blows through the tree you can hear her weep. The resin of the pine was equated with the tears of Pitys. In another version of the story, Pan chased her and in order to get away from him Pitys turned herself into a pine tree. The tree then became holy to Pan, who made a wreath of pine branches to wear.
- Sinis was a mythological Greek robber and personification of the North Wind, who was also known as Pitokampes“the pine-bender”. This charming figure executed his opponents by tying their legs to two pine trees that he had forced down to the ground, and letting the trees fly apart, with the result that his victims would be torn to pieces. In a contest, the hero Theseus inflicted the same form of death on Sinis, and proceeded to marry his daughter. This mythological story reflects the early perception of the importance of pines in contests. The wreaths of victory in the earliest athletic competitions in Greece were in fact made out of pine branches.
- Druids (ancient Celtic priests of Wales and Ireland) used to light large bonfires of Scots pine at the winter solstice to celebrate the passing of the seasons and to draw back the sun, a practice that eventually gave rise to the yule log. The trees were also decorated with lights and shiny objects, foreshadowing latter day Christmas tree customs.
- The New Jersey Pine Barrens or Pinelands, is a unique natural area covering over 1 million acres of the Outer Coastal Plain in southern and central New Jersey. Fires were prevalent and the dominant tree is the fire-adapted pitch pine (*P. rigida*). Rich in diversity and having species found nowhere else, the global significance of the Pinelands is illustrated by the fact that it was selected as a United Nations International Biosphere Reserve in 1973. The legend of The Jersey Devil (no relation to the New Jersey Devils of the National Hockey League) began in the Pine Barrens. According to a popular version of the story, in 1735 mother Leeds already has 12 children, is expecting, and is fed up with motherhood. The13th, a beautiful healthy baby boy appears one stormy night, and she exclaims “the Devil with you!” The baby turns into a hideous animal with wings, hooves, and a tail, and flies out the chimney. Ever since there have been sightings of the Jersey Devil, and numerous reports of grisly killings of sheep,

chickens, and dogs. Strange hoofprints have been found on rooftops, and some have even observed the demon prancing on roofs. Dogs couldn't be used to pursue the creature because they refuse to follow his tracks. There are many strange encounters, and a police officer spotted him drinking from a horse's trough. Sightings sometimes created panic, especially in 1909, when terrified people refused to leave their homes, and factories and schools remained closed. During one week there were over 1,000 calls for help to the police. Numerous citizens have shot at the Devil, but so far he has magically escaped being wounded (not surprising since one early account told how he survived a direct hit from a cannonball without any damage). Keeping up with modern technology, the Devil recently appeared on television's popular X-files. Experts believe the beast resides in the huge preserved forest of the Pine Barrens.

- "Story sticks" were prepared from lodgepole pine by Blackfoot Indian elders. These were given to children in return for favours. The children were entitled to receive stories from the elders, who added a notch to the stick each time they told a story. Story sticks were sometimes employed to hang tepee doors.
- Petrified wood, common in gravel pits throughout Alberta, was adopted as the official stone of the province in 1977, due to the efforts of the Alberta Federation of Rock Clubs. Petrified wood was formed by the deposit of microcrystalline quartz in the pores and cells of fallen trees of the Cretaceous and Paleocene periods, 60 to 90 million years ago. Petrified wood has also been declared to be the official stone or fossil of six states: Alabama, Louisiana, Mississippi, North Dakota, Texas, and Washington.

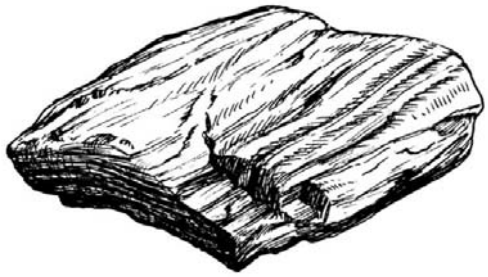


Fig. 18. Petrified wood. Courtesy of L. Hachey, Government of Alberta.

SOURCES OF ADDITIONAL INFORMATION

Baumgartner, D.M., Krebill, R.G., Arnott, J.T., and Weetman, G.F. (Editors). 1985. Lodgepole pine: the species and its management. Symposium proceedings. Cooperative Extension, Washington State University, Pullman WA. 381 pp.

Christensen, K.I. 2005. A morphometric study of the geographic variation in *Pinus contorta* (Pinaceae). Nordic J. Bot. 23: 563-575.

Fazekas, A.J., and Yeh, F.C. 2006. Postglacial colonization and population genetic relationships in the *Pinus contorta* complex. Can. J. Bot. 84: 223-234.

Horton, J.W. 1956. The ecology of lodgepole pine in Alberta and its role in forest succession. Tech. Note No. 45. Forest Res. Div., Forestry Branch, Dept. Northern Affairs and Nat. Resources, Ottawa, ON. 29 pp.

PINE POETRY

The elm lets fall its leaves before the frost,
The very oak grows shivering and sere,
The trees are barren when the summer's lost:
But one tree keeps its goodness all the year.
Green pine, unchanging as the days go by,
Thou art thyself beneath whatever sky:
My shelter from all winds, my own strong pine,
'Tis spring, 'tis summer, still, while thou art mine.
Augusta Davies Webster (1837-1894, English poet, novelist, and playwright)

Is it the lumberman, then, who is the friend and lover of the pine, stands nearest to it, and understands its nature best? Is it the tanner who has barked it, or he who has boxed it for turpentine, whom posterity will fable to have been changed into a pine at last? No! no! it is the poet... All the pines shudder and heave a sigh when that man steps on the forest floor."
Henry David Thoreau (1817-1862, American philosopher, author, and naturalist)

Who leaves the pine-tree, leaves his friend,
Unnerves his strength, invites his end.
Ralph Waldo Emerson (1803-1882, American essayist, poet, and philosopher)

"My apple trees will never get across
And eat the cones under his pines," I tell him.
He only says, "Good fences make good neighbors."
Robert Frost (1874-1963, American poet)

Koch, P. 1996. Lodgepole pine in North America. Forest Products Society, Madison, WI. 3 vols.
Kral, R. 1993. *Pinus*. pp. 373-398 *in* Flora of North America North of Mexico. *Edited by* Flora of North America Editorial Committee. Oxford University press, Oxford, U.K. Vol. 2.
Lotan, J.E., and Critchfield, W.B. 1990. *Pinus contorta* Dougl. ex Loud. Lodgepole pine. pp. 302-315 *in* Silvics of North America. Vol. 1. Conifers. *Edited by* R.M. Burns and B.H. Honkala. USDA Forest Service, Washington, D.C.
Lotan, J.E., and Perry, D.A. 1983. Ecology and regeneration of lodgepole pine. USDA Forest Service Ag. Handbook No. 606. Washington D.C. 51 pp.
Moss, E.H. 1949. Natural pine hybrids in Alberta. Can. J. Res. C, 27: 218-229.
Muir, P.S., and Lotan, J.E. 1985. Serotiny and life history of *Pinus contorta* var. *latifolia*. Can. J. Bot. 63: 938-945.
Owens, J.N. 2006. The reproductive biology of lodgepole pine. Forest Genetics Council of British Columbia Extension Note 07. 62 pp.
Rehfeldt, G.E., Wykoff, W.R., and Ying, C.C. 2001. Physiologic plasticity, evolution, and impacts of a changing climate on *Pinus contorta*. Climatic Change 50: 355-376.
Rweyongeza, D.M., Dhir, N.K., Barnhardt, L.K., Hansen, C., and Yang, R.-C. 2007. Population differentiation of the lodgepole pine (*Pinus contorta*) and jack pine (*Pinus banksiana*) complex in Alberta: growth, survival, and response to climate. Can. J. Bot. 86: 545-556.
Tackle, D. 1961. Silvics of lodgepole pine. Misc. Publ. 19. USDA, Forest Service, Intermountain Forest and Range Expt. Station, Ogden, UT. 24 pp.
Wheeler, N.C. and Guries, R.P. 1982*a*. Population structure, genic diversity, and morphological variation in *Pinus contorta* Dougl. Can. J. Forest Res. 12: 595-606.
Wheeler, N.C. and Guries, R.P. 1982*b*. Biogeography of lodgepole pine. Can. J. Bot. 60: 1805-1814.

GRASS: ROUGH FESCUE



Fig. 19. Rough fescue grassland dominated by *Festuca campestris*, in Nose Hill Park, a protected native prairie overlooking Calgary. Photo by Joseph Leung, reproduced by permission. (Nose Hill Park in northwestern Calgary is one of the largest municipal parks in North America. This natural environment preserve is said to have been named for the shape of the nose of a local Indian chief. Cf. Fig. 23.)

SYMBOLISM

For details on the debate about adopting a grass, see the next page

In addition to the economic and ecological importance of rough fescue grasses mentioned in the debate, others have cited their hardiness (capable of surviving extremely cold winters as well as drought), persistence (capable of living for decades), resiliency, beauty, diversity, and adaptiveness as desirable qualities symbolic of Albertans and their province.

LATIN NAMES

Festuca altaica Trin. (*Altaica* in the scientific name is a Latin word referring to the Altai region of Russia, where plants were found that were used to first recognize and describe the species.)
F. campestris Rydb. (*Campestris* in the scientific name is based on the Latin *campus*, field, used to indicate that the species occurs on plains.)
F. hallii (Vasey) Piper (*Hallii* in the scientific name commemorates the California botanist Harvey Monroe Hall, 1874-1932.)
(The name *F. scabrella* Torr. ex Hook. has been widely misapplied to the above three North American fescue grasses. The name *F. altaica* has also been used in some older literature to include all three species.)

The genus name *Festuca* is based on the Latin *festuca*, meaning stalk, stem, or straw, a name used by the classical Roman botanist Pliny for some plant.

ENGLISH NAMES

Rough fescue: a name applied collectively to the following three species. The leaf blades, rachis (central axis of the inflorescence) and lemma (explained below) of the species are scabrous (rough to the touch), hence the “rough” in the common name. The name “fescue” traces to the Latin *Festuca*, explained above.
F. altaica: northern rough fescue. Also: Altai fescue.
F. campestris: mountain rough fescue. Also: foothills rough fescue.
F. hallii: plains rough fescue. Also: Hall's fescue.

FRENCH NAMES

F. altaica: fétuque de l'Altaï.
F. campestris: fétuque des prés (a name also used for other species of *Festuca*).
F. hallii: fétuque de Hall.
(The name fétuque scabre has been used for *Festuca scabrella*, a name that has been misapplied to the above three fescue grasses. In some publications the name is used for one or more of the three fescue species. “Rough fescue” is translated as fétuque rude, a name applicable to the three species.)

HISTORY

a. Canada

In the late 1980s, a wide variety of educational, industrial, scientific, and conservation groups came together as the Prairie Conservation Forum of Alberta to promote sustainable use of grasslands. In 2001, this organization

Comments during the legislative debate to adopt rough fescue as the Alberta provincial emblem

"The gold heads of the rough fescue, standing tall, waving in the wind with roots that are deep, tenacious, and adapted to our prairie climates, reflect the heart and grit, the strength of the province and our people."
R. Danyluk

"Ecologically, it would be hard to argue for a better grass than rough fescue to represent the province of Alberta. Fescue grasslands are symbolic of natural and human-based systems and host a rich range of contrasting elements that do indeed reflect the diversity of the province."
D. Coutts

"You may ask, 'Why a provincial grass?' to which I would respond: rough fescue is a very worthy symbol of our prairie heritage of rich grasslands and fertile soil, soil that was the gift of the grasslands to the first homesteaders and remains a gift to our farmers and our ranchers today. The prairie and foothills grasslands sustained the buffalo and Plains Indians for thousands of years before the ranchers and homesteader arrived…. These grasslands were the builders of the soil which sustains Alberta agriculture to this day. I believe that it is fitting to recognize a suitable grass species such as rough fescue to help Albertans understand the importance of native grassland as an ecological unit, unique its own right, and a grassland which is of major cultural and economic value to our province… No other state or province in North America has designated rough fescue as its official grass, and Alberta today has the largest remaining rough fescue grassland, which, while not endangered, is at risk. Making rough rescue our provincial grass emblem, would, I believe, be an appropriate step to help Albertans recognize the importance of native grassland that is worthy of our respect and to preserve it for future generations."
D. Tannas

All three individuals are or were MLA's in the Legislative Assembly of Alberta; comments were recorded in Alberta Hansard, Feb.24, 2003.

sent ballots to interested Albertans asking them to vote on which of five common native grasses should be chosen as the provincial grass emblem. A committee had chosen the five species (blue grama, green needlegrass, June grass, rough fescue, and western wheatgrass) from the more than 135 grass species of the province on the criteria that they should be widespread in Alberta; ecologically significant; cultural, socially, and economically important; attractive; easily recognized; and have socially acceptable common names. Over 2000 Albertans voted, the largest number (36%) for rough fescue.
"Rough fescue" became the official grass emblem of Alberta in 2003: "the grass known botanically as *Festuca scabrella* and popularly known as 'rough fescue' is hereby adopted as the grass emblem of Alberta" (Emblems of Alberta Act, RSA 1980 cE-8 s4). As pointed out above, the name *Festuca scabrella* has been misapplied in North America to three different species, *F. altaica*, *F. campestris*, and *F. hallii*. The legislation recognizing the grass emblem of Alberta was proposed by Don Tannas, MLA for Highwood. In his proposal (recorded in Legislative Assembly of Alberta, Alberta Hansard, Feb. 24, 2003), Tannas stated the following:

"I'm honoured to move second reading of Bill 201, Emblems of Alberta (Grass Emblem) Amendment Act, 2003.

"Last February the Prairie Conservation Forum approached me to sponsor a private member's public bill to amend the Emblems of Alberta Act to have rough fescue designated as Alberta's provincial grass. I was asked in part because Highwood contains a considerable portion of the remaining rough fescue grassland, which includes both the plains rough fescue and foothills rough fescue. Today I'm asking all hon. members of this Assembly to support the Prairie Conservation forum and myself in amending the Emblems of Alberta Act to designate rough fescue, Latin name Festuca scabrella, as Alberta's provincial grass.

"This rough fescue complex may also be recognized as three varieties or, as some taxonomists would prefer, three separate species, known as plains rough fescue, which is Latin Festuca hallii; foothills rough fescue, which is Festuca campestris; or the third one, northern rough fescue, Festuca altaica. Alberta is the only area that is home to all three members of the rough fescue complex." [Note:scientific names weren't italicized in the official records.]

The above parliamentary and legislative information, as well as comments of others (recorded in Hansard, cited above) make it clear that in spite of the use of the misapplied and ambiguous scientific name "*Festuca scabrella*", and in spite of the natural assumption of most people that a plant with a common name ("rough fescue" in this case) chosen as an emblem would be just one species, the "Grass Emblem of Alberta" is a complex of three species of *Festuca*, one of which (*F. altaica*) is barely present in Alberta, a second (*F. campestris*) which has relatively limited presence, and a third (*F. hallii*) which is common in the province. If it were considered desirable to recognize a single species as an emblem of Alberta, *F. hallii* would best meet the criteria listed in History, above.

b. Foreign

Needle-and-thread grass (*Hesperostipa comata*) was chosen as the official grass of Saskatchewan in 2001 (see #9 of this series). Seventeen US states have official grasses (http://en.wikipedia.org/wiki/List_of_U.S._state_grasses).

APPEARANCE

The rough fescues are bunchgrasses, forming clumps with thick mats 13-50 cm (5-30 inches) in diameter, made up of persistent sheath and stem bases. Flowering stems are 30-140 cm (12-55 inches) high. The root systems are fibrous, sometimes reaching deeper than 120 cm (4 feet). The plants spread vegetatively by tillers (shoots that spring from the base of grasses) and sometimes by rhizomes (which are usually produced in *F. hallii*, short and inconspicuous in *F. altaica*, and rarely produced in *F. campestris*).

Pavlick and Looman (1984) provided the following information about the rough fescues:
"Plants of *F. campestris* are relatively tall and form large clumps, 25-30 cm in diameter with as many as 25 culms [stems] that typically slant at an angle of 45-50° from horizontal; their leaf blades are grey green and often more or less explanate [spread out flat] for the lower one-third to one-half portion with the upper part loosely to tightly folded; their panicles are usually erect (sometime nodding) with more or less rigid, ascending lower branches; and their flowers are dull green to moderately anthocyanic [purplish or reddish]. Plants of *F. hallii* are relatively short (as compared with *F. campestris*) and grow in clumps 7-10 cm in diameter, with often 3-5 and rarely as many as 10 culms that typically are erect or slant at an angle of 70-80° from horizontal; their leaf blades are also grey green but narrower than those of *F. campestris* and are always tightly folded; their panicles are always erect, although shorter and narrower than those of *F. campestris*, and always with lower branches more or less stiffly ascending; their floret color is similar to that of *F. campestris*. Plants of *F. altaica* range in height from as short as *F. hallii* to about as tall as *F. campestris*, with about 5-10 culms; their leaf blades are yellow green and often explanate or loosely folded in their upper parts; their panicles are usually nodding, often secund [florets all on one side], with weak, often recurved branches, and their florets are usually lustrous and intensely anthocyanic."

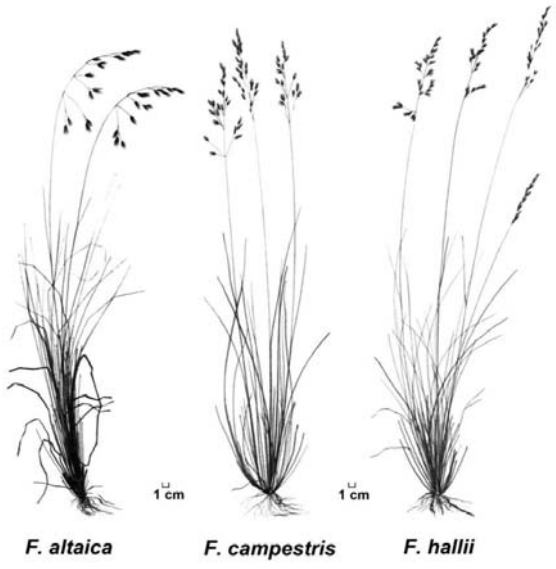


Fig. 20. Rough fescue species. Source: Aiken and Darbyshire 1990.

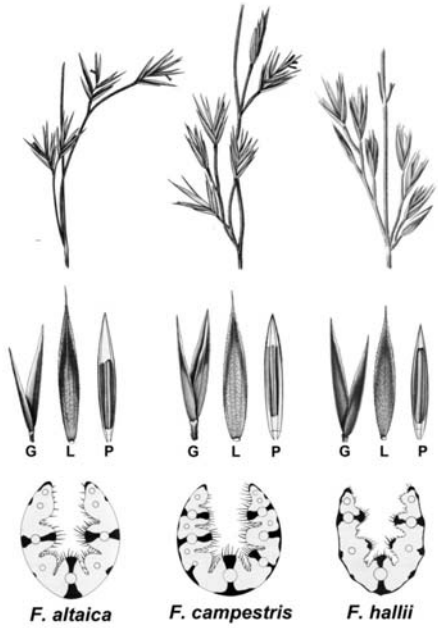


Fig. 21. Key features of rough fescue species. Top row: inflorescences. Middle row: G = glume, L = lemma, P = palea. Bottom row: leaf cross sections; darkened areas are schlerenchyma (defined below). Source: Aiken and Darbyshire 1990.

The rough fescues can be confused with other tussock-forming species, and are best identified when inflorescences are developed.

CLASSIFICATION

Family: Poaceae (Gramineae; grass family).
Festuca is a genus of more than 500 species, which occur in alpine, temperate, and polar regions of all continents except Antarctica. Thirty-seven species are native to North America north of Mexico, 18 of these native to Canada. The three rough fescue species discussed here have been placed in *Festuca* section *Breviaristatae*.

GEOGRAPHY

Festuca altaica is common in Alaska, Yukon, Northwest Territories, and northern British Columbia. The species occurs as localized populations in Quebec, western Labrador, Newfoundland, and Michigan. In the Old World it extends from the Bering Sea to the Altai region of central Asia.(See Fig 22 on next page)

F. campestris is found in southern Alberta, southern British Columbia, southwestern Saskatchewan, Washington, Oregon, Idaho, and Montana. *Festuca hallii* occurs mostly in the southern half of British Columbia and the southern half of Alberta. The species is rare in Ontario and Quebec. In the US it is found from Montana to North Dakota, south to Colorado. The distribution of *F. altaica* overlaps that of *F. hallii* in a limited region at about 51° N near the Alberta British Columbia border, and likely elsewhere.

Key to the Species of Rough Fescue (from Aiken and Darbyshire 1990)

1. Foliage yellow green to dark green; leaf blades in cross section with schlerenchyma only opposite veins. Panicle drooping (when mature), with branches flexuous and lax. Upper glume distinctly shorter than adjacent lemma. Lemmas laterally folded basally, usually red or purple with anthocyanin; lateral nerves more or les prominent. Plant of boreal and alpine grassland.....*F. altaica*

1. Foliage light green to gray green; leaf blades in cross section with sclerenchyma extending along abaxial side between veins. Panicle not drooping, with branches stiff, erect, or slightly spreading. Upper glume somewhat shorter than, to as long as, adjacent lemma. Lemmas dorsally rounded basally, usually green or stramineous; lateral nerves obscure. Plants of plains and montane grasslands.....2

2. Plants strongly caespitose; shoots intravaginal. Culms (30-)40-90(-140) cm high. Spikelets with (3-)4-5(-7) florets, distinctly longer than glumes. Upper glume somewhat shorter than adjacent lemma. Lemmas (6-)7-8.5(-10) mm long. Plant of foothills and montane grasslands in western Alberta and British Columbia.....*F. campestris*

2. Plants caespitose; shoots intravaginal and extra-vaginal forming creeping rhizomes. Culms (18-)20-65(-85) cm high. Spikelets with 2-3(-4) florets (3rd and 4th) usually sterile), scarcely if at all longer than glumes. Upper glume about equal to adjacent lemma. Lemmas 5.5-7(-9) mm long. Plants of western plains and parklands from western Ontario to Alberta.....*F. hallii*

Vocabulary for key

Abaxial: pertaining to position of a leaf, the "lower" side, i.e. pointing towards the base.
Caespitose: growing in dense clumps or tufts.
Extravaginal: branching in which the young shoot breaks through the base of the leaf sheath.
Glume: one of a pair of empty scales at the base of a grass spikelet.
Intravaginal: branching in which the young shoot grows up inside the leaf sheath, emerging at the shoot mouth.
Lemma: the lower of the two bracts enclosing the grass flower and together with the palea comprising a floret.
Panicle: in grasses, an inflorescence in which the primary axis bears branched axes with pedicillate spikelets.
Sclerenchyma: tissue with cells with thickened, rigid, secondary walls hardened with lignin, providing structural support.
Spikelet: the basic unit of a grass inflorescence; usually composed of two glumes and one or more florets on a rachilla (the central axis of the spikelet bearing the florets).
Sterile: lacking seeds.
Stramineous: straw-coloured.

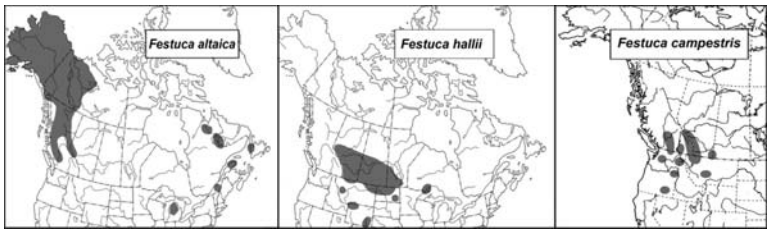


Fig. 22. Geographical distributions of northern rough fescue(*Festuca altaica*), mountain rough fescue (*Festuca campestris*), and plains rough fescue (*Festuca hallii*)

"Fescue prairie is the most typically Canadian of all the grassland associations, with only limited distribution in the United States" (Redmann, cited below). Today, rough fescue grasslands are merely remnants of pre-settlement distribution. Alberta has the largest area of rough fescue grassland in the world.

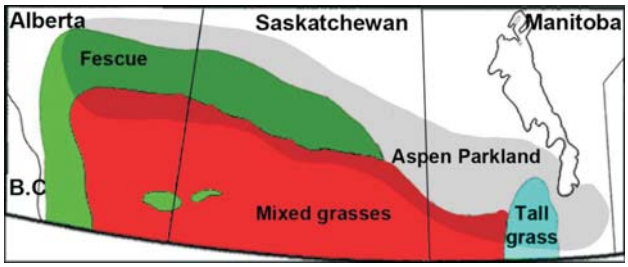


Fig. 23. Distribution of major vegetation zones of the southern Prairie Provinces. Source: modified from Parks Canada/Exploring a grassland: http://www.pc.gc.ca/apprendre earn/prof/sub/edukit/grassland/index_2_e.asp

ECOLOGY

Grasslands accumulate a layer of dead and decaying plant material called "litter". Litter is useful to the plants in serving as a kind of mulch, reducing moisture loss and the ability of competing plants to establish seedlings. When too much litter accumulates, growth of the grasses can be reduced and some low-growing species can be shaded out. Moreover, in the dry climate of grasslands litter constitutes fuel for fires. In the early 20th century, land managers were unaware of the beneficial effects of fire on grasslands, and often implemented fire suppression policies. By the late 20th century, it was understood that periodic fires resulting from lightning strikes were a natural process that maintained many grasslands. (Aboriginal Peoples set prairie fires to improve grassland for forage and to drive game.) Fire retards the spread of alien plant species, reduces litter accumulation, and reduces competition, and the resulting ash acts as a fertilizer. Plants that are natural components of grasslands are adapted to these circumstances. The dense, tufted shape of the rough fescues assists them in resisting fire (as well as grazing). It has been estimated that in pre-

settlement times, some areas of North American fescue grasslands burned as often as annually or as infrequently as once in 60 years (it has been suggested that rough fescues are naturally adapted to fire frequencies in the range of 5 to 10 years). Today, some areas have not been burned for more than 70 years because of fire suppression. Controlled burning is now considered to be an important management technique that promotes and maintains healthy prairie ecosystems. However, burning has to be done in a particular way, mimicking natural fires so as not to excessively negatively impact prairie fauna.

North American fescue grasslands were periodically grazed by herds of bison, elk, and other animals, many of which migrated seasonally. Dung from these animals fertilized the soil, and in some cases the animals distributed the seeds. The nomadic movements meant that heavy grazing tended to occur in different regions at different times. Prairie grasses in general and the grassland rough fescues in particular are adapted to withstanding such periodic grazing, but have suffered from overgrazing by cattle, which was once encouraged as a way to remove litter, leaving little to burn, and so reducing fires. Since the 19th century, European settlers have used North American grasslands as grazing pastures for cattle, and continuous, intensive grazing has degraded most of the grasslands. Moreover, many areas of grasslands with rich soil have been converted for the cultivation of crops.

Habitat

Early French explorers used the word “prairie” (for meadow) for the grasslands of North America. Today, many people use the word prairie as a synonym of grassland. By definition, grasslands are communities dominated by grasses, species of the Poaceae, of which there are about 7500 in the world. Conditions that favour the development of grasslands include sandy soil, low moisture, fire, and wind. In relatively moist areas scattered trees may occur, but generally grasslands occur in climates too dry for tree growth.

The rough fescues are plants of open forests, montane and subalpine grass balds, and arctic and alpine tundra, but they are most significant as components of grasslands. Rough fescue grasslands in North America may contain over 150 species of plants. “Forbs” (perennial non-graminoid herbs) are often an important component, but shrubs typically occupy less than 10% of grasslands.

Festuca altaica has been recorded on sand plains in north-central Quebec and Michigan; gravel outwashes in western Newfoundland and Gaspé; serpentine barrens in western Newfoundland, Gaspé, and southern Quebec); limestone plains in Ungava; basaltic slopes in western in western Newfoundland; and alpine and subalpine areas, open forests, treeless areas, rocky slopes, plateaus, meadows, and grasslands in Alaska, British Columbia, Yukon, and Northwest Territories.

Festuca campestris is a dominant species of several grassland associations in southern Alberta and British Columbia. It is common in foothills and in montane and subalpine grasslands at elevations up to 2000 m (6500 feet).

Festuca hallii is a major component of grasslands from the northern Great Plains to the boreal forest. In its southernmost range in Colorado it occurs in alpine meadows.

Inter-species Relationships

Bison and elk were major natural grazers of the Fescue Prairie in pre-settlement times. Thirty to 60 million North American bison once roamed the Great Plains. Other grazers include pronghorn antelope, mule deer, and bighorn sheep. In addition to the above-ground grazing by these ungulates, below-ground grazing is carried out by pocket gophers and prairie dogs.

Pollination & Dispersal

In western Canada, flowering of the three rough fescue species occurs during the times of maximum precipitation. *Festuca campestris* flowers in late May while *F. altaica* and *F. hallii* flower several weeks later. Like most grasses, the species are wind-pollinated.

There is little information on the agents of natural seed distribution of rough fescues. Gravity is an obvious factor, the seeds simply falling away from the maternal plants. Animals are perhaps the major means of distribution. The “seeds” (i.e. caryopses or grass fruits, including attached bracts) are rough, and so would tend to attach to fur and feathers (simple adhesion may also result from wetting). Possibly some seeds consumed by larger animals like bison might survive passage through the alimentary tract (such has not been demonstrated), but smaller animals would likely masticate the seeds, killing the embryos. Where seeds have been cached by animals, some often survive, and this may be true for the rough fescues.

USES

The three rough fescue species are important native wild forage grasses. *Festuca campestris* and *F. hallii* are dominant species of grassland associations of central and southern Alberta, and accordingly are an important source of nutrition for native ungulates, horses, and the large cattle herds of western Canada. The two species have high production potential and good forage quality after senescence; they cure on the stem, and as they remain more or less upright they are easily located for winter grazing even when partly covered by snow. Snow becomes trapped in the clumps, moistening the dried out plants, making them quite attractive to the animals.

Rough fescues are useful in landscape stabilization and roadside plantings because of their ability to form extensive fibrous root systems. Some ecologists have noted that the deep roots often developed by rough fescues (sometimes growing 3 m or 10 feet deep) decay slowly and represent considerable sequestering (storage) of carbon, thereby reducing carbon dioxide accumulation in the atmosphere and consequent warming of the planet. There have been recent attempts, sponsored by the oil and gas industries, to grow rough fescue specifically for the purpose of reducing CO_2 emissions.

TOXICITY

No information about toxicity of rough fescues was found. However, tall fescue (*F. arundinacea*), an introduced

European cool-season grass widely grown as turf and forage in North America, and established in southern Canada, is known to be susceptible to infection by the fungal endophyte, *Neotyphodium coenophialum* (formerly called *Acremonium coenophialum*) that is quite toxic to animals, and "fescue toxicosis" is a widespread concern for livestock operations. (For a review, see http://wiki.bugwood.org/Festuca_arundinacea.)

CULTIVATION

The rough fescues are not grown as crops, in pastures, or as ornamentals. They have been grown for seeds used to improve or rehabilitate wildlands, but most seed for these purposes is harvested from wild plants.

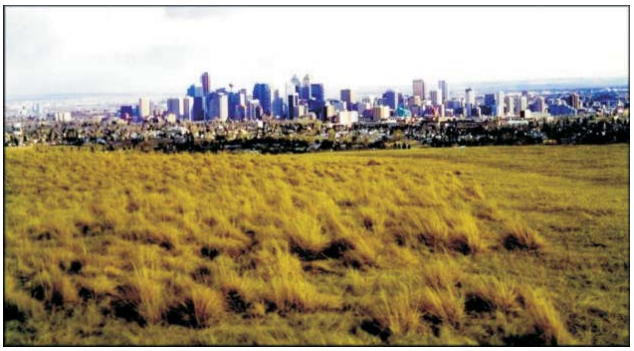


Fig. 24. View of the skyline of downtown Calgary, Alberta, from Nose Hill Park, showing fescue grassland dominated by *Festuca campestris*. Photo taken in 2001. Source: Wikimedia.

CONSERVATION STATUS

Because of their importance for furnishing food, the prairies of North America have been called "the bread basket of the world". Unfortunately, they are among the most extensively developed and altered landscapes. North American grasslands have suffered from several developments: fire control, domesticated animal overgrazing, land conversion for crops and urban development, drainage, extraction of water, oil, gas, and gravel, the introduction of invasive, non-native species, climate change, and poor management.

One-third of Canada's endangered species are found in the grasslands. In Alberta, 70% of all species at risk are in the grasslands, which cover only 14.5% (96000 square km or 24 million acres) of the province.

Several invasive alien weeds, such as leafy spurge (*Euphorbia esula*), have invaded North American grasslands, displacing native species. Some of the aliens are Eurasian species deliberately introduced to increase grassland productivity and improve forage quality. Examples include smooth brome (*Bromus inermis*), created wheat grass (*Agropyron cristatum*, *A. desertorum*) and timothy (*Phleum pratense*). All of these species have a deleterious effect on fescue grassland.

Fescue Prairie is one of several major grassland association of North America. It once formed an arc stretching from central Saskatchewan west to the foothills of the Rocky Mountains (see map) and south into Montana, Washington, and North Dakota. Elevation ranges from 500 m in central Saskatchewan to 1400 m in the Cypress Hills of Saskatchewan. Temperatures can reach 40 ºC (104 ºF) in the summer and -40 ºC (-40 º F) in the winter, and mean annual precipitation ranges from 350 to 600 mm (14-24 inches), of which 50-60% occurs between May and August. *Festuca campestris* dominates in the Rocky Mountain foothills and Cyress Hills, and *F. hallii* dominates much of the remainder. Most of the fescue grasslands of Alberta and Saskatchewan are now used to produce cereals. Fescue grasslands have been described as endangered by Environment Canada, with only about 5% remaining in pre-settlement condition. There have been several studies of methods to restore fescue grasslands, with very limited success to date.
Due to global warming, a 3 ºC (5.4 ºF) increase in temperature has been predicted for the prairie region of western Canada. As the climate changes, migration and alteration of species ranges are likely, and the vegetation will tend to change somewhat to species that are more resistant of drought and higher temperatures. Pastures and rangelands are thought to be very sensitive to climate change, and so the fescue grasslands may be particularly threatened.

MYTHS, LEGENDS, TALES, FOLKLORE, AND INTERESTING FACTS

- The grass family, Poaceae, with about 10000 species, is the fourth largest family of flowering plants, exceeded only by the pea family (Fabaceae, with about 18000 species), sunflower family (Asteraceae, with about 24000 species) and orchid family (Orchidaceae, variously estimated to have 22000-35000 species).
- There are two widespread physiological classes of grasses that differ in the way they carry out photosynthesis (a third photosynthetic class, crassulacean acid metabolism, is present in many succulent plants of desert and semi-arid ecosystems, but not in grasses). About 60% of grass species are called C3 (Calvin cycle) plants because the first stable compound formed when carbon dioxide is processed is a three carbon compound, i.e. C3. Such plants typically

"Sometime soon we will recognize the difference between going to a native grassland to sit and listen and learn from a microcosm of the World, to open ourselves to it for inspiration as to how best to live with it and minister to it, and going there with the intention of turning it into a source of recreation, into a show place for wild animals, into a landscape painting, into a pasture for cattle ormost terrible thoughtinto just another wheat field."
Stan Rowe (1918 2004, Canadian forester and eco-philosopher, in Home Place: Essays on Ecology, 1990; rev. ed. 2002)

grow best between 15-25 °C (59-77 °F) and produce maximum photosynthesis with only 20% of maximum sunlight. By contrast, about 40% of grass species are called C4 (dicarboxylic acid pathway) plants because the first organic compound incorporating CO_2 is a four carbon compound. C4 plants typically grow best between 30-40 °C (86-104 °F) and produce maximum photosynthesis only when light intensity reaches 100% of full sunlight. C4 plants also use water and nutrients more efficiently than C3 plants. Rough fescues are "cool-season grasses" that belong to the C3 class; indeed, most plant species of the northern prairies are dominated by C3 plants. By contrast, many tropical plants have the C4 type of photosynthesis, which allows for increased growth if temperature and light intensity are sufficiently high. Many tropical grass species are of the C4 type, accounting for the very high productivity of tropical and subtropical grasslands and savanna ecosystems. Many plant physiologists have concluded that C3 plants gain a competitive advantage at higher CO_2 levels, and predict that as climate change continues to increase CO_2 in the atmosphere, C3 plants will become more dominant.

- Samples of some fescue species growing almost 200 m (ca. 200 yards) apart in some pastures have proven to have identical genetic fingerprints, indicating that they can spread great distances by vegetative reproduction (reference: page 13 in Attenborough, D. 1995. the private life of plants. Princeton University Press, Princeton, NJ.). The resulting immense clones may be centuries old. When such clones are interpreted as "individuals", they are among the largest organisms in the world.

SOURCES OF ADDITIONAL INFORMATION

Aiken, S.G., and Darbyshire, S.J. 1990. Fescue grasses of Canada. Agriculture Canada Publ. 1844/E. Canadian Government Publishing Centre, Ottawa, ON. 113 pp.

Aiken, S.G., Dallwitz, M.J., McJannet, C.L., and Consaul, L.L. 1997. Fescue grasses of North America. Canadian Museum of Nature, Ottawa. (CD-ROM)

Darbyshire, S.J., and Pavlick, L.E. 2007*a*. *Festuca*. pp. 389-443 *in* Flora of North America north of Mexico, vol. 24. *Edited by* M.E. Barkworth, K.M. Capels, S. Long, L.K. Anderton, and M.B. Piep. Oxford University Press, New York, NY.

Darbyshire, S.J., and Pavlick, L.E. 2007*b*. *Festuca*. pp. 90-103 *in* Manual of grasses for North America. *Edited by* M.E. Barkworth, L.K. Anderton, K.M. Capels, S. Long, and M.B. Piep. Intermountain Herbarium and Utah State University Press, Utah State University, Logan. 629 pp.

Harms, V.L. 1985. A reconsideration of the nomenclature and taxonomy of the *Festuca altaica* complex (Poaceae) in North Amerca. Madroño 32: 1-10.

Hill, M.J., Aspinall, R.J., and Willms, W.D. 1997. Knowledge-based and inductive modelling of rough fescue (*Festuca altaica*, *F. campestris* and *F. hallii*) distribution in Alberta, Canada. Ecological Modelling 103: 135-150.

King, J.R., Hill, M.J., and Willms, W.D. 1995. Growth response of *Festuca altaica*, *Festuca hallii*, and *Festuca campestris* to temperature. Can. J. Bot. 73: 1074-1080.

Pavlick, L.E., and Looman, J. 1984. Taxonomy and nomenclature of rough fescues, *Festuca altaica*, *F. campestris* (*F. scabrella* var. *major*) and *F. hallii*, in Canada and the adjacent United States. Can. J. Bot. 62: 1739-1749.

Redmann, R.E. (undated.) Grasses and grasslands, native. The encyclopedia of Saskatchewan. http://esask.uregina.ca/entry/grasses_and_grassland_native.html

Trottier, G.C. 2002. A landowner's guide. Conservation of Canadian prairie grasslands. Minister of the Environment/Canadian Wildlife Service. http://www.mb.ec.gc.ca/nature/whp/prgrass/df03s00.en.html

ACKNOWLEDGMENTS

B. Brookes skillfully prepared the artwork for publication.

University of Hawaii at Manoa: Graduate Research Assistantship (Ph.D.) position (50% appointment) in molecular ecology / plant sciences.

Funding for Ph.D. project is available through the College of Tropical Agriculture and Human Resources (CTAHR) in the Department of Tropical Plant and Soil Sciences. This project will address potential hybridization and gene flow between agricultural crops and native species in Hawaii. The Hawaiian Islands are home to a unique and diverse assemblage of endemic plant species. Much of the native flora is either threatened or endangered, which has made the conservation of these species a priority. Due to the sensitivity of Hawaii's botanical resources, concern has been voiced that hybridization and gene flow between agricultural crops and native species may exacerbate the precarious position of rare endemic species. Molecular markers (AFLP's), seed viability and back-crossing will be used to quantify outcrossing compatibility and fitness of hybrids. This project primarily includes cross pollination and pollen drift assessment, therefore, experience with plant biology and cross pollination is essential. A Masters degree in a biological field and knowledge of risk assessment procedures, and interpretation of risk models is desirable but not essential. Experience with molecular genetic methods and analyses (e.g. AFLP, PCR, gel electrophoresis, automated sequencing/genotyping) is desirable but not essential.

The candidate will work under the supervision of Dr. Ania Wieczorek and Dr. Cliff Morden. Starting date is in August 2010, and the salary ($25,000/year) is for a 50% GRA, plus a tuition waiver and benefits. This appointment is renewable for up to three years, depending on performance and availability of funds.

Applicants should provide a full CV, including previous experience, a list of undergraduate courses and grades, a maximum 1-page description of research interests, three letters of reference, and desired start date. There is no fixed application deadline, but position will be filled once a suitable candidate is found. Potential applicants are encouraged to submit their applications as soon as possible. Applications should be sent (preferably by e-mail) to Dr. Ania Wieczorek (ania@hawaii.edu). In your initial contact, please send the following information: 1) a cover letter outlining your research interests and experience, 2) a detailed CV, 3) contact information for at least 2 academic referees, 4) GPAs, GRE score, and TOFEL scores (for foreign students)

The Annual CBA/ABC Meeting at Acadia May 2009



The poster session



Elegant venue for the AGM



The Barbecue



Coffee Break



The Saskatchewan group



The Banquet



Chris Eckert



David Garbary



Denis Barabé. Should I bid or not?



What am I bid?



The Barbecue

Photos: C. Maxwell

The CBA Board of Directors 2009-2010
Le bureau de direction de l'ABC 2009-2010

EXECUTIVE / ExÉCUTIF

President / président : 2008-2010 Dr. Rodger Evans, Biology Department, Acadia University, 24 University Avenue, Wolfville, NS B4P 2R6,Tel: (902)585-1710, Fax: (902)585-1059, E-mail rodger.evans@acadiau.ca
Past-President \Présidente sortante; 2008-2010. Dr Christian Lacroix, Dean of Science, University of P.E.I. Charlottetown PEI C1A 4P3. Tel: (902)-566-0320 Fax: (902)-628-4303 Email: lacroix@upei.ca
President-Elect / Président élu : 2008-2010. Dr.Hugues Massicotte, Ecosystem Science and Management Program, College of Science and Management, University of Northern British Columbia, Prince George, BC, V2N 4Z9, Tel.: (250) 960-5813; Fax: (250) 960-5538; E-mail:hugues@unbc.ca.
Vice President / Vice-présidente : 2009-10 Dr. Jeffery Saarela,Research Scientist, Botany, Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, ON K1P 6P4. Tel: 613-364-4080 Fax: 613-364-4027 E-mail: jsaarela@mus-nature.ca
Secretary / Secrétaire : 2009-2011 Dr. Laurie Consaul Research Division, Botany Canadian Museum of Nature P.O. Box 3443, Station D Ottawa, ON K1P 6P4 Tel: 613-364-4074 Fax: 613-364-4027 E-mail: lconsaul@mus-nature.ca
Treasurer/Trésorier: 2008-2010, Dr Jane Young, Ecosystem Science and Management Program College of Science and Management, University of Northern British Columbia, Prince George, BC V2N 4Z9. Tel: (250) 960-5861 Fax:(250) 960-5538, E-mail: youngj@unbc.ca
Directors/ Directeurs :
Dr S. Daya Dayanandan, 2008 -2010 Biology Department, Concordia University,7141 Sherbrooke St. West Montreal, Quebec. H4B1R6. Tel: (514)-848-2424, ext. 3414,Fax: (514)-848-2881, E-mail daya@alcor.concordia.ca
Dr. Usher Posluszny 2008-2010, Department of Molecular and Cellular Biology, University of Guelph,50 Stone Rd. East, Guelph, ON. N1G 2W1,Tel: (519)-824-4120, Ext 52745,Fax: (519)-767-1656 E-mail: uposlusz@uoguelph.ca.
Dr. Cynthia M. Ross Friedman, 2008-2010, Department of Biological Sciences, Thompson Rivers University P.O. Box 3010, 900 McGill Road. Kamloops, British Columbia,V2C 5N3. Tel.: (250) 828-5424,Fax: (250) 828-5450, E-mail: cross@tru.ca
Dr David Garbary, Department of Biology, St. Francis Xavier University, P.O.Box 5000, Antigonish, NS B2G 2W5. Tel: (902) 867-2164. Fax:(902) 867-2389. Email: dgarbary@gmail.com
Dr Art Fredeen, 2009-2011 Dr. Art Fredeen Associate Professor, Ecosystem Science and Management, University of Northern British Columbia, Prince George, BC V2N 4Z9 Tel: 250-427-5847 E-mail: fredeena@unbc.ca
Dr Arunika Gunawardena, 2008-2010 Dalhousie University, Biology Department Life Sciences Centre,1355 Oxford Street, Halifax, NS B3H 4J1 Tel: (902) 494-1594, Fax: (902) 494-3736 E-mail arunika.gunawardena@dal.ca
Student Representatives / Représentants étudiants
Julia Nowak(PhD candidate) c/o Department of Botany, University of British Columbia, 3529-6270 University Blvd, Vancouver, BC V6T 1Z4 Tel: (604) 374-7483. Fax: (604) 822-6089 E-mail: nowakj@interchange.ubc.ca
Jessica Stolar : jes951@mail.usask.ca

SECTION CHAIRS / RESPONSABLES DES SECTIONS
Ecology / Écologie and Conservation / Conservation : Dr.Liette Vasseur, Vice President - Research, Brock University, 500 Glenridge Avenue, St. Catharines, ON L2S 3A1 and Adrianne Sinclair Environment Canada - Wildlife Service, CITES Scientific Authority, 4th Floor, 351 St. Joseph Blv Gatineau, QC, K1A 0H3; Tel.:(613)-759-1373, fax (613)759-1599 E-mail: adrianne.sinclair@ec.gc.ca
Mycology / Mycologie : (Co-Chairs) Dr. Hugues Massicotte, Ecosystem Science and Management Program College of Science and Management, University of Northern British Columbia, Prince George, BC V2N 4Z9Tel.: (250) 960-5813; Fax: (250) 960-5538; E-mail:hugues@unbc.ca.
Dr. Shannon M. Berch, BC Ministry of Forests, Forests Research Branch Laboratory, 4300 North Road Victoria, BC V8Z 5J3 Tel: (250)952-4122,Fax:(250)952-4119,shannon.berch@gems7.gov.bc.ca
Plant Development / Développement des plantes : Dr Jane Young, Ecosystem Science and Management Program College of Science and Management, University of Northern British Columbia, Prince George, BC V2N 4Z9. Tel: (250) 960-5861 Fax:(250) 960-5538, E-mail: youngj@unbc.ca
Systematics & Phytogeography / Taxonomie et phytogéographie :Dr.Tim Dickinson, Green Plant Herbarium (TRT), Centre for Biodiversity & Conservation Biology,Dept. of Natural History, Royal Ontario Museum100 Queen's Park, Toronto, ON M5S 2C6,Tel.: (416)586-8032,Fax: (416)586-7921,E-mail: tim.dickinson@utoronto.ca
Teaching / Enseignement : Dr. Cynthia M. Ross Friedman, 2008-2010, Department of Biological Sciences, Thompson Rivers University P.O. Box 3010, 900 McGill Road. Kamloops, British Columbia,V2C 5N3. Tel.: (250)828-5424,Fax: (250)828-5450, E-mail: cross@tru.ca

COMMITTEES AND OTHER POSITIONS / COMITÉS ET AUTRES POSTES

Membership /Recrutement and **Development / Développement** See President and Treasurer. Voir sous Président et Trésorier
Archivist / Archiviste :Dr.Joe Gerrath, 70, Dumbarton St. Guelph, ON N1E 3T6, Tel: (519) 822- 1964

CBA/ABC web page / Page web de l'ABC/CBA Dr Daya Dayanandan, Biology Department, Concordia University,7141 Sherbrooke St. West Montreal, Quebec. H4B 1R6. Tel: (514) 848-2424, ext. 3414,Fax: (514) 848-2881,E-mail: daya@alcor.concordia.ca

Bulletin Editor / Rédacteur Bulletin : (2006-2009) Christine D. Maxwell, 924 Cassandra Place, Nanaimo, BC V9V 1C1, Tel: (250) 390 9240 Email: cba.abc.bulletin@gmail.com

Executive Assistant / Adjointe à la direction : Vanda Wutzke (2004-), Box 160, Aberdeen, SK, SOK OAO: Tel.: (306)253-4654: Fax: (306)253 4744: E-mail: vanda.wutzke@sasktel. Net.

Moving? Remember to let Vanda know your new address!