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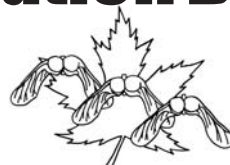
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The Canadian Botanical Association Bulletin



Bulletin de l'Association Botanique du Canada

March/Mars 2009. Volume 42 No.1/N°1

Association News



Read all about this exciting contest, sponsored by the American Society of Plant Biologists, the Botanical Society of America, the Canadian Botanical Association and PlantingScience.org, at www.chlorofilms.org and see the poster on page 4. The original deadline for the submissions was March 1st, but has been changed to April 12th 2009.



Nominations are invited for the following positions each of them for a 2 year term:

- Secretary
- Director representing Eastern Canada
- Director representing Western Canada

These terms will begin at the end of our next AGM in May 2009.

Please send your nominations (or expression of interest) to:
Christian Lacroix, Dean of Science, University of PEI, 550 Univ. Ave
Charlottetown, PE, C1A 4P3 E-mail: lacroix@upe.ca

L'ABC a besoin de VOUS ! Devenez un membre de notre conseil d'administration.

Un appel de candidatures est lancé pour les postes suivants, chacun d'une durée de deux ans:

- secrétaire
- directeur représentant l'est du Canada
- directeur représentant l'ouest du Canada

La période de service pour chaque poste débutera à la fin de la réunion annuelle générale en mai 2009.

Veuillez faire parvenir vos nominations (ou nous communiquer votre intérêt à soumettre votre candidature) à: Christian Lacroix, Dean of Science
University of PEI, 550 Univ. Ave, Charlottetown, PE C1A 4P3
E-mail: lacroix@upe.ca

New Website. Our affiliated group, The Organization of Botany Students at the University of Alberta, has a new website at www.ualberta.ca/~obs
The Editor wishes to apologize for giving them an incorrect title in Bulletin 41(2), in which I referred to them as Organization of Biology Students.

(Continued)

Canadian Botanical Association Bulletin

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

Information for submitting texts

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

Association botanique du Canada Bulletin

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

Soumission de textes

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

Editor / Rédacteur

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Next issue / Prochain numéro

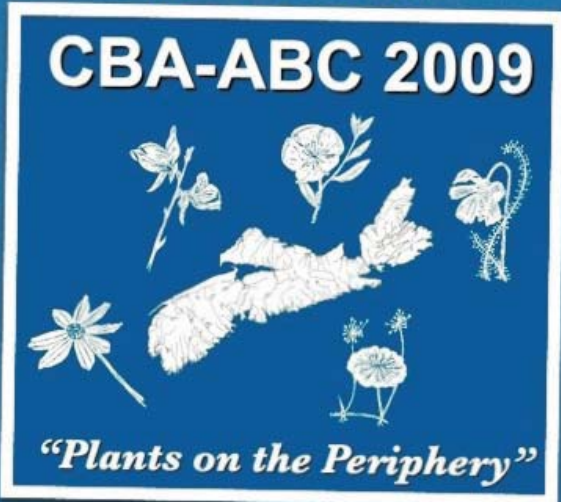
Texts for the next issue, **42(2)**, must be received **before August 17th 2009**

La date de tombée des textes du prochain numéro, le no **42(2)**, est le **17 août 2009**

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Publié à Peterborough, le 16 mars 2009

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**Registration and Abstract Submission
NOW OPEN!!!**



CBA-ABC 2009
"Plants on the Periphery"

Student Registration - \$100
Regular Registration - \$250
Prices in effect until April 1, 2009

Registration Includes:

- ★ Programme (on a USB drive)
- ★ Unbleached cotton conference "shopping" bag
- ★ Conference t-shirt
- ★ Refreshments at coffee breaks
- ★ Access to:
 - ★ all contributed scientific paper sessions
 - ★ Opening Mixer and two beverage tickets for the cash bar
 - ★ Poster session
 - ★ BBQ and Annual General Meeting
 - ★ Closing Banquet and Auction

Sign Up for a Field Trip!!

- Wines, Vines and History - \$75 / person*
- Cape Split Botanical Hike - \$30.00 / person*
- Walking Tour of Lunenburg - \$60.00 / person*

Acadia University, Wolfville, NS
May 18-21, 2009
cba-abc.acadiau.ca

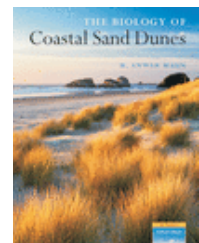
Deadline for Abstracts and early registration is April 1st 2009

Student attendees should remember to indicate whether they wish to be considered for the Lionel Cinq Mars Award (oral presentations) or for the Iain and Sylvia Taylor award (posters). In addition, remember that there are travel bursaries available. For graduate students these are the Macoun Travel Awards, and for undergraduates there is the Keith Winterhalder Travel award.

The Biology of Coastal Sand Dunes. By Anwar Maun.

Members of the CBA/ABC will remember Anwar as a long time member of the Association and winner of the Lawson medal in 1997. At the time of his passing in September 2007, he was writing a book on coastal sand dunes. The book has now been completed by Irene Krajnyk and published by Oxford University Press.

<http://www.oup.com/uk/catalogue/?ci=9780198570363#authors>



CBA/ ABC Website. The website has undergone some revision and a French version is expected to be added in the near future.

<http://www.cba-abc.ca>

News From the Sections.

Systematics and Phytogeography Section

A reminder about the Alf Erling Porsild Memorial Prize.

Last summer the 2008 Porsild Prize was awarded to Jeff Saarela, of the Canadian Museum of Nature, for his excellent paper, "Molecular phylogenetics of *Bromus* (Poaceae) based on chloroplast and nuclear DNA sequence data." The Porsild Prize is awarded annually, when suitable candidates are available, in recognition of the best paper published in the field of systematics and phytogeography that year by a graduate student in a Canadian university or a Canadian student in a foreign university; membership in the CBA/ABC is *not* required. The work should be published while the author is still a graduate student or be based on work done while a graduate student, and published within two (2) years of graduating. Judges for this year's Porsild Prize will be Suzanne Warwick, Marian Munro, and Mihai Costea. Consideration for the 2009 Porsild prize will be given to papers published during the calendar year 2008 (papers appearing in 2009 should be nominated for the 2010 prize). Nominations may originate with anyone (student, supervisor, co-author, etc.) but must consist of the following documents, submitted as e-mail attachments

1. The paper in question, in the form of a pdf file.
2. A letter of nomination. If from the student's supervisor, or a co-author, then this letter must include an indication of the extent to which the paper is the student's own work, with an indication of the nature and extent of the contributions made by the supervisor or any co-authors. If the nomination originates with the student or someone other than the supervisor or a co-author, and is for a multi-authored paper, then the nomination should include a statement from a co-author or the supervisor indicating the extent to which the paper is the student's own work, with an indication of the nature and extent of the contributions made by the supervisor or any co-authors. In all cases, the expectation is that the student should have done the majority of the research and the writing of the paper. Hardcopy will be accepted only in exceptional circumstances where a pdf file of the paper is unavailable. In such cases the supporting documents should be submitted electronically, together with a brief explanation of why the .pdf file was unavailable.
3. Please send your nominations for the Porsild award to Tim Dickinson, ROM Green Plant Herbarium (TRT) Department of Natural History, Royal Ontario Museum, 100 Queen's Park, Toronto ON.CANADA M5S 2C6 Phone: (416) 586 8032 FAX: (416) 586 7921 E-mail: tim.dickinson@utoronto.ca by the 1 April 2009 deadline. Last year by the time the deadline arrived there were only three nominations. This year we already have three and potentially there are more that could be submitted. In the September issue of the CBA/ABC Bulletin, there was a suggestion that the chair would poll members about our participation in the forthcoming meeting at Acadia in May. This was not done but in the meantime the local organizing committee has put together a single session programme with first-rate invited speakers. We will use the opportunity of our section meeting at midday on Wednesday, 20 May 2009, to plan what we will do at the 2010 meeting in Ottawa that will be held together with the Society for the Preservation of Natural History Collections (SPNHC) at the Canadian Museum of Nature in Ottawa. The conjunction of

another collection-oriented group, a major natural history museum, and several great herbaria offers us an opportunity of which we should try to take the greatest possible advantage.

Ecology section

Two panel discussions are planned for the meeting at Acadia.

1. Life After Graduation Panel Discussion: How do you get to where you want to go? An academic, a bureaucrat, a private sector worker and an NGO person will describe the paths they have taken from their botany education to their current positions. Participate in the questions and discussions to find out what a degree in botany can bring you and what skills may benefit you in these sectors.

2. Critical Habitat under SARA Panel Discussion: How do we define critical habitat for plants? Under SARA (Species at Risk Act), once a species is listed and requires a management plan, it is essential to define its critical habitat. Representatives from the federal and provincial governments, academia, and consulting agencies will present their perspectives and discuss this important and highly debated topic. The goal is to see the CBA develop a discussion paper on this issue over the next year.

1 Table ronde sur "Votre vie après le diplôme" : comment arriver où vous voulez aller?

Un professeur, un bureaucrate, un consultant du secteur privé et une personne d'une ONG décriront les chemins qu'ils ont pris après l'obtention de leur degré en botanique pour arriver à leur poste. Participer à une session de questions et de discussion pour découvrir ce que votre diplôme peut vous apporter et les atouts que vous devriez avoir pour obtenir ces postes.

2. Table de discussion sur la définition des habitats critiques sous la loi des espèces en péril : comment définissons-nous l'habitat critique pour les plantes? Sous la loi, lorsqu'une espèce est désignée et requiert un plan de gestion, il est nécessaire de définir l'habitat critique de celle-ci. Cependant la plupart des critiques se réfèrent aux espèces animales. Représentants des gouvernements fédéral et provinciaux, académiques et consultants présenteront leur point de vue et discuterons des enjeux reliés à ce sujet important et hautement débattu. L'intention est de voir l'ABC développer un papier de positionnement à ce sujet dans la prochaine année.

Times and places will be announced in the conference programme.

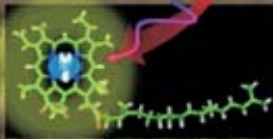
Teaching Section

Do you have innovative and novel ideas for teaching? Consider presenting your ideas at the upcoming conference at Acadia. There will be a teaching section meeting at lunch time on May 20th. We hope you will plan on attending. Dr Kate Frego, a 3M Teaching Fellowship Award winner will be a featured speaker at the conference.

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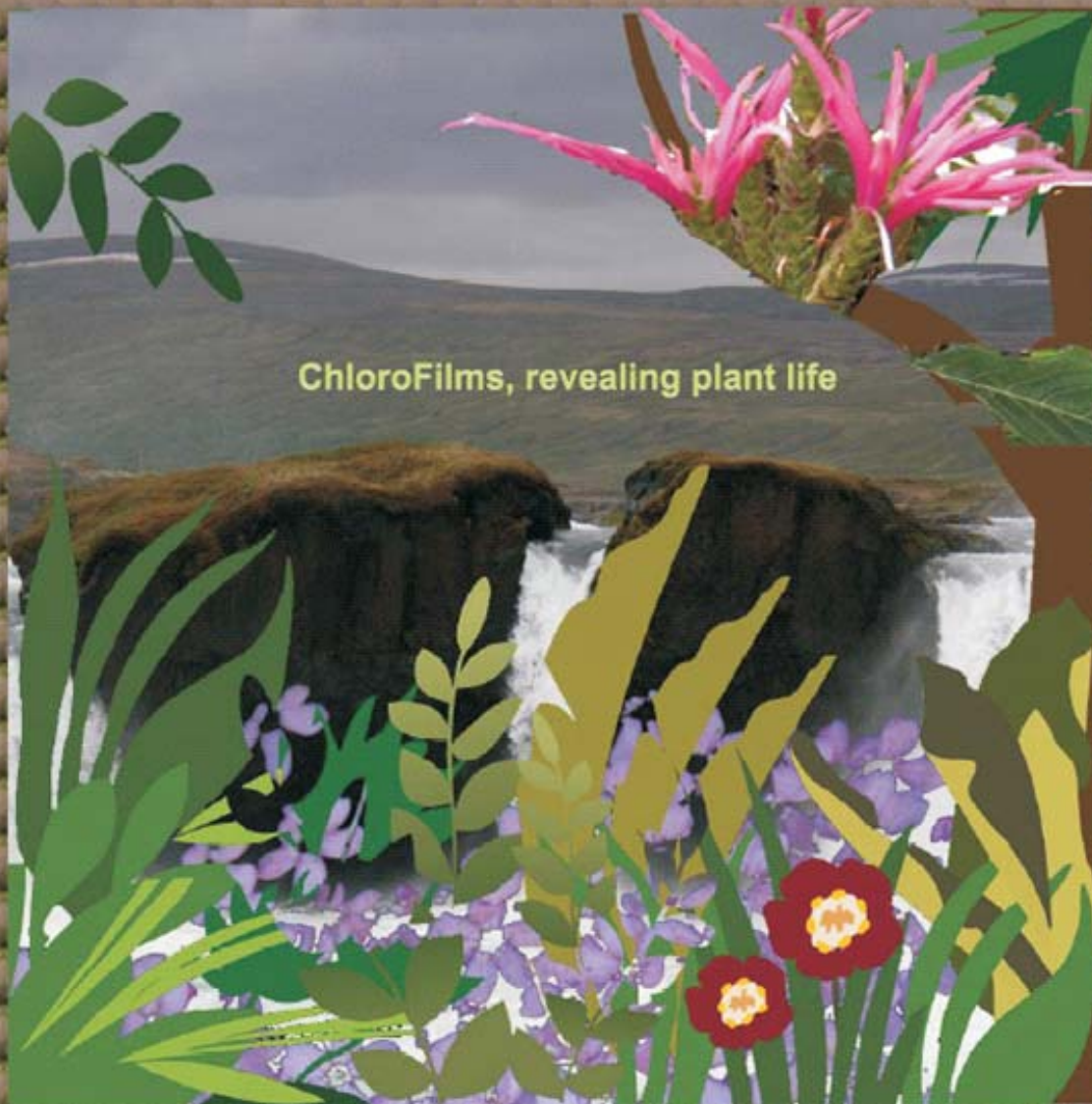
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Obituary

Wilfred Borden Schofield, 1927-2008

By Robert Ireland, Department of Botany, Smithsonian Institution
Washington DC 20560 U.S.A

It is with deep regret and much sadness to report that one of the greatest bryologists in Canada, and indeed in all of North America, Dr. Wilfred B. Schofield, an Emeritus Professor in Botany at the University of British Columbia, Vancouver, Canada, died of cancer on November 5, 2008. His death was a shock to everyone who knew this distinguished scientist since he always looked so fit with all of the exercise he got through his many days of hiking and climbing steep cliffs in search for bryophytes. He was collecting in the Aleutian Islands for about two months when he suddenly got sick on Umak Island and had to return to Vancouver to seek medical attention for his eventual fatal illness.

Wilf was born in Brooklyn Corner, Nova Scotia on July 19, 1927. He soon decided he wanted to become a school teacher so he attended Acadia University in Wolfville, Nova Scotia (1946-50) where he graduated with his B.A. degree. John S. Erskine, a botanist who collected many N.S. records was on staff at Acadia University and no doubt this association led Wilf into his interest in bryophytes. Wilf then did some internships, residencies and obtained his Teacher's License at Normal College, N.S. in 1951. However, after doing some teaching in Nova Scotia his passion for the bryophytes definitely helped him decide to go on to graduate school. He attended Stanford University (1954-56) where the well known bryologist, Dr. William C. Steere, was the Dean and also the director of his research, before becoming the President of the New York Botanical Garden. After receiving his M.A. degree with his dissertation entitled, "The Relationships and Geographic Distribution of Canadian and Alaskan species of *Hypnum*," he attended Duke University (1957-60) where he studied ecology under Dr. H. J. Oosting, obtaining his Ph.D. degree with his dissertation there entitled, "The Ecotone between Spruce-Fir and Deciduous Forest in the Great Smoky Mountains." The same year, after graduation in 1960, he obtained a position as Assistant Professor in Botany at the University of Montana Biological Station in the summer, before accepting a position in September on the faculty of the Botany Department at the University of British Columbia, where he eventually became Professor in Botany in 1971, remaining there until he retired to an Emeritus Professor position in 1992 until his death.

Wilf was an excellent teacher and he was well liked by his numerous students throughout his teaching career. He had a total of 19 graduate students: nine graduating with a M.Sc. and 10 with a Ph.D. Many of his students are currently teaching or in professional biological positions in North America and in various places in Asia. He has over 100 publications, mostly on bryophytes, but also some on lichens and vascular plants. He collaborated on five standard text-books in botany by being the author of a chapter in the books. Among them are the following that were all published by the Wadsworth Publishing Co.: An Evolutionary Survey of the Plant Kingdom. R.F. Scagel et. al. 658 pp., 1965; Plant Diversity: An Evolutionary Approach. R.F. Scagel et. al. 460 pp., 1969; and Plants: an Evolutionary Survey. R.F. Scagel et. al. 757 pp., 1984. He also produced two very impressive illustrated amateur guides to the bryophytes. One for the mosses: Some Common Mosses of British Columbia, Handbook 28: 262 pp., 1969 (revised 1993), B.C. Provincial Museums) and one for the liverworts: Field Guide to Liverwort Genera of Pacific North America. 228 pp., 2002, U. of Washington Press. Most importantly, however, he was the sole author of one of the most distinguished books, "Introduction to Bryology", published in 1985 (revised in 2001), which was the first comprehensive textbook in bryology. The book received many awards from several organizations, among them the Association of American Publishers and the Canadian Botanical Association.

Wilf was known as one of the best collectors in North America. He collected almost 129,000 plants, with roughly 90% of them or about 116,000 being bryophytes. Most of his bryophytes were collected in Canada, many on the Queen Charlotte Islands off the coast of British Columbia. He traveled extensively to numerous places around the world often collecting during his travels. Among the places where he traveled were Australia, New Zealand, Tasmania, Japan, Europe and Hawaii. However, recent collecting for the past 15 years of his life was in the Aleutian Islands with Stephen Talbot (U.S. Fish and Wildlife Service, Anchorage, Alaska) and his wife, Sandy (U.S. Geological Survey, Anchorage). As a result of all of his collecting, several plants were named in his honor: one genus (*Schofieldiella* W.R. Buck) and seven species of mosses in six different genera, one genus (*Schofieldia* J. D. Godfrey) and one species of liverwort, two lichen species and one vascular plant species. With his numerous collections and those from other institutions with which he exchanged specimens, the Bryophyte Herbarium of the U. of British Columbia (UBC) has become the largest in Canada and one of the largest in the world, containing approximately 253,000 specimens.

His professional accomplishments are also very impressive. He was the Vice-President (1965-67) and President

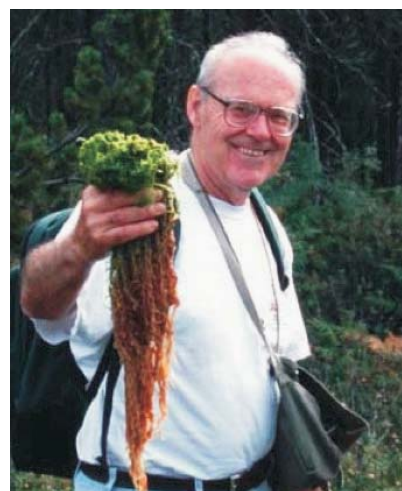


Wilf Schofield at 60 yrs



Wilf Schofield in 1967 in the Queen Charlotte Islands. He was 40 years old at the time. Photo: Irwin Brodo.

(1967-69) of the American Bryological and Lichenological Society that publishes the well known journal, *The Bryologist*. He was also a Director of the Canadian Botanical Association (1970-72) that publishes the distinguished journal, *The Canadian Journal of Botany*. He also held many other duties in a number of other societies. He held 12 Bryophyte workshops in several places in North America and he was an invited lecturer numerous times in many places throughout the world. In 1987 he received an invitation to contribute a paper to celebrate the 200th anniversary of the Linnean Society of London. In 1990 he was awarded an honorary Doctor of Science from Acadia University where he first started his educational career. He was honored by the Japanese in 1997 with the publication of Volume 82 of the Hattori Botanical Laboratory which contained, "Bryological and lichenological papers presented to Wilfred Borden Schofield on the occasion of his 70th birthday." He was very concerned with the environment, recently serving on the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) for several years. His most recent publications have been with the bryophyte (moss) volumes of the *Flora of North America*. He was the author or coauthor of treatments of five families and six genera in Volume 27, part 1, and he will be the author or coauthor of treatments of one family and 5 genera in Volume 28, part 2 when it is published. In addition, he will be author of three families and three genera in Volume 29 (hepatics and hornworts) when it is published in the near future. His research accomplishments, especially on his specialty the family Hypnaceae (Musci), and his professional services are immense. There will be a more complete obituary on Wilf published early this year in the journal, *The Bryologist*.



Moss glorious moss! Wilf with a handful of *Sphagnum*. Photo: Shona Ellis.

He was truly an extraordinary man with great accomplishments as a botanist, a true professional bryologist who was always willing to help anyone with their bryological problems, and a person who had very high human values. There is little doubt that he was loved by many people because of the kind person he was and he will be missed tremendously by everyone who had the pleasure of personally knowing this great man.

A celebration of Wilf's life will be held on Saturday April 25th 2009, 5.00pm-9.00pm at the Unitarian Church of Vancouver.



Nécrologie

Wilfred Borden Schofield, 1927-2008

Par Robert Ireland Department of Botany, Smithsonian Institution
Washington DC 20560 U.S.A



Wilf Schofield à 60 ans.

C'est avec grand regret et beaucoup de tristesse que nous souhaitons annoncer que le Dr Wilfred B. Schofield, l'un des plus éminents bryologistes du Canada et de toute l'Amérique du Nord, ainsi que professeur émérite en botanique de l'Université de la Colombie-Britannique à Vancouver au Canada, est décédé d'un cancer le 5 novembre 2008. Son décès a été un choc pour tout l'entourage de ce scientifique de renom, puisqu'il semblait toujours garder la forme grâce à ses nombreuses randonnées et escalades de collines à la recherche de bryophytes. Il effectuait une collecte dans les Îles Aléoutiennes depuis deux mois lorsqu'il tomba soudainement malade sur l'île Umak et dû revenir à Vancouver afin d'être soigné pour sa maladie qui s'avéra être mortelle par la suite.

Wilf est né à Brooklyn Corner, en Nouvelle-Écosse, le 19 juillet 1927. Il décida très tôt de devenir enseignant et obtint son baccalauréat du Acadia University de Wolfville, en Nouvelle-Écosse (1946-50). John S. Erskine, un botaniste qui collectionnait les spécimens de la Nouvelle-Écosse, était associé à l'université et ce contact avec Wilf a certainement contribué à sa passion pour les bryophytes. Wilf effectua ensuite plusieurs stages et résidences pour finalement obtenir sa licence d'enseignement de la Nouvelle-Écosse en 1951. Après quelques années dans le domaine, sa passion pour les bryophytes le poussa à entamer des études de cycle supérieur. Il étudia à Stanford University (1954-56) sous la direction du doyen et célèbre bryologiste Dr William C. Steere, qui allait par la suite devenir directeur du jardin botanique de New York. Suite à l'obtention de sa maîtrise grâce à la dissertation intitulée, « *The Relationships and Geographic Distribution of Canadian and Alaskan species of Hypnum* » (Relations et distribution géographique des variétés d'*Hypnum* du Canada et de l'Alaska), il étudia l'écologie à Duke University (1957-60) sous la tutelle du Dr H. J. Oosting pour ensuite compléter son doctorat avec la dissertation intitulée « *The Ecotone between Spruce-Fir and Deciduous Forest in the Great Smoky Mountains* » (Écotone entre la forêt de sapins et d'épinettes et la forêt à feuilles caduques dans les Great Smoky Mountains). La même année, suite à l'obtention de son diplôme doctoral en 1960, il décrocha un poste à titre de chargé de cours en botanique à la station biologique de l'Université du Montana au cours de l'été, pour ensuite être invité à joindre les rangs du département de botanique de l'Université de la Colombie-Britannique en septembre. Il devint professeur de botanique dès 1971 et demeura à ce poste jusqu'à retraite qui lui permit d'accéder au poste de professeur émérite de 1992 jusqu'à sa mort.

(Continued)

Wilf était un excellent professeur très apprécié par ses nombreux étudiants tout au long de sa carrière universitaire. Il a dirigé 19 étudiants aux cycles supérieurs dont 9 étudiants à la maîtrise et 10 étudiants au doctorat. Plusieurs de ses étudiants enseignent ou sont présentement employés dans le secteur de la biologie à différents endroits en Amérique du Nord et en Asie.

Au cours de sa carrière, il a participé à plus de 100 publications, principalement au sujet des bryophytes, mais également à propos des lichens et des plantes vasculaires. Il a également contribué à cinq manuels de botanique à titre d'auteur d'un chapitre. Parmi eux se trouvent ces livres tous publiés par Wadsworth Publishing Co. : *An Evolutionary Survey of the Plant Kingdom* (Une étude évolutionnaire du monde des plantes). R.F. Scagel et. al. 658 pp., 1965; *Plant Diversity: An Evolutionary Approach* (Diversité des plantes : Une étude évolutionnaire). R.F. Scagel et. al. 460 pp., 1969; et *Plants: An Evolutionary Survey* (Plantes : une étude évolutionnaire). R.F. Scagel et. al. 757 pp., 1984. Il a aussi publié deux guides illustrés sur les bryophytes. L'un est dédié aux mousses : *Some Common Mosses of British Columbia, Handbook 28* (Quelques mousses typiques de la Colombie-Britannique, guide 28). 262 pp., 1969 (révisé en 1993 et publié par B.C. Provincial Museums), tandis que l'autre traite des hépatiques : *Field Guide to Liverwort Genera of Pacific North America* (Guide de poche des genres de plantes hépatiques de la côte Pacifique de l'Amérique du Nord). 228 pp., 2002, U. of Washington Press. Sa contribution la plus importante à titre d'auteur est sans contredit le célèbre livre « *Introduction to Bryology* » (Introduction à la bryologie), publié en 1985 (et révisé en 2001), qui constitue le tout premier manuel complet sur la bryologie. Le livre s'est vu décerner plusieurs prix par de nombreuses organisations, notamment l'Association des éditeurs américains (Association of American Publishers) et l'Association botanique du Canada. Wilf était reconnu comme l'un des plus importants collectionneurs en Amérique du Nord. Il a amassé près de 129 000 plantes, dont près 90 % (environ 116 000) étaient des bryophytes. La plupart de ces bryophytes ont été recueillis au Canada, principalement sur les îles de la Reine-Charlotte au large de la Colombie-Britannique. Il a voyagé abondamment à plusieurs endroits autour du globe et a également profité de ses déplacements pour recueillir des plantes. Parmi les endroits qu'il a visités, mentionnons l'Australie, la Nouvelle-Zélande, la Tasmanie, le Japon, l'Europe et Hawaï. Il a passé les 15 dernières de sa vie à accroître sa collection sur les Îles Aléoutiennes en compagnie de Stephen Talbot (U.S. Fish and Wildlife Service d'Anchorage en Alaska) et de sa femme Sandy (U.S. Geological Survey d'Anchorage). Faisant foi des résultats concrets de toutes ces cueillettes, plusieurs plantes ont été nommées en son honneur : un genre (*Schofieldiella* W.R. Buck) et sept espèces de mousses de six genres différents, un genre (*Schofieldia* J. D. Godfrey) et une espèce d'hépatiques, deux espèces de lichens et une espèce de plantes vasculaires. Grâce à sa collection, et à celle d'autres institutions avec lesquelles il échangeait des spécimens, l'herbier de bryophytes de l'Université de la Colombie-Britannique (UBC) est devenu l'herbier de ce genre le plus important au Canada et compte parmi les plus importants dans le monde entier avec ses quelques 253 000 spécimens.

Ses réalisations professionnelles sont toutes aussi impressionnantes. Il a été le vice-président (1965-67) et le président (1967-69) de la American Bryological and Lichenological Society (Société bryologique et lichenologique américaine) qui publie le célèbre journal *The Bryologist*. Il a également été un directeur de l'Association botanique du Canada (1970-72) qui publie le prestigieux *Canadian Journal of Botany* (Journal canadien de botanique). Il a aussi occupé plusieurs postes au sein de nombreuses organisations en plus d'avoir présenté douze conférences sur les bryophytes et d'être invité comme conférencier à de multiples reprises partout autour de la planète. En 1987, il a été invité à contribuer à un article pour célébrer le 200^e anniversaire de la Linnean Society of London (Société linnéenne de Londres). En 1990, il s'est vu décerner un doctorat honorifique en sciences du Acadia University où il a débuté sa carrière en enseignement. Il a également été honoré par le Japon en 1997 par la publication du volume 82 du Hattori Botanical Laboratory (Laboratoire de botanique Hattori) qui comprenait « Bryological and lichenological papers presented to Wilfred Borden Schofield on the occasion of his 70th birthday » (Articles bryologiques et lichenologiques présentés à Wilfred Borden Schofield à l'occasion de son 70^e anniversaire).

L'environnement occupait une place de choix au sein de ses préoccupations et c'est pourquoi il a siégé sur le Comité sur la situation des espèces en péril au Canada (COSEPA) pendant plusieurs années.

Ses dernières publications ont été les volumes sur les bryophytes (mousses) pour *Flora of North America* (Flore de l'Amérique du Nord). Il a été auteur et collaborateur sur les traitements d'une famille et de cinq genres dans la seconde partie du volume 28 lorsqu'il sera publié. De plus, il sera l'auteur des traitements sur trois familles et trois genres du volume 29 (hépatiques et cornifelles) publié prochainement.

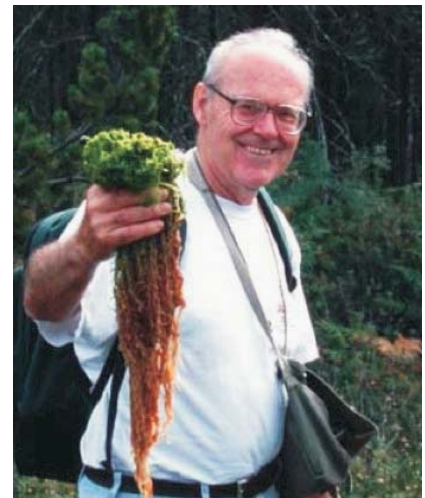
Ses réalisations en matière de recherche, particulièrement concernant la famille Hypnaceae (Musci) qui était sa spécialité, en plus de ses années de service à titre de professeur, forment un héritage inestimable pour toute la communauté scientifique. Un article rétrospectif exhaustif sera publié au début de l'année dans le journal *The Bryologist*.

Il était vraiment un homme extraordinaire et vertueux qui a accompli de grandes choses comme botaniste, un véritable

(Continued)



Wilf Schofield en 1967 dans les îles de la Reine-Charlotte. Il avait 40 ans à l'époque. Photo : Irwin Brodo.



Mousse glorieuse mousse! Wilf avec une poignée de *Sphagnum*. Photo : Shona Ellis.

bryologiste de profession qui était toujours prêt à aider quiconque œuvrant dans le domaine. Il est évident qu'il était le type d'homme apprécié de tous et que son décès laissera un vide difficile à combler pour tous ceux qui ont eu l'honneur et le plaisir de le connaître.

Il y aura une célébration de la vie de Wilf à l'Église unitarienne de Vancouver, le samedi 25 avril 2009, entre 17h et 21h.

Editor's Note: More obituaries for Wilf can be found in the Botanical Electronic News [BEN-L]BEN # 404



Ecology in Canada: What's New and Who's Doing It?

No 6. Art Fredeen's Lab



**Dr. Art Fredeen, Associate Professor, Ecosystem Science and Management Program
University of Northern British Columbia, Prince George, BC
V2N 4Z9
The Project(s)**



1. Explanations for the differences in abundance and diversity of cyanolichens in sub-boreal BC. Jocelyn Campbell



Jocelyn at work in the field.

In the inland, mixed-conifer forests of British Columbia, cyanolichens are generally restricted to forests more than 140 years old where the probability of stand-level disturbance is low. I am seeking to understand what the ecological factors are that facilitate both diversity and abundance of cyanolichens in these older stands. In these sub-boreal stands, cyanolichens are typically restricted to the lower canopy where moisture are permissive and light levels low. But these climatic conditions in and of themselves do not appear to explain cyanolichen abundance or diversity. We are using a variety of approaches to see if factors such as nutrient, carbohydrate, and other limitations might explain the differences in lichen thallus growth rate, photosynthesis or N_2 -fixation rates observed in forests of high, medium or low cyanolichen diversity.

Future plans may involve working in the area of forest ecology in British Columbia.

Jocelyn Campbell is currently working on her doctoral research; co-supervised by Cindy Prescott at UBC and Art Fredeen at UNBC. She obtained her B.Sc. from Queen's University and M.Sc. from UNBC. E-mail: joc_camp@telus.net; Phone: (250) 960-7800

2. Using natural ^{15}N and ^{13}C abundances to determine the N contributions of cyanolichens to sub-boreal forests of central B.C.

Ania Kobylinski

Forest canopy research has revealed diverse epiphytic lichen communities in old-growth fir and spruce forests of Northern British Columbia. These forests have low background N deposition rates and significant biomasses of epiphytic cyanolichens. I am looking to use the natural abundance of the heavy (stable) isotopes of nitrogen (^{15}N) and carbon (^{13}C) to determine the importance of epiphytic cyanolichens to nitrogen input in spruce and fir forest ecosystems of the central interior of northern British Columbia. Previous studies suggest that cyanolichens (especially *Lobaria pulmonaria*) make significant contributions to the nitrogen budgets of mature to old forests, but the amounts of these contributions are uncertain.

Future plans include combining the $\delta^{15}N$ & $\delta^{13}C$ data with a dynamic nitrogen cycle model to interpret natural ^{15}N abundance values from the SBS forest ecosystem and the importance of these epiphytes to the N budget.

Ania Kobylinski is in her first year of the Natural Resources and Environmental Studies M.Sc. graduate program at UNBC. She received her Honours B.Sc. in Biology from McMaster University in Hamilton, Ontario and came to BC to pursue her interests in forest canopy research and epiphytic cyanolichens.

E-mail : kobylin@unbc.ca; Phone : (250) 960-5673

(Continued)

3. Analysis of the solid waste stream at UNBC, Prince George Campus. Danielle Smyth

Two waste characterization studies were conducted at the University of Northern British Columbia (UNBC) Prince George campus, during the winter 2008 and fall 2008 semesters. Preliminary results revealed that over 70 % of the UNBC waste stream could have been diverted through recycling and/or composting. The case study of UNBC highlights the potential barriers to successful waste management within a northern and rural environment. The aim of this project is to provide recommendations for improving the efficiency and sustainability of institutional solid waste management systems. Upon successfully completing her master's degree, Danielle hopes to return to Ontario to pursue employment in the field of institutional sustainability.
E-mail : smythd@unbc.ca; Phone : (250) 552-2331



Danielle, her assistants and a bag of waste

4. Vulnerability and Adaptation of Tree species and Forests to Climate Change in the Yukon Territory.

Unprecedented climate change in the Yukon has led to concerns over the adaptability and vulnerability of Yukon tree species and forests. My lab will be looking at the ecophysiological traits in Yukon tree species in different regions and attempt to attribute past and current growth rates to particular environmental variables.

This study will begin in April 2009 and extend into 2011. A graduate student applicant has been selected for the ecophysiology component of this project to begin 1 April 2009.

Recently Published and Submitted Papers

Smyth DP, Fredeen AL, Booth AL Waste management and sustainability at 'Canada's Green University'™. (International Journal of Sustainability in Higher Education: *in review*)
Carson AW, Rea RV, Fredeen AL Compensatory shoot growth in trembling aspen (*Populus tremuloides* Michx.) in response to simulated moose browsing. (Alces: *in review*)
Campbell, J, Bradfield GE, Prescott CE, Fredeen AL Expanding the realized niche: Poplar as a facilitator of cyanolichen diversity (Oecologia, submitted January 2008)
Bois CH, Janzen DT, Sanborn PT, Fredeen AL 2009. Contrasting total carbon stocks between ecological site series in a sub-boreal spruce research forest in central British Columbia. Canadian Journal of Forest Research. (In press)
Botting R, J Campbell, AL Fredeen. 2008. Contrasting arboreal and terrestrial macrolichen and bryophyte communities in old-growth sub-boreal spruce forests of central British Columbia. The Bryologist 111(4): 607-619.
Campbell J, AL Fredeen 2007. Contrasting the abundance, nitrogen and carbon of epiphytic macrolichen species between host trees and soil types in a sub-boreal forest. Canadian Journal of Botany 85: 31-42.
Carson AW, Rea RV, AL Fredeen 2007. Extent of stem dieback in trembling aspen (*Populus tremuloides*) as an indicator of time since simulated browsing. *Journal of Range Management*. 60: 543-547.
Fredeen AL, Waughtal JD, TG Pypker. 2007. When do replanted sub-boreal clearcuts become net sinks for CO₂? Forest Ecology and Management 239: 210-216.
Janzen, DT, Fredeen AL, RD Wheate. 2006. Radiometric correction techniques and accuracy assessment for Landsat TM data in remote forested regions. Canadian Journal of Remote Sensing. 32(5): 330-340.



The Auctioneer will be in Action at Acadia!

Bring your items, particularly those of botanical significance, and watch Hugues skillfully extract money from the audience. Proceeds go to the Macoun Travel Bursary to help bring more graduate students to our conferences



Background Tree Mortality Rates Increase in Old Forests

Lori Daniels, Ph.D., R.P.Bio.
Department of Geography, UBC-Vancouver

In a recent collaboration with forest ecologists from the western United States, we made an alarming discovery. Tree death rates have more than doubled over the last few decades in old-growth forests of the western United States and southwestern British Columbia and the most probable cause of the worrisome trend is regional warming. Our study compares population changes in forests in southern British Columbia, Washington, Oregon, California, Idaho, Colorado and Arizona. For the last 15 to 50 years my colleagues and I have monitored 76 permanent plots that include more than 58,736 trees. During that time, 11,095 trees died and tree mortality rates have more than doubled in recent decades.



Western redcedar snag or standing dead tree providing log with moss and ferns growing on it in the Capilano River watershed near North Vancouver, British Columbia. (Photo by Steve Daniels, 1992)

Tree death is a natural part of old-growth forest dynamics. Each year we expect a small number of trees to die. But our long-term monitoring of many types of old forests shows that tree mortality has been increasing, but the establishment and growth of replacement trees has not. As a result, the forests are losing trees faster than they are gaining them. Mortality rates, the rate at which trees die, have increased from just under 1% to almost 2% per year. These numbers may seem small, but tree death rates are like interest on a bank account, the effects compound over time. So, a doubling of death rates eventually could reduce average tree age in a forest by half, thus reducing average tree size. The increase in dying trees has been pervasive. Tree death rates have increased across a wide variety of forest types, at all elevations, in trees of all sizes, and in pines, firs, hemlocks, and other genera. Ultimately increased mortality rates could lead to substantial changes in western forests. As trees die, they change the composition and structure of the forest, which can have



Western redcedar log with moss and ferns growing on it in the Capilano River watershed near North Vancouver, British Columbia. (Photo by Steve Daniels, 1992)

cascading effects, such as altering habitat for wildlife species. Additionally, increasing tree mortality rates mean that western forests could become net sources of carbon dioxide to the atmosphere, further speeding up the pace of global warming.

Our study ruled out a number of possible sources of the increasing tree deaths, including air pollution, long-term effects of fire suppression, and forest dynamics associated with stand development such as self-thinning of even-aged stands. In contrast, increasing regional temperature was correlated with tree deaths.

Average temperature in western North America rose by over 1.0° C over the last few decades. While this change may sound modest, it was enough to reduce winter snowpack, cause earlier snowmelt, and lengthen the summer drought. Changes in length of summer drought could be stressing trees, leading to higher death rates. Warmer temperatures also might favor insects and diseases that attack trees. For example the recent outbreak of mountain pine beetle in British Columbia has already been linked to warming temperatures.



Fallen western redcedar giant in the Coquitlam River watershed near Coquitlam, British Columbia. (Photo by Amanda Stan, 2004)

(Continued)

In some cases, increasing tree deaths could indicate forests vulnerable to sudden, extensive die-back, similar to forest die-back seen over the last few years in parts of the southwestern states, Colorado, and British Columbia. This is a major concern - the trend of increased death rates indicate our forests are stressed and may be susceptible to bigger, more abrupt changes.

My colleagues and I continue to monitor these forests and have on-going projects to understand the mechanisms and processes through which climate influences tree survival and old-growth forest dynamics.

Complete findings appear in the article, "Widespread increase of tree mortality rates in the western United States", by Phillip J. van Mantgem (USGS), Nathan L. Stephenson (USGS), John C. Byrne (U.S. Forest Service), Lori D. Daniels (University of British Columbia), Jerry F. Franklin (University of Washington), Peter Z. Fulé (Northern Arizona University), Mark E. Harmon (Oregon State University), Andrew J. Larson (University of Washington), Jeremy M. Smith (University of Colorado), Alan H. Taylor (Pennsylvania State University), and Thomas T. Veblen (University of Colorado), published in *Science* (Volume 323: 521-524; DOI: 10.1126/science.1165000)



Old-growth western redcedar, western hemlock and Pacific silver fir in the Capilano River watershed near North Vancouver, British Columbia. (Photo by Amanda Stan, 2004)

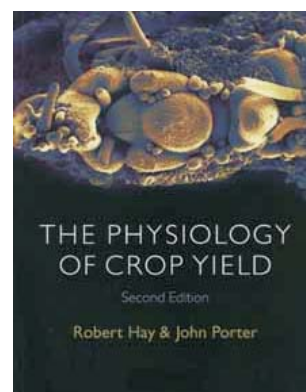
Book Reviews

The Physiology of Crop Yield, 2nd Ed. 2006

Robert KM Hay and John R Porter

Blackwell Publishing, Oxford, UK; Ames, IA; Carlton, Australia

The book was first published in 1989 as *An Introduction to the Physiology of Crop Yield*. I am mystified why the authors and the publisher chose to make it a 2nd edition when neither of the original authors contributed and the contents are substantially different from the so-called first edition. The book is indeed an introductory text and a well organized presentation. However, I am surprised that it does not point more forcefully to the future especially given the authors' hope that it "will contribute to the education, training and perhaps the inspiration of the new generation of crop scientists, who will need to have broad perspective from the ecosystem through the crop and plant to the gene." Given that the target is advanced undergraduates it is reasonable to assume that users of the book will have a sound understanding of basic ecology and at least know the basics of modern genetics and the techniques that are being considered as steps to engineering crop plants for increased yield. If this is indeed the case then it is likely that the reader will find the book useful in spite of the fact that there is little consideration potentially new crops.



This leads me to my only concern with the book. By 2005, when presumably the book was going to press, it was clear that we need to understand native species as crops. Long term work by ecologists, such as David Tilman (University of Minnesota), to cite just one example, point to a really important redirection for the way of thinking for crop yield and productivity. (For most recent work see references cited below). It seems that the agrology community is none too keen on this idea, which makes it essential for other plant biologists to put this book on their shelves and on their students' reading lists. That way the messages will be more widely read and students and colleagues in all areas of plant sciences will have some understanding of the background and the opportunities in studying crop biology. Without such broad awareness, I fear that the molecular biologists' efforts to increase yield through gene engineering will remain isolated and soon become mired in controversies about ecological and agricultural harms and benefits.

References:

- Fargione, J., Hill J., Tilman D., Polasky S., and Hawthorne P. 2008. Land clearing and the biofuel carbon debt. *Science* 319: 1235-1238.
- Clark, C.M. and D. Tilman. 2008. Loss of plant species after chronic low-level nitrogen deposition to prairie grasslands. *Nature* 451:712-715.
- Tilman, D., Hill J., Lehman C. 2006 Carbon-negative biofuels from low-input high-diversity grassland biomass. *Science* 314:1598-1600.

Iain Taylor

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Book Reviews (Continued)

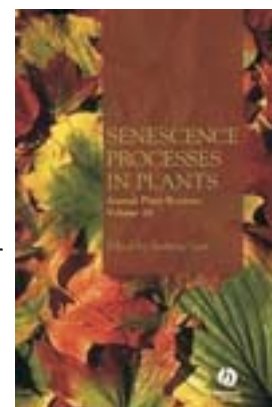
Senescence processes in plants
edited by Susheng Gan

*Annual Plant Reviews 26 (2007) Blackwell Publishing Ltd, Oxford, UK;
Ames, Iowa: and Carlton, Australia. xviii + 322 pages*

The 13 chapters in this book cover a broad range of senescence topics some of which will be excellent starting points for beginning graduate students, but three of them (Chapters 1, 6 and 12) should be particular interest to any one teaching beginning plant physiology or to provide a teacher of general botany with a clear sense of the current state of the field.

Much of the recent, technology-driven research will require some catch-up homework, but chapter 1 should be required reading for all plant biologists, many of whom seem to have become determined to find a historically unifying definition. As with most 'theme' publications, there are points where the theme gets lost in author enthusiasm for a pet approach, but there is considerable reward waiting for those who work to grasp the considerable achievements of the last 10-20 years.

Iain Taylor



Regional Undergraduate awards

The Atlantic Undergraduate Biology Conference was held on the weekend of March 7-8 at the Nova Scotia Agricultural College in Truro, NS.

The following students were winners of the CBA/ABC Regional Undergraduate Awards.

For oral presentation:

Kendra Sauerteig - Dalhousie University, Department of Biology, for her talk
"Actin microfilament dynamics and programmed cell death in the lace plant (*Aponogeton madagascariensis*)"

Her supervisor for the project Dr. Arunika Gunawardena.

The poster presentation winner was:

Adam McNamara, Nova Scotia Agricultural College, Department of Plant and Animal Sciences for his poster
titled "The light/dark effects on the sink/source transition and minor vein differentiation in developing tobacco leaves"

His supervisor was Dr. Bruce Gray.



Kendra giving her presentation



Kendra(at far right) at the awards presentation for oral contributions



Adam McNamara(centre) at the awards presentation for posters

Two more undergraduate conferences remain this year. They are the 22nd ANNUAL ONTARIO BIOLOGY DAY 2009 at the University of Windsor March 21-22, 2009, and in British Columbia, at UBC Okanagan on April 3rd 2009.

What's New in Botany? Graduate Student Research

Graduate Student Research will profile graduate students and their 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. Send it 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.

Matt Doering



Matt is a Masters student at UNBC, supervised by Darwyn Coxon.

Most studies on lichens and old-growth forests in B.C. have focused on coniferous forest stands. In mountain environments this has led to the examination of areas such as wet-toe slope positions, where topography and groundwater flow reduce the incidence of stand destroying fires. In contrast, forested landscapes in B.C.'s interior plateau are dominated by younger, often even-aged, coniferous forests; reflecting their past history of disturbance by forest harvesting, fires, and insect damage. When we look closely at plateau landscapes in B.C.'s interior, however, we can find areas where the frequency of disturbance appears to be much lower. In particular, willow and alder swales along small first-order streams and in wet seepage areas, so-called deciduous wetland swales (DWS), may represent quite stable plant communities. Fires often skip over these wet depressions and they are rarely targeted for forest harvesting. This work has now shown that DWS function as important repositories of canopy lichen biodiversity, including many cyanolichens as well as rare and old-growth associated species, supporting rich arboreal lichen communities across the sampled landscape. Greater cyanolichen diversity and abundance were present in wetter than average sites at moderate to low elevations where temperatures were warmer. In addition, they support important associated ecosystem processes such as nitrogen fixation and contribute to the cycling of nutrients in these areas. Therefore, these previously neglected linear landscape attributes should be included in the development of future landscape management objectives.



Carole Sinou



I am a Ph.D. student at the Plant Biology Research Institute (IRBV) of the University of Montreal. I am supervised by Dr. Anne Bruneau and I am interested in the phylogeny and the biogeography of the pantropical genus *Bauhinia*. It belongs to the Legume family and the Caesalpinioideae subfamily, and it is the largest genus in the tribe Cercideae. This species-rich genus is represented by shrubs, lianas, herbs and trees, mostly in seasonally dry tropical forests, wooded grasslands, evergreen and rainforests. It has been the subject of a few regional taxonomic treatments and of two major classifications, one based on morphology (Wunderlin et al., 1987), and the other based on molecular data but with a narrow taxon sampling (Lewis et al., 2005). This last study recognized eight segregate genera within *Bauhinia* sensu lato, which appear paraphyletic with the inclusion of the monospecific genus *Brenierea*. The aim of my research is to clarify the relationships within *Bauhinia* sensu lato by using plastid and nuclear DNA markers in combination with morphological data. Results from the plastid regions support the paraphyletic status of *Bauhinia* sensu lato and the recognition of, at least, eight segregate genera. I have also collected specimens in Mexico and Vietnam this year to obtain a representative sampling of the genus. I'm particularly interested in the historical biogeography of the genus due to its pantropical distribution in various biomes and the long-distance dispersal hypothesis this implies. Wunderlin, R., K. Larsen, S.S. Larsen (1987). Reorganization of the Cercideae (Fabaceae : Caesalpinioideae). *Biol. Skrift.* 28: 1-40. Lewis, G.P., F. Forest (2005). Cercideae. Pp 57-67 in *Legumes of the World* (G. Lewis, B. Schrire, B. MacKinder, and M. Lock, eds.). Royal Botanical Gardens, Kew, UK.



Carole in Vietnam in 2008. Photo: P Little

Vicky Bérubé



I am a graduate student at Laval University in Quebec under the supervision of Line Rochefort and Claude Lavoie. I work in collaboration with the **Peatland Ecology Research Group (PERG)** studying peatland ecological restoration after peat mining. In practice, peat mining can lead to the exposure of underlying minerotrophic peat. These sites should be restored as minerotrophic peatland because of the high pH of residual peat and high concentration of minerals. My study site is located in Bas-St-Laurent region where undisturbed minerotrophic peatlands are rare. The newly restored peatland should support in long-term the primary role of a peatland: carbon accumulation function. My research focuses on the description of a minerotrophic peatland as a reference ecosystem. The aim is to target plant assemblages for reintroduction. I used a paleoecological approach to estimate peatland historical variability and its dynamics during development. By comparing plant assemblages from peat cores of an abandoned area and a natural area of the peatland, I will be able to determine how much the abandoned peatland has regressed until now and it will allow me to set appropriate goals. Surveys of similar peatlands in the area, as other sources of reference, will help us to complete the study. Finally, I will be extending this master's project to a doctorate thesis. As a second part of the project, I would like to test if the functional biodiversity of a moderate-rich fen can have an influence on the carbon accumulation function.



NATIVE PLANT EMBLEMS OF CANADA

9. Saskatchewan

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: WESTERN RED LILY



Fig. 1. Western red lily (*Lilium philadelphicum*). 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.

SYMBOLISM

Lilium philadelphicum is perhaps the most attractive of the plants that thrive in the rugged environment of the prairies of northwestern North America. It symbolizes both the beauty of the natural landscape and the resourcefulness of its people. Accordingly it is an excellent floral emblem for the province of Saskatchewan.

Lilies in religion and art generally symbolize purity and spirituality, and as the flower of the Resurrection and of the Virgin in Christianity, white lilies are widely displayed at Easter. However, as explained in the discussion of iris in #6 of this series (CBA Bull. 41(1): 11-21), many references to "lilies" in the Bible probably refer to the iris, or perhaps other wildflowers.

LATIN NAMES

Lilium philadelphicum L.

As noted below, legislation in Saskatchewan specifically recognized *L. philadelphicum* var. *andinum* (Nutt.) Ker as the official flower of the province. This is one of two varieties (the other is var. *philadelphicum*) recognized as distinct by some authorities but not by others.

The genus name *Lilium* is based on the Greek *lirion*, white lily (assumed to be the Madonna lily, *L. candidum*). The epithet *philadelphicum* in the scientific name is Latin for Philadelphia. The botanist John Bartram sent a collection of the species from Philadelphia to Carolus Linnaeus, the Swedish taxonomist, who named it in 1762 after the Philadelphia area. The epithet *andinum* was coined by botanist Thomas Nuttall, based on a collection he made in North Dakota in 1811. Nuttall thought he was near the Rocky Mountains, which he called the "Andes" (a name now reserved for the Andes Mountains of South America) and he applied the descriptive word *andinum*, meaning "of the Andes".

ENGLISH NAMES

Western red lily. Also: Philadelphia lily, prairie lily, red lily, wood lily. The name wood lily is sometimes restricted to *L. philadelphicum* var. *philadelphicum*. While "wood lily" is used chiefly for *L. philadelphicum* it is applied also to some species of *Trillium* and *Clintonia*; wintergreen (*Pyrola minor*); lily of the valley (*Convallaria majalis*); an Australian orchid, *Dendrobium speciosum*; and other plants. The names western red lily and western red wood lily are sometimes restricted to *L. philadelphicum* var. *andinum*. As discussed below, the evidence that western plants deserve to be recognized separately is quite inconclusive. Therefore, the "western" in the name "western red lily" is perhaps debatable, but it is retained here since this common name is used in the legislation recognizing the species as the floral emblem of Saskatchewan. The name "tiger lily" is sometimes applied to the species, although it usually refers to the widely planted *L. lancifolium* Thunb., a native of China, Korea, and Japan.

The name "lily" is used chiefly for *Lilium* species, but is applied to plants of other families, especially in the amaryllid family (Amaryllidaceae, which is often included in the Liliaceae). Other examples are water lilies (of the Nymphaeaceae) and calla lily (*Zantedeschia aethiopica* of

the Araceae).

FRENCH NAMES

Lis de Philadelphie. Also: lis des prairies, lis rouge orangé (lis and lys are often interchanged). Lis des bois could refer to the species as a whole, just to *L. philadelphicum* L. var. *philadelphicum*, or to other species such as *Trillium grandiflorum* (Michx.) Salisb.

HISTORY

a. Canada

In 1935, the Regina Natural History Society began a search for an appropriate floral emblem for Saskatchewan. Being common in the province at the time, having attractive red flowers, and not used as a symbol elsewhere, the western red lily was a natural choice. Saskatchewan's *Floral Emblem Act* of 1941 designated variety *andinum* of *L. philadelphicum*, referred to as the "prairie lily", as the official floral emblem of the province. The subsequent *Floral Emblem Act* of 1981 also referred specifically to *L. philadelphicum* L. var. *andinum* (Nutt.) Ker, but called it "the western red lily". Another lily, the white lily (*L. candidum*), was the floral emblem of Quebec from 1963 to 1999 (see #6 of this series).

b. Foreign

No particular species of *Lilium* appears to have current official designation as the emblem of a political region, except in Saskatchewan. *Lilium bosniacum* has been claimed to be the national flower of Bosnia and Herzegovina, but this seems to be based primarily on (a) a tradition of it being a national emblem among the Bosniacs, and (b) the interpretation that the fleur-de-lis symbol that has been used officially is based on this lily species. Several so-called "lilies" are emblems of regions, but are not species of *Lilium* (e.g. the flame lily, *Gloriosa rothschildiana*, is the national flower of Zimbabwe).

APPEARANCE

The plants are perennials, developing a bulb 1.5-2.9 cm (0.6-1.1 inches) wide, with loosely arranged, jointed scales. The bulb is typically located 3-10 cm (1-2 inches) below the surface of the soil. Thin-branched roots spread laterally from it, and somewhat thicker "contractile roots" arise from the base, serving to pull the bulb downward as the plant matures (a widespread strategy in herbaceous perennials, preventing the plants from popping out of the soil as they grow). Flowering occurs from late spring to summer. Flowering stems may rise up to 1.2 m (53 inches), and bear narrow leaves that are sometimes single but often arranged in whorls. The flowers commonly occur singly, often in umbels of two or three or occasionally up to six. Young plants normally produce just one flower. The flowers are most often red-orange, fading to a yellowish throat with dark speckles. The tepals (petals and sepals that are very similar) are 4.5-8.2 cm (1.8-3.2 inches) long. Deep red, orange, pink, and rarely pure yellow flowers also occur. The fruits are cylindrical capsules, 2.2-7.7 cm (0.9-3 inches) long, the largest with up to 200 or so dark brown seeds that mature in the fall.

CLASSIFICATION

Family: lily family (Liliaceae).

The genus *Lilium* consists of about 100 species of the temperate northern Hemisphere, extending south to mountains of the Asian tropics. There are 22 species in North America north of Mexico. *Lilium philadelphicum* is the only species of the genus native to Canada with erect flowers (i.e., the only one with flowers that normally face upward instead of nodding), perianth segments (petals or sepals) that are highly clawed (i.e. with a well-developed stalk), and floral spots confined to well-defined nectar guides.

(Continued)



Fig. 2. Painting of the official flower of Saskatchewan, western red lily (*Lilium philadelphicum*), 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.

Alleged Differences between the Varieties of *Lilium philadelphicum*

	Variety <i>andinum</i>	Variety <i>philadelphicum</i>
Location	primarily western	primarily eastern
Ecology	low grassy vegetation	open woods and thickets
Capsule length	4–8 cm (1.6–3.1 inches)	2.5–3.5 cm (1–1.4 inches)
Mean plant height	48 cm (19 inches)	81 cm (32 inches)
Number of whorls of leaves with 3 or more leaves in a whorl on the stem (average in parenthesis)	0–5 (1.3)	2–5 (3.8)
Mean leaf length	5.1 cm (2 inches)	6.9 cm (2.7 inches)
Mean leaf width	0.6 cm (0.24 inch)	1.3 cm (0.5 inch)
Leaves usually scattered on stem?	yes	no
Stem usually topped by a whorl of leaves?	yes	no

Lilium philadelphicum is a highly variable species. Features claimed to distinguish varieties *andinum* and *philadelphicum* are given in the table above. As detailed in Skinner (2002), cited below, plants in various areas of North America frequently cannot be identified by the characters alleged to discriminate the two varieties, and “the status of var. *andinum* is unsettled”.

GEOGRAPHY

Lilium philadelphicum is the widest-ranging of the North American species of *Lilium*. It extends from eastern British Columbia across southern Canada into the northern United States from Montana to the east coast.

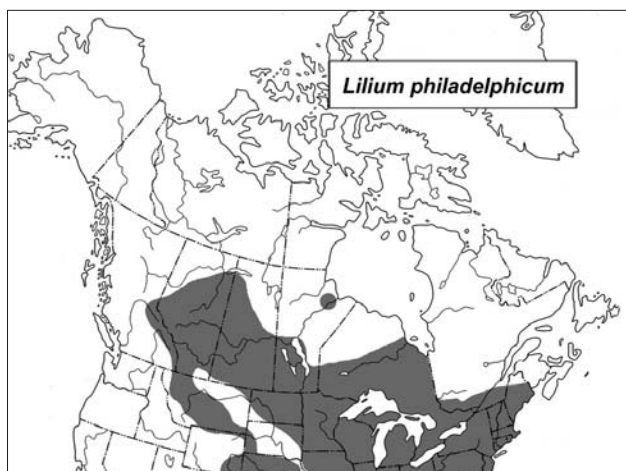


Fig. 3. Canadian and adjacent United States distribution of *Lilium philadelphicum*.

ECOLOGY

The number of flowering plants in an area varies from year to year and is decreased by unusually dry conditions. Herbivores eat most of the plants in some years. Moderate grazing reduces competition and contributes to successive flowering. Some lightly grazed pastures and rangelands have consistently good displays of lilies. Sometimes the creation of new roadside ditches disturbs the soil in such a way that lilies flourish for a short period.

Habitat

Numerous habitats are occupied. The species is particularly common in open prairie grasslands, but also occurs in moist meadows, semi-wooded areas, and the understory of semi-open boreal forests.

Inter-species Relationships

White-tailed deer and some small mammals (such as mice, voles, gophers, squirrels, and hares) consume the plants, occasionally down to ground level, and sometimes also eat the bulbs. Deer are particularly fond of the flowers, whereas some other large herbivores, such as cattle and bison, tend to consume the whole plants. A wide variety of insects (including true bugs, ants, and some bees) “steal” nectar from the flowers (i.e. “rob” the nectar but rarely if every transfer pollen), but only some species of butterflies are good pollinators, as noted below.

Pollination & Dispersal

Lilium philadelphicum is pollinated principally by butterflies, particularly swallowtail butterflies (*Papilio* species), the pollen transfer taking place by sticking to the wings of the insects. The pollen-containing sacs (thecae) of the anthers

Why “Prairie Phoenix”

Bonnie J. Lawrence and Anna L. Leighton were thinking of ecology when they developed the title for their wonderful book¹ about Saskatchewan's floral emblem. The sudden appearance of hundreds of spectacular vivid red lilies after a fire inspired the name “prairie phoenix”. The mythical phoenix is a bird that is reborn from its own ashes. Fires, once a frequent natural event on the prairies, often resulted in explosive appearances of lilies (and other flora and fauna). Despite temperatures of up to 400 °C (752 °F) at the surface during the fires, the lily bulbs are protected since they are 3 to 5 cm (about 12 inches) below the ground surface where there is very limited temperature change. Fires often occurred in the spring and fall when there was ample fuel, but because the lily grows mainly in summer, the above-ground parts were infrequently burned. Bulbs can remain dormant but they are ready and waiting to grow as soon as fire nourishes the soil and reduces competition from grasses. Lawrence and Leighton suggested that the benefit of a fire may last 5 years, after which the population begins to decline only to be reborn with the next fire.

¹Reviewed in Blue Jay 63(3): 159. 2005



have been observed to close in the rain, apparently an adaptation to protect the pollen from being washed away during rainy periods (when butterflies do not visit the flowers). The flowers lack fragrance, and rely on their size and colour to attract pollinators. Hummingbirds occasionally visit the flowers for nectar, but are thought not to act as pollinators (lily flowers in general have been hypothesized to have evolved characteristics that attract both Lepidoptera and hummingbirds). Nectar is produced by glands at the bases of three alternating members of the six tepals (these have been interpreted as the “sepals”, the remaining three tepals as “petals”).

Occasionally small mammals such as voles, that harvest the bulbs, disperse some of the scales that make up the bulbs. The individual scales of mature bulbs are capable of producing new plants, so the animals sometimes establish the plants in new locations by this method. However, most dispersal is by seeds, which are produced in large numbers.

USES

Historically, Native Americans used *L. philadelphicum* for medicine and food, albeit to a limited extent. Dakota Indians employed pulverized or chewed flowers of western red lily as an antidote for spider bites, Algonquins chewed the “root”

for stomach disorders, Chippewa employed a poultice of the bulbs to treat wounds, Iroquois used the plant to ease removal of the placenta after childbirth, and the Malecite used the roots as a cough medicine and to treat fevers. The Cree, Woodland, and Blackfoot Indians snacked on the bulbs. Today, the principal use of *L. philadelphicum* is as an ornamental, a fairly minor usage.

TOXICITY

The lily family (Liliaceae) includes the edible onion, garlic, and asparagus, but also poisonous plants. Bulbs of *Lilium* are generally thought to be edible, although all species are not palatable and some are quite bitter. *Lilium philadelphicum* is generally not considered toxic to humans or other animals, and as noted above it is consumed by a variety of animals. The internet has some warnings about toxicity of “red lily” and *L. lancifolium* to pets, and there have been reports about nephrotoxicosis (kidney poisoning) in cats resulting from consumption of lilies, but specific, authoritative information for *L. philadelphicum* is lacking.

CULTIVATION

Detailed advice on cultivating *L. philadelphicum* is found in Lawrence and Leighton (2005), cited below. The species

Will Invasive Alien Beetle Threaten the Western Red Lily?

The lily leaf beetle (*Lilioceris lili*) has devastated cultivated lilies in eastern Canada and was recently found on the wild Canada lily (*L. canadense*) in New Brunswick. This beetle apparently feeds on all species of *Lilium*. It became established in North America in Montreal in 1943. Based on its rapid recent spread in the east, its catholic tastes, and the fact that it reached Portage La Prairie, Manitoba in 1999, the future large scale destruction of the western red lily seems inevitable. The insect is 68 mm (about 1/4 inch) long, red above except for the head which is black, and often produces distinct chirping sounds when picked up. Biological control of the beetle is being vigorously pursued in the United States, and should be considered for implementation in Canada..

For more information see Majka, C.G. and LeSage, L. 2008. Introduced leaf beetles of the maritime provinces, 5: The lily leaf beetle, *Lilioceris lili* (Scopoli) (Coleoptera: Chrysomelidae). Proc. Entomol. Soc. Wash. 110: 186-195.



Fig. 4. Lily leaf beetles (*Lilioceris lili*). Source: Dr. H. Goulet.

can be grown from seeds or bulb scales, but it may require 4 years for the plants to produce flowers (plants grow somewhat faster from bulb scales, but still may require 4 years to produce flowers). While some recently collected seeds may germinate, cold stratification (e.g. 6-8 weeks in a refrigerator) is recommended to improve germination. Germination is also enhanced by repeated washing (presumably removing water-soluble germination inhibitors). Bulbs may be purchased from some suppliers, or transplanted from fellow gardeners (preferably not from wild plants). The bulbs can be moved without soil in early fall after the leaves have died down, but it is better to take them in a sod of earth. Bulbs can be planted either in the spring or fall. Although the lilies grow in a wide variety of soil conditions, a humus-rich, well-drained, friable soil 22 cm (9 inches) deep is recommended. A mixture of sandy soil and peat moss is ideal. Large bulbs (2 cm or $\frac{3}{4}$ inch or more in diameter) should be planted 5-7.5 cm (2-3 inches) below the soil surface; smaller bulbs may be planted more shallowly. Bulbs should be spaced 30-50 cm (12-18 inches) apart, in a fairly open location, although some shade from the hot afternoon sun is preferable. Protection from weeds and regular watering will increase growth and survival.



Fig. 5. *Lilium philadelphicum*. Source: Elwes, H.J. 1880. A monograph of the genus *Lilium*. Taylor and Francis, London.

CONSERVATION STATUS

*"Tom, Tom, the farmer's son
Found some lilies but picked not one
He picked not because he knew
It was better to leave them where they grew."
From Morrison (1948)*

The western red lily was once widespread in Saskatchewan. Agricultural expansion and urbanization have been the main factors responsible for considerable decrease of the species in the province, but picking the very attractive red flowers, once a popular activity, also contributed to the decline. Diminishing numbers of the lilies have also been attributed in part to fire suppression. The western red lily is now protected by Saskatchewan's *Floral Emblem Act* of 1981, which makes it an offence to transplant, pick, uproot, or in any way damage the plant, but has exceptions for necessary work and for property owners on their own land. *The Provincial Emblems and Honours Act* provides for fines ranging from \$50.00 to \$500.00. *Lilium philadelphicum* is rare in the lower Midwestern prairies of the United States, and in the southern Appalachians. It is listed as Endangered in Maryland, New Mexico, Tennessee, and North Carolina, and Threatened in Kentucky and Ohio. In the northeastern United States, the species has declined rapidly with the disappearance of prairies and increase of white-tailed deer. The article cited below by Olson provides suggestions for methods of conserving lily species that require protection. A new threat to lilies in North America is the lily leaf beetle (see textbox)

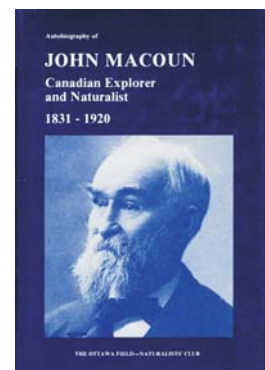
A Modern Message Half a Century Old



Man has destroyed the balance of nature. By conserving the lily, you can help to tilt the balance back again." The above illustration is slightly redrawn from: Morrison's 1948 book entitled "The prairie lily. Saskatchewan's floral emblem". This book, written in elementary language, is a remarkable early attempt to educate very young school children of the importance of preserving nature.

Macoun's Flower Garden

Exploring the Canadian prairies in July 1879, the famous Canadian field biologist, John Macoun, described the "Flower Garden of the Northwest" near Long Lake: "Sometimes, lilies (*Lilium philadelphicum*) are so abundant that they cover an acre of ground, bright red." His party celebrated the 12th of July by decorating their horses with these lilies and marching from camp to the beat of an old tin pan. (Page 141 in Autobiography of John Macoun, Canadian explorer and naturalist, 1831-1920, second edition. Ottawa Field-Naturalists' Club, 1979.) The general region of Macoun's "Flower Garden of the Northwest", north of Last Mountain Lake, became Canada's first migratory bird sanctuary in 1887, 8 years after Macoun's visit. Fire has been used in the management of the Last Mountain Lake National Wildlife Area since the early 1980s, and this may explain why lilies are still abundant there today.



Saving Lilies - A Four Point Prescription

- (1) Protect and create natural habitat wherever possible.
- (2) Allow and promote disturbance events such as fire, grazing, rodent tunneling, haying, and brush removal.
- (3) Stop planting invasive exotics, such as crested wheatgrass and smooth brome (for "improving" pasture and creating cover along road allowances). Wherever possible, replace invasive vegetation with native species.
- (4) Remember that "to conserve the wild places where lilies grow is to preserve a vital part of ourselves our cultural and spiritual well-being".

Adapted from Lawrence and Leighton (2005).

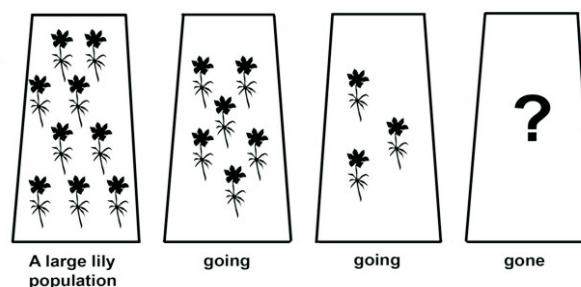


Fig. 6. The Coat of Arms of Saskatchewan. The scroll at the bottom is decorated with western prairie lily flowers. The deer carries a pendant with a lily flower, and the beaver holds another flower in its paw. The inscription *Multis E Gentibus Vires* means "From Many Peoples Strength".



Fig. 7. The provincial flag of Saskatchewan, bearing the official floral emblem, the western red lily.

MYTHS, LEGENDS, TALES, FOLKLORE, AND INTERESTING FACTS

- According to Chippewa lore, a poultice of western red lily applied to the wounds of someone bitten by a dog would cause that animal's fangs to fall out.
- Iroquois tradition held that if the stems of two harvested western red lilies were allowed to dry out in the sun near each other, and they twisted together, one's wife was unfaithful.
- Still another belief among the Iroquois was that a boiled tea of the roots of western red lily should be used internally as an emetic and externally as a wash to cleanse a wife if her husband was unfaithful.
- In the Victorian era, "floriography" or the language of flowers was the basis of sending messages by careful choice of the composition and colour of the flowers included. A white lily conveyed the sentiment that the receiver was pure and sweet; a yellow lily could mean gratitude or jubilation; an orange lily, however, indicated hatred.
- The rose is the leading flower for the names of people ("Rose", "Rosie", "Roselyn", etc.). The lily is the second most popular basis for floral names ("Lily", "Lil", "Lilliane", etc.).

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Fig. 8. Flower of *Lilium philadelphicum*, photographed by P.M. Catling.



TREE: WHITE BIRCH

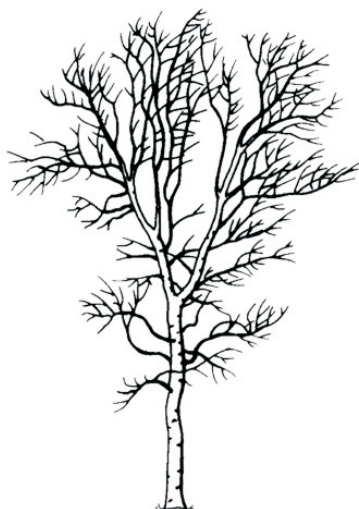


Fig. 9. Silhouette of white birch (*Betula papyrifera*). Source: Farrar, J.L. 1995. Trees in Canada. Canadian Forest Service and Fitzhenry and Whiteside, Markham, ON, Canada. Reproduced with permission.

SYMBOLISM

White birch is common in the northern three-quarters of Saskatchewan, and is a significant component of the province's forest resources. It is also an exceptionally

attractive, easily recognized tree. Accordingly, the species is a good choice as the province's arboreal emblem. In several native North American cultures, birch symbolizes the feminine, or Mother Nature, and in the Old World birch species have been associated historically with renewal rites of spring.

LATIN NAMES

Betula papyrifera Marsh.

The genus name *Betula* is based on *betulla*, the Latin name for birch (some authorities ascribe *Betula* to the Celtic *betu*, meaning tree and shining, a reference to the white bark of some species). *Papyrifera* is from the Greek word *papyrus*, meaning papyrus or paper, referring to the paper-thin bark that has actually been used as paper, + the Greek *fero*, or Latin *ferre*, to bear, carry, or bring, i.e. "paper bearing".

ENGLISH NAMES

White birch. Also: American white birch, canoe birch, paper birch, silver birch. The names white and silver birch are based on the bark colour; the names canoe birch and paper birch reflect the historical use of the bark by Native Americans for canoes and writing parchment, respectively. The name "white birch" is sometimes used for white-barked *Betula* species other than *B. papyrifera* (especially Eurasian species), but is adopted here as it is the name used in legislation recognizing the species as the arboreal emblem of Saskatchewan. Paper birch is a more widely used name for *B. papyrifera*.

FRENCH NAMES

Bouleau blanc. Also bouleau à papier, bouleau à canot.

HISTORY

a. Canada

The white birch was designated the provincial tree of Saskatchewan in 1988. Another birch species, yellow birch (*B. alleghaniensis*), was adopted in 1993 as the provincial tree of Quebec.

b. Foreign

The white birch was recognized as the New Hampshire state tree in 1947. The silver birch (*B. pendula*) is the national tree of Finland. The "birch" is the national tree of Russia.

APPEARANCE

Betula papyrifera grows occasionally as a shrub but is usually a deciduous tree up to 35 m (115 feet) in height and 80 cm (32 inches) in diameter. Most trees in Canada are 15-25 m (49-82 feet) and 30-40 cm (12-16 inches) in diameter at maturity. There may be a single or several stems (trunks), and often the presence of several trunks is the result of damage to a young plant by browsing animals. The tree is shallow-rooted, most of the roots found in the top 60 cm (2 feet) of soil. The bark of young trunks and branches is dark reddish brown, and smooth, and in mature trunks it is creamy to chalky white or pale (infrequently dark brown) with small black marks and scars, and elongated horizontal

Yes! Peeling off the Attractive White Bark Can Kill Birch Trees



Fig. 10. White birch (*Betula papyrifera*) in fall, photographed in Ottawa in 2001. Photo© courtesy of Daniel Tigner, Canadian Forest Tree Essences,

lenticels (natural openings in the bark that allow for gaseous exchange). The chalky white covering on the bark can rub off onto clothing. The inner bark is often reddish-orange, turning black with age. The outer bark is easily peeled off in sheets; however, doing so results in the reddish-orange bark dying and turning an ugly black; the papery white outer bark never grows back, although a new bark develops if removal of bark is not so extensive that it kills the tree. The flowers appear in male or female catkins. The male catkins are 4-10 cm or 1.5-4 inches long at maturity in the spring, shorter during the previous late fall when they develop, and during the winter. They hang down, singly or up to five in a cluster, from the ends of branches. The female catkins, up to 5 cm or 2 inches long, are upright and somewhat back from the ends of branches where the male catkins are located. The fruiting cones hang down, and are cylindrical, brownish, and 2.5-5 cm (1-2 inches) long. The tiny, papery "seeds" (fruits or nutlets) are two-winged. White birch is considered to be a short-lived species; few trees live longer than 140 years (some for up to 200 years), most survive for no longer than 70 years.

CLASSIFICATION

Family: Betulaceae (birch family).

There are about 35 species of *Betula*, distributed in north temperate regions of the world. About 18 species are native to North America north of Mexico, most of these occurring in Canada. *Betula papyrifera* is a very variable species, some authorities recognizing as many as six varieties. As well, hybridization with several other species of *Betula* occurs, complicating identification. White birch crosses with most of the other birches that it comes in contact with across Canada, even with species as different as yellow birch (*B. alleghaniensis*) or bog birch (*B. pumila*). There are four other birches that occur naturally in Saskatchewan and white birch hybridizes with three of them; with water birch (*B. occidentalis*) to produce *B. × utahensis*, with resin birch (*B.*

neolaskana) to produce *B. × winteri*, and with bog birch (*B. pumila*) to produce *B. × sandbergii*. Hybrids with *B. glandulosa* which also occurs in Saskatchewan remain to be documented. Canadian taxonomists J.R. Dugle, W.H. Brittain, and W.F. Grant have contributed much to an understanding of the evolution and classification of birches. Grant received the Lawson Medal from the Canadian Botanical Association in 1989 (CBA Bulletin 22(4): 37), largely for his work on birch. For a series of important papers by Brittain and Grant, see Furlow (1997).



Fig. 11. White birch (*Betula papyrifera*). A, A branch bearing three, hanging, flowering male catkins at the end and two upright, flowering female catkins farther back. B, branches bearing young male catkins at the tips and fruiting catkins farther back. C, branch in winter with young male catkins. D, branch in early spring, with unfolding leaves and a female catkin. E, scale from a fruiting catkin. F, two-winged "seed" (nutlet). Source: Sargent, C.S. 1896. The silva of North America. Houghton, Mifflin and Company, Boston, MA. Vol. 9, plate 451.

GEOGRAPHY

Betula papyrifera occurs across northern North America, from Newfoundland to northwestern Alaska, from the treeline in the north southward to the northern United States, from Washington state to New York, with scattered populations in Iowa, Nebraska, the Dakotas, and on a few high mountains in North Carolina. The tree occurs in all provinces and territories of Canada, except Nunavut. (See Fig 12 on page 22)

ECOLOGY

White birch is adapted to colonizing areas cleared by fire, often regenerating by stump sprouts, and often appearing following logging and abandonment of cleared land. The

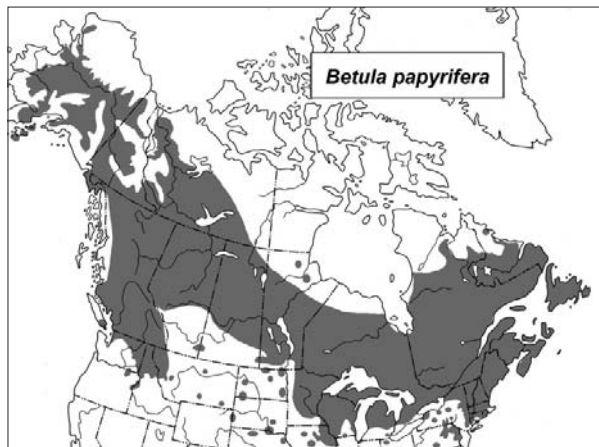


Fig. 12. North American distribution of white birch (*Betula papyrifera*).

thin, inflammable bark makes the tree susceptible to fire. The species frequently grows in pure stands or in associations with conifers.

Birch trees are susceptible to dieback, a condition in which there is a general deterioration and eventual death of the trees. Symptoms may include sparse, stunted foliage near the top of the tree, followed by progressive dying off of branches from the top of the tree downwards. The foliage that remains on the tree may be stunted and chlorotic (yellow). White birch die-back in eastern Canada and the adjacent US has been interpreted as due in part to global warming, fungal disease, or a physiological response to heat and drought.

Habitat

White birch occurs in moist, more or less open, upland forests, often on rocky slopes, and sometimes in swampy woods. It is common on the margins of forests, in clearings in closed forests, on rock cliffs, in ravines, and along shores. The tree occupies a wide range of soil types, including peat, but does best on deep, well-drained, fertile soils. It is intolerant of shade, and prefers cool, moist sites.

Inter-species Relationships

White birch is an important browse plant for moose and white-tailed deer. Snowshoe hares consume the seedlings and saplings, and porcupines feed on the inner bark of trees. Hare and beaver also eat the young plants. Birds and small mammals eat the buds, catkins, and seeds. Voles and shrews also eat the seeds. Yellow-bellied sapsuckers peck holes in the bark to feed on the sap, and subsequently hummingbirds and red squirrels feed on the resulting sapwells. In addition to furnishing food for animals, white birch also provides cover for deer and moose, and many cavity-nesting birds. The bronze birch borer (described in #6 of this series) is the most well known insect found on white birch.

Pollination & Dispersal

Flowering occurs in late spring, and pollination is by wind. The fruiting cones shed winged seeds that are mostly wind-distributed in the fall. The seeds are quite small, about 3.4



Fig. 13. White birch (*Betula papyrifera*) in winter, photographed at Val-des-Monts, Quebec, in 2001. Photo© courtesy of Daniel Tigner, Canadian Forest Tree Essences, www.essences.ca.

million in a kilogram (1.5 million in a pound). In good seed years, some trees can produce more than 10 million seeds. Most seeds fall from 30-61 m (100-200 feet) from the parent tree, but seeds may travel considerable distances by being blown across crusted snow. Most successful seeds germinate the following spring, but a small proportion of the seeds may remain viable for several years on the forest floor.



Fig. 14. Peeling bark of white birch (*Betula papyrifera*). Photo taken on 06/12/1999 in the Ottawa National Forest in Michigan's Upper Peninsula, courtesy of Joseph G. O'Brien, USDA Forest Service.

USES

Historically, North American Indians used white birch for a wide range of medicinal and construction purposes. The bark is waterproof because of a high oil content. It was

Why Is My Birch Turning Brown?

Fig. 16. Birch leaf almost totally mined by several larvae of birch leafminer (*Fenusa pusilla*). Source: Thérèse Arcand, Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre.

Browning of the leaves of white-barked birches, including *B. papyrifera*, is usually due to the birch leafminer (*Fenusa pusilla*), a sawfly wasp introduced from Europe. The greenish-white larvae (to 6 mm or 1/4 inch) feed on tissue between the upper and lower leaf surfaces and this causes portions of the leaf to die and turn brown. Although a number of birch trees are resistant to the insect, most of these do not have white bark and are not popular as ornamentals. Attempts to produce resistant cultivars through hybridization have not yet been successful. Trees can withstand a heavy infestation but become weakened if the attacks continue. Some birches sold as white birch are short-lived hybrids of the European *B. pendula* that die after a few decades regardless of leafminer infestations. *Betula papyrifera* can be distinguished from these plants by its short pointed instead of long pointed leaves.



especially used for many items, including canoes, baskets, containers for food and liquids, shelters, bathtubs, clothing, kindling, torches, drums, moosecallers, paper, playing cards, and even as a cast for broken limbs. Canoes were made by stretching stripped bark over frames of white cedar, sewing the pieces of bark together with tamarack roots, and caulking the seams with pine or balsam fir resin. The bark has been used to make "sunglasses" to prevent damage from snow glare; this was simply a strip of bark about 5 cm (2 inches) wide in which lenticels were used as eye apertures. Indians used the strong, flexible wood to construct such items as spears, bows, arrows, snowshoes, and sleds. Occasionally Indians ate fresh cambium (the growing portion of the trunk, between the wood and the bark).

Today, white birch wood is mostly valuable as lumber, plywood, veneer, fuel, and pulpwood. It is employed for furniture and cabinets, flooring, and for specialty wood products including clothespins, spools, pool cues, golf tees, broom handles, and toys. The odourless and tasteless qualities of the wood, as well as its uniform texture and white appearance, make it useful for ice cream sticks, toothpicks, and tongue depressors. Although burned as firewood, giving off considerable heat even when green, birch tends to coat chimneys with a layer of creosote, posing a fire danger.

White birch syrup, produced in the manner of maple syrup, is a cottage industry in North America, especially in Canada and Alaska. Birch trees are occasionally used to produce alcoholic or non-alcoholic birch beer in Europe and North America (for more information, see the discussion of culinary uses of yellow birch, *B. alleghaniensis*, in #6 of this series). Occasionally the species is used as a source of medicinal extracts.

White birch is a popular ornamental or landscape tree, because of its graceful form (often forming clumps) and attractive bark. It is also used for revegetation and soil stabilization, including severely disturbed sites such as mine spoils.

TOXICITY

Birch sawdust can cause dermatitis in sensitive individuals, but generally birches are not considered toxic, either to

humans or animals, and as noted above, birch syrup is considered a gourmet item.



Fig. 15. Cree hunter calling a moose on a birch-bark trumpet. Source: <http://publicdomainclip-art.blogspot.com/2007/10/native-american-heritage-month-calling.html> (URL examined Feb. 2009).

CULTIVATION

White birch is a significant forestry species, and there is considerable information on its management. Although there are several white-barked birch species native to Europe, *B. papyrifera* has been a popular ornamental there since about 1750. Although wild plants are occasionally transplanted from nature, homeowners can conveniently plant containerized stock, and ornamental cultivars are available. Roots spread at least twice the height of the tree, so ample space should be allowed. The soil should be well draining (sand, silt, or loam), but nevertheless considerable moisture may be required (during the spring, a large tree can consume enough water in 1 day to fill about ten bathtubs). An open site providing full sun is best, and some protection from wind is beneficial. Birches tend to be well-formed, not requiring much pruning. Because cut branches exude considerable sap, as with maples, pruning should not be done in early spring when sap is flowing, or in late summer

or fall, when cuts may be slow to heal. It has been recommended that *B. papyrifera* not be planted where it will grow above cars, because honeydew from aphids on the tree can coat vehicles with a sticky slime that attracts dirt.

CONSERVATION STATUS

Throughout most of its range, white birch is abundant, and not at risk. However, in some places along its southern range limit it is threatened. For example, it is Vulnerable in Indiana, Imperiled in Illinois, Virginia, West Virginia, and Wyoming, and Critically Imperiled in Colorado and Tennessee.

MYTHS, LEGENDS, TALES, FOLKLORE, AND INTERESTING FACTS

- White birch was a sacred tree for the Ojibwa Indians, who placed bark on the coffins when burying their dead. While gathering material from the trees, offerings of tobacco were made to the Great Spirit, Winabojo, and to Grandmother Earth.
- Ojibwas claimed that the birch was never struck by lightning and offered a safe place during thunderstorms. Curiously reminiscent, European farmers sometimes planted birch trees around their houses in the belief that this would protect them against lightning. (Since birches are generally not the tallest trees in a region, perhaps they are less likely to be struck by lightning, and this gave rise to the impression that they are immune.)
- The Ukrainian word for the month of March is *berezen*, meaning "time when the birch trees flower".
- Native Americans produced a beautiful art form called birch bark biting, by which marks were made to create intricate designs. Birch bark bitings, a tradition dating back centuries, were usually made by First Nations women as a social activity at gatherings.
- White birch has an entirely positive image, making it a good choice as a symbol, in contrast to the negative reputation of some other trees. White poplar (*Populus alba*), for example, spreads very aggressively from root suckers and is regarded as a serious weed. (For a discussion of "bad trees" see <http://forestry.about.com/b/2007/05/23/pick-a-tree-you-simply-cant-stand.htm>.)
- Bark from white birch was used by North American Indians to prepare scrolls, inscribed with figures, maps, and in some cases ancient language systems. Some of these scrolls, deposited in museums, are at least 400 years of age. Birch bark scrolls (based on other species of *Betula*) are also known from the Old World. The British Museum has some birch scrolls from Afghanistan that are 2,000 years old, inscribed with Buddhist hymns, medical treatments, and historical details.

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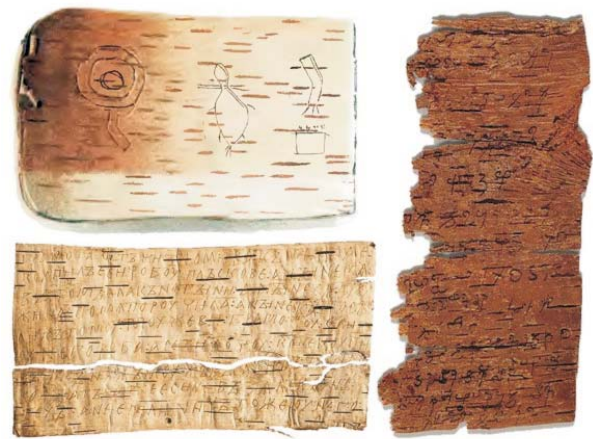


Fig. 17. Portions of ancient birch bark scrolls: top left: Ojibwe hieroglyphics (considered sacred, these symbols are known only to some elders, and their meanings are usually kept secret); bottom left: 800 year old Russian scroll; right 2,000 year old Afghanistan scroll. Source: Wikipedia.

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GRASS: NEEDLE-AND-THREAD GRASS

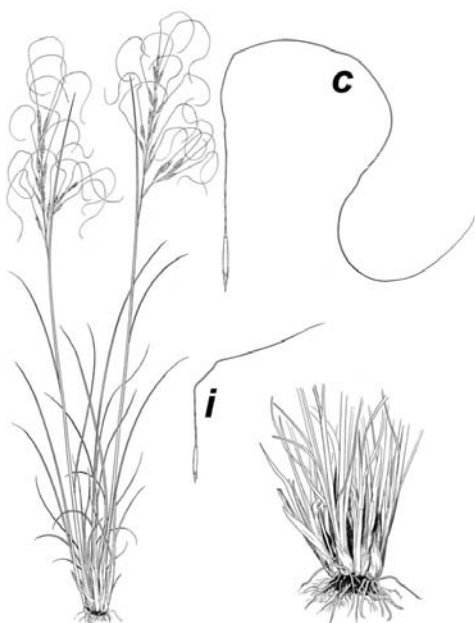


Fig. 18. Needle-and-thread grass (*Hesperostipa comata*). Source: Unpublished drawings housed in the botanical illustration collection of the AAFC Vascular Plant Herbarium (DAO) in Ottawa. Prepared by Anne Hanes under the direction of M.E. Barkworth. *c* = subspecies *comata*, *i* = subspecies *intermedia*.

SYMBOLISM

Needle-and-thread grass has become symbolic of the movement to protect declining natural prairie grasslands. As the dominant grass of the province's mixed grassland eco-region, and also common in the moist mixed grassland and aspen parkland eco-regions, it is an excellent representative of the natural prairie ecosystems of Saskatchewan. Moreover, since the plant is a protein-rich grass that provides important forage for grazing cattle, the species well represents the sustainable agricultural industry of the province.

LATIN NAMES

Hesperostipa comata (Trin. & Rupr.) Barkworth subsp. *comata* (= *Stipa comata*, a name used in the older literature). The genus name *Hesperostipa* is from the Greek *hesperos*, "west" (for the western North American distribution), + the name of the Eurasian grass genus *Stipa*. The name *Stipa* is based on the Latin *stipa*, meaning "oakum", i.e. a combination of fibres and tar used to caulk joints; the name was applied to the plants because the grass inflorescences were reminiscent of a loose bunch of fibres; as well, a species of *Stipa*, *S. tenacissima*, was employed as a source of fibres used for cordage, a component of oakum. *Comata* in the scientific name is a Latin word meaning "head of hair", and is also based on the appearance of the mass of hair-like awns of the inflorescence.

ENGLISH NAMES

Needle-and-thread grass. Also: speargrass, common speargrass, western speargrass, needle and thread, needleandthread, sewing needlegrass, western needlegrass. Subspecies *intermedia* has been called intermediate needle and thread. The name needle-and-thread grass is based on the sharp, needle-like "seeds" (fruits, technically caryopses) attached to a long thread-like, thin awn that when dried often becomes curly, all of this resembling a threaded needle.

FRENCH NAMES

Stipe chevelue. Also: stipe comateuse.

HISTORY

a. Canada

Needle-and-thread grass was chosen as the provincial emblem by a coalition of environmental, wildlife, and agricultural organizations, acting through the "Prairie Conservation Action Plan", in order to maintain the native prairie ecosystem of Saskatchewan. It was designated the official grass of Saskatchewan in 2001. The conservation-oriented groups backed *H. comata* because of its value to both prairie ecosystems and to ranching. Rough fescue (*Festuca scabrella*), another prominent native prairie grass, became the official grass emblem of Alberta in 2003.

b. Foreign

Hesperostipa species have not received any form of honorary recognition, except for *H. comata* as the official grass of Saskatchewan. Seventeen US states have official grasses (http://en.wikipedia.org/wiki/List_of_U.S._state_grasses). Given the fact that grasses provide more food for humans and livestock than any other family of plants, grass species are remarkably absent as official emblems of political regions of most of the world.

APPEARANCE

Needle-and-thread grass is a "bunchgrass", the small clumps generally from 2.5-10 cm (1-4 inches) in diameter at the base, and widely spaced. The plant is a perennial herb, growing from its base in early spring or when moisture becomes available. The leaves have narrow blades (generally 3-8 mm or 3/16-3/8 inch) that are usually enrolled, 5-40 cm (2-16 inches) long, and taper to a sharp point. The fruiting stems are generally 30-90 cm (1-3 feet) tall. The plant reproduces by seed and also by tillers (rooting branches produced from the base). The flowering head is nodding, loosely spreading, 10-50 cm (4-20 inches) long. The seeds have a sharp attachment point.

"Awns" in botany are either hair-like or bristle-like appendages on a larger structure, or in the case of the Asteraceae (daisy family), the individual elements of the set of bracts (scales, bristles, or hairs) at the base of the florets. Awns are characteristic of many grass species, where they extend from the lemmas of the florets (lemmas are the outer, and paleas are the inner, of the pair of bracts typically subtending a grass floret). Awns may be several centimetres long or short, straight or curved, single or multiple per floret.

At maturity, the “seeds” (strictly these are fruits) are enclosed in the floral bracts (lemma and palea), and the awn is attached to the tip of the lemma. For simplicity, the entire dispersal unit (i.e. lemma, palea, seed) is commonly referred to as an “awned seed”.



Fig. 19. Needle-and-thread grass (*Hesperostipa comata*). Source: Looman, J., and Best, K.F. 1979. Budd's flora of the Canadian prairie provinces. Agriculture Canada Research Branch Publication 1662.

CLASSIFICATION

Family: Poaceae (Gramineae; grass family).

Hesperostipa is a genus of four North American species, all of which occur in Canada (a collection from Mexico has been represented as a fifth species, but is of uncertain status). *Hesperostipa comata* differs from the other species in having scabrous (rough to the touch) instead of pilose (hairy) awns and lemmas that are evenly white-pubescent instead of unevenly brown-pubescent. *Hesperostipa comata* subsp. *comata* has awns that are 4-12 cm (1.6-4.7 inches) long and are sinuous to curled at maturity. *Hesperostipa comata* subsp. *intermedia* (Scribn. & Tweedy) Barkworth has terminal awn segments that are 3-8 cm (1.2-3.1 inches) long, and are straight. Some authors recognize the two subspecies as varieties.

GEOGRAPHY

Needle-and-thread grass grows throughout western Canada and western and Midwestern United States, from the Yukon to California, extending east to Ontario, Indiana, and Texas, and south into Mexico. Occasional populations occur as far east as Rhode Island and New York. The species is often the most common grass of the dry prairies of western Canada. It is rare in Ontario, Rhode Island, and Oklahoma.

Hesperostipa comata subsp. *comata* is widespread and frequently abundant in western and central North America. *Hesperostipa comata* subsp. *intermedia* is found from the Rocky Mountains of southern Canada through the Sierra

Nevada to New Mexico. The two subspecies overlap geographically, but infrequently grow together.

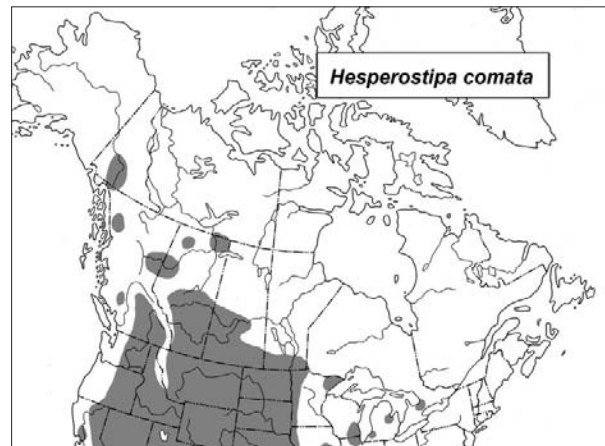


Fig. 20. North American distribution of needle-and-thread grass (*Hesperostipa comata*).

ECOLOGY

Hesperostipa comata is adapted to well-drained, sandy and rocky soils. The fibrous root system may reach as deep as 1.5 m (5 feet), making the plant somewhat drought-resistant. However, much of the root system is quite shallow, and during hot weather the plants may become dormant, resuming growth when sufficient moisture becomes available. The species helps to protect drier soils from erosion from wind, heavy rains, and spring snow melt. The plants withstand grazing well, and indeed often increase in frequency under moderate grazing.

The prairies where needle-and-thread grass occurs once experienced periodic natural fires, and indeed it appears that North American Indians also frequently burned native prairies. The plant sprouts from its base following a fire, if the heat was not sufficiently severe to kill the underground parts.

Needle-and-thread is one of the grasses that have “rhizosheaths” formed by sand grains adhering to the roots. Rhizosheaths are especially common in grass species found in sandy soils where drought is frequent. Sticky mucilage secreted from the roots results in them becoming encased in a layer of sand. These structures are important because it has been found that nitrogen-fixing bacteria are associated with them, and enrich the soil around the roots, benefiting the plants. Also, water uptake and retention by the plants are sometimes improved, and it has been hypothesized that rhizosheaths are protective against pests and low temperatures. Rhizosheaths are thought to improve the success of species under stressful conditions, such as drought and soil infertility.

Habitat

Hesperostipa comata subsp. *comata* occurs in cool deserts, grasslands, and sagebrush associations, at elevations of 200-2,500 m (650-8,200 feet). It is often found in disturbed

areas. *Hesperostipa comata* subsp. *intermedia* occurs in pinyon-juniper woodlands at elevations of 2,175-3,075 m (7,100-10,000 feet).

Inter-species Relationships

Hesperostipa comata is eaten by wildlife, including mule deer, rabbits, and black-tailed prairie dogs. Mostly it is the foliage that is attractive, but seeds and roots may also be eaten. To some extent, animals avoid grazing mature plants, because of the damaging awned seeds. The plants provide cover for sage grouse, other birds, and small mammals.

Pollination & Dispersal

Grasses are usually wind-pollinated, but wind is of limited significance in needle-and-thread grass since it produces mostly cleistogamous seeds (i.e. developing from self-pollination in closed flowers). The seeds are dispersed soon after they mature. The long awns and hairs on the lemmas and awns facilitate attachment to fur, and the 50 million bison that formerly roamed the North American plains may have been significant dispersal agents. As with some other grasses, the seeds have hygroscopic awns that bend with changes in humidity. In response to humidity, the sharp awn twists through several turns. The long awn braces against surrounding objects, and this transmits the twisting force to the seed, screwing the seed into the soil. Upon drying, the awn untwists, and upon becoming moist as humidity increases, the awn untwists. Because backwardly-directed hairs on the lemma (which covers the seed) fix the position of the seeds in the soil, and act like barbs, ensuring that the seeds move in only one direction, the seeds are propelled into the soil. (Commonly, this is compared to a screw, but in this case the screw twists downward regardless of the direction of rotation, and cannot be removed by any rotation.) The tip of the seed is slightly bent to facilitate digging into the soil (it digs a hole large enough for the body of the seed to more easily enter the soil).

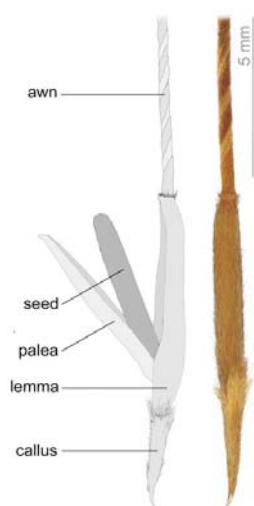


Fig. 21. Parts of a mature floret of *Hesperostipa comata*. Drawings by P.M. Catling based on a specimen in the vascular plant collection of Agriculture Canada, collected by W.G. Dore on the high arid banks of the Qu'Appelle Valley in Saskatchewan on 5 July 1951. Dore went on to make major contributions to the understanding of Canada's grass flora.

USES

Needle-and-thread grass is most important as a key component of native prairies, and therefore for sustainable ranching. *Hesperostipa comata* is protein-rich (up to 20% in the early spring) and has some value for livestock. The plant is useful as forage during the spring before seeds develop, and again during the fall after the seeds have dropped. As noted below, when seeds are present the plants can be injurious. Accordingly, this grass is rarely planted for forage. It is, however, planted for prairie reclamation. The species has often been used in native prairie reclamation projects, to stabilize eroded or degraded sites, and to assist in rehabilitation of mining sites. The fibrous root system binds soil, reducing water and wind erosion.

TOXICITY

This species is not known to be poisonous, but mechanical injury to animals is common. The corkscrew action of the awned seeds coupled with the backwardly-projecting hairs not only serve to drill into soil, but also the skin of animals, including livestock, dogs, and people, sometimes damaging eyes, mouths, and ears. The barb-like hairs on the fruit prevent the seed from reversing its direction, and the seed continues to embed itself with every slight movement. Sheep have been known to shed their fleece because of excessive irritation of the skin by the awns. Livestock often exhibit avoidance of needle-and-thread grass while it is in its dangerous fruiting stage, but more readily consume it before and after the fruiting stage.



Fig. 22. *Hesperostipa comata*, growing in a field near Lyons, Colorado. Photographed by Charles M. Sauer on June 7, 2005. Source: Wikipedia

CULTIVATION

Needle-and-thread grass is a suitable subject for cultivation as an ornamental, especially in native plant gardens, and seeds are available from some garden sources. Seeds are sometimes dormant, requiring a period of cold, but generally plants can be established without pre-treatment. When the seeds are planted in containers, the awn end should be

uppermost, with the pointed end down. This grass is preferably grown in well-drained soils, in full sunlight. Massed plantings make for an especially elegant appearance. Generally seeds are limited in availability, both for prairie rehabilitation and horticultural purposes. Seed sources can be found by searching the internet.

CONSERVATION STATUS

Hesperostipa comata is a widespread grass, not in need of special conservation measures over most of its range, but it may be threatened on the periphery of its range (such as in Ontario), where genetically unique plants are likely present. The prairie habitat in which it is typically found has been catastrophically diminished in North America since the arrival of European settlers. In Saskatchewan, more than three-quarters of the native prairie has been eliminated.

MYTHS, LEGENDS, TALES, FOLKLORE, AND INTERESTING FACTS

- In past times, Blackfoot Indians used the maturing of seed heads of needle-and-thread grass as a guide to the best time in the fall to hunt buffalo (i.e. bison) cows.
- During a budgetary crisis in Colorado in 2003, it was suggested that the state adopt AstroTurf as the state's official grass, to encourage saving money by replacing lawns that require expensive maintenance (The Colorado Springs Gazette, Oct. 21, 2003). Using native drought-tolerant vegetation, such as needle-and-thread, should have been considered as an option.
- The children of Native American tribes used the seeds of needle-and-thread grass as toy darts.
- As Lewis and Clark travelled through Montana in 1806, Lewis noted in his journal that the seeds of needle-and-thread penetrated his shoes and leather pants and caused his dog great suffering. This is one of the earliest references to the remarkable characteristics of the seeds.

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First Announcement

Biodiversity 2010 and Beyond : Science and Collections

31 May-5 June 2010

Ottawa, Ontario, Canada

The first joint meeting of the

Canadian Botanical Association/L'Association Botanique du Canada (CBA-ABC) and the Society for the Preservation of Natural History Collections (SPNHC)

Hosted by the

Canadian Museum of Nature / Musée canadien de la nature
and to be held at the University of Ottawa / Université d'Ottawa