

Contents
Table des matières

2004 CBA/ABC 40th Annual Meeting
David Punter
page 1

President's Message
Mot de la présidente
Liette Vasseur
pages 2-3

On the Message Board
Sur le babillard
page 3

Papers / Articles



Poorly Known Economic
Plants of Canada - 40.
Shagbark hickory
(*Carya ovata* (Mill.) K. Koch)
and shellbark hickory
(*C. laciniosa* (F. Michx.) Loud.)
- the best native nuts?
E. Small and P.M. Catling
pages 4-11



Saving Annapolis Heathlands
P.M. Catling, S. Carbyn,
S.P. vander Kloet, K. MacKenzie,
S. Javorek, and M. Grant
pages 12-14



The White Lilies - What are they?
P.M. Catling and G. Mitrow
pages 15-16

The Canadian Botanical Association Bulletin



Bulletin de l'Association botanique du Canada

March / Mars 2004 • Volume 37 No. / N°1

2004 CBA/ABC 40th ANNUAL MEETING

WINNIPEG, MB, 26-30 JUNE

Come celebrate the **40th Anniversary of CBA/ABC** and the **Centenary of the Department of Botany at the University of Manitoba**. We have **3 keynote speakers, 3 symposia, a workshop on Invasive Plants** and many other activities lined up for you. The choice of **full-day field trips** encompasses freshwater marsh, sand dune, tall-grass prairie and boreal forest. You will also have an opportunity to see our recently **renovated and expanded herbarium** and an exhibit of archival materials commemorating **Prof. A.H. Reginald Buller**.

Complete information on abstract submission, registration and accommodation is available at:

[http://www.umanitoba.ca/faculties/science/botany/
faculty_staff/markham/CBA/index.html](http://www.umanitoba.ca/faculties/science/botany/faculty_staff/markham/CBA/index.html)

or through a link at <http://www.uoguelph.ca/botany/cba/>

Deadline for abstract submission and early registration is 15 april 2004

The Local Arrangements Committee looks forward to welcoming you in June.

AUCTION ALERT

Dr. Hugues Massicotte will, once again, entertain us with his skills as an auctioneer but he will need attractive and exotic items to sell. Please dig through your possessions for any books, photographs, botanical memorabilia, art or crafts that might be of interest. Donations can be dropped off at the registration desk on arrival. Rest assured that the proceeds will go to a good botanical cause.

David Punter, CBA Vice-president and Organizer of the 2004 Meeting

Canadian Botanical Association



Bulletin

The CBA Bulletin is issued quarterly (in theory in March, June, September, and December) and sent to all CBA members. Comments or suggestions about the Bulletin should be directed to the Editor at the address below.

Information for submitting texts

Texts and illustrations for the Bulletin should preferably be sent to the Editor as electronic documents, nevertheless any medium is acceptable. Any format for texts or illustrations are welcome. Please make sure that scanned illustrations are done with a very good resolution. The pictures should be made available separately from the text. If you have any question about text submission, please contact the Editor.

For general info on CBA, go to the web site: <http://www.uoguelph.ca/botany/cba/>

Association botanique du Canada



Bulletin

Le Bulletin de l'ABC paraît quatre fois par année, normalement en mars, juin, septembre et décembre. Il est envoyé à tous les membres de l'ABC. Tout commentaire concernant le bulletin est apprécié par le rédacteur.

Directives aux contributeurs

Les textes et les images sont de préférence envoyés sous forme électronique, néanmoins, tous les supports de même que tous les formats imaginables sont acceptables. Les fichiers graphiques doivent être de très bonne définition et disponibles indépendamment du texte. N'hésitez pas à contacter le rédacteur pour toute information.

Infos générales sur l'ABC à l'url suivant: <http://www.uoguelph.ca/botany/cba/>

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Next issue / Prochain numéro

Texts for the next issue, 37(2), must be received before May 10th, 2004.

La date de tombée des textes du prochain numéro, le no 37(2), est le 10 mai 2004.

Published in Edmundston, on March 13th, 2004.
Publié à Edmundston, le 13 mars 2004.

ISSN 0008-3046

President's Message

Some news is troubling our universities. In the various regions of Canada, reports are published estimating that several thousands of full-time faculty position will become vacant over the next decade. Just in the Atlantic Provinces, we are talking about 1800 professors. What are we doing about this in botany? I believe that as an association we often overlook this challenge. However, as we are all aware the number of graduate students in botany in our universities is relatively low. In the next few years, we will have to address this challenge. Already positions are open in different universities and competition is severe. I would like to invite all of you to initiate discussion on how we can address this issue. Decline in number of graduate students in botany is also reflected in our membership. As we are going to celebrate our 40th anniversary this year, I would like to discuss this topic at the next June meeting as a small round table and to gradually initiate some actions. While most scientific societies have had round tables and have in some cases published position papers, we still have to look at this issue. I hope that we can start a good discussion at the next meeting.

Talking about encouragement, I also would like to invite you to send nominations for the various awards that the Association offers each year. This really helps promote botany in Canada. I would like to encourage you to send nominations for the **Georges Lawson medal** and the **Mary E. Elliot award**. The Georges Lawson medal is given each year to a botanist who significantly contributes to botany in Canada, either in terms of life-long accomplishment or for a major contribution to the field. The Mary E. Elliot award is presented to a particularly active member of the association who contributed to the development and the profile of the CBA. For students, the **Lionel Cinq Mars** oral presentation and the **Iain and Sylvia Taylor** poster presentation awards as well as the **John Macoun** travel bursaries are all ways to encourage them going further in their carrier. At this level, as supervisors, we have to encourage our students to participate. For further information concerning these awards or for other comments, you can contact the CBA secretary, Christine Maxwell (cmaxwell@trentu.ca).

Liette Vasseur, CBA President

Mot de la présidente

Les nouvelles sont troublantes dans les universités ces jours-ci. Dans toutes les régions du Canada, les rapports démontrent que le nombre de professeurs à temps plein à remplacer dans nos universités montera dans les milliers. Juste dans les provinces de l'Atlantique, un nouveau rapport indique que 1800 nouveaux professeurs seront nécessaires pour combler les départ à la retraite. Que faisons-nous en botanique ? En tant qu'association y a-t-on vraiment pensé ? Je crois que nous avons souvent évité de discuter de ce défi de taille. Pourtant, tôt ou tard il faudra aborder ce sujet. Déjà cette pression se fait sentir avec plusieurs postes ouverts et une compétition de plus en plus importante. Le nombre d'étudiants dans le domaine de la botanique est à la baisse. À la veille de célébrer notre 40^e anniversaire, j'aimerais vous inviter à entamer cette discussion. Déjà d'autres associations ont commencé ces discussions,

(suite à la page suivante)

initié des tables rondes et même pris des positions. J'espère qu'à notre prochaine réunion nous aurons la chance de commencer cet échange.

Parlant d'encouragement, j'aimerais aussi vous inviter à soumettre des candidatures pour les les **prix Georges Lawson et Mary E. Elliot**. Votre participation est importante, surtout en cette année du 40^e anniversaire de l'Association. Ce sont des prix importants pour le rayonnement de l'association et des botanistes au Canada. Le prix Georges Lawson vise à reconnaître une personne qui a contribué de façon significative au développement de la botanique au Canada, soit au niveau de l'ensemble d'une carrière ou d'une contribution de grande envergure. Le prix Mary E. Elliot est décerné à un membre qui a servi activement l'association. Pour les étudiantes et étudiants, les **prix Lionel Cinq Mars** pour la meilleure présentation orale et **Iain et Sylvia Taylor** pour la meilleure affiche ainsi que les bourses de voyage **John Macoun** sont aussi des opportunités pour les encourager à aller plus loin dans leurs carrières. Pour obtenir plus d'information, veuillez contacter notre secrétaire, Christine Maxwell (cmaxwell@trentu.ca).

Liette Vasseur, présidente de l'ABC



Message Board / Babillard

Does your expertise relate in any way to Canada's wild medicinal plants?

A database providing information about people dealing in any way with any of Canada's approximately 1500 wild medicinal plant species is under construction at Agriculture & Agri-Food Canada. This information will be made available to the public. If your work relates to this subject, you are invited to complete the following on-line form:

http://www.agr.gc.ca/med/index_e.php

Vos connaissances sont-elles liées d'une façon ou d'une autre aux plantes médicinales sauvages du Canada?

Une base de données contenant les noms de personnes bien informées au sujet des divers aspects des quelques 1 500 plantes médicinales qui poussent à l'état sauvage au Canada est en voie d'élaboration à Agriculture et Agroalimentaire Canada. Cette base sera publique. Si votre travail concerne ces plantes, vous êtes invités à remplir le questionnaire à l'URL suivant:

http://www.agr.gc.ca/med/index_f.php

About book reviews

Members are invited to suggest titles of recent books to be reviewed and names of persons (including themselves) that could write a review for the Bulletin. This kind of activity should be important, I think, for an association's bulletin as this one but I must know members needs. Thanks in advance for your input.

The Editor

À propos de revues de livres

J'aimerais recevoir des membres des suggestions de titres de livres récents et de noms de personnes (incluant eux-mêmes) susceptibles d'écrire un compte rendu pour le Bulletin. Je crois que ce genre de contenu est important pour un bulletin comme celui-ci mais il me faut connaître les besoins des membres à ce sujet. Merci à l'avance.

Le rédacteur

Omissions

Readers should note that some omissions were made in the issue **36(4)** of the CBA Bulletin. First of all, it would be more appropriate to tell that the Symposium on invasive plants (on page 49) was organized by **Pam Krannitz**, Environment Canada, Delta, BC (then Chair of the Conservation Committee) and **Paul Catling**, Agriculture and Agri-Food Canada, Ottawa, ON, member of the Association.

In second place, credits for some photographs were missing: in *Memorabilia from CBA/ABC Meeting 2003*, on page 47, the first two photos were taken by **Joe Gerrath**, the third one, at the bottom, by **Christine Maxwell**. Finally, in the *News from Mycology Section* on page 67, the photo of Thomas Rand was contributed by **Joe Gerrath**.

The Editor



Quelques oublis

Les lecteurs voudront bien prendre note des informations suivantes omises dans le dernier numéro du Bulletin de l'ABC, le **36(4)**. D'abord, il convient de dire que le Symposium sur les plantes invasives (voir page 49) a été organisé par **Pam Krannitz**, Environnement Canada, B Delta, CB (alors présidente du Comité sur la conservation) et **Paul Catling**, Agriculture et agro-alimentaire Canada, Ottawa, ON, membre de l'Association.

En second lieu, l'origine de certaines photos n'a pas été indiquée. **Joe Gerrath** a fourni les deux premières photos de la page 47 ainsi que celle de Thomas Rand à la page 67. **Christine Maxwell** est l'auteure de la troisième photo (celle d'en bas) à la page 47.



Poorly Known Economic Plants of Canada - 40.

Shagbark hickory (*Carya ovata* (Mill.) K. Koch) and shellbark hickory (*C. laciniosa* (F. Michx.) Loud.) – the best native nuts?

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

Four species of the hickory genus *Carya* are native to Canada, all occurring in southern Ontario, two of them also in southern Quebec. Only the shellbark and shagbark hickories, treated in detail here, produce nuts of good quality. Next to the pecan the shagbark hickory is the best nut tree in the genus *Carya*, and some consider it to be the best native nut tree in Canada. The shellbark hickory is often judged to be somewhat inferior to the shagbark as a source of edible nuts, although its nuts are larger. Trees of both species, with large, easily cracked nuts have been found in various parts of the range, and hybrids between them and with pecan suggest that excellent varieties can be created.

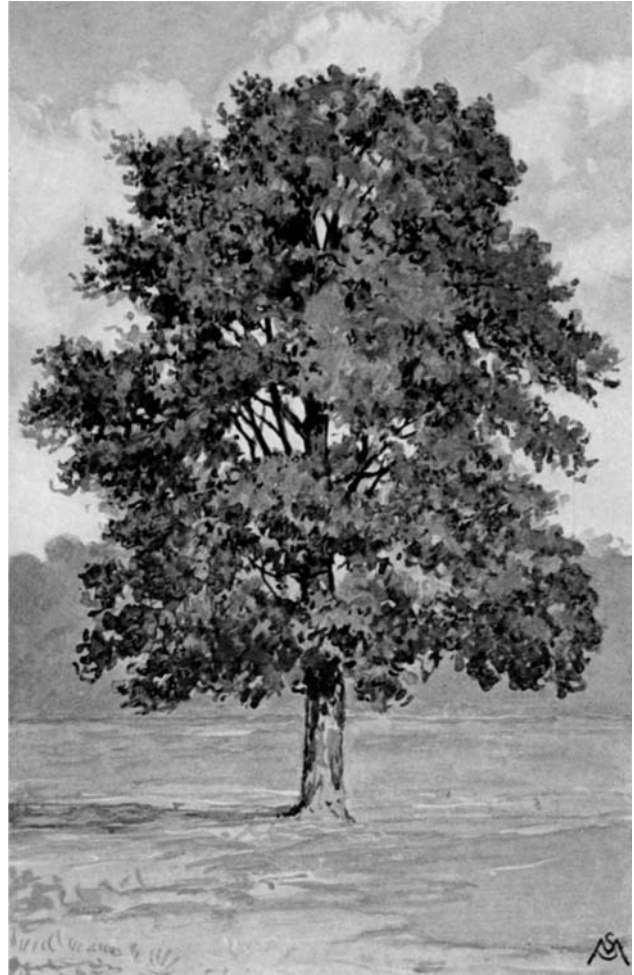
Latin Names

Carya (Juglandaceae) is the classical Latin word for walnut, and was adopted by the botanist Nuttall in 1818 when he named the genus. The Latin name came from the Greek word for the walnut tree, *karua*. According to Greek mythology, *Karua*, i.e. *Carya*, was the daughter of the king of Laconia (a region of far southern Greece, where supposedly the entrance to Hades was located), and she was changed into a walnut tree by Dionysus, the god of wine, for obscure reasons. *Ovata* in the scientific name *C. ovata* is Latin for ovate, interpreted by some as referring to the shape of the leaflets, and by others as referring to the shape of the fruits. The epithet *laciniosa* in the scientific name *C. laciniosa* is based on the Latin *lacinia*, cut in shreds, and refers to the loose plates of bark on the trunk.

English Names

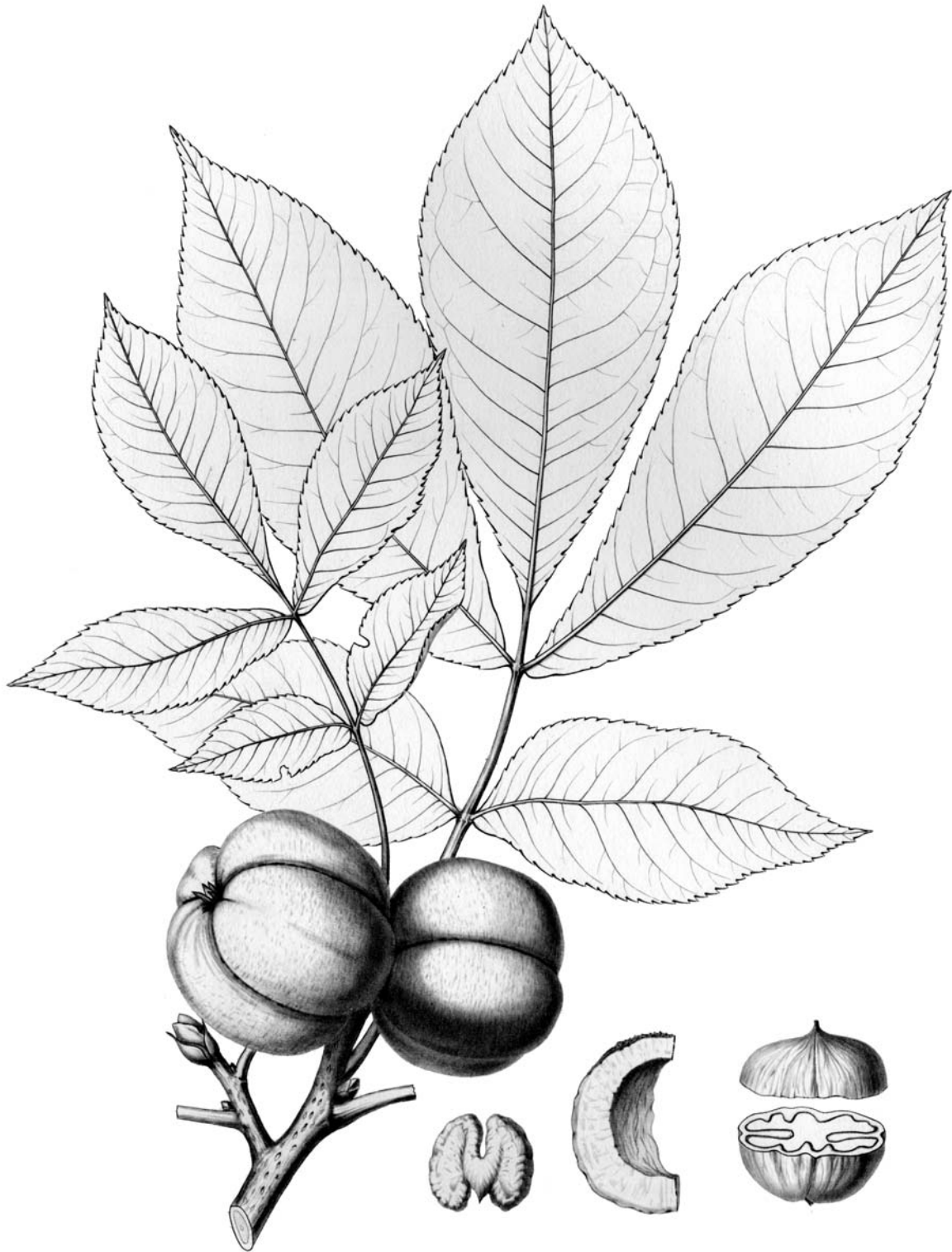
“Hickory” is an English contraction of pikahickory, from the Native American powcohiccora, a food prepared from pounded nuts, as designated in some native language. The common English names of hickory species are often highly undependable for identification. Five different species are called “pignut.” “Mockernut” is a name that was originally applied to hickory species that sometimes produced empty nuts (i.e., the nuts seemed to “mock” people looking for tasty treats). (Alternatively, it has been claimed, the name is derived from New York Dutch moker-noot, heavy-hammer nut, i.e. requiring much force to break the thick shell.) The name mockernut is now most commonly applied to *C. tomentosa* (Poiret) Nutt., a species whose possible presence in Canada is discussed below. The two species highlighted here are known by numerous names, some of which are the same.

The shagbark hickory (*C. ovata*) is so-named for the peculiar, shaggy, untidy appearance of the bark of mature trees, which peels off in thin, tough, vertical strips. These strips are attached by their upper ends, or by their centres

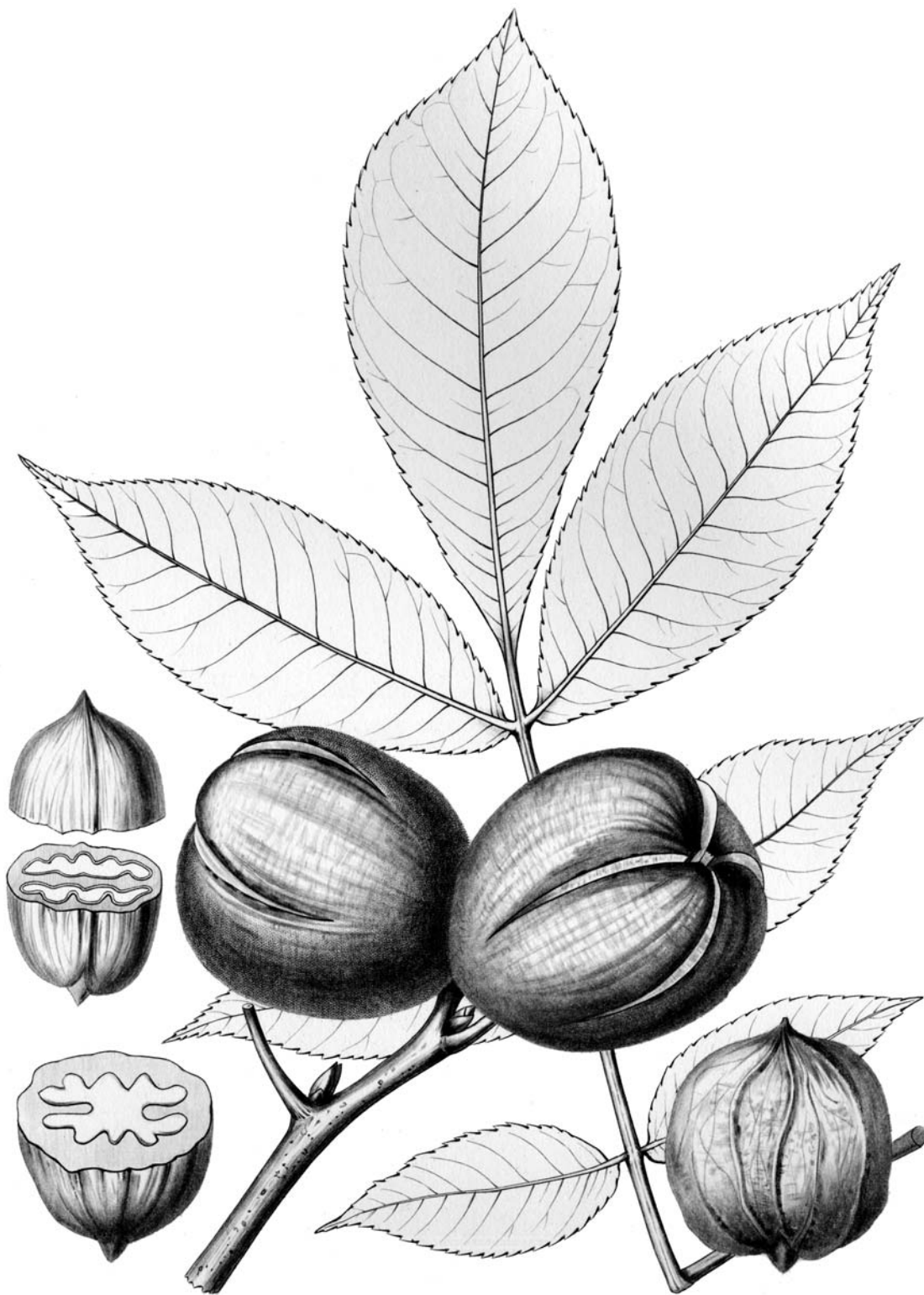


Shagbark hickory. Source: Mathews, F.S. 1901. *Familiar trees and their leaves.* D. Appleton and Company, New York, 320 pp.

(in which case they often spring out at the top and bottom), giving the trunk a shaggy, untidy appearance (young trees have smooth bark). The shagbark hickory is also known as: bird's eye hickory, Carolina hickory, curly hickory, littlenut, little pignut, little shagbark ("little" alluding to the relatively smaller nuts in comparison to the shellbark hickory), false shagbark, mockernut hickory, red hickory, redheart hickory, scalybark hickory, shagbark, shagbark hickory, shagbark walnut, shellbark, shellbark hickory, shellbark tree, skid hickory, small pignut, small pignut hickory, sweet pignut, southern hickory, southern shagbark hickory, southern shellbark, sweet walnut, true hickory, upland hickory, white



Shagbark hickory. Source: Sargent, C.S. 1890-1892. *The silva of North America*. Houghton, Mifflin and Company, Boston. Vol. 7, Tab. CCCXLVII.



Shellbark hickory. Source: Sargent, C.S. 1890-1892. *The silva of North America*. Houghton, Mifflin and Company, Boston. Vol. 7, Tab. CCCLIX.

hickory, whiteheart hickory, and white walnut. Some of the preceding names with "shellbark" lead to confusion with *C. laciniosa*. The names white hickory (and whiteheart hickory) and white walnut respectively indicate the pale colour of the wood and nutshells.

The shellbark hickory (*C. laciniosa*) is also so-named for the shaggy appearance of the bark, which seems to be peeling off in plates or "shells". Other names include: big shagbark, big shagbark hickory, big shellbark, bigleaf, bigleaf shagbark hickory, bottom shagbark hickory, shellbark, king nut, ridge hickory, thickbark hickory, thick shellbark, thick shellbark hickory, true hickory, and western shellbark. Some of the preceding names with "shagbark" lead to confusion with *C. ovata*. Names such as "king nut" (or kingnut or kingnut hickory) and big shellbark allude to the size of the nuts, sometimes reaching 7.5 cm in length.

French Names

C. ovata - caryer ovale, caryer à noix douces, caryer à fruits doux, caryer blanc, arbre à noix piquées, noyer blanc, noyer écailleux, noyer tendre

C. laciniosa - caryer lacinié, caryer à écorce laciniée

Morphology

Hickories are medium to large deciduous trees bearing alternate, compound leaves. The monoecious trees bear male flowers in catkins arising from buds along the sides of the twigs, while the females are in short spikes of 2-10 flowers on the tips of new growth. Flowering occurs in the early spring, and nuts are mature in the autumn. Hickory species produce deep taproots, making the trees very wind-firm (although in wet or waterlogged soils, the taproot is less developed). The two species treated here are easily distinguished from all other Canadian trees by the peculiar, rough, shaggy bark of the trunks and larger branches after they reach the age of about 10 years.

Shagbark hickory trees grow 18–46 m in height (usually not larger than 25 m in Canada), and sometimes live for 300 or more years. One of the largest shagbark hickories in Canada is in the Backus Tract of Norfolk County; it has a diameter at breast height of 95 cm and a height of 32 m. The trunk of shagbark is straight and slender in the forest, and the crown, widening out and almost flattened, is composed of short, ascending, spreading branches. In the open the crown is oblong, and supported by a short, branch-free trunk, noticeably tapered at the base. After trees are cut or damaged by fire, sprouts develop prolifically from the stump, and (especially with larger trees) root suckers also may appear. The leaflet serrations have a dense tuft of persistent hairs on one or both sides near the apex of the tooth, a character that distinguishes the shagbark from other hickories native to Canada. The loose, scaly bark separates into plates up to a foot long and hangs down from the trunk like loose shingles. The fruit is brown to reddish-brown, 2.6-4 cm long, and is somewhat longer than wide. The husk is 4-15 mm thick, and splits into four separate pieces to the base of the nut. The nut of the shagbark hickory has been esteemed for its sweetness and superior flavour since colonial times. It has been recommended as one of the best nuts for northern regions

of North America, where the pecan can not be grown. The shagbark is the only shaggy-barked hickory that usually has five leaflets per leaf.



Trunks of shagbark hickory trees, showing peeling bark. Photographed by P. Catling on the shore of the Ottawa River, at Deschênes Rapids, Aylmer, Quebec. These trees likely originated from First Peoples using the location, a former portage route at the head of the rapids, as a campsite.

Shellbark trees grow up to 30 m in height in Canada, up to 41 m in part of the US range. They tend to develop heavier branches and larger leaves than shagbark hickory. The bark of the tree exfoliates in plates, as in shagbark hickory, but the trunk is not as shaggy. The fruit is tan to brown in color, spherical to ellipsoidal, rather similar to that of the shagbark hickory but larger (the largest of all hickory species), 4.4-7.5 cm in both width and length, with a husk 6-13 mm thick. The shellbark is the only shaggy-barked hickory that usually has seven or nine leaflets and a fruit at least 5 cm in diameter.

Classification and Geography

The genus *Carya* is taxonomically challenging. Many names have been given to minor intergrading variations in shape and size of fruit and in characters of foliage. Identification of species is difficult and frequently both leaves and fruit are necessary for reliable determination. There is disagreement about the number of species deserving recognition, with the most recent authoritative account (Stone 1997) accepting 18. One species occurs in eastern China, another in Indochina, and the remainder in eastern North America. Hickory species were once abundant in Europe, but were eliminated by the last ice age on that continent, about a million years ago. The only significant commercial species of *Carya* is the pecan, *C. illinoensis* (Wangenh.) C. Koch (commonly misspelled "illinoensis"), which is native to the south-central United States.

The genus *Juglans* (which includes walnut and butternut – #30 in this series) is quite similar to *Carya*, and species of the two genera often grow together. All the North American

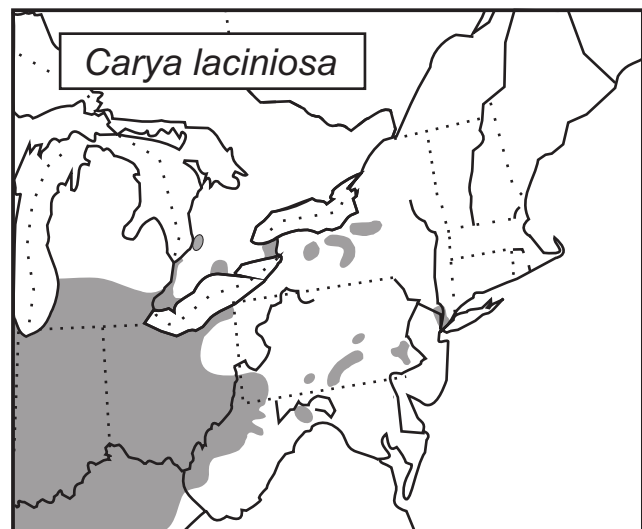
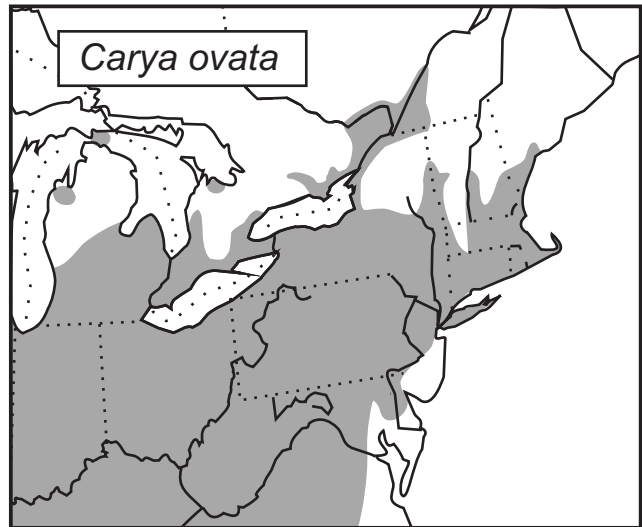
species of both genera are deciduous nut trees with alternate, pinnately compound leaves, and drooping male catkins as well as compact female inflorescences on the same plants. The pith of the twigs is a reliable means of distinguishing the genera: after the first year the species of *Juglans* develop a chambered pith with alternating cavities and partitions, while the pith of *Carya* is solid. The fruit also differs. In *Juglans* it is indehiscent: the husk does not split to release the seed, but rots away; in *Carya* the husk splits along four sutures as the fruit matures (usually to above the middle in the bitternut hickory, all the way to the base in the remaining three Canadian species).

KEY TO CANADIAN SPECIES OF *Carya*

- 1a. Bark of larger trunks (over 15 cm in diameter) not exfoliating; bud-scales yellow, not overlapping; leaves mostly with 7-11 leaflets; fruit husk 4-winged, shell thin and easily cracked.....bitternut hickory (*C. cordiformis*)
- 1b. Bark of larger trunks (over 15 cm in diameter) exfoliating or not; Bud-scales brownish, overlapping; leaves mostly with 3-7 leaflets; fruit husk not winged, shell bonelike, not easily cracked.....2
- 2a. Bark not conspicuously exfoliating; twigs thin and mostly hairless; fruit somewhat pear-shaped, husk thin and easily cut (up to 3 mm thick); kernels bitterpignut hickory (*C. glabra*)
- 2b. Bark conspicuously exfoliating; twigs stout and hairy; fruit more or less globular, husk woody and difficult to cut (4-13 mm thick); kernels sweet.....3
- 3a. Leaves usually with 5 leaflets; sides of leaflet serrations have tufts of hairs; fruits mostly 3-5 cm longshagbark hickory (*C. ovata*)
- 3b. Leaves usually with 7 leaflets; sides of leaflet serration without tufts of hairs (hairs often present); fruits mostly 5-7 cm long.....shellbark hickory (*C. laciniosa*)

Shagbark hickory is one of the most abundant hickories in the eastern and central states. It grows wild in the north from southwestern Quebec and southern Ontario to southwestern Maine, Michigan and southeastern Minnesota, and south to Florida and Texas; the species also occurs scattered in the mountains of northeastern Mexico. *Carya ovata* var. *australis* (Ashe) Little occurs in a restricted area of the southeastern US, while the much more widespread *C. ovata* var. *ovata* is found in Canada as well as in the US range of the species. Several other varieties of *C. ovata* have been accepted in the past (particularly var. *fraxinifolia* Sargent), but are generally not recognized today. The occurrence of shagbark hickory (as well as hazelnut – #25 in this series) along the St. Lawrence River in eastern Ontario corresponds to the area once occupied by the St. Lawrence Iroquois, who lived in large villages and practised extensive and advanced agriculture. Thus the St. Lawrence population may have been introduced by these indigenous people.

The shellbark hickory has a Midwestern distribution, extending north to southern Ontario and western New York, west to southeastern Iowa, and south to northeastern Oklahoma and Tennessee, with isolated populations in southern Arkansas, Mississippi, Alabama and northern



Georgia. In Canada the species occurs only in the counties bordering Lake Erie in southern Ontario. Scoggan (in his Flora of Canada) indicated the possibility that the Canadian distribution arose from trees planted for lumber, but cited evidence suggesting otherwise.

Bitternut hickory (*C. cordiformis* (Wangenh.) K. Koch) is the most abundant and widespread of Canadian hickories, occurring throughout much of southern Ontario and extreme southern Quebec. Pignut hickory (*C. glabra* (Miller) Sweet) is rare in Canada, occurring in scattered locations in the deciduous forests of southern Ontario. *Carya ovata* is known to hybridize with the pecan, *C. laciniosa* (producing *C. ×dunbarii* Sargent), and the bitternut (producing *C. ×laneyi* Sargent). A form of the latter hybrid, nothovar. *chateauguayensis* Sargent, has been reported from Châteauguay, Île Chatelaine and Sainte-Rose in Quebec and Thompson Island and a few locations near Summerstown in eastern Ontario. (A "nothovariety" is a variety of a hybrid.) With smooth bark and seven leaflets, this resembles *C. cordiformis*, but has larger buds that are not yellow and the valves of the fruit separate to near the

base instead of to the middle. *Carya laciniosa* is also known to hybridize with the pecan (producing *C. xnussbaumeri* Sargent).

Mockernut hickory occurs just south of the Canadian border (see text box). It is similar to shellbark in its stout twigs, but differs in that its bark is ridged rather than exfoliating, its husks are smooth instead of minutely hairy, and the leaf stalk is densely rather than lightly hairy.

Ecology

The shagbark hickory occupies a wide range of sites over its range, occurring in both moist and dry woods, often along streams. In the northern part of its range it often grows on upland slopes, generally in mixed hardwoods. At its extreme northern limit it is confined to periodically flooded river shores. In Canada the trees occur in valleys, on moist hillsides, and on the borders of swamps, generally in deep, moist, fertile, well-drained soils. For the most part, shagbark hickory occurs as scattered individuals or in small groups, rarely in pure stands. The shagbark is moderately shade tolerant, and saplings can persist for many years under a forest canopy, but it will be outcompeted by extremely shade-tolerant trees such as sugar maple.

The shellbark hickory is found in low woods, rich bottomlands, and along streams. In much of its natural range, the trees are subject to seasonal inundation.

Note

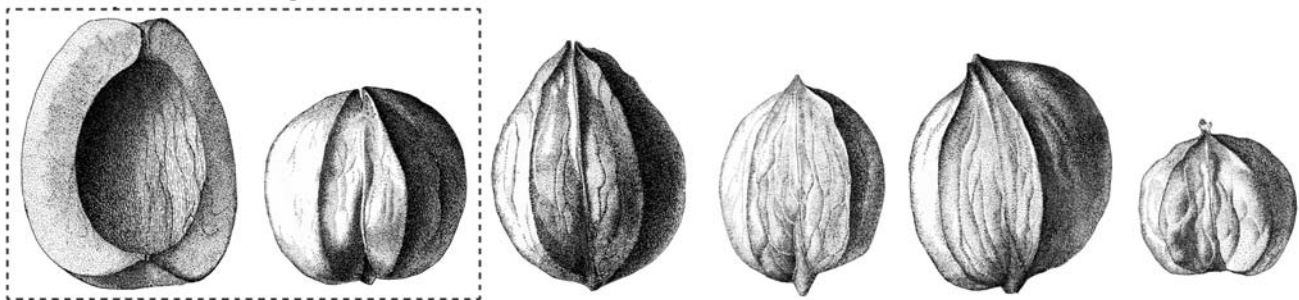
Is mockernut hickory a native of Canada?

Mockernut hickory (*Carya tomentosa* (Poiret) Nutt.) occurs on the south shore of Lakes Erie and Ontario. Although previously reported for southern Ontario, most recent authors do not accept its presence in Canada. There is an uncertain record for the Canadian shore of Lake Erie based on a collection by John Macoun in 1877 (Manning in *Michigan Botanist* 12: 203-209. 1973). There do not appear to be voucher specimens supporting published reports for occurrence in Ontario at Point Pelee, Pelee Island, Windsor, Squirrel Island and Niagara Falls (Fox and Soper in *Trans Roy. Can. Inst.* 30: 104. 1954). Could it have occurred in Canada prior to the destruction of 95% of the Carolinian forest? Could isolated populations still exist in Canada? Possibly. Over the past few decades several native trees and shrubs have been discovered for the first time in Canada. Examples include pumpkin ash (*Fraxinus profunda* (Bush) Bush), bear oak (*Quercus ilicifolia* Wang.), Shumard oak (*Q. shumardii* Buckl.), Hill's Oak (*Q. ellipsoidalis* E. J. Hill), Ohio Buckeye (*Aesculus glabra* Willd.) and most recently swamp cottonwood (*Populus heterophylla* L.). There is evidence that these species have been present for centuries, not recently introduced. The fact is that Canada's botanical inventory is incomplete, even in southwestern Ontario where less than 5% of the original forest cover remains.

shagbark hickory



shellbark hickory



husks and corresponding nuts

variation in size and shape of nuts

Nuts of shagbark and shell bark hickory. Source (various figures in): United States Department of Agriculture, Division of Pomology. 1896. *Nut culture in the United States*. Government Printing Office, Washington, D.C., 144 pp.

The nuts of the more palatable hickory species provide food for many kinds of wildlife, including wild turkey, other birds, black bears, foxes, rabbits, and racoons. Most years (i.e. the one in several years in which a very large crop of seeds is produced) for shagbark hickory tend to occur every 2 or 3 years, with very little or no seed production in intervening years. Most years for hickory have been found to increase the reproductive success of black bears during the following year. Several species of squirrel relish the nuts, which constitute 10 to 25% of their diet. Gravity, squirrels and chipmunks, and to a lesser extent birds, are the most important dispersal agents. The extinct passenger pigeon is thought to have been an important disperser of hickory seeds.

Use as Food

Indigenous Peoples in North America consumed hickory nuts wherever they could be collected. Algonquin Indians were observed to pound hickory kernels in a mortar until finely powdered, add water and strain the mixture to produce a nourishing "hickory milk." Early settlers also valued the nuts, which could be kept for more than 2 years in a cool cellar without significant deterioration. By the early 19th century, a few hundred bushels of hickories were being traded among the colonies and exported to the West Indies and England. Settlers also sometimes tapped hickory trees for the thick, sweet sap, which could be boiled into sugar, although quantities were small.

The thick-shelled nuts of hickory generally have relatively poor cracking quality, although some varieties are superior in this respect. Striking shagbark and shellbark hickory nuts at the centre of the widest point with a single sharp hammer blow is said to free the most, and often largest pieces of kernel. How to open hickory nuts is a subject that has been much debated, and some recommend hitting the nuts on the narrowest, not the widest side. By contrast, a percussive blow on the ends of pecan nuts buckles their shells, and produces whole kernels. Shagbark hickory nuts are highly flavored, and for incorporation in ice cream, cookies and candies only about half as much is required as for pecans. Hickory nuts are occasionally available as a gourmet, specialty item, but to a considerable degree are simply collected from the wild or from ornamental trees for personal use. They are best harvested by allowing them to drop from the trees in the autumn. The nuts contain about 10% moisture when harvested in this way, and will mould if not dried to about 5%. Properly dried nuts will keep for at least a year under cool conditions.

Pigs were allowed to forage on hickory nuts in the woods during the winter in the milder parts of colonial New England. Not only were the pigs fattened on hickory nuts, their meat was also hickory-smoked, producing highly prized bacon and hams. Hickory wood chips, especially from the bitternut, are widely used today to produce charcoal for smoking and barbecuing meats, especially hams and bacon.

Non-Food Uses

Indigenous peoples used the bark of the two species highlighted here for a variety of medicinal applications,

young wood and saplings for basketry, and the branches for constructing tools, bows, arrows, war clubs, and snowshoes. The husk was once ground up to produce a fish poison. A yellow dye produced from the bark was patented in the 18th century, but did not attain much commercial success. The size and shape of several of the hickories adapt them well as shade trees for small places. Shagbark hickory, together with pignut hickory, furnish the bulk of commercial hickory wood. Hickory wood has long been used by cabinet makers, and is a favourite for kitchen cabinets. Hickory wood is rather uniquely suited for sporting goods in its combination of strength and elasticity, and has been used to make hockey sticks, skis, fishing rods, bows, baseball bats, golf club shafts, tennis rackets, and heavy sea fishing rods. Almost the entire world's supply of lacrosse sticks is made in Canada from hickory. The shock and stress resistance of hickory also makes it ideal for striking tools, such as the handles of axes, hammers, and picks, for ladder rungs, and for flooring. However, the amount of hickory lumber produced in Canada is very limited and most of it is imported from the United States. Hickory is an excellent fuel, and during pioneer days it was very widely used as firewood.

Agricultural and Commercial Aspects

In contrast to pecan, which has been extensively selected for desirable traits, there has been very little selection of improved varieties of other species of *Carya*. However, most species bear edible, although not necessarily pleasant-tasting nuts. The two species highlighted here have nuts of excellent flavour and have been developed to a minor extent as commercial nut trees. The hickories have several drawbacks as nut trees, including slow growth and a long period before bearing nuts (20 years at least for most species, 40 years until a commercial crop can be harvested), thick shells, poor cleavage or cracking qualities, small size of nuts, and the fact that the nuts are round whereas commercial cracking machines are adapted to oblong shapes. A few commercial plantations exist in the US, but there are no commercial plantings of *Carya* in Canada. Canadian hickory nuts are gathered mostly from wild trees by nut fanciers, and are rarely grown for nuts except as curiosities. Hickories are notorious for attracting squirrels, and protecting the nuts from them is a major problem. The shellbark requires a long ripening season, and in the northern part of its range it is a less reliable nut bearer than the shagbark.

Cultivars & Germplasm

Most cultivars of hickories have originated as cuttings from wild trees. There are at least 15 cultivars of the shagbark hickory, some with large kernels and good cracking qualities. Most of these were acquired after 1950. Improved lines of shellbark hickory have been selected in the last few years, and there are now over 40 cultivars, most originating from Iowa and Pennsylvania.

Several valuable germplasm collections of hickories exist in the US. The most important of these is the National Clonal Germplasm Repository of Pecans and Hickories at Brownwood, Texas. Many named cultivars and most of the world's species of *Carya* are represented. In Canada, the

University of Guelph Arboretum has a collection of big shellbark hickories from the Carolinian zone of Ontario.

When cross pollinated, pecans and hickories produce vigorous hybrids called "hicans." These tend to be poor nut producers but excellent ornamental shade trees. However, occasional hicans have been found that produce nuts combining the best characteristics of their parents. A hican called Burton (a pecan-shagbark hybrid) produced an abundance of good nuts in the Midwest but was apparently poorly adapted to the northeastern climate. Hicans also have some potential for use as dwarfing rootstocks, i.e. for grafting pecan trees onto the rootstocks with the result that the trees grown are relatively short and the nuts are easy to reach.

Prospects

Some nut specialists consider shagbark hickory to have the potential to become the best tree nut for Canada. Most cultivars have been selected in the United States, and are not ideal for Canada's climate. Hardy cultivars suitable for northern conditions and producing good nuts should eventually be available, and could be the basis for a commercial industry. There is also a long-standing hope that hybrids between the shagbark hickory and the pecan will be the basis of thin-shelled, improved hickory cultivars suitable for Canada.

Myths, Legends, Tales, Folklore, and Interesting Facts

Note

Despite their hardness, hickory nuts have held an immense fascination for small boys from time immemorial. "An amusing story is told about a farmer who finally, reaching the limit of his endurance, took down all his signs which read 'Posted, Keep Out' and carefully replaced them with 'Carya Abound in These Woods, Enter at Your Own risk.' It is said that for quite some time after that he was not bothered by poaching boys."

— Riotte, L. 1975. Nuts for the food gardener: growing quick crops anywhere. Storey Books, North Adams, MA, USA. 179 pp.

- Wheelwrights commonly used shagbark hickory to form the spokes of wooden wheels for carriages and carts, especially for westward-trekking pioneers. Hickory spokes were even used for early automobiles, and the Wright Brothers whittled hickory for their "flying contraption." In the early 19th century, American carpenters, who used hickory wood for these purposes,

preferred trees with limited shagginess, as it was easier to remove the bark. Nevertheless, they disrespectfully referred to the smoother-barked trees as "bastard hickories," presumably based on the idea that the parentage of such unusual trees was suspect.

- The 18th century Finnish naturalist Pehr Kalm alleged that the clear strong flame of burning hickory injured the eyes of those looking at it.
- The tough, almost unbreakable wood of hickory contributed to uses considered unacceptable today. As a classroom ruler or stick it caused pupils who weren't learning their "readin', writin', and 'rithmetic" to cringe as the schoolmaster aimed for their heads or knuckles.
- Early American settlers commonly referred to durable things as being "as tough as hickory." American president Andrew Jackson (1767-1845) was known as "Old Hickory" because of his ruggedness as a frontier militiaman in 1813, fighting Amerindians.
- Some parrots, Staffordshire bull terriers and the occasional human being are capable of cracking open hickory nuts with their teeth, but the nuts are nevertheless very strong. The southern US expression "he can crack hickory nuts between his toes" is a way of saying that someone is a really tough character.

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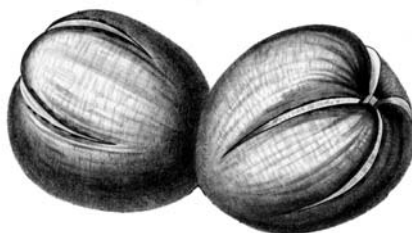
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Acknowledgments

W.J. Cody (review), B. Brookes (artwork).



Saving Annapolis Heathlands

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Corema heath vegetation in the Annapolis valley near Auburn with scattered Red Pines. Photographer: P. Catling.

After the Canadian Botanical Association meetings in Antigonish, we decided to investigate the significance and conservation status of the heathland vegetation of the Annapolis Valley. The indications were that this unusual vegetation centered near Greenwood had been seriously degraded over the past decade, and that if some action was not taken soon, it would be too late. The following is a brief report of our findings.

Why are the Annapolis heathlands important?

***In situ* protection of genetic resources** - Genotypes of Blackberries (*Rubus hispidus* and others), Juneberries (*Amelanchier lucida* and *A. laevis*), Blueberries (*Vaccinium angustifolium* and *V. myrtilloides*), Huckleberries (*Gaylussacia baccata* and *G. dumosa*), Cherries (*Prunus pensylvanica*, *P. virginiana*, *P. serotina*) and a strawberry (*Fragaria virginiana*) on the heathlands are adapted to periodically dry conditions and there is some evidence for distinctive patterns of variation. For example a sand barren ecotype of *Amelanchier lucida* (related to the rapidly growing western crop, Saskatoon) occurs in the Annapolis valley. Elsewhere this species grows on rock barrens. Also taxa of Blackberries (*Rubus particeps*, *R. arenicola*), although not currently recognized as discrete, have been reported from the region suggesting the presence of distinctive genetic variants within broadly defined species.

Reservoir of beneficial insects - The service of pollinators to crops has increasingly been recognized as a benefit of protecting the natural areas within an agricultural landscape (Javorek et al. 1996). The natural heathlands have a great diversity of continuously available wildflowers upon which crop pollinators depend. Parasitic insects utilizing the natural landscape also help to control crop pests.

Rare species and biodiversity - In Nova Scotia, *Hudsonia ericoides* (provincially ranked as S2 - sensitive) is known on sandy heathlands only from the Annapolis Valley and Shelburne County. Also in the Rockrose family (Cistaceae), *Helianthemum canadense* (provincially ranked as S1 - at risk) is known only from sandy areas in the Annapolis valley. The third Nova Scotian member of the family, *Lechea intermedia* is also present in this region. The Annapolis heathlands are the only part of the province where all three Nova Scotian representatives of the family can be seen together.

Although rare species are frequently emphasized, the protection of biodiversity should also include reference to infraspecific variation. In addition to the Blackberry variants, *Viola fimbriatula* f. *glabrata*, (almost glabrous with glabrous sepals) is reported only from the Annapolis heathlands in Nova Scotia. Biodiversity also includes communities (see below) and ecological processes (below).



Shining Juneberry (*Amelanchier lucida*) is one of a number of crop relatives that can be effectively protected *in situ* in a heathland preserve. Note also the heathland dominant *Corema conradii*. Photographer: P. Catling.

Type localities - An Annapolis heathland at Middleton is the type locality (where the specimen for the application of the name was collected) for *Amelanchier lucida* and *Panicum depauperatum* var. *psilophyllum* f. *cryptostachys*. *Rubus particeps* Bailey was described from the same region near Kingston. Type localities are sometimes used to help establish the correct application of plant names.

Research and teaching - One of the best remaining heathland landscapes along the Evangeline trail, has been used for many years as a representative example for teaching an Acadia University course featuring the flora of Nova Scotia. This same site provided a location for a study of blueberry seedbanks (Wesley et al., 1986) and for the classification of Juneberries and for estimation of the impact of invasive species on heathland habitats (Catling in prep.).



A bee (and thousands of others like it) depend upon a continuity of native heathland blossoms like *Rosa carolina* when the nearby agricultural crop is not in flower. Photographer: P. Catling.

Special plant community - "Barrens" with heath vegetation occupied a large part of western Nova Scotia. In 1972, Strang estimated 31,000 ha in Digby, Yarmouth and Shelburne counties and the area was undoubtedly much larger in the past, prior to suppression of natural fire. Although the "barrens" (here heathlands) are dominated by heath vegetation, they can be divided into two major vegetation types based on either granitic or sandy substrates. The sandy heathlands are well developed in the interior of Yarmouth County and in the Annapolis valley with smaller examples near Debert, Springhill, Parrsboro, and on coastal dunes in Guysborough and Kings counties and on Sable Island. The coastal heathlands on sand differ from the interior sandy heathlands. For example *Lechea intermedia* var. *intermedia* occurs in interior heathlands while *L. intermedia* var. *juniperina* occurs on the coastal sandy heathlands. Sable Island heathlands are quite distinct (Catling et al. 1985). The interior sandy heathlands also vary regionally, presumably due to differences in climate, the climate in southern Yarmouth and Shelburne being quite different from that of the Annapolis valley. Preliminary data

suggest that the Annapolis heathlands are distinctive in their floristic composition. Thus their protection is essential to the idea of protecting the full range of variation in Nova Scotian sand barren vegetation within a provincial system of representative protected sites.

How much is left?

As recently as the 1960s mile after mile of the Evangeline Trail was surrounded by extensive open heathlands with scattered Red Pines. In presettlement times the actual area of heathland is believed to have encompassed an area of approximately 200 km². Today it appears that less than 3% of the original heathland remains.

Present threats

Loss of natural disturbance - In presettlement times natural fires undoubtedly contributed to the maintenance of the open landscape and provided special successional niches for plants and animals. Browsing by herds of Caribou and their use of regular paths through the "barrens" would also have created a diversity of disturbance regimes to which different species were adapted. The spatially and temporally dispersed patches of natural disturbance are largely gone. Caribou were extirpated in southern Nova Scotia in the early 1900s. In scattered remnants of heathland, fires are no longer a natural ecological process. Succession to woodland is steadily replacing open heath, especially on more mesic sites. The barrens that remain tend to be those that are the driest and most resistant to succession. Biodiversity was probably greatest on the less extreme successional sites, which are the first to be lost to lost.

Invasive non-indigenous species - Thirty years ago Scots Pine became established on the Annapolis heathlands. It establishes on the heath much more readily than any of the native trees and quickly produces dense stands. In many places the open heath vegetation has been replaced by a dense forest of these alien pines with a sparse understory of grasses. In some places where the heath vegetation is intact, young Scots Pines outnumber the native Red and White Pines 100 to 1. Based on rate of growth and recruitment it will take less than 20 years for the Scots Pines to form a dense stand completely replacing the open heath.

Although several native species can benefit from disturbance that exposes the sandy soil, there are also a number of aggressive non-indigenous species that quickly invade disturbed places occupying the space that would otherwise be available to natives. One of the foremost among these troublesome invaders is *Hieracium pilosella*, which is often accompanied by *Rumex acetosella* and *Poa compressa*.

Conversion of the landscape - Roads, residential and commercial development, and fields of corn, wheat, barley, and vegetables have replaced natural heathland on a grand scale. There are also orchards and cranberry farms and some areas have been converted to peat extraction. While a multi-use landscape is a reasonable goal, the problem is that, until now, the desirability of protecting elements of a

quality natural environment within the landscape has not been sufficiently recognized.

Some of the heathlands have extensive All-Terrain-Vehicle (ATV) tracks. A first reaction is that these are negatively impacting the heath vegetation. However, they also create disturbed habitats required by some native species leading to an overall increase in native biodiversity. They are in fact the closest impacts to previous fire and caribou trails. Consequently recreational use of the heathlands by ATVs is much less of a problem than might be assumed. They do however, provide an avenue of dispersal for the introduction of alien species.



Alien Scots Pine that invaded natural heathland near Greenwood. The very dense growth of trees of different ages has eliminated the original heathland producing an understory with a sparse cover of a single species of grass. Photographer: P. Catling.

Vegetation and landscape

The driest areas are dominated by *Corema* (*Corema conradii*), with greater or lesser amounts of lichens (*Cladina* spp.), Bracken (*Pteridium aquilinum*), Shining Juneberry (*Amelanchier lucida*), Hudsonia (*Hudsonia tomentosa*), Sweet Fern (*Myrica asplenifolia*), Blueberry (*Vaccinium angustifolium*), Juniper (*Juniperus communis*), Chokeberry (*Aronia prunifolia*) and Bearberry (*Arctostaphylos uva-ursi*). *Carex umbellata*, *Panicum depauperatum*, *P. implicatum*, *Danthonia spicata*, *Rubus hispidus*, *Rosa* spp., and *Viola fimbriatula* occur on open sand.

Lower and periodically wet substrates are dominated by *Chamaedaphne calyculata*, *Kalmia angustifolia* and *Rhododendron canadense*. These often grade into pools surrounded by *Carex oligosperma*, *Scirpus* spp., and *Eriophorum* spp.

Although the dry barrens vegetation is a major feature it is desirable to protect an entire landscape because many species thrive on the edges of habitats. In addition, pollinating insects utilize the entire landscape.

Prospects

Sand barrens and sandy heathlands in eastern Canada were long persisting, distinctive natural habitats dominated by a discrete group of native species. They are declining due to conversion of the landscape, loss of essential ecological processes which has led to succession of woodland and replacement by invasive alien species. They have been under-emphasized in planning for representative habitat protection (e.g. Carbyn & Catling 1995). In the Annapolis region of Nova Scotia, the prospects for protection are good. The Nova Scotia Department of Natural Resources (NSDNR) has strongly supported the concept of developing a system of protected representative heathland sites depending upon adequate scientific documentation. NSDNR provided logistical support for a preliminary evaluation of heathland remnants in the Annapolis region. The next steps will be to determine which heathland landscapes are most deserving of protection. It will also be necessary to determine how the protected sites can be best managed to preserve valuable biodiversity, as well as allowing continuing research, teaching and recreational opportunities.

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The White Lilies - What are they?

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The familiar lilies with horizontal or nodding white flowers and scattered linear-lanceolate leaves are a source of many questions.

WHITE LILY, LIS BLANC

Lilium candidum L.

Also called the Madonna Lily, this spectacular plant has bell-shaped flowers with the floral tube widening from the base. It originates from southern Europe and southwestern Asia, and possibly from the relatively restricted area of the Balkan Peninsula. It is a garden plant propagated from seeds and bulbs.

A floral emblem or not?

The White Lily, Lis Blanc (*Lilium candidum*) was officially designated as the floral emblem of Quebec in 1963, but there has been confusion and debate as to whether it was the appropriate floral emblem. It was widely contested and the debate continued for 36 years until November 1999, when the Multi-coloured Blue Flag, L'Iris versicolore (*Iris versicolor* L.) was officially adopted as Quebec's new floral emblem. The change was considered by most to be desirable because the latter species is native rather than introduced and is a characteristic element of the flora of the most inhabited part of the province. *Iris versicolor* opens its flowers on or around St. Jean Baptiste Day which is Quebec's National holiday. The different colours of the flower signify a multicultural province. The Iris flower also has the advantage of resembling the "Fleur de lis" symbol which is on the coat of arms and the flag. It has been said that the "Fleur de lis" was the first floral symbol used in Quebec (since Jacques Cartier's arrival in 1534) but there is even some doubt that this symbol actually represented a plant. It does tie Quebec to France. A detailed and very illuminating discussion of the origins of the Quebec emblem is provided by Lamoureux (2002, pp. 368-371).

EASTER LILY, LIS DE PÂQUES

Lilium longiflorum Thunb. var. *eximium* Baker

A large and vigorous variety of the White Trumpet Lily, the Easter Lily is dynamic yet delicate, bold yet reserved, and a striking plant of remarkable contrasts. It is as much a part of Easter as chocolate bunnies, egg hunts and special church services. It differs from



EASTER LILY, LIS DE PÂQUES (*Lilium longiflorum* Thunb. var. *eximium* Baker), a spectacular plant that serves as an excellent symbol of Easter. Photo used with permission of William Ferry of the Easter Lily Research Foundation.

Lilium candidum in having the floral tube widening relatively little from the base to the middle and in having longer flowers 4-7 inches long (instead of bell-shaped flowers 2-3 inches long). Believed to have been endemic to the Ryukyu Islands south of Japan, it has been widely introduced elsewhere. It is evidently the most important of the commercial lilies and is used at weddings and funerals, but Easter is the main event for Easter Lilies.

Economic aspects of Easter Lilies

In the 1880s most of the cultivation of Easter Lilies

was in Bermuda. By 1900 Japan became the main supplier but this ended during the 1940s and the Pacific coast of North America became the main North American supplier. By 1945 1200 farmers were growing white gold (lily bulbs) on the Pacific coast from Vancouver to Long Beach.

Today most Easter Lilies for the potted market are grown in the mild and wet coastal region of the California/Oregon border often referred to as the Easter Lily Capital of the World. They are cultivated for 3-4 years in a 3-6 year rotation with pasture for cattle and sheep. Bulbs are dug up and replanted each year until they are mature. They are harvested in the fall and, when mature, are sold to greenhouse operators to produce flowering plants. Over 12 million bulbs are shipped to commercial greenhouses in the U.S. and Canada each year. In Michigan 560 growers are said to produce 1.3 million potted Easter Lilies valued at \$ 5 million each year. Following Michigan in production are California, Pennsylvania and Ohio. In the U.S., Easter Lilies have a wholesale value of approximately \$ 40 million and have occupied the fourth most valuable position following poinsettias, mums and azaleas. This is remarkable considering their short sales window of 2 weeks compared to 6 weeks to all year for the three leaders.

Producing Easter Lilies

Easter lily producers have to ensure that all of their lilies bloom at the same time and are just in time for Easter. Easter is on a different day each year so the schedule is always being adjusted. It is the first Sunday after a full moon following spring equinox and can be anytime from the end of March to the end of April. The schedule is adjusted by counting leaves and measuring height to obtain an idea of when flowering will occur according to existing conditions and then modifying temperature and humidity of the greenhouse in order to slow or accelerate growth as required to ensure flowering on a particular date. Different cultivars vary in their time of flowering under similar condition from 85 to 120 days.

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