The Canadian Sweet Chestnut

-Newsletter of the Canadian Chestnut Council-

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http://www.canadianchestnutcouncil.ca

Council Mission - to help restore the American Chestnut to the areas of Canada it once occupied.

Current Priorities

1) Breeding resistance
2) Breaking Isolation / Establishing Gene Nodes
3) DNA Analysis
4) Survey of existing Chestnuts in the wild

In this issue:

- Survey of Chestnuts in the wild – Part 2 – where are they?
- Trees and Test Tubes - Growing the American Chestnuts in the Lab – Christie Lovat – McGill University
- Leaf Contributors

Survey of Chestnuts in the wild – Part 2

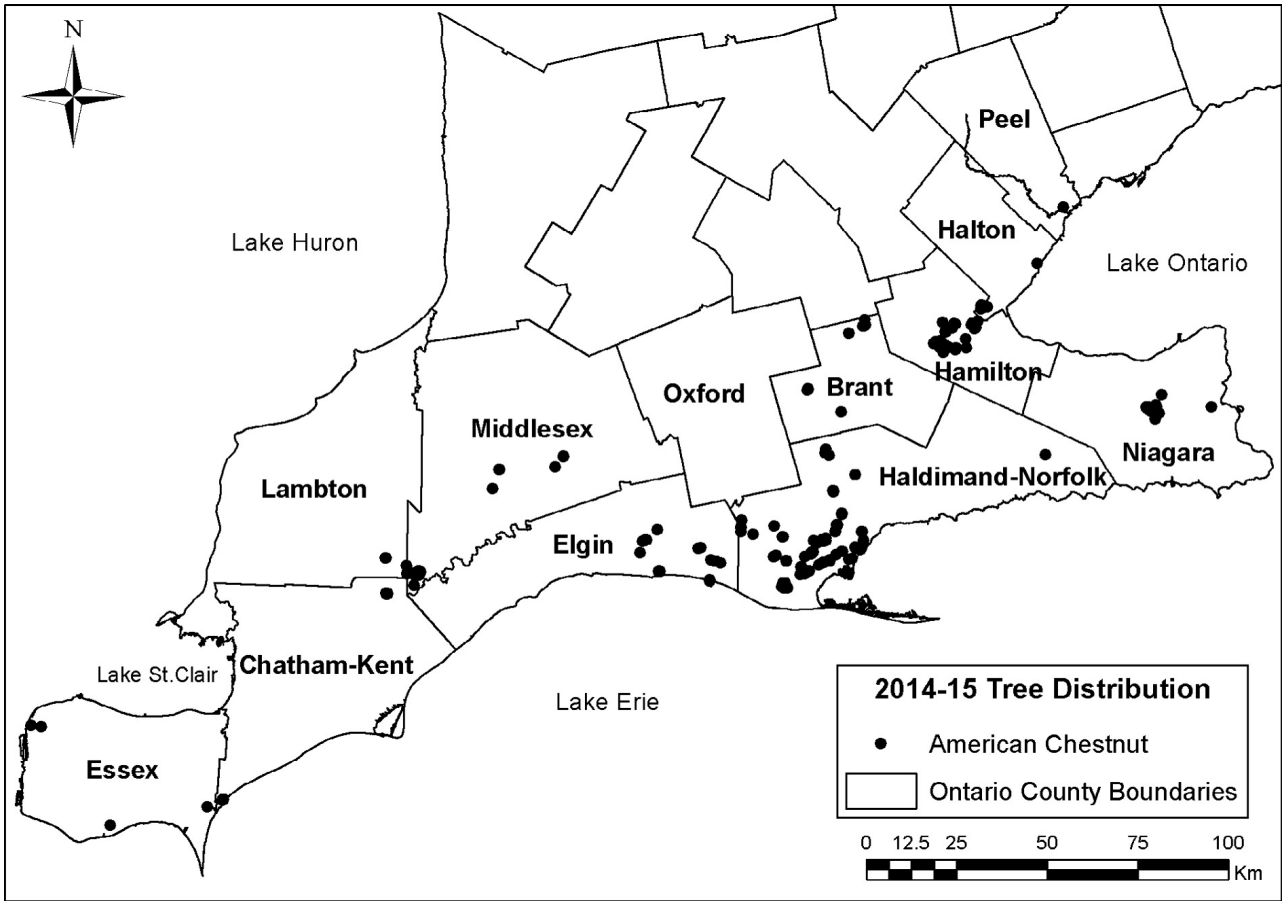
Southern Ontario marks what is generally regarded as the northern limit of the American Chestnut. Prior to the devastation caused by the blight, the tree provided a substantial contribution to the tree canopy. In the Sept. 2017 issue of the CCC newsletter, we featured the recent publication by University of Guelph researchers on the wild population of American Chestnuts in southern Ontario. The publication compared the results of a survey conducted in 2001 – 2002 (Tindall et al.2004) with a subsequent survey in 2014 -2015 (Van Drunen et. al. 2017).

So how many wild American Chestnuts are there in southern Ontario? - The provincial data base maintained by Stephen Van Drunen at the University of Guelph has approximately 1200 geo referenced trees. (not all alive) The actual number of living trees has been estimated to be as high as 2,000 trees.

Where are they? - A review of the data base provides the following information.
Over 50 % of the live trees in the wild are found in Haldimand-Norfolk

Trees found alive by County

Brant	37	Kent	33
Elgin	32	Lambton	9
Essex	5	Middlesex	163
Haldimand - Norfolk	630	Niagara	122
Halton	14	Waterloo	2
Hamilton - Wentworth	85		
Total	**1132**		



From - Population dynamics and the influence of blight on American chestnut at

its northern range limit: Lessons for conservation- Van Drunen et. al 2017

Trees and Test Tubes – Christie Lovat

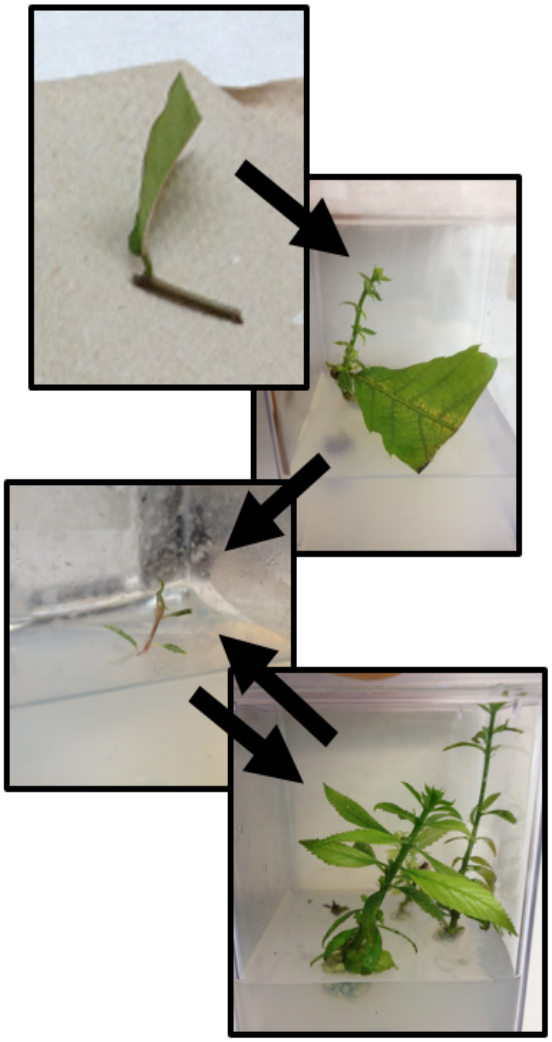
A single cell contains all the genetic information required to make an entire organism, from a simple bacteria to a complex organism such as an elephant. However, within the same organism, not all cells are the same. Your skin cells and your liver cells contain all the same genetic material, but a skin cell looks very different from a liver cell and performs very different functions. For instance, your skin is terrible at detoxifying alcohol. What allows these cells to look different and perform different functions, despite having the same genetic material, is something we call epigenetics. In essence, although all of your DNA is found in each of your cells, not all of your genes are expressed (used) at the same time. So, in your skin cell, only skin-related genes are expressed. While in your liver cell, only liver-related genes are expressed. The rest of your genes are what we term "silenced", they are not used in the cell because they are not needed. In animals, it is very difficult to re-program a cell once it has determined its fate. So, a skin cell cannot become a liver cell. However, in plants, things are a lot more flexible. Plants have the ability to reprogram their own cells. So, if a pesky deer comes along and chews off your shoot, a cell which may never have been destined to be a shoot (perhaps its fate was to be a vascular cell) can reprogram itself and eventually become a replacement shoot for the one which was lost. This genetic flexibility has allowed plants to be very successful as a group, even though they largely cannot leave their environment if things take a turn for the worse (say an entire herd of deer).

In the late 19th century, we began to learn the different ways in which plants can reprogram their own cells. Today, we have largely mastered this system. This means that for many plant species, we can harvest a few simple cells and encourage those cells to become anything we need – from humble pollen to an entire plant! We call it tissue culture. It's a very versatile tool, allowing us to make many new plants from very limited initial material. It also guarantees that whatever plant we create will be genetically identical (a clone) to the original plant. This is a tool currently being employed to help restore the American chestnut (*Castanea dentata*) in Canada.

The tissue culture of American chestnut is an interesting process. As with grafting and rooting from cuttings, American chestnut likes to be a little more difficult than similar plant species in tissue culture. We can't currently regenerate an entire plant from a few cells. Instead, we can take a simple cutting from a branch (a single-node cutting), and regenerate a nearly limitless number of new shoots from dormant buds. This method also has a secondary advantage – guaranteed blight-free! In order to go through tissue culture, plants grow in sterile conditions. Therefore, any trees being used in tissue culture are completely surface sterilized. If this method fails, we will see the fungus growing in culture (the fungus will grow better

than the tree). So, we have a test to make sure that our material is contamination free! A real advantage for a species like American chestnut, where it is critical to prevent the unintentional spread of pathogens. When new shoots grow in tissue culture, they tend to be very small compared to the full-sized trees. This is for the same reason your skin and liver cells are different – epigenetics! We believe that in tissue culture, plants express genes associated with very young plants. So, they stay small. However, we need them to be full sized once we move them out into the field. To achieve this involves basically the same method you use to move your vegetable seeds started indoors to the spring garden outdoors. A careful and slow exposure of the small American chestnut tissue culture plants to real world conditions (higher light, lower humidity, temperature fluctuations, wind, etc.) changes gene expression in the plant. Leaves become larger, stems become stronger. After 5 months, you have a seedling-sized plant in the greenhouse!

This summer, tissue culture will be making a major contribution to the restoration project of the Canadian Chestnut Council. At least one third of the trees going into the ground will be derived from tissue culture clones of existing elite Canadian *C. dentata*. See if you can tell them apart from the grafted and seedling trees! Science – coming to a forest near you!



From a single node cutting taken from a grafted shoot, the axillary bud grows in culture. From the shoot which emerges from this bud, new single node cuttings will be taken and grown in culture. By continuously expanding new shoots from axillary buds and subsequently harvesting them for new single node cuttings, a potentially limitless number of new trees can be produced.

On left -A clump of shoots from culture, ready to be rooted in soil. This single clump will produce 4 new trees.

On right - A new chestnut shoot emerging from the stem cutting of a seedling.

A rooted chestnut fresh out of culture. In 4 – 5 months, it will be ready to go into the field.

CCC Leaf Awards 2017

White Leaf $30-$99

Fabian Tivolle
Robin Cunningham
Neil Castagna
Janet Kellam
Jocelyn Clarke
Doug Fagan
Adam Dale
Gordon Chinnick
Wes Horley
Chuck Beach
Sal Paccione
Keith Johnson
John Drain
Neal Stein
Gerry Winger

Green Leaf $100-$249

Gordon & Sue Miller
Hugh Scott Garrioch
David & Emma Catt
Norfolk Woodlot Owners Assoc.

Green Leaf (cont)

Faye & Peter Rice
Charles Hooker
Fergus District Horticultural Society
Greg Boland
Dragan Gallic
Kathleen Potter
Peter Smith
Christian Schroeder
Tim Casson

Bronze Leaf $250- $499

Dorothy MacLeod
Terry & Candace Anderson
Walter Zimmerman
Ron Casier

Gold Leaf $1000 +

Peter and Annita Bergen

Annual General Meeting – Oct. 20, 2018

*mark your calendar

Want more information:

Website - www.canadianchestnutcouncil.ca
Contact - Mr. Ron Casier
Phone - 519-631-5279
Email - ronjcasier@gmail.com

Membership Secretary - Terry Anderson
Address - 888 Rd 3 E. Kingsville, ON.N9Y 2E5
Phone - 519-733-3796
Email - andersonterry419@gmail.com

Council Directors – Chuck Beach, Ron Casier, Tim Casson, Gord Chinnick, Adam Dale, Doug Fagan, Dragan Galic, Kathryn Harrison, John Hill, Adam Kozoil, Christine Vey. Rylan Zimny
Interim Directors – Stan Furman, Sal Paccione, Peter Smith