

**REGION OF QUEENS MUNICIPALITY
REGULAR COUNCIL
TUESDAY, JUNE 10, 2014
9:00 A.M.**

PRESENT: Mayor Christopher Clarke, Chair
Councillor Darlene Norman
Councillor Susan MacLeod
Councillor Bruce Inglis
Councillor Brian Fralic
Councillor Raymond Fiske
Councillor Jack Fancy
Councillor Peter Waterman
Kathleen Rafuse, Chief Administrative Officer
Jennifer Keating-Hubley, Director of Finance
Bobbi Jo Goulden, Recording / Management Secretary

1.0 CALL TO ORDER:

The meeting was called to order at 9:00 a.m.

2.0 CHANGES / APPROVAL OF AGENDA:

It was moved by Councillor Waterman and seconded by Councillor Inglis that the Agenda be approved with the following additions:

Add: 13.6 Friends of Hank Snow Society Request
16.3 Personnel Matter

MOTION CARRIED unanimously.

3.0 PRESENTATION(S):

3.1 SMART Tree Cooperative

Murray Crouse, member of the Lunenburg County Christmas Tree Producer Association and Les Harlow, Queens County Christmas Tree Producer, were welcomed to the meeting where Mr. Crouse advised that the Christmas Tree Industry has been operating in rural Nova Scotia for 100 years and noted that currently in Atlantic Canada, Christmas Tree growing and exporting is about a \$100 million industry, employing 20,000 people.

Mr. Crouse explained that the Christmas Tree industry has been on the decline for the past number of years due to the sales of artificial Christmas Trees. He advised that the number one reason people purchase artificial trees is because of having to clean up tree needles that drop off natural trees.

Mr. Murray Crouse provided information on the Atlantic Christmas Tree Research Centre in Truro and the work being completed to enhance Atlantic Canada's knowledge-based bio-economy through the development of science-driven technologies and products for increasing the sustainability of Atlantic Canada's Christmas Tree industry. He explained that the Centre is researching ways to will produce healthier, longer-lasting, highly marketable Christmas Trees and greenery products, called the SMART Christmas tree.

Mr. Crouse spoke on the following topics:

- Needle loss and cold acclimation
- Unique Balsam Fir gene pool
- Integrated pest management and bio-control technologies for pest control

- SMART Christmas Trees with enhanced growth and vigor, increased needle retention, and higher tolerance to stresses such as drought, acid rain, temperature, flooding, nutrient deficiency and mechanical injury

Mr. Crouse spoke on the SMART Christmas Tree Research Co-operative which was established to allow growers to invest in the research that is being conducted at the Research Centre, and they have committed \$350,000 to the research project. He advised that they are looking for groups and municipal units to invest in this project to raise the profile of the Atlantic Christmas Tree industry and its products on a global scale which will be beneficial for the economy of Atlantic Canada.

Following questions and comments from Council, and Staff, Mayor Clarke thanked Mr. Crouse and Mr. Harlow for their presentation and they left the meeting at 9:35 a.m. A copy of their brochure is attached at the end of the minutes.

3.2 Child Care Awareness Month - Queens Daycare

Amber Purdy, Director Tarina Risser, Acting Assistant Director, Queens Day Care, along with Carley and Alley (attendees) Queens Day Care, were welcomed to the meeting.

Amber Purdy proceeded to explain that June is Child Care Awareness month and it is a month to promote the value of quality child care and those who provide it to our communities and noted that they were presenting today to speak about what they do.

Amber Purdy advised that Queens Day Care is a licensed Child Care Facility that brings in over \$200,000 in wages to the county each year and they have over 50 children who attend the programs each week and noted that they have served over 500 children since 1998.

Ms. Purdy explained that staff are trained as early childhood educators and recognize that young children's early experiences and environment lay the foundation of future health, success and well-being. The early years, a period of rapid growth and development from 18 months until school age, are critical for a child's physical, social/emotional and cognitive development, and noted they provide programs and services designed to ensure children get the best possible start in life as well as detect barriers and challenges before children reach grade primary.

Following questions from Council, Mayor Clarke thanked the group for making their presentation and they left the meeting at 9:50 a.m.

4.0 **TABLING OF PETITIONS:**

There were no petitions to come before this meeting.

5.0 **PUBLIC QUESTION / COMMENT SESSION:**

**Shirley Shot
382 Shore Road
Brooklyn**

Mrs. Shot advised that she came to the last Council meeting and spoke about the flooding issue that is affecting two residences on Lawrence Street in Liverpool.

She explained that there is a licensed Day Care being operated in the basement of one of the houses that has been flooded which had to be torn apart due to damage caused by the flooding. She asked Mayor Clarke why she has not heard anything more from him on the flooding issue.

Mayor Clarke noted that at the last meeting he advised her that he would get back to her if he found out any information, but added the matter is still being investigated and legalities of water flow still being researched. He noted that he has not found any information to pass along. He hoped to have some information by the end of the month, but noted that he is not optimistic.

Dan MacLaren
112 Shore Road
Brooklyn

Mr. MacLaren noted that he operates a Bed & Breakfast at his residence and added that it may be affected by the road closure Brooklyn, due to construction work. He asked when the road is expected to be reopened.

Mayor Clarke advised that he will find out and get back to him.

6.0 APPROVAL OF MINUTES:

6.1 Council Minutes – May 27, 2014

It was moved by Councillor Fiske and seconded by Councillor Fralic:

THAT the minutes of the Regular Council meeting held on May 27, 2014, be approved as circulated.

MOTION CARRIED unanimously.

7.0 DANGEROUS OR UNSIGHTLY PREMISES:

There were no Dangerous or Unsightly Premises issues discussed at this meeting.

8.0 ECONOMIC DEVELOPMENT:

There were no items to be discussed at this meeting from the Economic Development Department, however; Councillor Fralic want to provide an update on the bid for Nova Scotia Music week. He informed that it has been delivered and he wanted to thank everyone who participated in putting the bid together.

Mayor Clarke wanted to comment on the Charlie Pride Concert and noted that over 2000 people attended the show, which provided many spin offs in the community. He noted that the promoters of this event were pleased with the facility.

9.0 CORPORATE SERVICES:

There were no matters to be discussed from the Corporate Services Department, however; Councillor Inglis noted that the Liverpool Fire Department have their ladder truck back in service and that things are moving forward with the North Queens Fire Service and their goal of having a new facility.

10.0 ENGINEERING AND WORKS:

10.1 Replacement Backhoe

It was moved by Councillor Waterman and seconded by Councillor Fiske:

THAT the Council of the Region of Queens Municipality approve the purchase of a new Caterpillar 430 FIT Backhoe from Atlantic Tractors and Equipment Ltd. for \$98,400.00 + HST;

AND FURTHER THAT \$7,617.00 be funded from the General Equipment Reserve.

Brad Rowter, Director of Engineering and Works, noted that the budgeted price set last fall was based on the Region's existing backhoe's condition, and the new selling price. Since this time, the backhoe's condition has deteriorated and the new model prices have risen.

MOTION CARRIED unanimously.

Brad Rowter proceeded to provide an update on the Capital Works projects taking place in Brooklyn and in Liverpool.

11.0 FINANCE:

There were no matters to be discussed from the Finance Department.

12.0 RECREATION AND COMMUNITY FACILITIES:

12.1 Sport Travel Assistance – Ron Williams

It was moved by Councillor Fancy and seconded by Councillor Norman:

THAT the Council of the Region of Queens Municipality approve a Sport Travel Assistance Grant of \$ 150.00 to Ron Williams to participate in the 2014 Canadian National Darts Championship in Halifax, NS, to be funded from the Community Grants and Programs budget line of the Recreation and Community Facilities Department.

Norm Amirault, Director of Recreation and Community Facilities, noted that this request meets the criteria for the Sport Travel Policy.

MOTION CARRIED unanimously.

12.2 Canada Day Celebrations Update

Councillor Norman provided an update from the Canada Day Committee which is comprised of a few members of Council, John Winters, Tara Smith, Kevin Page, along with Norm Amirault. She explained that there is a two day event planned for this year and provided a rundown of activities at Queens Place Emera Centre for the youth event on June 30th, "Schools Out Party" for youth 12 and older, the "Family Fun Day", and the 5 Km. run happening on July 1st

Councillor Norman advised flyers will be mailed out with all the July 1st events listed on it.

Councillor Fiske stated that July 1st events are also scheduled in North Queens with most of the actives happening at the North Queens Fair grounds. He noted that there will be fireworks as well.

Bill Cox, spoke from the public gallery and wanted to pass along that Royal Canadian Legion, Mersey Branch #38 , Liverpool will be celebrating their 75th Anniversary, hosting a, July 1st Garden Party beginning at 1:00 p.m.

13.0 PLANNING:

13.1 Rezoning Portion of 709 / 717 Main Street, Liverpool

It was moved by Councillor MacLeod and seconded by Councillor Fralic:

THAT the Council of the Region of Queens Municipality adopt a bylaw respecting the rezoning of a portion of PID#'s 70015078 and 70015060, located at 709 / 717 Main Street in Liverpool, from Restricted Residential (RI) to Neighbourhood Commercial (C3).

MOTION CARRIED unanimously.

13.2 Development Agreement - Eugene Conrad and Cathy Boliver, Gull Island Road

It was moved by Councillor MacLeod and seconded by Councillor Norman:

THAT the Council of the Region of Queens Municipality adopt an administrative policy respecting a development agreement to allow for a small engine repair and retail sales shop on property located at 20 Gull Island Road in the Community of White Point and identified as PID# 70049978.

Councillor Norman advised the Region's Municipal Planning Strategy had something in place to support these types of request.

Councillor Inglis noted that it is nice to see those who were impacted due to the closure of Bowater able to stay in the community.

Councillor MacLeod thanked Mr. Conrad and Ms. Bolivar for investing in the community by opening a small business.

MOTION CARRIED unanimously.

13.3 Rezoning of 9793 Highway #8, Caledonia

It was moved by Councillor MacLeod and seconded by Councillor Waterman:

THAT the Council of the Region of Queens Municipality adopt a bylaw respecting the rezoning of PID# 70154505 from General Residential (R2) and Mixed Use Rural Residential (R5) to Highway Commercial (C2).

Councillor Inglis noted that the North Queens Fire Association and members of the community have waited over 20 years for a new fire hall and it is nice to see that are getting closer to a new facility.

MOTION CARRIED unanimously.

13.4 Rezoning of 382 Main Street, Liverpool

It was moved by Councillor MacLeod and seconded by Councillor Fralic:

THAT the Council of the Region of Queens Municipality adopt a Bylaw respecting an amendment to the Region of Queens Municipality Municipal Planning Strategy, which amends the Generalized Future Land Use Map 4 (1) changing the designation of PID# 70026562, from Residential (R) to Commercial (C);

AND THAT the Council of the Region of Queens Municipality adopt a Bylaw respecting an amendment to the Region of Queens Municipality Land Use Bylaw, which amends Zoning Map (1) to change the Zoning of PID# 70026562, from Restricted Residential (RI) to Downtown Commercial (CI).

Councillor Norman noted that she cannot support this motion, because it is a huge jump for a property to be recategorized from for Restricted Residential to Downtown Commercial. She noted that she thinks that there is no need at this time to expand the Downtown Commercial area. She indicated that Council needs to be careful when dealing with planning because it is important to look at the long term outlook for these types of changes. Councillor Norman advised that it was the long term vision of past councils to have a Municipal Planning Strategy in place to protect future land uses.

Councillor Fralic commented that he does support this motion because the property is on the boarder of the Downtown Commercial zone and this request is no different from the others. He noted that Council needs to congratulate those who want to start business in the community and assist them when it is needed.

Councillor Inglis advised that he has researched this issue and noted that there is a difference with this request from the others. He noted that neighborhoods need to be protected and by having a Municipal Planning Strategy in place, the future of neighborhoods was protected by having a cut off for the Downtown Commercial Zone. He noted that in some communities there is a need for the expansion of commercial zones due to not having space available, but this is not the case in this request. Councillor Inglis added that currently, there is plenty of available commercial space in the downtown. He advised that he cannot support this motion.

Councillor Fiske stated that Council needs to support business owners.

Councillor MacLeod said that she supports this motion because it is important to grow the business community. She added that it is already tough for small business owners to get up and running, she doesn't want Council to discourage business. She noted that restrictions can be put in place on the property for future uses.

MOTION CARRIED with 5 for and 3 against.

13.5 Development Agreement – Debby Baggs and Matthew DesRoches – Beech Hill Road, Hunts Point

It was moved by Councillor MacLeod and seconded by Councillor Norman:

THAT the Council of the Region of Queens Municipality adopt an administrative policy respecting a development agreement to allow for a dog kennel, dog grooming and training and retail sales shop on property located at 800 Beech Hill Road in the Community of Hunts Point and identified as PID# 70055959.

Mike MacLeod, Planner, advised that letters went out to nearby property owners advising them of this request to allow them to speak on the matter at the Public Hearing earlier this morning.

MOTION CARRIED unanimously.

13.6 Friends of Hank Snow Society Request

It was moved by Councillor MacLeod and seconded by Councillor Fralic:

THAT the Council of the Region of Queens Municipality grant permission to the Friends of Hank Snow Society; for the period of August 13th to 17th, 2014; to:

1. Park Recreational Vehicles on the gravel overflow parking area beside Queens Place Emera Centre;
2. Park Recreational Vehicles on the grass area between the water tower and Bristol Avenue; and
3. Utilize PID# 70243233 and the southern portion of PID# 70081740 for overflow car parking

Councillor Norman spoke of the importance of having RV parking during this event.

MOTION CARRIED unanimously.

14.0 **QUEENS PLACE EMERA CENTRE:**

There were no matters discussed at this meeting from Queens Place Emera Centre.

15.0 OTHER:

There were no other items to be discussed at this meeting.

16.0 IN-CAMERA ITEMS:

It was moved by Councillor Fralic and seconded by Councillor Fancy that the proceedings go "In-Camera" at 11:10 a.m. to discuss the following:

- 16.1 Acquisition of Municipal Property
- 16.2 Sale of Municipal Property
- 16.3 Personnel Matters

MOTION CARRIED unanimously.

Bobbi Jo Goulden left the meeting following 16.2 – Sale of Municipal Property, and did not return.

It was moved by Councillor Inglis and seconded by Councillor Fancy that the proceedings come out of "In-Camera" at 12:02 p.m.

Baby Friendly Initiative

Mayor Clarke, upon the request of Councillor Susan MacLeod, asked council if they would like to have Natalie MacMaster present on Baby Friendly Initiative. Council agreed that they would request a presentation.

South Queens Middle School-Running Track

Councillor Fancy indicated that he had approached Principal Leo Campbell to see if there would be an outside running track at the new school. Mr. Campbell indicated to Councillor Fancy that there was a possibility of a 4 lane track. Councillor Fancy would like to approach the School Board to see what the plans are in this regard. He also stated it would be great if our community could have a six lane track and depending on the financial requirement potentially have this rubberized. Council Fancy indicated that we would then have the potential of hosting Para-Olympic games, wheel chair events, university events, and potentially other large scale track events.

Councillor Norman stated that she had sat on the committee that had been responsible for conceptual ideas for the facility and at that time there had been talk about installing a four lane dirt track. She also felt that the School Board should be asked because track is one sport that does not cost a lot of money to become involved in.

Councillor Fancy received support from council to move forth in speaking to the School Board to see what the plans are for the outdoor area at the South Queens Middle School.

17.0 ADJOURNMENT:


There being no further business, the meeting adjourned at 12:25 p.m.



Mayor Christopher Clarke, Chair



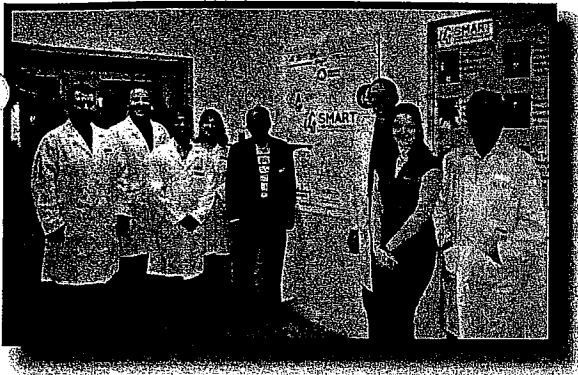
Jennifer Keating-Hubley, Director of Finance



Bobbi Jo Goulden, Recording / Management Secretary

Date approved: June 24/14

Christmas Tree Research Centre – Impact Report



CRC Research Team, Dalhousie University

The Mission

The Atlantic Christmas Tree Research Centre (CRC) enhances Atlantic Canada's knowledge-based bio-economy by developing innovative technologies and products to improve the economic and environmental sustainability of the region's Christmas tree and greenery industry.

What is a SMART tree?

SMART (senescence modulated, abscission regulating technology) trees is the technical foundation of the CRC. The SMART tree is the Christmas tree with superior needle retention, colour, aroma, pest resistance, tree architecture, responsive shearing characteristics and consumer appeal.



Christmas tree Research Centre at Perennia Park

About CRC

The Christmas tree and greenery industry is one of Atlantic Canada's rural economic nerve centers and adds nearly \$100 million to the regional economy. The industry faces scientific, trade, marketing and promotional challenges and competition from both the artificial tree market and real tree production in the US. Needle drop from post-harvest trees and wreaths threatens our industry, providing a market foothold for artificial trees and other tree species. Increasing pressure from customs and quarantine processes in export markets are further threats.

CRC collaborates with industry to develop lasting solutions for the Christmas tree and greenery industry. In 2009, national, regional and provincial agencies including NSERC, AgriFutures Nova Scotia, Growing Forward NB and the Atlantic Canada Opportunity Agency (ACOA) under the Atlantic Innovation Fund (AIF) program, all heeded the funding call. Those funds allow CRC to address critical research needs and seek solutions for the most pressing problems in the industry.

Benefits to the Christmas tree industry

- SMART Christmas trees that keep their needles longer
- unique Balsam Fir gene pool
- better understanding of needle loss and cold acclimation
- innovative technologies for improving needle retention
- integrated pest management (IPM) and bio-control technologies for pest control



Inspiring Minds
Faculty of Agriculture

RESEARCH MILESTONES & FUNDING

Research Platforms & Leaders

Needle Abscission Physiology and Abscission Control Technologies: Research under this platform will help to uncover the physiological processes that lead to needle drop and develop science-based innovative technologies to promote needle longevity and freshness. Principal Investigator: Dr. R. Lada, Dalhousie University.

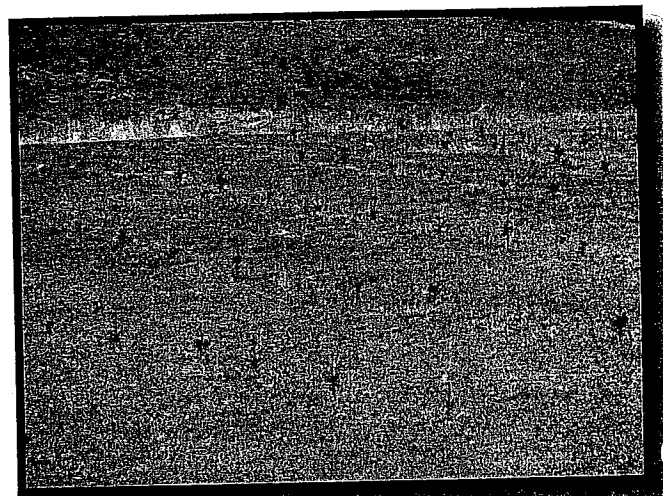
Tree Molecular Breeding and Germplasm Development: Research under this platform will identify trees with high needle retention, develop protocols for mass multiplication and enhance germplasm. Co-Investigators: Dr. A. Schofield & Dr. R. Lada, Dalhousie University.

Biocontrol and Pest Management: Research under this platform will identify genetic and environmental influence on pest resistance. Principal Investigator: Dr. D. Quiring, UNB.

Milestones

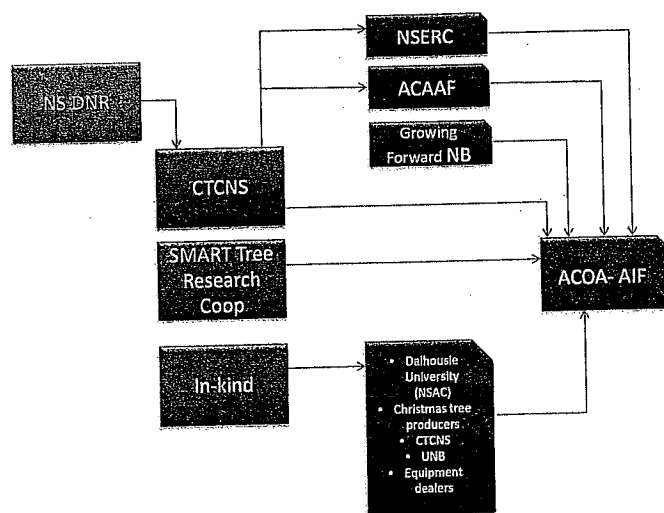
1. Improved genetic resistance to most common insect pests identified.
2. Identified relationship between commercial traits and resistance to pests.
3. Identified link between stand density and pest abundance.
4. Established link between temperature and distribution and damage by wooly adelgid.
5. Identified NAR (needle abscission resistance) clones from the Atlantic province and from the seed populations.
6. Developed protocol for tissue, cell and pollen culture, mass multiplication and DNA, protein markers- associated with needle abscission protocol finalized.
7. Uncovered physiological mechanisms and signals involved in needle abscission and the role of certain abiotic stresses on needle drop.
8. Identified specific markers associated with needle retention and other traits; completed biometric profiling of clones and NAR and integrated biometric profile information.
9. Discovered role of roots and root derived factors in needle retention.
10. Advanced germplasm with high needle retention qualities and other desirable traits.
11. Developed, formulated and tested Needle Abscission Prevention Agents (NAPA).
12. Produced SMART Christmas tree scions invitro.

13. Developed and tested Artificial Root Technology (ART).
14. Determined influence of pruning density and plant growth on susceptibility to pests; established the link between mortality rates and natural enemies and potential biological control.

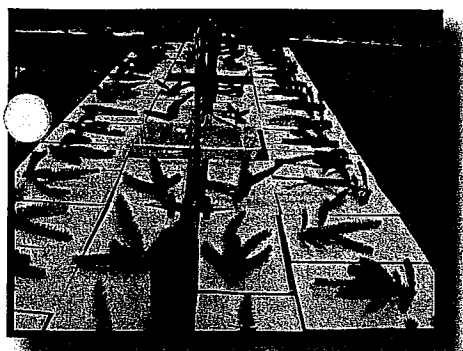


Balsam fir Germplasm Centre, Dalhousie University. SMART Tree clones with high needle abscission resistance are planted.

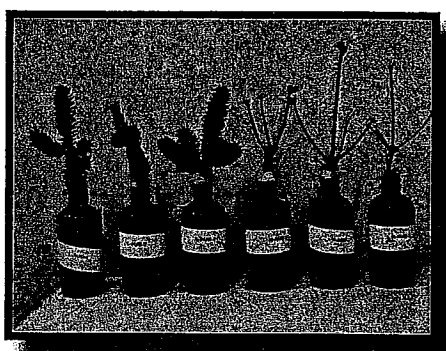
FUNDING MODEL FOR CRC



KNOWLEDGE, PRODUCTS & TECHNOLOGIES



Balsam branches being screened for an understanding of their needle retention properties



Branches being tested for needle abscission resistance under different treatments



Branches in a closed system being used for volatile collection and analysis

RESEARCH AND INNOVATIVE TECHNOLOGIES WILL CHANGE THE CHRISTMAS TREE INDUSTRY

KNOWLEDGE

While there is significant knowledge generated through research and it is ongoing, the key knowledge discoveries are:

Tree molecular breeding and germplasm development:

- needle abscission resistance (NAR) varies among clones
- NAR ranking is consistent for 120 clones and it is stable
- callus induction in balsam fir is possible
- there is genetic variation in NAR among NS phenotypes

Needle abscission physiology:

- needle abscission (NA) is triggered by ethylene, a phytohormone
- low NAR genotypes synthesize ethylene faster; respond to lower concentrations of ethylene, and respond faster to ethylene than high NAR genotype
- post-harvest induces significant changes in endogenous hormones, ABA levels increase, auxin levels decline, cytokinins increase
- auxin application promotes NA
- dehydration above 20%, depending on the clones, is a factor in reducing needle longevity
- cold acclimation (CA) is beneficial for NR in some clones. CA promotes endogenous hormone ABA
- bacterial population increases exponentially post-harvest
- the relationships between NA and over 11 nutrient concentrations of needles and soil were found to be weak
- difference in N, Ca, Mg, Mn & Zn between contrasting clones. Only N & Ca were higher in the clone that had slower NA
- P, Fe & Cu concentrations declined during senescence & abscission. They were negatively associated with NA
- 12 new volatile compounds discovered in balsam fir and there is a possible link between NV and NR
- post-harvest NA is tightly linked to moisture loss in the needles, decline in needle capacitance and membrane damage

- polyols at all concentrations promoted NA. Similar response was seen with Manitol, Sorbitol & Myo-inositol. Polyols do not appear to be a factor in cold-acclimation induced enhanced NR.

Pest management and biocontrol technologies:

- In New Brunswick the mean percentage of shoots damaged by twig aphid decreased during our four-year study from 27.1% in 2009 to 6.3% in 2012. Linear mixed models suggested that a significant proportion of the variation in damage was attributable to year, clone and the clone x year interaction. During each year, except for 2012, when twig aphid densities were very low ($6.3 \pm 0.4\%$), clone explained between 16.5% and 31.4% of variation among trees. Aphid damage at Debert was negligible in 2011 and 2012 and thus data for these two years were not included in analyses.
- Broad-sense individual () and clone-mean () heritability estimates varied between years in each orchard, due in large part to yearly variations in twig aphid damage. Heritability estimates were positively correlated to the mean percentage of shoots damaged by twig aphid. When $> 15\%$ of shoots exhibited symptoms of feeding by twig aphid, heritability estimates were relatively high (>0.20 and >0.70 , respectively).
- In New Brunswick, where damage by the twig aphid was highest, but not in Nova Scotia where damage was very low, correlations of mean clone damage among years were positive and generally significant, indicating that the resistance ranking of the different clones remained similar among years. The significant clone x year interaction in New Brunswick was due to minor changes in clone ranking among years and does not reflect major changes to clone susceptibility over time. Twenty-five percent of clones consistently ranked in the top 50% of clones during each of the four years.

KNOWLEDGE, PRODUCTS, TECHNOLOGIES

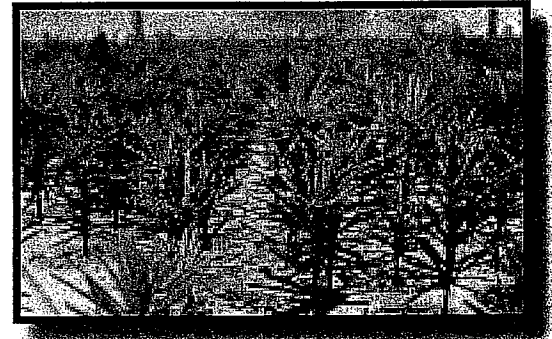
PRODUCTS & TECHNOLOGIES

Several products and technologies are under development, some of which have been disclosed.

1. Abscission promoting Needle Volatile Compounds – *compounds that promote needle loss discovered which will have application in organ (leaf, flower, fruit thinning in horticulture sector, sprout control). (Disclosed)*
2. Foliar application of a phytohormone in controlling NA. *A phytohormone is discovered to promote needle retention. Further research is in progress.*
3. AMCs in promoting needle retention. *AMC has been identified to promote needle retention significantly. Whole tree research is in progress.*
4. Clones with high NAR under dehydration postharvest: *Several clones and phenotypes were identified to have high NAR, which were grafted and set in Balsam fir germplasm centre. (Disclosed)*
5. Needle Abscission Control Agents (NACA): *Several NACA's were developed and tested to promote needle retention. (Disclosed)*
6. Four anti-abscission compounds: *Four anti-abscission compounds that delay needle fall discovered, tested and developed. (Disclosed)*
7. Integrated Controlled Environment Storage and Transportation (ICEST) technology. *An ICEST technology developed which will help to reduce the postharvest needle loss during transshipment significantly (Disclosed).*
8. Synthetic Root Sap Technology- *under development*

In development

1. Protocols to advance clones with high NAR
2. Artificial Root Technology
3. Several formulations to promote needle retention.
4. Membrane protective agents (MPA)
5. The SMART tree



Balsam Seedlings

Christmas Tree Research Centre
Dalhousie University
Dalhousie Agricultural Campus
90 Research Drive
Perennia Park, Bible Hill, NS, B6L 2R2
Tel: (902) 893-2309/893-5379
FAX: (902) 893-1404
Contacts: Dr. R. Lada, Director,
CRC: Rachel Kennedy, PAO



Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada

Nova Scotia's ACAAF Council
Advancing Canadian Agriculture and Agri-Food

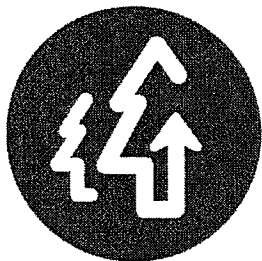
Canada



Atlantic Canada
Opportunities
Agency

Agence de
promotion économique
du Canada atlantique

Canada



*SMART Christmas Tree Research
Cooperative Ltd.
"a growing investment"*

60 Research Drive, Bible Hill, NS, B6L 2R2
Ph: (902) 893-2293 Fax: 893-7063 E-mail: info@ctcns.com

Background

The SMART Christmas Tree Research Co-operative was established to allow growers to invest in the research being conducted at the Christmas Tree Research Centre in Bible Hill, Nova Scotia. The primary goal of this research project is to increase rural wealth in the Christmas tree industry by developing innovative products and technologies in the areas of tree molecular breeding, needle retention and pest management.

Financial commitment

The SMART Christmas Tree Research Co-operative has committed \$350,000 to the research project on behalf of the Atlantic Canadian Christmas tree industry. This commitment is an important portion of the approximately \$6 million in funding being contributed. To generate these necessary funds, preferred shares in the Co-operative are available to industry members and are being sold for \$500.00 each.

Why invest?

This is an opportunity to raise the profile of the Atlantic Canadian Christmas tree industry and its products on a global scale. In addition, the Co-operative will have the option to commercialize and market any products or technologies the project develops.* Should the Co-operative decide it does not wish to, or cannot, commercialize any product, its members will then have the first opportunity to make application for development. The board of the Co-operative is limited to Atlantic Canadian Christmas tree growers and greenery producers, so decisions will always be made by growers, for growers.

Share breakdown

A preferred share is \$500.00. It can be purchased all at once or over two payments of \$250.00 per year. A member may purchase more than one share. The Atlantic Provinces Industry Share Package includes 20 shares and five years of promotion in the Nova Scotia Christmas Tree Journal for \$10,000.00. Every individual or business who joins the Co-operative must also purchase a one-time \$10.00 member share.

To purchase shares, contact your local association or:

Krista Vroegh
60 Research Drive, Perennia Innovation Park
Bible Hill, NS B6L 2R2
Phone: (902) 893-2293
Email: kvroegh@nsfa-fane.ca

Christmas tree Research Centre

Summary of Research Activities

Dear Reader,

On behalf of the Christmas tree Research Centre, and Dalhousie University, I wish you all a very happy New Year, 2014.

During 2013-14, CRC made significant strides in research, development and outreach activities. Funding from NSERC, AIF and ACAAF continued. Growing Forward New Brunswick funding programme ended and a final report on the Pest control platform submitted. During this year, two of my graduate students successfully defended their Master's thesis and their research received exemplary compliments from the external examiners. On behalf of CRC and the industry community, I would like to Congratulate Ernest Korange and Melissa Georgeson for their contribution to science and on their graduation. Ernest is currently working as a Ph.D. student with me in CRC and continuing his research on "Mechanical stresses and needle abscission physiology". Gaye MacDonald is continuing her research on "Lipid metabolism in postharvest needle abscission in balsam fir".

Under the Tree Molecular Breeding Platform, we have screened 120 clones from Debert, NS; 24 top ranking clones from Kingsclear, NB; and 134 trees from NS grower lots in three major production areas last September. Six superior trees from commercial producer's lots were obtained and grafted on to the rootstock material in Balsam fir Germplasm Centre. We have also developed 35 lines from embryonic callus from the seeds of CRC superior germplasm through controlled crosses and open pollinated cones. We have also attempted various tissue culture techniques for mass multiplication and developed protocol for induction of callus from male reproductive tissues, female reproductive tissue, vegetative shoots and buds. The next stage is to standardize and develop protocols for transforming callus to shoots and roots, which is ongoing. We are also working on identifying RNA transcripts and specific markers associated with the specific traits. We will soon be submitting RNA transcripts from needles of several clones. We have also obtained samples from the Abscission zone and needle tissues during various stages in postharvest to do transcriptome study to understand the gene expression and identify specific markers, which we will use it to identify ideal candidates with high needle keepability from a large pool.

Under the Needle Abscission Physiology platform we have made significant discoveries and generated new knowledge, developed innovative products and technologies. Some of the highlights are:

- Balsam fir is known to have high aroma that is unique to this species. It is possible that the aromatic volatile compounds released during various postharvest operations could be detrimental to keepability. We have discovered 12 Volatile Terpene Compounds (VTCs) in balsam fir. These VTCs constitute the unique aroma in balsam fir. The total terpene concentration was higher with the high needle abscission resistant (NAR) clone than the low NAR clone. The low NAR clone had high beta-pinene concentration than the high NAR clone.
- The VTCs especially, β -pinene, β -terpinene, fenchyl acetate, camphene and 3-carene were released in significant quantities prior to initiation of needle abscission suggesting they could play a role in abscission.

- We also discovered that while ethylene induce VTC, ethylene and VTC independently initiate needle abscission.
- We have also discovered that the photosynthetic electron transport in photosystem II functions such as Fv/Fm, ETR are indicative of needle freshness, which are positively correlated with needle keepability. These parameters would serve as indicators of keepability. Further research is in progress.
- Christmas trees postharvest are often subjected to dehydration until it reaches homes and rehydration after it is set up. It is possible that dehydration-rehydration process could exert significant stress to trees. While we have investigated the effect of dehydration and identified that dehydration has indeed influenced keepability negatively at least in some clones beyond a threshold we have no information on the effects of dehydration-rehydration on keepability. Our investigation relating to dehydration and rehydration effects suggests that needle loss occurred at a higher rate and intensity in trees moved from a state of dehydration to rehydration. While ethylene was not released under rehydration, needle abscission occurred suggesting the postharvest needle abscission can occur both via ethylene-dependent and ethylene-independent pathways. Again, no needle abscission or ethylene evolution observed in trees with intact roots suggesting strongly that the needle drop is triggered by postharvest factors.
- It was speculated that xylem blockage could be a possible reason for the decline in water consumption, possibly leading to dehydration, triggering needle drop. Our anatomical studies revealed that xylem blockage did not appear to be the factor inducing needle drop. This was also confirmed through another study by removing section of the stem at the bottom at various frequencies. None of the treatment improved water consumption again suggesting xylem blockage may not be the reason for needle drop. Porometry investigations revealed that the stomatal conductance decline both under dehydrated and hydrated conditions but more rapidly under dehydrated state. Such a response would help to control water loss and possibly extend shelf life. Further research is in progress to understand the stomatal behavior of the high and low NAR clones.
- **Integrated Storage and Transportation (IST) Technologies:** We have through a series of experiments developed an IST technology for extending keepability. The IST technology increased the keepability by 5 folds. Under the IST technology it took 68 days to lose 10 per cent needles as against the control, which lost 10 per cent needles in 16 days. The IST technology has been disclosed to the university as the potential commercial technology.
- **Needle Abscission Delaying Agents:** Several potential NADA's were discovered to delay needle loss. In a whole tree system, Compound NADA-B caused a significant delay in needle loss at all levels. For example, treatment with NADA-B took 37% longer to lose 1% of its needles, 27% longer to lose 5% of its needles, and 30% longer to lose 10% of its needles compared to the control. The product has also been disclosed to the university.

- **Nutritional Physiology and Postharvest needle loss:** Fertilization to Christmas tree plantations and the effect of fertilizer application on keepability has been intensively debated. There is little or no scientific evidence on the link between needle nutrient content and keepability. Several experiments were conducted to understand and uncover the link between needle nutrient concentrations and needle keepability. The following are the results:
 - While there was a significant difference in needle nutrient contents especially, N, Ca, Mg, Mn and Zn, there was no significant difference in needle abscission at any point of time suggesting that these nutrient elements in the needle does not have direct influence on postharvest needle abscission.
 - During postharvest observations the levels of P and Fe changed significantly with no other changes that were statistically significant. The changes in P and Fe however, were negatively correlated with needle retention.
 - Pre-harvest needle concentration of Zn, Ca, Fe and Mn significantly positively correlated with NRD among different tiers of a same clone.
 - Application of various concentrations of nutrients, however promoted needle drop.
 - While needle retention was superior with Lunenburg county samples, there was no significant link between needle nutrient concentration and needle retention.

- During this period of report, seven disclosures have been made to the university.
- We have published 7 scientific articles in peer-reviewed, international journals.
- Six conference presentations, seven poster presentations were made at the International Christmas tree research and extension conference.
- Six oral presentations were made.
- An Impact Report was prepared for the SMART Christmas tree Research Cooperative.
- CRC organized the International Union of Forest Research and Extension Conference. Nearly 30 scientists and extension workers from around the world participated.
- Three media events were given through various TV networks.
- For the first time, a Land and Sea Project was initiated and completed. It was aired on Dec 21st, 2013.

I am proud to report that the International Scientist regarded the research that is carried out at CRC is indeed a world-class research and CRC stands as a World Centre for Christmas tree Research. CRC works diligently in partnership with CTCNS and other regional associations to uncover knowledge, develop innovative science-driven products and technologies for positioning our industry in the competitive global market.

At this point, I would like to thank my research team, funding agencies, our partners, provincial Government Departments of Nova Scotia and New Brunswick, Dalhousie University for their efforts and support in making our collective dreams come true.

Innovative, science-driven products and technologies are the future for solving industry problems and we are committed to engage in that process.



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