Institut de recherche sur les feuillus nordiques Inc.
Northern Hardwoods Research Institute Inc.

THE LEAFLET
NHRI's Monthly Newsletter
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AMERICAN BEECH
What's the problem with beech?

All was well for our American beech until a scale insect (*Cryptococcus fagisuga* Lind.) was introduced from European beech at Halifax, NS around 1890. Its association with the *Nectria ditissima* fungus initiated the beech bark disease (BBD) complex. Today, the infection covers all of the Maritime provinces and reaches the Lake States.

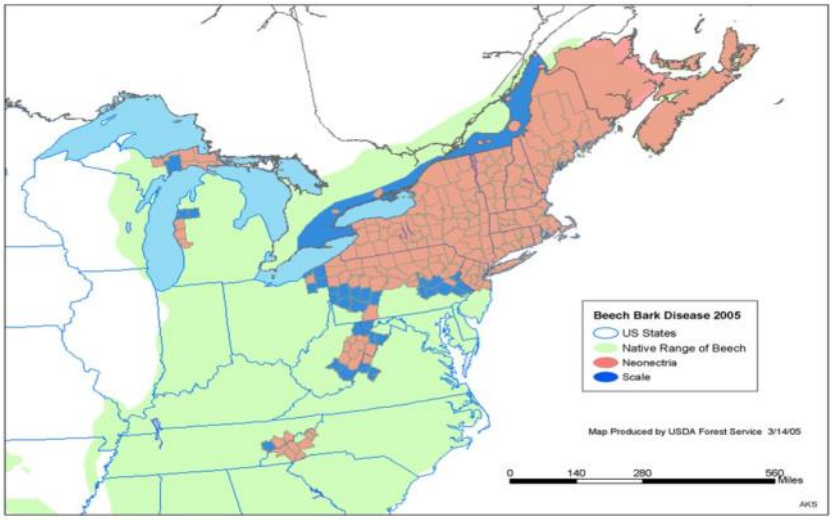

Figure 1. Map produced by USDA Forest Service showing the spread of Beech Bark Desease in 2005.

Beech trees in the region are heavily infected by the beech bark disease (BBD), a complex phenomenon that starts when bark tissues are attacked by the beech scale insect *Cryptococcus fagisuga* Lind. and then become susceptible to *Nectria* fungi. The BBD is expressed only after the scale-altered tissues are attacked by the *Nectria* fungi. In 1927, the disease was first observed in the southeastern part of New Brunswick which gradually spread towards the northwest. This disease had infected the entire province of New Brunswick by 1969 (Magasi and Newell 1982). The disease has made those trees less commercially desirable compared with other tolerant hardwood tree species in New Brunswick. When beech trees die, they produce suckers from their roots (genetically identical trees). However, these suckers do not become big trees as those trees will subsequently be affected by the beech bark disease. As a result, a dense understory commonly occurs in stands infected with (BBD) which interferes with other desirable tree species (e.g.: sugar maple, yellow birch).

(Continued on next page...)

POINTS OF INTEREST INSIDE THIS ISSUE

AMERICAN BEECH

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AMERICAN BEECH
What's the problem with beech? (Continued...)

It is however acknowledged that as much as 5% of beech individuals are resistant to the BBC (although not completely immune). Last month, while planning hardwood management activities Charles Neveu discovered such an indivdual near Saint Quentin, New Brunswick. Near Rang 5&6, on J.D. Irving Limited's land, Charles found a seemingly unaffected individual beech that had been spared during a single-tree selection treatment back in 1999. Although the tree is in poor health for reasons other that the BBD, it is 23 meters in height and has a diameter at breast height of 73cm. It is likely over 200 years old but has a spiral seam-split on a couple of faces that makes it a tree of high risk of losing health and value (category R3 from the NHRI tree classification system).

Because the specimen of good form (F1 from the NHRI tree classification system) is considered un-common, the company has decided to preserve it and designate it as a Legacy Tree in their Unique Sites program. Thank you Charles and JDI for sharing this find with us.

Figure 2. Picture of crown and stem of a beech tree seemingly unaffected by beech bark disease. The tree discovered by Charles Neveu on JDI's land near Saint-Quentin, NB is 23 meters in height and has a diameter at breast height of 73cm. It is likely over 200 years old.

NHRI Tree Classification System

" It is however acknowledged that as much as 5% of beech individuals are resistant to the BBC - although not completely immune."

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AMERICAN BEECH
Current Stand Archetypes in New Brunswick

American Beech
Current Stand Archetypes in New Brunswick

In New Brunswick, American beech (BE) is widely distributed in tolerant hardwood stands. It is considered as a species of low commercial importance that competes with more important species like sugar maple and yellow birch. Beech bark disease (BBD) is also commonly present in stands having a dense BE under-story, and it has infected the entire province of New Brunswick in the past decades. In conjunction with previous forest management activities, it has created a variety of aftermath forest conditions with different proportion of species. In this context, we do not know the proportions of each types of forests that were created by past management and by BBD. Proper management of such stands requires detail understanding of forest stand structure. Therefore, it is important to classify and characterize forest stands based on BE dominance in different layers of forest canopy.

TECHNICAL NOTE
Research Highlights

In order to provide useful information for future management of BE-present stands, this study: 1) attempts to identify, classify, and characterize BE-present forest stands in New Brunswick, 2) evaluates the proportion of BE-present archetypes, and 3) demonstrates the location of these archetypes within the province of New Brunswick.

Results Highlights

- Stand archetypes distributed spatially in New Brunswick were identified from Type-1 to Type-5, in order of increasing beech abundancy.
- Beech would be likely to dominate more stands in the future by their strong competition abilities in the absence of proper silviculture measures.
- Since BE has low commercial value and a high risk of being infected by BBD, a BE-dominant stand has far less economical value than stands dominated by other hardwood species.

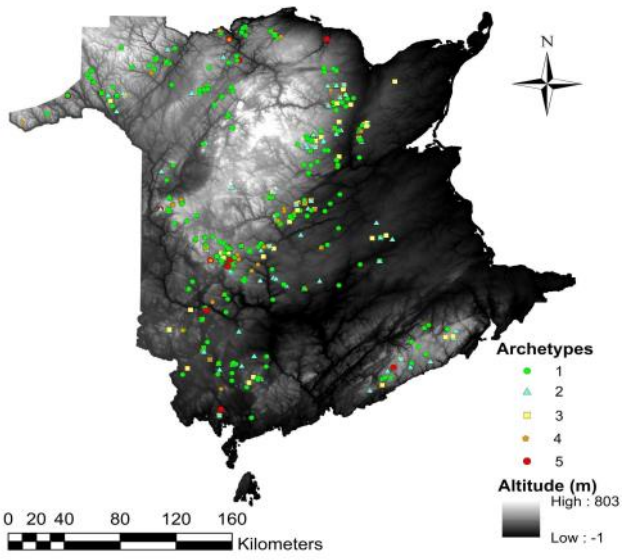


Figure 1. Spatial distribution of plots containing beech. Lighter shade of gray indicates higher altitude and darker shade indicate lower altitude.

Green Triangle = low abundance of BE

Yellow Square = moderate abundance of BE

Red Circle = high abundance of BE.

Technical Note

AMERICAN BEECH
Factors Associated with Beech Dominance in NB

American Beech
Factors Associated with Beech Dominance

Dense Beech understory can inhibit the regeneration and growth of other desirable hardwood species (e.g.: sugar maple, yellow birch), thus reducing stand productivity and quality. Studies have shown that local and largescale variation in BE abundance is the outcome of several interacting factors (Messier et al. 2011, Bose et al. 2017). In general, (1) abiotic factors such as soil (moisture and nutrients), topography (slope, aspect, and altitude), and climate (temperature and precipitation); and (2) biotic factors such as insect/pest (BBD), wildlife browsing, and harvesting (season, intensity, and root damages) are considered responsible for BE dominance. In this context, a comprehensive study is necessary to assess factors associated to BE dominance.

Technical Note

TECHNICAL NOTE
Research Highlights

This study aimed to (i) identify key abiotic and biotic factors related to BE dominance, (ii) establish their relationship with BE dominance, and (iii) provide necessary information to help design silvicultural solutions for managing BE-present tolerant hardwood stands in New Brunswick.

Results Highlights

- Beech abundance is related to abiotic factors (soil, altitude, depth of water table, temperature, and precipitation) and biotic factors (stand condition, treatment type and intensity).
- Beech was more abundant in hardwood forests located in nutrient-poor, warmer sites where a low intensity partial cut was conducted.
- Beech abundance is likely to increase in the absence of silviculture intervention and in situations where harvesting promotes vegetative propagation. Current practices must change!

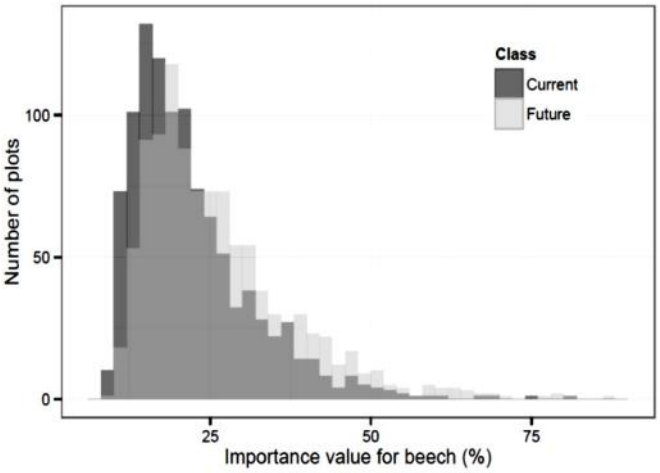


Figure 1. Current distribution of beech: during observation period, Future: scenario of increase in mean annual temperature by 2100. Increase in mean annual temperature by 4°C was assumed according to Swansberg et al. (2004).

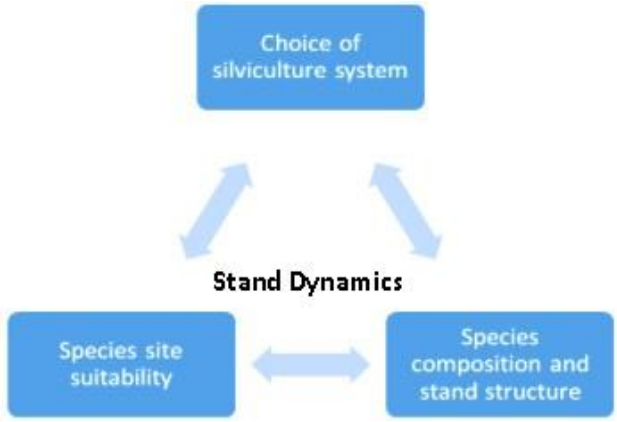


Figure 2. : Key factors controlling dynamics of beech-present stands.

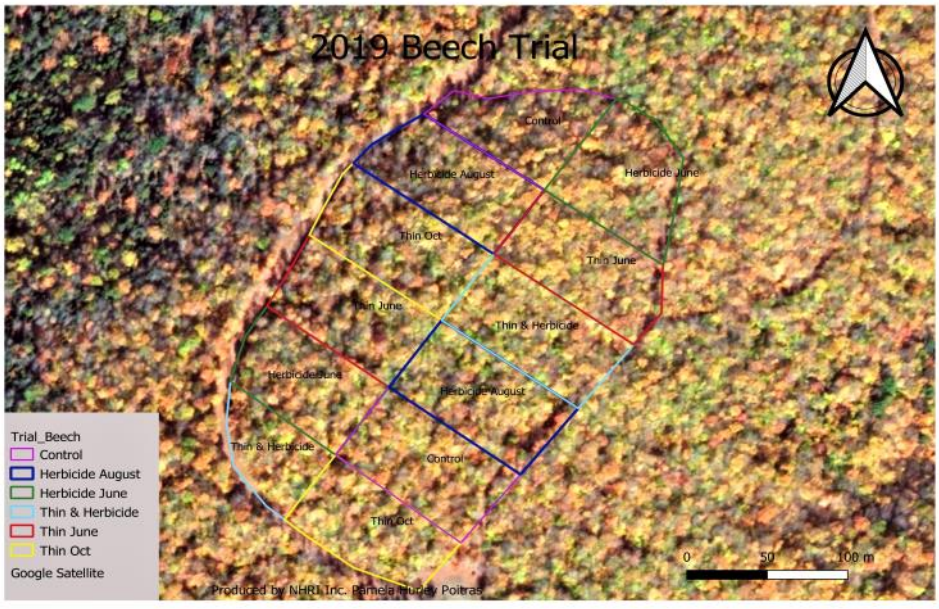
ONGOING RESEARCH
Riley Brook Beech Management Trials

RILEY BROOK BEECH TRIAL
Preliminary Research: Managing Beech Regeneration

The NHRI's Precision Silviculture Team (PST) is currently working on a preliminary research project on various silviculture treatments that could be applied to better manage beech regeneration.

The project aims to test various silviculture tools and protocols to better manage beech regeneration which predominantly interferes with sugar maple and yellow birch saplings establishment and growth in tolerant hardwood stands.

The NHRI's PST have established a beech regeneration control trial under maple canopy in Riley Brook, New Brunswick. The control trial has a total area of 6.3 ha and is divided in 12 sections of approximately 0.5 ha each. Both mechanical and chemical treatments are being tested on various control plots and at various times during the season. The project's objective is to identify and vet which silvicultural regime is most feasible and effective to control beech regeneration so that sugar maple and yellow birch have a better chance to establish.



ON-GOING RESEARCH

Best Management Practices to Minimize American Beech in Tolerant Hardwood Stands

American beech, not a commercially important species in our region, occurs sporadically on many site types in Northeastern North America. Its ecological niche, propensity to regenerate, susceptibility to the beech bark disease complex and resilience make it a serious interfering plant for the species of commercial importance such as sugar maple and yellow birch.

Furthermore, the species has been very opportunistic and has very well adapted to past forest management practices and other gap level disturbances. Several studies in the New England States and in the eastern Canadian Provinces demonstrate an alarming trend; the distribution, occurrence and abundance of American beech in our forests has been increasing at a rapid pace in the last few decades. Compounded with the effects of a changing climate, a clear shift in species composition is occurring that could have negative consequences to the forest sector.

The consensus amongst experts in the field of hardwood and mixed wood management is that if current silviculture practices do not evolve, the beech problem will worsen exponentially in the future.

The Northern Hardwoods Research Institute (NHRI), inspired by its own research and that of leading experts on the topic, is currently working on the production of the first version of the *Best Management Practices (BMP) to Minimize American Beech in Tolerant Hardwood Stands*. Once completed it will serve as a practical guide for forest practitioners and landowners to mitigate the potential negative effects of beech in their forests. This important tool is due to be completed by the fall of 2019.

" The consensus amongst experts in the field of hardwood and mixed wood management is that if current silviculture practices do not evolve, the beech problem will worsen exponentially in the future."

PEOPLE IN THE SPOTLIGHT

Ines Khedrhi: Newest Addition to our Team!

Dr Ines Khedhri, Scientific Researcher at NHRI

Ines Khedhri recently joined our team as a Scientific Researcher. Her work at NHRI revolves around researching modelling approaches applicable to the prediction of regeneration, quality and growth of northern hardwoods. She is currently building a statistical model that will help better predict the growth and quality of hardwoods in a given stand. The models constructed by Ines will serve to develop various field tools to help foresters better predict these variables based on field data.

Originally from Tunisia, Ines speaks and writes three languages fluently – English, French and Arabic. She holds a doctorate degree in biology from l'Université de Tunis (El Manar) and recently completed her post-doctoral work with the Université de Moncton's K.-C.-Irving Research Chair in Environmental Sciences and Sustainable Development.

Doctor Khedhri brings a wealth of knowledge to our team, especially when it comes to her experience in managing large databases and developing statistical models. Her expertise coupled with her professionalism, excellent work ethic and solutions driven mindset, make her a very valuable addition to our team. Her work has already proven to be a key element to reaching some of our research objectives and deliverables, and more importantly, very useful for our members and clients! It should be obvious why we are so happy and excited to welcome Dr. Khedhri in our fold!

WELCOME TO THE TEAM!

"Her work has already proven to be a key element to reaching some of our research objectives and deliverables, and more importantly, very useful for our members and clients!"

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UPCOMING EVENTS

NHRI Roundtable on Regeneration

Managing Forests Today to Ensure Quality Stock Tomorrow

On Monday July 29th, 2019 several of our academic, research and industry partners will converge at the NHRI for a full day roundtable on tolerant hardwood and mixed-wood regeneration. Everyone involved will have a chance to discuss their research projects and brainstorm on stumbling blocks and solutions surrounding our regeneration research agenda. Based on this work our team will produce a special edition of our monthly newsletter in August. The special edition will revolve around innovation and research in the field of hardwood and mixed-wood forest regeneration.

October 2-3, 2019 - Campbellton, NB

Quality Hotel & Conference Centre

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Watch for program and registration details later this summer!

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