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NORTHERN HARDWOODS RESEARCH INSTITUTE'S MONTHLY NEWSLETTER

# THE LEAFLET

HARVEST KNOWLEDGE, PROMOTE GROWTH

## SMARTER SILVICULTURE…

## ADAPTING TO A CHANGING CLIMATE!

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# FOREWORD TO THIS ISSUE

## CLIMATE CHANGE AS A CATALYST FOR IMPLEMENTING ADAPTIVE MANAGEMENT

Full disclosure about this issue of the Leaflet… NHRI is not trying to jump on the climate change panic band wagon, and we are certainly not trying to add any further anguish to some of our readers who may already be "climate stressed" enough as it is. While we appreciate the seriousness of the issues surrounding climate change, we are convinced that the climate science space is already occupied by a considerable amount of very capable people that have much more in-depth knowledge of the issue than we could ever hope to acquire. In short, our objective is not to further develop the science surrounding the problem, but rather to focus on the practical, affordable, and timely solutions that good silviculture practices can bring to the table in terms of adapting to climate change and mitigating some of its most serious negative effects.

With that in mind we have recently put our team to work on climate change adaptation and mitigation. We have come to believe that there are many aspects surrounding this important issue that converge almost symmetrically with some of NHRI's core objectives. Below are three of the most important reasons why we believe our team can play an important role when it comes to adapting to climate change and mitigating some of its negative effects on our forests. Contrary to some schools of thinking that recommend setting vast areas of forests aside, the Northern Hardwoods Research Institute is a firm believer (backed by research findings) that well managed and highly productive working forests are the best option for the mitigation of the negative effects of a changing climate.

**WE ARE SOLUTION DRIVEN**… While the problems related to climate change have been articulated clearly and continuously, one must dig much deeper to find pragmatic and affordable solutions. We all know that cutting our use of fossil fuels would be the right thing to do and would help stabilize the earths' climate in the medium to long term. However, international efforts have failed time and again at attaining carbon emission reduction targets, and even if they succeeded, this solution would bring relief only in the long term.

At NHRI our experience revolves around finding pragmatic and timely solutions for our clients through the development and field implementation of good silviculture practices. We firmly believe that forestry and silviculture practices offer some of the most promising, timely and affordable solutions available when it comes to climate change. As you will see in the following pages we are working hard on developing and promoting these solutions. Developing, promoting and implementing silviculture solutions is simply part of our DNA… nothing new there!

**WE WORK CLOSELY WITH PEOPLE IN THE FIELD**... Complex models and climate change forecasts are necessary, and very helpful tools, when it comes to predicting the effects of climate change; however, they offer little in terms of practical solutions to these forecasted negative effects. Our team's strength revolves around interpreting scientific data from a forest management perspective, and more importantly, making it accessible, and useable, by people doing the work in the field. If silviculture is to fulfill its impressive potential in terms of alleviating some of the worst forecasted effects associated with climate change, it will ultimately depend on the decisions made by forest managers, forest technologists and technicians, operations supervisors, woodlot owners and machine operators. Putting the best available knowledge and tools in their hands, and bringing support to them in implementing these solutions in the field, is really were we shine… it's our bread and butter.

**WE BELIEVE IN ADAPTIVE FOREST MANAGEMENT**… If there is one thing everyone agrees on, it's the fact that climate change will bring with it much uncertainty! In the face of an uncertain future, it is necessary to act with the knowledge that we have, measure the outcomes and readjust our targets frequently. The name coined for such an approach is "adaptive management". The four steps of adaptive management are as follows: first, using the best available knowledge, decide on the change that is needed to mitigate negative effects that threatens your management objectives. Secondly, implement the strategy and decide on the performance indicators to use in the future to evaluate the results. Then, measure attainment towards the objectives and evaluate effectiveness. Finally, adjust accordingly and re-start the process. Whether dealing with the potential for devasting fires, or a spiking population of insects, we have been preaching adapting management since our inception. A task that has sometimes proven challenging in a more traditional sector that manages for very long term results. We hope that if there is at least one good thing that comes out of climate change it is that it will serve as a catalyst for more industry and government players to speed up efforts to implement adaptive management and invest in the required science behind the concept!

## THE TIME FOR ADAPTIVE FOREST MANAGEMENT HAS COME

WHAT CAN WE DO NOW TO ENSURE OUR FORESTS THRIVE IN A CHANGING CLIMATE?

According to the Intergovernmental Panel on Climate Change, under the more likely business as usual scenario, where humanity continues to emit greenhouse gases at the current rate, we can expect one degree of increase in average annual temperature per decade. By the end of this century we could be experiencing a climate like that of Virginia today. Great news! We can contact the tree nurseries down there, order black cherry, black walnut and loblolly pine and we are all set right? Absolutely not; at least not just yet; the next late spring frost would likely kill the new recruits!

It is certain however that we will witness a variety of impacts in the future, both in the forest itself and in the forest sector resulting from climate change. Case in point is with regards to our spruce; the backbone of the industry today. According to Dr, Jean-Martin Lussier at NRCan, it is expected that it will be more difficult to produce spruce, or at least we will have silvicultural challenges to do so. If the drought issues aren't so bad and if we have more heat and maintain water levels, then we may have an interesting opportunity. In the very short term, it is conceivable that forest productivity could increase; for at least a short time as climate is the main limiting factor relating to forest productivity. The question will be what type of management approaches are going to be required in order to allow our industries and our biodiversity and our forest-dependent communities to adapt to that in the future. Climate change could be beneficial up to a certain point, for some species in some stands but the trajectory of the benefits is not linear. For most tree species, there might be a period of opportunities followed by a period of threat as average temperatures keep increasing.

We will certainly see a variety of impacts in the future, both in the forest itself and in the forest sector, resulting from climate change but it is too early to tell entirely what those impacts might be. The question will be what type of management approaches are going to be required in order to allow our industries and our biodiversity and our forest-dependent communities to adapt?

**READ FULL ARTICLE**

Gaetan Pelletier and Joey Volpé, "The time for adaptive management has come : What can we do to ensure our forests thrive in a changing climate?", **Atlantic Forestry Review**, November 2019, p.32.

Sugar maple will be particularly affected by climate change, as its niche is taken over by species such as American Beech. Although there is much uncertainty about interactions among many factors influenced by climate change, species such as Black Walnut may eventually expand northward.

# MAPPING IMPACTS OF CLIMATE CHANGE IN NB

ACCESSIBLE AND EASY TO USE MAPPING TOOL NOW AVAILABLE ON-LINE!


After less than a year of formal collaboration between Northern Hardwoods Research Institute and Northwest Regional Service Commission (NB), these two organizations have already managed to collaboratively launch several new useful tools for the forest sector. The partnership has achieved much in a very short time.

A documentary entitled "Our Forests at Risk: un paysage en transition" that deals with the impact of climate change on the forest sector has been produced and successfully disseminated on several social media platforms, at the Canadian Woodlands Forum fall meeting 2019, and was even an official selection at the Silver Wave Film Festival in Fredericton, NB.

Last week the collaborators officially launched the beta version of their free mapping platform to visualize the impacts of climate change at the eco-district and community level in the province of New Brunswick. This tool will be useful not only for foresters, but for communities, environmental organizations and farmers interested in adapting to climate change. Users of the tool are encouraged to send their comments to the NHRI and NWRSC to facilitate the enhancement of the platform. This work has been accomplished through grants from Natural Resources Canada and the New Brunswick Environmental Trust Fund and thanks to collaborations with UNB.

The mapping tool was created from a synthesis of the data produced by Ouranos (2016) and Dr. Charles Bourque (2015, 2019). The NHRI compiled and processed the data. The original data are projections derived from simulations.

Partners are also working on developing climate change adaptation guides, courses, workshops, training videos, mobile apps, etc. for the forest sector that are planned to be released in the summer of 2020.

"This partnership has allowed us to explore the impact of climate change on the forest sector in a way that we could not have done alone," says Adrian Prado, NWRSC Land Analyst. "Through this collaboration we have optimized our resources while innovating. "

***"Through this collaboration we managed to optimize our resources while innovating. The partnership allowed us to explore the impact of climate change on the forest sector in ways that we could not have done alone."***

**Adrian Prado**
Land Analyst, NWRSC

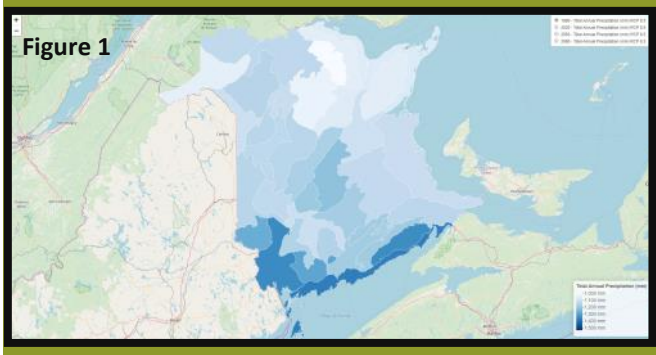



Figure 1: 1990 - Total Annual Precipitation (mm) RCP 8.5

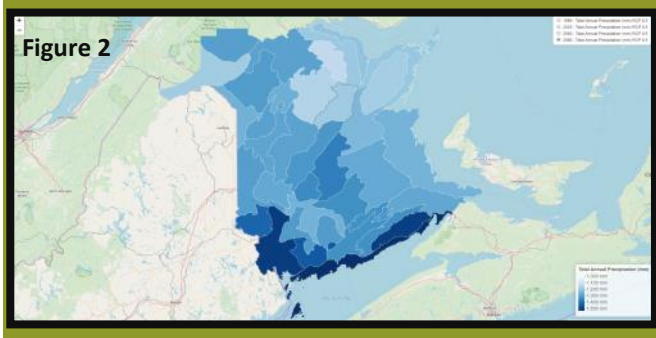



Figure 2: 2080 - Total Annual Precipitation (mm) RCP 8.5

**ACCESS MAPPING TOOL**

## NHRI AND UMCE TEAM UP TO OFFER NEW UNDERGRADUATE COURSE

FORS3909: CLIMATE CHANGE AND SILVICULTURE OF NORTHERN HARDWOOD AND MIXED FORESTS.

The École de foresterie de l'Université de Moncton, Campus d'Edmundston and the Northern Hardwoods Research Institute are happy to announce that they will be teaming up to offer a brand new elective course for the 2020 winter semester. The course entitled *FORS3903 – Gestion du boisé : Changements climatiques et sylviculture des forêts feuillues et mélangées nordiques* will delve into the potential effects of climate change on northern mixed and hardwood forests and more importantly showcase some of the best forest management practices and silviculture techniques available when it comes to adapting our northern hardwoods and mixed forests in the context of a changing climate.

FORS3909 will have three disctinct segments. The first part entitled *Climate change and its effects on forests* will cover the history of global actions on climate change, global climate and carbon cycles, climate scenarios and predictions for our region. The second part entitled *Silviculture for northern hardwood forests* will present the principles, management approaches and silviculture techniques applicable to those forests. Finally, in the third part, the course will cover the effects of climate change on northern hardwood and mixed forests and propose management options for local forests based on some of the material learned in part two of the course.

Students, forestry professionals and people with good basic forestry knowledge and an interest in the subject are encouraged to register! Click below to view the course syllabus!


UNIVERSITÉ DE MONCTON
CAMPUS D'EDMUNDSTON

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

# OUR FORESTS AT RISK: UN PAYSAGE EN TRANSITION

## NHRI VIDEO DOCUMENTARY CHOSEN AS OFFICIAL SELECTION OF THE SILVERWAVE FILM FESTIVAL!


**Happy to announce that our documentary "Our Forests At Risk: Un paysage en transition", produced by NHRI, was an official selection at the 19th Annual Silver Wave Film Festival. The viewing was held on November 8th, 2019 at the Gallery on Queen.**

**The 25-minute video documentary delves into the subject of climate change, its potential effects on our forests, and what can, and should be done to adapt. The documentary is based on interviews with many well-respected forestry researchers and professionals. Through their interviews an interesting storyline emerges. The story is based on finding solutions in terms of climate change adaptation and mitigation. More importantly, the storyline highlights the fact that forest management can be one of the most promising and cost-effective solutions available today. The main message of the documentary is that forest and forest management are undoubtedly crucial elements and potential solutions to mitigating the environmental and socio-economic effects of climate change. If you haven't seen it yet click below and watch it for free on YouTube.**

**WATCH TV INTERVIEW**

**WATCH DOCUMENTARY**

## EXPERT PANEL: FOREST MANAGEMENT AND THE CHANGING CLIMATE

CAN FOREST MANAGEMENT PROVIDE SOLUTIONS IN ADAPTING AND MITIGATING THE EFFECTS OF A CHANGING CLIMATE?

**WATCH PANEL DISCUSSION**

For those interested in the role of forestry in climate adaptation, the panel discussion featuring forestry experts and professionals held during the CWF Fall Meeting 2019 is a must-watch! This very interesting panel was moderated by Chris Norfolk, Director of Forest Planning and Stewardship at the New Brunswick Department of Natural Resources and Energy Development. The discussion gravitated towards the role of forest management, and more specifically adaptive silviculture practices, in adapting to climate change and mitigating its negative effects. The panel featured the following well-respected experts in the field:

**Chris Norfolk.** NB Department of Natural Resources and Energy Development, Director of Forest Planning and Stewardship

**Jean-Martin Lussier**. NRCAN, Canadian Wood Fibre Centre, Research Scientist, Silviculture and Forest Productivity

**Anthony Taylor**. Natural Resources Canada, Atlantic Forestry Centre, Forest Ecologist

**Charles Bourque**. UNB, Faculty of Forestry and Environmental Management, Professor

**Louise Comeau**. UNB, Faculty of Forestry and Environmental Management, Research Associate

**Chris Hennigar**. N. B. Department of Energy and Resource Development, Forester, Forest Strategy Section

**Adrian Prado**. Northern Hardwoods Research Institute, Project Lead: Adaptation to climate change

**Greg Adams**. J.D. Irving Ltd. and Maritime Innovation Ltd., Advisor - Tree Improvement and Forest R&D

# ADAPTIVE SILVICULTURE PRACTICES

## GUIDEBOOKS AND TRAINING VIDEOS TO BE RELEASED IN 2020

In collaboration with various partners the NHRI team is currently working on the production of guidebooks on adaptive silviculture in the context of a changing climate. The production of these guidebooks, in conjunction with the adaptive management courses and workshops the NHRI team is developing, will ultimately lead to the production of a series of training videos aimed at forest managers and woodlot owners. Packaged together these new products should be a very useful toolkit for those looking to consider the potential impacts of climate change on our forests and how best to adapt silviculture practices within the context of a continually changing climate.

### ADAPTIVE SILVICULTURE IN A CHANGING CLIMATE

**Guidebook #1: Vulnerability of New Brunswick's forests to the effects of climate change**

An analysis of the specific effects to our species, stands and forests based on the modeling work of Bourque, Taylor, Hennigar and others. Will include maps of temperature, wind and drought changes to 2100, maps of areas of concern for our key species based on probability of occurrence from past inventories and modeled pathways.

Using the maps of probability of species distribution prepared by FORUS Research as a starting point, identify areas where biophysical changes will threaten species of interest and then, characterize by impact type (timeline, magnitude etc.).

NHRI lead: Adrian Prado, Yves Claveau (consultant)

Collaborators: Chris Hennigar (NB NRED); Charles Bourque (UNB); Anthony Taylor (NRCan); Heidi Erdle (former NHRI); Gaetan Pelletier (NHRI).

**Guidebook #2: Adaptive silviculture in the context of a changing climate in New Brunswick**

A guidebook on the selection of approaches to use based on the severity of the impacts, silviculture pathways and management objectives will be prepared after consultation with the stakeholders.

The main approaches/pathways will include (but not limited to):

- Maintaining status quo (passive adaptation);
- Increasing resistance of trees to stress;
- Promoting resilience of stands;
- Facilitating transition (migration).

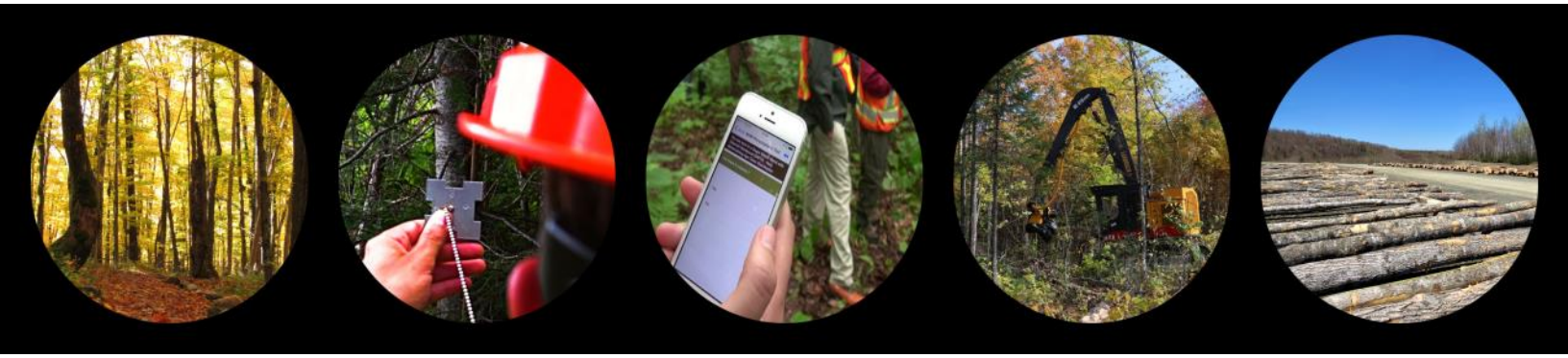
NHRI lead: Gaetan Pelletier
Collaborators: Jean-Martin Lussier, Yves Claveau (consultant)

# FINANCIAL CALCULATOR FOR SILVICULTURE SCENARIOS

## A USEFUL TOOL FOR FORECASTING COSTS ASSOCIATED WITH CLIMATE ADAPTATION

NHRI, in collaboration with Strata Resource Management, is developing a financial calculator tool for forest managers. Amongst other uses, this new tool will be very useful for calculating some of the financial ramifications associated with considering various silviculture scenarios in the context of a changing climate. This new product will serve the purpose of comparing predicted outcomes based on various treatment options in hardwood stands. The financial calculator for silviculture scenarios will also enable the production of financial yield curves that can eventually be incorporated in the ERD wood-supply model. This tool is meant to serve the interest of operational forest practitioners whether on private or crown land.

For now, the financial calculator is Excel-based as this platform makes it is easy to explicitly show calculations and connections to a wider audience and also renders the on-going modifications much simpler during the beta phase of development. It is currently meant to be used at a stand-level with pre-defined treatments and regimes. It will also be able to determine some block inputs, such as road cost, silviculture cost and harvest cost. Later on, with the help of other partners, this financial tool could be improved upon and have the flexibility of optimizing treatment sequences and choices. As the initial phases of the project are completed the format might change to allow integration of data directly into OSM—Open Stand Model. This improved version could create financial Woodstock yield data and create a more user-friendly interface for less software savvy practitioners.



**KEY INPUTS**

**Tree/Product Related Attributes**

- OSM Treelist: The treelist is the logical fundamental input since it has the necessary attributes to connect to the NHRI Product Matrix, using species, diameter, and a form and risk prediction. Removal volumes will be used to calculate revenues and inventory volumes will be used to calculate standing value;
- Timber product splits will be informed by the data from the NHRI Product Matrix;
- General financial data such as timber product prices, and harvest and transport costs.

**Costs**

*Harvest Cost*

- By machine system type;
- Tree Size dependent costs;
- Prescription.

*Silviculture Cost*

- Area-based silviculture (non-harvest methods);
- Additional harvest cost beyond clearcut could be considered as silviculture cost.

*Transportation and road building Costs*

- Both costs will not be incorporated into the treelist element of the calculator; however, there will be an option for users to add in these costs. This element will be further refined in following phases where spatial functionality can be incorporated (e.g. in a wood-supply model).

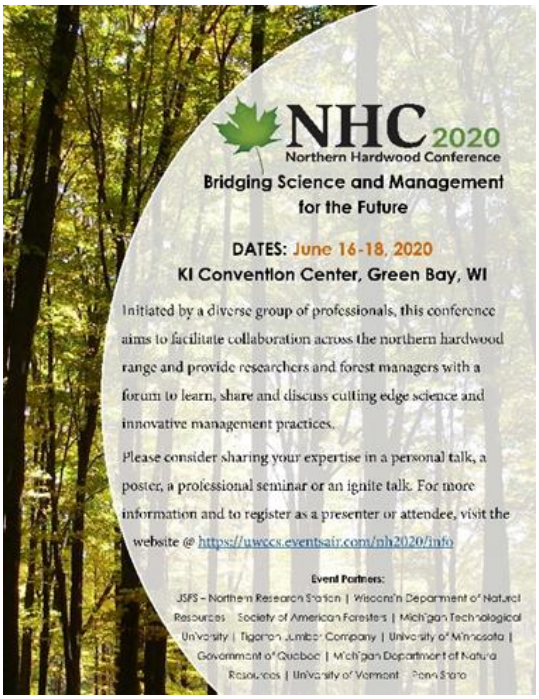
**VALUATION METHOD**

- Net Present Value (NPV) is really the only option since it can value the forest at any point within a stand's life;
- The use of a discount rate (or Opportunity Cost) will be necessary to account for the time value of money to make all financial results available in present value.

# UPCOMING EVENTS

## NHC 2020 NORTHERN HARDWOOD CONFERENCE

Bridging Science and Management for the Future




Are you a forest manager, industry representative, researcher or academic who works with northern hardwoods? The 2020 Northern Hardwood Conference is now accepting abstracts on a range of topics related to northern hardwood science and management.

**MORE INFO**

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**MIXED SPECIES FORESTS**
**Risks, resilience and management**

**25-27 March, 2020**
**Swedish University of Agricultural Sciences**
**Lund, Sweden**

Mixed forests are strategic means of adapting forest management to climate change. Higher tree species diversity is expected to provide higher productivity, higher temporal stability, lower risk of biotic and abiotic disturbances and a more diverse portfolio of ecosystem services from forests. Although the knowledge base concerning the ecology of mixed forests has increased during the last decades, almost all forest research has been conducted in monocultures. As a result, there is a lack of knowledge about how to design and manage mixed forests, to sustain production and carbon sequestration, and mitigate abiotic and biotic risks. It is our expectation that this conference will be an arena for discussion and communication between researchers from different disciplines, and also between managers and policy makers. Our main objective is thus to communicate the state-of-the-art scientific knowledge in various fields connected to both mixed forest functioning and management.

**MORE INFO**

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