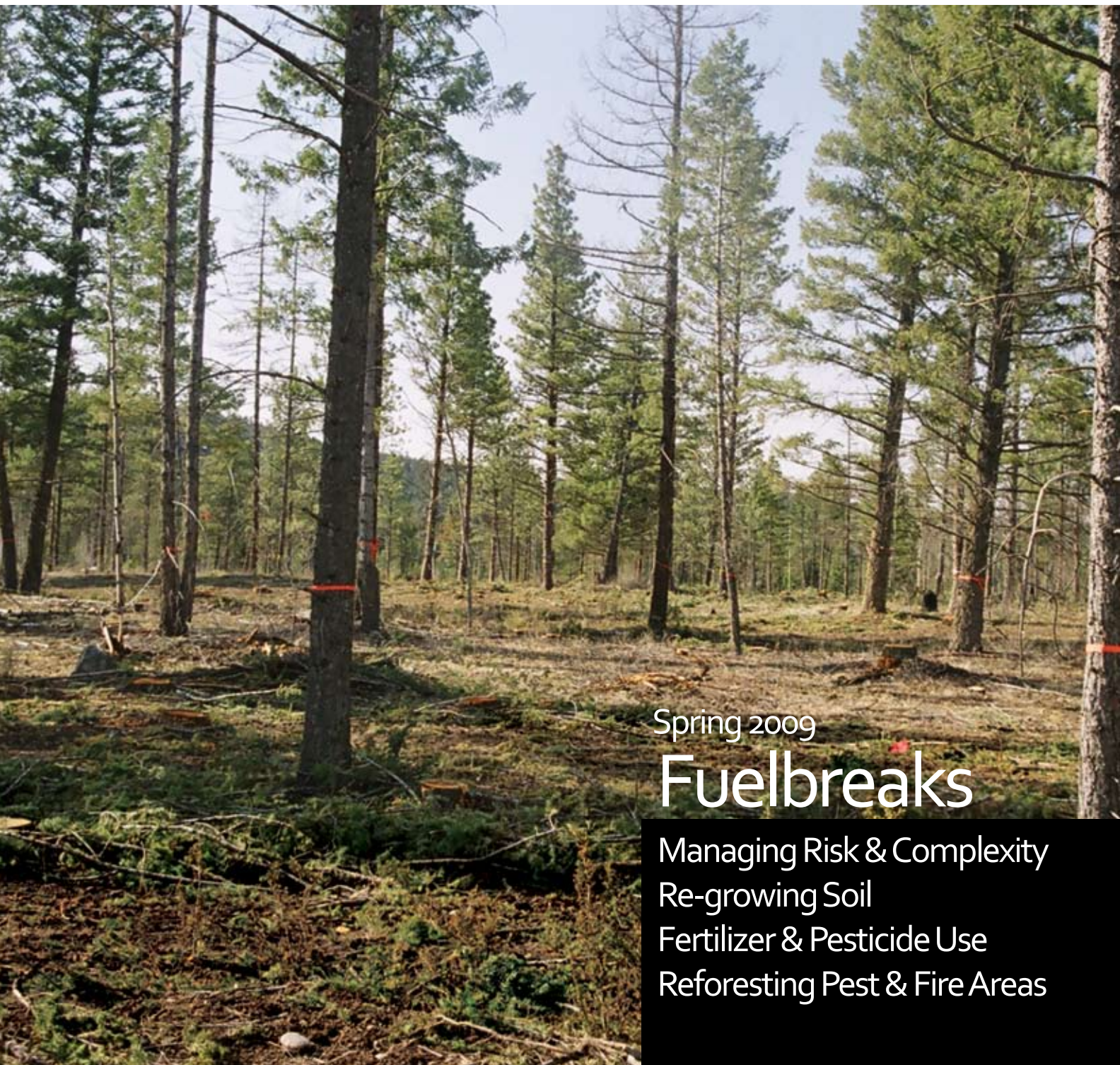
Silviculture
MAGAZINE



Spring 2009

Fuelbreaks

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Re-growing Soil
Fertilizer & Pesticide Use
Reforesting Pest & Fire Areas

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Editorial

by Dirk Brinkman

Welcome to the inaugural digital edition of *Silviculture Magazine* created for forest managers and practitioners around the world.

Since 1992, *Canadian Silviculture* has provided a theatre for reflecting dynamic developments in the practice and science of restoring and supporting Canada's 250 million ha of managed but natural forests. The regional silviculture associations across Canada that have been core to the magazine will continue to have a place of pride in *Silviculture Magazine* and share reports on their regional developments. We will also be adding reports from other silviculture associations around the world.

A rationale that this *Canadian Silviculture* exchange should become a more global *Silviculture Magazine* is that the Canadian silviculture sector's standards, tools, techniques, and talent for maintaining natural systems are in strong demand in many regions of the world. With a digital magazine, readers overseas can easily access the magazine.

It has been a privilege to have been the editor of *Canadian Silviculture* magazine for fifteen years and witness the immense benefits of sharing best practices, problem analysis, tools, techniques, policy, and business operating challenges. Now these can begin cross pollinating globally.

The good practices that are now standard in Canada still have to be established in other jurisdictions. At the same time, new silviculture forces are in play, which have been featured in *Canadian Silviculture* magazine over the past five years. Two new Canadian themes emerged: bioenergy, which is an emerging forest value that affords new silviculture practices, and climatic disruption, which is changing all of Canada's forests, some of it dramatically as 15 million ha of Mountain Pine Beetle mortality in BC alone illustrate. The effect of climate change on forests has redefined silviculture as Adaptive Forest Management. Good silviculture practices will always remain the foundation of every project and forest process intervention, whether undertaken to sustain timber supplies or bioenergy, contain climate, or for other ecosystem services.

The main reason to launch a global silviculture magazine is the new urgency to extend global forest cover.

The atmosphere is shared by the world, so forest-based climate action initiatives are being developed to international standards, which demands an almost overwhelming new level of analytic silviculture rigour. Three major forest-based climate tools have emerged. The first is Reduced Emissions from Deforestation and Degradation (REDD), the second Improved Forest Management (IFM), and the third Afforestation, Reforestation, and Restoration (ARR). The REDD tool cranks back forest loss and avoids emissions; the IFM tool adjusts management to create higher forest sink value and sometimes also reduces emissions; and the ARR tool builds new forest sinks. In all three, the CO_2e climate value of applying each of these tools is measured the same way - by comparing future results to an agreed upon "business as usual" projection of historic land use patterns. Buyers of forest carbon credits depend on the data integrity of the baseline analysis (business as usual), and on the reliability of quality silviculture service and operational performance.

Further parallels exist between the development of silviculture in Canada and the current development of forest climate action. In the 70s and 80s, reforesting harvest disturbances was the living example of the concept of sustainable yield, upon which the UN's 1987 *Our Common Future* core intergenerational concept of sustainable development was built. Through that lens, finding a market mechanism for reforestation offsets to harvesting to succeed was a very satisfying critical mission, one that was accomplished in BC in 1987.

Today, the incredible urgency of avoiding the catastrophic consequences of 2°C climate warming is no less of a critical mission. Containing climate through forest sinks and reduced emissions can demand the full capabilities of every committed silviculture practitioner, both analytic and operational. REDD initiatives can reduce emissions by up to 20%. Terrestrial ecosystems already absorb 30% of annual industrial greenhouse gases. IFM and ARR initiatives can offset another 15% of industrial emissions. The future of civilization may depend on getting these forest climate actions right. Silviculture is the implementation science and practice that is common to each of these climate action tools. In order to meet local and global demands for forest benefits and services, a new level of silviculture discussion and ideas is required.

Thank you for joining us in this inaugural online edition of *Silviculture Magazine*.

Upcoming Issue

Summer 2009
Online July 17

- Innovative Plantations
- Enhancing Timber Value
- Water Dynamics:
  Plantation vs. Natural Forest
- Role of Plantations in Climate Action

Forest Health

by Michelle Cleary, PhD

Armillaria Root Disease: A Cryptic Pest in BC's Forests

Armillaria root disease is the most widespread and damaging root disease pathogen of conifers in the Southern Interior of BC. The disease causes significant mortality, limits growth potential, and can make trees more susceptible to attack by other insects and pathogens. In undisturbed mature stands in the Interior Cedar-Hemlock (ICH) biogeoclimatic zone, up to 90% of trees will have Armillaria lesions on their root systems. Within this zone, above ground symptoms of Armillaria can be detected in only about one-quarter of the trees with below ground infection. This creates serious challenges for forest managers when it comes to disease detection and managing sustainable timber production on infested sites.

Armillaria is typically known as a "disease of the site". After harvesting, the fungus is carried over to the next plantation on colonized stump and root systems where it can persist for decades. Tree mortality usually begins about 5-7 years after stand establishment, will peak around 12-15 years and then decline, although in highly susceptible host species like Douglas-fir, mortality can continue throughout a rotation.

Photo courtesy of USDA Forest Service

Long-term monitoring of permanent sample plots provides good estimates of actual losses incurred by this cryptic disease. In a Douglas-fir plantation near Sugar Lake now approaching its mid-point of rotation, cumulative mortality of planted trees is as much as 40%, mostly attributable to Armillaria. In this stand, openings caused by tree mortality (disease centres) are being filled in with hosts including paper birch and western red cedar. The result of this progressive tree mortality is a marked shift in species composition, from a pure plantation of Douglas-fir trees to a stand that comprises a mixture of several species. Thus, Armillaria can be a major driver behind reshaping the structure and growth potential of stands. Being a natural component of these forests, Armillaria plays an ecological role with accelerating species succession by selectively removing susceptible conifers and creating gaps in the stand that are filled in with tolerant host species; those that have a greater ability to survive in the presence of inoculum. Nonetheless, these changes to stand structure and potential losses to timber supply generally go undetected over time.

Any practice that creates stumps (a suitable foodbase for the fungus), increases the amount and potential of Armillaria inoculum. Rapid regeneration of infested sites with highly susceptible conifers means that trees will be exposed to that inoculum when it is at, or near, its peak potential. The long-term threat of this pathogen in second-growth forests can be reduced by removing stumps after harvest or by planting trees that are more resistant to the fungus.

Results from surveys of juvenile mixed conifer stands that documented symptom development and mortality rates in conifers showed significantly higher rates of mortality in Douglas-fir relative to western red cedar. Further work also revealed effective resistance mechanisms operating in the roots of western red cedar. This resistance is attributable, in some part, to structural barriers formed within the tissues that are affected (i.e. necrophylactic periderm formation in the bark and compartmentalization and callusing in the wood). Frequent and successful formation of these barriers in infected cedar roots prevented further spread of the fungus in host tissue and girdling of roots. These results strongly imply effective resistance in western red cedar against Armillaria.

Implementing best management practices that minimize exposure of trees to root disease inoculum (i.e. stumping and utilizing more tolerant host species like western red cedar when regenerating infested sites) will reduce mortality rates in crop trees, increase overall site productivity and help maintain resilience in managed forests.

Michelle Cleary, PhD, is Regional Forest Pathologist at BC Ministry of Forests and Range, Southern Interior Forest Region. She can be contacted at Michelle.Cleary@gov.bc.ca.

Managing Risk & Complexity

in the Rehabilitation of Young MPB Stands

by Bruce A. Blackwell, Jeff McWilliams, Colin Mahony, Nathan Davis, and Robert Sandberg

Mechanical knockdown and site preparation with partial green tree retention in the Williams Lake TSA

The Mountain Pine Beetle (MPB) has had an enormous impact in BC, resulting in over 15 million ha of damaged and dead forests. While many people associate the MPB with mature forests, there has been widespread mortality within younger stands that range in age from 20-80 years. Since the MPB targets larger diameter stems, a large component of the mortality in these young stands is on productive sites, which have been spaced and/or fertilized, and are within close proximity to forest product manufacturing centres. These stands were considered critical to the mid-term timber supply in the Cariboo. The rehabilitation of young pine stands is essential to mitigating the economic and social impacts of the MPB epidemic.

The Forests for Tomorrow (FFT) Program was initiated by the Ministry of Forests and Range in 2005 to reforest areas damaged by wildfires and the MPB epidemic that are not expected to be harvested under existing forestry tenures. This article summarizes what some foresters have learned while working on behalf of FFT in three Cariboo TSAs (Quesnel, Williams Lake, and 100 Mile House) during the past two years.

What is the stocking situation in MPB-impacted young pine stands?

Surveys of 20- 40 year-old stands with visual evidence of moderate to significant MPB mortality indicate that a large proportion (70%) of the areas have more than 700 stems per ha of well-spaced trees and therefore are classified as restocked (SR). The well-spaced trees are ecologically suitable, healthy, and of good form, and are from dominant to understory crown classes. Stands with less than 700 well-spaced trees per ha are classified as not satisfactorily stocked (NSR) and account for approximately 30% of the surveyed area. The MPB-impacted stands generally have highly variable stocking, which confounds treatment decision-making and delineation of areas requiring rehabilitation.

NSR stands typically have a pine dominated overstory, which has mostly been killed by the MPB and a low understory density of spruce, Douglas-fir, subalpine fir and/or lodgepole pine. Some stands have substantial surviving overstory pine but have non-MPB forest health problems and therefore are also NSR. Despite some concerns for the quality and health and therefore future reliability of some of the SR areas, the initial focus of the FFT rehabilitation efforts has been on the NSR stands. However, we are developing monitoring criteria to ensure stands not currently scheduled for active management but showing symptoms of decline are reassessed in the next 5-10 years.

How have the NSR stands been rehabilitated?

Due to short planning timelines and the need to use previously sown seedlings, fill planting (aka underplanting) was the most feasible rehabilitation treatment in the 2007/2008 Cariboo FFT program year. In spring 2008, over three million trees (about 60% spruce and 40% Douglas-fir) were underplanted in NSR areas in the three Cariboo TSAs. Manual brushing of alder was required to facilitate planting on some sites in the Quesnel TSA. Due to concerns that similar site preparation treatments would be required on many underplanted sites and concerns for other risk factors, we began to examine other treatment regimes in the summer of 2008.

What are some of the key risk factors affecting the efficacy of rehabilitation and the opportunities for improved results of treatments?

Based on our current knowledge and experience in these stand types, there are a number of concerns related to the underplanting treatment, which include:

- mortality or damage to planted seedlings from rodents, ungulates, and cattle;
- competition from existing understory vegetation complexes that are vigorously expanding due to increasing light levels;
- spread of pathogens such as dwarf mistletoe from infected residual overstory pine to other live pine in the stand;
- loss of green overstory pine due to stem breakage attributed to hard pine stem rusts;
- poor form and vigour of existing understory pine regeneration, leading to susceptibility to snow press;
- increasing fire risk due to the problematic fuel complex of dead material combined with the regenerating stand;
- growth reduction of regeneration due to shading by overstory trees;
- damage to regeneration from the breakup of the dead overstory pine; and
- site occupancy by residual overstory pine of poor form that will have low value at rotation.

"The rehabilitation of young pine stands is essential to mitigating the economic and social impacts of the MPB epidemic."

These risks have the potential to significantly influence the long term efficacy and financial viability of rehabilitation efforts. For example, while it may be cheaper in the short term to underplant ($600 to $800 per ha), if remedial brushings and seedling protection are required to achieve free growing, the total investment could total well over $1,200 per ha. For some sites this cost may not be financially justified. In addition, if there are substantial risks of future loss of volume or value due to fire, forest health issues, or damage, alternative treatment regimes may provide better long term solutions.

Revenue generating opportunities also need to be considered when evaluating rehabilitation options. Of particular interest is the growing demand from non-solid wood industries (e.g. pellet manufacturers and co-generation facilities) for fibre produced directly from logs. This has become increasingly important as sawmills have been curtailed during the current market downturn and can no longer supply the required residual wood fibre. If small logs, many of which are from dead young trees, can be a viable source of fibre to the non-solid wood industry, revenues from logging portions of these stands could offset other rehabilitation costs and give better long term results.

Figure 1: Seedlings underplanted into this stand face several risks, including brush competition, catastrophic fire, overstory shading, rodent browse, and damage by falling snags. Residual live pine will be open-grown and therefore may contribute very little to the value of the future harvest.

In an effort to deal with the key risk factors associated with underplanting and the potential market for logs generated from rehabilitation treatments, we embarked on operational "knockdown" trials in the Williams Lake and Quesnel TSAs in the fall of 2008. These treatments involved cutting down and either slashing, mulching, or removing the dead and diseased overstory pine and protecting as many of the other trees as possible. Through this process we hope to improve the survival and growth rates of the understory trees and the seedlings to be planted and also reduce the long term fire risk. We hope these trials will provide an opportunity for foresters to assess and debate their effectiveness over the coming years and help build on the early success of the FFT Program.

Addressing complexity and treatment prioritization through Stand Rehabilitation Analysis

All of the concerns discussed here have led us to think critically about the best treatment regimes for the different sites in the Cariboo. Given the uncertainty about future stand dynamics, consensus on appropriate management has been elusive both within our group and between professionals throughout the province. The complexity of the problem means that an ongoing dialogue between people from different perspectives is essential. However, there is general agreement that these diverse and complex stands do not fit within a cookbook prescription framework. There must be a linkage between the stand and landscape that clarifies what stand attributes and risk factors determine the best investments.

To address the complexity of the rehabilitation question, our team has developed a framework for sound and consistent decision-making that is a structure for adaptive management at both the stand and landscape scale. We have developed a landscape scale strategic fire risk analysis that identifies priority areas for hazard reduction treatments. We have also developed a process for analyzing the stand-level growth and yield as well as the financial implications of different rehabilitation options. We are currently in the early stages of using these tools to determine the most appropriate treatment regimes for the areas we found to be NSR in our 2008 survey program.

Summary

Our work in the Cariboo over the past two years has taught us that rehabilitation of young MPB-impacted pine stands is a highly complex and a novel silvicultural problem. Risks from fire, animal damage, competition, and disease have shown themselves to be a crucial consideration when choosing between treatments. While underplanting is an inexpensive option and will remain an important tool for stand rehabilitation, it does not adequately manage for these risks in some stand types and landscapes. We are actively experimenting with other treatments, such as mechanical knockdown and biofuel harvesting, that while more expensive or complex, are able to mitigate the risks present on some sites. Some risks, such as fire, must be addressed at the landscape level, which has led us to develop a strategic approach to locating rehabilitation treatments. It is clear that existing silviculture techniques cannot address all of the issues that we are facing in the Cariboo FFT program. Our approach will evolve quickly over the next year as we learn the most effective ways to ensure a resilient future for young MPB-impacted stands.

Fuelbreaks

Silviculture's Role in Designing and Implementing Fuelbreaks Around Communities

by R.W. Gray

Fuelbreak adjacent to Cranbrook, BC. This area was mechanically thinned (feller-buncher plus skidder) and prescribe burned. The project goal was to reduce fire behaviour and increase residual tree survival. This area will need to be burned on a 5 -10 year rotation in order to maintain the desired fuelbed conditions.

The scale and extent of the MPB epidemic and the dead standing and cutover forests in its wake have generated a great deal of concern for BC community wildfire protection. Some would advocate that the matrix of treated and untreated forests surrounding these communities constitutes a fuelbreak that will retard fire spread as it moves toward the community. In order to understand if this is true, it is important to first understand what a fuelbreak is and how it is intended to work.

What is the difference between a fuelbreak and a firebreak? A fuelbreak is an area of very light fuels; its primary purpose is to slow down fire spread and reduce fire intensity and severity. A firebreak is an area of no fuel; its primary purpose is to stop surface fire spread by robbing the fire of a horizontally contiguous fuelbed. A fuelbreak is intentionally placed in the path of an actual fire or a potential fire for the purpose of aiding fire suppression by reducing fire spread. Fuelbreaks are also intended to mitigate the negative aspects of fire severity. Both of these objectives are met by altering the fuelbed characteristics; most notably fuel loading by size class, fuel arrangement, and fuel moisture. This can best be illustrated by describing how two common fuelbreak strategies work.

High Forest Utilization Followed by Prescribed Burning

High utilization on harvested or thinned units means that the majority of large, coarse fuels have been removed from the site. Much of the material that contributes to high burn severity has therefore been removed. What is typically left from harvesting/thinning, however, is fine fuels - branches and foliage. A follow-up prescribed burn is intended to consume these fuels, leaving a site with very little large, coarse fuels (the rotten coarse fuels are consumed in the burn) and no fine fuels. This area can function as a firebreak for a year or more until the herbaceous layer re-establishes itself. At that point the area functions as a fuelbreak because fuel loading has been substantially reduced and fuel horizontal continuity has been interrupted. Fire spread through these units is initially very slow and intensity and severity are equally low. Over time, fuel arrangement will become more contiguous leading to an increased rate of spread and fire intensity.

Planting Deciduous Units

Dense deciduous units, especially trembling aspen stands, function as fuelbreaks primarily by affecting fuel moisture. The goal with aspen fuelbreaks is to create stands with high canopy closure and multiple canopy layers of shrubs and herbs. The dense broadleaf canopy is intended to trap surface moisture and prevent surface fuels and vegetation from curing and supporting ignition and combustion. Surface and crown fires that come upon these types of aspen stands encounter an impenetrable fuel moisture barrier that inhibits forward spread.

Limitations and Constraints

In the case of high utilization units followed by prescribed burning, the greatest limitations are intensity of treatment and time since treatment. Whether particular silvicultural activities function as a fuelbreak depends on the fuelbed in the treated area. A cutblock with a fuelbed consisting of harvest slash mixed with an herbaceous layer is not a fuelbreak. Fire researchers in California, Colorado, and Montana have recently reviewed the efficacy of a range of silvicultural treatments in affecting fire behaviour and fire effects. The researchers concluded that harvesting followed by prescribed broadcast

burning (not pile or windrow burning) has the greatest and longest-lasting effect on fire behaviour and effects. As for the temporal element of treatment efficacy, this is highly dependent on the ecosystem. More productive sites will grow herbaceous material much quicker than dry sites. Planting a unit immediately after the treatment is adding fuel back onto the site - primarily aerial fuel. This can be a benign influence, for example with a low density plantation of larch, or an antagonistic influence by planting a dense stand of Douglas-fir (open stands of larch rarely crown while dense stands of Douglas-fir easily crown). If the goal behind the fuelbreak is to reduce fire spread and intensity for as long as possible, then serious consideration needs to be given to how the site is planted and tended.

> "Whether particular silvicultural activities function as a fuelbreak depends on the fuelbed in the treated area."

The spatial extent of the fuelbreak is another critical element. Fuelbreak size needs to be commensurate with the scale of the fire threat and potential fire behaviour. The fuelbreak also needs to be large enough to provide the internal conditions necessary to its function. This is the case with aspen fuelbreaks. Fire managers in Utah estimate that aspen fuelbreaks need to be at least 1000 m in depth in order to have the necessary internal fuel moisture conditions to interrupt fire spread. These types of fuelbreaks also have a temporal component as aspen forests can eventually give way to conifer forests, which do not offer the same fuelbreak benefit.

Thinned area adjacent to Kimberley, BC. This area will be prescribe burned this fall and maintained in a low fuel load condition into perpetuity. Despite the tree density, the lack of surface fuels plus the height of the forest canopy above the ground, make this stand type unlikely to support an active crown fire.

Reforesting Pest and Fire areas in BC

Forests for Tomorrow Program

by John McClarnon

Forests for Tomorrow (FFT) is a long-term program that reforests areas that have been damaged by the Mountain Pine Beetle (MPB) and/or wildfires that will not be harvested by conventional means.

Progress to Date

Total hectares planted:	Over 17,000 ha
Total trees planted:	Over 17 million seedlings
Total surveys:	Over 260,000 ha

Forecast

- In 2009 FFT will plant an estimated 11,000 ha with 12 million trees. 17 million seedlings are being grown in nurseries to be planted in 2010.
- FFT Full program level of 17 million seedlings planted (approx. 17,000 ha) per year will be reached in 2010. 90% will be used for MPB reforestation and 10% in wildfire areas.
- By the end of the 2010 planting season, FFT will have planted 45 million seedlings, using a diversity of tree species on sites to increase forest resilience

A whole new industry is developing in response to an opportunity created by FFT to prepare non-economic MPB impacted forests for reforestation, whereby operators grind small-diameter beetle-wood that was previously considered unusable into fibre. Most of the material is processed at cogeneration facilities and transformed into electricity or purchased by pulp mills or pellet plants. Some of the fibre is being used by the Lower Mainland greenhouse industry to heat their vegetable greenhouses.

An FFT-funded mapping project clearly identifies the best areas for harvesting and reforestation of MPB-attacked stands. Impact maps show dead pine by attack severity, attack status, age class, density, and site productivity. These thematic maps are available for each of the 22 timber supply areas affected by MPB. Opportunities maps will help plan salvage priorities based on reforestation factors, shelf-life characteristics, and the best areas to harvest wood biomass for energy production. These opportunities maps are expected to be available this spring.

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	ACCOMPLISHED			FORECAST		
Activity/ Fiscal Year	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Planting (ha)	348	3,364	6,611	6,871	12,000	17,000
Planting (seedlings)	.35 M	3.5 M	6.886M	6.985M	12.0 M	17.0 M
Surveys (ha)	76,600	32,800	60,102	95,000	105,000	110,000
Funding ($M)	$26.0	$26.7	$32.9	$53.0	$53.0	$53.0

Western Canada

Western Silvicultural Contractors Association

by John Lawrence, President

In recent months, the BC government and its new Minister of Forests and Range Pat Bell have articulated a vision that will revitalize silviculture in the province. Given the massive decline in silviculture activity associated with the crisis in the forest industry, this is a welcome development. The report of the Working Roundtable on Forestry and the recent *Discussion Paper on Silviculture* point to the importance of silviculture both to the future of the BC forest industry and to the BC economy in general. Concrete evidence of a renewed focus on silviculture came when the WSCA was granted $500,000 over two years through the Community Development Trust to deliver safety programs designed specifically for the silviculture workforce.

In the Working Roundtable on Forestry report, "growing trees" is identified as the second of the six key priorities in order for BC to realize the potential of the current and future forest industry. Flowing out of this priority are several recommendations that, if followed, should plant the seeds of a strong future for silviculture in the province. One of the key recommendations, "We should review our forest management and silviculture practices to ensure that they encourage maximum productivity, value, and support forest resilience", led to the release of a *Discussion Paper on Silviculture*. The discussion paper is being touted as an effort to seek input (by June 30, 2009) towards a new silviculture framework, and presumably new policies, which will lift silviculture activity from its current focus on "free growing" stands following harvest, to a leading role in creating value from the forest resource for a variety of end uses.

From reading these documents and listening to the forest minister speak about the future, it is clear that the "art" of silviculture is going to experience a renaissance, which will spark innovation and opportunity for the industry. The only problem for many contractors and tree seedling growers is the timing of this bright new dawn. With the precipitous and dramatic decline in seedling numbers and silviculture activity in general, there is serious concern that the industry needed to realize this vision will not make it through the current downturn.

At the WSCA's Annual Conference and AGM, held in February, there was considerable discussion of the smaller volume of work available in 2009, and the forecast for 2010 and 2011 is showing an even lower volume of work. Already some nurseries and contractors are facing the prospect of shutting down, while many others are worried that the work they do have will potentially bankrupt them if their beleaguered forest industry clients delay or default on payment. Yet, as one of the key panels at the convention illustrated, there is a solution that meets both the silviculture industry's capacity for increased work and the province's need to deal with the immense problem of the Mountain Pine Beetle epidemic. The excellent and informative panel, "What is the appropriate forestry response to the Mountain Pine Beetle Plague", revealed that 20-40% of the 15 million ha of area affected by the MPB requires reforestation due to limited natural regeneration or secondary structure. Furthermore, the remaining 60-80% of the area is highly susceptible to catastrophic fire due to the buildup of fuels from dead and dying trees. Just considering the potential for massive fires, let alone the unprecedented changes in hydrology occasioned by the demise of so many trees, it was noted that there is a need to create large scale variation on the landscape. This large scale variation can, and will, occur naturally through catastrophic fires, or it could happen in a planned manner through bold action to remove, sort and auction logs and biomass, followed by reforestation of fire breaks and riparian restoration zones. In addition to alleviating the very real dangers and costs to communities associated with fire and flooding, such a program would provide opportunity for many of the small to medium-sized businesses impacted by the forest industry crisis.

These days, with the vision emanating from the government, the long-term trend for the silviculture industry in BC is very good. But in the short to medium term, without bold action to address a pressing problem in need of immediate attention, the industry will shrink dramatically and the MPB problem will take on an increasingly ominous dimension.

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Ontario

Ontario Forest Renewal Co-operative Inc.

by Bill Murphy, Executive Director

Renewal In Decline

For the past 6 weeks, the 2009 renewal and maintenance of Ontario's forests has come under fire. In conversation with the Forest Renewal Co-op and the Silviculture Contractors Association, the Ontario Ministry of Natural Resources (ONMR) has indicated that the Forest Renewal Trust is again at the minimum balance for continued operation of this year's growing stock to be planted this spring. Part of the problem is that the OMNR has had to top up some of the management units through the Ministry of Finance in order to maintain this minimum balance. Some of the forest companies are on the verge of decisions that could affect the outcome of the entire renewal scenario in the province. There is at least one company that has gone into receivership and is not signing any contracts for the planting of 27 million tree seedlings held in cold storage over the past 6 months.

The OMNR is trying to get these trees planted, but guaranteeing monies from the Trust fund is deemed inadequate and unacceptable by the growers and silviculture planting contractors. The contractors want to have their dollars guaranteed and the growers want to have their cold storage stock and this spring sowings paid for. One of the most contentious issues and a big concern for anyone who is depending on payment of their invoices is the use of the Trust fund as a bank loan. What this means is that the forest companies are accessing the funds on April 1, and not paying any silviculture invoices until later in the year. This money can then be used internally with the intention that the company will reimburse the fund later in the year and will top up the minimum balance and dollars used later on. The OMNR cannot determine how this money is being used until statements are presented to them from the Trust later in the year. This is a scary situation in that during the time that the companies have "borrowed" the dollars from the Trust, they could file for chapter 11, file for bankruptcy protection, or even go into receivership. If in fact they are in receivership prior to April 1, the Trust can better monitor the dollars and hopefully not allow the removal of said minimum balance.

At this point, all the renewal and maintenance work is being monitored by the OMNR and payments are to be "guaranteed" to the contractors. Since the OMNR cannot at this point access dollars from the Trust, except through the SFL invoicing system, the monies are still going to have to come through the government coffers. We are now in a deficit situation, so although this means of accessing dollars is guaranteed for this year, what about next year and the year after?

> "Some of the forest companies are on the verge of decisions that could affect the outcome of the entire renewal scenario in the province."

No such guarantees are in place for future years. Back in 1994, it was the intention of the Crown to have funds set aside, from the original stumpage contracts, to be used for renewal and maintenance in the future. It is now uncertain how long this future is going to last, as there are no guarantees for any future work in the units under receivership or those units that the OMNR has to continue to support financially. Harvesting volumes are lower now that the markets have collapsed, and silviculture dollars that are hopefully being put into the Trust are less. This will provide for the renewal and maintenance for the cutovers recently harvested, but we also have thinning, spraying, etc. that needs to be continued. Can the OMNR still maintain the minimum balances, since work on the future forest is established by the funds of previous years?

I sincerely hope that the OMNR comes through with their promises for payment for 2009. If they don't, the renewal industry will be in a state of collapse as contractors and growers will no longer be in business. With no funds and no renewal, industry will compromise the health, growth, and value of the future forests that the fund was intended to protect.

Québec
Association des Entrepreneurs de Travaux Sylvicoles

par Audrey Harvey

L'industrie sylvicole survivra-t-elle à la crise?

Avant même de parler de crise économique, l'industrie sylvicole du Québec a dû se débattre dans une crise forestière qui sévit toujours et laisse des séquelles importantes dans nos régions. Le géant AbitibiBowater fait face à des difficultés financières, laissant les entreprises qui travaillaient pour elles dans l'insécurité. Ce cas est abondamment documenté dans les médias mais ce n'est, hélas, pas le seul. Toutes les régions du Québec sont touchées par cette crise sans précédent qui affecte le secteur forestier. Partout, des usines sont fermées, laissant derrière ceux qui en dépendent avec leurs inquiétudes.

Photos: Landes forestières Uapats

Chaque année, les entreprises sylvicoles réalisent des travaux qui sont directement liés à la quantité de bois récolté en forêt. Malheureusement, depuis plusieurs années, cette récolte a chuté à vue d'œil, entraînant avec elle les travaux sylvicoles. Le gouvernement a tenté de freiner cette dégringolade en instaurant le Programme d'intensification sylvicole, un programme qui prévoyait injecter 75 millions de dollars en 3 ans. Sur papier, ces annonces semblaient encourageantes mais sur le terrain, la réalité est plutôt que ces efforts sont nettement insuffisants car entre 2003 et 2008, les travaux sylvicoles ont été en baisse constante.

Total des travaux réalisés sur terres publiques au Québec

Année	2003	2004	2005	2006	2007	2008*
Ha	248,300	267,100	241,800	223,800	202,100	184,000

**Estimation du MRNF*

Les travaux de reboisement, qui sont pourtant "populaires" auprès du gouvernement, ont baissé de 9% pendant ces cinq années. Mais ce n'est rien si l'on compare aux travaux d'éclaircie précommerciale qui eux, ont littéralement dégringolé de près de 30% en cinq ans. Dans son dernier budget, le gouvernement du Québec a annoncé quelques mesures supposées venir en aide à l'ensemble du secteur forestier. Malheureusement, les annonces qui ont été faites ne semblent pas correspondre aux besoins des entrepreneurs forestiers qui doivent conserver leur main-d'œuvre en vue de la reprise en plus de maintenir l'expertise au sein des entreprises. D'abord, plusieurs des mesures annoncées l'avaient déjà été dans le budget précédent et que l'argent annoncé en bonification n'est pas prévu uniquement pour la réalisation de travaux sylvicoles. Devant la crise historique que nous vivons, le gouvernement investira moins de 10 millions de dollars, ce qui est nettement insuffisant pour revigorer notre secteur.

Les entreprises sylvicoles seront finalement certifiées

Depuis quelques années maintenant, on parle de cette fameuse certification qui permettrait à l'industrie sylvicole d'être plus transparente et respectueuse de sa main-d'œuvre. Le rêve est maintenant devenu réalité. Après plus d'un an de travail, les représentants de l'industrie de l'aménagement ont travaillé avec le Bureau de normalisation du Québec (BNQ) afin de mettre sur pied une norme spécifique qui correspondrait exactement à nos besoins. Le travail a donné de bons résultats et la norme fut testée dans trois entreprises, avec succès. Il a toutefois fallu beaucoup de temps et d'énergie afin que le MRNF rende obligatoire cette certification que nous jugions essentielle pour l'industrie sylvicole. Lors du dernier congrès de l'AETSQ, qui a eu lieu en février dernier, un représentant du gouvernement est venu annoncer que le ministre allait rendre la Certification des pratiques de gestion des entreprises sylvicoles obligatoire. À ce jour, plus de 120 entreprises sont inscrites et les premiers audits devraient se tenir au tout début de la prochaine saison. Les entreprises ont l'obligation d'entrer dans le processus dès maintenant et devront avoir obtenu leur certification au plus tard en septembre 2010, sans quoi elles ne pourront pas réaliser de travaux sur les terres publiques.

Quebec
Association of Silviculture Contractors

by Audrey Harvey, Communications Coordinator, AETSQ

Will the forestry industry survive the crisis?

Before even approaching the topic of the economic crisis, the forestry industry in Quebec has been struggling through a forestry crisis that is still raging and causing serious consequences in our regions. The AbitibiBowater giant faces financial difficulties, leaving the companies that work for it in insecurity. This case has been abundantly documented in the media but unfortunately it is not the only one. Every region in Quebec has been touched by this unprecedented crisis that has been affecting the forestry sector. Everywhere, factories are closing leaving those who depend on them behind to dwell on their worries.

Photos: Landes forestières Uapats

Each year, forestry companies complete work that is directly linked to the amount of wood harvested in the forest. Unfortunately, over the past several years, this harvest has plummeted, dragging with it forestry work. The government attempted to slow this collapse by implementing the Forestry Intensification Program, a program that projected an injection of $75 million over 3 years. On paper, these announcements seemed encouraging but on the ground, the reality is that these efforts are clearly insufficient as between 2003 and 2008, forestry work has been in constant decline.

Total of all work completed on public land in Quebec

Year	2003	2004	2005	2006	2007	2008*
Ha	248,300	267,100	241,800	223,800	202,100	184,000

**MRNF Estimation*

Reforestation work, which is "popular" with the government, has decreased by 9% over these same five years. But this is nothing in comparison to the pre-commercial thinning work, which has literally tumbled by close to 30% in five years. In its last budget, the Quebec government announced several measures that are supposed to come to the aide of the forest industry as a whole. Unfortunately, the announcements made don't seem to be in keeping with the forestry companies' needs as they must hold on to the workforce for when things pick up again but also keep the expertise level within their companies. Several of the measures had already been announced in the previous budget and the improvement money announced was not meant only for the completion of forestry-related work. Faced with the historic crisis we are in, the government would invest less than $10 million, which is clearly insufficient to breathe life into our sector.

Forestry companies will finally be certified

For several years now, there has been much talk about certification, which would enable the forestry industry to be more transparent and respectful of its workforce. The dream has now become reality. After more than a year's work, representatives from the development industry have worked with the Bureau de normalisation du Québec (Quebec Standards Council) in order to set up specific norms that meet our needs precisely. The work has brought forth good results and the norms have been successfully tested in three companies. However, a lot of time and energy was required in order for the MRNF to make this certification mandatory, which we considered essential to the forestry industry. At the last AETSQ conference, which took place this past February, a government representative came to announce that the Minister was going to make Silvicultural Forestry Companies' Management Practices Certification mandatory. To date, more than 120 companies have registered and the first audits should take place at the very beginning of next season. Companies must enter into the process now and must have obtained their certification no later than September 2010 or they will no longer be able to complete work on public land.

PEI
Forest, Fish & Wildlife Division

by Ken Mayhew, Information Officer

New Climate Change Study Begins in PEI

The PEI Department of Environment Energy and Forestry has initiated a new climate change study designed to assess implications on selected tree species and thus the future of the Island's forests. The study is being conducted by Dr. Charles Bourque of UNB's Forestry and Environmental Management faculty. Dr. Bourque specializes in atmosphere-forest interactions, forest-pest management, and environmental monitoring. He will use forest inventory data from the 2000 Corporate Land Use Inventory, long-term climate data from Environment Canada and the results of the 2008 LIDAR elevation and slope study to develop a computer model, which will predict how the selected Acadian Forest tree species may respond to various climate change scenarios.

The study will focus on Acadian Forest species such as white spruce, cedar, hemlock, white pine, red oak, and several maples and birches. Once the model is completed, researchers can use it to analyze climate change effects on other native trees as well as species from more southern regions of North America to see how they may perform under different climatic conditions. The outcomes will enable government, forest managers, wildlife biologists, forest product businesses, landowners, and others who rely on healthy forests to plan for the future.

The Acadian Forest is part of the larger North American system called the Transition Forest. This forest stretches from the Maritimes across the middle of the continent to the Great Lakes and Minnesota. One of the primary characteristics of this forest is its mixture of northern and southern tree, plant, and animal species. For instance, in a typical Island forest it is common to see white birch and yellow birch growing side by side. However, white birch grows from above the Arctic Circle south to New England, so PEI marks the southern limits of its range. Yellow birch on the other hand ranges from Georgia north to the Gaspé, so the Island is at the northern end of its range. In our forest region the ranges of these two birches and many other tree species overlap creating a unique ecosystem, which is constantly adapting and changing in response to a variety of environmental and climatic influences.

PEI's environment has traditionally offered suitable growing conditions to both northern and southern tree species. However, trees which are adapted to more northern conditions such as white birch, white spruce, eastern larch and balsam fir may be at risk if the climate continues to warm. These species play critical roles in the environment and economy of our region, so their loss would have significant implications.

An example of these potential impacts can already be seen in western Canada where huge areas of forest have been killed by a severe infestation of a native insect species - the Mountain Pine Beetle (MPB). In some areas of eastern Canada, balsam fir and white spruce are showing signs of suffering infestations of native insects. The Balsam Wooly Adelgid and the Spruce Beetle seem to be benefitting from recent warmer winters, killing large numbers of fir and spruce across the region. Because our forest has a greater range of species that can quickly fill in the gaps, we often do not notice these losses. However, the implications are that several native tree species, which have important economic and ecological roles in the Acadian Forest region, may already be disappearing from the Maritime landscape.

Developing the model, inputting data and running the scenarios will take about a year. Once the results are available, the information will be shared with interested Islanders. As well, once the 2010 State of the Forest data becomes available, researchers will be able to update their models and see if any of the predictions are already occurring.

Ken Mayhew, Information Officer, Forests, Fish and Wildlife Division, can be reached at kmayhew@gov.pe.ca or 902-368-6450.

Gallery

PRODUCTS & SERVICES

Nova Scotia

Federation of Nova Scotia Woodland Owners

by Mike Hutchinson, Program Coordinator

Private Woodlot Certification Program

On November 18, 2008, the Federation of Nova Scotia Woodland Owners (FNSWO) signed a contract with the Department of Natural Resources to deliver a woodlot certification program to small, independent landowners throughout the province. The funding for the project originated from the Community Development Trust Fund, a federally funded program designed to assist one-industry towns facing major downturns. The Community Development Trust Fund allocated $2.52 million to the Nova Scotia Forestry Joint Task Force Plan, of which $1.5 million was further allocated for private woodlot certification through the Nova Scotia Department of Natural Resources.

The FNSWO will receive $575,000 over four years to implement their CSA Z804 forest certification program. Two other woodlot owner groups in the province received funding to implement small-private woodlot forest certification programs as well. The Nova Scotia Landowners and Forest Fiber Producers Association will receive $850,000 over four years to implement their FSC certification program for small woodlots in the seven eastern counties of the province. The Nova Scotia Woodlot Owners and Operators Association will receive $75,000 to help Nagaya Forest Restoration Ltd. maintain an existing FSC certification program for its members.

Forest certification is a market-driven governance system that provides consumer confidence by ensuring forest products are sourced from sustainably managed forests. This confidence may lead to opportunities to increase value and marketability of forest products in difficult economic times. More importantly, it will raise the bar of forest management prescriptions and activities on the lands of private woodlots. After careful consideration, the FNSWO Board of Directors selected the CSA Z804 "Sustainable Forest Management for Woodlots and other Small Area Forests" Standard. The Z804 Standard is an adaptation of the Z809 Standard currently used worldwide by the forest industry. The Z804 Standard was designed by a technical committee to reflect the objectives and challenges faced by private woodlot owners.

The FNSWO will implement the program with assistance from existing private woodlot management organizations. Eligible landowners will have a woodlot management plan (WMP) developed and be given opportunities to attend forest management education and training seminars in their area. The FNSWO will monitor the woodlot periodically to ensure that the landowner is operating within the parameters of the program. Woodlots in the program will be third party audited to ensure requirements of the CSA Z804 Standard are being met. Once certified, the role of the FNSWO is to provide continual improvement to the program. This may include further training, developing marketing innovations, enhancing forest management techniques, streamlining record-keeping systems, etc.

Having a woodlot that is CSA Z804 certified means that woodlot owners will manage their forested land within ecological, socio-economic and conservation parameters that contribute to long-term sustainability. More specifically, the CSA Z804 Standard uses the Canadian Council of Forest Ministers (CCFM) Criteria and Indicators of Sustainable Forest Management. The list of six criteria set a framework for applying a holistic approach to forest management, and are as follows:

> "Forest certification is a market-driven governance system that provides consumer confidence..."

1. Conservation of biological diversity
2. Maintenance and enhancement of forest ecosystem condition and productivity
3. Conservation of soil and water resources
4. Contribution of forest ecosystems to global ecological cycles
5. Multiple benefits (of sustainable forests) to society
6. Society's responsibility for sustainable development

The program is now well underway and the first wave of woodlot owners have been chosen for the first year pilot. We hope to have 25 woodlots certified by October. The program will be extended to 100 more woodlots in year two and three. Eight woodlot management planners have been selected to assist with the woodlot management plan writing and site visits required to monitor developments in the first year. With the addition of 100 more woodlots, there will be a need to contract more woodlot management planners. The FNSWO has a positive outlook on the outcome of the program, which we believe will be involving more landowners in sustainable forest management, and working together as a group. Being part of an organized group with a well built framework will lead to increased opportunities in the future, especially taking advantage of funding programs aimed at woodlot owner groups.

We are currently accepting applications from small, independent woodlot owners to join the Woodlot Owner Program and get their woodlots into the CSA Z804 certification process. Preference will be given (but not limited) to members of the FNSWO, especially those with woodlots containing mature stands that need a management plan written. For more information, please go to www.fnswo.ca or contact Mike Hutchinson at 902-670-1870 or mhutchison@fnswo.ca.

Mike Hutchinson is Forest Technologist Programs Coordinator at FNSWO. He can be reached at 902-670-1870 or mhutchinson@fnswo.ca.

Fertilizer and Pesticide Use by Treeplanters:

Safety Bulletin based on Research Summary

by Jordan Tesluk, BC Safe Silviculture Project

A research project examining pesticide and fertilizer exposure among treeplanters was conducted between May 2006 and April 2007. The study was a joint venture between researchers at the University of British Columbia (UBC) and FP Innovations, Feric Division. The project was funded by FP Innovations, Feric Division and supported by grants from Island Timberlands Limited Partnership, WorkSafeBC, and the Western Silvicultural Contractors' Association (WSCA) in response to concerns voiced by workers regarding potential health effects of the substances they handle on a daily basis.

The research was headed by Dr. Hugh Davies (professor at the UBC School of Environmental Health) and Mr. Ernst Stjernberg (researcher and professional forester at FP Innovations, Feric Division). The research was subject to the Tri-Council Policy Statement on research ethics, and was externally reviewed before funding was approved. The research was coordinated by Ms. Melanie Gorman, and the outcomes of the research were made available in late 2008, with the completion of Ms. Gorman's thesis.

This summary has been prepared in order to assist workers and members of the industry in identifying the most salient findings and recommendations drawn from the research. Past research on pesticide exposure on Canadian treeplanters has been very limited, and this research represented the largest and most reliable study done to date on the treeplanting workforce.

The study focused on two issues:

1. Exposure to fertilizers (specifically the teabag variety commonly used in planting contracts)

2. Exposure to pesticides (those that are sprayed by nurseries on seedlings, prior to planting)

Exposure data was collected using skin swabs from planters' hands, blood samples, and air samples using a filtering device carried by planters. Data were collected from 54 different planters at 5 different worksites, including a control site at which no fertilizer was being utilized. The research also included interviews with 223 treeplanters based in 13 different work crews.

Key Findings Regarding Fertilizer

- Heavy metals are naturally occurring substances, and sampling found that trace amounts were detectable in the soils at the site as well as the seedling root balls and fertilizers.
- There was no indication of heavy metal contamination in worker blood samples, and the highest level of metal exposure was found at a worksite where fertilizers were not being used.
- No heavy metals associated with fertilizers were found in the air samples.
- Small amounts of cadmium were found in three workers' blood samples, but two of them had not been handling fertilizer, and all three of them were smokers (smoking is a known source of cadmium exposure).
- In some instances, overall dust levels were a concern. However, the dust is likely from wind blown soil and road dust rather than from the fertilizer.
- Ammonia may be released from fertilizer when it becomes wet. Exposure to ammonia was not directly measured in this study, and it may warrant further examination in the future.
- Tree planters reported a higher than expected level of respiratory irritation symptoms, such as coughs and phlegm. It is not possible to determine the potential

Picture 1

Photo courtesy of BushPro

Picture 2

Picture 3

Picture 4

cause of these symptoms through this research, but those who self-reported longer duration of work with fertilizer tended to be more likely to report work-related health effects. Tree planters should monitor their own personal health, and take whatever reasonably practicable measures they can to reduce their exposure to irritants, including smoke, dust, and chemicals.

Key Findings Regarding Pesticides

- Pesticide residues were found on some seedlings. Levels were higher on trees that have had more recent applications of the substances prior to being planted.
- Pesticide residue was found on the skin of some treeplanters. The amount of pesticides found on planters' skin was determined to be far below what would be considered dangerous.
- Although exposure levels found in this study were extremely low, workers should be aware that exposure to pesticides can have harmful health effects, and workers should minimize exposure through whichever reasonably practical means are available. One commonly used pesticide, chlorothalonil, has been classified by regulatory agencies as a probable human carcinogen.
- The research could not control for every possible factor associated with exposure, but estimates based on maximum levels of exposure still indicate that the level of pesticide exposure experienced by the planters in the study does not pose a serious and immediate risk to their health.
- Poor hygiene and use of improper gloves can increase the level of pesticide and fertilizer exposure, and workers should be informed of better ways of protecting themselves and be provided with appropriate resources.
- Although the levels of exposure for both pesticide and fungicides were below levels considered harmful by several orders of magnitude, the substances applied to trees may have harmful health effects and workers can limit their exposure through the use of personal protective equipment and proper hygiene procedures.

Recommendations for Minimizing Exposure

These recommendations have been derived from the research, with additional content (photos and glove examples) added to help identify specific equipment and practices, and to place the research recommendations within the context of the work environment.

- Contractors should familiarize themselves with their responsibilities with respect to supervising work with potentially hazardous substances, particularly regarding provision of information, protective equipment, and opportunities for maintaining adequate personal hygiene.
- Treeplanters work at an extremely high level of physical performance, and may be vulnerable to increased uptake of toxins. They should therefore exercise caution in regards to all potential toxins, not only those potentially associated with pesticides and fertilizers.
- Workers should exercise particular caution when working with trees treated with chlorothalonil. Although estimated exposure levels were far below acceptable limits, chlorothalonil can have harmful health effects after heavy or prolonged exposure. Chlorothalonil is listed under various trade names including Bombardier, Bravo, Echo, and Daconil.
- It is important for workers to handle fertilizers properly, prevent spills, and minimize absorption into their clothing in order to reduce exposure.
- Different bag materials are more effective at preventing leakage or transfer through the bags to the carrier. Butyl rubber, nitrile, and neoprene are some of the materials that would be effective for carrying fertilizer. Carrying teabags loose in canvas planting bags or silvacool bags does not offer effective containment.
- Contractors and workers should examine different methods and engineered receptacles for carrying fertilizer in a way that reduces the amount of water contacting the fertilizer teabags, and minimizing spillage. Two models currently used in the field include manufactured fertilizer pouches (picture 1), and the modified milk jug (picture 2). Both of these containers are designed to be attached to the belt of the planting bags. The goal of these designs is to prevent the fertilizer teabags from becoming wet, and to separate them from the body and other work gear.
- When the same clothes are worn on consecutive planting days, contaminants can build up on the clothing. This can result in higher levels of exposure. Planting clothes should be worn only once, and then washed. Clothes should be washed in hot water to maximize the cleaning effect, and work clothes should be washed separately from casual clothes.
- Planters should change their clothes as soon as they get home. An extra long sleeve shirt for changing into at the end of the day may be a useful piece of gear.

• Planters should wash their hands with soap and water as often as possible, especially before eating, drinking, or smoking. Washing with water alone is not nearly as effective. Sanitary wipes and alcohol-based cleaners are effective at preventing the spread of germs and disease, but are not designed to remove dirt and chemicals from the skin.

• The industry may want to experiment with different methods of enabling hand washing, such as 3.5-gallon mobile hand wash stations or Scrub 'n Go Scrub Jug Minis. While such options may not be practical in all treeplanting work environments, other methods of hand washing in the treeplanting environment warrant examination. For example, workers can be encouraged to take a small vial of biodegradable soap to work. This can be used in combination with an extra bottle of water that can be poured over the hands (see picture 3), or with a camping style water jug with a faucet that can provide a stream of water (see picture 4). Local water sources such as streams and creeks may also offer opportunities for workers to wash their hands and reduce their exposure levels.

• Industry (contractors) should implement adequate personal protective equipment programs. These programs should address the following issues:

1. Contractors should train treeplanters in the proper use and maintenance of their gloves. For example, gloves should be changed if they become damaged or contaminated on the inside and gloves should be washed prior to reuse.

2. Different glove materials work best for different chemicals. The contractor is required to tell treeplanters what is required. Planters should use gloves that provide a chemically impervious barrier. Nitrile, butyl rubber, or neoprene gloves should be used when handling fertilizers and pesticides. Latex does not provide an effective chemical barrier. Examination of the ergonomic demands of gloves for treeplanting and the types of gloves most frequently used in the industry indicates that nitrile is the most suitable material.

3. Workers should avoid using gloves that have open fabric backs (see pictures 5 and 6), as they may trap chemicals and increase exposure levels by holding the contaminated fabric against the skin.

It has been noticed that many workers utilize open-backed gloves in combination with an inner nitrile liner that covers the entire hand (see picture 7). This would provide better protection, but the outer gloves should still be washed on a regular basis. There are also several types of nitrile gloves available for use that offer complete hand coverage along with suitable durability and ergonomic design (see picture 8 and 9)

A pamphlet has been prepared by the WSCA to provide employers and employees with immediate recommendations for reducing worker exposure to pesticides and fertilizers. The pamphlet includes information on hygiene and laundering work clothes as well as a detailed guide on the types of gloves used in the industry.

A Note on Responsibility

While many of the measures required to reduce exposure focus on the equipment used by individual workers and their actions in the workplace, employers are responsible for properly informing workers of all foreseeable hazards and providing them with the knowledge and the means to protect their health and safety. Employers must provide workers with the personal protective equipment required for their jobs, and instruct them in regard to the care and maintenance of that equipment. Employers are also responsible for ensuring that all worker activities are in compliance with WorkSafeBC regulations and ensuring that workers are not engaging in practices that are hazardous to their immediate or long-term health. This includes inspecting workers to ensure they are using personal protective equipment (such as proper gloves), and ensuring that hazardous substances are being handled in a safe manner. Employers are also required to implement WHMIS programs, and provide the correct Material Safety Data Sheets (MSDS) for the substances being used in the worksite.

Employers must acknowledge these requirements as they shape their health and safety policies and programs. Maintaining a safe and healthy work environment is based on shared responsibility between the clear leadership of employers and the individual actions of their employees. This article has been provided to assist both employers and employees in fulfilling their roles in maintaining a safe and healthy workplace.

Those interested in reviewing the specific recommendations and suggestions for sites of future study can view the thesis at the following web address: https://dspace.library.ubc.ca/dspace/bitstream/2429/2493/1/ubc_2008_fall_gorman_melanie.pdf. Additional information on the research can be found at www.cher.ubc.ca/treeplanter.

The following people contributed to this research summary: Dr. Hugh Davies (UBC School of Environmental Health), Ernst Stjernberg (professional forester and researcher at FP Innovations, Feric Division), Melanie Gorman (research coordinator), and Jordan Tesluk (BC Safe Silviculture Project).

Picture 5

Picture 6

Picture 7

Picture 8

Picture 9

Focus on Safety

by the Ontario Forestry Safe Workplace Association

First Aid is Often the Only Aid in the Wilderness

As the front-line medical response to any situation, first aid is a vital part of a workplace health and safety program - especially when the workplace is in the wilderness, far from professional medical help.

The legal requirements for first aid at Ontario bush sites such as treeplanting operations are contained in Regulation 1101 of the Workplace Safety and Insurance Act. Section 16 of the Regulation requires employers of bush workers to provide a first aid box with prescribed supplies at "a central location" as well as in any vehicle used by the employer to transport workers.

In addition to the first aid box, employers are required by law to have a designated person in charge of the box who works in the immediate vicinity of it and holds a valid St. John Ambulance Standard First Aid Certificate or its equivalent. All members of treeplanting crews should be aware of the locations of first aid boxes and of crew members who are certified first aid providers.

Apart from the employer's legal obligation to provide and equip a first aid box, workers have responsibilities to safeguard themselves on the job. Although training in first aid and CPR isn't a legislated requirement for everyone in the workplace, it is a major advantage for a worker's own care. He or she may also be in a position to provide vital help to a fellow planter in the event of an injury.

Insect bites and stings - Treeplanters need to be aware of two types of allergic sensitivity to insect bites. The first type, consisting of swelling and irritation of the skin around the bite, can be annoying - especially in cases of multiple bites - but it is not life-threatening. Treat the reaction with an over-the-counter antihistamine, following the directions carefully. Cleansing the irritated areas with soap and water and applying a calamine lotion can also help.

Anaphylaxis, the second type of allergic reaction to insect bites, is much more serious. Symptoms can include shortness of breath, faintness, dizziness, general itching, swelling of the throat, and a sudden drop in blood pressure as well as unconsciousness. In the most severe cases of anaphylaxis, injection or inhalation of epinephrine (adrenaline) may be the only effective treatment. Individuals who are prone to severe allergic reactions should carry an Epi-Pen with them at all times. Directions on the use of the Epi-Pen will be known by the person who carries one.

Dehydration - Preventing dehydration is a lot easier than treating it, so treeplanters need to be very aware of their body's fluid levels as they work. They should not rely on thirst as an indicator of their need to absorb fluids - thirst is a late response to low fluid levels. The colour and amount of urine is a better indicator. A lot of light-coloured urine means that the body is well hydrated. Smaller amounts of dark urine indicate that the body is trying to hoard its remaining fluid.

In hot and humid weather, treeplanters lose more fluid through sweating than they normally would as a result of their exertions, so water intake is even more important at those times. They should take short, frequent sips rather than big gulps. They should cut back on coffee, tea, and soft drink consumption, as these liquids cause more frequent urination.

Poison ivy - The best first-aid advice on poison ivy is to avoid it like the plague. All parts of the poison ivy plant can cause an allergic reaction. Touching the plant or even touching clothes that have some of the plant's toxin on it can cause a painful skin rash. Skin reaction to contact tends to be most severe in cool, dry weather. Heat and humidity neutralize the poison ivy toxin somewhat.

The allergic reaction usually begins a day or two after contact. Symptoms include itching, redness, burning, swelling, and blisters. If a worker is fairly certain he or she has come into contact with poison ivy within the past few hours, an allergic reaction can be minimized or even prevented by:

- washing clothes and shoes with soap and hot water;
- washing skin with strong soap and hot water;
- applying rubbing alcohol to the affected parts of the skin and rinsing with water.

Blisters - A treeplanter's hands and feet are the most prone to blistering. Hand blisters are caused by all the shovel work. The punishment can be eased to some extent by wearing gloves and tape. Friction blisters to the feet and toes are created (or aggravated) by badly-fitting footwear that cause continuous rubbing or pressure against the skin.

Most blisters will dry up in time and should not be broken. But if a blister is causing severe pain, it can be drained. Start by cleaning the blister with rubbing alcohol or antiseptic cream. Heat a straight pin or safety pin over a flame until it glows red. Allow the pin to cool before carefully pricking the edge of the blister. Drain the fluid by putting gentle pressure on the blister, then apply an antibiotic ointment and place a bandage on the blister that puts light pressure on the blister area. Change the bandage every day. When the wound looks and feels like normal skin, it no longer needs bandaging.

Cuts and scratches - Given the treeplanting work environment, cuts and scratches are virtually inevitable. Planters should wear appropriate PPE and work as carefully as possible at all times to reduce the risk of such injuries. Planters should wash their hands before treating any cut or scratch to avoid infection from hazardous chemicals, insect repellent or dirt. The wound should be cleaned and disinfected and a bandage applied as required. It's important to watch for any sign of infection and to get medical help if necessary.

The Ontario Forestry Safe Workplace Association (OFSWA) has created SafePlanting.com, a comprehensive online health and safety training program for treeplanters. For more information or to order the program for your workers, visit www.safeplanting.com or contact OFSWA at 705-474-7233 ext. 267.

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Soil's Role in Evolving Healthy Earth

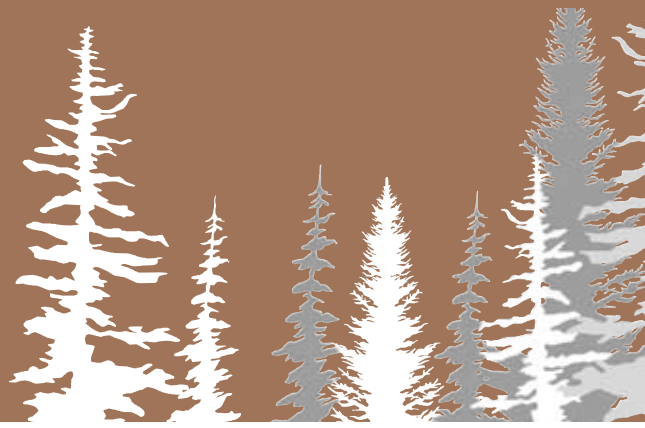
by Steve Apfelbaum, Dirk Brinkman & Robert Seaton

The next climate action frontier is meeting the challenge of "re-growing soils on the earth". This means rebuilding the soil organic carbon stocks that have been depleted, according to USDA estimates, by as much as 50% in most agricultural lands, and more in other land uses. Soil is the foundation of all land ecosystems and in a global terrestrial climate action program each land use change wedge - including forests, agriculture, grasslands and even semi-arid and wetlands - will depend on healthy soil. The benefits of growing soil include increasing ground and water surface supplies, food and fibre production, nutritional food quality, and biodiversity as well as reducing fertilizer and energy input needs. However, it is the capability of healthy soils to mop up atmospheric carbon that may fund a major global shift in land use practices. Soil being degraded by poor land use practices, primarily agricultural and silvicultural, may be responsible for as much as 30% of annual human greenhouse gas (GHG) emissions. The implementation of a large scale soil health program will have profound benefits for poverty, social unrest, inequity, and human health. In order to facilitate this shift on a large scale, The Earth Partners (TEP) has undertaken to develop a robust soil quantification methodology for measuring the climate change benefits of shifting from poor to sustainable soil management practices. This article explores the opportunities and challenges of developing and then applying this tool.

"Growing soil" will not only grow organic and inorganic carbon, it will:

- **Grow ground and surface water supplies** - A 1% increase in organic soil matter holds 675 thousand litres of water per ha (or 60,000 gallons per acre), recharging potable ground water systems and revitalizing drought-stricken landscapes and peoples.
- **Grow healthy food** - With improved soils, farm operating costs have been reduced 40-90%, while yields have increased by 10%.
- **Grow biodiversity** - Healthy soils are one of the strongest foundations for restoring the diversity of life and human prosperity on earth.
- **Grow a healthy climate** - By investing in "soil sinks" we can effectively absorb 50-70% of the existing excessive GHGs in the atmosphere and 30-50% of the current annual contribution.
- **Reduce resource use and waste** - With improved soils, reductions in fertilizers, irrigation, pesticides, and herbicides are realized.

Getting paid for all of these other land use change benefits remains a challenge, but the biggest challenge has been developing a valid



GHG quantification approach for measuring and monitizing soil carbon accrual value that is, and is perceived to be, rigorous and demonstrates that the GHG benefits are real, additional, verifiable, and permanent.

The Climate Challenge and Opportunity for Soil

The challenge of developing this methodology has been not so much an issue of measurement capabilities as a question of applying efficient sampling designs and rigorous, easily replicable protocols. The science of soil carbon management is valid and robust, as every farmer has experienced, and research scientists have relied and refined this science over nearly 200 years of rigorous sampling and testing. What isn't understood, and is perhaps most alarming, is that the robustness of the soil sampling and analytical field data collection has not been realized within the regulatory and policy arena.

Thus, the implementation challenge has been both the educational process and keeping costs low enough to include and aggregate smaller landowners (normally marginalized from the Payments for Ecosystem Services [PES] process). TEP uses a combination of remote sensing to stratify soil sampling, rapid or participatory ground survey methods, and developed the parameters to streamline the direct measurement and land based verification process. Therefore the methodology rests on an efficient and rapid field sampling design needed for the multi-year re-measurement intervals applied through a set of rigorous field protocols, which would be applied across all soil sequestration projects using a common analytic data approach. It is the hope that this structure can effectively overcome the discount concepts now in Senator Waxman-Markey's bill, currently before the US Congress, which unfortunately proposes to discount land use change credits by 25% because of some perceived methodological uncertainty. This discounting is a strong disincentive to participation in a carbon marketplace, especially by smaller landowners.

It requires a high level of professionalism to help the climate world abandon the concept that land use reduced emissions or increased sinks are "offsets" for reducing industrial emissions. Land use change is a stand-alone GHG action with some unique strengths and lots of side benefits.

Leakage is less of a problem for most soil management practices, including agricultural operations where healthy soils increase food production and decrease costs by reducing the need for fertilizers and irrigation water. Obviously, even in industrial agricultural operations, where the economic benefits of "grown soil" are realized, these benefits will increase the assurance of the permanence of soil carbon. At this time armchair debates about soil carbon permanence issues are just that! Even under the most degrading of land uses, soils have continued to self-replenish, simply at reduced rates. As water limitations threaten the very foundations of US agricultural systems (think of California's Central Valley's challenges at this time), farmers see a real problem in being forced to reduce their operations due to water scarcity. Growing soils present a crop-ready water retention alternative and drought alleviation strategy. Although initially this option may be perceived as a complex problem, as farmers realize the sustainability benefits, they will make sure the soil carbon is permanent. Pilot projects find that although initially landowners hesitate to participate, they are soon motivated to maintain their healthy soil practices by the roster of benefits. This suggests that over time demonstrating permanence will not prove to be a problem.

To avoid the trap of the overwhelming complexity in the methodologies that has bogged down reforestation initiatives through the UNFCCC Clean Development Mechanism, TEP developed a soil carbon methodology which is comprised of 21 modules, so that the key component parts could each stand alone and modifications for specific projects could be minimized to the relevant components. Global food security issues are driving institutional regulatory frameworks and the US's inclusion of soil carbon in its draft bills recognizes that food security issues may also be addressed through using climate credits to shift the sector toward healthier soil nurturing practices. The soil methodology can be embedded in the other land use change initiatives to help build out a global scale land use change program which may make the inevitability of 2°C warming less likely.

Mobilizing a Global Land Use Change Sinks Program

With the US finally developing serious climate legislation, the world is really only starting to think about implementing a serious preemptive global climate change response. US policy initiatives recognize that it is too late to prevent global warming greater than 2°C by only reducing emissions. All US policy initiatives include strategies to increase terrestrial sinks, because they are taking advantage of America's extensive land area. The policies also include stimulating land change projects and programs through bilateral carbon trading.

While some argue that it is also important to create ocean sinks, the knowledge base for nurturing terrestrial ecosystems and creating healthy soils is nearly embedded in our genes. The hundreds of generations of farming and ecosystem stewardship are matched today by

a robust land use science base, while our ocean ecosystems science is still shallow in comparison and is vulnerable in predicting outcomes. Not only are the terrestrial ecosystem mop-up services more important, a healthy earth ethic is ready to be implemented, and at perhaps the lowest possible economic costs. Given the co-benefits, growing soil may represent some of the highest no-regrets climate action along with the quickest recovery rates on earth. After all, the earth's soils, next to the dissolved carbon dioxide in the oceans, accumulated to become the second largest living carbon sink on the planet. Most importantly, every gardener and farmer knows how to improve organic soil matter, which is over 30% carbon.

The annual uptake of GHG emissions by ecosystems is not well understood. In the 2000-2005 period, human emissions averaged 8.9 Gt, with 1.6 Gt due to deforestation. The annual average uptake by forests, wetlands, and grasslands was 2.6 Gt, while the oceans uptook 2.2 Gt. In other words, over 53% of annual emissions were mopped up by surface ecosystems including oceans. This is down from 65% in the 1990-1999 period, due in part to increasing emissions, but the startling 19% decline underlines the urgency of reversing soil degradation.

The IPCC recently reported that the technical mitigation potential of agriculture (estimated upper limit if "Best Management Practices" are widely adopted) may be 5.5-6 Gt of $CO2_e$ per year by 2030, which offers a greater potential for mitigating climate than forests. With 90% potentially achieved through soil carbon sequestration, up to 70% can be realized in developing countries. Due to all of the other benefits, many of the abatement options are cost neutral or net-profit-positive with little capital required potentially coming from carbon credit investment.

Examining the importance of growing soil carbon for seven terrestrial land use change wedges finds that a global program will not only be driven by climate credit benefits, but also by PES. The role of soil across a global scale land use change initiative includes:

1. **Grassland restoration** - TEP finds that modifying land use practices in US grasslands and restored rangelands can sequester soil carbon at a surprisingly low land use change cost. These initiatives have the potential to cover hundreds of millions of hectares within the decade and this may be the best use of the soil methodology.

2. **Changes in agricultural practices** - Changing today's industrial chemical agricultural practices offers perhaps the quickest route to transforming sources into sinks on a global scale, and can perhaps sequester more carbon because of the immense land area used for agricultural production. Through possible increases in production, this sector may have the potential to use large acreages, which now grow annual crops through perennialization, to grow biofuels that can be harvested annually or on short cycles without creating a food pricing crisis.

3. **Char soil building** - Char appears to grow the soil, and may drive land use change in semi-arid and arid regions, which comprise 42% of the land surface. Trials in Australia have soils growing in thickness by 1 cm per year. Char, a by-product of pyrolisis or incomplete combustion, such as from charcoal production, seems to swell soils with stimulated biotic activity. With 80% of the poorest of the poor living in these semi-arid and arid regions, this initiative's potential to absorb 9 Gt annually, as Johannes Lehman predicts in the May 2007 issue of *Nature*, growing soil with char may also heal global wealth assymetry.

4. **Wetlands restoration** - While one of the greatest terrestrial sources of GHGs is methane released from degraded wetlands, these vast areas respond surprisingly quickly to restoration. Good soil practices can mend wetlands due to nutrient enriched agricultural landscapes in their watershed. Organic soils, drained for agriculture years ago, can use seasonal water management strategies to simply restore and effectively reverse the wetland GHG emissions from their decomposing muck and peat soils. Wetland restoration can significantly renew and restore soil sinks around the earth.

5. **Forest plantation renewal** - Forests may also benefit from a good soil methodology to help projects fully capture the climate benefits that will help drive it to the scale of up to 250 million ha of new plantation, which the Food and Agriculture Organization of the United Nations suggests global timber demand will require. A global reforestation program will include monoculture and ecologically-appropriate mixed species, and both may benefit from better measurement of soil change factors.

6. **Secondary forest improvement** - This can be turned into an intentional program from an abandoned land program. Degraded land around the globe once cleared of forests and now marginal for agriculture is returning to forest, and with a good soil methodology, may be able to use soil healing to make restoring forests on marginal farmland a profitable activity.

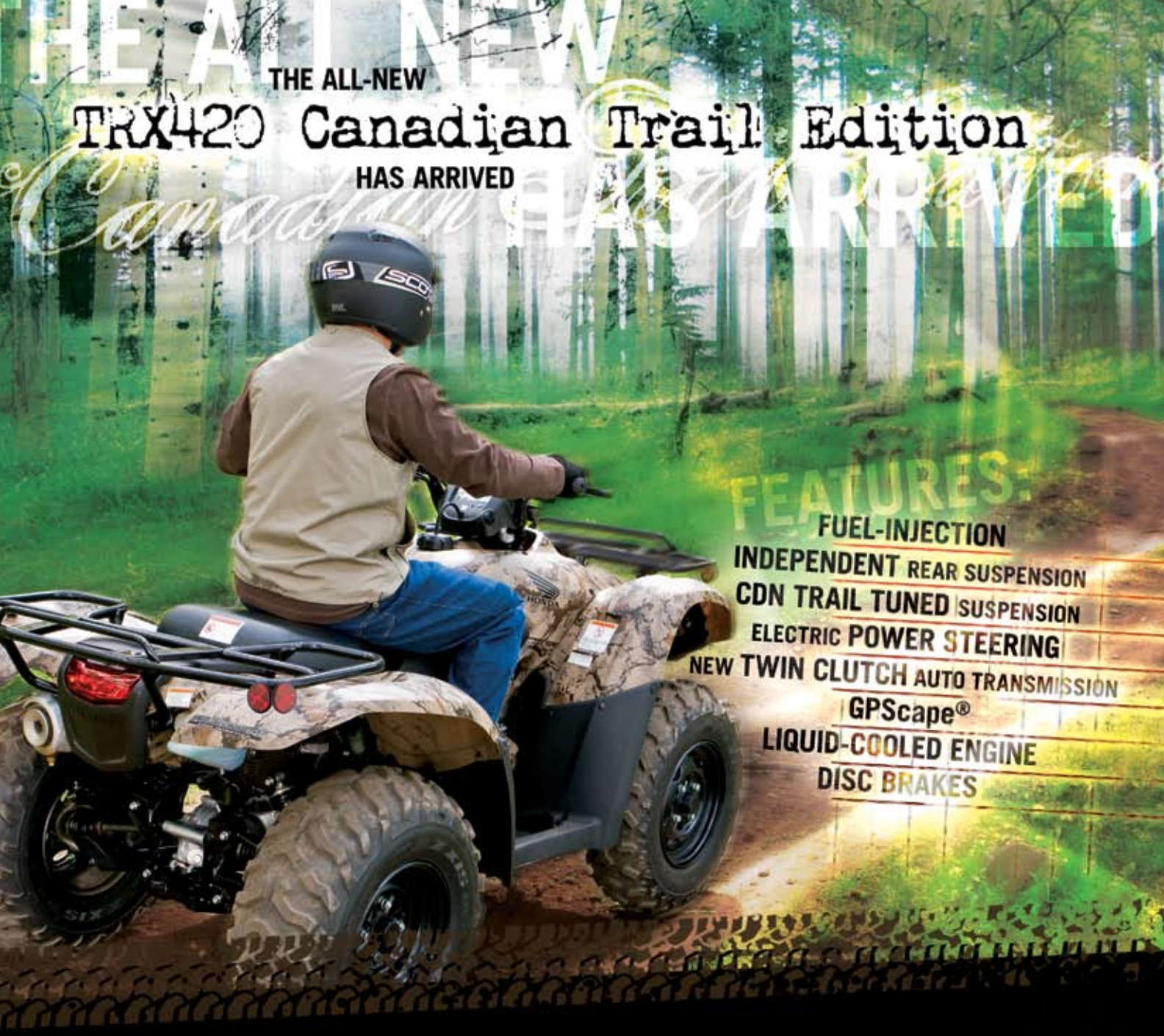
7. **Reduced emissions from deforestation and degradation (REDD)** -

Deforestation and degradation are estimated to contribute 9-25% of annual emissions, and according to the November 2008 issue of *The Eliasch Review: Climate Change, Financing Global Forests*, REDD initiatives can reduce deforestation emissions by 75%. Deforestation is often followed by soil degradation, and having a robust soil methodology may enable better modelling of REDD initiatives.

Since a robust soil methodology can underpin a global land use change program, TEP undertook to develop it and is currently testing this methodology in conservation, ecosystem restoration, and a range of agricultural projects throughout the US and beyond. The methodology has had a strong foundation since so much work with soil sampling, analysis, computations, projections, and modeling has been done by many scientists worldwide. These tests are welcomed because farmers are a practical group, and when given a challenge, such as that created by drought, declining water supplies, and declining soil health, they quickly engage in testing and demonstrating constant improvement in one field trial after the next. Farms are key partners in documenting the benefits of re-growing soils. Through integrating their significant economic benefits, they will be the ones to demonstrate that farms can grow better food and simultaneously contribute to living within a new healthy earth ethic.

The soil carbon quantification method is now in technical peer review and testing, and will soon be released so other organizations can participate. Developing these soil GHG measurement tools may become one of the most important collaborations in the journey we are all on - to address climate change. The ground beneath your feet appears to be the right place to start - let's re-grow all soils!

Steve Apfelbaum, CEO of Applied Ecological Services, Inc,. and Dirk Brinkman, CEO of Brinkman Forest Restoration, are both founding partners of The Earth Partners. Robert Seaton, Silviculture Analyst with the Brinkman Group worked with Steve to develop the soil methodology in 2009. More information can be found at www.theearthparters.com.



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Small Woodlot Recognized for Sustainable Forestry

by Erin Haluschak

Despite the economic downturn and its impact on the forest industry, Harold Macy is doing quite well. Macy and his wife Judy own Headquarters Creek Woodlot, a small sustainable forest on Crown land at the base of Mount Washington on Vancouver Island in BC. The Macys have succeeded by providing timber to niche markets looking for products such as house logs, post and beam construction materials, crossarms for power lines and more. Macy also focuses on non-timber forest products such as mushrooms, berries, and sap for maple syrup. He gives informative tours and education in woodlot management, agro-forestry, and rural land use.

Just last month, Macy was recognized for his sustainable practices at the Business Examiner Awards in Nanaimo, BC, as the woodlot won the Business of the Year award in the forestry/wood category.

"There were more than 800 people (at the awards) from all over. I thought okay, we're from Merville; at least we're not wearing our gumboots. But it was absolutely amazing," said Macy. "Accolades are usually deferred...my praise comes from when I walk into a forest and see it healthy and know there's something that I can hand over to my sons. Although whenever I can bring forestry into the spotlight, it's wonderful."

The Macys received their woodlot licence in 1998 through a partnership agreement between the province and private landowners to manage a parcel of Crown forest land in conjunction with private land. The Crown land portion is nearly 400 hectares of primarily coniferous forest.

Following approval of plans and permits, they began harvesting in 2000, and continue to harvest nearly 60 logging truckloads a year, using a partial cut system - a single stem selection (thinning) and small patch openings to treat root disease pockets or damaged stands.

"I would like to change people's attitudes about logging. It's not just about wood products. Being in forestry is not 'yesterday's man'...it is still a noble occupation which was regarded as guardianship rather than exploitation, but the profession has devolved. The emphasis these days is on information technology. Try building a house with JPGs," he noted.

Macy's work experience in the industry spans more than 40 years, as he has worked as a forest manager and in forest education with the University of British Columbia research farms. When the woodlot license was advertised, some of the objectives for the applicant included emphasis on personal sustainability, the ability of private land to co-manage with Crown land, and to increase silviculture education. Macy admitted when he saw the application, he thought "I can do that. I've been doing that for 20 years."

> **"Being in forestry is... still a noble occupation which was regarded as guardianship rather than exploitation..."**

As a small business, he noted the lot is very adaptable to market conditions, "as we can sell one log or a truckload, whatever the market will bear. No matter what, forestry is one of the foundations of the economy."

In addition to the woodlot, Macy said he would like to work more with non-timber products and education. He has developed a course called "Forestry from the Ground Up" and has travelled to Denman, Pender, and Cortez islands and a variety of locations on Vancouver Island offering the weekend course to private land owners, environmental groups, and farmers' institutes.

"I see my role as an incubator for new ideas in forestry. When people say forestry they think TimberWest. It's condos versus conifers. Give us a chance to say 'Hey, we're doing this differently.' "