CANADIAN
SILVICULTURE
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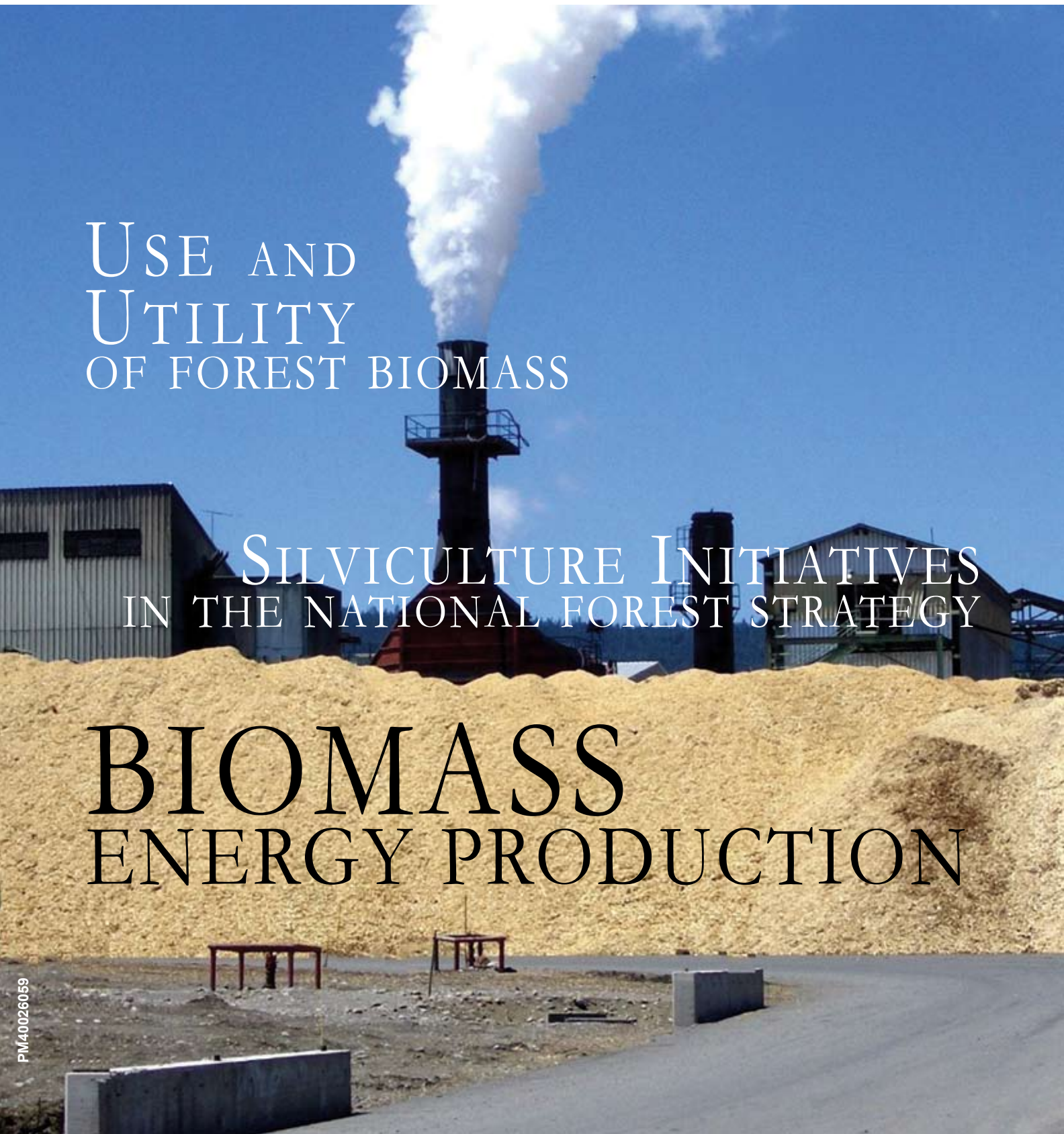

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Columns

Editorial

by Dirk Brinkman

Reversing Global Warming with Photosynthesis

In December I was privileged to be a part of nearly 10,000 people in Montreal for the 11th Conference of the Parties (COP-11) to the UN Framework Convention on Climate Change and its Kyoto Protocol - the largest international negotiation ever convened in Canada.

Despite the host government having fallen in a non-confidence vote on the first days of the conference, Canada distinguished itself due to its unique capacity for compromise and skill at drafting text, which satisfied everyone. Canada was deferred to repeatedly throughout the negotiations to help achieve the consensus required of all parties by the UN process. On matters sometimes as minor as punctuation, one country's hesitation forces all other parties to find an acceptable solution, a process of extended negotiations that more often than not lasted all night for almost every one of the forty agreements.

Fortunately, Canada's commitment to the Kyoto Protocol is not easily extinguished. Though the country may elect a government, which proposes to withdraw from the agreement, passing legislation to withdraw may take up to a year. After that, the protocol requires a formal 3-year notice to the UN declaring Canada's intention to withdraw. While government intentions have a huge influence on in-country compliance and performance, four years is usually enough time for popular support to change a Canadian government or its position.

Canada's influence and goodwill currently trades far above its population or capital trading weight. Withdrawing from clean development mechanism projects would erode the leverage of Canada's international credibility, and lead to trade loss because of the poverty amelioration benefits of many of these projects. If Canada did withdraw from the Kyoto Protocol, it would still remain a signatory to the UN Convention on Climate Change, like the US.

One of the most important forest-related accomplishments of COP-11 was the indefinite extension of the Kyoto Agreement past the first commitment period of 2008-2012. The extension of the agreement makes many forestry projects with slow

temperate growth rates and long-time scales viable.

The biggest forest-related breakthrough was the commitment to pursue Papua New Guinea and Costa Rica's proposal to stimulate action through policy approaches and positive incentives to avoid further deforestation in developing countries.

Fully 25% of average global greenhouse gas (GHG) emissions are from deforestation, primarily in the tropics. In November the UN's Food and Agriculture Organization (FAO) released its 5-year Global Assessment of Forest Resources report, which indicated that net deforestation has declined to about 13 million hectares per year. The FAO has been criticized for reporting statistics that net the annual area of new plantations out of the annual area of natural forest loss. It is the net annual loss of natural forests that was the conference focus.

The COP-11 negotiations used the staggering annual figure of 25 million hectares of forest loss in developing countries. This represents an increase from the alarming rate of 17 million hectares in the 90s. All countries agreed to the urgency of stopping deforestation, but some cautioned that the millions of people now dependent on slash-and-burn agriculture for their livelihood will make this a complex proposal.

With this new trading principle being worked out internationally, Canada has the opportunity to develop a parallel national initiative. Given the marginal profitability of today's harvest sector, there are extensive operational harvest areas whose carbon returns may be greater than their harvest returns. Like ore smelter that can make more money selling its hydro electricity when electricity prices are high, high carbon prices may periodically shut down harvest and milling operations. Avoiding deforestation in Canada shares the same complexity for the people whose livelihood depends on harvesting. Once this option is widely understood, it will not be far from the thoughts of forest managers and policymakers as a solution to marginal forest operations.

These agreements are important because it is only through photosynthesis that we can take CO2 out of the atmosphere and begin to reverse global warming. There is no known technology that can take GHGs out of the atmosphere. All other aspects of the Kyoto Protocol agreements are for reducing the rate of GHG emissions. None begin to reverse global warming except afforestation/reforestation and the new deforestation avoidance mechanisms.

At the conference there were proposals to give sustainability premiums to forest carbon because of its poverty amelioration benefits, and its importance to forests regarding erosion control, cleaner water, habitat and biodiversity. Up until this conference, forest carbon prices were discounted for impermanence, but a premium for forest carbon climate change reversal and sustainability may offset this problem.

Forests are the largest managed plant community, a living storehouse for carbon and the largest terrestrial CO2 pump for getting GHGs out of the atmosphere. Canada has 10% of the world's forests. In hosting our largest global conference ever, we may have established agreements that lead to some of the greatest changes that we have seen in decades in the way we manage our forests.

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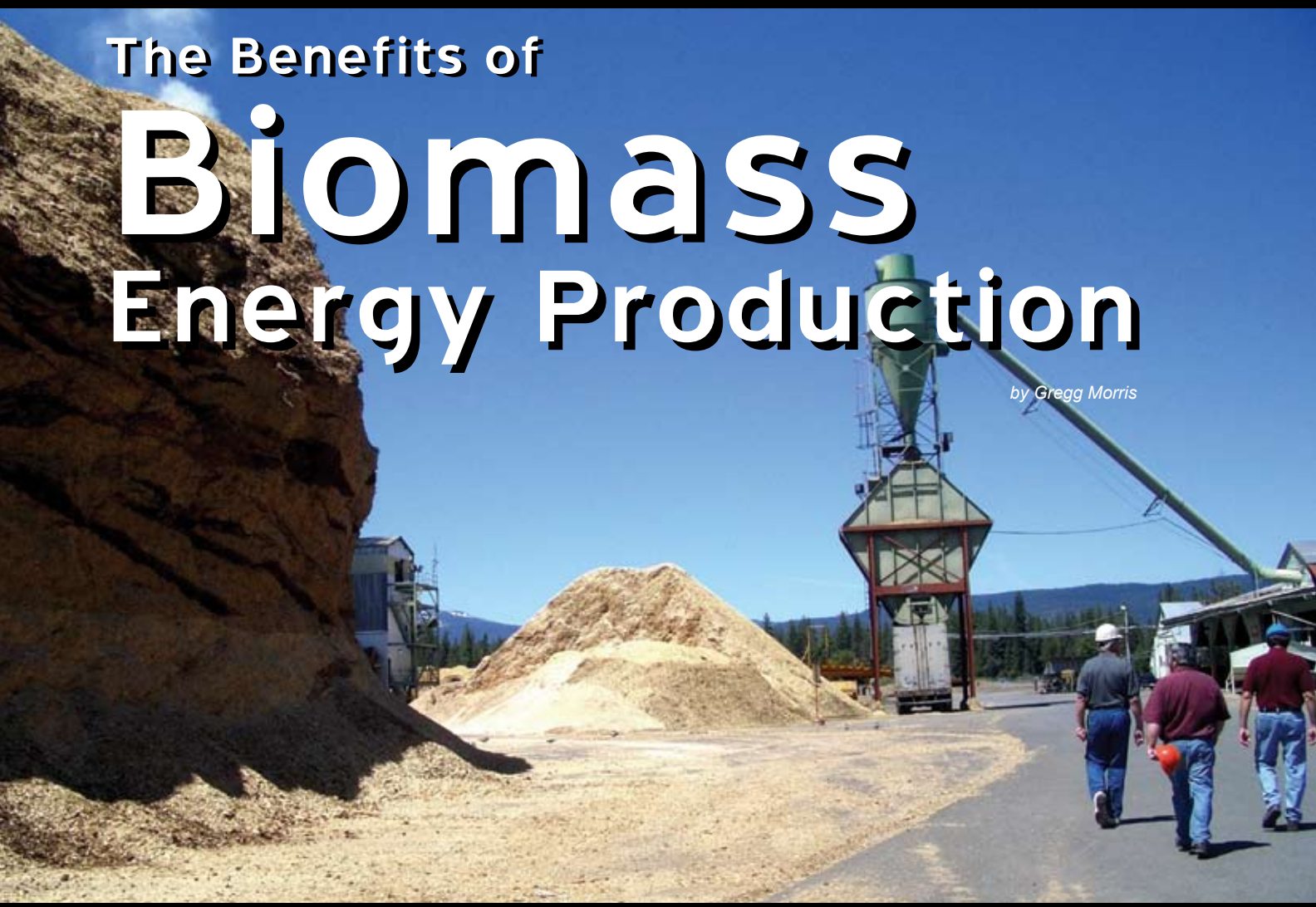
The Benefits of Biomass Energy Production

by Gregg Morris



Canada's biomass resources are extensive, and their use as energy resources provides many valuable benefits. Biomass energy generation produces two distinct and important products: renewable energy and environmentally preferred disposal.

A broadly based biomass energy industry supports sustainable agriculture and forestry, minimizes the amount of material entering landfills, contributes to improved air and water quality, and substantially reduces greenhouse gas emissions. The great challenge for biomass energy development is that it is not often the lowest cost option, but when its disposal services are factored in it is often society's best total package.

Converting Canada's forests to a healthier, more resilient state will require the removal of huge quantities of residues. The biomass energy industry offers a productive use for these residues, which otherwise would be open burned, or not removed at all. The development of an infrastructure of biomass power plants and related wood product applications will not only provide renewable electricity, it will also facilitate the restoration of Canada's forests, promote rural development, and reduce open burning and landfilling of wastes.

Framework for Biomass Benefits Assessment

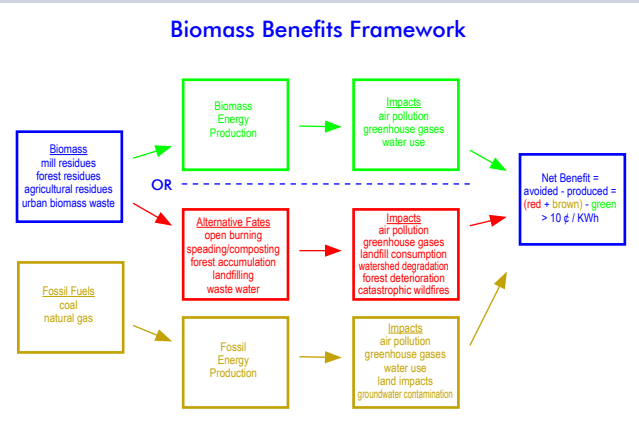
Energy production from biomass displaces the production of a like amount of energy from conventional (fossil) sources. At the same time, the use of biomass as fuels avoids the alternative disposal of these materials. While biomass energy production causes environmental impacts during fuel preparation and conversion to energy, these impacts have to be balanced against the avoidance of both the impacts associated with an equivalent amount of energy generation from fossil fuels, and the avoidance of the impacts that would otherwise be caused by the disposal of the biomass residues.

The net environmental impacts of biomass energy production are defined as the impacts of the energy-production pathway less the sum of the impacts of the alternative production of the same amount of energy from fossil fuels, plus the impacts of alternate disposal of the biomass residues. Most of the biomass that is used for energy production would meet one of three fates if it were not converted to energy: open burning, burial, or accumulation as overgrowth in Canada's forests.

Open burning produces much more pollution than controlled combustion in a power boiler, and much greater quantities of greenhouse gases. Accumulation of forest overgrowth can have negative consequences for fish and wildlife habitat, reduces forest growth and resiliency to natural disturbance regimes, increases the risk of devastating wildfires, and degrades the functioning of forested watersheds. Landfill burial of usable

biomass depletes available landfill space, and produces many times greater quantities of greenhouse gas emissions than controlled combustion. In all cases, the energy production pathway provides an environmentally superior disposal alternative for the biomass that is being converted.

A framework for understanding the social and environmental benefits associated with energy production from biomass is illustrated in the figure below.



The Costs and Benefits of Biomass

A major US study showed that the net benefits of biomass power production are worth more than 11 cents (US) per kWh. This is greater than the value of the electricity that is produced. Approximately 80% of the total net benefits are attributable to the productive use of the biomass resources, while the remaining benefits are due to the displacement of fossil fuel powered electricity production. The impacts that were quantified in the study included conventional air pollutants, greenhouse gases, landfill consumption, and improvements in forest productivity.

Open burning of biomass residues is standard practice throughout Canada. Open burning is a major contributor to local and regional air pollution. Controlled combustion of biomass in a power plant leads to emissions of air pollutants, but net emissions of conventional air pollutants associated with the disposal of the biomass are typically reduced by 90-99% compared with open burning.

Biomass energy use provides significant reductions in greenhouse gas emissions. Climate change is one of the greatest environmental challenges of our time, and biomass energy production not only displaces the use of fossil fuels, which is the primary cause of the buildup of global greenhouse gases, it also reduces the greenhouse gas emissions associated with the disposal of the biomass by shifting emissions from methane to carbon dioxide, and by making forests more resistant to wildfires and pest and disease outbreaks.

Biomass energy production also provides highly desirable rural employment and economic development opportunities, and biomass power plants are among the most dependable generators on the grid. The dispatchability characteristics and dependable nature of biomass power technologies are important considerations for acceptance within the electric utility sector. Biomass power production provides jobs not only in the construction and operation of the generating facilities; it also supports jobs in fuel production (forestry, agriculture) and transportation.

the case for

public policy intervention

is overwhelming

Policy Implications

The future of biomass energy development is in doubt. On the one hand, biomass energy delivers unique and valuable social and environmental benefits that not even other renewables can match. On the other hand, biomass energy production is expensive. Often the energy market cannot carry the entire enterprise by itself. The case for public policy intervention on behalf of beneficial applications for biomass is clear and overwhelming. In addition to the financial challenges, there are a number of barriers that will restrain the future development of Canada's biomass potential. Three key barriers to increased biomass energy development include:

• The social and environmental benefits of biomass are not compensated in the commercial marketplace. As an inevitable result, they are under-produced in comparison to their value to society.

• Permitting issues plague biomass energy development across Canada. Permitting barriers challenge both the locating of the conversion facilities, and the ability of the facilities to gain access to the biomass resources they need in order to obtain financing and sustain operations. Air quality regulations usually ignore the alternative disposal fates of potential biomass fuels, which are usually much worse for the same and adjacent air basins.

• RECs (renewable energy credits) are poised to become the common currency of renewable "attributes". Alberta and BC, for example, are members of the regional tracking system for RECs called WREGIS. The definition of the REC must carefully differentiate between those characteristics that are common to all renewables, and thus the essence of the REC, and those environmental services that are produced as ancillary products - or co-products - of energy production, and thus should be the rightful property of the generator.

Gregg Morris is with Future Resources Assoc., Inc. in Berkeley, CA. He can be reached at 510-644-2700 or gmorris@emf.net

Silviculture Initiatives in the National Forest Strategy

by Dirk Brinkman

Archimedes:
"Give me a fixed point
and I can move the world."

National Forest Plans are prepared by many nations, but Canada is unique in developing a vision by bringing together forest stakeholders from civil society and government to participate equally to create consensus commitments. A countrywide process of meetings, Internet submissions, and collaborative synthesis in 2002-2003 resulted in the fifth National Forest Strategy 2003-2008. The National Forest Strategy Coalition (NFSC) was formed in 2003 to implement the National Forest Strategy (http://NFSC.Forest.ca). The Coalition formed teams to implement the objectives and action items of each theme and this article summarizes some of the coalition's initiatives that will impact silviculture.

Within the forest sector, consensus forms a rare 'fixed point' from which, as Archimedes declared, "we may move the world." Certainly, leveraging change is much easier from a fulcrum of consensus than when acting alone or even through a stakeholder association. Through informing the silviculture community of these leverage points, others may join the coalition of individuals whose strength of commitment and experience make it a unique forum.

The National Forest Strategy is nested into eight inter-related themes. While silviculture threads through most of them, it is predominantly a part of Theme One Ecosystem-based Management, which is the foundation of the strategy.

Over 2004-2005 each of the themes and objectives had specific indicators developed by the coalition. Indicators were synchronized where possible with provincial and federal legislative and international commitment reporting requirements.

The first objective and its indicator for Theme One is land-use planning including First Nations. It is difficult, but once in place, provides continuing savings from integrated planning and reduced conflicts. Built into provincial resource management legislation, it provides certainty for resource managers and stakeholders alike.

The two parts of Action 1.5 comprise a 'no net loss' principle that will conserve Canada's forest capital. The first part has formed the basis of the reforestation industry, but while the harvest sector reforests all areas harvested, the oil and gas sector in Saskatchewan, Alberta and BC does not reforest its seismic

lines and well sites. These areas are 'cut for temporary use' but when usage is complete they are reseeded to non-native grass species and not reforested.

NFSC asked industry, ministries, associations, commissions and boards to lead and regulate the reforestation of seismic lines and well sites after use. Data indicates that the annual deforestation from oil and gas sites in some areas is greater than the annual area of forest harvest. Scientific reports warn that a lack of reforestation by oil and gas developers will lead to a shortfall in the availability of softwood timber from these regions and fracture species habitat. In these communications, the oil and gas sector were also referred to Action Item 1.8 by the implementation team.

Theme One asked oil and gas companies, government and associations to review the site reclamation practice of reseeding seismic lines and well sites with non-native grass seed instead of restoring the original ecosystem communities including trees. There is a concern that invasive species presently used are reseeding into the forest and upsetting the ecosystem balance.

Theme One: Ecosystem-based Management Objectives

Manage Canada's natural forest using an ecosystem-based approach that maintains forest health, structure, functions, composition and biodiversity, and includes, but is not limited to:

A. Using integrated land-use planning, especially before tenure allocation;

B. Maintaining natural forested ecosystems;

C. Completing a system of representative protected areas;

D. On a national basis, maintaining carbon reservoirs and managing the forest to be a net carbon sink, over the long term;

E. Conserving old-growth forests and threatened ecosystems.

Silviculture Objectives & Action from the NFS

Objective A

Using integrated land-use planning, especially before tenure allocation

Indicators

1) Does your jurisdiction have a policy to ensure that ecosystem-based integrated land-use planning occurs?

2) If yes, is it required that this planning take place prior to tenure allocation?

3) In your jurisdiction, what is the percent of crown forest area under an ecosystem-based integrated land-use plan?

Action Item 1.5

Reforest areas that are cut for temporary uses and use afforestation, where feasible, to mitigate the permanent loss of forest.

Indicators

a) In your jurisdiction, what is the proportion of area cut for temporary use that has been reforested successfully?

b) In your jurisdiction, what is the annual area of successful afforestation to mitigate the permanent loss of forest?

Action Item 1.7

Evaluate the full range of advantages and disadvantages of Intensive Forest Management across Canada.

Action Item 1.8

Manage to avoid or mitigate the adverse impact of invasive species on our forest ecosystems.

Action Item 1.9

Increase the use of Integrated Pest Management approaches to gradually reduce the use of synthetic, chemical pesticides in forest management.

Indicators

a) Does your jurisdiction require the use of integrated pest management planning?

b) If yes, what % of your total managed area is under integrated pest-management planning?

c) Does your jurisdiction have a policy to reduce and phase out reliance on chemical pest management?

Objective D

On a national basis, maintaining carbon reservoirs and managing the forest to be a net carbon sink, over the long term

Indicators

1) Net changes in forest ecosystem carbon (CCFM SFM indicator 4.1.1)

2) Forest ecosystem carbon storage by forest type and age class (CCFM indicator 4.1.2)

Action item 1.4

Develop a better understanding of the effects of climate change and the Kyoto Protocol commitments on the forest ecosystem and incorporate these into forest policy and forest management planning.

Indicators

a) The number of, and investment in, research efforts to explore the impact of climate change and the Kyoto Protocol commitments on the forest ecosystem in each jurisdiction.

b) Forest management policies and planning processes in each jurisdiction that have incorporated climate change related research findings (e.g. through carbon budget models).

Soil amendment on severe degraded soil afforestation for Forest 2020, Trail BC

Forest 2020 Afforestation project on land deforested by Trail Smelter emissions

Environment Canada's section responsible for invasive species, the Invasive Plant Council of BC and the Alberta Invasive Plant Council responded in support of Action Item 1.8. Team One encouraged other provinces to form comparable invasive species councils to provide provincial coordination roles.

Another new initiative is expected to follow from Action item 1.5 and its indicator. Permanent loss of forests occurs from clearing for rights of way for energy transport, hydro-pondage, industrial and urban development, and highways. This action item requires that permanent depletions are 'off-set by forest ecosystem restoration' elsewhere. This creates a principle of neutralizing the footprint of permanent disturbances with afforestation.

Offset programs are not new to Canada. Ontario Hydro introduced such a mitigation program to offset the annual area of deforestation from their new transmission rights of way in 1989 and this program continues today. Construction developments have offset their disturbances, especially with wetland restoration.

Intensive silviculture referred to in Action Item 1.7 was one of the more difficult areas in which to negotiate a strategic commitment to action. 'Study the problem further' is a death knell for entrepreneurs who need immediate opportunities. However, a full national evaluation of intensive forest management will give managers the tools to assess the range of advantages and disadvantages so that intensive forest management decisions can be made with greater certainty.

Preventing and managing the aftermath of catastrophic stress on forest ecosystems requires a new kind of intensive forest management. (See Amelia Needoba and Bruce Blackwell's article in the Fall 2005 issue of Canadian Silviculture.)

The challenge with offset programs is proving the afforestation is 'additional'. Like in carbon trading, offset planting has to be independently verified to widely accepted and transparent standards. Only projects incremental to government or industry obligations for disturbances are fair trades. In the US, some trading allows ecosystems with greater needs to be targeted for restoration of offset depletions from more robust ecosystems. High uniform standards will create a market and trading up in biodiversity value will create green market developers.

offset planting has to be

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Integrated Pest Management (IPM) dealt with in Action 1.9 is an NFS action that will have a more immediate impact on silviculture. This action commits jurisdictions to reduce or phase out reliance on chemical pest management. A full assessment will have to include an inventory of policies, which encourage the use of chemicals.

In 2008 the first Kyoto commitment period begins and the fifth National Forest Strategy 2003-2008 will have to report on its accomplishments. In November/December the National Forest Strategy Coalition had a display booth to celebrate some of its accomplishments at the 11th Conference of the Parties (COP) to the United Nations Convention on Climate Change. This meeting was known as COP/MOP. In February over 55% of the parties (countries) had ratified the Kyoto accord, so the conference was the first formal Meeting of the Parties (MOP) in which all decisions are binding on those who have ratified. This provides a context for trading forest management and afforestation sinks and reviving reforestation and intensive forest management with carbon funding. For more discussion on COP/MOP see the editorial on page 4.

The National Forest Strategy objectives and action items are closely related and have to be implemented simultaneously. With broad representation and engagement, the 2008 National Forest Strategy Coalition report has the potential to celebrate the most vital revivals of investment in silviculture management in Canada in a decade.

Dirk Brinkman of the Canadian Silviculture Association and Elizabeth May of the Sierra Club are Co-chairs of Theme One: Ecosystem Based Forest Management for the NFSC http://NFSC.Forest.ca

The Mysterious Nexus of Treeplanting and Humanitarian Logistics

by Tyler Fainstat

I worked for 12 years in the silviculture industry, and recently made the jump to working as a Logistician with Médecins Sans Frontières (MSF or Doctors Without Borders).

I love the Canadian bush, and miss it terribly, but have found a new level of personal satisfaction working to save life, limb and dignity in some of the dark places of the earth.

I find myself a rookie again, with all of the awkwardness and growing pains of the greener's first season in the slash. The work is hard, the hours are long, and the learning curve is steep. Often there are intensely frustrating moments involving stalled work, arrogant, obstructionist officials (or even people within our own organization), and we often witness injustices and crimes we are powerless to prevent. Despite all this, the work is tremendous fun.

I travel the world, meet amazing people from far-flung cultures, see landscapes most tourists or travellers can only dream of visiting, and enjoy some of the finest parties around.

The Technical Similarities

There are tremendous similarities between the work and lifestyle of a humanitarian logistician and a treeplanter (especially a crew boss or supervisor). Many aspects of the work I do in the remote hospitals and refugee camps of war-torn Africa are eerily familiar.

An MSF logistician is usually responsible for the upkeep of a remote worksite. The elements of this will be familiar to most bush workers. Power is supplied by small diesel generators with that familiar sound that means home, light, food, and sonic aggravation. Both planter and "Loggie" (as we logisticians are affectionately dubbed by our colleagues) will find themselves pulling the starter cord of an unresponsive generator, wondering whether the problem is the spark plug or fuel pump (for both of which the replacements are far, far away), and missing dinner while others, impatient for light, call from the table, "I don't mean to bother you, but when will there be electricity?"

Water is pumped from wells, boreholes, or trucks into tanks, then chlorinated, and distributed using a familiar pile of plastic pipes, faucets, and duct tape (though in Canadian planting camps the tape is silver, and in Africa, the tape is a sticky cellophane with the MSF logo printed on it). Leaks are a universal feature on all continents.

The metal-tube-framed, white canvas tent is a fixture in both the planting camp and refugee camp. In Canada they contain tables covered in luxurious, 6000-calorie per planter banquets. In Africa the tents may contain vaccination tables, emergency feeding programs (1500-calorie packets of an imperishable, nutrient-rich, horrible-tasting peanut paste called PlumpyNut), tools and equipment for chlorinating the water supply of a 100,000-person refugee camp, or counselling centres for victims of wartime rape. The tent structure itself, however, is identical.

Latrines are very similar the world over. Just as every planter has been singled out at one time or another to be responsible for digging and erecting the outhouse, so it is the destiny of the Loggie to be responsible for the spadework (though the Loggie has access to a local labour force that is generally quite pleased to get to it for 1 to 5 dollars a day, depending on the country).

Communication in MSF projects usually involves handheld walky-talkies (the familiar ICOM or Motorola handheld), truck-mounted VHF radios, and satellite phones. All of these will be familiar to the seasoned treeplanter. A system used in Africa that will not be familiar to most planters is the HF radio, with its esoteric antenna placements and unpredictable response to atmospheric conditions (some really old-school planters will have seen this type of system, particularly those who worked on boats).

A mysterious aspect of medical logistics is called "Cold Chain". This seems like a fancy technical concept until you discover that it basically means keeping certain medicines and vaccines cool before use. Anyone familiar with seedling management will find this rather simple. Treeplanting operations have gigantic cooled stock warehouses, reefer trucks, FIST units on pickups, Silvicool tarps, and Silvicool bags, all to keep millions of seedlings cool right up until the moments before planting. Dealing with a few boxes of Measles vaccine or Methylergometrine (total size for a whole project, one 2 X 4-foot insulated box filled with frozen ice packs) is a piece of cake!

The Intangible Similarities

More subtle aspects of humanitarian logistics are the isolation, team dynamics, safety/security management, and human resources.

MSF teams work in remote locations, usually well beyond phone contact with the outside world. We often cannot speak to our families for weeks or months on end, and email is a poor substitute when available (which it increasingly is, though not universally). In an MSF team, you are stuck with the people you work with, 24/7. You work with them, eat with them, and live with them. When you are sick they tend to you, and vice versa. If you have a problem with someone, get used to it!

Many people find this to be the most difficult aspect of their mission. Ex-treeplanters tend to find it familiar and easy to deal with!

Most Canadian bush workers have been through seemingly endless safety orientations. While often boring, the safety programs of the better treeplanting companies, based on hazard assessment and risk management, are very similar in theory and design to war-zone security management by humanitarian organizations. The main danger is in fact the same one - it's the trucks full of people not wearing seat belts and being driven

too fast!

Kalashnikov automatic rifle crossfires and mortar shells may be more spectacular than bears and slippery slash, but the way to manage these risks is much the same: look ahead to predict possible hazards, if possible adapt your work to avoid them, where necessary take precautions to reduce the possible consequences, and make a good emergency plan. Carry a first aid kit and fire extinguisher, keep your truck fuelled and parked facing toward the exit, and have some extra water on hand.

An MSF logistician almost always has a substantial staff of local workers. This can be anywhere between a dozen day labourers digging latrines, or a staff of 450 running a massive feeding, health care, and water/sanitation program in a refugee camp. Local African staff don't cost as much per day as Canadian treeplanters (try to get planters to dig a well for 2 weeks being paid $1/day each and see how far you get), but they take no less skill to manage properly.

Just as a good crew boss or supervisor understands their role as a support and enabler for those doing the actual production work, a good Loggie knows how to make his or her staff feel valued, respected, motivated, and clear on their duties, rights and responsibilities.

Spending time with the crew outside of work (with or without a beer, depending on whether or not you are in a Muslim country), learning a few words of the local language, getting to know local customs, and generally being open-minded, friendly, and good-tempered are essential.

Rookie management mistakes (yelling at people, favouring people that you personally like, expecting everyone else to think as you do, etc.) compromise not only the work but the safety of the whole team!

Any seasoned silviculture crew boss or supervisor is likely to easily adapt to managing local staff in an MSF project (unless they are one of those crew bosses whose entire crew quits mid-season every year).

Most Canadian bush workers have worked with others from a vast array of cultures. I had a brushing crew that was 30% African, with brushers from the Middle East, Peru, Romania, Czechoslovakia, northern Native reserves, France, and the US among others!

Why Do It?

Humanitarian logistics is an amazing job. The work is hard, and the pay sucks. However, the rewards are incalculable and all expenses including travel are paid. I can think of no better training ground than silviculture in Canada. Anyone with a planting background looking for an incredible opportunity to see the world should take a look at this!

WESTERN SILVICULTURAL CONTRACTORS' ASSOCIATION

by John Betts, Executive Director

Jim Snetsinger's Poisoned Chalice

After a year as BC's Chief Forester, Jim Snetsinger may be wondering if he hasn't been handed a poisoned chalice. All the usual assumptions and practices that might have guided the Chief Forester in the past are pretty much void across large portions of the province. Minus these conventions, Snetsinger's work is less about setting the annual cut and more about hedging against the uncertainty the future now presents. It looks like the Chief Forester is in the untenable position of having to manage chaos rather than the mean annual increment.

Not helping Mr. Snetsinger is the simplistic belief held in the public imagination, and in some political quarters too, that all the present assault on our forests needs is a few weeks of cold temperatures. But the present circumstances are not about the weather, or even just climate change for that matter. The current catastrophe is about forest ecosystems that are severely out of equilibrium. The destructive outbreaks of bugs and blights are not the causes of that imbalance, they are expressions of it. To think and act otherwise is to miss the point, perhaps fatally.

Yet our present forest policies and practices do miss that point according to many presenters who attended a recent forum in Prince George sponsored by the Chief Forester. Most presentations at the Future Forest Ecosystems conference could be grounds for pessimism. Our forest industry is in an ultimately fatal embrace with the international commodity market. Conservative modelling shows climate change will dramatically shift plant and animal habitats, something our current planning ignores. Fuel buildups in our forests will lead to unstoppable landscape-scale wildfires. The "free to grow" model encourages industry to think short-term to achieve their minimum obligations, exposing the forest to repeats of the present collapse. A host of other pathogens threaten North America's forests, and they are gathering force.

Add to that litany the provincial and federal governments' propensities for handing out pork while posturing around the forest health issue, and you have reason to fall on your sword. At last count there were more than 12 government-created task forces, action plans, planning committees, trusts and so on vying for elbow room at the various troughs dedicated to mitigating the effects of the mountain pine beetle. None of this effort seems to be guided by an overarching strategy. Within the bureaucracies there are a number of criss-crossed mandates as well, the most recent being the creation of a new addition to the ministry of forests organizational charts called the Mountain Pine Beetle Emergency Response Division.

Fortunately the Chief Forester has a statutory mandate and perhaps enjoys some diplomatic immunity from the vagaries of the politicking surrounding the mountain pine beetle. He also has an obligation to see the bigger picture, unpalatable as it might be. To his credit, Jim Snetsinger is rising to the problem by asking some of the tougher questions and listening to the answers. By venturing to ask academics and scientists from outside the usual planning and management circles, he risks offending the guardians of the status quo and the defenders of received wisdom within his own ministry, the cabinet and industry. But those traditional views have had their day for which the beetle is providing ample evidence. In a paradoxical way, being able to hear the bad news at the Chief Forester's forum was some of the best news I have heard in a while. Fully recognizing the present predicament is the first step in eventually redesigning the future forest environment, which it seems the Chief Forester is recognizing as his task.

ONTARIO

FOREST RENEWAL CO-OPERATIVE INC.

by William F. Murphy, RPF General Manager

Ontario has more than its fair share of problems in the forestry sector, with natural gas, fuel and gas prices increasing, electricity costs higher than anticipated, the Canadian dollar at its highest, wood flow projections questioned, and the softwood lumber crisis still looming. This is quite a chunk for business to chew on and swallow without choking. Some operations have begun to shut down, such as Abitibi in Kenora, Cascades in Thunder Bay, Norampac in Red Rock, and Domtar in Cornwall. Other companies, including Weyerhaeuser, are anticipating shut downs or slowdowns in the future.

Although there is some progress being made with the softwood lumber, there seems to be a stalemate occurring between the government and the gas, oil and electricity producers. Another increase in natural gas prices has just been announced and supported by the government. Millions of dollars are supposedly coming a day late and a dollar short to get the forest companies and subsidiary-supporting businesses back into some sort of break-even or profit-producing economy. However, when one is doling money out faster than it is coming in for a long period of time, when financial help finally does occur there are ramifications far beyond dollars that have to be rectified, and decisions that have to be reversed. These are usually internal and significant.

Forest companies can make decisions that first affect woodlands, then the mill. Sometimes capital budgets are slashed and in doing so, it puts the mills behind in competitive changes. Competitive advantage is one of the main aspects of profit making in the forest sector. With increasing outside government-controlled costs, a company's edge is weakened, no matter how much internal cost cutting is done. This puts the company in a position that any work done externally has to be purchased at a lesser cost. Thus we have a chain reaction that is initiated and supported by the government and flows directly down through large forestry corporations to the contractor and then to the employees.

In the silviculture as well as the harvesting business, everyone is trying to do the best job they can, but the bottom line is still the bottom line. Are we getting less forest management, renewal and maintenance, along with an increase in paper work, due to the government's negative influence on our economic growth? The government is worried that companies are trying to reduce silviculture costs by reducing the renewal trust dollars. Isn't it time that our government realizes that supporting businesses that eventually have an overall positive affect on the bottom line, and not just one individual corporation that they support unconditionally, will have more influence on all aspects of forestry?

par Fabien Simard, ing.f., Directeur général

La Commission Coulombe : bilan de l'an un

En 2004, la Commission d'étude sur la gestion de la forêt publique québécoise, mieux connue sous le nom de Commission Coulombe, a parcouru les quatre coins de la province. Cette commission, qui avait pour mandat général de dresser l'état de la situation en ce qui concerne la gestion des forêts publiques du Québec, a pris connaissance de 303 mémoires ainsi qu'écouté en audience 1800 personnes, pour finalement déposer son rapport final le 14 décembre 2004. En tout, c'est 308 pages et 81 recommandations qui ont été rédigées afin de suggérer des améliorations au régime forestier québécois. Depuis le dépôt du rapport, beaucoup d'eau a coulé sous les ponts : beaucoup d'attentes ont surgi et beaucoup de promesses ont été faites. Mais après un an, penchons-nous plus concrètement sur les recommandations réalisées dans le milieu sylvicole.

Réduction de la possibilité forestière

Au printemps 2005, le ministre des Ressources naturelles et de la Faune a réduit, de façon préventive, la possibilité forestière de 20 %. Quelques mois plus tard, l'industrie commence à fortement ressentir les effets de cette décision dans l'ensemble de la province. Comme effet direct de cette réduction, des fermetures de quart de travail ont été annoncées dans certaines usines et pour d'autres, c'est la fermeture complète. Par contre, ce qui est moins connu, c'est qu'une très bonne partie des pertes d'emplois devrait se situer directement en forêt, sur les travaux liés à la récolte.

Programmes de formation

La seule bonne nouvelle pour l'industrie sylvicole en 2005 se situe dans les nouveaux programmes de formation mis à la disposition des travailleurs sylvicoles. Car suite aux représentations de l'Association des entrepreneurs en travaux sylvicoles du Québec (AETSQ) et de ses partenaires, le gouvernement a mis en place un programme de formation et d'intégration de nouveaux travailleurs sylvicoles n'ayant aucune expérience dans le secteur forestier. Devant la pénurie de main d'oeuvre qui est de plus en plus problématique en sylviculture, cet investissement survient au moment opportun et surtout, au moment où l'industrie en a le plus besoin.

Le forestier en chef

Suite à la recommandation 7.2 de la Commission Coulombe, le forestier en chef du Québec a été nommé : il s'agit de M. Pierre Levac, ing. f. Tout d'abord, cette nomination a créé un certain scepticisme quant à savoir s'il pourra réellement être crédible, indépendant et transparent, tel que demandé dans le rapport Coulombe. Car selon un organigramme rendu public dernièrement, il sera seulement sous-ministre associé. Les dénigreurs du forestier en chef croient qu'il sera difficile pour le forestier en chef d'atteindre les objectifs de transparence s'il a le même statut que tout autre sous-ministre associé. De plus, certaines rumeurs à l'effet que le forestier en chef conservera, à une personne près (lui-même), le même personnel qui procédait au calcul de la possibilité forestière, ajoutent aux doutes quant à la crédibilité du poste.

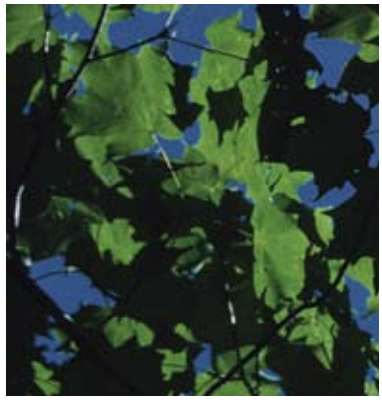
Intensification de l'aménagement

Lors de l'annonce de la réduction de la possibilité forestière le printemps dernier, le ministre a procédé à une consultation dans les régions pour recevoir des propositions de mesure d'atténuation. L'une des mesures proposées en priorité par l'ensemble des régions est l'intensification des travaux sylvicoles. Depuis le dépôt de cette proposition en juin 2005, le ministre a annoncé une enveloppe de 60 millions $, qui serait peut-être disponible pour intensifier les travaux sylvicoles au Québec. Nous attendons toujours l'annonce officielle et surtout, l'annonce des régions visées, des types de travaux et des types de peuplement inclus dans l'intensification.

Règlement sur les redevances forestières

Juste avant la fin de la session parlementaire à Québec, le ministre a déposé un projet de règlement sur les redevances forestières. M. Corbeil a proposé de garder le statut quo et de poursuivre tout comme en 2005. Ainsi, en 2006, l'industrie continuera de fonctionner sous les instructions suivantes : le gouvernement remboursera 90 % du coût des travaux sylvicoles et les industriels assumeront 10 % de l'investissement. Pour certains, cette nouvelle est rassurante, puisqu'il avait déjà été question d'augmenter la part des industriels à 20 %. Pour d'autres, la majorité, il s'agit d'une déception, puisqu'ils souhaitaient voir ce ticket modérateur redescendre à zéro. Pour l'instant, une seule chose est certaine : 2006 risque d'être aussi difficile pour les entrepreneurs sylvicoles que 2005.

En somme, un constat s'impose : devant tant de promesses et d'attentes, peu a été réalisé en 2005 et tout est encore à venir. Et même si elle traverse des années difficiles, l'industrie sylvicole demeure optimiste. Présentement, le gouvernement étudie des avenues pour atténuer les pertes d'emplois en usine. Nous aimerions qu'il s'attarde aussi sur les pertes d'emplois liés à la récolte et qu'il améliore également l'environnement économique de l'industrie sylvicole en facilitant l'exécution des travaux. Car en bout de ligne, ce sont des milliers de familles qui habitent dans les municipalités des régions et qui vivent des travaux forestiers. Ne les oublions pas !



QUEBEC

TRANSLATION

by Fabien Simard, RPF, Executive Director

The Coulombe Commission: One Year Later

In 2004 the Commission to Study the Management of Public Forests in Quebec, better known as the Coulombe Commission, visited all parts of the province. The Commission, whose general mandate was to report on the situation with respect to the management of public forests in Quebec, studied 303 briefs and granted audience to 1,800 persons before submitting its final report on December 14, 2004. A total of 308 pages and 81 recommendations were presented in order to suggest improvements to the forestry system in Quebec. Since the submission of the report, many expectations have been aroused and many promises have been made. One year later, let's look more specifically at the recommendations that have been implemented in the silvicultural setting.

Reduction of Potential Forest Harvest

In the spring of 2005, the Ministry of Natural Resources and Wildlife, as a precautionary measure, reduced forestry potential by 20%. Within a few months the industry began to feel the serious effects of this decision throughout the province. As a direct result of this reduction, certain mills announced cuts of one quarter in their working time, and others closed completely. Furthermore, and this is less widely known, a considerable proportion of the job losses occurred in the forest itself, in activities related to the harvest.

Training Programs

The only good news for the forestry industry in 2005 came from the new training programs made available to silvicultural workers. As a result of representations made by the AETSQ and its partners, the government implemented a program to train and integrate new silvicultural workers who had no experience in the forestry sector. In light of the manpower shortage that is becoming increasingly problematic in silviculture, this investment came at an opportune moment, when the industry needed it most.

The Chief Forester

In keeping with Recommendation 7.2 of the Coulombe Commission, a Chief Forester for Quebec has been appointed: Mr Pierre Levac, RPF. At the outset this appointment gave rise to some skepticism as to whether the nominee could be credible, independent and transparent, as required by the Coulombe report, since, according to a recently released organizational diagram, he will be only an associate deputy minister. Critics of the Chief Forester appointment think that it will be difficult for this official to achieve visibility and transparency if he has only the same rank as any other associate deputy minister. In addition, certain rumours that the Chief Forester will retain the same personnel responsible for making the calculations of forestry potential, add to the misgivings about the credibility of the appointment.

Intensified Management

When the reduction in forestry potential was announced last spring, the Minister undertook consultations in the regions to hear proposals about possible attenuations. One of the measures given priority by all regions was the intensification of silvicultural activities. Since this proposal was put forward in June 2005, the Minister has announced an envelope of sixty million dollars that might be available for the intensification of forestry management practices in Quebec. We are still awaiting the official announcement, and in particular, an announcement about the regions concerned, the types of activities and the population classes included in this intensification.

Regulations with Respect to Forestry Subsidies

Just before the end of the parliamentary session in Quebec City, the Minister tabled draft regulations concerning forestry subsidies. Mr. Corbeil undertook to respect the status quo and to proceed exactly as in 2005. Thus, in 2006, the industry would continue to function according to the following instructions: the government will reimburse 90% of the cost of silvicultural work and industry participants will assume 10% of their outlay. For some this news was reassuring, as there had already been talk of increasing the industry share to 20%. For others, and indeed for the majority, there was disappointment, because they wanted to see the industry contribution return to zero. For the present one thing is certain, 2006 could be as difficult for forestry contractors as 2005.

In short, one observation must be made. Despite all the promises and expectations, very little was accomplished in 2005. But even if it faces difficult years, the forestry industry remains optimistic. At present the government is studying ways of reducing the loss of mill jobs. We would also like to see it focus on job losses related to cutting, and on improving the economic environment of the silvicultural industry by facilitating work carried out in the forest. In the final analysis, there are thousands of families living in the towns and villages of the region who depend on forestry work for their livelihood. Let's not forget them!

NEW BRUNSWICK

DEPARTMENT OF NATURAL RESOURCES

by Craig Frame, Silviculture Forester

The silviculture operating season has wrapped up for another year. On provincial crown land approximately 14,000 ha of planting and 24,000 ha of precommercial thinning and plantation cleaning were treated. The private woodlot sector completed an additional 1,800 ha of planting and 6,700 ha of precommercial thinning. The silviculture treatments done on these two land bases are funded by the provincial government and form a large part of the work done within the province. With additional areas treated on industrial freehold, silviculture provides important employment opportunities in New Brunswick. To place these treatment levels in context a summary of the distribution of productive forest is provided in Table 1.

Table 1:
A summary of New Brunswick productive forest

Tenure	Area (million ha)	Percentage
Provincial Crown	3.0	51
Private Woodlot	1.7	29
Industrial Freehold	1.1	18
Federal Crown	0.1	2

Recognizing the importance of silviculture to rural employment and in maintaining wood supply for the New Brunswick forest industry, the provincial government has committed to provide sustainable funding levels for crown and private woodlot silviculture through 2011. These funding levels should help to maintain current work force levels by adjusting future budgets for inflation and other cost increases.

Annual silviculture levels on crown land are set every five years through a province-wide forest management planning process happening simultaneously on the 10 crown timber licences. Planning for the 2007 to 2011 management period is currently underway. Under this process planting and precommercial thinning levels are varied in order to allow licence managers to meet various wood and specific wildlife habitat supply objectives as well as the maintenance of landscape-level vegetative communities.

In May of this year the New Brunswick Department of Natural Resources (DNR) implemented a web-based application that allows for the updating, tracking, and querying of crown land silviculture information in both spatial and attribute formats. The Electronic Silviculture System (eSilv) is accessible through a web browser and Internet connection by both DNR and forest industry staff. The system will also allow the transfer of spatial and tabular data to handheld computers equipped with GPS receivers that are used by DNR field staff for monitoring.

The objectives for the eSilv application were to streamline and standardize licensee submission of spatial and non-spatial crown silviculture data, provide multi-user access to the most current silviculture information, and make silviculture GIS and attribute data available to users in a more timely fashion. The application has been a great success with savings in both time and money for both the DNR and licensees.

Our next report will look at recent experiences in New Brunswick with the seeding of multiple species within the same planting tray for subsequent planting on crown land. We will discuss the rationale for multiple species planting trays and the issues raised by this practice at the nursery, during planting and for plantation tending.

Focus on Safety

By Ontario Forestry Safe Workplace Association

Personal Protective Equipment for Tree Planters

Tree planting is extremely demanding work that requires a combination of aerobic capacity to handle the duration of the work and recover from it, muscular endurance to manage repetition and fatigue, and flexibility to enable the wide range of movements involved in the work. But physical conditioning alone can't control all the hazards tree planters face in their work. That's where personal protective equipment comes in.

Hats and hardhats

When tree planters are in areas where there are standing dead trees and trees with dead branches, hardhats are an absolute necessity. Planters should wear hardhats, preferably ones with a wide wrap-around brim, at all times in the planting area, whether they're deep in the bush or at the side of a road. In addition to providing protection from falling objects, the hat cuts down on sunlight glare, helps protect their face and head from sunburn and keeps insects out of their hair. All hardhats should be CSA-certified and bear a recent manufacturing date stamp.

Safety glasses/sunglasses

Wearing safety glasses or sunglasses protects tree planters from eye injuries resulting from inadvertent contact with sticks, branches or other objects. They also prevent eye damage from exposure to the sun's ultraviolet (UV) rays.

Boots and socks

Planters need to make sure their boots are CSA-certified with steel toes and shanks. If planters are buying new boots, they should acquire them several weeks before the start of the planting season and wear them at every opportunity to help break them in.

Planters will routinely encounter uneven terrain studded with roots and rocks, as well as slippery, wet and loose surfaces. Because ankle support is crucial, boots should always be laced up, even at the campsite. Planters suffer a high number of ankle sprains every season because of unlaced boots that cause trips, slips and falls.

Good work socks (high wool and low synthetic content) are essential. Planters should bring enough socks with them so that they can wear fresh, clean socks every day between visits to the laundromat. If they will be wearing rubber boots, they should invest in Bama socks (quilted booties that are worn over regular socks) and wear them while having their boots fitted.

Gloves

While the rest of a tree planter's body can be conditioned in advance for the rigours of planting, it's hard to toughen up hands. Gloves are a must to help planters' hands survive the work. Gloves should be properly fitted to the planter's hand size. Badly-fitting gloves can contribute to hand and wrist fatigue, and gloves that are too large for the hand require excessive grip forces.

Reflective safety clothing

A high-visibility vest should be worn at all times in the planting area. Reflective clothing is especially important when planters are working around machinery such as slashers or scarifiers, or when the planting area is a fair distance from camp and crews have to travel in the dark.

Pants, tops, jackets and raingear

What an employee wears to work isn't considered safety equipment in most other occupations. But uncomfortable tree planters are much more likely to be injured in the bush than planters who are dressed for the occasion. Long pants protect the legs from sunburn, scratches and insect bites. Planters should take along pants with zip-off legs if they feel more comfortable working in shorts while planting open areas.

Regardless of general weather conditions, it's going to be cold and it's going to get wet at some point in the planting season. Planters should bring along appropriate clothing for these conditions.

Life jackets on water

If travel by boat or canoe is required to reach a planting site, floatation devices must be used. These are usually supplied by the company, along with training in their use. If a planter can't swim, the best course of action is to team him or her with someone who is a swimmer, and who may have aquatic safety training.

The Ontario Forestry Safe Workplace Association has created SafePlanting.com, a comprehensive web-based health and safety training program for tree planters. For more information about the program, visit www.safeplanting.com or contact OFSWA at 705-474-7233.

Global Trends Local Options

Use and Utility of Forest Biomass

Dr. David DeYoe

Background

The Bio-Economy

For over a century, Canada and other industrialized nations have relied on petrochemicals and fossil fuels to drive the creation of many industrial products, including energy. That reliance is undergoing a quantum shift as energy prices soar, demands from developing countries such as China and India increase, and the implications of global warming become increasingly apparent. Interest is now growing in what is known as the bio-economy - an economy founded upon biological resources, or their functional processes, to supply components or products of value to the major economic sectors. The bio-economy is prompting industrialized nations to emphasize the use of renewable resources from forests, agriculture, and municipal wastes in environmentally compatible ways.

The forest sector is also beginning to acknowledge opportunities apparent in the use of forest biomass. Although the forest industry has been using residue from the processing of lumber and pulp and paper products for energy and composite wood products for years, it has been slow to explore value-added opportunities derived from unused forest biomass, such as fuels/energy, specialty chemicals and polymers.

Figure 1 provides a conceptual perspective of the direction being advocated by the Ontario Ministry of Natural Resources (OMNR) to develop its value-added forest resource options, wood, bio-products and non-timber forest products.

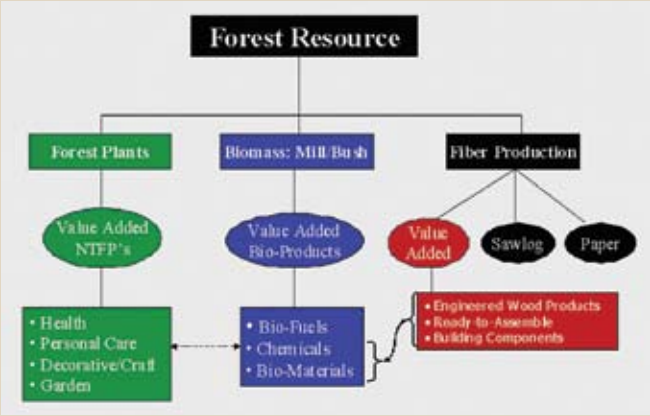


Figure 1: The Resources the Forest Can Provide.

This article provides the context for why the OMNR is helping set the stage for innovative exploration to occur. In this regard, OMNR envisions 3 major areas for which a provincial government can assume responsibility: 1) develop inventory and logistical data to support tools for financial analysis and scenario planning, 2) invest in technology capable of using forest biomass to create value-added options which foster rural economic development and jobs, and 3) develop policy, institutional and incentive options to stimulate business investment and the sustainable use of forest biomass in Canada.

Global Trends – What's Driving Use of Renewable Resources

Expansion of the bio-economy is being stimulated by a host of environmental, economic, technological, and social trends. These trends are driving the need to consider new ways of doing business and awakening our sensitivity as to how we use, or abuse, both finite and renewable resources. The drivers do not act in isolation; they are interconnected. For example, population growth, global warming, and natural disturbance have mutually exacerbating effects on the quality and quantity of water, habitat suitability, and arable land for food production, not to mention human health. Global warming is an especially strong driver because the conditions created by increases in CO_2 and other greenhouse gases intensify other adverse effects on the environment which, in turn, can influence social and/or economic outcomes. Figure 2 on the next page conceptualizes the key drivers, and the inter-connected nature of the relations that help exacerbate these outcomes. Although some action is being taken to decelerate global warming, it is becoming clear that what we have been predicting for the future is already a reality, particularly in northern latitudes. In the past 3 decades the rate of CO_2 increase in the atmosphere has risen from 1 to 3 ppm annually in atmospheric concentration, global temperature has increased 1.8° F, and local temperatures in more northern latitudes have increased between 2° and 5° F, to which numerous environmental (and hence economic and social), impacts have been linked, including the BC Mountain Pine Beetle outbreak. These effects of global warming should not be surprising considering that: 1) 5 million Chinese work in 25,000 coal mines to produce 70% of China's energy demand, 2) exploitation of the tar sands in Alberta produces 6 times the level of CO_2 as conventional extraction, and 3) regions of Alaskan permafrost have begun to switch from a CO_2 sink to a CO_2 source. It should also come as no surprise that 2005 is expected to surpass 1998 as the warmest year on record, even without an El Niño.

Social trends of significance include world population growth and demographics. For example, the combined population of China and India (2.5 billion people) comprising nearly half the world's population is growing at a rate of 1.2%, or 30 million people annually. That's Canada's total population every year! This represents a significant influence on the global economy, the demand for goods and services from industrialized countries, and implications for environmental quality. In North America 40% of the population will be over 50 years old in less than 7 years. Other industrialized countries face similar statistics. This will affect the priorities for research and technological development to serve the needs and interests of this aging "boomer" population and hence national and local economies. Proliferation within the past decade of medicinal products from forest plants, particularly neutraceuticals and functional foods, is an excellent example involving forest resources. The value the boomer cohort places on natural products makes this big business!!

Economic drivers affecting forest business and production growth include:

- increasing costs of fossil fuel-based resources,
- lack of readily available low cost alternatives for energy/fuels,
- global competitiveness in traditionally sound commodity markets,

Figure 2. A Global Web – Everything's Connected to Everything Else

• limited fibre supply,

• high wood costs,

• a "free" trade agreement that's costing Canada billions, and

• a soaring Canadian dollar.

These drivers/pressures are exacerbated by increasing evidence of global warming, a rapidly changing global marketplace, and increasing pressure by regulatory agencies to protect land, water and air. This array of unsettled conditions seemingly has many industry investors transfixed between the commodity-based industrial age and the emerging bio-economy, which is projected to grow at a pace that will eclipse the information technology age.

Investment in a bio-based products industry not only provides direct mitigative benefits to help curb the progression of global warming, but also provides significant economic and social advantages to diversification and growth of primary and secondary industry. It also provides a wealth of opportunities for small to medium sized enterprises (SMEs), particularly in rural communities. The opportunities are readily accessible because the technologies being promoted to access and use forest biomass are well suited to fit within existing infrastructure and traditional core business of primary industry. Currently, a bio-refinery approach is being advocated corporately by companies like Shell, Total, Weyerhaeuser, BP (now called Beyond Petroleum), and Volkswagon, which suggests a growing interest and future markets for biomass as a resource that can support a diverse array of products.

The Canadian forest sector faces enormous challenges convincing its traditional sources of capital to invest in new forest-based opportunities. However, despite these challenges, government and industry need to consider how they might capitalize on the opportunity to use forest biomass to create business and jobs in resource-rich rural centers while mitigating against environmental and economic uncertainties.

Advancements in biotechnology are making it possible to manipulate and/or accelerate biological processing, which translates into useful new products or major improvements in traditional products. Coupled with rapidly advancing computer technology, the pace of knowledge expansion into new or improved product opportunities for forest biomass is encouraging. Further, as the role of quantum physics is integrated into the mix, the benefits of nanotechnology to all major trend sectors is also becoming apparent. These enabling technologies provide the tools that will help build the bio-products industry by facilitating convergence of biology, chemistry and physics with engineering, which will promote the move toward commercialization and profitability.

Forest Biomass

Products in the bio-economy are derived from biological material or biomass. Biomass is defined as all non-fossil organic materials, including water and land-based plants (trees, shrubs, herbs, grasses, algae, lichen, moss, etc.), and all waste biomass such as municipal solid waste, municipal sewage and animal manures, forestry and agricultural residues, and certain types of industrial wastes. Table 1 provides a detailed accounting of forest biomass options for use in biomass energy systems, or for value-added bio-products.

Forest biomass sources for energy or bio-products include materials derived from

Table 1: Biomass Options

Current Practices		Biomass Possibilities 2 and 3			
Allocations to the Environment	**Allocations to Economy**	**Harvesting Residues**	**Silvicultural Treatment Residuals**	**Natural Disturbance Residues**	**Waste Residues**
Parks and protected areas	Traditional harvest (sawlog, pulp, etc)	Slash	Standing residual low value trees designated for removal left behind	Fire	Mill Waste
AOC reserves	Limited natural disturbance salvage	Cull	Thinning residual, pre-commercial or commercial	Insects	Urban
Designated Trees: buffer strips, wildlife		Un-merchantable Logs	Biomass plantations	Disease	Recycled
Annual inputs: twigs, leaves, bark, fine roots, etc.		Chipping Frass	Sanitation Cuts (minimize risk of insect or disease spreading)	Wind, flooding, drought, etc.	
Intermittent inputs: natural thinning, breakage, individual mortality, etc.		Log Merchandising	Harvest residual from harvests conducted in previous years		
Soil inputs: Stumps, roots, microbes, fungi, etc.		Low quality forest stands[1]			

[1] Historically, Ontario has allocated close to 30 MM³ annually and the industry has only harvested 20-22 m³ because product revenues do not justify entry. Now a substantial backlog of allocated, unharvested, low quality timber exists which could be accessed to produce value-added wood or biomass products.

[2] Residuals from designated management practices, natural disasters and industrial waste. These 4 categories do not involve economic allocation, nor do they distract from the environmental commitment.

[3] Color Code: Immediate. Short-term (1-2 years). Longer-term (2-4 years).

harvesting, silvicultural practices, natural disturbances and waste materials. Unlike fossil fuels, biomass is renewable since it can be replaced within a relatively short time. Biomass is also considered carbon neutral with respect to carbon dioxide emissions, that is, it returns to the atmosphere only what it incorporated during growth, and growth of new plants sequesters CO2 which was emitted.

Forest Biomass for Energy: Benefits and Challenges

Energy from biomass can be generated directly, or by conversion to bio-fuels (gas, liquid or solid), for use in cogeneration of heat and electricity. Cogeneration using forest biomass is well established in northern Europe, New Zealand, and Australia. Presently about 40% of electricity generation in Denmark is derived from biomass cogeneration plants using wood waste and straw. In Finland, cogeneration supplies about 10% of electricity using sawdust, forest residues, and pulping liquors. Bio-energy as a whole, including traditional small-scale combustion, supplies 19.5% of Finland's total primary energy consumption. In contrast, bio-energy contributes only about 3 to 4% of total energy in Canada and the US.

The benefits of using forest biomass for energy include: 1) dependability and sustainability as an energy source, 2) affordability, 3) ability to create small business opportunities and jobs, and 4) energy self-sufficiency for industry and rural communities. Given the rising cost of energy derived from fossil fuels and the inefficiencies in energy transmission and distribution, particularly for remote localities, energy self-sufficiency is becoming a key incentive in the move to biomass utilization for energy.

BioProducts from Forest Biomass

Like the petroleum industry, which produces a wide array of by-products with value greater than gas or oil, biomass may serve as a source of value-added chemicals and polymers that far exceeds the base value of energy. The forest resource provides a diversity of product options using the plant resource. Figure 1 provides a conceptual array of different product types, both commodity and value-added. Forest-based companies and communities are being encouraged to explore value-added opportunities with wood, biomass and non-timber forest products to help stimulate local economies.

Biomass-based products are particularly intriguing. Products derived from biomass are known as bio-products. Bio-products are classified into 3 broad types, fuels/energy, specialty chemicals and biomaterials or polymers. Figure 3 depicts the types of products that can be derived from forest biomass.

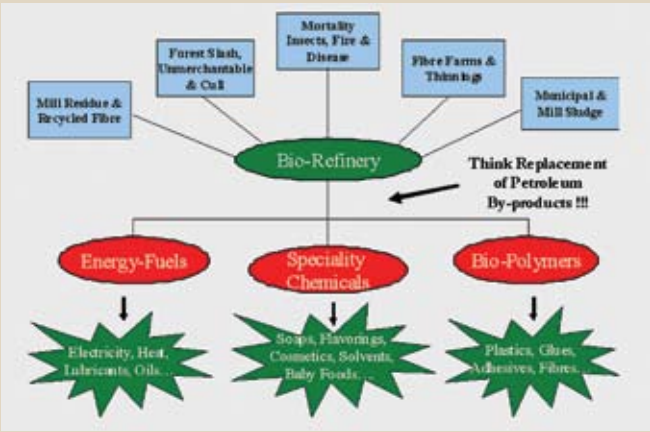


Figure 3. A New Value Added Stream for Forest

The "bio-refinery" approach describes different technologies which are used to facilitate conversion of biomass by chemical, physical or biological processes into substrates used directly (ethanol, methane or bio-oils), or further refined (chemicals/polymers used as a base for adhesives, soaps, baby foods, cosmetics, etc.). In forestry, bio-products exist alongside a range of value-added non-timber forest products, which include herbal medicines, functional foods, arts and crafts, and gardening products which are traditionally obtained from different types of plants (trees, shrubs, herbs, grasses, lichen, moss, etc.). These value-added options, plus those using wood, help to build the foundations of a diversified forest-based economy which can supplement the more traditional fibre-based forest industry, which is struggling due to increasingly powerful global trends, which are expected to continue.

Canada's large forest and agricultural sectors provide significant opportunities for bio-products. Canada's agricultural sector began shifting from a commodity-based economy 15 years ago to capitalize on the diverse array of products available from agricultural plant and animal biomass. Although the forest sector has been reluctant to pursue bio-product options, the benefits to the forest sector and forest-dependent communities could equal or exceed those being realized or projected by agriculture. This is particularly relevant to Canada's rural and northern communities, whose industries have been challenged in recent times, and who are seeking opportunities to stabilize, revitalize and grow.

New Horizons

The bio-economy is a rapidly emerging economic and social construct that can provide positive opportunities for Canadian companies and communities. Figure 1 provides a conceptual sketch of a new horizon in which different market values can be derived from the forest resource, and for which clear economic markets can be identified and developed. It does not include non-market or ecosystem values that are equally important to the social, economic and environmental fabric of sustainable development. This was not an oversight, but recognition that values inherent in the soil, water, nutritional capital, recreational options, wilderness attributes, habitat, etc., deserve special and focused attention.

The intent here has been to introduce you to a rapidly evolving opportunity that has arisen in response to key global drivers and their implications locally. The use and utility of unused or under-utilized forest biomass is becoming an important value-added product option for the forest sector. To realize the potential of biomass will require thinking about trees not just as a source of fiber for wood and paper, but also as a source of chemicals which can serve new and different markets, locally and globally. It will require dynamic partnerships that engage and coordinate expertise from sectors previously not considered germane to forestry business. It will require academia, government and industry members of the forest sector to be more inclusive and to consider "new expressions" of what they do and how they work, as corporations and partners. It will require many changes or adjustments that may not be easy. However, the alternative of not moving, or only moving incrementally, toward a new horizon will not position the sector to capture the prize.

Dr. David DeYoe is the Senior Advisor, BioProducts/BioTechnology, Industrial Relations Branch, Ontario Ministry of Natural Resources. He has had a long career in the silviculture industry.

Forest Health

by Marianela Ramirez, Marek Krasowski & Judy Loo

Beech Bark Disease: New Hope for a Species in Trouble

Beech bark disease (BBD), like Dutch elm disease and Chestnut blight, is a foreign disease introduced to North America with devastating consequences. BBD is caused by the woolly beech scale (Cryptococcus fagisuga Lind.) and a fungus (most commonly Nectria coccinea var. faginata Lohmam Watson and Ayres). Both the insect and the fungus were introduced to North America through Halifax and possibly through other east coast ports some time around 1890. They apparently arrived together with imported ornamental European beech (Fagus sylvatica L). Since then, BBD has been spreading throughout the native range of American beech (Fagus grandifolia Ehrh.). Today, the disease is found throughout the Maritime provinces and eastern Quebec, south to North Carolina and Tennessee, and as far west as Michigan and parts of Ontario.

A plantlet in tissue culture

The disease begins with the scale insect attacking the bark of beech trees making them susceptible to fungal infection. The spread of the disease into new areas typically involves the movement of the so-called "killing front," characterized by massive mortality among the affected trees. As American beech easily regenerates by suckering, roots of the dying trees produce suckers that become infected by BBD. The resulting condition is known as "aftermath forest", in which the disease is endemic and canker-deformed trees grow poorly but produce new suckers before they eventually die. The cycle continues, causing problems for silviculture because the shade-tolerant, vigorous beech suckers out-compete other species, only to fall victim to the disease again. For this reason, management of such forests often aims to eliminate beech. Not only is the value of the wood lost; diseased trees produce little mast, reducing the availability of beech nuts to wildlife, especially to black bear.

In heavily infested stands, a few clear beech trees showing no sign of BBD occur singly or in groups, while surrounded by deformed, diseased trees. When tested, groups of clear trees are found to be closely related, suggesting genetically-based resistance to the disease. The resistance mechanism has not been determined but it may have an anatomical and/or chemical basis. True genetic resistance to BBD would provide the opportunity to increase the proportion of disease-free genotypes in affected stands, but the resistance must be first confirmed and its extent evaluated. Only then may it make sense to propagate resistant genotypes and reintroduce them into forests. The research described here aimed at testing the extent of the resistance to BBD and developing methods for vegetative propagation of American beech.

Since colonization by the scale insect is prerequisite for the development of the fungus into full-blown disease, challenge experiments were conducted to determine if the disease-free trees were genetically resistant to the scale insect. Scions from putatively resistant trees were grafted on wild rootstock and inoculated with eggs of the scale insect. This approach worked well, showing that grafts from putatively resistant trees had significantly less colonization than grafts from diseased trees. Even when insect colonies developed on the resistant scions, no eggs were found, suggesting that the insects were unable to reproduce. This is a significant finding, confirming the existence of genetic resistance to BBD.

The seedlings resulting from controlled crossings

Vegetative propagation of American beech has been very difficult. Different methods of propagation were attempted, including tissue culture, rooting of stem cuttings, culturing of suckers, and grafting. Micropropagation has encountered many difficulties including high initial contamination of tissue cultures, low rooting success, and failure of plantlets to establish after transferring from sterile culture to the soil. Few stem cuttings rooted successfully, and even those that did failed to survive beyond a few months. Grafting was the only successful method of propagation. Its efficiency was unsatisfactory but it provided experimental material from putatively resistant trees, enabling the continuation of research on BBD. Refining cultural conditions for grafted material and determining the reasons for graft incompatibility may improve grafting success.

A stand showing a diseased (left) and a clean (middle) tree

Anyone interested in this research is welcome to contact any of the authors. We are continuing our work on the resistance of American beech to BBD. Current activities focus on controlled breeding, and challenging the progeny obtained from different combinations of crossing resistant and diseased trees. The research aims at elucidating the mode of inheritance, understanding the nature of the resistance, and finding molecular markers for the resistance. In the meantime, it is important to improve silvicultural approaches, preventing the loss of resistant genotypes from our forests.

Marianela Ramirez, Marek Krasowski and Judy Loo are in the Faculty of Forestry and Environmental Management at the University of New Brunswick. They can be reached at 506-453-4915.

GPRC scientist completes forest research project:

Findings present opportunities for sustainable reforestation

A recently completed 5-year research study has identified practices which could significantly improve the productivity of commercial tree planting sites in the Peace Region. The study was a collaborative project of Grande Prairie Regional College (GPRC), Manning Diversified Forest Products (MDFP) and PRT Beaverlodge Nursery.

The research suggests that the hardier white spruce seedlings may not necessarily be better for summer planting in northern Alberta boreal regions, contrary to our "common sense" hypothesis.

The issue was studied through planting some 5,000 white spruce seedlings with variable pre-planting seedling hardiness (stress tolerance) and physiological conditions on four different cutblocks in the summer of 1999. The results showed that the seedlings which received no hardening (low stress tolerance) to moderate hardening before planting grew and survived much better than those that were highly hardened. The results were consistent over years two to five, as well as on all four cutblocks in spite of different site conditions.

Over the five years the differences in survival or stem volume growth were up to 20-30% (survival) or 50-100% (stem volume). It was found that the less hardened seedlings grew more new roots, probably through maintaining better physiological activities under stressful field conditions, thereby leading to better survival and growth.

"The findings from this study present not only a significant theoretical challenge, but also operational opportunities for sustainable reforestation practices," stated Dr. Weixing Tan, the principal investigator and Natural Resources Management Programs Coordinator at GPRC.

Operational foresters Steve Blanton and J.P. Bielech from MDFP, collaborating partners in the project, are enthusiastic about the results. "Through optimizing pre-planting physiological treatments we may be able to significantly improve site productivity with only limited investment." Further research would be very useful to test under a wider range of site conditions and among other commercially important planting tree species.

"The teaching faculty at GPRC are second to none, and often lead academic thought in their fields of expertise," suggested Jim Henderson, GPRC President. "We are proud of the achievements of our faculty, and proud to offer the students of our region the opportunity to study with such highly respected faculty members as Dr. Tan."

For further information please contact Dr. Tan at wtan@gprc.ab.ca or MDFP Research Trust Fund at mfrfadm@telus.net.

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Photo Credit

In the Fall 2005 issue of Canadian Silviculture, we forgot to credit the photos in the Thinning as a Restoration Tool article. Thanks to Bob Gray for the use of his photos in this article.

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