The background of the cover is a lush, green forest. In the center, a person wearing a red backpack and a hat is walking away from the viewer down a dirt path. The forest is filled with various types of trees and ferns, creating a dense and vibrant scene. The top half of the cover has a green background with a repeating pattern of palm leaves.

Silviculture

MAGAZINE

Spring 2011

REDD in the Congo Basin

Lodgepole Pine in BC

BC's Not Sufficiently Restocked Crisis

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CORRECTION

Managing the Mountain Pine Beetle in Alberta on Page 16 of the Fall 2010 edition of *Silviculture Magazine* incorrectly associated Alberta Newsprint Company with the town of Edson, Alberta. Alberta Newsprint Company is located in Whitecourt, Alberta.

Publisher Kate Menzies
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Editorial



by Dirk Brinkman

Binding the great global threats with sustainable land use

Climate change's predicted geopolitical chaos

Since 2002-2004, food prices have more than doubled. An unprecedented cascade of droughts, floods and extreme storms induced predominantly by global climate change have driven harvests down and food prices up. The world's poor who spend over half of their time on food, have been hard hit. In an era of real-time electronic networks, large groups of now-desperate youth self-organize to overthrow the most obvious obstacle to opportunity, corrupt power elites. But the 'geopolitical chaos', a phrase used in a 2004 Pentagon climate change report, will reach beyond the domino collapse of Arab dictatorships.

A challenge for silviculture & agriculture practitioners

By December 2011, the hundreds of millions of the world's poor will find their new leaders are helpless without massive industrial country aid, which cannot be food aid alone. The global pandemic of revolutions is also a call on industrial nations' promise at COP16 in Cancun to fund the developing world's climate solutions up to \$100 billion by 2020. The world's initiative to restore degraded soils, wetlands, grasslands and forests and to conserve what is still intact - REDD+ is needed now, as are silviculture and agriculture practitioners.

Navigating the new bioethical pathway

Every forest climate project, even bioenergy, will have to improve or be neutral to food security. Germany legislated gradually limiting its biodiesel production to the non-food feedstock, *Jatropha* and *Lister oil* in 2011, which grow on degraded arid soil with a marginal capacity for food production. Compared to burning feedstock grown on natural soils, feedstock grown using fertilizer-intensive agriculture practices cause power plants to emit excessive quantities of chlorine, chlorinated compounds and contaminants. The inorganic fertilizers of conventional agricultural destroy soil health and result in excess nutrients like phosphorous and nitrogen leaching into aquatic ecosystems. Consequent air and water quality deterioration impacts regional human health, wildlife, fisheries and ecosystem degradation.

These factors increase the demand for natural forest feedstock whose excessive removal will risk eventually stripping soil wealth from every forest ecosystem.

Vulnerable earth systems put humans' future at risk

Like climate, soil is a disrupted global system, affecting the poor immediately and food security in the long term. David Montgomery's recent book "Dirt, The Erosion of Civilizations" traces how soil began to form through chemical processes as atmospheric oxygen levels increased about 500 million years ago. Since then, soil formation and erosion loss came gradually into balance, and soils became the key factor in the rise of new civilizations. Since the advent of agriculture - first ploughing, and now fertilizers - the balance has tipped; the net loss of healthy soils contributes to today's food crisis.

Nine vulnerable earth systems

Vulnerable climate and soil systems are not the only critical earth systems

on which the future of human civilization may depend: the Stockholm Resilience Centre identified nine interdependent systems on which the future of human life may depend, the destabilization of each threaten human survival:

- Biodiversity (loss) in ecosystems
- Toxic chemicals dispersion
- Climate Change
- The global hydrological cycle and freshwater consumption
- Land change: ecosystems to agriculture to urban development
- Nitrogen and phosphorus inputs to the biosphere and oceans
- Atmospheric aerosol loading

The two less likely to be impacted by forest related projects are

- Ocean acidification
- Stratospheric ozone layer

Seven systems can benefit from good silviculture. Taking all systems together highlights' it is not only the poor, but all of us who are vulnerable to an earth systems' collapse.

The IPCC built bioethical pathway

Forest project design must navigate this labyrinth of sustainability decisions that have not been considered together before. Thankfully, the structure for designing terrestrial climate projects developed by the Intergovernmental Panel on Climate Change (IPCC) scientists also applies to analyzing a projects impact within any earth system. Whether for water quality, biodiversity or soil, practitioners can begin by identifying a business-as-usual scenario without the project, against which they can demonstrate project benefits, measurable by identified quantities, less 'leakage' or effects outside of the project, adjusted by project risks—a set of well-established principles for climate accounting.

One local ring to bind all global risks

Forging an integrated toolbox to measure and fix all vulnerable earth systems is the next challenge. But global land use change problems require long term local community adaptation planning. The world's poorest live on some of the most degraded lands. Community adaptation, can yield land use plans that combine forest conservation, restoration and enhancement with more sustainable agriculture and agroforestry practices and can bind benefits for all vulnerable earth systems into one local land use change 'ring'.

Restoring the poor one tree at a time

At COP 16 in Cancun, Sir Nicolas Stern declared that two thirds of the 25% of the world's land that has been degraded is reclaimable. Reforestation, grassland and wetland restoration and improved farming on these lands could remove enough greenhouse gases to make up for delayed emission reduction actions of industrial nations. Restoring one seventh of the earth's surface and solving climate, food security and perhaps even geopolitical chaos seems daunting, until we all look around locally and think one tree at a time.

Focus on Safety



By John Levesque, Workplace Safety North

Travelling Safely is More Than a Minor Detail

The demanding physical work of tree planting presents a variety of hazards, from musculoskeletal injuries to insect stings, dehydration, and sudden encounters with wild animals – and we don't mean other tree planters.

But travelling to and from and even within the planting block is in some cases the most dangerous time of all for tree planters. The rough and often remote routes into the planting area, and the various methods used to get planters in and out, are the sources of many hazards, and planting crews may be the least alert during these times -- especially at the end of an exhausting day's work.

Quite often, the vehicles that are used to transport tree planters are designed for use on pavement, with suspension that's a lot less forgiving on rough, winding forest resource roads. Passenger vans are known for their lack of stability. As the load increases, so does the potential for rollover.

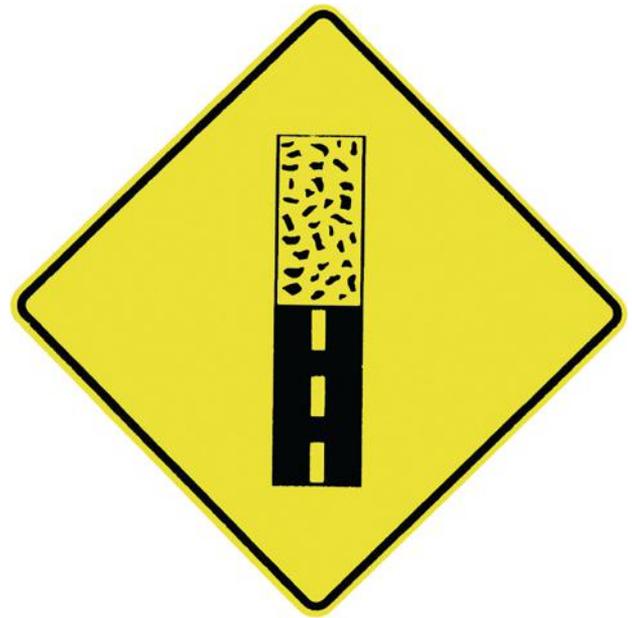
Most companies have strict written policies on safe driving and riding in company vehicles. It's the driver's responsibility to follow those policies. Many of the rules are elementary, but that doesn't mean they aren't important. The driver needs to verify that all of the seatbelts are serviceable before the passengers are seated. The driver is also responsible for ensuring that all cargo is secure. Tools, equipment and flammable liquids must not be stored in the passenger compartment of the vehicle.

Driver fatigue affects many aspects of driving, including general control of the vehicle and reaction time. A driver with passengers needs to be alert and well-rested before taking on driving responsibilities, and must remain focused while driving. Drivers should always keep right and slow down, especially at bends in the road.

Many tree planting companies use all-terrain vehicles (ATVs) to deliver seedlings, supplies and personnel to the planting ground. The company's safety policy should clearly state who may use these vehicles, the training required before they may use them, personal protective equipment required for riders and drivers, and safe operating procedures. No one should operate an ATV unless they have received proper training and are wearing all the required personal protective equipment.

In especially remote or rugged areas, aircraft are often essential for the transportation of personnel, seedlings, equipment and supplies. There is one overriding rule: The pilot of the aircraft is always in charge and responsible for safe operations. Appropriate and approved personal protective equipment must be provided and used. Before air operations begin, planting personnel must be trained to approach and depart from the aircraft, load and unload the aircraft, safely handle sling loads from helicopters, and know and follow emergency procedures.

In some situations, people, seedlings and supplies are transported to the planting ground by watercraft. Employers are responsible for ensuring the operating safety of watercraft, as well as appropriate training for operators and passengers. In some jurisdictions, operators may be



required to pass an approved operator's course and be licensed to operate certain craft. All personnel must wear approved flotation devices when operating or travelling in watercraft.

And finally there's the oldest form of human transportation – foot travel. On good ground such as sand or cleared areas, the going may be easy, but most of the time, tree planters are expected to work among rocks, deadfalls, slash, mud and other challenging conditions. A combination of good physical conditioning, ongoing warm-up and stretching breaks and prudent, attentive work habits will go a long way to preventing slips, trips and falls. Because ankle support is crucial, boots should always be laced up, even at the campsite.

Planters can easily become disoriented and even lost when planting in areas with restricted visibility. Planters should carry a compass and a loud whistle in their pack. In especially dense terrain, the buddy system should be used so that planters can check on each other's whereabouts frequently during the day.

Workplace Safety North, an Ontario health and safety association, has created SafePlanting.com, a comprehensive online health and safety training program for tree planters. For more information or to order the program for your workers, visit www.safeplanting.com or contact Workplace Safety North at 705-474-7233 ext. 267 or 288. Also visit www.workplacesafetynorth.ca.

Monitoring to Improve Management Practices of Juvenile Lodgepole Pine in British Columbia

By Jim Snetsinger, ADM Stewardship Division/Chief Forester, Ministry of Forests, Mines and Lands





Juvenile Pine stand



Introduction

British Columbia has significant areas of healthy and vigorous juvenile lodgepole pine, both pure and mixed with other species. Some areas, however, are showing a range of impacts by forest health agents, from light to severe. The Winter 2010 issue of *Silviculture* magazine presented two articles that raised concerns about the potential of lodgepole pine at, or near, the free-growing stage¹ to reach forecast stand volumes at rotation. Lodgepole pine's vulnerability to a range of forest health agents, added to a potential gap in the mid-term timber supply following the mountain pine beetle infestation, has created a situation that requires attention.

The provincial government is developing a comprehensive approach that addresses different aspects of juvenile lodgepole pine performance. This summary describes six initiatives underway.

1) Monitoring the Performance of Juvenile Stands

After the mountain pine beetle epidemic and through impending climate change, monitoring juvenile stands is particularly critical to check expectations of growth rates and create a feedback loop for management decisions. Two branches in the Ministry of Forests, Mines and Lands (MFML)—Forest Analysis and Inventory, and Forest Practices and Investment—are developing an inclusive monitoring strategy for stands of all ages. The purpose of the monitoring is to:

- enable early detection of forest health concerns,
- update forest inventories,
- refine predictions of future forest harvest yields,
- support planning of investments and helping adapt managed forests to climate change, and
- provide information to inform forest management decision-making.

At this preliminary stage, the strategy will likely integrate three existing information sources of lodgepole pine growth performance:

1. The RESULTS database (“Reporting Silviculture Updates and Landstatus Tracking System”), which captures silviculture survey data and updates stand inventories. Each year over 600,000 hectares of surveys are completed to monitor young stands;
2. Mid-rotation monitoring data collected using the Forest and Range Evaluation Program's stand development monitoring (SDM) protocol, conducted after the free-growing stage is achieved for intermediate-aged stands, to check and report on changes in stand attributes since free growing (e.g., inventory label , site index , stand yield estimates, forest health pest incidence); and

3. Monitoring of all higher risk younger age class stands, both managed and unmanaged, through Change Monitoring Inventory plots for stands up to age 60, to assess growth trends against Timber Supply Review assumptions.

Impacts of the mountain pine beetle on young stands are also being monitored through information from a range of aerial and ground surveys and permanent sample plots. This monitoring is continuing in areas of the province where beetle mortality is still occurring.

2) Improving Forest Health Risk and Hazard Ratings, and Species Recommendations

To provide surveyors and resource professionals with access to the most current information, provincial and regional forest health specialists are updating forest health risk and hazard ratings and species recommendations that will reduce the risk of severe pest losses in young stands. This work includes:

- i. Updating current information on existing websites² to point practitioners to the available tools and latest information. This will help ensure the most current information is used to develop and review stocking standards in Forest Stewardship Plans.
- ii. Generating maps that spatially describe known pest hazards using the best available information.
- iii. Translating recommendations into stocking standards guidance for incorporation into forest health strategies for Timber Supply Areas.

- iv. Providing the necessary training and information resources for field staff to correctly identify forest health agents and prescribe the most appropriate management practices:

- Stocking standard training will be provided to Forest Stewardship Plan reviewers through two on-line training sessions scheduled for February 2011,
- Regional forest health training will be available to silviculture surveyors in 2011,
- Best management practices are being developed for three biogeoclimatic zones to guide practitioners to important considerations for forest health and species recommendations, and
- SDM training will be provided across the province in all districts starting in 2011.

One example of a forest health risk and hazard rating that provides guidance in management of lodgepole pine is the Mackenzie Pine Stem Rust Management Strategy, which aims for best management of stands with comandra and stalactiform blister rusts and western gall rust in the Mackenzie Timber Supply Area. New information will be used to improve the strategy over time. Other hazard and risk ratings that are in development or are currently available are for western spruce budworm, tussock moth, spruce weevil, and yellow cedar decline.



Naturally regenerating lodgepole pine near Vanderhoof, BC

3) Reviewing Minimum and Target Densities

Minimum and target densities for lodgepole pine are closely linked to stand productivity, wood quality, branch size, anticipated survival rates, and other factors. Higher densities for planting or free-growing target levels may be required. Staff in the Forest Practices and Investment Branch will monitor and quantify the scope of this issue, and, if required, determine cost-effective methods to address planting increased densities.

4) Promoting Species Diversity

Species diversity is an important part of risk reduction, biodiversity and climate change adaptation and mitigation in forest management. In British Columbia, the Interior Cedar-Hemlock biogeoclimatic zone is currently experiencing a very high rate of forest health agent damage to lodgepole pine. Reducing the reliance on pine by increasing species diversity in this and other zones is subsequently very important for mitigating potential losses from pine damaging agents.

Practitioners need to take advantage of opportunities to maximize productivity through effective species selection and silviculture practices. Examples include regenerating lodgepole pine, where appropriate, as a component of a broader species mix, planting genetically improved white pine, and using stumping treatments in areas of high root disease. The MFML will be developing clearer direction on expectations and best practices from both the analysis of species trial summary reports and a species diversity project at the landscape level. Forest districts will also have access to planting diversity statistics from RESULTS to assist in identifying potential problem areas. In addition, SDM will provide valuable feedback on the performance of silviculture regimes in adapting to a changing climate.

5) Informing Current Practices From Long-Term Research Trial Results

New practitioners often have insufficient experience or exposure to the impacts of forest health agents on lodgepole pine. Practitioners must fully understand the implications of stocking standards and survey results on future forest conditions. Long-term research trials can provide significant insight to inform decisions and provide training to new practitioners, and to current practitioners needing a technical refresher or update. Two examples include:

- Experimental Plot 660 at Chilko Creek, established in 1967, provides an opportunity to compare performance of white spruce, Douglas-fir, and lodgepole pine at different establishment densities, and
- The Bednesti site preparation trial is providing detailed 22-year results on the development and impact of hard stem rusts on lodgepole pine performance.

Staff in the Forest Practices and Investment Branch will identify key long-term silviculture trial installations and conduct tours in 2011 with those who develop or review stocking standards in Forest Stewardship Plans.

6) Using Multi-Block Free Growing Assessments

The MFML is also considering the expansion of a pilot system that assesses free-growing status by grouping blocks together. A multi-block system can be used to ensure that productivity targets are met at the landscape level while allowing for some tolerances to natural factors at the stand level. The objective is to develop a simple multi-block system for provincial application.

Summary

These six initiatives are being implemented to comprehensively address the performance of juvenile lodgepole pine in British Columbia and address the following three goals:

1. Implementation of a reliable monitoring strategy that will identify the necessary action to provide reliable timber supply projections and outcomes.
2. Knowledgeable silviculture surveyors who can accurately detect, identify, and report forest health agents.
3. Well-informed forestry practitioners who have access to the latest information on forest health hazard and risk to make appropriate management prescriptions. †

¹ “free growing stand” means a stand of healthy trees of a commercially valuable species, the growth of which is not impeded by competition from plants, shrubs or other trees;

² Forest and Range Evaluation Program www.for.gov.bc.ca/hfp/frep/index.htm
Silviculture Surveys www.for.gov.bc.ca/hfp/silviculture/Silviculture_Surveys.html
Stocking Standards www.for.gov.bc.ca/hfp/silviculture/stocking_stds.htm



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BC's Not Sufficiently Restocked Crisis

By Anthony Britneff, RPF (ret)

An abridged version of a background paper prepared for the 2011 Annual Conference of the Western Silvicultural Contractors' Association on February 3, 2011

The area of inadequately restocked or reforested land in British Columbia is larger than at any point in the history of forest management in the province and is estimated to be around nine million hectares, with about half attributable to the mountain pine beetle infestation.

In fact, this area known in forestry parlance as NSR or Not Satisfactorily Restocked is nearly three times greater than it was 25 years ago when the provincial and federal governments embarked on concerted efforts to address what was then a reforestation challenge of the first order. Not only is today's reforestation challenge so much greater than in the past, but the growth in NSR continues, and will likely worsen in the face of continued provincial inaction.

To give context to the present challenge a brief look at the past is instructive. In 1984, British Columbia's NSR stood at 3.4 million hectares. It was considered so outrageous that it precipitated a crisis in forest management, critical national media coverage and a federal response of over \$457 million from 1985 to 1995 to assist the province in reforestation.

The reforestation crisis of the 1980s was not only informative because of the sustained public investments that resulted but also because it led the province to enact new laws in 1987 that made it a legal requirement for logging companies to reforest the lands that they logged and for the provincial government to come up with reforestation plans on lands disturbed by forest fires and insect and disease outbreaks.

Fifteen years later in 2002, however, the provincial government reversed its position. It rescinded its own legal responsibilities for reforestation and relaxed reforestation rules for forest companies over hundreds of thousands of hectares of forestland that would subsequently be logged under what became known as "small-scale-salvage" operations.

To make matters worse, the government also rescinded in 2002 its legal responsibility to survey forestlands. The third edition (2010) of the report titled *The State of British Columbia's Forests* states that the inventory for just under three quarters of the province's total forest estate – 74 per cent – which is supposed to be re-surveyed or re-inventoried every 10 years -- is now 25 years or more out of date. In the face of a paucity of reliable and timely data, our provincial government cannot provide us with a credible figure on the true extent of NSR.

In British Columbia, the province's chief forester sets the stocking standards that are the benchmark by which foresters manage forest renewal. The number of healthy "free-growing" trees on a reforested site will determine whether or not the site is considered NSR or not.

The chief forester also, theoretically at least, uses NSR statistics to help determine what forest companies will be allowed to log on public lands. This decision is known as the allowable annual cut or AAC determination, a determination that also includes reviews of government and industry performance in forest management programs related to the protection, conservation and maintenance of forest resources.

NSR statistics come from two primary sources: inventory surveys and silvicultural surveys. Therefore, the Ministry of Forests, Mines and Lands records two types of NSR: inventory gross NSR and silviculture net NSR (see Table 2).

Provincial government inventory specialists, most working under contract to the province, classify the land. In theory, provincial silviculture staff take inventory gross NSR land classifications, factor them for natural regeneration, for accessibility and operability, and for potential return-on-investment (ROI), netting out all low (and often poor) sites to determine silviculture net NSR (the area deemed economically feasible and practicable to plant).

The former Research Branch of the forests ministry provides cumulative figures for the timber volume of mature or older pine trees impacted by the beetle attack as well as cumulative areas affected pegging the area affected by mountain pine beetle by 2009 at 16.3 million hectares.

Given that the forest ministry has conducted NSR surveys on only a fraction of those lands -- 360,000 hectares out of 17.38 million hectares of forestland disturbed by the mountain pine beetle (16.3 million hectares) and fire (1.08 million hectares) since 1998¹ (see Table 1) -- we have to estimate the area of inventory gross NSR and silviculture net NSR based on the public record and on empirical evidence from the field.

The public record of areas of inventory gross NSR and silviculture net NSR and of areas disturbed by wildfire and pests is found in the *Forest and Range Resource Analysis* (1984), in Ministry of Forests and Range annual reports, and on various ministry web sites (see Tables 1 and 2). The 2010 edition of *The State of British Columbia's Forests* also provides information. All are unhelpful in providing a complete portrayal of the reforestation challenge.

Table 2 provides the public record of areas burnt by wildfire and disturbed by insects and disease and of associated NSR data. The



inadequacy of that record is dramatically illustrated by Chart 1, in which the reader can readily grasp how the NSR impact of vast areas of disturbance by mountain pine beetle and fire (red area) is not being captured in the forest ministry's inventory (blue area) and in the NSR area identified as being economically feasible to plant (green area).

Such a trend line for silviculture net NSR (green area in Chart 1) stands in stark contrast to what provincial and federal government forest scientists say. For example, David Coates of the Ministry of Natural Resource Operations (MNRO) is a renowned authority on secondary structure in forests that have been attacked by mountain pine beetles. Coates' estimate based on field studies in north central BC is that:

... 20 to 25% of the area affected had very low levels of stocking and would be considered NSR by just about any criteria. Another 40 to 50% of the area is stocked with green trees but depending on species suitability criteria and well-spacing criteria may or may not be NSR. Some 25 to 30% is clearly well stocked².

Similarly, Philip Burton of the Canadian Forestry Service has studied the variation in forests attacked by mountain pine beetles and drawn conclusions that many such forests are adequately stocked with trees while others are less so:

... available data indicate that pure pine stands constitute a minority of the forest area affected by the mountain pine beetle ... , and that more than 40% of stands dominated by lodgepole pine ... have adequately stocked understories.

Table 1.

Areas surveyed and planted under the Forests-For-Tomorrow (FFT) program by fiscal year

Year	Source	Planted (hectares)	Surveyed (hectares)
2005/06	FFT Annual Report	350	76,600
2006/07	FFT Annual Report	830	32,800
2007/08	FFT Annual Report	6,500	60,100
2008/09	FFT Annual Report	7,000	115,000
2009/10	FP&I Branch, MFML	Estimated 12,000	Planned 80,000
Totals		≈26,680	≈364,500

Table 2.

NSR statistics and areas disturbed by wildfire, by pests and by MPB and fire combined

Year	Wildfires – Area Burned (ha)	Pests – Area Affected (ha)	MPB + Fire – Area Affected (ha)	Inventory Gross NSR (ha)	Silviculture Net NSR (ha)
	Annual data (no area overlap)	Generic data (area overlap)	Cumulative data	Not Stocked (NSR, NCB, DSD)	Backlog + Current NSR
1955				4,801,409	
1976				3,888,034	
1984				3,386,928	738,000
1988-89	11,482	688,526		3,779,000	1,972,151
1989-90	25,380	392,180		3,836,000	1,862,853
1990-91	75,781	679,785		3,836,000	1,968,864
1991-92	30,914	787,074		3,785,000	1,529,480
1992-93	30,452	1,301,053		3,617,000	1,362,407
1993-94	4,709	1,367,000		3,242,000	1,290,233
1994-95	30,370	511,701		3,016,000	1,050,611
1995-96	48,080	287,017		2,964,000	956,988
1996-97	14,952	24,808		2,844,000	827,938
1997-98	1,870	DNA		2,752,000	752,732
1998-99	71,769	2,352,175		2,826,000	687,241
1999-00	13,989	3,729,741	2,313,781	2,779,000	642,207
2000-01	16,407	3,545,876	3,504,892	2,762,000	642,529
2001-02	9,762	3,912,649	4,490,974	DNA	633,903
2002-03	20,471	4,009,051	5,467,829	DNA	603,193
2003-04	265,053	7,709,594	7,304,338	DNA	570,461
2004-05	220,518	10,618,639	9,476,472	DNA	611,055
2005-06	34,588	11,388,422	11,359,620	DNA	654,781
2006-07	139,265	11,818,680	12,560,517	DNA	696,240
2007-08	29,440	12,784,194	14,259,381	DNA	725,528
2008-09	13,211	9,642,872	15,239,440	DNA	750,431
2009-10	242,170	13,246,896	17,261,754	DNA	722,731



Photos by John Huizinga, Taken in 2010 in the Ingenika River region, at the north end of Williston Lake, BC.

Furthermore, a study by forest health staff with the forestry division of the Province of Alberta concluded that in British Columbia 40 to 70 per cent of the area disturbed by mountain pine beetle is not sufficiently stocked with healthy numbers of living trees³.

Finally, the reader must bear in mind that much of this research and estimation would be unnecessary if the forest inventory were not out-of-date, unreliable and grossly under-funded.

The forests ministry should be able to tell its landlord, the public, with certainty how much of the pine-affected forests is not adequately stocked with trees and how much of that area is economically suitable for tree planting.

So what might the true NSR picture be? To answer that question it is important to estimate the present total (inventory gross) NSR, area. Such an estimate can draw on the following:

1. The inventory gross NSR on the forest ministry's books for fiscal year 2000/01, but not updated since, is 2.762 million hectares.

2. 70 per cent of the area burned by wildfire from 1998/99 to 2009/10 [0.7 x 1,076,643], adds another 753,650 hectares to the area of inventory gross NSR.

3. 30 per cent of the area infested by mountain pine beetle from 1998/99 to 2009/10

[0.30 x 16,256,880] is similarly considered inventory gross NSR, which adds another 4.877 million hectares to the total.

4. An estimated 200,000 hectares of inventory gross NSR from small-scale salvage logging conducted since 2000/01 and on which the provincial government waived the logging companies of reforestation responsibilities. This NSR area could be greater.

5. Finally, an estimated 0.5 million hectares of additional inventory gross NSR from other forest health disturbances incremental to endemic losses and attributable to climate change⁴.

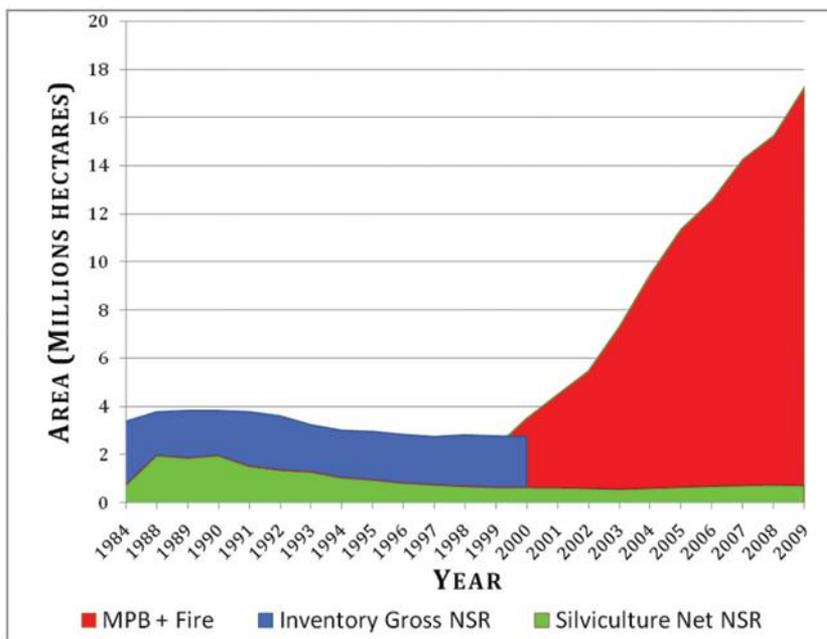
This gives an estimated total (inventory gross) NSR area of 9.1 million hectares.

From 1988/89 to 2000/01, the average ratio of total (inventory gross) NSR to silviculture net NSR is 3:1 (see Table 2). If a more conservative ratio, say 4:1, were applied to the present estimated total NSR area of 9.1 million hectares, the estimated area of silviculture net NSR economically feasible for tree planting would be 2.3 million hectares. Minister Bell's publicly stated estimate in response to criticisms about the province's lack of zeal when it comes to reforestation is 10 per cent of that figure⁵.

In summary, this paper concludes that the

Chart 1.

Cumulative areas by year for inventory gross NSR, for silviculture net NSR and for MPB and fire combined (NSR is for the province; all TSAs; all sites; and Crown land -- ownership 62)





present areas for inventory gross NSR and silviculture net NSR are estimated to be 9.1 and 2.3 million hectares, respectively.

This represents a serious forest policy problem of the first order. To know how much land is not stocked and to be able to estimate for how long that land will remain out-of-production for growing trees are critical building blocks in setting sustainable logging rates over time.

Given the unprecedented estimated total area of NSR – 9.1 million hectares – and the wholly inadequate forest ministry response,

it is clear that the public interest is not being served and forest management on publicly owned lands in British Columbia is unsustainable. To highlight the point, consider the following:

Since 2005/06, provincially funded reforestation efforts resulted in the planting of just 26,680 hectares of NSR forestlands. In other words, over five years the province could only manage to plant roughly one per cent of the area of land that this paper conservatively estimates to be economically feasible and desirable to replant. It does not take much to see that at such paltry levels of reinvestment in our public forestlands we will never come close to addressing the growing reforestation crisis on our hands, thus condemning the residents of our super-natural, beautiful province to an impoverished future. ‡

Anthony Britneff, RPF (ret) recently retired from a 39-year career with the B.C. Forest Service where he held senior professional positions in the inventory, silviculture and forest health programs.

¹ Forest Minister Pat Bell, *Times Colonist*, June 12, 2010

² Coates, Dave. Personal communication (January 10, 2011)

³ Cerezke, H.F. 2009. "Climate Change and Alberta's Forests". Forest Health Section, Forestry Division, Alberta Sustainable Resource Development. Page 44

⁴ Woods, A.J., Heppner, D., Kope, H.H., Burleigh, J. and MacLauchlan, L. 2010. "Forest health and climate change: A British Columbia perspective". *The Forestry Chronicle*. Vol. 86, No. 4

⁵ See Pat Bell, *Times Colonist* (June 12, 2010) and Graham Ross-Smith, *Times Colonist* (June 18, 2010).

Excerpt from Anthony Britneff's original February 3rd, 2011 Opinion Editorial to the Vancouver Sun.

"British Columbia is blessed by nature with a vast, ecologically rich forest estate that has also been a source of sustained economic wealth in the province for more than a century. But today there are troubling signs that the most important of natural assets is facing challenges never before seen. The area of inadequately restocked or reforested land in British Columbia is larger than at any point in the history of forest management in the province and is estimated to be around nine million hectares, with about half attributable to the mountain pine beetle infestation...

So why should we care? Well, the most obvious reply is that forestland in British Columbia is by and large public land. Whenever such lands are inadequately restocked ... questions are rightly asked about impacts on our environment and economy... that indirectly puts the standard of living of our urban populations at risk. Most British Columbians live in Vancouver and Victoria and each was blessed at birth, or upon taking up residence, with a shared inheritance of publicly owned natural assets and wealth beyond the wildest dreams of any peoples on Earth.

The affluence and lifestyle enjoyed by the people of Vancouver and Victoria exist because of the variety and wealth of the rural estates that sustain them: the agriculture and fisheries estates that feed them; the water estate that provides their drinking water, irrigates their food crops and powers their homes and industries; the mining and energy estates that bring in wealth and foreign exchange; the forestry estate that provides their paper and lumber for homes and export; and lastly, the richest estate of all, a natural world of

forests, mountains and rivers abundant with plants and animals, a destination for recreation and tourism, and a sanctuary for intellectual and artistic inspiration. This is the Super Natural British Columbia that defines us as a people and sustains us as a culture.

All these rural estates collectively form Vancouver and Victoria's backyard. Their common thread and defining element is water. The safety, quality and availability of water are critical to all life and to our provincial economy. And this is precisely the role that forests play: they store, purify and regulate water. And that is why nine million hectares of NSR is a serious issue that all British Columbians cannot ignore.

The more we allow the inadequately reforested land base to grow unchecked, the poorer the public interest is served. Addressing the accumulated NSR, then, is a public policy issue of the first order and requires an open, honest accounting of just how significant the area of NSR is and what may be required by way of public reforestation investments to begin to restore the land base to a healthier state.

British Columbia's forest estate is among one of its most valuable public assets, with the timber alone worth \$0.25 trillion and, when all natural assets and ecosystem services are included, a trillion dollars.

The present magnitude of NSR is a threat not only to forest sustainability but also to the safety, quality and availability of water, to the survival of salmon, and to the economic future of the rural communities that in turn sustain the populations of Vancouver and Victoria. Hold your politicians accountable for taking care of your backyard because if you don't, they won't."



Western Canada

Western Silvicultural Contractors Association

By Tony Harrison

Will BC's Climate Change Policy be a Boom for Silviculture?the Jury's Out

BC is going through interesting times in the world of climate change and forest carbon offsets. Three years ago our minister of forests trumpeted that silviculture would double and by 2012 and the increase would be funded by carbon credits. This interested some and bemused others at the WSCA 2008 annual conference. As of 2011 the bureaucratic bemusement has transformed into climate change initiatives that are bold, emerging and unproven. All attributes that risk seeking missiles like silviculture contractors thrive on. The emerging initiatives include a commitment by the Pacific Carbon Trust to source one third of its CO_{2e} offsets through provincial forests, a shiny new BC Forest Carbon Offset Protocol, the rolling out of Zero Net Deforestation legislation and a draft BC cap and trade bill. Here's the rub;

"... large corporations like BC Hydro are developing policy to reflect a commitment to ZND..."

The Pacific Carbon Trust (PCT) is a new Crown Corporation, capitalized to \$24 million, created to enable the provincial government and its bureaucracy to be carbon neutral by the end of 2010 fiscal year. By definition PCT must use ex post carbon credits or carbon that has been already sequestered at the time of sale. This makes for challenging number crunching and a need to embrace the concept of ex ante purchases. An ex ante purchase is buying carbon credit futures and is used for the voluntary market.

The BC Forest Offset protocol (FCOP) is the means for PCT to accomplish its commitment to having one third of PCT carbon credits related to our forests. The protocol is broken down into four parts Afforestation, Reforestation, Improved forest management, and Conservation /avoided deforestation. The final protocol will be out in March and looks like it will be better adapted for the specific needs of BC forests but structurally different from the Voluntary Carbon Standard (VCS). Different from VCS means it may be too risky for use in a pre compliance market or may be not able to integrate with other voluntary standards. Initial feedback to the draft version of FCOP around enabling voluntary credits was met with a surprising mix of resistance and befuddlement.

The Zero Net deforestation (ZND) legislation is an interesting piece of government policy that identifies an annual average deforestation rate of 6000 hectares from non forestry activity, like creation of transmission line corridors, non forestry roads and urban and municipal expansion. This could equate to an additional 8-10 million trees a year. Unfortunately, this program currently has no real teeth due to lack of binding regulation. A potential silver lining is that some large corporations like BC Hydro are developing policy to reflect a commitment to ZND that could translate into a related silviculture market.

A draft BC Cap and Trade Bill is under way making reasonable progress. Demand for forest offsets will be given a demand boost when this bill goes through, though there will be a second effect of more buyers, more sellers and more competitive, liquid and volatile pricing in the growing market. Some models for the US market suggest that forestry will reduce carbon trading prices. There is some low hanging fruit, but the cost of many interventions is high. BC's Cap and Trade act is scheduled to come into force next year, new Liberal leader dependant.

In Summary, a tally of the net benefits for silviculture from carbon credits is a challenge. But here is a shot; a combined total between a bold PCT, a toothier ZND, low hanging cap and trade fruit and support of the volunteer market by a less hesitant FCOP would very optimistically add up to 20 million trees. That is 10% increase in the annual BC planting program. So where is the potential for doubling silviculture in the near future? The mountain pine beetle (MPB) affected area is the 15 million hectare elephant in the room and holds the only realistic answer. The problem is that many MPB sites take too long to grow trees for a PCT ex post market that yields payback over 25 years. This problem disappears if the goal of reforested MPB sites is to reach optimum sequestration levels by the defining climate change year of 2050. The deadline the world has set to reach and maintain international CO₂ reduction goals.

Premier Campbell has been chastised for controversial policies and his governing style but may be best remembered in the end for instituting enlightened climate change policy when few had the courage. Pat Bell as his forest minister had a vision to translate the controversial climate policy into a means of transforming the beetle forest from a carbon emitting causality of global warming to world class carbon sink. Inspired ideas! But ideas that require strong leadership and an informed rural public. The jury's still out....



Ontario

Ontario Forest Renewal Co-operative Inc.

By John Lawrence and Judi Tetro

Tenure Reform

Following requests for comments and a series of forums across the province, the Ontario government has modified its original plans for tenure reform. In its original proposal, government had outlined a new governance model known as Local Forest Management Corporations (LFMC); government agencies that would replace current licensees in the management of all Crown forests, and oversee the competitive sale of the timber in a given area. In addition, the proposal sought to rationalize the number of management units from the current total of 43 to somewhere between 5 and 15.

The notion of a new governance model being imposed in the midst of the successful implementation of Co-operative forest management agencies was not well received. Clearly, it is too early to abandon the Co-op model which is showing increasing signs of viability, as well as the potential for innovation as locally focused forest practitioners group together to create efficiencies, both operationally and in terms of market opportunity, for the diversity of products and values to be managed on the landscape. Similarly, the rationalization of the number of management units was deemed excessive, though many agree that some level of rationalization is necessary in order to provide for viable management units. Government is now proposing the following;

- recognition and support for a move to enhance Co-operative Sustainable Forest Licenses over the next 5-7 years as a viable and appropriate tenure reform
- commitment to limited implementation of two Local Forest Management Corporations (LFMCs), which will be evaluated against predefined criteria prior to potentially broader application
- maintain wood supply commitments to companies that have consistently utilized their allocated fibre.

One of the least understood aspects of the government's original proposal was the financial model. In that model, all of the revenues generated in the management unit would stay within the unit in order to provide for effective funding of all of the timber and non-timber management priorities, for which there is currently no funding beyond what can be squeezed from a 2"x4" or tonne of pulp. Revenues to government would be recouped from any surpluses generated, but primarily would be realized via the tax base created through the employment and industry associated with the land base. This aspect of the original proposal still deserves careful consideration by government if it hopes to achieve all of the objectives it has on the landscape, including enhancing the health of the forests. The original proposal only envisioned this financial model as possible within the context of government led agencies, the LFMCs. It is time

the government put more faith in the capacity and integrity of the Co-operative tenure management model, and provide management units with all of the tools required to responsibly steward the public's resources now and for the future. From the perspective of Ontario's silviculture practitioners, the most pressing issue facing forest management in Ontario is the lack of a viable funding model to ensure that the province's forests are healthy and able to sustain the wealth of timber and non-timber values that the public expects from its forest patrimony. A financial model that recognizes the importance of re-investing in the forest is an opportunity that should not be missed.

"... it is too early to abandon the Co-op model which is showing increasing signs of viability..."

Wood Supply Competition

In an effort to provide access to unused and under-utilized fibre, the Ontario government launched a wood supply competition and recently announced the first successful applicants (www.news.ontario.ca/mndmf/en/2011/02/creating-jobs-in-ontarios-forestry-industry.html). From electricity generation, wood pellet and briquette production, to traditional lumber and niche market products for the mining sector, the successful proponents will share over three quarters of a million m³, and create and sustain more than 500 jobs.

The Ontario forest industry has come through a difficult time and there are still new casualties, particularly in the northwest with the further decline of the once mighty Buchanan empire. At first glance, the small initial list of successful applicants will not create a host of new manufacturing facilities in the province. When will there be more announcements regarding the rest of the 11 million m³ that are available? As numerous market analysts agree, the ever cyclical lumber supply dynamics are shifting back towards a constrained supply in the coming years. With a re-invigorated model of forest management via Co-operative tenure holders, new opportunities for market synergies with bioenergy, and a government commitment to move forward in the allocation of unused and under-utilized timber supplies, Ontario needs to ensure it is ready to benefit by effectively encouraging the resurgence of the wood manufacturing sector.



Québec

Association des Entrepreneurs de Travaux Sylvicoles

Par Shanie Lévesque-Baker, Responsable des communications

Le bois québécois au libre-marché

Mme Nathalie Normandeau, ministre des Ressources naturelles et de la Faune (MRNF), a récemment annoncé la mise en place du Bureau de mise en marché des bois (BMMB). La création de cette nouvelle instance amène avec elle un tout autre mode de fonctionnement de l'octroi des bois de la forêt publique québécoise. En allouant une partie de ses bois par processus d'enchères, le Québec devient ainsi la deuxième province seulement à procéder de cette façon, après la Colombie-Britannique.

“...les entrepreneurs souhaitent qu'en octroyant des volumes de bois au marché...”

Un pas vers le nouveau régime forestier

Cette mise en œuvre d'un marché libre d'une partie des bois de la forêt publique constitue également un grand pas vers le nouveau régime forestier, prévu pour avril 2013. Au cœur des changements, la refonte du régime amène entre autres le MRNF à devenir responsable de l'aménagement durable des forêts du domaine de l'État et de leur gestion.

Rappelons-nous que ces changements ont été précédés de la publication du Livre vert, en février 2008, puis du Document de travail : « L'occupation du territoire forestier québécois et la constitution des sociétés d'aménagement des forêts » publié en juin 2008, qui est venu apporter des précisions sur certains objectifs proposés dans le Livre vert. C'est en juin 2009 que le Projet de loi sur l'occupation du territoire forestier a été déposé à l'Assemblée nationale. Celui-ci a fait l'objet d'une réécriture, pour devenir le Projet de loi sur l'aménagement

durable du territoire forestier, puis amené en consultation parlementaire à l'automne 2009. Finalement, la Loi sur l'aménagement durable du territoire forestier a été sanctionnée le 1er avril 2010.

Dès les premiers pourparlers qui ont mené à la refonte du régime, un changement majeur s'annonçait dans l'attribution des bois, où des contrats à long terme et des volumes de bois réservés au libre-marché se côtoieraient dans une proportion qui demeurerait à déterminer. Le Ministère des Ressources naturelles et de la Faune estime entre 20 et 25 % les bois des forêts publiques qui seront offerts aux enchères.

Mais le Bureau de mise en marché du bois ne devra pas attendre l'implantation du nouveau régime forestier en 2013 pour lancer les premières mises aux enchères. En effet, dès cet hiver, ce sont des projets de plus de 200 000 mètres cubes de bois qui seront réalisés dans diverses régions du Québec. Ces premiers projets permettront au MRNF ainsi qu'à l'ensemble du secteur forestier de s'ajuster face à la nouvelle façon de faire, et de faciliter la transition avec le nouveau régime forestier.

Une innovation qui favorise l'entrepreneuriat

La mise aux enchères de volumes de bois pourrait offrir des opportunités d'affaires intéressantes pour certaines entreprises du secteur forestier. En effet, les entrepreneurs souhaitent qu'en octroyant des volumes de bois au marché, la mise en place d'un tel système réduise la vulnérabilité de l'approvisionnement des entrepreneurs qui sont impliqués dans la deuxième transformation.

Les opportunités de l'accès aux bois devraient modifier les façons de faire de plusieurs entreprises, mais le gouvernement du Québec doit être patient et se donner le temps pour que les effets réels de sa mise en marché des bois se concrétisent sur le développement de la deuxième et troisième transformation.



Quebec

Association of Silviculture Contractors

Translated by Lumi Faucher

Quebec Timber on the Free Market

Ms. Nathalie Normandeau, Minister of Natural Resources and Wildlife (MRNF) recently announced the establishment of the Bureau de la mise en marché de bois (BMMB). Along with the creation of this new office comes an entirely different mode of granting timber rights from Quebec's public forest. Quebec becomes the second province after British Columbia to adopt this new way of distributing the public resource; granting a portion of its timber through an auction system.

A Step Towards the New Forestry Regime

This implementation of a portion of the public forest on the free market is a major step towards the new forestry regime, scheduled to commence in April 2013. This new regime also brings with it a great deal of change with the MRNF becoming responsible for the sustainable management of public forest.

These changes were preceded by the publication of the Livre vert (Green book) in February 2008, and the work document "The occupation of forest land in Quebec and the constitution of forest management societies" published in June 2008, clarified certain objectives proposed in the Livre vert. A year later, the Bill on the Occupation of Forest Land was proposed at the National Assembly. It was rewritten to become the Bill on Sustainable Management of Forest Land and was brought in for parliamentary debate in autumn 2009. Finally, the Act on the Sustainable Management of Forest Land was sanctioned on April 1st 2010.

From the first discussion that led to the remodelling of the regime, it was clear a major change was happening within the industry; long term contracts and volumes of timber are going to be put on the free market. The MRNF estimates between 20%-25% of public timber will be up for auction.

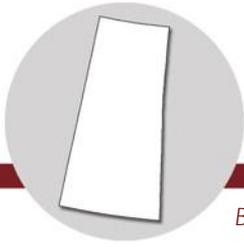
Although the new regime does not take effect until 2013, the BMMB will not wait for its implementation to launch the first auctions. This winter in Québec, over 200 000 cubic metres of wood are expected to be auctioned. This will allow the MRNF and the rest of the major players to gradually transition toward a new way of doing things within the new forestry regime.

An Innovation that Promotes Entrepreneurship

The auctioning of timber volumes could offer interesting business opportunities for some enterprises in the forestry sector. Entrepreneurs involved in secondary processing are enthusiastic about the new system because there is the potential that granting timber supplies to the free market will reduce the vulnerability of supply.

The opportunities that will result from access of wood on the market will surely change matters for many enterprises but the government will have to be patient and allow the changes to make a distinct mark on the development of secondary and tertiary processing.

"Entrepreneurs involved in secondary processing are enthusiastic about the new system..."



Saskatchewan

Saskatchewan Ministry of Environment

By David Stevenson

Modelling the Future of Silviculture in Saskatchewan

Saskatchewan, like other western jurisdictions, has recently revisited the regeneration assessment standards for its forest industry. Alberta's Reforestation Standard and Manitoba's Forest Regeneration Survey Manual were both revised in 2010. While all three standards measure renewal success, they differ in how this is accomplished.

All regeneration assessment standards aim to provide several sources of information to ensure proper management of the future forest after harvest. Regeneration surveys provide basic information – stocking, survival, growth and species mixtures – to answer the question: is the forest regenerating?

At this basic level, however, there are still unanswered questions that are important to forest sustainability:

- Is the regenerating stand meeting the growth and yield predictions that underlie the timber supply analysis (and thus the allowable harvest)?
- Is a transition in cover type occurring from harvested to regenerated stands on a landscape level?
- Is industry meeting the landscape level renewal commitments in their forest management plans?

In answering these questions, Saskatchewan's approach is to leave the growth and yield analysis within the planning process, while tailoring the regeneration surveys to the issue of cover type transitions and compliance with the forest management planning assumptions. Changes to the Saskatchewan Regeneration Assessment Standard are currently in development. The intent of the changes is to generate cost-effective data that can be used to assess both block and landscape level compliance with forest management plans.

In Saskatchewan, the government requires industry to maintain cover species groups (S, SH, HS, and H) after harvest at the landscape level on each licence, not at the block level. In other words, industry is not required to return a particular hardwood-dominated mixedwood block to that state after harvest, as long as this happens for a similar area elsewhere on the licence area. Since most of Saskatchewan's forest harvest is in the aspen-spruce mixedwood, ensuring the stability of cover species groups becomes a bit of an accounting exercise. Mixedwood succession is also an issue; rarely does the stand harvested at age 100 match what is regenerating at age 14.

The proposed changes to the standard will generate data that can be used for licence area

and landscape level analyses. These analyses will assess compliance with forest cover type transitions as described in the forest management plans and associated timber supply models, using modelled predictions of the future cover species groups.

Saskatchewan has been involved in the Western Boreal Growth and Yield Association for many years. One of the products of this effort is the Mixedwood Growth Model (MGM) developed by researchers at the University of Alberta. Details of MGM's recent validation will be published in an upcoming issue of the *Forestry Chronicle*. Saskatchewan has used MGM to develop matrices, based on regeneration survey density, that predict future cover species groups at various rotation ages. Using the regeneration survey data, these matrices will help determine whether industry is meeting landscape level planning targets in their renewal programs.

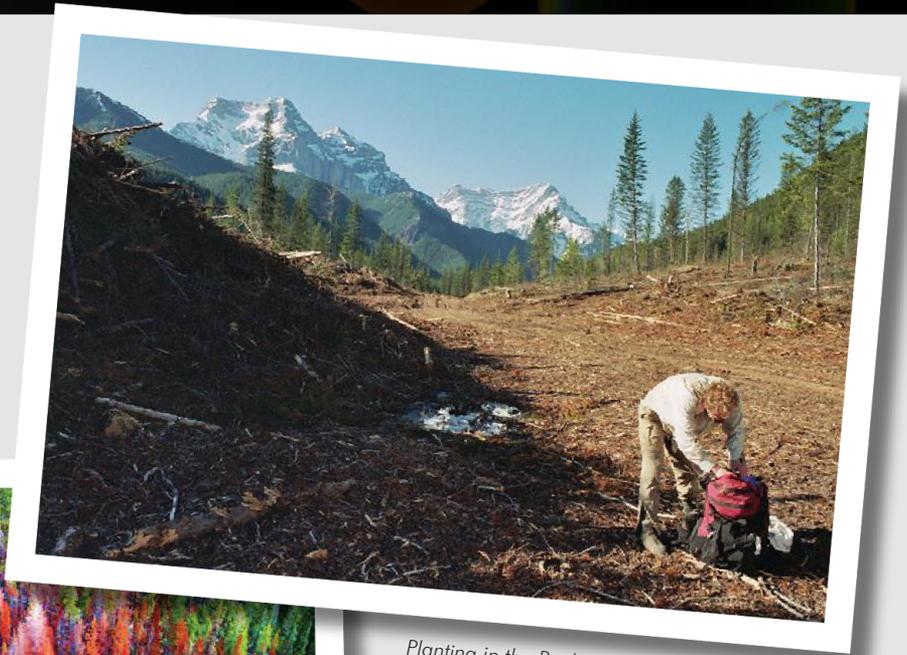
Assessing whether industry is meeting its landscape level forest cover type targets will be, for the most part, a GIS exercise. Analysts will overlay harvest depletion areas on the pre-harvest inventory to determine the overall area of the different cover species groups. Polygon by polygon, the species densities from regeneration surveys will be compared with the appropriate MGM matrix, providing a prediction of rotation age cover species group designations for each polygon. Compiling these areas by cover species group and then comparing it to the pre-harvest areas will give an indication of whether the landscape level targets are being met.

Repeated analyses over several years will detect any shifts in cover species groups affecting the approved harvest levels. By studying these trends, the government and industry can develop silvicultural practices to mitigate shifts. For example, if the analysis predicts a drop in hardwood-dominated mixedwoods, silvicultural ground rules can be developed that increase planting or better protect the spruce understory.

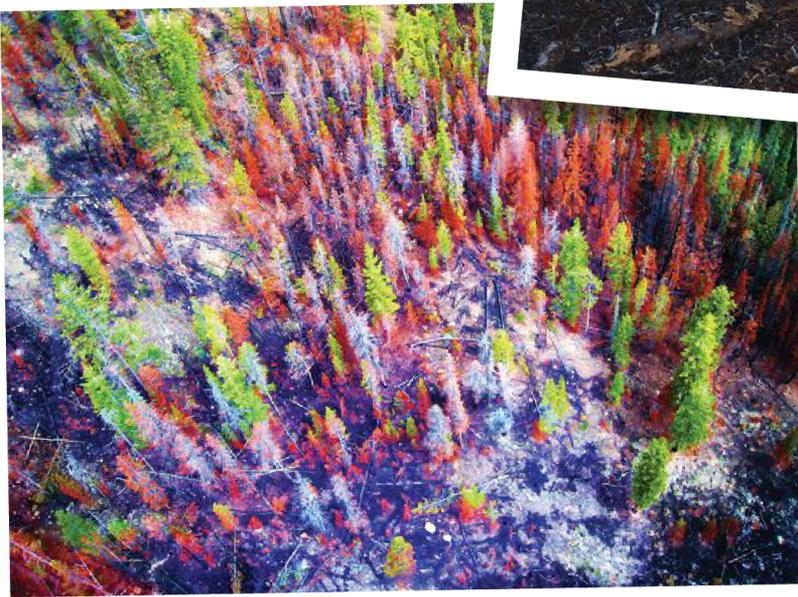
The proposed changes to the Regeneration Assessment Standard will have the dual benefit of being results-based and providing the information needed to assess industry's compliance with landscape level forest management planning assumptions. Saskatchewan intends to have the new standard in place in 2011.

David Stevenson, RPF works for the Forest Service Branch at Saskatchewan Ministry of Environment. He can be reached at david.stevenson5@gov.sk.ca

Reader's Lens



Planting in the Rockies | Photo by David Pellizzari



MPB Burn | Photo by Kim Nidderly



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Elko block | Photo by Kate Hardman

Making REDD work for the Congo Basin

By Jane Boles



Rural youth such as these living on the shores of Lac Mai Ndombe, will play a key role in REDD implementation in the Congo by participating in swapping conservation services for development revenue

Avoiding deforestation and degradation in the Congo Basin means working at the grass roots – and that means drawing from lessons already learned in Community-based conservation.

Anyone who has been following the evolution of Reduced Emissions from Deforestation and Degradation –‘REDD’- could be forgiven harboring concerns as to how the mechanism will perform as it gears up for implementation over the next several years. The concept of REDD is just as compelling today as it was when first announced at the COP 11 of the UN Climate Convention in Montreal in 2005,

and is just as urgently needed. It aims to halt the approximately 12% of global greenhouse gas emissions that are caused annually by tropical deforestation, by paying land users from private or bilateral funds to keep tropical forests standing, rather than cutting them down .

But achieving positive outcomes in REDD means relying on brand new under-tested concepts. One is the spatial analytical technologies capable of remotely detecting single crown removals over massive swaths of tropical forest, but the technology may be the simplest part of the equation.

A bigger REDD quagmire is in the social,

political and economic challenges of monitoring, reporting and verifying REDD conservation activities, given that most countries where REDD is expected to take root are mired in political corruption. Critics have also pointed to the possibility that REDD could erode indigenous peoples’ rights by restricting customary access to forests in the name of carbon conservation.

Guyana and Indonesia are furthest along in the process of integrating REDD into a national economic strategy. Indonesia is currently losing forest cover at an alarming rate, and Guyana is at risk of Brazilian colonels slashing and clearing. Each



are slated to receive a billion dollars of bilateral REDD funding from Norway in return for establishing, among other things, a moratorium on new forest conversions. Unfortunately, in the lead up to REDD implementation, both countries continue to struggle with credibility issues following recent exposure of unregulated timber concession allocations by both governments.

Rocky beginnings in Guyana and Indonesia have led many to wonder how the Democratic Republic of Congo (DRC) – a country which cannot specify to the nearest million how many civilians were lost in its protracted civil war – will manage large funds across multiple government ministries, donor agencies, and civil society stakeholders to produce tangible, verifiable conservation benefits.

And the stakes could not be higher. The DRC is home to over 105 million hectares of intact forest – more than any country except Brazil – and most of the countries’ rural citizens are directly dependent on this forest for timber, cooking wood, medicinal plants, arable land and other non-ligneous forest products . Unlike other major tropical forested countries, the DRC’s deforestation rates have remained low over the past several decades, held down mainly by the infrastructural stagnation caused by decades of war. But as the country emerges into an unsteady peace, foreign investors, eager to build roads and to tap the estimated 24 trillion dollars in mineral wealth lying just beneath the thin layer of biomass, represent a large-scale and immediate threat to Congo’s forests as well as global climatic stability.

For these reasons, there is a strong imperative on proponents of REDD in the Congo to get it right the first time. But what will ‘getting it right’ look like on the ground?

Context matters

Deforestation in the Congo Basin differs from that in South East Asia and the Amazon in a second critical way: it is driven less by global demand for commodities such as soy and palm oil as it is by local subsistence activities –mainly unregulated artisanal timber harvesting for local charcoal markets and slash and burn agriculture. The Food and Agriculture Organization (FAO) estimates as much as 80% of the Congo Basin’s carbon emissions come from burning wood for cooking.



Far from the clear cut palm plantations of Indonesia or the cattle ranches of Brazil, most forest emissions in the DRC are the result of degradation from local subsistence activities, which remove timber while leaving the canopy mostly intact. This situation could easily change as civil conflict gives way to commodity production for international markets.



The new Conservation Economy? In Western DRC’s Luki Biosphere, an Ecoguard is employed by the World Wildlife Fund to monitor unregulated land use.

This fact highlights the unique character of Congo Basin-based REDD: real Emissions Reductions will be generated not through top-down designation of new protected areas or logging moratoriums alone, but at the grass roots.

The local nature of degradation drivers in the DRC bodes well for the future success of REDD, because it means that positive outcomes in REDD are intrinsically linked to positive outcomes in Community Based Natural Resource Management (CBNRM). Unlike REDD itself, CBNRM has a long empirical legacy of successes and failures to draw from, which can be used to inform best practice project design.

Achieving successful REDD: Lessons from CBNRM

There are a number of practical solutions to the problem of unsustainable local wood use; improved stove efficiency and agricultural intensification techniques alone can achieve massive reductions in deforestation and degradation with very low technical and capital inputs.

However, the history of CBNRM in Sub-Saharan Africa tells us that failure to achieve community-based conservation objectives is rarely a function of insufficient funds or technology. Rather, CBNRM projects tend to fail in their stated objectives of conserving ecosystems while promoting sustainable development because they do not adequately consider critical aspects of community-based project design. Some of the most important lessons from CBNRM are outlined below.

Creating Appropriate Incentive Structures: REDD credits are created through shifting business as usual ('baseline') wood use and are measured in tonnes of CO_{2e}, whose release into the

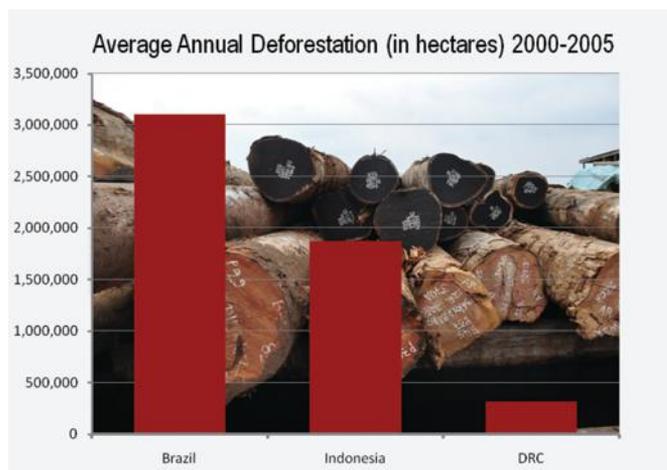
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atmosphere was prevented through project conservation activities. In the case of Community-based REDD, those credits are generated as rural stakeholders change their wood use patterns, in exchange for compensation.

How much compensation? In general terms, benefits shared with local stakeholders should be at least equivalent to lost opportunity costs. Because lost opportunity costs vary greatly across regions, project developers must develop a socio-economic baseline which quantifies the portion of household income derived from forest products and crops in cleared forest land.

Compensation should also be directly tied to baseline shifting activities in a way that is clear and tangible to the resource user. This means clear establishment of a project baseline in a way that is broadly understood and agreed upon by the stakeholder community. Compensation should also be success-based, and commensurate with the portion of conservation objectives that were achieved by the stakeholder in a given year.

What type of compensation? Because of low infrastructure and the absence of a coherent banking system outside of the capital, cash payments are less favorable than in-kind compensation. In return for successful achievement of conservation goals, a stakeholder community may, for example, chose to receive technical and financial assistance in establishing aquaculture facilities, or they may wish to improve a local clinic.

Participatory Project Design: The history of CBNRM demonstrates clearly that successful achievement of conservation goals is closely linked with inclusive project design, which incorporates stakeholders in meaningful decision-making at the earlier possible stage in order to ensure that a sense of ownership over project outcomes is felt by stakeholder communities. For example, participatory mapping using hand held GPS devices, and the creation of community-based land use plans which designate protected areas and multiple use areas. Beyond that, the establishment of a baseline should be seen as an opportunity to create technical capacity in forest carbon management within the stakeholder communities.

If REDD is implemented successfully at the village level where, low-level CO₂ emissions are created, it will represent a viable development option for the DRC, seeking to balance economic growth with forest-dependent development objectives. ‡

Jane Boles is currently managing a REDD project in the Democratic Republic of Congo for ERA Ecosystem Restoration Associates Inc. You can reach her at jane.boles@eraecosystems.com



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Forest Health

By Patricia Macklin & Doug Macaulay, Alberta Agriculture and Rural Development

Restoring Fish Habitat One Tree at a Time

Prior to European settlement, the Beaverlodge Watershed in northwestern Alberta was wooded and scattered with wetlands. With settlement, the watershed was modified for agricultural use. Where farm lands weren't managed to maintain riparian health, there has been general degradation of water quality due to the increase of sediments, nutrients and other chemicals in the water. The Beaverlodge River, a tributary of the Peace River, was an important spawning ground of the Arctic Grayling, a cool-water sportfish. Since 1994 Arctic grayling have not been present in the Beaverlodge River or its tributaries and are presumed to have been extirpated from the watershed. With the Arctic grayling now only found in 60% of its historical range in Alberta, Alberta's Endangered Species Conservation Committee (ESCC) has identified Arctic grayling as a Species of Special Concern, meaning that without human intervention, it may soon become threatened with extinction.

Observation on the state of the watershed by the Alberta Conservation Association (ACA), Alberta Sustainable Resource Development (ASRD) and the County of Grande Prairie from the early 2000s, identified agricultural impacts on the river and determined that Arctic grayling no longer use the Beaverlodge for spawning. In 2003, the Grande Prairie Riparian Action Team (GPRAT) was formed by members of various departments, organizations and non-profits for the purpose of restoring the watershed. Between 2004 and 2007, the group completed a number of riparian restoration projects. Though now disbanded, GPRAT's work has provided a strong foundation for subsequent efforts in the watershed's restoration.

In 2006 the Agroforestry and Woodlot Extension Society (AWES) along with the County of Grande Prairie, the West



Planters from New Generation Reforestation at Dautel Farm, 2008.

County Watershed Group, and the (ACA) initiated a project to establish riparian forest buffers on farms in the Beaverlodge watershed. According to the Association for Temperate Agroforestry, riparian forest buffers are "strips of trees, shrubs and grass planted between cropland or pasture and surface water courses. Buffers protect water quality, reduce erosion and flooding." Riparian buffers allow for the coexistence of agricultural production and environmental sustainability. This project was initiated with a small group of amateur tree planters from the partner organizations who, with the help of Jill Henry, the County's Rural Extension Officer, identified farmers who might be interested in participating.

As the project developed it became clear that there was a substantial amount of private land available for tree planting, a daunting task well beyond the capacity of a handful of extension officers. Doug Macaulay, Agroforestry Specialist with the

AWES, recalls his realization of the breadth of the task, "We had hundreds of acres available to us but if we continued to rely on the original handful of us 'desk folk' to do the planting, it would take a century or more to reforest the watershed! We needed tree planters."

Macaulay spent the winter of 2007 developing an ambitious three year project to plant a total of 66 000 trees on several farms along the Beaverlodge River and its tributaries. By spring of 2008 he was informed that his application to the ACA's Grant Eligible Fund had been successful. Moreover, local nurseries had surplus trees to donate. PRT Nurseries in Beaverlodge and Woodmere Nurseries in Fairview, supplied 22 000 seedlings free of charge. The local tree planting company, Next Generation Reforestation, was hired to work on the project.

Advertising the program through the local media, five farmers with land that was



suitable for planting were chosen for the project. By the end of 2008, 50 acres of riparian buffer had been planted to trees. The following two years the project received further funding from the ACA's Grant Eligible Fund, enabling a total of 66,000 trees to be planted on 150 acres of farmland. Knowing that the status of riparian health can help determine further improvements, an inventory and assessment of the current riparian health status on 10 project sites was completed in 2009, in partnership with Cows and Fish. These assessments also provide a baseline for monitoring. About half of the sites were already healthy and are enhanced with the tree planting. Most of the others were healthy but with problems and one was unhealthy. Work towards improving the health of those sites will include enhancing or restoring a native plant component.

In 2010 the project received a grant from Alberta Environment's Environmental Damages Fund allowing another 50 acres to be planted. By the end of 2010, the combined efforts of the ACA, AWES and the County had led to the planting of nearly 100,000 trees on approximately 200 acres of 22 different farms. Furthermore, they were no longer actively seeking participants but rather local farmers were coming to the group requesting to participate.

Though the Arctic Grayling and a few other sportfish are lost from the Beaverlodge watershed, there is hope that they will return one day as the fish habitats are restored, including replanting and revitalizing the riparian forests. Residents of the region formalized their watershed group as the West County Watershed Society (WCWS) last spring. "The West County Watershed Society (WCWS) believes the loss of fish is a cumulative issue," says President Cathy Newhook. "WCWS plans to look at all the actions required to bring the Beaverlodge



Toews Farm showing degraded area that was fenced off from cattle access and the riparian area planted to pine, spruce and willows.

River back. We are getting a very positive response from private land owners, industry and all levels of government and we will all work together for the restoration of our water shed." In 2011 and beyond the partners are planning to continue working in the area. "In sites at all levels of riparian health," says Kerri O'Shaughnessy, riparian specialist, "attention to land and riparian management principles will help maintain and improve riparian health overall in the watershed, and ensure the success of the newly planted trees." Perhaps the next generation of landowners will see the fish back in the watershed.

Agriculture and Agri-Food Canada's Prairie Shelterbelt Program

Interested in establishing your own riparian buffer? Rural land owners of 5 acres (2 hectares) or more, in the provinces of Manitoba, Saskatchewan, Alberta and the Peace River Region of British Columbia are eligible to apply for tree and shrub seedlings. Though seedlings are available at no charge, eligible applicants are responsible for seedling transportation costs, planting, and maintenance. Seedlings range from 1-4 years old and are distributed as either bare-root, containerized or cuttings depending on species and availability.

Contact Agroforestry Development Centre 1-866-766-2284 agroforestry@agr.gc.ca. Applications are accepted from June 1 to March 15 for delivery in early May. The application form is available for download.

Cows and Fish- Want to know more about riparian health and management principles. See the Cows and Fish website www.cowsandfish.org



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