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Fall 2002
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CANADIAN SILVICULTURE
FALL 2002

ON THE COVER:

Commercial Thinning
Thinning is an important long-term investment strategy which can result in various responses at the tree, stand and forest management unit level
by Janet Mitchell

DEPARTMENTS

FEATURES

CANADIAN SILVICULTURE is published four times a year by EMC Executive Marketing Consultants Inc., 6058 187A Street, Surrey, BC V3S 7R6.
Phone 604-574-4577, Fax 604-574-2196
e-mail: silviculture@emcmarketing.com.

Subscription rates: 4 issues per year - $30.00 & GST
Canadian Publication Mail Sales Agreement #40026059

Editorial

Dirk Brinkman, Editor

Johannesburg to Quebec City

In September, I had the extraordinary privilege of participating in the World Summit on Sustainable Development in South Africa. It was sobering to witness the conflicting agendas in the international diplomacy of nations. It was inspiring to witness mutually acceptable progress emerge despite shifting alliances between nations and divisions within nations.

It gave me great pride to watch the leadership role that Canada played in these negotiations, which committed all nations to an implementation plan for sustainable development. The timing of Prime Minister Jean Cretien's carefully stated and gutsy promise at the Summit to put ratification of Kyoto before parliament this November palpably raised Canada's stature as a leader in sustainability. It also triggered an internal assault by Canadian's opposed whose previous agenda had been to postpone as long as possible. While there may be sectors that suffer costs from a decarbonisation commitment, others, like silviculture, may enjoy benefits.

For Canada to reduce its net projected emission by 30% within ten years it will have to sink the maximum amount of carbon into off-setting afforestation and forest management sinks. (See Dave Spittlehouse's article on silviculture sinks in this issue).

In September 2002, the Canadian Council of Forest Ministers re-committed (for the third year running) to a new initiative called Forest 2020. However, this time, the new Chair of the committee for the coming year, Federal Natural Resources Minister Herb Daliwal added "with the support of the provinces and territories I will engage my federal colleagues in providing the necessary federal support for an initial investment that will enable Forest 2020 to unfold."

Forest 2020 will target the afforestation of 1 million hectares of marginal farm land (or one billion trees) with hybrid poplar over the next 8 years. A 20% increase in the national reforestation program would be a welcome relief from its steady decline over the past ten years.

Forest 2020 also calls for more intensive forest management in our natural forests while maintaining the environmental benefits of sustainable forest management. Carbon driven Forest Land Use management changes are the other way that Canada can meet its Kyoto promise through forests. This means potential action on two fronts: first by reducing the net loss of forest carbon from areas harvested across Canada through shorter regen lags, faster growth to free growing and intensive silviculture; second by increasing the net sinking of carbon into the parks, biological reserves, conservation forests and remote forest areas wilderness through conservation measures, protection and fire and pest management. Adding intensive silviculture across Canada would also be a welcome shift from its recent decline in the last few years.

May 2003 marks the culmination of the process of developing Canada's renewed National Forest Strategy - the next five year phase to 2008, which is the first year for meeting the Kyoto accord targets. Silviculture investment was in decline during the last five year National Forest Strategy (1999-2003) 'Sustainable Forests: a Canadian Commitment.' Silviculture investment's revival through forest carbon funding complimenting and enhancing existing treatments over the next five years will require healing the divisions within the country of the interests that oppose the ratification of Kyoto.

In September 2003, Canada will host the XIIth World Forestry Congress in Quebec City. The congress is the largest international forum in the field of forestry, bringing together customer representatives, decision makers, specialists, industry leaders, NGOs and ENGOs. The congress is an unprecedented opportunity for Canada's forest industry to differentiate its sustainable forest management practices from those of the rest of the world.

But in the run up to the congress, the forest sector faces its worst market conditions in the past decade's roller coaster ride. Besides current lumber prices being the lowest in many years, it faces the prospect of two to three years of an 8-27% countervail and anti-dumping duty along with harvesting, forest management environmental protection, stumpage and shipping costs that are among the highest in the world. Canada's historic markets in Europe, the US, across the southern hemisphere and in the Pacific rim are turning from net importers to net exporters of timber and engineered products due to decades of silviculture investments.

With the forest industry being in no position to ante spare resource rent for new forest management initiatives, adding the value of forest carbon care to silviculture's funding sources is essential to a strong future in silviculture investment. The need to integrate a national forest vision, that includes a carbon strategy, sets the stage for the silviculture and forest industry priority over the next year.

By September 2003, I know I will be privileged to be inspired again by Canada's leadership in sustainable development, this time in Quebec City at the World Forestry Congress.

Letters to the Editor

"The fact that foresters, ecologists, fire managers and fire researchers in southern British Columbia are coming to the realization that fire exclusion practices and the corresponding lack of prescribed burning in their short-interval fire regime ecosystems have contributed to a forest-fire fuel situation that is remarkably similar to the current U.S. wildland fire scene is indeed encouraging."

An Emerging Fire Management Issue in Canada: Forest-fire Fuels

It was gratifying to see the article "Growing Threat of Wildfire" by Bruce Blackwell and Bob Gray in the Summer 2002 issue of Canadian Silviculture. It's certainly worth noting that the current wildfire situation in the U.S. as described by Blackwell and Gray was prophesied by Harold Weaver, a forester with the U.S. Bureau of Indian Affairs, 60 years ago (Weaver 1943)! Less this be denounced as simply coincidence, one only need read Thomas 's (2002) recent "heads up" article to appreciate that this is not the case (Thomas is a former Chief of the U.S. Service Forest). And there were several subsequent post-Weaver warnings (e.g., Wilson and Dell 1971; Dodge 1972) so the notion of the benefit of hindsight is not relevant either.

The fact that foresters, ecologists, fire managers and fire researchers in southern British Columbia are coming to the realization that fire exclusion practices and the corresponding lack of prescribed burning in their short-interval fire regime ecosystems have contributed to a forest-fire fuel situation that is remarkably similar to the current U.S. wildland fire scene is indeed encouraging (*see* Holmes 1995; Taylor *et al.* 1998) . While we wish our neighbours to the south the best in their endeavors to manage their hazardous fuel situation, it may well be a case of being too late. The same may be said for southern British Columbia - " only time will tell" unless we act now.

What about the larger boreal forest region of Canada? The nature of wildfire occurrences in the past two and a half decades would suggest that perhaps we are beginning to see the early indications of attempted fire exclusion policies in regards to the

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Background

Thinning is an important long-term investment strategy which can result in various responses at the tree, stand and forest management unit level. Thinning can provide a source of fibre and may reduce fibre supply shortfalls where suitable stands are available. One theory suggests an increase in total harvest volume can be gained by repeated light thinning, removing only the mortality and maintaining the stand at a density that uses the site to the fullest. The required stand density in the suitable stand would vary depending on species and site, and the ability of the trees to respond to the increased light, nutrients, water, and space after thinning. Another theory suggests there is no increase in total harvest volume; the volume is simply recovered earlier.

Research Team

The Forest Engineering Research Institute of Canada (FERIC) and researchers from the Canadian Forest Service (CFS), and Forintek have been monitoring a commercial thinning operation north of Athabasca, Alberta this past summer. We worked with Vanderwell Contractors (1971) Ltd. to examine how commercial thinning affects the development of white spruce at different residual densities, and to develop information on best practices in commercial thinning operations. Researchers from the CFS are examining the response of the residual trees, changes in stand microclimate, incidence of post-harvest windthrow, and the establishment of white spruce regeneration under three different residual densities.

Vanderwell wants to track the cost of the commercial thinning operation from the planning stage through to delivery of the finished products. As a senior researcher in FERIC's Silvicultural Operations Group, I monitored the productivity of the commercial thinning operation during the harvesting phase and will calculate harvesting costs for the different treatment units. The CFS will complete an in-depth financial/economic analysis of the overall commercial thinning operation. Forintek will determine the effects of commercial thinning on

Thinning Operations

A Timberjack 1270 harvester and a Timberjack 1210B forwarder were used to remove 30, 50 and 70% of the merchantable basal area. Extraction trails were marked 20 m apart and aligned perpendicular to the prevailing winds. The harvester then cut the 4 m wide trails, processed the stems at-the-stump, and left the tops and branches on the trail to provide a debris mat to reduce ground disturbance. Approximately 25% of the merchantable basal

area for the block was harvested from the extraction trails. The harvester operator also cut the smallest and largest diameter trees between the trails to bring the total volume removed to the designated target for that treatment (30, 50 or 70%). The trees to be removed were not marked, but for each treatment unit the CFS provided the operator with minimum and maximum diameters to cut and provided a "cut-no-cut" gauge to help the operator with tree selection.

The forwarder then followed the harvester's trails and forwarded the logs from the piles at the side of the trail to the decking areas along existing seismic lines and road right-of-ways. The poplar logs were decked separately from the white spruce. The logs will remain in the decks until they are transported to the mill this winter when the road conditions are suitable for hauling.

Equipment Considerations

Profitable commercial thinning may require modifying a harvesting system to suit the site and stand conditions. Ground-based harvesting systems composed of a harvester-forwarder combination, small skidders, small crawlers, or horses are well suited for commercial thinning on flat ground. On steeper slopes or on sensitive soils, a light-weight cable system is more appropriate. The key is to match the equipment to the slope, soil sensitivity and size of trees.

Matching equipment to the size of trees is important, but operator attitude and experience also plays a big part in residual stand quality. The harvester-forwarder combination was chosen for this operation because the operators had experience in commercial thinning and the equipment was well suited to the site and stand conditions. The harvester and forwarder are both less than 3.0 m wide and the harvester can reach up to 8 m, and can cut trees up to 48 cm in diameter.

Harvester operators often say brush and non-merchantable trees cause them frustration and lower their productivity. Therefore, a crew with chainsaws cut brush and non-merchantable trees in the treatment units before the harvester established the trails. The harvester operator could then concentrate on cutting merchantable trees. Cutting non-merchantable trees takes time away from productive work and poor visibility from dense brush can result in increased damage to the residual trees. In portions of two of the treatment units, the brush and non-merchantable material was not removed. FERIC timed the harvester in these areas and will calculate the effect of brushing on productivity.

Costing Concerns

Commercial thinning is more expensive than conventional harvesting because block development, road upgrades, and harvesting costs are offset against a lower volume and smaller piece size. When determining the value of a stand, the quantity, quality, utility and size of the products as well as the costs of harvesting and manufacturing must be examined. While production in terms of volume is usually considered to be the factor of greatest importance, the differences in quantity and quality of product in thinned and unthinned stands should be examined. Forest managers considering commercial thinning must examine the size and quality of the final crop trees rather than merely the volume they represent.

Commercial thinning usually produces small sawlogs and pulpwood. When a stand has a high percentage of pulpwood, the financial return for the commercial thinning operation is directly linked to the pulp market. High pulp prices generate interest in commercial thinning, but when prices and the demand for pulp drop, commercial thinning operations are postponed until the markets recover. New markets and new products need to be developed to decrease the dependency of commercial thinning on the pulp market.

Even if total harvest volume does not increase with commercial thinning, merchantable volume does and the total value gained from the stand could increase. Ideally, thinning will reduce density, but increase the average diameter of the trees at final harvest. Final harvesting cost should be lower in a thinned block than an unthinned block, because the trees are larger, the piece size is more uniform, and the roads and extraction trails are in place. In this commercial thinning operation near Athabasca, trees from the smaller and larger diameter classes were removed, narrowing the range of diameters in the residual stand. A more uniform tree at the final harvest will be produced, maximizing productivity of the harvesting, transportation and manufacturing phase.

Thinning and Silvicultural Benefits

A commercial thinning operation needs to balance the economic and silvicultural benefits. The challenge is to remove enough volume to maintain equipment productivity and make the operation feasible, but leave enough residual trees to ensure that the integrity of the stand is maintained and that growth and yield are maximized. The codominant trees left in this operation have the best potential for release and will have access to increased light, nutrients, water and space.

The residual trees are expected to increase in volume following the commercial thinning. Researchers at the CFS are planning a second entry in 15-20 years, after the residual trees have recovered 60-80% of the removed basal area. At that time, natural white spruce regeneration is expected to be 0.3-1.3 m in height with a stocking of 80%.

Conclusions

Commercial thinning may reduce fibre supply shortfalls. Although there may be no increase in total harvest volume from a thinned stand over an unthinned stand, volume is recovered earlier. In order to benefit from cutting larger, more valuable trees at the final harvest it is necessary to accept a higher harvesting cost during commercial thinning and to make use of smaller trees in earlier thinnings. Matching equipment to the piece size will help minimize costs. Contractors with training and suitable equipment will be able to minimize damage to residual trees while maintaining equipment productivity.

When determining the returns from commercial thinning, the quantity, quality, utility, and size of the products as well as the costs of harvesting, transporting and manufacturing must be examined. Even if total harvest volume does not increase, merchantable volume does. New markets and products must be developed to decrease the dependency on pulp prices. The goal of commercial thinning should be to obtain fibre at a reasonable cost prior to final harvest and to maintain the integrity of the site and stand, while increasing the merchantable volume and value of the stand.

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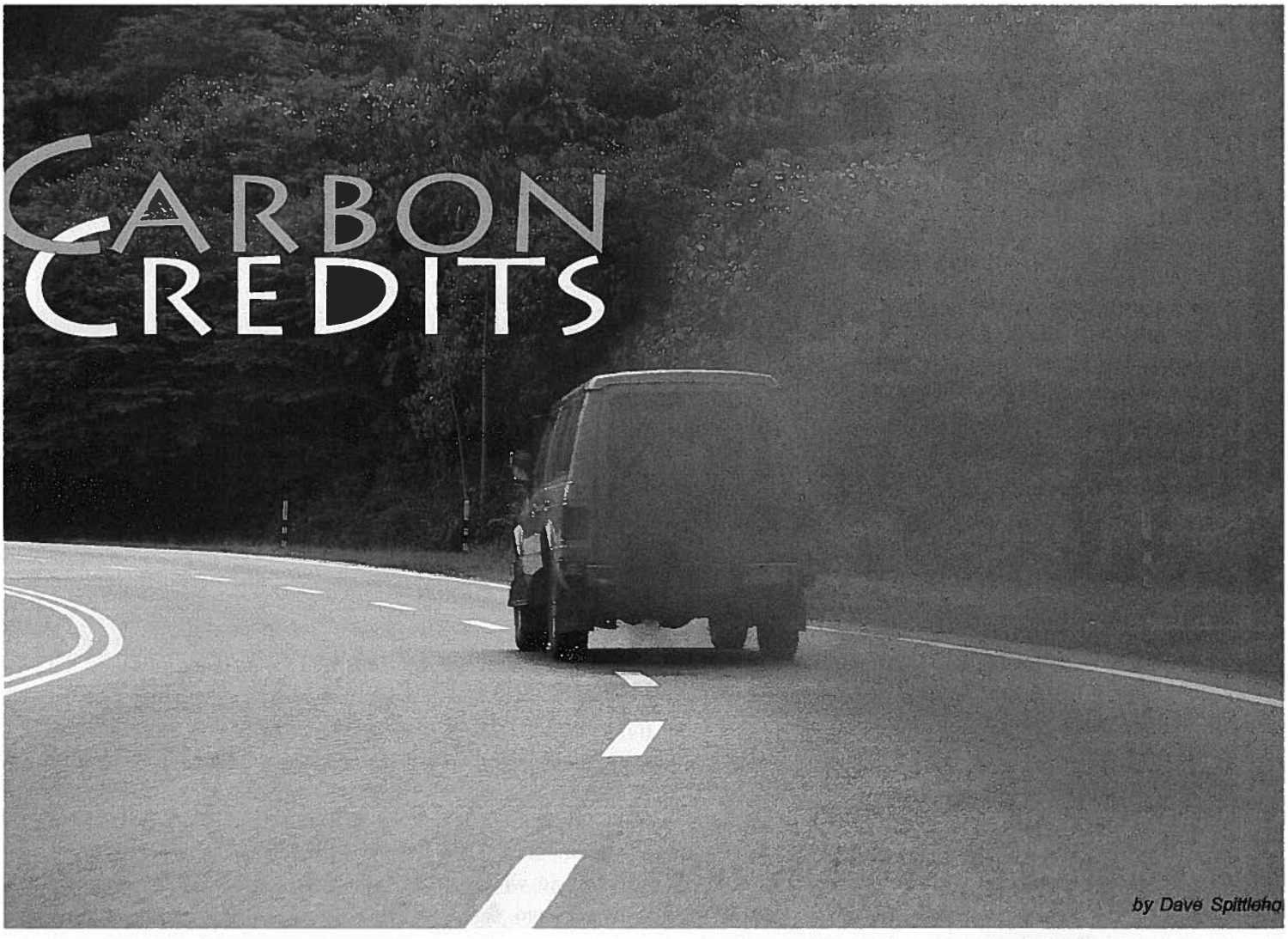


by Dave Spittleho

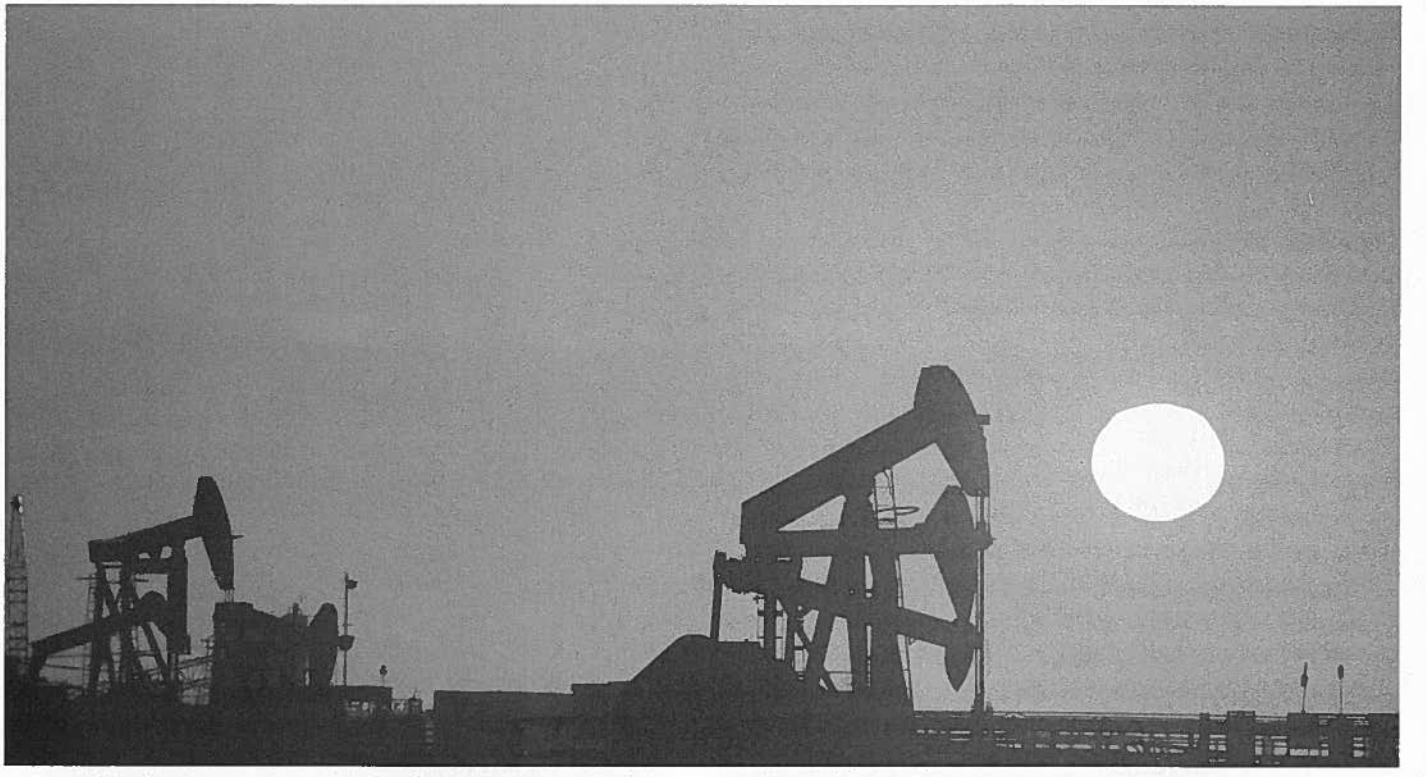
Prime Minister Jean Cretien has stated that Canada would sign the Kyoto Protocol by the end of the year. This action would commit Canada to annual emissions of carbon dioxide (CO_2) and other greenhouse gases during the first commitment period (2008 to 2012) that are 6% below the level they were in 1990. This is equivalent to a reduction of 240 Mt CO_2 below projected emissions. In May 2002, the federal government released a discussion paper that offered four options to meet the reduction target. A detailed plan is expected this fall. The Prime Minister's announcement has triggered a lot of debate in parliament and in the media about the potential economic implications for Canada. Attention has focused on impacts to the fossil fuel sector, but little has been said about what Kyoto means for the forest sector. The forest industry uses fossil fuels to run logging equipment and mills to process wood. Carbon dioxide is lost from the forest to the atmosphere through disturbances such as harvesting, fire and pests, and respiration, and is taken up by the forest through photosynthesis.

Over the last decade, the forest industry has made substantial increases in fuel efficiency and is switching to fuels with lower carbon emissions. It is hoped that they will get credit for this early action and not be burdened with excessive demands for further reduction. In the November 2001 issue of Canadian Silviculture, Deborah Bakker suggested that Canadian forests could also play a role addressing global warming, and how the Forests 2020 initiative could be part of this. This is achieved by forests taking up carbon dioxide through photosynthesis and sequestering it as wood in the tree and eventually some of it in the soil. A number of analyses have been done to determine the potential of forest carbon sequestration and the creation of carbon credits in Canada. What have they found and where are we in Canada in making this happen?

The recent negotiations in Bonn and Marrakech clarified how Canada's forests fit into the Kyoto Protocol. Article 3.3, which is a mandatory article, discourages the permanent loss of forests (deforestation) and encourages the creation of new forests where they have not existed for many years (afforestation in North American terminology). Deforestation must be counted as an emission of carbon to the atmosphere and growth of new forest can be counted as sequestration of carbon from the atmosphere.

There are no limits on the credits that can be obtained from afforestation. A number of countries with areas that were deforested in the past, prior to the Kyoto Protocol, are actively pursuing the afforestation option as a way to create carbon credits that can be sold to offset fossil fuel emissions. They are planting fast growing tree species such as eucalyptus or hybrid poplar. However, once sold, the carbon must be sequestered permanently. If these plantations are harvested or are destroyed by fire or pests, the carbon removed from the site must be offset by purchasing credits from elsewhere or by growth in other forests owned by the seller. In 1999, Canada's National Sinks Table suggested that there was about one million hectares of land as marginal farmland and as prairie shelterbelts 'readily' available for afforestation in Canada. The Table identified a number of barriers to this activity such as availability of suitable planting stock and up-front costs. Part of the Forest 2020 initiative focuses on this issue in considering ways to promote afforestation.

Article 3.4 is an optional part of the Kyoto Protocol. It addresses the use of managed forests to sequester carbon. Managed forests are our existing forests where we perform



activities such as harvesting, reforestation, stand tending, fire protection and control of disease and insects. Canada has to decide by 2006 if it wishes to have the managed forest counted in Canada's carbon balance and to define the land area to be included. Canada negotiated hard to get the managed forest included in the protocol so it is likely we will take this option. Countries have been given limits on how much sequestration in the managed forest they can claim to offset fossil fuel emissions. Canada has a limit of 44 Mt CO2 per year during the first commitment. This is equivalent to the annual net sequestration of CO2 on 3 million hectares of 60-year-old, site index 30 coastal Douglas-fir in BC; or the merchantable volume on 100,000 ha of the same forest. The federal government has assumed that sequestration in forest growth will be used to meet about 20% of Canada's reduction target during the first commitment period. Carbon credits are predicted to be worth from $2 to $10/tonne CO2 by the first commitment period, consequently sequestration could generate annually up to $440 million in income for forest owners in Canada by 2010.

Forest growth on what was once non-forested land is an obvious sequestration of carbon in the trees and soil, but how can this occur on the managed forest? Consider the managed forest as a leaky bucket of carbon. Carbon enters the bucket through photosynthesis and leaks out through plant respiration, decay, streamflow, harvest, and disturbance by fire, insects and disease. Increasing the carbon content of the bucket requires us to reduce the rate of leakage (e.g., reduced harvest and increased fire protection), and/or increase the uptake of carbon through photosynthesis (e.g. improved reforestation, faster growing trees and longer rotations). The downside is that this cannot go on indefinitely. Disturbance is a fact of life in the forest, and once you have increased the carbon store, you will be penalized for future natural or artificial reductions.

Scientists in the federal and provincial governments are involved in the difficult task of assessing the carbon balance at provincial and Canada wide scales. Forest inventory, growth and yield and disturbance (harvest fire and insect) information are combined in a computer model to track changes in tree and soil carbon over the past and project the changes in carbon stock over the next few decades. The answers they are getting highlight the importance of the data quality and the differences between provinces in the scale of the data available. For example, in a Canada-wide assessment with an old database, BC's forests are a net sink at present but become a source about 30 years from now. However, using more recent inventory data and a much finer biological and geographical resolution of forest type, BC can show that its forests are a bigger sink today and stay as a sink over the next 30 years. It is unlikely that all the provinces can provide the same resolution of information as BC for all their forested land within the implementation timeframe. On the other hand, the detail that was available for BC may not be fine enough to meet future international rules for forest carbon accounting.

What are the implications of all this for Canada in general and forestry in particular? The analysis done by the Sinks Table showed that Canada will have significant emissions of carbon through deforestation and that by the first commitment period gains through afforestation will not be sufficient to offset these losses. Consequently, sequestration in the managed forest will

be required to offset these losses as well as to offset fossil fuel emissions. But before this can happen there is a long way to go. Internationally acceptable accounting rules are still being developed. There will be costs associated with the accounting such as improvements in forest inventory data and ongoing monitoring. Risk analyses must be done on how much carbon we can maintain on the landscape in the face of the future age class structure of the forest, and the increasing risk of large-scale forest fires and insect disturbance. Trading mechanisms and verification systems for forest carbon are being developed. There have already been a number of private trades, mainly in Australia, where companies are paying for planting trees in the expectation of being able to claim the future sequestered carbon as an offset to their fossil fuel emissions.

To develop a parallel market in Canada, there are a number of policy questions that have to be considered. Different provinces within Canada may prefer different definitions of the managed forest. Depending on the definition, a province's forest could go from being a sink to a source. How do we deal with a situation that within a province some management areas may be sinks while others are sources? How should Canada's cap on forest sink credits be allocated between the provinces? Is private land also included under the cap and if so how would they be allocated credits? There is a debate as to whether forest companies own a share of any credits on the Crown land that they manage. The Canadian government maintains that forest sinks are a 'national treasure' and because the federal government is the 'Party' to the Kyoto agreement, it owns forest credits. The government of New Zealand has also claimed its forest sinks, including those on private land, as a national resource. Provinces incur the expense of forest management. For example, BC spends about $50 million annually on fire protection to protect potentially over $150 million a year in forest sinks. If the 'national treasure' argument prevails, would the federal government compensate provinces for actions to maintain its national carbon 'treasure'? Will the federal government pressure provincial forest management agencies to minimize sources and maximize sinks?

In conclusion, there are opportunities for Canada in using forests to help offset fossil fuel emissions, at least in the near term. How long this can be continued will depend on the cost-effectiveness of forest sinks as opposed to other options to reduce emissions. As noted earlier, there is the potential for a substantial revenue in forest carbon credits in Canada; however, the ownership issue will have to be resolved before people will be keen to take management actions related directly to carbon storage in the managed forests. Until the national and international forest management issues are resolved, afforestation seems to be the only 'safe bet' for investment in the use of Canada's forests to offset fossil emissions.

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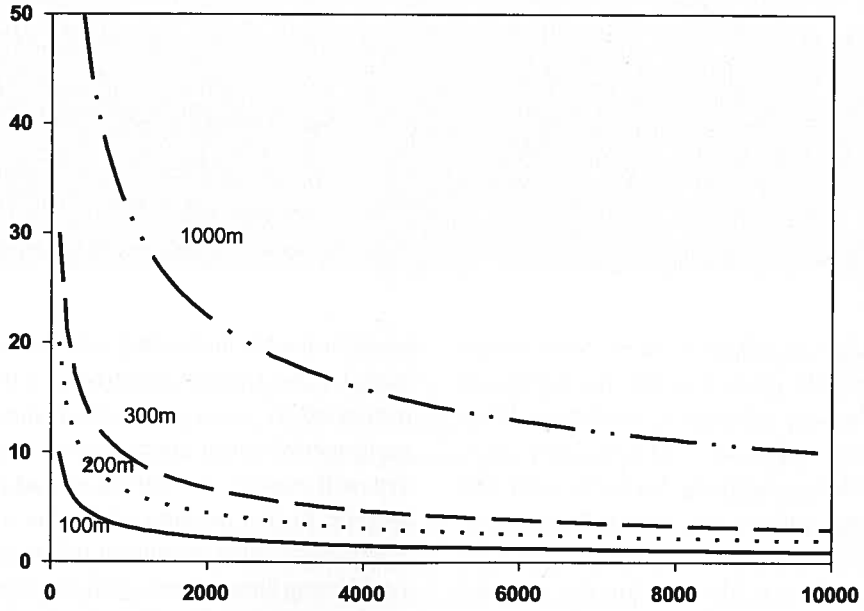
continuity aspect of the fuel type mosaic in the boreal forest; the situation in southern British Columbia is more a case of increased fuel loads at a given point (commonly referred to as "fuel buildup'). Fire control has been practiced in the boreal forest region for 50-80 years. Based on my travels across Canada in the last two and half decades, I think it would be fair to say that past and present forest management practices may have also had an unknowing, detrimental affect.

It has been suggested that the increase in annual area burned since about 1980 may be attributable to climate change but weather is only one of the three elements of the "fire environment" (the others being fuel and topography) which along with ignition sources determine fire occurrence and fire behavior. There is good circumstantial evidence (e.g., the post-fire mosaics from the 1988 fires in the Greater Yellowstone area) to suggest that the fuel component of the fire environment needs to be examined equally well as the weather or climatic component in any global change research effort.

It would be easy to reject this whole notion that attempted fire exclusion/forest management practices have perhaps and/or will contribute to the occurrence of catastrophic wildfires in the future. Admittedly, it's not a popular idea considering the funds and effort that have been invested in controlling wildfires in Canada. However, we only need to examine Harold Weaver's earlier prophesy regarding the wildfire threat to the ponderosa pine forests in the U.S. Inland West and Pacific Northwest to attest to the importance of being prudently cautious.

A preliminary study of the issue of managing fuels on the boreal forest landscape (Amiro et al. 2001) suggests that it's just as "daunting" a task in the boreal forest as it is in dry forest type ecosystems of southern British Columbia (see graph on next page). However, not all areas are equally at risk. Assessments need to be carried and priorities established. There are admittedly many knowledge gaps to be addressed (e.g., variations in fuel flammability in time and space, spot fire behavior). Nevertheless, what we can't do is simply wait. The forestry community in Canada has a responsibility and the related experiences to start addressing a problem that was certainly not foreseen when they received their early forestry school training. The issues are so subtle as to almost make them imperceptible in the short-term. The long-term consequences are however, horrific. It's time we acknowledge this!



Limit of single fire area

Geometrics of a proactive fuel isolation treatment (from Amiro et al. 2001). The lines are curves of the % of the landscape area that needs to be treated to provide a fuel break of a given width (100m, 200m, 300m, 1000m), such that the maximum fire size is limited to that shown on the x-axis. This assumes that the fuel isolation treatments are in a square grid pattern, and act as perfect fuel breaks.

Martin E. Alexander, PhD, RPF
New Sarepta, Alberta

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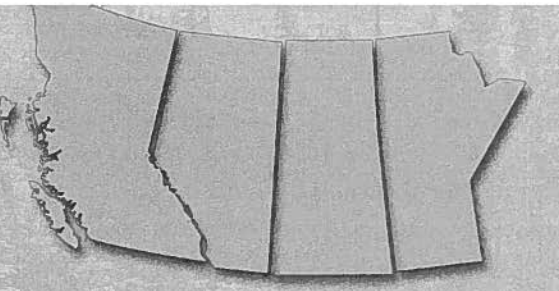
Western Silvicultural Contractors' Association



by John Betts, Executive Director WSCA

Silviculture Safety and Wage Statistics Show Disturbing Trends

It is time to take some collective action on health and safety for the industry. There are some disconcerting safety and earnings figures coming out of B.C.'s Workers' Compensation Board, that need to be looked at by the silvicultural contracting industry. Tree planting and stand tending injury rates are among the highest in the province and well above other forest sector activities. Tree planting sits at 18 injuries per one hundred, chemical brushing at 23, and spacing at 31. By comparison, the logging sector injury rate is 6.2 injuries per hundred with the more hazardous hand falling class at 9 injuries per hundred.

Some silvicultural contractors have dismissed these industry trends saying that the injuries are not often severe or fatal and therefore more acceptable. However, this is a poor defense. Just because workers may not be killing or crippling themselves, it does not logically answer the sheer volume of hurt that seems to increasingly characterize the industry.

Between 1995 and 1999, tree planting contractors in B.C. paid over $6 million in claims. Spacing contractors, who comprise a much smaller work force, paid almost $5.5-million over the same period. These are monies this industry can scarcely afford.

Wage trends add another bleak dimension to this statistical portrait. According to WCB, average weekly earnings for the tree planting industry have declined 20 per cent over the period 1995-1999. In 1999, the industry average weekly wage for tree planting was $695. Spacers earned a weekly average of $672 for the same year. All anecdotal evidence for the past two years suggests the pattern of decreased earnings is continuing. What these aggregate figures show is a workforce working harder to earn less money and injuring itself in the process.

Nevertheless the market can't be completely blamed for the present predicament. Poor training, poor supervision and poor claims management are all factors along with low wages and increased competition. Some companies have developed their own safety programs, which they guard with some justifiable jealousy and use to market themselves. But even this responsible and practical strategy on the part of individual companies evidently is having little effect across the industry. Injury rates continue to rise and having a well-organized corporate health and safety program is not necessarily a guarantee of more access to work. In fact, in some markets, where price is the sole indicator of bidding success, carrying the costs independently for safety could be an impediment, especially when other competitors have applied minimal or no effort towards worker-health.

For the past few years, the W.S.C.A. has begun investigating the advantages of belonging to or setting up its own health and safety association for the silvicultural industry. These programs have proven successful for other industries in reducing injury rates and costs while improving training and creating an industry safety culture. The association and its programs are paid for through an additional levy on the WCB base rate for the industry. The logic is that the extra costs eventually pay for themselves by bringing down assessment rates through reduced claims.

Collectively getting our injury rates and costs in order is a good reason to look into the health and safety association model. The Liberal government has indicated it wants to see a more performance-based approach to safety that will require developing standards specific to our industry. A health and safety association would be helpful in establishing these criteria. Training costs would be reduced through an association while creating standardized courses and certification. A faller certification program, which will affect spacers in the province, is in the works. It is a good example of where a health and safety association could reduce costs.

The money needed to create a health and safety association on our own would run between 25 and 40 cents per $100 dollars of assessed payroll. This cost reflects the relatively small pool our industry represents.

Another option is to join the already established B.C. Logging Health and Safety Association, which would bring those costs as low as 8 cents per $100 assessed payroll. Joining the BCLHSA would have us up and running with little delay and no start-up costs. We could use programs already in place and the BCLHSA has reserved two seats on their board of directors to ensure us some autonomy to develop strategies to address problems specific to our industry. We could have an operating association as soon as next year, perhaps even sooner if we choose this strategy.

Another option is to do nothing. However, if the trend continues, there is little to prevent us from possibly spending more money on WCB to cover for steadily increasing injuries. We need a more strategic, collective approach to this problem and we need to act soon.

Association des entrepreneurs de travaux sylvicoles du Québec

Par Fabien Simard, ing. f., Directeur général

La valeur des traitements sylvicoles

L'industrie de l'aménagement forestier du Québec pourrait dans un avenir très rapproché vivre des changements considérables qui auraient pour effet d'affecter le mode de fonctionnement de l'industrie.

Effectivement, le ministère des Ressources naturelles (MRN) a mis sur pied un comité consultatif qui a pour mission de le conseiller quant à la révision de la procédure d'établissement de la valeur des traitements et autres activités de protection ou de mise en valeur des ressources du milieu forestier. Ce comité regroupe des représentants du MRN, de l'Association des entrepreneurs en travaux sylvicoles du Québec (AETSQ), de la Conférence des coopératives forestières du Québec (CCFQ) du Regroupement des sociétés d'aménagement du Québec (RESAM) de l'Association des manufacturiers du bois de sciage du Québec (AMBSQ) et l'Association de déroulage et sciage de feuillus du Québec (ADSFQ).

Le ministère des Ressources naturelles croit nécessaire de réviser le mode de calcul (et donc de rémunération) de la valeur des traitements en modifiant la grille de taux de la valeur des traitements sylvicoles. Le MRN a présenté trois (3) options dont deux modifiant substantiellement la méthode de calcul pour établir la grille de taux actuelle et une troisième qui élimine complètement la grille de taux, soit celle du libre marché ou par négociation entre le bénéficiaire et l'entrepreneur sylvicole.

L'AETSQ ayant le souci de protéger et sauvegarder une des plus grandes richesses du Québec, la forêt, n'a eu autre choix que de proposer une 4e option qui se veut une vision plus globale et plus conciliante que celles proposées. Il est primordial de choisir une option où le mécanisme pour établir la grille de taux tient compte davantage de la main-d'œuvre et de la qualité des travaux à exécuter.

L'industrie de l'aménagement forestier est un milieu où la main-d'œuvre est très instable et aurait grandement besoin d'une certaine permanence. Dans cette situation, il n'est plus nécessaire d'expliquer davantage la complexité de recruter et de conserver une main-d'œuvre qualifiée et motivée dans un contexte où la précarité l'emporte. Il faudrait donc prendre cette occasion pour donner un second souffle à l'industrie de l'aménagement en évitant de négliger l'équation qu'une bonne qualité des travaux est étroitement proportionnelle à la qualité de la matière première produite.

Les recommandations du comité et la décision du MRN qui en découlera sont d'une importance capitale sur la main-d'œuvre, sur les entreprises sylvicoles et sur la stabilité de l'industrie de l'aménagement. Pour les membres de l'AETSQ, le défi sera de convaincre les autres partenaires du comité de modifier en profondeur les conditions et les pratiques dans l'industrie de l'aménagement comme par exemple : les instructions relatives, les inventaires avant et après traitement, l'accréditation de la main-d'œuvre, les disparités régionales etc.

Il est donc primordial pour les sylviculteurs de définir une position qui assure leur pérennité et qui permet à l'ensemble de l'industrie de se développer.

by Fabien Simard RPF, Executive Director

THE VALUATION OF FORESTRY SERVICES

The forestry management industry in Quebec might in the very near future experience considerable changes that may affect the basic functioning of the industry.

What has happened is that the Quebec Ministry of Natural Resources (MRN) has established an advisory committee whose mandate is to counsel the Ministry on possible revisions to the procedure for costing forestry services and other activities intended to protect or develop the resources of our forests. This committee has representation from the MRN, the Association des entrepreneurs en travaux sylvicoles du Québec (AETSQ), the Conférence des coopératives forestières du Québec (CCFQ), the Regroupement des sociétés d'aménagement du Québec (RESAM), the Association des manufacturiers du bois de sciage du Québec (AMBSQ) and the Association de déroulage et sciage de feuillus du Québec (ADSFQ).

The Ministry of Natural Resources deems it necessary to revise the method of calculating (and consequently of remunerating) forestry services by modifying the rate schedule by which such services are evaluated. The Ministry has proposed three (3) options, two of which radically alter the method by which the existing rate schedule is calculated, while the third eliminates the rate schedule entirely, creating a free market or one determined by negotiation between the client and the forestry contractor.

Since the AETSQ is concerned to protect and safeguard one of Quebec's greatest riches, its forests, it had no alternative but to propose a fourth option that presents a wider and more conciliatory vision than those put forward. It is essential to select an option in which the mechanism for drawing up the rate schedule gives greater prominence to the manpower component and to the quality of the work to be carried out.

The forestry management industry is a sector in which labour is very unstable and would benefit greatly from increased permanence. Given this situation, it is unnecessary to explain further the complications of recruiting and retaining qualified and motivated labour in a context in which instability reigns. We must seize this opportunity to provide the management industry with a second wind by not neglecting the principle that high quality work affects directly the quality of the raw material produced.

The committee's recommendations and the Ministry's eventual decision are of prime importance for the manpower question, for forestry companies, and for the stability of the management industry itself. For the members of the AETSQ, the challenge will be to convince their fellow committee members to approve basic modifications to the working conditions and practices prevalent in the industry, as, for example, in the relevant instructions, in the inventories drawn up before and after services are performed, in the accreditation of manpower, in the event of regional disparities, etc.

It is therefore of paramount importance for forestry firms to define a position that will ensure their continued existence and will allow the entire industry to develop.

Changing Silviculture Directions

by Gaston Damecour

New Brunswick has perhaps the most intensively managed forests in Canada. As with most Eastern provinces, the provincial wood supply is tight. The tight wood supply has been managed for over the last 20 years through a series of regeneration and stand tending and harvest strategies. To compound matters, the fiber production land base (shared with other resource management objectives) has seen several reductions through forest management strategies, operating practices and set-asides such as the Protected Areas Program. Over the last twenty years, the areas set-aside alone have increased to almost 30% of the land base. The result is an increased demand for wood from all land tenures.

Aside from the review of the forest management objectives every five years leading to the renewal forest management plan, every jurisdiction, from time to time reviews its basic goals, objectives and relationships in a big way, looking well into the future. The last such exercise took place in the mid 70's leading to the Crown Lands Act.

Faced with a reduced Crown land base dedicated to producing wood fiber, both the Province and the province's forest industries through the New Brunswick Forest Products Association have undertaken a major review of how forest management is conducted and the objectives that drive it. One of the proposed objectives is to double the provincial wood supply by 2050. New Brunswick is approaching the bottom of its wood supply curve. Consequently, the objective to double the wood supply will in part be achieved as a result of the forest management planning strategies used since the early seventies.

One component of this exercise is a review of forest management policies and relationships in several jurisdictions around the world. Jaakko Pöyry Management Consulting (JPMC) has been retained to (source JPMC STUDY – Terms of Reference):

- *Benchmark policies and practices for stewardship and management of New Brunswick's forests with other regions in North America, Nordic countries, and other relevant timber producing regions*
- *Identify the potential for improvement in New Brunswick*
- *Prepare scenarios for improvement in New Brunswick*
- *Determine the conditions for success for each scenario*

An important assignment of this nature is not done with the status quo in mind. Clearly changes are in the making, and given where we are on the wood supply curve, they will certainly influence the type, levels and intensity of silviculture interventions and perhaps more importantly their funding. This has the potential to impact silviculture in the province.

While this important study is still underway, it is important to note gradual trends in the forest sector with the corresponding checks and balances of public involvement and the provincial objective of third party certification for all Crown operations by December 2003. Exercises of this nature often begin on Crown Forest Licences and eventually influence other tenures that are all an integral part of the provincial wood basket.

The move towards partial harvesting is driven by forest management objectives, the wood supply curve and public pressure to reduce clear cutting. As the bottom of the wood supply curve nears, strategies that mitigate the immediate fiber reduction are considered while other prescriptions now have longer-term impacts. Partial harvesting under suitable stand conditions does contribute to mitigate the fiber shortage by capturing tree mortality and offering harvest scheduling flexibility while respecting adjacency rules (see the Winter 2002 column). Most partial harvesting strategies are aimed at providing improved piece size in subsequent harvests.

In addition, partial harvesting often allows the next rotation to begin well in advance of the "final" harvest that, in the writer's opinion, effectively shortens the rotation time without the cost of regeneration. On the other side, the opportunity to use the province's superior seedlings, the result of thirty years of plus tree selection, is forfeited on that site.

The JPMC study will most likely point in the direction of more intensive management and silviculture on selected sites.

Finally the move towards forest certification of one form or another on each of the land tenures will ensure responsible forestry in relation to a wide range of timber and non-timber objectives. Some of the more intensive strategies will be subject to careful checks and balances.

The next few years should see challenges and changes in New Brunswick. Changes often begin on the larger private and public tenures before implementation on the smaller land holdings. More on this next time.

Mr. Damecour is a registered professional forester. He is a senior consultant and principal of AGFOR and has been instrumental in bringing about significant changes in the forest sector by representing both governments and industries on such issues as health and safety, standards for forestry equipment, industrial relations, wood allocations and forest management policy.

Prince Edward Island Forest Improvement Association

by Wanson Hemphill, Manager

Summer is over in the land of golf courses, beaches, potatoes and 280,000 hectares of forest. With it goes the heat and flies and long days. Fall means frequent rain, cool shorter days and soft ground operating conditions.

The softwood market is weaker with the 8.4% anti-dumping duty and the big American market softening. Local prices for stud wood have dropped to $109/cord roadside and pulp is at breakeven prices. Some contractors without heavy machine payments are slowing operations or temporarily shutting down. The firewood market is brisk, especially for dry wood, although prices don't approach the Halifax or Fredericton prices.

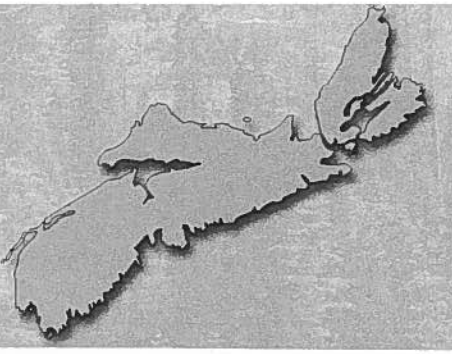
A new American forest safety site *www.loggingsafety.com* has a lot of useful safety alerts, resources and links.

next issue

Global Warming
Scandinavian Silviculture
Australian Silviculture
Silviculture Practices in the US

February 2003

Nova Scotia Silviculture Contractors Association



by Ed Davidson, President

It appears that higher Workmen's Compensation rates may well be in store for not only Nova Scotia silviculture but perhaps the forest industry in general. It seems that this time the increase will be tied more to a national trend than to an increase in the number of injuries at the provincial level. This trend is due to increasing costs, and according to one spokesman, it's what happens when the medical industry starts putting up prices. After working so hard to reduce the number of accidents, this is clearly a disappointment for those of us working in the woods. Although it would be great if we could pass along our increased costs with similar apparent ease.

The report from the Forest Safety Society of Nova Scotia that I mentioned here in the summer issue has now become public. Titled, "A Comparison of Silviculture Rates on Small Private Woodland in Nova Scotia and the Atlantic Provinces", it makes for some disappointing reading. Among other things, the report suggests that founding of new silviculture companies in this province is becoming increasingly difficult. New contractors are often asked to complete work on poor sites, avoided by others, while at the same time workers with experience are becoming more difficult to find and keep. The author cites administration expense as a primary cause for the failure of new silviculture companies, particularly within the first two years. The report goes on to suggest that while New Brunswick and Prince Edward Island have provisions of 20% and 28% respectively to address these overhead costs, no similar allowance was built into the Nova Scotia program. Based on preliminary indications, the report clearly states the silviculture credit system is working, but at a cost to contractors.

Monitoring results are becoming known and it seems audits of completed work under our system have generated a very high number of failed jobs. One suggestion is that up to 40% of planting jobs are failing. Although this number seems very high, it is still enough to set off warning bells. Either the bar has been set too high for inspections or there are other contributing factors causing problems. Either way, this is a matter that warrants scrutiny over the winter.

$500,000 is available for silviculture over the next 11 months

The Nova Scotia Department of Natural Resources has recently signed an agreement to replenish funding for the Association for Sustainable Forestry. $500,000 is available for silviculture over the next 11 months. This program was given birth last year through a pilot project and was well received. Although it was allowed to lapse, this re-establishment is seen as positive since it is consistent with advice given to DNR by groups such as the Nova Scotia Silviculture Contractors Association. The program will provide funding to areas within the province where demand is not being met by existing opportunities legislated by the province but funded by private industry.

Finally, congratulations once again to Nova Scotia's provincial woodlot owner of the year. Les Corkum of Falmouth, Hants County is long-time woodsman and a deserving winner. The other two regional winners were Bob Glaze from Cape Breton and Earle Tanner from the central region. All three of these gentlemen provide excellent examples of the benefits of silviculture and forest management.

by Rob Van Schubert

The Canadian model of forest management and silviculture focuses on the production of timber and other products while maintaining the full range of other ecosystem values in the land-base. Under this model, the goal of silviculture is to maintain and restore fully functioning, productive ecosystems, including both the terrestrial and aquatic elements. Over the past 20 years, changes in policy and practice have focused on reducing the impacts of timber harvest activities on other values, thereby reducing the anticipated cost of restoration. However, in all provinces, there remains some backlog of ecosystems where specific values have been degraded by past management.

The Watershed Restoration Program (WRP) in British Columbia was a provincial initiative (1996-2002) under Forest Renewal BC (FRBC) to restore the productive capacity of fisheries, forest and aquatic resources that had been adversely impacted by past forest harvest practices. Under the program, a broad scale assessment and inventory program was undertaken to identify priority watersheds for treatment. The assessment program focused on:

- The degree to which the watershed had been impacted by past management activities;
- The values impacted, with a particular focus on fish habitat and fish populations.

This article focuses on work undertaken within one major watershed in BC, as an example of the scale and nature of the problems identified, and some specific types of solutions.

The Parsnip River rises north-east of Prince George, in the Rocky Mountains of North Central British Columbia, and flows north-west to Williston Lake. Overview assessments of 6 major watersheds in the Upper Parsnip Drainage were undertaken in 1999. Of the watersheds assessed, 3 showed significant impacts from past harvest practices, while the others showed less impact. Based on the criteria discussed above, the watershed of the Table River was identified as the highest priority watershed. The Table River supports populations of resident salmonids including Arctic grayling, bull trout and rainbow trout, with bull trout being a species of particular concern due to population declines in many areas.

The Table River watershed lies within the operating areas of Canadian Forest Products Ltd. (*Canfor*). *Canfor* retained the services of EDI Environmental Dynamics Inc. (*Environmental Dynamics*) and P. Beaudry and Associates Ltd. to identify the specific problem areas by conducting channel stability assessments and evaluating fish habitat. Based on the assessments of these two consulting firms, in-stream restoration prescriptions were then developed.

In general, watershed assessments in BC have identified three major areas of impact on aquatic habitats:

- Sediment impacts arising from upslope erosion and slope failure, often associated with roads;
- Loss of in-stream large woody debris (LWD) and stream shading due to harvesting in the riparian area;
- Changes in stream bank and bed morphology due to changes in the hydraulic regime in the watershed (typically greater variability in stream flows due to loss of storage capacity in the watershed, and interception of subsurface flows).

Within the Table River watershed, upslope sediment sources were being reduced through an active road deactivation program, and changes in the hydraulic regime were expected to decline as harvested areas re-grew. Consequently, the prescription focused on in-stream issues.

Between 1999 and 2001, detailed overview and field assessments prioritized sub-basins and specific sites within the watershed for restoration activities. Portions of four tributaries to the Table River were selected for restoration, based on the presence of degraded fish habitat and disturbed channel conditions. Indicators of channel disturbance in these areas included moderately to severely over-widened stream channels, a lack of fish habitat and channel complexity resulting from low

concentrations of in-stream LWD and depleted sources of future LWD recruitment associated with a lack of mature coniferous vegetation in the immediate riparian area.

These problems were particularly severe in the Table River tributaries due to the nature of the watershed. Lying at a relatively high elevation, the harvestable timber is mostly found in the valley bottom. Historic logging had focused on the flood plain areas, with the result that, although only approximately 6% of the watershed had been logged, between 25 and 30% of the riparian areas had been harvested. Harvesting took place from the late 1970's to the early 1980's. In keeping with the standards of the day, blocks were often logged to the stream banks.

Based on the assessments, the high priority restoration goals for the watershed were:

- Stabilization of stream banks;
- Increase in the quantity and variety of fish habitat (pools, riffles, etc.).

Prescribed treatments within the selected streams involved the design and configuration of ballasted LWD structures and rock riffle/pool sequences, aimed at accelerating the recovery process within these systems. Installed structures were expected to halt the trend of channel widening, protect vulnerable stream channel banks and provide additional fish habitat, all of which would contribute to the eventual stability of the aquatic environment. Prescriptions closely followed techniques recently developed and published by the WRP, the US Forest Service, and various forest companies in BC. All in-stream structures were designed to withstand a 1 in 50 year flood event.

The prescribed work did not include measures to accelerate growth or increase the density of riparian trees and other vegetation, since the logged areas along the stream-banks were mostly well stocked with coniferous species, and re-establishment of natural sources of LWD required only time.

In-stream restoration works were carried out in the summer of 2001. All materials were delivered to the staging areas, in each of the sub-basins, using self-loading logging trucks and dump trucks. Wind-fallen trees that were scavenged from the area provided most of the root wads and whole trees were used during the project. Several loads of large-diameter spruce and cedar were also delivered from a sawmill in the nearby community of Bear Lake. Log diameters ranged from about 35 to 55 cm, with an average of about 40 cm. Ballast and riffle rock were blasted and sorted from nearby rock quarries. Riffle rock sizes ranged from about 0.5 to 1.0 m in diameter. Ballast boulders ranged from 0.7 to 0.9 m in diameter, with an average of about 0.8 m. Materials were transported from the staging areas to the individual structure sites using a horse logging crew (for sites with good access) and a Bell-205 helicopter (for more remote sites). Riffle material for some sites in the Table River watershed was delivered to the stream using a six-wheel drive rock truck. Individual logs and boulders were positioned using a Schaeff Spyder 41 mobile walking excavator, and fastened together using ½" galvanized steel-core cable, ½" galvanized cable clamps and Hilti HY150 epoxy. The epoxy system is used to fix cables into 8" deep holes drilled into boulders and provides an extremely strong, water resistant bond. Logs were attached to mature trees or stumps near the stream bank where possible. Cables were left slightly slack to allow for the growth of live trees.

Following construction, all areas of disturbed soil along the stream banks and riparian areas were dry seeded with a roadside reclamation grass seed mixture, containing a variety of grass and legume species. Seeded areas included stream banks that were excavated to embed LWD structures and the trails in the riparian zones that were built by the horse crews to deliver structure materials.

A total of 62 sites were restored over approximately 3 km of tributary stream length within the Table River watershed. Prescriptions involved the use of 320 pieces of LWD and 512 boulders. In addition, roughly 775 m^3 of rock was used in construction of the riffles.

Formal evaluation of the results of the work will be undertaken in 2003. However, a walkthrough of the area this year indicated that the structures appeared to be performing relatively well. Some of the structures, which fully spanned the

channel, showed some instability. Problems with structures of this type have also been noted in other projects.

It is too early to judge what the impacts of this work will be on fish habitat and fish populations. However, based on this work, some discussion of in-stream restoration as a tool in our forest management toolkit is possible.

In-stream work of this sort is expensive. The cost of the work on these 3 kms. in the Table Watershed was in excess of $275,000, including both the assessment and treatment phases. Although these costs were increased by the fact that helicopter delivery of some of the materials was required, the cost of over $90,000 per treated kilometer indicates the scale of costs involved in doing this sort of work. Based on these costs, treatment of all 6 of the watersheds evaluated in the Upper Parsnip might well have exceeded $1,000,000. These cost figures are in line with those experienced in other similar projects in British Columbia. On a broader scale, the cost of treating the existing backlog of impacted watersheds at a provincial level is substantial. It has been roughly estimated that about 2,000 anatropous and resident fish streams have been logged to the banks for an average distance of 10 km each.

Despite the high costs that can be involved, restoration treatments are felt to be the preferred alternative in high priority watersheds. Although we currently have little data on the rate or degree to which impacted watersheds would recover naturally, current models of in-stream LWD function have estimated that up to 200 years may be required for a stream that is logged to the banks to fully recover to pre-logging conditions. Restoration works accelerate the natural recovery of watersheds, resulting in a more rapid rehabilitation of the productive land base. Funding watershed restoration should therefore remain a priority for both governments and the forest industry.

The quality of the existing data on streams in BC creates the groundwork for critical research that would allow us to optimize our expenditures in this area. For instance, within the Upper Parsnip, comparison of changes in fish habitat and populations on the treated reaches of the Table River, the untreated reaches of the Table River, and the untreated reaches of the other drainages would allow us to more precisely prioritize our watershed restoration expenditures, and to optimize our future management of aquatic resources in the forested areas of Canada.

The relatively high cost of watershed restoration makes reducing the requirement for treatment through pro-active management decisions an attractive alternative. Under the current Forest Practices Code in British Columbia, many of the impacts that were found in the Table River would not have occurred. Although improved logging practices and better information on natural recovery may reduce the requirement for watershed restoration, it will remain a critical forest management activity under the Canadian model of forest management for the foreseeable future.

For technical information related to this article, please contact Rob Van Schubert, R.P. Bio., Fisheries Biologist, EDI Environmental Dynamics Inc. e-mail: rvanschubert@edynamics.com
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Protection from deer browse damage will almost always focus on protecting the tree leaders. Once the leader reaches a height beyond the browsing reach of the local browser, the tree can continue to grow. Lateral browsing is a lesser economic issue causing some growth loss but is rarely pivotal to tree survival.

The real sum cost of using browse barriers is considerable. If the severity of the leader browsing is low, consider accepting the damage and ignoring the problem. Alternatively, consider repellent products. Repellent products quickly loose their effectiveness in a rainy climate and need a reapplication schedule. They are at their most effective on easily accessible sites, where browse pressure is low to moderate, in a region where rainfall is not likely to wash the chemical off the foliage.

There are numerous repellent products available including Deer-Away Big Game Repellent®, Plantskydd® and Ropel®. To be used, the products must be registered as a Pest Control Product (as a pesticide). They cause deer to be repelled as a result of fear (predator odour), bad taste, or mouth/nasal irritation. The spray treatment is timed to get up to four months of browse protection but local climate determines the number of spray treatments needed in any given length of time. None of these products actually cause the deer to relocate to another area.

You have a range of options available for browse protection. Most homespun browse protectors, such as milk cartons, or handcrafted wire cages don't work in commercial operations. Either the barriers are not durable or the real cost of barrier creation, installation and maintenance makes them too expensive. An exception is handcrafted "bud-caps". A "bud-cap" is simply a rolled-up piece of rain durable paper placed over the leader and held via friction-fit with staples. These work well to protect leaders of young trees with stiff, erect leaders, where browse pressure is low, in areas protected from high winds. They will have to be adjusted to sit over the new leader tips each year.

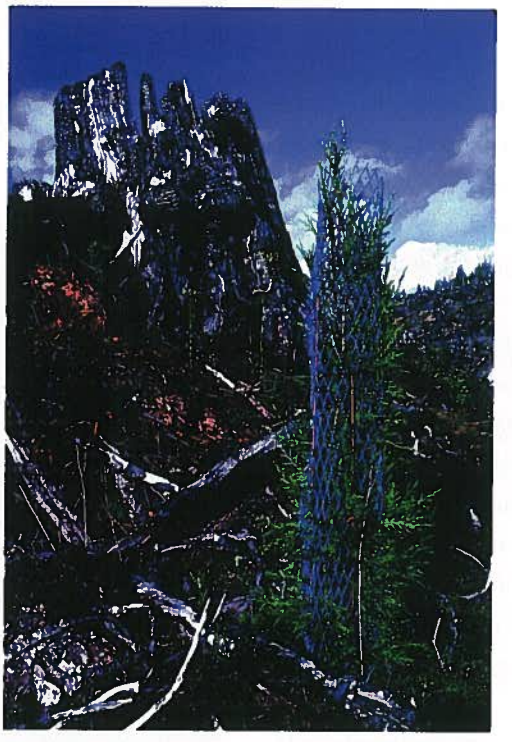
For browse barrier projects that protect more of the tree, all of the associated costs have to be carefully considered. These costs include the barriers, stakes, transport, installation, periodic maintenance and barrier removal, if required. Expect to rely on experienced crews for installation as it is critical to do the work correctly. Don't skimp on the stakes, installation quality or ignore the need for maintenance, especially in the first two years.

In British Columbia, deer browsing is most damaging to western red cedar on the coast. Reports of serious deer browsing damage in the interior are uncommon. On the coast, browse pressure for cedar is typically moderate to high, and is usually extreme on Haida Gwaii (Queen Charlotte Islands) and on other islands lacking predators.

Browsing of other species like young Douglas fir and Sitka spruce also occurs on the coast. However, the severity of the damage is low enough that the damage can often be ignored, or that relatively simple and short-term barrier projection can be relied upon.

The high cost of cedar browse protection on the coast has

required further investigation. Starting in 1997, a field research study was initiated on Haida Gwaii to determine the effectiveness and net present cost of four different deer browse barrier products. The products are 4-foot plastic tube (Growcone® tube), a 4-foot plastic cone (Sinocast® tree shelter), a 4.5-foot metal cage (Sweetwood® cage) and a 3-foot plastic mesh (Vexar® mesh). Observations from locations outside the study area have allowed us to also evaluate the performance of 4-foot plastic mesh (also Vexar® mesh).



The long-term objective of the research is to determine which attributes of the barriers bring western red cedar to free growing most effectively and at the lowest cost. Most of the costs associated with the barriers are now known or can be estimated, though the research is not yet complete.

It is intended that the seedlings and their browse protectors be maintained and monitored until the trees are growing free of leader browse damage. A detailed record of the associated costs and production levels of the installation and maintenance are kept.

Two Provincial legislative requirements in BC underlie forest company obligations to protect the cedar. They are the green-up requirement that affects permission to undertake further harvests of trees in an area, and the free-growing requirements on all areas harvested of establishing young reforested stands. Related to these obligations, the goal of the forest companies is to produce 3-m tall cedar trees, as soon as possible, in order to achieve green-up. In the case of cedar, the achievement of green-up by the forest companies will normally also meet the free-growing obligations.

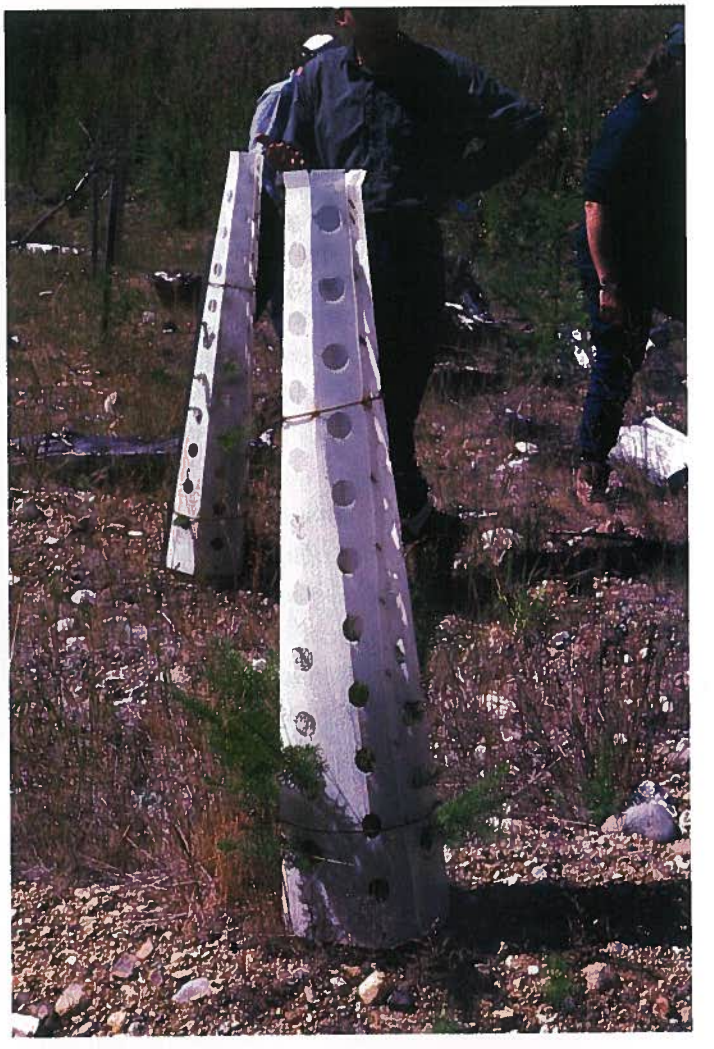
The tree height where deer do not normally browse has been determined to be 1.75 m (5.7 feet). All of the barrier top heights within the study are well below this height. Unprotected tree leaders must grow about 0.5 m above the barriers to escape the deer. Practical barrier products that would protect trees over the 1.75-m length were not available and would be very difficult to create. We are currently studying the significance of this issue and will understand how the trees respond in a few years.

Most of the barriers used for our study provide good browse protection, though for radically different unit costs. As well, each barrier has its own limitations. The plastic tube, 4-foot plastic mesh and metal cage all appear to offer effective protection. Practical characteristics of an effective product include both a durable barrier and stake that is carefully installed. Maintenance, especially in the first two years is very important, and its relative cost is usually small.

Until the free growing assessment, there is no need to remove barriers as long as they do not interfere with the growth of the trees. We hope by then that the plastic barriers will have split apart, having been weakened from UV sunlight. This will probably be the case for the plastic mesh barriers, but it is not clear for the other products. The metal cage barriers and the metal rings of the plastic cones will likely have to be manually removed from the trees. This removal could dramatically increase project costs. If the removed barriers can be recycled on to new young seedlings, this cost may be reduced.

Current per tree net present costs for the barrier products in this study are as follows: 3 foot plastic mesh: $3.12, 4 foot plastic mesh: $3.50 (est.), plastic tube: $5.83, metal cage: $8.32, and plastic cone: $8.91. The costs in this study may differ from yours but the proportional cost differences between the products should remain the same. The 4-foot mesh and plastic tube barriers continue to be most practical and most affordable. The inexpensive 3-foot plastic mesh barriers are not providing adequate browse protection. Our study indicates the plastic cones have had many problems protecting seedlings, such as holding their shape when exposed to the elements, and are costly. The metal cages will be even more costly unless they can be reused.

It remains to be seen which barrier will be the survivor after the others are voted off the Island.



John Henigman RPF RPBio, Forest Health Forester, BC Ministry of Forests, Victoria

What's New

PRT Celebrates One Billion Seedlings

Pacific Regeneration Technologies Inc. (PRT) celebrated shipping of its one billionth seedling during the spring of 2002, with a ceremonial planting which was held in Victoria, BC on June 21, 2002. "Achievement of this milestone attests to the sustained support and loyalty of our customers, and provides recognition of the dedication of all our employees at all levels during the past 14 years", commented retiring CEO Evert (Ev) Van Eerden. "I feel very privileged that our principal founder and my Executive predecessor, Charlie Johnson, and I were able to start and grow PRT, together with our employees, to what it is today, the largest producer of container-grown forest seedlings in North America."

Starting with six nurseries in British Columbia in 1988, and annual production of approximately 55 million forest seedlings, the Company has grown to 13 nurseries and annual production of over 130 million seedlings. Newly appointed CEO, John Kitchen, observed that PRT's strategy of providing superior customer service and a local presence have been key factors in PRT's growth and success to date.

According to an old saying, "to plant a tree is to plant hope". With this thought, Dan Davies, former Vice President, Finance and Administration, who had to leave his position due to serious illness shortly after PRT became a public company in 1997, was invited to plant the ceremonial tree.

Cansel Launches Cansel Resources

Cansel Survey Equipment Inc. has launched a new natural resource equipment supply division, Cansel Resources. "The formation of Cansel Resources is an extension of our commitment to our many forestry, mining and environmental customers and strengthens our position to become their premier supplier", states Lovett Lewis, President of Cansel.

Cansel Resources is pleased to announce their appointment as the exclusive Canadian distributor for Miracle Tube. Miracle Tube is a next generation style seedling protector manufactured by Tree Pro Industries of Lafayette, Indiana. Tree Pro Industries has been producing innovative browse protectors for more than a decade, and the Miracle Tube has become the preferred protector choice in many parts of the USA.

Miracle Tube addresses the needs of foresters experiencing browse problems from deer, elk, moose and other animals. A solid plastic protector, Miracle Tube comes in a variety of sizes and offers seedlings complete protection from browse. Its solid design meets the challenges of extremely windy conditions, and ventilation holes are available to prevent incidents of Keithia and other diseases.

Cansel has also been appointed the Western Canadian Distributor for FINN Corporations HydroSeeder and Eagle Compact Skid-Steer Landscape Machine. The labour-saving original FINN HydroSeeder machines combine seed, fertilizer, soil amendments, mulch fiber, tackifier, and other additives into a thick slurry and spray it onto the seedbed for superior seeding. HydroSeeding allows for quick establishment of vegetation for land reclamation and erosion control.

The recently introduced FINN Eagle is a compact, stand-on skid-steer machine designed to save manpower in site and soil. An extension of the full-sized skid-steer loaders, the 35 1/2" wide Eagle can get into smaller spaces and delivers the same power, down to the tools, as the larger machines. The Eagle offers the highest hydraulic flow rate in its class and features a parallel hydraulic system that provides full power to all functions simultaneously. This enables the machine to provide maximum power to the drive wheels and the working implements at the same time.

Timberjack's 1270D

The Timberjack 1270D harvester has several new upgrades to make it the toughest, most reliable and most productive machine in the forest for later thinning and regeneration harvesting. The upgrades include improved power and fuel efficiency, an improved hydraulic system and a new PC based control system.

SWEDA—Big axle solves big problems

Who says big feet can't tread lightly? Wherever soft going is an issue, loggers are moving more wood with less soil compaction and ruts by using flotation tires and duals on skidders. When ground conditions are critical, and high clearance with a soft footprint is required to meet contract requirements and environmental concerns, Timberjack's Super Wide Extreme Duty Axle (SWEDA) comes to the rescue. This axle helps skidders glide over the forest floor and stay on top in soft ground.

The SWEDA is an axle built with the strength to handle a bigger load. That solves a problem that has been growing since loggers started using more rubber—axle durability. Many skidders have suffered early final-drive failure from running larger flotation or dual tires on standard axles. The SWEDA can comfortably handle tires up to 70 inches or duals with its stronger housing and bigger axle diameter—almost twice the size of conventional axles. Overall width of the axle is 100 inches.

The SWEDA can be ordered on new Timberjack 460D and 560D skidders, or it can be retrofitted with a field installation kit on the same Timberjack D Series skidders.