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SILVICULTURE

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Editorial

by Dirk Brinkman

Plant Trees. Plant Lots of Trees. *An Inconvenient Truth*

For 10 years the silviculture contractor's cruel reality was a declining forest sector driving lower prices, fewer trees per hectare, and less tending funding. Prices in shrinking markets fell and experienced contractors, field supervisors and planters left. Reduced forest funding and expertise has placed Canada's forest health at risk.

Canadian Silviculture magazine's contribution was to promote 2 new market drivers for forest management: carbon funded reforestation and bioenergy - 2 challenging initiatives with a current federal government supported by oil interests.

This magazine's causes were just joined by a potent movie called *An Inconvenient Truth*. Expertly set in the tragedy of Al Gore's unsuccessful life mission to prevent climate change by becoming the US President, it tells the story of his subsequent years of penance - giving his climate lecture 'over a 1,000 times'. The lecture encapsulates Gore's learning journey to make the science accessible. Content is honed by his awareness that only indisputable facts can survive the cynical reception given to a known presidential aspirant.

A refining cauldron for simplifying the science was urgently needed for this complex issue. It resulted in a powerful and compelling presentation of the facts underlying the science and risks of climate change. Gore's most persuasive image is his summary of last year's report on 650,000 years of ice core data (see graph below).

"At no point in the last 650,000 years before the pre-industrial era did the CO₂ concentration go above 300 parts per million. The grey line shows the world's temperature over the same 650,000 years. And within 45 years this (2050 & 600ppm) is where the CO₂ levels will be if we do not make dramatic changes quickly. There is not a single part of this graph - no fact, date or number - that is controversial in any way or in dispute by anybody. If we allow this to happen, it will condemn future generations to a catastrophically diminished future."

A second champion has also joined the fray. Gaia system discoverer James Lovelock, now in his late 80s, published *The Revenge of Gaia: why the earth is fighting back - and how we can still save humanity* in April 2006. Gaia is the term he gave earth's amazing self-regulating capacity, which over the past 4.5 billion years maintained stable conditions favouring life. In changing circumstances earth's equilibrium phase shifts into other stable, self regulating states -

not necessarily as supportive of our present civilization or population.

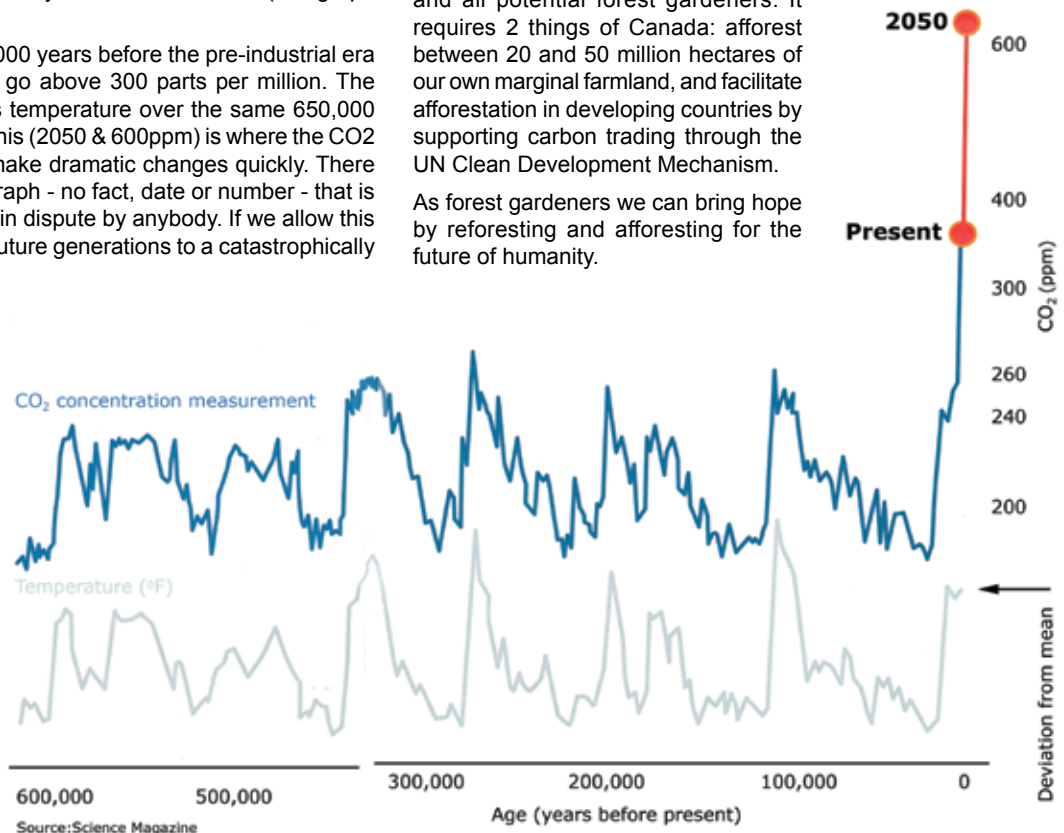
Last year's severe droughts in the Amazon basin fit scientists' predictions that it may dry and burn up. If the Amazon burns, because surface temperatures will be over 25°C, they predict all soil moisture will transpire until it becomes a desert. Losing the Amazon's dynamic carbon pool is predicted to add 300 ppm to atmospheric CO₂.

Borneo's 1997-1998 fires released 40% of the total greenhouse gas emissions that year. Last month I flew over a 5 million hectare 1998 Borneo burn. Some areas are still bare rock, soil, or savannah. The recovering forests are nearly monocultures without the abundant bird life evident in the intact rainforest.

Lovelock does not give much cause for hope. "Our religions have not yet given us the rules and guidance for our relationship with Gaia...We are no more qualified to be stewards or developers of the earth than are goats to be gardeners."

But forest gardeners are what we need. The credits for *An Inconvenient Truth* end with the words "Plant trees. Plant lots of trees." To add a forest area the size of the Amazon and reduce atmospheric CO₂ by 300 ppm would require the engagement of all nations and all potential forest gardeners. It requires 2 things of Canada: afforest between 20 and 50 million hectares of our own marginal farmland, and facilitate afforestation in developing countries by supporting carbon trading through the UN Clean Development Mechanism.

As forest gardeners we can bring hope by reforesting and afforesting for the future of humanity.



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Integrated Vegetation Management

Is It Right For You?

by Dusty Cooper

Vegetation Management (VM) controls vegetation where it is undesirable or where it has become competitive or detrimental to desirable plant species or may even pose a safety or health risk. Many individuals relate VM to the forest and in particular the silviculture industry. However, VM is widely used throughout Canada in many different industries including rail, hydro, oil and gas, transportation, transmission, and many others.

VM took on a new look in the early 1990s when the BC Ministry of Environment helped

define the purpose of Integrated Vegetation Management (IVM) throughout BC to control vegetation growth using a more systematic approach. Now the industry in BC is working under the Integrated Pest Management Act & Regulation that was introduced in 2005. The Act provides the statutory authority to use Integrated Pest Management Plans (PMPs) as an authorization vehicle for pesticide use on crown and some types of private land.

IVM is the selection of treatment options that involve a decision making process based

on integrated vegetation management concepts, which include several factors. This process should include an evaluation of the site, an examination of the need for IVM as well as what type of treatment that may be necessary i.e. herbicide/mechanical, choosing an approved method available for the control you are trying to achieve, what is required to meet your objectives, the potential for any negative impact on the environment or human health and safety, monitoring, post evaluation, and the economics of the IVM treatment. Safety is without a question one of the



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biggest concerns when developing a vegetation control program. You will have to decide what safety measures are adequate for your program. Some data has shown that there is an increased risk to workers using chain saws vs herbicides, while other data may support the opposite.

IVM requires you to do your research to find the best method of controlling vegetation, considering what is most economical, what provides the best efficacy, and what is safest for your workers and the environment.

A PMP involves strategies to develop an integrated vegetation management program, which may include mechanical, manual, biological, cultural, and herbicide control measures. Mechanical methods include excavators, brush saws, mowers, and chain saws. Manual methods include hand weeding, girdling, and manual cutting. Biological methods usually refer to biological agents (bugs) used for the control of invasive alien plants (noxious weeds). Cultural control methods include burning or sheep grazing to control undesirable vegetation. Herbicides are used in many different techniques such as basal bark, cut stump, cone, and hack and squirt, and can be applied using backpacks, truck mounted sprayers, or airplanes, depending on whether you require a selective, spot, or broadcast treatment.



In the forest industry VM or IVM is generally used for 2 different reasons. Research shows that intense, unmanaged vegetation competition elevates seedling mortality to much higher levels, and this can have serious implications on planted stands. Research also shows that without some form of vegetation control of competitive species, sustainable harvest can be reduced on most planted stands. When undesirable, competitive vegetation is a problem, it will influence conifer seedling growth by different factors such as

low light, soil moisture, and air and soil temperatures. Vegetation managers recognize that it is very important to protect plant species' diversity to maintain healthy ecosystems and forest productivity while controlling competitive species.

Vegetation cover may benefit or interfere with the growth and development of a crop species. Benefits may be thermal cover, protection of soil from erosion, and retention and accumulation of nutrients. Detrimental effects include competition for light, water, and nutrients, along with physical, chemical, and environmental interferences.

Treatment thresholds are developed and implemented to determine whether a treatment is required or not. All brush, broadleaf tree, and non-broadleaf tree vegetation including herbaceous/low shrub and tall/woody shrub species, which are found within the 1 m radius effective growing space of a crop tree, must be considered when assessing levels of competition. This includes competing vegetation originating inside and outside of the 1 m radius cylinder. To be declared free growing, trees must also be free from damage

or infection from insects, disease, mammals, or abiotic agents as outlined in the free growing damage criteria for BC.

A treatment may be implemented when one or more of the following are present and are negatively affecting the crop trees:

Snow press - Crop tree damage or mortality is evident due to snow press.

Shading - The competing vegetation complex shades the crop trees to a degree where the crop trees vigorous growth and development is suppressed, or is likely to be suppressed, resulting in poor growth or possible mortality.

Soil temperature - The competing vegetation complex is such that the soil temperature is reduced or is likely to be reduced, thereby suppressing the growth level to poor or possibly causing mortality.

Nutrients - The competing vegetation complex is such that the nutrient level required by crop trees for vigorous or normal development and growth is suppressed, or likely to be



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suppressed, resulting in poor growth or possible mortality.

Moisture - The competing vegetation complex is such that competition for limited moisture represses the crop trees, reducing or likely reducing vigorous or normal development, and possibly causing mortality.

Allelopathy - The competing vegetation complex releases chemicals, which interfere with vigorous or normal crop tree development and growth, resulting in poor growth or possible mortality.

Free Growing - The free growing criteria as established in operational plans cannot be met.



Cost comparisons have shown that when controlling vegetation on planted blocks in the forestry sector, there is generally a substantial cost reduction for herbicidal over mechanical or manual treatments. For example, in BC, the average backpack herbicidal treatment may cost \$400.00 per ha to treat a planted block, and only one treatment is required to meet free to grow, while the average cost of a mechanical treatment could be approximately \$800.00 per ha and multiple treatments are required before establishing free to grow.

Invasive plant species are a major problem in BC. Timber is the primary product of our forests, however range management is also important. The ranching industry relies on crown forage for grazing livestock, even though many foresters believe that cattle grazing poses a problem for some silviculture plantations. Grazing cattle on crown land is considered a non-timber forest product and faces just as many threats as the timber industry. Invasive weeds are a very large threat to the ranching industry on crown land as well as on private land, so IVM is being used to help contain the spread of these alien plant species.

The BC Weed Control Act specifies that land occupiers must control noxious weeds on private or public land. Noxious

weeds impact agriculture where they displace or reduce the quality of crop and forage species and natural environments where they take over native plant species, thereby reducing biodiversity and forage for wildlife.

If invasive (noxious) weeds are not contained and are allowed to spread, the province stands to lose good productive land and forage for wildlife as well as experience degradation of riparian areas, which will be a huge potential economic loss. The spread of invasive plant species is the second most significant threat to biodiversity after urban development, and in some cases if the site is heavily infested it may never be restored to its natural habitat.

The Fraser Basin Council has shown that knapweed in Glacier National Park has reduced elk winter forage by 50-90%. Large infestations of knapweed have also resulted in the loss of water quality and fish habitat. Native grasses, wildflowers, and endangered species are being destroyed throughout BC by alien invasive weeds such as dalmatian toadflax, oxeye daisy, rush skeleton weed, purple loosestrife, orange hawkweed, hoary alyssum, and several others.

These alien, invasive weeds are brought into BC and Canada primarily from foreign countries where the indigenous plant species have predators that keep the plants in check. However, those predators are not naturally present here in Canada and the invasive plants must be contained with other measures. One of these measures is bio-control, where biological agents are released in the infested areas and the bugs eat the plant or root. Several biological agents such as *L. minutus* and *S. jugoslavica* are currently being used on knapweed, while other agents are being distributed in trials on new, invasive plant species and the results are being monitored at this time. Early indication shows promising results with bio-control for some invasive plant species.

Whether to control invasives or undesirable native competition, the systematic rigor required by IVM has improved both the efficacy, cost, and public acceptance of vegetation management for all users.

For more information on IVM, go to www.ivma.com

Dusty Cooper is current president of the Integrated Vegetation Management Association of BC and is President and General Manager of DJ Silviculture Enterprises Ltd.

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NEW TOOL FOR INTEGRATED WATER QUALITY MANAGEMENT

by Joelle Muyldermans

a number of developing and industrialized countries are
extremely vulnerable

As an emerging issue, water management and the control of water quality constitute priorities due to the importance of this resource on the economy and public health. A number of developing and industrialized countries are extremely vulnerable to the availability and quality degradation of this resource. Water quality control mechanisms must be developed in addition to political and technological initiatives put in place to ensure sufficient water supplies.



In Quebec, integrated watershed management, based on an ecosystem approach, constitutes one of the major commitments of the Quebec Water Policy adopted in 2002. A watershed means a geographic area bounded peripherally by a water parting and draining to a common outlet - a point on a larger stream or river, a lake, bay, etc. This policy prioritized 33 rivers due to environmental issues or use conflicts. At the time, 33 watershed organizations were created with the task of developing a water management vision with the involvement of all stakeholders. The participation from the various affected sectors is essential for a successful watershed management strategy implementation. These participants are either users or actors, and belong to sectors such as agriculture, forestry, surrounding community, energy producers, industrial, institutional, municipal, or tourism.

A number of problems are often raised with water quality management and hinder rapid and effective decision-making. These include:

1. large number of parameters to track (imposed by regulations)
2. large quantity of data captured, often dispersed in various organizations, and associated difficulty for interpretation and comparison of this data
3. poor diffusion of water quality information and poor access to information needed for tracking water quality
4. no integrated approach in which all steps from data collection to creation of useable information are considered and addressed

In this context, the creation of an adapted system, which integrates all information and harmonizes the data to supplement existing procedures is essential. The availability of a tool, which provides real

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time integrated information in the desired form to stakeholders (administrators, surveillance organizations, volunteer networks) would allow for informed decision-making.

Enviro-Access, along with a number of regional partners, has coordinated an integrated water quality management system pilot project, financed in part by Canada Economic Development, which reached its culminating point in September 2005. This project allowed for the creation of the first limited access version of the content manager with the following functionalities:

1. a dynamic map of the river basin with various information layers
2. data entry forms
3. a database with data query tools
4. user-based content management (from simple data viewing to full data access/management contained in the database)
5. a pilot automated water quality measurement station with real time data transfer into the database

The pilot project was implemented on the Saint-François River watershed in collaboration with the Saint-François River Watershed Committee. The software portion, based on the use of public domain software, was realized by Groupe S.M. International.



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Additional development efforts remain to improve and implement the Internet portal and ensure it is transferable for future replication with other watershed organizations throughout Canada and beyond. Funding requests have been submitted in order to improve the Integrated Water Quality Management System, upgrading the performance of data content management to ensure appropriate data transfer, and then packaging it in a form which will assist watershed organizations to better accomplish their missions. In addition, the portal will make the data available to the public and administrators.

From a technical point of view, the main innovation resides in integrating data acquisition, dissemination of the information on a website, data validation, data use, inclusion in dynamic maps, and analysis/interpretation of certain datasets.

The graphical data presentation aspect with the specific goal of improved data analysis was achieved through the use of the web environment: 2D/3D graphics, data series animations, automated real time data tables (based on ceiling values or ranges), etc. Such a web-based system makes the data readily accessible and facilitates decision-making or further analysis (such as feeding information into mathematical pollutant dispersion models).

The system will allow for distribution of water quality data and water management plans while providing a collaborative work environment for all stakeholders involved in watershed management. It will improve established practices in regards to water management in Quebec by providing an accessible and low cost structure required for efficient data manipulation. ♣

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SILVICULTURAL CONTRACTORS' ASSOCIATION

by John Betts

COFI Rejects Camp Cost Proposal

BC's Council of Forest Industries (COFI) says it can't support a WSCA effort to eliminate tree planting camp costs across the province this spring. The WSCA had proposed that forest companies and BC Timber Sales (BCTS) compensate tree planting firms for ceasing the common practice of charging workers \$25.00 per work day for food and accommodation amenities starting May 1, 2006. The reimbursement, which would have meant an estimated 8% increase in planting costs, is part of an emerging WSCA strategy to retain and recruit competent tree planters in an increasingly tight labour market. This year, experienced seasonal workers continued a trend of leaving the silviculture sector, causing a planting capacity shortfall felt across BC.

Earlier this spring, the WSCA met with executives of 6 of the major interior licensees and BCTS to make the case for the camp cost elimination and explain the causes and implications of the growing capacity problem. The WSCA said that the market for silviculture services would have to correct a decade-long trend of declining bid prices, lower wages and shrinking profits. The WSCA feared that the province's reforestation program could not continue to attract and keep capable workers and contractors if the present trends continue. The WSCA suggested the province's reforestation program was in possible jeopardy threatening forest health, harvests, and markets.

COFI said it took the silviculture capacity problem seriously after its forestry committee undertook extensive discussions regarding the WSCA proposal. But in the end "no single point of view emerged" regarding eliminating camp costs. COFI did recommend contractors who felt their contracts and businesses were in jeopardy because of the capacity shortfalls, should approach companies individually to negotiate concessions. COFI and the WSCA have agreed to continue talks around the capacity problem and market conditions.



Like COFI, BC Timber Sales would not support the proposal citing contract administrative problems. At the same time BCTS said it was prepared to consider other long-term proposals regarding how and when future projects could be tendered and undertaken to alleviate capacity problems.

Tree planters' piecework wages have generally not increased in a decade, and the camp cost charge is now seen as a discouragement when other industrial sectors, particularly oil and gas, pay camp costs, and even offer bonuses to recruits. Six years ago, when the WSCA negotiated a new set of Employment Standard Act Regulations for silviculture workers, the camp cost was capped at \$25.00 per day and written into the regulation. Originally intended to protect workers from exploitive camp costs, the regulation had the unintended effect of legally enshrining the practice. Now some contractors are promising to eliminate the charge voluntarily by passing the costs onto their clients rather than their employees in next year's bidding. The WSCA is considering asking the province's cabinet to change the Act's silviculture regulations so they are silent on camp costs.



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FOREST RENEWAL CO-OPERATIVE INC.

by William F. Murphy, RPF General Manager

Another planting season is almost complete. The growers are winding down the thawing and the shipping, and the silviculture contractors have completed this spring's plant.

However, we still have seedlings that were grown and not planted. For some reason, this year the surplus seedlings grown for the Crown lands were not planted. A normal year would see the majority of these non-target (outside contract size specifications) or surplus seedlings picked up and planted on the Crown lands. What happened this year? This phenomenon is not region specific but, talking to growers throughout Ontario, it is essentially occurring from northwestern to southern Ontario.

Was there sufficient time given to the growers to allow them to look for other purchasers for this surplus stock? Normally they do not have to worry about the 10-20% over-sow that they are requested to grow as it is usually taken and planted up. Some growers have substantial numbers of seedlings that are still waiting for a home.

In previous issues we have discussed private land issues in Ontario and the lack of regenerative efforts being made after cutting. Could this surplus situation have been a solution? I believe it could have been. If sufficient time had been given - and maybe it was and was not taken seriously - we could have aggressively marketed these

seedlings. There is still time to sell the seedlings, but holding them in cold storage adds greater cost to the grower.

In Thunder Bay, there is a township that is looking at limiting logging activities within its jurisdiction, but it has not addressed the regenerative efforts that could be made to offset the logging activity. Our Co-op and the Ontario Forest Business Association are working together to provide an alternative to leaving private land vacant after cutting through regeneration.

Trees live and die in the forest. When they become overly mature and before they die, they open up the understory to brush and unsightly vegetation that restricts natural regeneration until a fire occurs to clean out the underbrush and allow the seeds lying dormant in the ground to start to grow. Why not harvest the trees before this happens? Regenerating a forest artificially at the right age is better than waiting for Mother Nature to take her course.

Perhaps in the future, if the surplus seedlings are not going to be used, notice can be given in time for the grower to aggressively market the remainder for private land use.

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ASSOCIATION DES ENTREPRENEURS DE TRAVAUX SYLVICOLES

par Solajo Couturier et Anne Moisan-Lapointe, responsable des communications, AETSQ

Un Printemps Chaud pour les Sylviculteurs

Depuis plusieurs mois, l'industrie forestière québécoise est en crise. Le ministre des Ressources naturelles et des Parcs, M. Pierre Corbeil, a donc profité du budget 2006, dévoilé en mars dernier, pour annoncer certains investissements dans le milieu forestier, dont des mesures particulières pour le monde sylvicole.

Le ministre a ainsi pris en considération quelques suggestions des associations sylvicoles du Québec qui avaient dénoncé certaines iniquités vécues par les sylviculteurs, comme le non paiement des travaux de planification et de suivi. Car depuis quelques années, les charges travaillées pour réaliser la planification et le suivi étaient en constante croissance, sans pour autant être prises en considération dans la rémunération des travaux sylvicoles.

En annonçant des investissements de 925 millions \$, dont environ 200 millions \$ pour le milieu sylvicole, le ministre indiquait clairement son intention de soutenir l'industrie forestière et sylvicole québécoise. Il a alors profité de ces annonces pour consulter le milieu concernant les modifications précises à apporter au Règlement sur les redevances forestières et à l'Arrêté ministériel concernant la valeur des traitements sylvicoles admissibles en paiements des droits (grille de taux). L'AETSQ a alors rédigé des mémoires expliquant les problématiques et les solutions possibles. Plus précisément, l'Association a demandé de rendre admissibles en paiement des droits les travaux de planification (et de bien l'identifier dans la grille de taux), d'élaborer un mécanisme de suivi et de contrôle pour le paiement des travaux (planification et exécution), d'éliminer

la contribution monétaire (10 %) des bénéficiaires de CAAF à l'exécution des travaux sylvicoles (ticket modérateur), d'indexer l'allocation des camps forestiers, de rendre admissible d'autres types d'hébergement pour l'allocation des camps et d'indexer la plantation 45 cavités, PFD et regarnis. Cette liste peut sembler exhaustive, mais depuis plusieurs années, l'industrie sylvicole était laissée pour compte et un rattrapage important est maintenant nécessaire.

Après plusieurs mois de représentations, l'AETSQ et les autres associations sylvicoles ont été entendues sur un des points les plus importants : les travaux de planification et de suivi sont maintenant séparés des travaux d'exécution et le coût de planification opérationnelle est admissible en paiement des droits. Cela comprend les coûts :

- de négociation et de préparation de contrat visant la réalisation des travaux sylvicoles ;
- de recherche, de délimitation et de réalisation des inventaires avant traitement des secteurs d'intervention ;
- de supervision générale et de suivi de la qualité des traitements sylvicoles ;
- de réalisation des inventaires après traitement, de mesurage et de numérisation des superficies traitées ;
- de cartographie et de préparation des rapports d'exécution des traitements et des autres activités.

Malgré cet ajustement à la grille de taux, tout n'est pas réglé pour les entrepreneurs sylvicoles : le défi sera maintenant de s'assurer que les crédits alloués aux travaux de planification et de suivi reviennent

vraiment à ceux qui les ont réalisés. Pour cela, l'AETSQ a proposé un mécanisme de suivi des paiements : les crédits payés aux industriels ne devraient être donnés que sur le dépôt des factures et preuves de paiements de l'exécutant des travaux de planification et de suivi. Selon ce qui se pointe à l'horizon, une autre période de consultation devrait avoir lieu à ce sujet d'ici l'automne. Mais avec un mécanisme de suivi approprié, les exécutants des travaux de planification et de suivi devraient être rassurés. C'est à suivre.

Par ailleurs, d'autres demandes ont été accordées aux entrepreneurs sylvicoles ce printemps. Entre autres, le 10 % payé par le bénéficiaire (ticket modérateur) demeure uniquement pour les travaux réalisés pour le rendement annuel et les travaux inscrits et identifiés au CAAF (la réelle recette de base). Par contre, le 10 % est aboli (autant pour la planification que l'exécution) pour les travaux favorisant la protection ou la mise en valeur des ressources du milieu forestier. De plus, les plantations 45 cavités, PFD et regarnis ont été indexés, tel que demandé.

Pour 2006, le ministre n'a pas indexé le taux pour les camps forestiers tel que souhaité. Par contre, il semble ouvert à le faire prochainement et l'avenir nous dira si nous pourrons le convaincre de cette nécessité. De plus, les entrepreneurs souhaitent ardemment que soit admissibles d'autres types d'hébergement dans l'allocation des camps.

Somme toute, certains pas importants ont été franchis ce printemps... mais il reste encore et toujours des points à améliorer pour les entrepreneurs sylvicoles québécois.

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QUEBEC

TRANSLATION

by Solajo Couturier and Anne Moisan-Lapointe, Communications Co-ordinator, AETSQ

A “Hot” Spring for the Silvicultural Industry



The Quebec forestry industry has been in crisis for several months. The Minister of Natural Resources and Parks, Mr. Pierre Corbeil, has therefore taken advantage of the 2006 budget, tabled last March, to announce certain investments in the forestry sector, including some measures directed to the silvicultural community.

The Minister has thus acted upon some of the suggestions put forward by forestry organizations in Quebec that had criticized certain injustices suffered by silvicultural companies, such as non-payment for planning and follow-up work. For some years the charges incurred in the course of planning and follow-up have been constantly increasing, but were not taken into consideration in the remuneration for silvicultural projects.

In announcing grants of 925 million dollars, including approximately 200 million for the silvicultural community, the Minister clearly indicated his intention to support the forestry and silvicultural industry in Quebec. He then took advantage of these announcements to consult the industry about the specific changes required in the regulation with respect to forestry taxes, and the ministerial decree concerning the value of silvicultural projects eligible as payment of these fees (rate schedule). The AETSQ then submitted briefs explaining the problems involved and possible solutions. More precisely, the association asked that planning expenses be admissible as tax credits (and that this eligibility be clearly set out in the rate schedule). The AETSQ also asked that a follow-up and accountability

mechanism be set up for payment of both the planning and execution of projects, that the financial contribution of 10% by CAAF contract holders be eliminated (reduction credit), that the allowance for forestry camps be indexed, that other types of accommodation be eligible for the camp allowance, and that 45-cavity plantations, PFD, and restorations be indexed. This list may seem excessive, but the silvicultural industry has been left to its own devices for a number of years and a massive catch-up is now necessary.

After several months of negotiation, the AETSQ and the other silvicultural associations have been heard on one of the most important points: planning and follow-up work are now separated from execution, and the cost of operational planning is eligible as payment of taxes. This includes the following costs:

- negotiation and contract preparation preceding silvicultural work
- research, delimitation and inventory preparation before the relevant areas are treated
- general supervision and follow-up regarding the quality of silvicultural treatment
- preparation of inventories after treatment, measuring and computer entry of the surfaces treated
- mapping and preparation of reports on completion of treatment and on other activities

Despite this adjustment to the rate schedule, everything is not yet settled for silvicultural contractors. The challenge now is to be assured that the credits granted for planning and follow-up work actually return to those who did the work. For that purpose the AETSQ has proposed a procedure to track payments: credits paid to companies should be paid only on presentation of invoices and proof of payment by the agent who carried out the planning and follow-up projects. According to all indications, another period of consultation will have to take place on this subject between now and the fall. But with a suitable tracking

procedure, contractors who carry out planning and follow-up projects should be reassured. That remains to be seen.

In addition, other requests by silvicultural contractors have been satisfied this spring. Among these, the 10% payable by the recipient (reduction credit) remains in effect only for work done to increase the annual yield and for work registered and recognized by the CAAF (which is the real revenue base). On the other hand, the 10% charge is abolished (with respect to both planning and execution) for work that contributes to protection or enhancement of the resources of the forestry sector. Furthermore, 45-cavity plantations, PDF and restocking have been indexed as requested.

For 2006, the Minister has not indexed the rate for forestry camps as we had wished. He appears, however, open to the idea of doing so in due course, and the future will tell whether we can convince him of this need. In addition, contractors are anxious to see other types of accommodation approved for the camp allowance.

In summary, certain important steps have been taken this spring, but there are still, and always will be, improvements to be made with respect to Quebec's silvicultural contractors.

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NEW BRUNSWICK

DEPARTMENT OF NATURAL RESOURCES

by Craig Frame, Silviculture Forester



As in other provinces, regeneration following harvest is becoming a hot topic within New Brunswick forestry circles, particularly on crown land. There are many facets to the discussion, from ecological and economic to operational, and solutions often seem interconnected and complex. The eventual outcome of this dialogue may lead to changes that affect where and how much planting can occur on crown land.

The current situation in New Brunswick has evolved over the past 25 years. Planting levels are set every 5 years within the forest management planning process. Natural regeneration patterns are predicted within these forest management plans. During the planning process, the level of planting is determined based on its ability to support various timber, forest cover type, and wildlife habitat objectives. The planting level is limited by government funding and policies that promote the protection of natural softwood regeneration on softwood sites, and of hardwood regeneration on hardwood sites.

The ecological discussion centres on the nature, size and distribution of various forest types within the province. Of particular interest is the Acadian forest. The New Brunswick government has contributed to the discussion by forming a Forestry Task Force, chaired by Dr. Thom Erdle of the University of New Brunswick, part of whose mandate is "To develop a broad set of practical forest management alternatives for crown land. These alternatives must allow a healthy wood supply for all commercial species, yet retain characteristics of the Acadian forest." How plantations will fit into a view of the New Brunswick crown forest that emerges from the work of the task force should be clearer when their report is finished at the end of 2007.

The economic situation was made

somewhat clearer when the government committed stable funding for silviculture on crown land amounting to \$105 million between 2007 and 2012. The remaining dialogue includes issues such as a process to ensure that plantations are established on sites that provide the best economic return while respecting existing policies and objectives.

One of the operational issues relates to the development of tools that tightly link the forest management plan level strategies to actual planting site decisions. These tools should allow areas to be ranked on their suitability to grow softwood and on their productivity. It would then seem most desirable to first plant those sites that were highly suitable for softwood and highly productive. Funding levels would seem to be the factor limiting area treated when moving from high to low site productivity, and ecological factors would limit planting levels when moving from high to low softwood suitability.

All of these various dialogues must lead to an integrated solution that will fit into the 5-year management planning process. While there is currently no formal mechanism in this framework that would allow this to happen, the realization that one is needed, and the relatively short time left to prepare for the development of the 2012 management plans is quickly focusing attention on this issue.

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NOVA SCOTIA

SILVICULTURE CONTRACTORS ASSOCIATION

by Alan O'Brien

Things have been rather quiet here on the silviculture homefront. Nova Scotia has been on the receiving end of much higher than usual amounts of precipitation, putting a damper on the plans of many contractors.

After a 178-day lockout, just over 50% of STORA employees at the Point Tupper mill in Cape Breton recently voted to accept the contract offered by management. Although this ratification ends the lockout, employees will remain off the job unless the NS Utility & Review Board approves a long-term, stable electricity rate for large industrial users such as STORA. A decision is expected soon. The lockout effectively halted the mill's purchase of private round wood, significantly impacting silviculture funding and leaving eastern contractors grasping to hang on.

The NS Silviculture Contractors Association held their annual general meeting in May and voted to hire a lobbyist to work

on behalf of the province's contractors. The association had a tentative meeting scheduled with the Minister of Natural Resources, however, since the June 13 provincial election and a cabinet shuffle, we now have our third Minister in 12 months. David Morse replaces Brooke Taylor in this post, and we again look forward to meeting with him once he familiarizes himself with the portfolio.

The Department of Natural Resources has held public information sessions on an outbreak of pale winged gray moth in Queens County. The insect, native to this area, is damaging hemlock trees in the western end of the province. Although much of the damage has occurred within Kejimikujik National Park, DNR surveys have also confirmed damage on private properties approximately 13 km outside of the park. When the population of pale winged gray moth is high, trees can be completely defoliated and killed within 2 years. DNR plans to monitor the spread of this current outbreak.

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by Ken Mayhew

Climate Change

While many Islanders enjoyed last winter's warmer than normal temperatures, many maple syrup producers were scratching their heads and wondering when to start tapping their trees. The springlike temperatures meant that maple sap started to flow in early winter in many areas. Some producers had to gamble on whether or not this was the start of the season, or if it was still a few months off in the normal March and April tapping season.

Island maples also showed signs of coming out of dormancy earlier than usual. Reports from across the province indicated that maple buds were standing out from the twig and that both species were showing the red flush of spring in early February. Most producers waited until March to tap their trees, but they also kept their fingers crossed just to be safe.

While this year's winter does not provide proof that climate change is occurring, there are signs that something is changing across the Acadian Forest region. Forest researchers are trying to determine climate trends and predict the consequences to enable forest managers and society to prepare for, and if possible, minimize potentially negative outcomes. The results of this research may help the Island to focus and improve silviculture and planting programs to better reflect the new realities brought on by predicted climate change.

Last summer, staff from the Department of Environment, Energy and Forestry began a survey to determine which non-native tree and shrub species have been successfully planted on PEI, where they are growing, and how they are performing. The 2005 survey mostly focused on the Charlottetown area, and found many non-native species such as sequoia, tulip tree, hickory, and locust as well as several oak and fir species. Most of them were planted as



ornamentals in parks, lawns, and gardens over the last several decades. Each tree was assessed to determine how well it was doing in terms of growth development and health. This information will be used to determine if a warmer climate may make PEI hospitable for more southerly species.

Another research project looked at tree rooting depth to determine how far down the roots of Acadian Forest species can reach in order to access water. The shallow nature of Island soils combined with the adaptation of many Acadian Forest species to northern growing conditions, has led forest researchers to conclude that most trees have root systems which only go down about 60 cm. However, the 2005 study found

that on 2 Island soil types, maples, birches, and white spruce had root systems that penetrated 2 to 3 or more metres down. This means they have the ability to access deep-water sources and thus may be better able to withstand periods of drought than was previously thought.

Climate change seems to be a reality, but just what the short and long term implications are is yet to be determined. However, some forestry programs are exploring options related to climate to try to buffer future impacts.

For instance, the department's Hedgerow and Forest Enhancement (silviculture) programs are looking at increasing the percentage of climate change resistant species included in their planting efforts. By expanding the planting of beech, ash, and red oak across the Island, these programs could establish seed sources for native species that are expected to do well under warmer climate conditions. As more information becomes available, PEI's silviculture programs could also focus on favouring these species for their climate change resistance properties.

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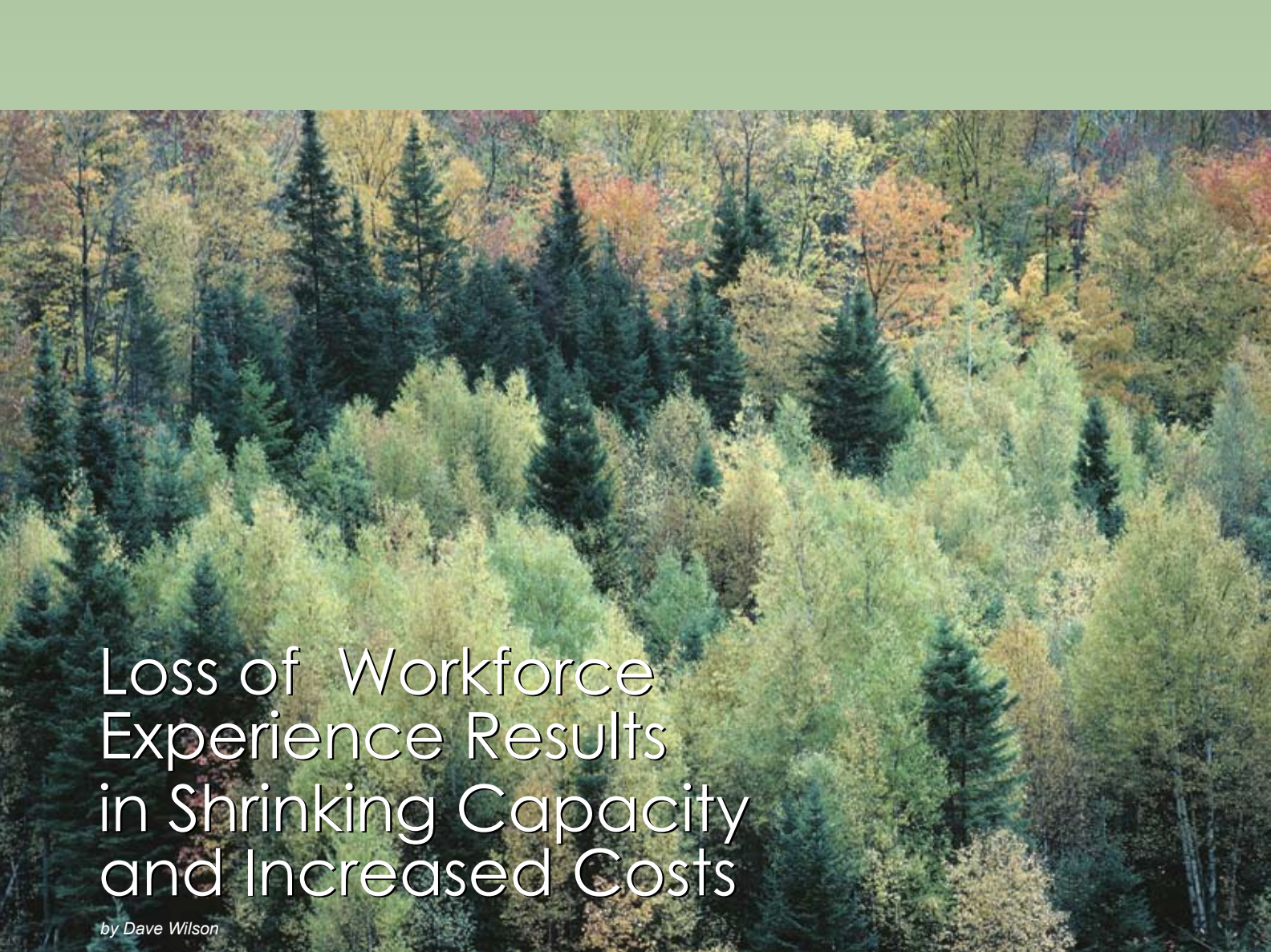
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Loss of Workforce Experience Results in Shrinking Capacity and Increased Costs

by Dave Wilson

Canada is facing a skills and labour shortage that will require industry and government to come up with some well thought-out strategies to address the demand for future workers in both the short and long term. The same is true for the forest industry in general. However, the silviculture component of the forest sector in BC and Alberta is facing a series of labour challenges that are quite different from the rest of the country, and may have already impacted the industry's capacity to deliver silviculture services in the future. Silviculture contractors and their experienced workers, who deliver 90% of the ground-based silvicultural activities in BC and Alberta, are leaving the industry in increasing numbers.

Over the last 10 years, as the forest industry has faced declining lumber prices, rising logging costs, and trade tariffs, there has been substantial pressure to lower mill delivered log costs. As part of that process, reducing silviculture costs has been a focus of most woods managers. With aggressive price setting, and sometimes heavy-handed

negotiating tactics, woods managers have kept the price of silviculture services down. Competitive bidding amongst contractors on fewer, larger contracts, where the consequences to contractors of not being the successful bidder might mean not working at all, has also contributed to price declines. All this has been happening in a period when operating costs have been continually rising.

Since wages and benefits are the biggest component of silviculture contractors cost structure (67-70%), contractors have cut wages in order to stay in business. The net result is that over the last 10-15 years wages have declined or remained static, while wages in other parts of the economy have risen, in some cases dramatically.

In BC and Alberta the oil and gas, mining and construction industries are operating at full capacity and are experiencing such dramatic shortfalls of labour that wages have risen precipitously. These industries have embarked on national recruitment initiatives to find workers to meet their needs. They have also come to recognize

that BC and Alberta's approximate 12,000 silviculture workers represent a substantial source of labour that not only has an extraordinary work ethic, but is also "bush ready", generally well educated and highly trainable. Many of the silviculture industry's most prolific performers have already been recruited by the lure of better wages, probably never to return.

The bottom line is that the silviculture industry no longer has the lure of being able to pay top wages for a season in the bush. It has become too much work for too little pay, especially when working conditions are considered. Working on construction in Calgary, Edmonton, or Vancouver, or on the rigs in Fort McMurray or Fort St. John for better wages while living in town far outweighs what silviculture has to offer. Retaining experienced silviculture workers, so critical to the success of the industry, has become a losing battle.

While all industries are competing for workers against rising resource sector wages, what makes this situation different is that the silviculture sector has experienced

a decline in wages that makes it difficult to retain experienced workers. Contractors are not experiencing a labour shortage. It is rather a loss of productivity from an inability to retain experienced workers that severely limits their capacity and drives their costs up. As a result there have been some dramatic shifts in worker efficiency, workforce composition and worker safety.

The most serious and immediate change has been the rapid increase in the number of inexperienced or green workers brought on to replace lost experience. It is estimated that the number of green workers is somewhere in the 65-70% range in the sector, greatly increased from the 35-40% range of 5-10 years ago. Some companies are operating with up to 90% green workers to meet their production time lines. The number of long term or career silviculture workers that used to make up 40-50% of the workforce has fallen to just less than 25%.

Since green workers generally produce at about 1/2 to 2/3 of the rate of experienced workers it stands to reason that silviculture costs will rise substantially as more equipment, vehicles, fuel, and groceries will be needed to mobilize them. Contractors have experienced a dramatic increase in the real costs of fuel and vehicles prior to the commencement of the 2006 season. These cost increases are amplified by the need to carry and transport many more workers to offset the loss of experience. It also stands to reason that if this trend continues, there will be an increase in the number of new workers needed for future work, and yet another decline in worker productivity.

The average age of the silviculture workforce has dropped from around 27 years of age to approximately 23. Younger workers require extensive and costly training to get them up to speed and to get them working safely in the bush. With the loss of many multi-seasoned experienced workers, much of the mentoring capability that is critical to keeping increasingly younger crews working safely has been lost. This is coming at a time when the forest sector's injury and death statistics in BC are at a 25-year high. Although the silviculture industry is generally very advanced in health and safety, it is yet to be determined how the drop in age will play out on the ground.

One curious factor that may help to mitigate this situation is a sudden change in workforce gender proportion. Women, who used to represent about 20-25% of the silviculture workforce 10 years ago now make up approximately 35-40%. They are statistically less likely to have a workplace accident when doing the same work as men.

Just as serious a change is the continued loss of key employees and managers. The success of silviculture projects is carried squarely on the shoulders of its experienced supervisors, foremen, and crew bosses. These managers are highly skilled with 10-20 years of silviculture experience, and are capable of responding professionally to rapidly changing circumstances in remote sites with limited resources at their disposal. Although they tend to be the highest paid silviculture sector employees, their wages have remained stagnant over the last 10-15 years. They are highly sought-after by other industries, and many have been recruited and have made the move. Once that experience leaves, it is lost to the industry and will take many years to re-grow.

Perhaps the biggest potential loss to the industry is the depletion of entrepreneurial expertise itself. Most silviculture contractors work very closely with their workers, having developed symbiotic relationships that are a model to the rest of the forest industry. As profit margins have declined and the "hassle factor" of being sandwiched between demanding clients who want cheaper prices and unhappy workers who want increased wages, many contractors are looking at other industries. Rather than have their

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disgruntled workforce gradually poached away, many are actively engaged in courting those industries and leading their workforce to an easier industry to work in.

This loss of experienced silviculture workers, managers, and silviculture firms is coming at a time when the demand for silviculture services is about to increase dramatically. It is estimated that there will be 30% more seedlings to plant in 2007 in BC and Alberta. Increased cut levels to deal with the mountain pine beetle epidemic in BC have made their way through the system and onto the ground. Alberta will soon be dealing with a similar situation as the mountain pine beetle inevitably crosses the Rockies into Alberta. After 7-8 years of dangerously low levels of government expenditure on silviculture, funding is on the increase. The Forests For Tomorrow program is coming online in BC and new levels of silviculture funding are promised through combined federal and provincial programs for both provinces.

The BC "reforestation ratio", against which the Forests For Tomorrow program is being developed, is a good measure of the silviculture spending required. It is a calculation of the number of hectares harvested and lost to fire and pests versus the number of hectares reforested. The provincial commitment is to have it at 1, where disturbance losses equal reforestation.

The BC Forest Service's own Service Report from 2004 states the reforestation ratio has fallen below 1 to .84 (84% of denuded areas are being reforested). The number does not include the hectares of the fires of 2004 and 2005 nor all the hectares of mountain pine beetle that have not been reforested. The real ratio is likely nearer to .65 and growing smaller with each subsequent year. When you add the requirement to make up the backlog of annual missed treatments

you get a sense of the background market against which the labour trends are taking place.

The combined loss of experience and future capacity combined with the increase in silviculture funding could create a very unstable situation for the forest industry. It is highly likely that some 2007 scheduled silviculture work will not be able to be completed due to lack of industry capacity. There will likely be substantial corresponding increases in the cost of providing silviculture services as the market moves from a silviculture service buyers market to a service providers market.

These circumstances have just played out on the ground in the 2006 spring season. While it appears that at press time there were no major silviculture company collapses, many contractors are reeling from the sudden increases in fuel, vehicle, and operational costs that were amplified by the sudden departure of experienced workers this field season. It remains to be seen if silviculture companies have "ripped up the floor boards to heat the house" and if they will remain viable by year's end.

There is an understanding at the senior management level that it is in the long-term interest of the forest industry to deal with the silviculture capacity issue, even if it means rate increases. But there appears to be a reluctance to deal with it at the woods manager level, where the "money meets the ground". Silviculture contractors and their forest manager clients will need to find ways to work together to reverse the loss of silviculture experience before a permanent loss of capacity occurs. Failure to do so could result in a major collapse of capacity that will not sit well on the forest industry.

Dave Wilson is a board member of the Western Silvicultural Contractors' Association.

Industry News

Commercial Solutions Opens New Distribution Centre

Commercial Solutions marked its latest stage of growth by opening a new 40,000 sq. ft. distribution centre and branch office in Edmonton. The new facility has 6 bays, housing more than 35,000 different items supplied by over 400 manufacturers.

Jim Barker, President and CEO of Commercial Solutions Inc., said that he is confident the company will maintain its annual compounded growth rate of 16%, which it has enjoyed for the past 16 years. Explaining the growth of the company, Barker said that the company has made six acquisitions in the past ten years and each of these has played a role in diversifying the company, either geographically or sectorally. "Our practice of growing the company will continue," he added. "Earlier this month we concluded the acquisition of Excel Bearings in Ontario. While this was a relatively small purchase of a \$3.5 million company with ten employees, it provided us with additional visibility in the Ontario marketplace, and as such was strategically valuable."

Safety Solution for Remote Workers

All West Surveys is utilizing Globalstar Satellite Data Services and hardware by Alta-Comm Wireless Inc. to improve remote worker safety and meet the Lone Worker Alberta legislative requirements. The solution delivers detailed information on field crew location well beyond traditional cellular range.

Alberta Occupational Health and Safety legislation requires that companies are aware of their remote workers' locations at all times and that a viable communications device is present with workers in remote and dangerous conditions. Companies throughout Alberta are developing plans to help ensure their companies adhere to the legislation and avoid potentially costly penalties for breaking the rules.

Beyond the tracking features, the hardware was adapted by All West to provide a software system with additional tools such as truck-to-truck messaging, email to and from the trucks, SMS monitoring by the safety officer, field query of truck locations, conversion to local township coordinates and integration with the corporate GIS.

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The company also announced hardware price reductions on its GSP-1600 mobile satellite handset, the GSP-2900 fixed unit, and various major accessories. Globalstar is also introducing North American wide calling, which will eliminate roaming charges for those Canadian customers traveling to the US and Caribbean.

Focus on Safety

By Dave Lachance

Don't Get on the Wrong Side of This Cutting Edge



Chainsaws aren't exotic creatures in silviculture, but it's a mistake to let familiarity breed contempt and risk. With that in mind, here's a combination of a primer and refresher course with some basics on giving this power tool all the respect that both you and it deserve.

Do only what you know

Only use chainsaws you've been trained to run, and follow manufacturers' operating instructions. Always ask questions if you have any doubt about doing the work safely. This is your right and responsibility.

What to wear

When operating a chainsaw, wear clothing that protects you from scrapes and scratches and allows free movement - a long-sleeved shirt, comfortable pants and quality boots with ankle support and non-slip soles are recommended. CSA approved safety gear includes a hardhat, visor, and gloves as well as hearing, eye, hand, and leg protection.

Before starting up

Remove the chain guard, check for signs of wear and leaks around the engine, and repair or replace damaged, loose, or missing parts. Ensure the guide bar is tight, and adjust the tension if necessary so the chain fits snugly without binding. Be sure the chain is filed correctly and sharp for the cut you are attempting. Also inspect the air filter, muffler spark arrestor screen, and chain catcher.

Starting points

Engage the chain brake. With a well-balanced stance and secure footing, hold the saw firmly on the ground, and point it away from your body. Use a quick, sharp motion on the starter cord, and let the saw warm up. If the chain turns as the engine idles, stop the saw and adjust the idle. Ensure proper operation of controls like the throttle trigger, throttle trigger interlock, and master control lever.

Never start a chainsaw when:

- holding it in your hands, or letting any part of it touch your body
- you're within 3 metres of any fuel container, especially during hot weather

On with the job

Carry the saw with the bar behind you, and always know the location of anyone working with you.

When you cut

Maintain full power while cutting. Use a firm, 2-handed grip with fingers and thumb surrounding the handles. Keep both hands on the chainsaw and both feet firmly positioned. Don't let anyone else in the area distract you. Before moving from one cut to another, make sure the chain has stopped, unless the next cut is in the immediate area.

Never operate a chainsaw while:

- standing directly behind the saw or holding it above waist level
- adjusting the chain or guide bar
- the engine is backfiring
- sharpening the chain

Running dry?

Before refuelling, allow a hot chainsaw to cool for 2 or 3 minutes. Check the fuel line and tank cap connections for leaks. Follow the manufacturer's recommendation for the gas-and-oil mixture, preparing it in a well-ventilated area with a fire extinguisher nearby. Use a funnel or spout to fill the tank from an approved fuel container. Afterwards, tighten the tank cap, and wipe any spillage from the engine.

Never refuel when:

- standing near ignition sources
- you're smoking

Maintenance

Safe, trouble-free chainsaw operation requires proper maintenance according to manufacturer's guidelines and instructions. Wear appropriate gloves when keeping the chain properly filed for smooth cutting, and fit the file with a handle to prevent puncture wounds from the tang.

Dave Lachance is a Worksafe BC Forestry Industry Specialist.



How to Tread Lightly, Save Money & Still Get Your Work Done

by Mark Gollner, RPBio

How would you like to save money, get your work done more efficiently, work in healthier conditions, and have less negative impact on the environment? Sounds interesting, doesn't it? Many of the ideas that we will discuss here may have crossed your mind before, but have never made it further than that. In this time of high fuel costs, the increasing cost of equipment and supplies, a more competitive business environment, and the desire to tread lightly on the land, air, and water, we should all be trying to do our part instead of just thinking about it.

How many of you think that Smart Cars are for less macho people? Well, those people may be less macho than you (in your mind), but they are also putting more money into their pockets than you are! With an average of 55 mpg, compared to the 15 mpg (maybe) that you get in your truck now, saving money would be an obvious advantage. Now you are asking, "How the heck do I get 4 people and all my equipment into one of those puny German imports?" That's right, Smart Car is made by Mercedes in Germany. Well, although there isn't a Smart Car available right now that would be a good substitute for your current work truck, there are other vehicles available that have better fuel mileage.

How about that monstrous 1 ton, crew cab, V8 turbo-charged work truck that you drive? Spending an hour (or less) and likely less than \$100, you can probably save yourself many hundreds of dollars in improved fuel economy, less downtime dealing with breakdowns in the field, and possibly thousands less for a more modest vehicle. It is as simple as replacing a dirty air filter, doing an oil and filter change, checking that all of your tires (yes, even

your spare tire) have the correct air pressure. Even unloading any unneeded gear, junk and supplies that are growing roots in the back of your truck will help. By doing this, you can improve your gas mileage by as much as 10-15%.

For a more modest vehicle, the Toyota 4-Runner (that we have been using for over 14 years now, with over 350,000 km, averages about 15 litres /100 km or 20-25 mpg. As you see from the photo, we have had this truck through some pretty tough terrain.

Another option is the new (and very cool) FJ Cruiser. It seats 5,



has a V6 engine, lots of torque, and takes you back in time to those retro 70s days, while offering reliability and economy. The MSRP on this truck is only about \$35,000!

For those of you who live and work in Ontario, there is actually a tax credit for fuel conservation (TCFFC) that could save you hundreds or even a thousand dollars or more when you purchase or lease a new vehicle. Information about this can be obtained from the Retail Sales Tax Branch of Ontario. Unfortunately, in BC there are no such tax credits available, but then again, helping to reduce impacts to the environment should be incentive enough!

Diesel-powered trucks have their place well rooted in the silviculture industry. They generally have reduced fuel consumption, are better for hauling heavy loads or towing heavy trailers, and some say they require less maintenance than a gas engine. That being said, there are still ways that you can do your part to help those trees grow that you may have just finished planting. Currently all on-highway diesel fuel sold in Canada contains less than 500 parts per million (ppm) sulphur. However, if you use off road diesel fuel in your truck (generally used for farm equipment, heavy machinery, etc.) then it currently has 5,000 ppm sulphur. As of September 1st 2006, all gas stations will be required to have diesel fuel with less than 15 ppm sulphur. So, do your part and be sure to use the diesel fuel with the lowest sulphur concentration.

How about an alcohol-powered chain saw, brush cutter, or trimmer? Sound crazy? Well maybe not as crazy as you might



think! There are alcohol-powered chainsaws available but they are generally used for chainsaw racing, and are not likely suitable for work purposes, as after about 1 hour of use the engine melts! Not so good if you have more than 1 hour of work to do! Something more reasonable that you can do to reduce environmental impact is to use an ethanol blended fuel (like Mohawk 15% Supreme). If you like new technology then you should check out www.stihlusa.com/chainsaws to see the latest MS 441 STIHL Magnum chainsaw. It boasts a 15% reduced fuel consumption that can save you \$0.20 per hour or more if you burn a litre of fuel per hour.

You can also seriously consider using vegetable-based chain/bar oil instead of the conventional hydrocarbon-based oils. To check out this product go to www.greenoil-online.com. Then again, to really go green you could break out the old cross cut saw and have



your workout at the same time as getting your work done.

The same theory applies when thinking about that new 700cc monster quad that you just bought. How about using a smaller (and quieter), more fuel efficient 350cc or 500cc quad. Your work

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a number of developing and industrialized countries are

extremely vulnerable



isn't likely going to get done any faster and you aren't going to get to the jobsite any quicker with those extra 200-350cc of engine! The TRX 350 that we use to do our forestry work has seen some pretty nasty terrain and even transported 4 people and gear all at once.

Regardless of what size quad you have, you can reduce emissions by using an ethanol blended fuel. Although this fuel is a few cents per litre more than conventional fuel, you will be doing your part to help slow the melting of the polar ice caps.



As an alternative fuel, how about LPG (Liquid Propane Gas) or even diesel fuel for your quad? In doing the research for this article, we came across some very interesting information on propane powered ATVs in England. The Calor company has a conversion kit available for Honda and Yamaha ATVs that can save you as much as 60% on fuel bills! This is definitely something worth checking out, especially if you already have other LPG powered vehicles in your fleet.

Now, to put some theoretical numbers to some of the suggestions outlined above, a typical company that owns 3 trucks and 6 ATVs could potentially have the following savings:

Vehicle	Fuel Consumption			Fuel cost	
	mpg	litres/100km	Litres Consumed		
F350 Crew (4x4)	14	16.8	3360	\$ 4,032.00	\$ 50,000.00
Toyota 4 Runner or Tundra (4x4)	22	10.7	2140	\$ 2,568.00	\$ 40,000.00
				Savings \$ 1,464.00	\$ 10,000.00

Based on an average 20,000 km driven per year. \$1.20 per litre for gasoline. Vehicle prices based on MSRP price info.

Vehicle	Fuel Consumption			Fuel cost	
	mpg	litres/100km	Litres Consumed		
700cc ATV (4x4)	30	7.8	390	468	\$ 12,000.00
350cc ATV (4x4)	50	4.7	235	282	\$ 8,000.00
				Savings \$ 186.00	\$ 4,000.00

Based on an average 20,000 km driven per year. \$1.20 per litre for gasoline. Vehicle prices based on MSRP price info.

Vehicle	Savings	
	Mileage	Vehicle Purchase
3 trucks	\$ 4,392.00	\$ 30,000.00
6 ATV's	\$ 1,116.00	\$ 24,000.00
Sub-total	\$ 5,508.00	\$ 54,000.00
TOTAL POTENTIAL SAVINGS		\$ 59,508.00

Obviously, if you have more than 3 trucks, 6 ATVs, drive more than 20,000 km per year, or choose a vehicle that is used and/or not as expensive as the ones listed here, you can save even more money. Even if you are leasing your trucks, there would be a considerable cost savings by leasing a vehicle that has a lower sticker price.

One final note, what about the aerosol bug spray that you baste yourself with before venturing outside the comfort of your vehicle? Have you ever considered bug lotion or cream to reduce ozone/aerosol effects? Well if not, then there is no time like the present. Then again, you could do like I do and not use any bug repellent at all and just let the mosquitoes bite you and donate blood to the worthy cause of increasing the mosquito population!

Mark Gollner, RPBio is with Marlim Ecological Consulting Ltd. He can be reached at 604-531-4338.



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Forest Health

by Richard A. Fleming

Insects are Responding to Climatic Change

Insects are the world's most diverse class of organisms and as such they play a major role in the well-being of most natural and human-managed ecosystems. Climatic influences on insect populations can be both positive and negative, direct and indirect, and obvious and subtle, so understanding how climatic change might influence insects in Canada's forests is a daunting challenge. This article focuses on the direct influences and evidence that some insect populations are already responding to climatic change. A future article will discuss indirect influences and forecasting how forest insect populations are likely to respond.

In discussing climate change, we focus mainly on temperature, the climate variable for which there is most confidence in future predictions and for which evidence of effects on insects is most plentiful. The potential rate of increase of many insects is strongly dependent on temperature, and their survival is impaired at temperature extremes. Changes in both mean temperature as well as the extent and frequency of extremes can hence have major impacts on insect populations. It is also important to recognize, however, that climate change involves much more than just changes in temperature. Rainfall, snowfall, humidity, wind, and cloudiness are among the other climate variables expected to change, and atmospheric chemistry (e.g., CO₂ levels) will also be affected. In addition, even where each of these variables is well within their historical ranges, their combinations (interactions) may present forests and their insects with environments never experienced before.

In Canada, where temperatures affecting physiological processes tend to be below optima for most insect species for most of the year, temperature increases will likely accelerate these processes thus causing faster development, more activity and movement, reduced mortality from climatic factors, and possibly even more generations in a season. Where life-cycle events are controlled by temperature, they may be expected to occur earlier in the year, and higher temperatures are likely to facilitate extended periods of activity at both ends of the season, subject to constraints that other factors such as day length and drought might impose. Warmer conditions may also be expected to promote the poleward extension of the range of species currently limited by low temperature, or the altitude at which they can survive. A 2°C rise in temperature, which is expected in northern temperate latitudes over the next century, is equivalent to shifting current conditions 600 km north or 330 m up in elevation. This amounts to average rates of about 6 km northward and 3.3 m upward per year, but much variability around these averages can be expected. Most insects could easily follow such shifts, but many of their host plants may not, so it may be the spread of their host plants that limits the spread of some insect species. On the other hand, spreading insect species may come into contact with new potential hosts, and these hosts may already be under some (e.g., climatic) stress, and hence less able to defend themselves from these new invading insect species.

There is evidence that many insect populations may already be starting to respond directly to climate change. In 1994, I published results showing that the seasonal flight periods of 5 important aphid species covered by Britain's long-term data sets were occurring earlier in more recent years, as one might expect in a warming climate. Evidence of faster development rates has since been shown from all the long-running insect datasets in the UK.

There is also evidence of changes in range, which are consistent with climate change. A study of data over the last century on the northern limits of the ranges of 35 non-migratory, European butterfly species showed that 63% of these northern limits have moved north, 34% have changed little, and only 3% have retracted southwards. Together, the limited spatial and temporal resolution of the surveys for, and the long outbreak cycles of, many forest insects (e.g., spruce budworm) have so far obscured any clear signal of climatic change effects in the survey data. Mountain pine beetle is the major exception: it has moved north and east, killing trees where it has never reportedly done so before. The availability of extensive swaths of vulnerable host trees is a contributing factor, but clear evidence of climatic change effects have been reported.

This evidence of climatic change effects is largely restricted to agricultural and grassland insects, but there is no reason for their response to climatic change to be substantially different from that of forest insects. This evidence is also limited in that it consists of correlations of observed patterns with model or theoretical expectations. The free air carbon enrichment (FACE) program exposes insects to a variety of atmospheric chemistries in agricultural and forest settings. Unfortunately, the broad relevance of this approach is currently limited by its small scale, high cost, and lack of climatic (e.g., temperature, rainfall, humidity) control on the treatments the insects are exposed to. It remains an enormous logistical challenge to conduct the manipulative experiments necessary to establish causation by climate change rigorously. We know of no such experiments to date which may anticipate forest insect climate responses like the bark beetle.

Richard Fleming is with Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Centre. He can be reached at rfleming@nrccan.gc.ca.

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