This package contains examples of good answers that were submitted for t portion of the 2010 RPF registration exam. Although the answers were chosen as the two better answers submitted in 2010, take note of the score each answer received and be advised that answers may contain errors. Please note that the examples do not conform to the criteria and formatting outlined in the exams procedures.

Table of Contents

Question 1 (30 marks)

There is considerable interest in development of a bioenergy sector in British Columbia, and discussion regarding fibre supply for this sector. Sources of feedstock may include harvest residues and wood from stands killed by natural forces (e.g. mountain pine beetle). In terms of your responsibilities as a professional forester what do you believe are the most important issues surrounding development of a bioenergy sector? Why are these important? If you had an opportunity to influence policy on this initiative, what would you recommend and why?

Answer 1 (scored 95)

A Balancing Act: Developing a Bioenergy Sector in B.C

TABLE OF CONTENTS

1.0 INTRODUCTION

Forests have long been an important resource for British Columbia's (B.C.) economy. Like most natural resources, they are in a constant state of change. As these changes occur, our forests come under greater pressure to fulfill the social, economic and environmental needs of society, now and in the future (Richardson *et al.*, 2002). These pressures have increased even more in light of the recent Mountain Pine Beetle (MPB) outbreak and growing concern over climate change. The challenge now is to find ways to gain economic recovery from our forests while also maintaining the balance between the environmental and social aspects. In response to the changes our forests and environment are going through, B.C. has created the B.C. Bioenergy Strategy (2008) that looks to recover maximum value from our forests and MPB damaged timber while helping to address climate change through the development of a bioenergy[1] sector in B.C. With increased interest in this sector and shifting priorities and uses from the forest, a whole new set of opportunities and challenges emerge. Opportunities to utilize timber and waste for purposes other than traditional lumber products are abundant (Hayden, 2010),but along with these economic opportunities also come the issues with managing the social, economic, and environmental sustainability of our forests.

There are a number of issues that need to be considered and addressed in regards to a bioenergy sector in B.C.: pricing and revenue, harvest and transportation costs, impacts on timber supply and annual allowable cuts (AAC), fibre supply, sustainability and environmental implications, just to name a few. The objective of this paper is to look at some of the important issues that a forest professional will face in regards to the development of a bioenergy sector in

[1] Bioenergy – for the purpose of this paper refers to the creation of energy from biomass sources such as sustainable forestry and Mountain pine beetle timber.

B.C. This paper will touch on a few of the aforementioned issues, and explain why these issu are important to forest management. It will also recommend some policy initiatives to help minimize the impact of these issues and also give reasons as to why these initiatives are recommended.

2.0 BACKGROUND

2.1 Situation in BC

A number of initiatives have occurred recently in regards to bioenergy in B.C. With the government's announcement of the BC Bioenergy Strategy in 2008, in support of the BC Energy Plan, awareness surrounding the natural resource advantages that are unique to B.C and the use of sawmill residue, logging debris and beetle-killed timber to reduce impacts of the mountain pine beetle infestation (MEMPR, 2008) have come to the fore-front of everyone's mind. Using wood fibre to create pulp and paper products in B.C. is not new, however, the commercial use of woody biomass and fibre for energy production, is a less common but increasingly popular topic (Stennes and MacBeth, 2006). B.C has about 9 million hectares of forested landbase that has been affected by the MPB outbreak (Westfall and Ebata, 2009) which gives us a unique opportunity to be a lead in the bioenergy industry (Mohammadhossein *et al*., 2009).

The increased interest in bioenergy can also be seen in the recent changes to our forest legislation. Policy changes to the *Forest Act* (Sections 13.1 and 13.2) and the more recent change to the scaling requirements of the *Forest Act* in March of this year encourage utilization of low-grade timber and wood waste for bioenergy purposes (MFR, 2010a). These changes only verify that bioenergy is a big part of the way society looks at forestry today and how we will continue to look at it in the future. As we slowly move towards finding new ways to achieve sustainable production, and reduce waste, vehicle emissions, and green house gases (Sims, 2003) greater

pressure is being put on our forested ecosystems. While interest in this sector increases and policy and legislation changes begin to occur, there is increasing importance on determining what the results and effects of this new sector will have on our forests and other values that are important to society.

3.0 DISCUSSION AND ARGUMENT

3.1 Development of a Bioenergy Sector in B.C. - Important Issues

Under section 11.3.1 of the Association of BC Forest Professionals *Code of Ethics*, forest professionals are "to advocate and practice good stewardship of forest land based on sound ecological principles to sustain its ability to provide those values that have been assigned by society" (ABCFP, 2003). The 11 resource values identified under Section 149 of the *Forest and Range Practices Act* (FRPA) (2004) are indicative of the values that are most important to society. Therefore, even more emphasis should be placed on advocating a stewardship approach to managing and balancing those values and understanding the responsibilities surrounding the implications and pressures that a new sector such as this can have.

3.1.1 *Biodiversity and Environmental Implications*

One of the main issues with development of a bioenergy sector in B.C. is in regards to its impact on biodiversity and the environment. As interest in a bioenergy sector increases so does the pressure and potential risk of impacts to our forested ecosystems. There is the potential for a conflict between the fuels (dead wood) used for bioenergy and biodiversity (Day, 2010) and impacts can occur to a whole array of environmental factors such as soil and site productivity, wildlife, hydrology (water quality), landscape biodiversity (tree retention), and coarse woody debris (CWD) management if bioenergy is not managed appropriately. The impacts on CWD, soil and site productivity, and landscape level tree retention specifically will be discussed here.

Coarse Woody Debris As stated in the Chief Forester's Guidance on Coarse Woody De Management (Snetsinger, 2010), "coarse woody debris is often seen as a source material for new products". Debris that would otherwise be left to meet biologically preferred CWD levels has the potential to be targeted as a fuel source for this developing sector. As interest in bioenergy increases in B.C. it is important to address the management of CWD at the stand level as well as the landscape level because of the impact it has on soil productivity, forest productivity, tree growth, ecosystems and habitat (Snetsinger, 2010). As forest professionals it is imperative to balance CWD on the landscape to ensure the future productivity and health of our forests and to maintain many of the other values that are associated with CWD on the landscape.

Soil and Site Productivity Utilization of forest residue for bioenergy may target and remove large quantities of dead wood from the forest which could impact the long-term productivity and biodiversity of the forest (Richardson *et al.*, 2002) and would ultimately effect the ability to maintain ecosystem integrity over the long-term (Arsenault, 2002). The removal of deadwood, downed wood and slash for bioenergy purposes also affects soil and site productivity in regards to site regeneration (i.e. lack of suitable micro-sites for seedling regeneration), and reduction in plant growth rates (Lattimore *et al.*, 2009). It is important to maintain CWD at the stand level as we may not see the immediate impacts of a loss of soil and site productivity over the short-term but rather over the long term. Over the landscape level, this ultimately could have a significant impact on our timber supply for the future.

Landscape Level Retention The effects of a loss of biodiversity at the landscape level is also an issue as standing dead MPB attacked timber is looked at as a fuel source. This puts pressure on the landscape as these stands that are beyond economic harvest for traditional timber production, and that would otherwise be left as retention, are now suddenly a potential fuel

source for the emerging bioenergy sector. Lattimore *et al.* (2009) state that the potential environmental impacts of woodfuel production systems on forest biodiversity at the landscape level are a decrease in area and diversity of forest cover with excessive gathering of dead and downed wood as the contributing factor. With the development of this sector in B.C it is also imperative to keep in mind the Chief Forester's Guidance on Landscape and Stand-level Structural Retention in Large-Scale Mountain Pine Beetle Salvage Operations (Snetsinger, 2005) which discusses the potential loss to stand and landscape biodiversity with the increased amount of salvage harvesting. As there are already concerns about a loss of biodiversity due to salvage harvesting, putting the added demands of bioenergy on the landbase with the removal of even more timber also increases the risk to watersheds in regards to other ecological functions such as stream stability and management of sedimentation.

When it comes to removing forest residues for bioenergy production, the challenge is to find a balance that will secure both the economic and ecological sustainability of the operation (Richardson *et al.*, 2002). Leaving enough retention and debris on the landbase and across the landscape for wildlife and biodiversity values (soils, hydrology, etc.) becomes even more important as interest in a bioenergy sector increases.

3.1.2 *Timber Supply and Allocation*

Timber supply and allocation are other important issues when it comes to development of a bioenergy sector in B.C as the social and economic impacts can be profound. As a result of the MPB epidemic, there have been a number of allowable annual cut (AAC) uplifts around the province (Girvan and Hall, 2009) to address the epidemic and gain value out of the wood before it deteriorates. Now as the MPB has run its course through most of the province, it is expected that the AAC will decline in a number of timber supply areas (TSAs) throughout the province,

therefore making it more difficult to keep mills and other organizations running at the same capacity they have been accustomed to for the past 10 years or so. This brings about difficult decisions in regards to the social implications that a reduced AAC can have on communities. The added pressure of the development of a bioenergy sector in B.C. puts even more constraint on our forested landbase. This allocation of timber becomes even more critical because there is the need to ensure that bioenergy is able to fit in with other operations on the landbase, such as the existing pulp and paper sector (Stennes *et al*., 2009), and that the social objectives of communities are maintained. As the landbase becomes more constrained, there is even more of a need to be able to balance the short-term needs of both the industry and communities while maintaining the long- term sustainability of the forest resource (Girvan and Hall, 2009).

Because of the social and ultimately economic implications that a reduction in AAC could have on the industry and other sectors that rely on wood fibre it is even more important to understand what the potential effects of allocating a portion of the AAC to the bioenergy sector would be. The questions of how the AAC is shared (allocated, tenured, etc) among all the players (industry, First Nations, bioenergy, etc) on the landbase is an important question that needs to be considered if bioenergy is going to become a player in B.C.s forest industry (Girvan and Hall, 2009).

Another issue in regards to bioenergy allocation is the issue of reforestation. As using standing dead timber for generating bioenergy is costly (Stennes *et al.*, 2009), there is the issue that the added cost of reforesting areas would put added cost to the operation and therefore make any utilization of standing dead timber non economical. Pricing ultimately plays a role as to whether it is feasible for bioenergy producers to harvest and utilize standing timber (Stennes *et al*., 2009) and whether those areas can be reforested (Hein, 2008). As it seems that the present

value of bioenergy has very little profit margin operations are currently restricted to waste pi and locations close to town and mills. In order to be viable, bioenergy will eventually need to move into utilizing standing dead timber but in order for it to be sustainable on the landbase it is critical for reforestation activities to occur. The key is to manage the forest resource for present and future values which would allow for the social and economic growth today but to also maintain our timber supply into the future.

3.2 Recommended Policy Initiatives

Section 11.3.5 of the Association of BC Forest Professionals *Code of Ethics* states that, as forest professionals it is our obligation "to work to improve practices and policies affecting the stewardship of forest land" (ABCFP, 2003). This applies to improving current practices and policies as well influencing new policy initiatives that support economic development and maintain the integrity of our forest resource for all values on the landbase.

3.2.1 *Biodiversity and Coarse Woody Debris Management*

As identified earlier in this paper, biodiversity and CWD management are essential to maintaining the diversity and long-term productivity of our forests. With the development of a bioenergy sector in B.C. there is the potential that deadwood (standing and downed) could be looked at as source material. Current guidance by the Chief Forester suggests that forest professionals consider CWD and structural retention in their long-term planning and that a large diversity of CWD (with a focus on larger and longer pieces) and retention be left across cutblocks and the landscape (Snetsinger, 2010; Snetsinger, 2005). Policy initiatives surrounding this issue should address the maintenance of CWD and structural retention levels, and move towards a more firm and measurable way of managing CWD and standing dead timber. One way

this could be addressed is to move towards measuring CWD and retention on a tonnes/ha basis rather than on a number pieces/site or percentage of the landscape. The key here would be to create policy that would measure standing dead and downed timber on a tonnes/hectare basis. The limits should be below the limit allowed under the *Wildfire Act*, in order to mitigate fire risks, but should also be conservative enough to protect our current understanding of CWD levels needed for biodiversity. This would make CWD and standing retention levels more measurable so they can be included in Forest Stewardship Plans (FSPs) under the results and strategies. This policy could also indicate that so many tonnes/ha could be left on a watershed or landscape level basis (as different watersheds or landscapes may have varying requirements on retention and debris levels). Essentially this policy would also address a number of other ecological issues surrounding the loss of standing dead and downed wood such as water management (i.e. hydrology, water quality and riparian management).

As more demands are being put on the landbase, it would also be prudent to form more measurable policies around landscape level biodiversity. With the removal of standing MPB attacked timber indicated as a focus for bioenergy operations it would be wise to consider including more measurable policies in FSPs around landscape level retention. These policies should be created to help determine how much, if any, of our landscape can sustain the demands of introducing another sector.

3.2.2 *Timber Supply*

With the development of a bioenergy sector in B.C, it is important to bring about policies that will allow for the use of standing dead timber but won't impact the values that are important to society. In order to get the most value out of our standing dead timber, it is important to support and develop opportunities that can utilize the wood but it is imperative to weigh the implications

of bringing a new sector onto the landbase and what the effects will be on the resource and existing operations. The key is to be able to maintain that balance between all operations and sectors on the landbase but not at the expense of one over the other. Currently the cost to harvest and reforest standing dead trees is not economical for most bioenergy projects (Hein, 2008). Perhaps one way to support this would be to create some policy initiatives that would allow for bioenergy to be able to operate and generate revenue for the economy while still maintaining and sustaining the forest resource. A non-replaceable forest licence (NRFL) where the silviculture obligation to reforest would be covered under some other program or initiative such as the Forests For Tomorrow (FFT) through the Land Based Investment Program would allow for bioenergy operations to occur while ensuring forest longevity. The key here would be to give this same opportunity to other industries, licencees, and First Nations that are interested in a bioenergy project. This initiative would not be considered subsidizing under the Softwood Lumber Agreement (SLA) as the standing dead timber is not considered to be sawlog as per *Export Control List* item 5104 for Softwood Lumber Products. It would be important to realize that any policy created around this type of initiative would not interfere with the markets and not give an unfair advantage to one sector over the other.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The impacts of a bioenergy sector on biodiversity, retention, timber allocation and supply are only a small portion of issues. The initiatives brought forth by government to utilize residues and waste from the MPB epidemic bring about numerous opportunities but also numerous risks to managing the public's best interest. Support for bioenergy in B.C. could come with the increased notion of employment and economic revitalization and in tough economic times it

seems maintaining communities and social values may attempt to compromise the stewardship the land. As forest professionals it is our responsibility to uphold the social, economic and environmental values that are important to society as a whole while encouraging and advocating for firm and measurable policies and practices that allow stewardship to be maintained. The policy initiatives recommended in this paper look to work with the bioenergy initiatives set forth by government while providing options for maintaining the longevity of our resource values. Creating policies that allow for definable measures of CWD and standing dead timber will ensure those values are not compromised. Initiatives that work with bioenergy projects to gain the most economic value out of our MPB attacked timber without jeopardizing our future timber supply will bring some balance.

As markets, societal values and the products we derive from our forests change over time, forest professionals are consistently faced with finding a way to sustain the balance. Maintaining a stewardship approach to managing the landbase will ensure that forest activities are weighed against their future and present values and guarantee their ability to sustain the forest resource that makes our province unique.

5.0 REFERENCES

Arsenault, A. 2002. *Managing Coarse Woody Debris in British Columbia's Forests: A Cultural Shift for Professional Forester?* USDA Forest Service General Technical Report. PSW-GTR-181. Pp. 869-878.

Association of British Columbia Forest Professionals (ABCFP). 2003. *ABCFP Bylaw 11: Code of Ethics.* September 17, 2003. Association of British Columbia Forest Professionals, Vancouver, B.C. Accessed Online August 14, 2010 at: http://www.abcfp.ca/regulating_the_profession/bylaws/documents/ABCFPCodeOfEthics.pdf

Day, K. 2010. *Feedstock Supply Logistics – Challenges & Opportunities for Biofuels: Learnings from Finland, Sweden, and the Cariboo*. UBC Alex Fraser Research Forest. Accessed Online August 10, 2010 at: http://www.bccfa.ca/index.php?option=com_k2&view=item&id=2:2010-conference

Girvan, J. and M. Hall. 2009. *Biomass Availiability: Balancing Short-Term Demand with Long-Term Sustainability*. BC Forest Professional. November-December, **16**: 22 &29.

Hayden, D. 2010. *Keynote Presentation: British Columbia's Forest Sector Bioenergy Opportunities*. BioEnergy Conference and Exhibition 2010. Prince George, British Columbia. BC Bioenergy Network.

Hein, T. 2008. *Beetle – Wood Mania*. Canadian Biomass Magazine. Accessed Online August 17, 2010 at: http://www.canadianbiomassmagazine.ca/content/view/1555/61/

Lattimore, B., C.T. Smith, B.D. Titus, I. Stupak, and G. Egnell. 2009. *Environmental factors in woodfuel production: Opportunities, risks, criteria and indicators for sustainable practices.* Biomass and Bioenergy. **33**: 1321-1342.

Ministry of Energy, Mines and Petroleum Resources (MEMPR). 2008. *BC Bioenergy Strategy: Growing our Natural Energy Advantage.* Accessed Online August 4, 2010 at: http://energyplan.gov.bc.ca/bioenergy/PDF/BioEnergy_Plan_05_0130_web000.pdf, pp. 4

Ministry of Forests and Range (MFR). 2010a. *Forest Act [RSBC 1996] Chapter 157 s13.1,13.2 and s94.1.* Accessed Online August 15, 2010 at: http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/96157_00

Ministry of Forests and Range (MFR). 2010b. *Wildfire Act [SBC 2004] CHAPTER 31*. Accessed August 15, 2010 at: http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_04031_01

Ministry of Forests and Range (MFR). 2004. *Forest and Range Practices Act [SBC 2002] CHAPTER 6 s.149.* Accessed Online August 15, 2010 at: http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_02069_01

Mohammadhossein, M., T. Sowlati, and S. Sokhansanj. 2009. *Logistics of supplying biomass from a mountain-pine beetle-infested forest to a power plant in British Columbia*. Scandinavian Journal of Forest Research, **24**: 76-86.

Richardson, J., R. Bjorheden, P. Hakkila, A.T. Lowe, and C.T. Smith. 2002. *Bioenergy from Sustainable Forestry: Guiding Principles and Practice.* Kluwer Academic Publishers, Netherlands, pp. 234, 262

Sims, R.E.H. 2003. *Bioenergy to Mitigate for Climate Change and Meet the Needs of Society, the Economy, and the Environment.* Mitigation and Adaptation Strategies for Global Change. **8**: pg 349. Kluwer Academic publishers. Netherlands.

Snetsinger, J. 2010. *Chief Forester's Guidance on Coarse Woody Debris Management – DRAFT*. BC Ministry of Forests and Range. Accessed Online August 5, 2010 at: ftp://ftp.for.gov.bc.ca/HFP/external/!publish/FREP/extension/Chief%20Forester%20short%20CWD.pdf

Snetsinger, J. 2005. *Chief Forester's guidance on landscape and stand level retention. For large-scale mountain pine beetle salvage harvesting operations.* BC Ministry of Forests and Range. Accessed Online August 10, 2010 at: http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/stewardship/cf_retention_guidance_dec2005.pdf

Stennes, B., K. Niquidet, and G. Cornelis van Kooten. 2009. *Implications of Expanding Bioenergy Production from Wood in British Columbia: An Application of a Regional Wood Fibre Allocation Model*. Working Paper 2009-02, Resource Economics & Policy Analysis Research Group, Department of Economics, University of Victoria, British Columbia. Pp 1-31.

Stennes, B. and A. MacBeath. 2006. *Bioenergy options for woody feedstock: are trees killed by mountain pine beetle in British Columbia a viable bioenergy resource?* Natural Resources Canada, Canadian Forest Service Pacific Forestry Centre, Victoria, B.C. Information Report BC-X-405. Pp. 1

Westfall, J. and T. Ebata. 2009. *2009 Summary of Forest Health Conditions in British Columbia.* Pest Management Report Number 15. BC Ministry of Forests and Range, Forest Practices Branch, Victoria, B.C. Accessed online August 30, 2010 at: http://www.for.gov.bc.ca/ftp/HFP/external/!publish/Aerial_Overview/2009/Aerial%20OV%202009%20Final.pdf

Answer 2 (scored 94)

Bioenergy and Forest Management: Responsibilities of the Forest Professional

TABLE OF CONTENTS

1.0 Introduction

The provincial government has recently issued a mandate to initiate bioenergy production on a large scale, sourcing biomass from increased utilization in timber harvesting and initiating bioenergy-specific harvests of timber killed in the recent mountain pine beetle epidemic (BC Gov, 2008).

Existing co-gen biomass facilities in British Columbia have the capacity to produce 800 megawatts of electricity annually (BC Gov, 2008). However, the logistics and rationale involved in current bioenergy production, namely increasing industrial efficiency through utilizing an in-situ wood byproduct (burning sawdust in a mills boiler), cannot simply be 'scaled-up' to apply to harvesting live forests for the sole intent of producing energy. The emergence of a large-scale bioenergy industry will introduce significant concerns which need to be addressed by forest professionals.

There are many important operational constraints involved in economically acquiring and utilizing timber as an energy feedstock, especially in stands affected by the mountain pine beetle. These include but are not limited to wood quality, hill-to-mill timber procurement costs and biomass-generator efficiencies (Stennes, 2006). However, the focus of this report is to discuss bioenergy in terms of forest management and our responsibilities as forest professionals. This report discusses the new professional challenges involved with this form of forest management, those challenges related to stewardship, valuation and challenges to professional practice.

2.0 Background

The Government of British Columbia has recently integrated greenhouse gas emissions, bioenergy, mountain pine beetle, wildfire management and the economy into several strategic

initiatives: the BC Climate Action Plan, the BC Bioenergy Strategy and the Mountain Pine Beetle Action Plan. Each initiative highlights the use of beetle-killed wood (an estimated volume of 700 million cubic meters) as a bioenergy feedstock and an instrument for sustaining local economies (ABCFP, 2010). Specific strategic-level forest management actions the government has recently taken to facilitate bioenergy include:

- Expanding the scope of the *Forests for Tomorrow Program* (FFT) to include the harvesting, site preparation and reforestation of otherwise-uneconomical-to-harvest beetle-killed stands,
- Amending the *Forest Act* (Bill 31: *Greenhouse Gas Reductions Statute Amendment Act*); enabling the Minister to direct award non-replaceable forest license to cut (FLTC) to proponents of a BC Hydro Bioenergy Supply Contract,
- Amending the Wildfire Act (Bill 17, 2010) to restrict open burning of slash where bioenergy markets exist (BC Hydro *Phase 2 Call for Power*),
- Amending the *Forest Act* to enable volume harvested for bioenergy to have a discounted contribution to cut control (ABCFP, 2010).

3.1 Forest Stewardship

Silviculture; Ensuring Forests for the Future

To uphold the principle of good stewardship over our forest resource, we as forest professionals need to ensure that our actions are based on sound ecological principles. Although the new FFT and FLTC initiatives provide economical incentive for stand rehabilitation, we need to ensure that rehabilitation in this manner is appropriate. Consider the following statements:

- Whole-tree harvesting and large scale removals of biomass can negatively impact soil nutrient and moisture regimes as well as important mycorrhizal communities. This can lead to soil acidification, root disease, invasive species immigration and overall poor performance of future forest growth (ABCFP, 2010).

- More than 40% of pine leading stands affected by mountain pine beetle already have adequately stocked understories and only 37% of attacked stands are pure pine (Burton, 2006).

- Stands in the Chilcotin, killed by mountain pine beetle in the 1970s have naturally regenerated with diverse stand-structures and species-composition in the absence of human intervention. Climax species such as spruce, Douglas fir, and amabilis fir grew back where there was once uniform pine (Burton, 2006).

To uphold good forest stewardship, forest professionals need to ensure the integrity and resilience of future forests and assess the potential impacts of coupling a new, more intense harvesting regime with the uncertainties associated with impending climate change (Spittlehouse, 2003). Specific silvicultural actions that forest professionals can take to ensure good forest stewardship include:

- ***Researching*** areas such as stand growth-and-yield under alternative silviculture scenarios in bioenergy management.

- ***Monitoring*** for potential stagnation of advanced regeneration in beetle-killed pine stands left to natural regeneration under undisturbed canopies.

- ***Establishing*** guiding principles for biomass harvesting; coarse woody debris (CWD) retention requirements for example.

- ***Upholding*** silvicultural diligence when faced with potential pressures caused by the government's bioenergy mandate and narrowing economic margins.

Bioenergy and Wildfire Management

Yellowstone National Park in Montana, suffered a disastrous fire in 1988 with over 300,000 hectares of forest burned. The spatial pattern of the fire was directly correlated to the area of a mountain pine beetle outbreak which occurred in the early 1970s (Lynch, 2006). In British Columbia, coupling the nearly 700 million cubic meters of beetle killed timber with the impending warmer, dryer climate of the future creates a catastrophic fire hazard (Filmon, 2003). The 2003 provincial review of wildfire, *The Filmon Report*, calls for government intervention on wildfire prevention measures including the harvest of 'low-value, high-risk' stands.

Considering our professional duties toward forest stewardship, safety and upholding the public interest, fuel loading on the landscape is a liability which needs to be addressed promptly and effectively by forest professionals. Fuel management must be conducted to ensure:

- Protection of the young plantations and non-pine forests which will be the post-beetle timber supply.

- Reduction of the governments substantial fire suppression budget (over $400 million for 2009) (Dhillon, 2010).

- Increased public safety in urban-wildland interface areas.

An emerging bioenergy industry could provide economic incentive to harvest the very 'low-value, high-risk' stands which were mentioned in the Filmon Report. This would offset the

fuel management costs which would otherwise come out of provincial or municipal budgets. Actions that forest professionals can take to facilitate wildfire hazard abatement through biomass production include:

- ***Establishing*** and implementing fuel-hazard assessment systems and subsequent Guiding principles for fuel management (Filmon, 2003).
- ***Working*** with communities to prepare Community Wildfire Prevention Programs.
- ***Integrating*** fuel management with bioenergy supply contracts.
- ***Facilitating*** multi-agency initiatives on fuel-hazard abatement.

3.2 Valuation of the Forest Resource

Public Valuation of a Deteriorating Resource

There are several concerns involved in the proposed economic valuation of forest resources for bioenergy use. First, it has been estimated that two-fifths of the stands killed by mountain pine beetle are currently uneconomical to salvage for production of traditional forest products (Stennes, 2006). Bioenergy harvests attained through FFT beetle salvage initiatives receive economic incentive (reduced upset stumpage rates) to harvest otherwise uneconomical stands (Stennes, 2006; ABCFP, 2010). Second, competition is a fundamental factor in the economic valuation of timber in British Columbia. However, under Bill 31 the government has the ability to grant non-replaceable forest licenses (FLTC) to a proponent of a BC Hydro Bioenergy Contract by direct award (ABCFP, 2010). When considering the potential value returned to the public from a bioenergy harvest on public land, it is our duty as forest professionals to ensure that valuation of the resource is in the public's best interest and is determined in a fair and systematic manner. Value can be quantified by stumpage paid for

resources extracted or through services provided to the public which are deemed appropriate by the public (i.e. employment, contribution to greenhouse gas emissions targets, fire hazard abatement, etc.). Steps forest professionals should take to ensure proper valuation of the forest resource include:

- ***Consulting*** the public to establish fair non-stumpage values or services that can be attained through bioenergy harvesting.
- ***Promoting*** and facilitating bioenergy to encourage new applicants to enter the sector. Increased competition will promote efficiency in the industry and increase the integrity of the valuation system.

Sustaining Value through the Mid-term Timber Supply Shortage

The 'shelf-life' of timber killed by the mountain pine beetle is estimated at 10 to 15 years (Stennes, 2006). Areas affected by the mountain pine beetle have received temporary increases in annual allowable cut to maximize utilization of the resource before it deteriorates. This increased harvest however will result in a mid-term timber supply shortage (ABCFP, 2010).

Given the economic dependence of many British Columbian communities on the forest industry (for example, forestry related jobs account for 40% of employment in Vanderhoof), it is in the public's best interest to permanently maintain a viable forest industry (Thibeault, 2008). An emerging bioenergy sector within the forest industry could sustain employment and the economy in the short-term. However, as bioenergy facilities would not likely achieve their return on investment in the short-term, energy producers would likely expect long-term fiber supply commitments. If post-beetle fiber demand is not fully satisfied by increased utilization in non-beetle harvesting, a bioenergy-specific harvest of live timber (as proposed in the BC Bioenergy Strategy) would likely be required. Considering the recent policy changes made to facilitate

bioenergy, including the discounted contribution of bioenergy harvests to cut control, we must ensure that our actions sustain the timber supply and sustain the value of products derived from the forest. It is important to remember that young and currently 'low-value' timber is not equivalent to 'marginal timber'. Young, healthy stands are the future supply of higher value forest products and can serve important non-timber values such as recruitment of old-growth or wildlife habitat. Forest professionals can ensure the sustainability of the resource by:

- ***Establishing*** criteria and guidelines for selecting stands to devote to bioenergy production.
- ***Maintaining*** forest inventories and analyzing growth-and-yield projections to ensure sustainability of timber harvests.
- ***Attaining*** balance between forest industry sectors (namely energy and timber) which compete for similar resources to ensure that devoting stands to bioenergy will not unduly forfeit the potential of future higher value forest products.

3.3 Challenges to Upholding Standards of Professional Practice

The *Foresters Act* is founded upon the professional accountability of practicing members. The emergence of a bioenergy sector within the forest industry may increase the difficulty of providing professional quality forest management in several ways. First, the narrow profit margins involved with bioenergy production and utilization of a deteriorating resource could make it financially difficult to provide adequate forest management activities (ex. Silviculture

treatments) (Stennes, 2006). Constrained economics may also result in conflicts with employ over attaining fair remuneration for professional services provided.

Second, streamlining of forest policy and administrative processes to promote the bioenergy industry may result in the downloading of additional responsibilities onto individual forest professionals. For example, a 2010 amendment to the *Forest Act* which increases flexibility around scaling and the transport of unscaled wood, or the provision in the *FRPA* (Sec. 33) for exemptions from producing operational-level site plans in a Emergency Bark Beetle Management Area. Under these circumstances forest professionals must still exercise the same level of due-diligence that would otherwise be expected for upholding good stewardship regardless of streamlined policies or employer acceptance of such policies. Measures which forest professionals can take to address these concerns are:

- ***Collaborating*** with industry and multiple agencies to establish adequate funding for silviculture obligations.
- ***Consulting*** with employers to establish clear and comprehensive management objectives.
- ***Upholding*** our standards of professional practice; specifically maintaining professional independence and conducting due diligence (ABCFP Bylaw 12).

4.0 My Influence on Bioenergy-specific Forest Policy

I believe that the benefits of bioenergy are too great to ignore and that we as forest professionals need to embrace and facilitate the adoption of a bioenergy industry. We need to work with government to ensure good stewardship in the management of the forest resource. I believe that our advocacy should be focused at:

1. ***Establishing*** guiding principles for:

    a. CWD retention under increased utilization in non-beetle forest harvesting.

    b. Wildlife tree retention in bioenergy and fuel management forest harvesting.

    c. Selecting stands to devote to bioenergy production after the short term beetle salvage period and outside of beetle affected areas.

2. ***Establishing*** operationally efficient forest initiatives which incorporate government, industry and community interests into the acquisition of biomass feedstock,

3. ***Establishing*** a system for quantifying and monitoring the non-stumpage values and services provided to the public through bioenergy production.

4. ***Prohibiting*** the streamlining of policy that could result in compromising good forest stewardship.

5.0 Conclusion

An emerging bioenergy sector within the forest industry has the potential to achieve social, economic and environmental objectives if strategic and operational forest management is conducted in a thoughtful manner. However, this new form of forest management needs to be established on a sound footing; it cannot be initiated prematurely, regardless of government mandate or impending resource depreciation. First, we must ensure that our actions are sustainable, ecologically appropriate and founded on sound ecological principles. Second, our actions must simultaneously achieve economic stability in forest dependent communities and optimize the balance of current and future value of forest products. Third, we as forest

professionals must uphold our standard of professional practice; continue our due diligence a

remain independent of external pressures management pressures.

References:

(ABCFP, 2010) Association of BC Forest Professionals. *Forest Legislation and Policy Reference Guide 2010*

(BC Gov. 2008) BC Government of Energy, Mines and Petroleum Resources: *BC Bioenergy Strategy – Growing Our natural Energy Advantage* http://www.energyplan.gov.bc.ca/bioenergy/PDF/BioEnergy_Plan_005_0130_web0000.pdf

(Burton, 2006) Burton, P.J. *Restoration of forests attacked by mountain pine beetle: Misnomer, misdirected, or must-do?* BC Journal of Ecosystems and Management 7 (2): pg 1-10 http://siferp.org/publications/jem/ISS35/JEM_Vol7_no2_full.pdf#page=45

(Dhillon, 2010) Dhillon, S. *Wildfires burn up BC's forest firefighting budget*. The Globe and Mail, August 3, 2010 http://www.theglobeandmail.com/news/national/british-columbia/wildfires-burn-up-bcs-forest-firefighting-budget/article1660945/

(Filmon, 2003) Filmon, G.P. *Firestorm 2003 - Provincial Review* http://www.2003firestorm.gov.bc.ca/firestormreport/FirestormReport.pdf

(Lynch, 2006) Lynch, H.J. *The Infulence of Previous Mountain Pine Beetle Activity on the 1988 Yellowstone Fires*. Ecosystems (2006) 9: pg 1318-1327 http://www.wy.blm.gov/fireuse/pubs/Lynch-etal2006-mpb-fire-yell.pdf

(Spittlehouse, 2003) Spittlehouse, D.L. *Adaptation to climate change in forest management*. BC Journal of Ecosystems and Management Volume 4, No.1 2003 http://www.siferp.org/publications/jem/ISS21/vol4_no1_art1.pdf

(Stennes, 2006) Stennes, B. *Bioenergy options for woody feedstock: are trees killed by mountain pine beetle in British Columbia a viable bioenergy source?* Natural Resources Canada, Canadian Forest Service. http://www.for.gov.bc.ca/hfd/library/documents/bib97154.pdf

(Thibeault, 2008) Thibeault, B. *The Heart of the Infestation.* BC Forest Professional March-April 2008 pg 13 http://www.abcfp.ca/publications_forms/BCFORmagazine/documents/BCFORPRO-2008-2.pdf

Question 2 (30 marks)

Community wildfire protection is an important issue in BC. Discuss the management of forests and forest fuels in the context of community wildfire protection and public safety. What is the role of forest professionals in regards to community wildfire protection plans? What recommendations would you make regarding the improvement of community wildfire protection?

Answer 1 (scored 88)

Keeping Our Communities Safe From Forest Fires

The Need for Further Improvements in the Management of British Columbia's Wildland Urban Interface

Table of Contents

Introduction:

Over that past 15 years there has been an increase in the number and severity of forest fires occurring in the wildland urban interface (WUI). The worst fire season in recent British Columbia's (BC) history occurred in 2003 which resulted in the loss of 3 pilots, the destruction of 334 homes and business, the forced evacuation of 45,000 people and incurred a total cost of about 700 million dollars (Filmon 2004). The Provincial Government responded in 2004 with an interface fuel management program. This paper discusses the management of WUI fire risks in BC. The new fuel management program has resulted in a significant improvement in our management of the WUI. However, it is complicated due to 100 years of fire suppression, a changing climate, and a growing interface area. There are still many challenges that need addressed such as jurisdiction issues, legislative hurtles, not enough use of qualified professionals, varying public concern, no requirements for long term dynamic management, little actual on the ground change, and a needed paradigm shift in our forest management priorities for ecosystem health.

Background: *History of Fire in BC*

The First Nations prior to European settlement (pre-1850) used fire to encourage the growth of preferred plants, for cover when hunting animals upwind, and in modifying areas to promote grazing (Parminter 1978). Early settlers used fire to clear land and promote grazing. The first regulations appeared with the 1874 *Bush Fire Act* that set out fines if fires got away (Parminter 1978). As a result the use of fire started to decline in the late 1800s (Daniels 2008). he *Bush Fire Act* became the *Forest Fires Act*, and is currently the *Wildfire Act*. The first Fire Wardens in the province were appointed in 1905 (Parminter 1995). This was the start of the fire suppression era. During this period, BC has effectively eliminated low to moderated severe

forest fires from our forest's ecosystems (Daniels, 2008). Past fire suppression can be directly linked to increased fuel loads resulting in high severity forest fires (Filmon 2004). BC has started to see an increase in the number and severity of fires in the zone between forests and communities. This zone, the WUI, was defined by the Forest Practices Board (2010) as the area where human development meets or transitions to forest and/or grassland fuel types. At the same time the WUI is expanding through urban expansion. The growing population also increases the occurrence of human caused ignitions (Westhaver et al 2007). To further increase the fire risk this development tends to be concentrated in the drier low elevation fire adapted ecosystems that have a higher probability of fire (Westhaver et al 2007).

Fire Control around the Wildland Urban Interface

Within the last 15 years we have started to see the influence of decades of fire suppression, increased population in the WUI, and drier warmer conditions. There have been multiple major reports on the WUI zone which are summarized in Table 1. The most recent influential report, *Firestorm 2003* (Filmon 2004), looked at the 2003 fire seasons and incorporated suggestions from previous reports along with making their own recommendations.

Table 1: Summary of major fire reports in British Columbia

Date	Report	Major Event Details	Major Findings
Mar 1995	Garnet Fire 1994 (Princeton Area) (PWC 1995)	▪ 5,500 ha burned ▪ 3,000 evacuated ▪ 18 buildings lost	▪ need for improved building codes ▪ need for interface education ▪ regional districts need to make emergency plans
May 1999	Silver Creek Fire 1998 (Salmon Arm) (Ombudsman 1999)	▪ 6,000 ha burned ▪ 7,000 evacuated ▪ 40 buildings lost	▪ need for interface education ▪ improved training ▪ improved communication with the public
June 2001	Managing Interface Fire Risks (Audit. Gen. 2001)	▪ Concerns about increased risks in the interface zone	▪ population growth in interface increasing risks ▪ increased build up of interface fuels ▪ clarified rolls of provincial & local governments
Dec 2002	Assessment: BC Forest Protection (PWC 2002)	▪ Commissioned report on BC Fire Protection Program	▪ BC Fire Protection compares well to others ▪ strong safety record & low amount of area burned ▪ highly received around the world
Feb 2004	Firestorm 2003	▪ 3 lives lost ▪ 2,500 wildfire starts	▪ *FireSmart* program should be law province wide ▪ Province in consultation with communities needs

	(Filmon 2004)	▪ 45,000 evacuated ▪ 334 buildings lost	to develop plans to prevent interface fires t fuel management
June 2006	Managing Forest Fuels (FPB 2006)	▪ FPB looked at how forest practices are affecting forest fires.	▪ WUI forest should be exempt from FRPA ▪ riparian & old growth require fuel treatments ▪ need for landscape level forest fuel planning
Feb 2010	Managing Forest Fuels in the WUI (FPB 2010)	Special Investigation of the progress in fuel management in the WUI.	▪ jurisdictional challenges in interface ▪ lack of funding to manage fuel & expertise ▪ interest drops after fire season ▪ timber stumpage / Stocking standards issues

Fires are affected by weather, topography, and fuel. Fuel management is the key means for managing interface fires since topography and weather cannot be controlled. Partners for protection (2003) acknowledge fuel management as the best method for reducing the impact of interface fires. They also recognize training, preparedness, and enhanced structure resistant as important tools and have developed the Canadian standards for interface fuel management. These standards have been available since 1999 and published in the manual, *FireSmart: Protection Your Community from Wildfire* (Westhaver 2007). The program is aimed at private landowners, business, and communities. *FireSmart* also provides a rating system for homeowners to rate the fire resistance of properties with suggestions for improvement. Filmon (2004) strongly urged that BC adopt the *FireSmart* program.

In response to the Firestorm report in 2004, the Ministry of Forests and Range Protection Branch started a WUI fuel management program that is administered by the Union of BC Municipalities. This fuel management program includes three parts; Community Wildfire Protection Plan (CWPP), Pilot Projects, and Operational Treatments. A CWPP helps a community identify WUI areas of risk and recommends an action plan to reduce those risks (FPB 2010). The Union of BC Municipalities will pay 50% of the cost, up to a maximum of $15,000, for preparing a CWPP. As of October 2009, the Minister of Forest and Range is offering an accelerated program that provides staff and resources to help communities develop

CWPP. These Pilot Projects are considered small fuel treatments, which allow the community to evaluate treatments, understand costs associated with the treatment, and showcase treatments to the public. Pilot Projects are eligible for up to 50% provincial funding. Operational Treatments are full scale fuel management treatments and up to 75% of these costs are eligible for funding.

All CWPP require a mapping and reporting section. The mapping must show an overview of the area, land ownership, and areas of risk. The reporting must contain a general description of the forest area, the objectives, a risk hazard analysis, photos of high risk areas, an implementation plan prioritizing treatments, a review of by-laws, a commitment to adopt and promote *FireSmart* principles, and recommended projects (CWPPP 2010). CWPP's that contain information related to higher level plans, forest policy, and/or impact statements are required to be reviewed by a Registered Professional Forester. Since the start of the program in 2004, 84 of 189 communities have prepared community wildfire protection plans (FPB 2010).

Discussion: ***Are we doing enough to reduce WUI fire risks?***

Is the new fuel management program doing enough to protect communities? To answer this question this paper looks at recent reports, a review of some CWPP, and current literature. Although a fuel management program is a huge improvement over what was being done in the past there is still room for enhancement. Some key areas that need further improvement include addressing jurisdictional challenges, public support, long term monitoring, need for actual on the ground treatments, increase use of qualified professionals, and a need for a new forest management paradigm as we move forward from an era of fire suppression.

Jurisdictional Challenges

One of the biggest problems in the WUI is around landownership. The multiple stake holders within the interface zone can include crown timber, community land, private land, parks,

federal lands, business, First Nations communities, and/or farming. Multiple stake holders wi different levels of interest make a united approach to fuel management challenging. Responsibility for WUI fuel management was vague prior municipalities taking the proponent role in the current CWPP approach. At this time the Forest Protection branch had no legal mandate to carry out preventive measures in the WUI, although they did perform some mediation (BC Auditor General 2001). The Office of the Fire Commissioner had jurisdiction over WUI and in 2001 was active in a few communities with high WUI fire risks. Though not legally required, it is promising that almost 50% of BC's communities have prepared a CWPP (FPB 2010). In the FPB (2010) report there is still some reluctance within a few communities regarding the requirement for them to manage fuels on crown land. Municipalities also have other local issues that may rank higher in priority, especially when a forest fire is not imminent.

Another jurisdictional issue is around legislation. With different landownership come different legislative frameworks. For example treatments on crown land fall under the Forest Range Practices Act (FRPA) and Forest Act. This means that treatments on crown land may require stumpage payments and require inappropriate silviculture treatments for fuel management (SISCO 2007). City Parks and Provincial Parks within a community's WUI would again be governed by different legislations. Any treatments carried out within an endangered species habitat would need to meet the federal Species at Risk Act. Pre-established bylaws such as Prince George's "no open fires" could be a hindrance to proper fuel management and could ironically result in an uncontrolled fire (FPB 2010).

Local Public Support

In the City of Revelstoke's CWPP, public resistance to the need for change was noted as a main challenge to the implementation of the plan. Examples given are concerns over smoke

from fuel treatments, loss of trees, aesthetics concerns over tree and vegetation removed, and unwillingness to support new bylaws for private property that govern non-flammable building materials or types and amounts of vegetation (Hope et al. Not Dated). Local resistance to adopt *FireSmart* further highlights the challenges that local governments have in trying to balance public safety and re-election. The public's interest in fuel management is closely tied to the current forest fire conditions in the area (Filmon 2003, Davis 2010). Since public concern with wildfire is proportional to current fire risk, further incentives may be needed. Filmon (2004) strongly urged the government to encourage home insurance companies in BC to offer a discount for home owners that follow the *FireSmart* program.

Long term limitations of current CWPP

The WUI is an area that is constantly changing. Typically the WUI is growing outward through urban expansion intermixed with a dynamic forest ecosystems. Prior to significant European influence (pre-1850) the fire return interval in the Cariboo and Kootenay regions ranged from 10 to 78 years (Daniels 2008). Most predictions for future climate change in BC expect an increase in fire season duration, temperatures, and a reduction in moisture. The current CWPP are static reports of the current conditions, recommendations for remedial measures, and a required recommendation that the community adopt the *FireSmart* program. Though adoption of the *FireSmart* program and new development bylaws will offer some adaptable protection, all WUI require some type of continuous monitoring program. There is currently no funding or requirements for the conditions within the WUI to be monitored and treated on an ongoing bases. Current funding from the province and local governments is for one time treatments only. No future monitoring was mentioned in a review of CWPP for the following cities; Williams Lake, Logan Lake, and the City of Revelstoke (Wallin 2005, Thrower 2004, Hope et al Not Dated).

The exception was in Prince George's CWPP which made a small reference that the interface should be re-evaluated every 5 to 10 years post treatments (Prince George 2005).

CWPP alone offers no community protection

Although 84 of the 189 communities in BC have completed CWPP only ~35,000 ha of the estimated 1.7 million ha (685,000 ha is high risk) of WUI has been treated (FPB 2010). The FPB (2010) report found the CWPP was an important first step in accessing risk. However, without completing a prescription and treatment, the CWPP printed out on paper will only raise the local WUI fire risk. Community's ability to complete operational treatments is hindered by the requirement for communities to pay 25% of the costs. Smaller communities, which tend to have proportional large WUI areas, seem to have the greatest funding short falls (FPB 2010).

Challenge of finding qualified professionals and need for further research

The FPB (2010) reported that some communities have reported difficulties in finding qualified people to prepare their CWPP. The use of prescribed fire as a management tool was basically eliminated in the 1980s due to treatment escapes, unacceptable results, liability issues, and public concerns over smoke (Gray 2008). Gray (2008) points out that prescribed burning needs to be clearly defined by strengthening the ambiguous references currently in the *Wildfire Act* and FRPA. The FPB (2010) worried that the lack of qualified professionals resulted in some plans being developed by people with limited knowledge and experience around fuel management. The past 30 years of limited use of fire in management, coupled with the increased concern in the interface, has resulted in knowledge gaps that need to be addressed.

Limited use of fire and the increased severity of fires have resulted in a reduction in our understanding of fire behaviour. There is an urgent need for research around fire regimes, fire ecology, fire behaviour, and the influence of forest management on fire behaviour (Feller, 2008).

Need for Ecological Based Management

The BC Forest Service, Wildfire Management Branch has a simple mandate to protect forests and grasslands from forest fires (BC Wildfire 2010). Recent events such as the increased severity of wildfires and the mountain pine beetle epidemic can be linked to the success of this program (Taylor & Carroll 2004). For the past 100 years BC has been trying to protect its forests to maximize the amount of wood available (Pedersen 2003). A recent government roundtable report on forestry in BC has made 29 recommendations to build a new vibrant forest industry (Bell 2009). The new vision is a shift to diversify from tradition pulp and lumber towards bio-fuels, maximizing productivity through silviculture, using forests as carbon sources, areas of short term rotation, and developing commercial land reserve areas (Bell 2009). The problem is that this is not a new concept, but instead a shift to treat BC forests as warehouses of carbon credits or what ever new product we can imagine. Instead, the severity of the fires and current forest health conditions should be used as an indication for the need for a shift in our management approaches. Until we accept ecosystems as dynamic and manage them to maximize health, we will be constantly fighting both fire and forest health challenges. It is imperative that we have a new forest management paradigm where we maximize the health of the ecosystem first with forest products becoming a by product of that management. The severity of recent forest fires in the face of climate change highlights the importance of the need to allow low to moderate fires to provide their key ecosystem function.

Recommendations:

Filmon (2004) concluded that the ownership of this problem belongs to governments and private landowners. This same report strongly urged that all levels of government must carefully review policies and practices. The recommendations that this report makes regarding the

improvement of community wildfire protection are broken down into Federal, Provincial and Forest Industry, Local Governments, Private Landowners, and Forest Professionals.

Federal Government

The Government of Canada needs to review and to make amendments to federal legislation such as *SARA*, *National Parks Act*, and the *Fisheries Act* to streamline legislation to support WUI mitigation. They should become more proactive by supporting treatments and therefore reduce future disaster relief funding. The Government of Canada also has a duty to insure that federal lands are part of the solution within the WUI.

BC Government and Forest Industry

The Province of BC should be commended that it has started a fuel management program. The government needs to insure that it is willing to continue with long term funding for its share of the program as originally recommended in Firestorm 2003 (FPB 2010).

The biggest area of improvement for the Province lies around legislation. There needs to be a complete review of current legislation to address hindrances to WUI fuel management such as stumpage and silviculture requirements. BC should also bring in legislation around the adoption of *FireSmart*, Building Codes, and subdivision legislation. This has been a recommendation of both Garnet Fire review 1994 and Firestorm 2003 (Price Waterhouse 1995, Filmon 2004). This would reduce the burden on local governments which currently have to do this as part of the CWPP. This level of government needs to look at incentives to property owners and local governments. This could be done through tax incentives and encouraging insurance companies to lower premium for properties that have adopted *FireSmart* principles.

For 100 years we have been using fire suppression to increase public safety and protect forest assets. However, the current forest health conditions and the increase in fire severity

demonstrate that fire is a part of a healthy ecosystem (Filmon 2004). We need to recognise th forest must be managed with the primary focus being on healthy ecosystems. By adopting this paradigm shift, we will indirectly maximize the forest products available over the long term. Be those products, timber, carbon credits, bio-energy, or what ever innovating use we can imagine.

The provincial government and the forest industry need to retain and increase the knowledge around fuel management and treatment. As well, education, certification, and research are all areas needing further development and support.

Local Governments

Half of the local governments to date have done a good job of stepping up to completing a CWPP. The other local governments need to realize the seriousness of the risks involved by not being proactive and the implications of their actions. More importantly all of these communities need to start their programs of fuel management and monitoring.

Property Owners

Property owners must accept the risks associated with living within a forest interface. There are now enough examples demonstrating that fuel management can be done and still provide the visual principles that draw people to the forest interface. Government tax reductions and reduced insurance rates would encourage people participate in the program.

Forest Profession

The ABCFP needs to work with the government to help establish certification, education and research programs to insure that all fuel management is carried out by qualified registered professionals. The association should implicitly state that it recognize hours volunteered by professional foresters to help with community fuel management as hours acceptable towards a certificate of Professional Development Program.

References

Bell, P. (Chair). 2009. The working roundtable on forestry: moving toward a high value, globally competitive, sustainable forest industry. Available online at: http://www.for.gov.bc.ca/mof/forestry_roundtable/Moving_Toward_a_Globally_Competitive_Forest_Industry.pdf Accessed August 10, 2010. 56pp.

British Columbia Office of the Auditor General 2001. Managing interface fire risks. 118pp.

British Columbia Office of the Ombudsman 1999. The Silver Creek Fire Review Public Report no 39, Public Report to the Legislative Assemble of British Columbia May 31, 1999. 79pp.

BC Wildfire Management Branch 2010. Wildfire Management Branch About Us. Available Online at: http://bcwildfire.ca/AboutUs/ Accessed August 29,2010.

CWPPP - Community Wildfire Protection Plan Program. Available online at: https://ground.hpr.for.gov.bc.ca/cwpp2006program.htm Accessed August 10, 2010.

Community Wildfire Protection Plan 2010. Program & Access Guide. Available online at: http://www.ubcm.ca/assets/Funding~Programs/Documents/wildfire-protection-plan-program-guide-v2.pdf Accessed August 8, 2010.

Daniels, L. D. 2008. Tree Rings and Fire Regimes. BC Forest Professional July-August 2008. pp. 18.

Feller, M. 2008. The state of forest fire science and major knowledge gaps relevant to forest fire management in BC. BC Forest Professional July-August 2008. pp. 19.

Filmon, G. 2004. Firestorm 2003, provincial review. Report to the Provincial Government of British Columbia. Gary Filmon, Chair. 100 pp.

Forest Practices Board (FPB) 2006. Special Report: Managing forest fuels. FPB/SR/29 June 2006. 23pp.

Forest Practices Board (FPB) 2010. Special Investigation: Managing forest fuel in the wildland urban interface. FPB/SIR/28 February 2010. 19 pp.

Gray, R. W. 2008. The urgent need to legitimize, professionalize and organize prescribed fire in British Columbia. BC Forest Professional July-August 2008. pp. 12.

Hall, L.R. Mark. 2008. Fire history of a 416-year-old western larch tree in southeastern British Columbia Extension Note. BC Journal of Ecosystems and Management.

9(2):5-10. url: http:// www.forrex.org/jem/ISS48/vol9_no2_art2.pdf

Hope, S., Clark R.B., and Cheung K. Not Dated. Community wildfire protection plan for the City of Revelstoke. Available online at: http://www.cityofrevelstoke.com/pdf/CommunityWildfireProtectionPlanFinal.pdf Accessed August 15, 2010.

Parminter, J. 1995. Human Influence on Landscape Pattern in the Pacific Region: Impacts of Burning by First Nations and Early European Settlers. Presented at the Landscape Ecology Symposium, 76th Annual Meeting of the Pacific Division, American Association for the Advancement of Science. Vancouver BC. June 20, 1995.

Parminter, J. V. 1978. An historical review of forest fires management in British Columbia. The University of British Columbia. 150pp.

Partners in Protection. 2003. FireSmart: Protecting your community from wildfire. Second Edition. Edmonton, Alberta, Canada: Capital Color Press Ltd.

Pedersen, L. 2003. Allowable annual cuts in British Columbia: the agony and the ecstasy Presented at UBC Faculty of Forestry - Jubilee Lecture at UBC March 20, 2003.

Price Waterhouse Coopers (PWC), 1995. Garnet Fire Review. British Columbia Ministry of Forest Protection Program, Vancouver, BC, 94 pp

Price Waterhouse Coopers (PWC), 2002. Performance Benchmarking Survey and Organizational Assessment of the BC Ministry of Forests Forest Protection Program. December 2002.

Prince George (Diamond Head Consulting Ltd., Davies Wildfire Management Inc., and Timberline) Forest Inventory Consultants (PG 2005). City of Prince George wildland/urban interface a wildfire management strategy. Available online at: http://www.city.pg.bc.ca/rec_culture/parks/urbanforestry/documents/Wildland_Urban_Interface_Wildfire_Mgmt_Plan.pdf Accessed August 24, 2010. 82pp.

SISCO Southern Interior Silviculture Committee 2008. Presentation by the City of Merritt on their WUI fuel treatments. Arthur in attendance September 2007.

Taylor, S.W, & Carroll, A. L. 2004. Disturbance, forest age, and mountain pine beetle outbreak dynamics in BC: a historical perspective. Mountain Pine Beetle Symposium: Challenges and Solutions (ed. by T. L. Shore, J. E. Brooks and J. E. Stone), pp. 41 – 49. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. Information Report BC-X-399. Natural Resources Canada, Canada.

Thrower (J. S. Thrower & Associates Ltd). 2004. A wildfire safety plan for the

District of Logan Lake. Available online at: http://www.loganlake.ca/docs/wildfire%20safety%20plan.pdf. Accessed August 24, 2010. 37pp.

Wallin, G. (contact). 2005. Williams Lake and area interface fire plan. Available online at: http://www.williamslake.ca/files/4/Interface%20Fire%20Plan.pdf Accessed August 24, 2010. 60pp.

Westhaver, A., Revel R.D., and Hawkes, B.C. 2007. Firesmart-ForestWise: Managing wildlife and wildfire risk in the wildland/urban interface – a Canadian case study. USDA Forest Service Proceedings RMRS-P-46CD.2007.

Answer 2 (scored 87)

Managing Forests and Forest Fuels in the Context of Community Wildfire Protection

Table of Contents:

1.0 Introduction:

Community wildfire protection has become an important issue in British Columbia as threats to public safety and property loss have increased in recent years from severe wildfires within the interface zone of communities. The interface is the zone where there is potential for a fire that involves human development and wild land simultaneously (Ministry of Forests and Range). Changing the fire ecology through fire suppression efforts has altered fire regimes, and resulted in dangerous fuel accumulations within many forested areas of the province. These fuel accumulations are increasing the wildfire hazard (Anderson and Neal 2010). The mountain pine beetle epidemic has also added to the problem by causing an abundance of standing dead and suspended materials, increase the fire hazard in beetle affected areas.

The Filmon Report, in response to the fires of 2003, recommended that the government help support communities in developing Community Wildfire Protection Plans (CWPPs) to take steps to reduce the risk and hazard of wildland fires within the interface zone. The report also recommended that communities reduce forest fuels within the interface zone (Filmon 2004). Forest stewardship, with a focus on managing and reducing fuels is important because fuel reduction treatments can lessen the severity of a wildfire within the interface zone, improving public safety. Ecosystem restoration projects that integrate mechanical treatments and prescribed fire can be an important part of a fuel reduction program that considers landscape level objectives (Anderson and Neal 2010). Forest management, with respect to fuel reduction strategies, is part of the practice of professional forestry, requiring that forest professionals be involved in the writing and implementation of CWPPs, with the ultimate goal of increasing public safety. Forest professionals must still ensure that good stewardship is achieved within the interface zone, and not solely focus on the reduction of forest fuels to the detriment of other values.

This paper will discuss forest management and strategies in the context of managing forest fuels, including the use of appropriate fuel hazard reduction treatment options. The paper will also discuss the important role of forest professionals in community wildfire protection planning through strong leadership. Forest professionals, practicing within the standards of professional practice, contribute a valuable understanding of forestry practices related to fire behaviour and fuel management. Finally, recommendations will be made on how to improve community wildfire protection in BC.

2.0 Background Information:

The idea of reducing hazards within the interface zone is not new in BC. The fires of 2003 were more severe, and much closer to communities, than the people of BC were willing to accept as part of a natural cycle. The increased public and government attention led to the commissioning of the Filmon Report, which was released in 2004, and recommended the creation and funding of the Community Wildfire Protection Plan program. Previous to the report, other fires, which threatened communities, led to reports and recommendations of planning within the interface zone. The 1998 Silver Creek fire resulted in a report by the Ombudsman of BC. The 1994 Garnet fire, near Penticton led to a report by Price Waterhouse, and the 2001 report, Managing Interface Fire Risks, was issued by the Auditor General of BC (Filmon 2004). These reports all recommended the implementation of strategies to reduce the hazard from forest fuels within the interface zone.

2.1 Changes to Fire Ecology

Successful fire suppression programs during the last 80 years have changed the natural fire ecology in many areas of British Columbia, resulting in an accumulation of forest fuels.

During the same period, communities have expanded into forested areas, and those forests ha matured and accumulated dangerous amounts of forest fuels that are now likely to result in severe wildfires. Stand densities have increased, and forest fuels have accumulated in areas that would have previously burned more frequently without fire suppression measures in place (Anderson and Neal 2010). The mountain pine beetle epidemic is linked to the changes in fire ecology by causing an abundance of mature pine stands. The beetle damaged stands now pose a greater fire hazard because of the increased proportion of dry fuels, though the fuel hazard will eventually decrease over time as beetle killed trees decompose (Page and Jenkins 2007). This combination puts rural communities at risk of being impacted by a severe wildfire that cannot be controlled by suppression efforts.

3.0 Discussion:

3.1 Management of Forests and Forest Fuels

Forests can be managed, through precautionary measures that are carefully designed to decrease the fire hazard. Fuel hazard influences fire severity, which is logically linked to the risk of human injury and property damage, and is why this discussion will focus on fuel hazard as a means of improving public safety. Fire behaviour is influenced by the interactions of fuels, weather and topography. Forest fuels are the only variable that can be influenced before a wildfire occurs. The first forestry related step in the planning process is to help define the extent of the area to be managed under the CWPP. The extent of this area would depend on the location of acreages and residences near the community. The Williams lake CWPP identified a three kilometre buffer around municipal boundaries as the extent of the plan (Cariboo Regional District et al. 2005).

Fire hazard is based on the structural characteristics of a forested stand. There are six structural characteristics of stands that control fire behaviour, and are easily identified in the field; stand density, ladder fuels, crown closure, ground fuels, total tree volume, and suspended dead fuels (Farnden et al. 2003).

1. Stand density influences fire behaviour through the arrangement of fuels. Stand density affect the horizontal rate of spread.

2. Ladder fuels represent the vertical connectivity of fuels from the ground up to the crowns. This influences the vertical rate of spread.

3. Crown closure is a measure of the horizontal continuity of crowns in the primary tree layer. This influences the heat held under the canopy, and the horizontal rate of spread once a wildfire reaches the crown canopy layer.

4. Ground fuels are the fuels on the forest floor, which impact potential fire intensity.

5. Total tree volume is an expression of the amount of above ground fuels available to a fire, affecting fire intensity.

6. Suspended dead fuels influence both the horizontal rate of spread and fire intensity.

These six indicators must be managed in order to reduce the fire hazard of a stand. Management cannot be based solely upon one indicator because the structural indicators are not additive. Managing one indicator will not necessarily reduce the fire hazard. The indicators must be managed together in order to sufficiently lower the fire hazard enough to qualify for a lower hazard classification. This can be accomplished by weighing the contribution of each indicator at the stand level (Farnden et al. 2003).

3.2 Fuel Hazard Mapping

Mapping fire hazard requires a system of hazard classification using stand structure. Lignum Ltd. has developed a classification system that groups stands into 17 classifications by focusing on vertical structure (Cariboo Regional District et al. 2005). These classifications form a good basis for initial management decisions. An initial fire hazard map of the interface area can then be produced by assigning the stand structure classification to existing forest cover polygon information. The original 17 classifications can then be grouped into five hazard classes: Extreme, Very high, High, Medium, and Low. These should be assigned qualitatively to reduce planning costs, as it is only an initial assessment upon which to base field assessments and potential management prescriptions. The second step in the hazard mapping process is to include the influence of terrain and aspect. Terrain and aspect influence fire behaviour, and their influence must be included in a hazard analysis (Wildfire Management Branch). For areas on steep slopes (>20 percent), and south or west aspects, the initial hazard should be increased by three levels. For areas on steep slopes and on north or east aspects, the initial hazard should be increased by two levels (Cariboo Regional District et al. 2005). The completed fire hazard map can then be used to prioritize fuel hazard reduction operations.

3.3 Fuel Reduction Options

Fuel reduction activities focus on reducing the amounts of the six forest structure indicators. The options of manual treatment, mechanical treatment, strategic harvesting, prescribed fire, and the combination of mechanical treatment or manual treatment and prescribed fire have been chosen as the potentially viable treatment options (Agee and Skinner 2005).

Priority for field assessment and treatments should be based from the fuel hazard map of the interface zone.

Manual treatment by slashing, thinning, pruning, and then either piling or leaving the materials to be consumed using prescribed fire, is an option for fuel hazard reduction. This can be accomplished by decreasing the stand density, removing ladder fuels and suspended fuels (Agee and Skinner 2005). It is a useful option where steep slopes preclude the use of machinery, and where using prescribed fire is not a viable option.

Mechanical treatment such as mechanical mastication, the pulverizing of fuels in place, is a fuel treatment option where terrain allows machinery to operate, and especially in areas where high stand density made up of small diameter trees (Gray et al. 2010). A variety of rubber-tired and tracked machines can be used such as the hydro-axe, slashbuster, or rotary brush cutter and ProMac. The choice of machine should be based upon availability and matching fuel conditions to the machine in order to maximize efficiency. A benefit of mechanical treatment is that it is more cost effective than manual treatment options (Gray et al. 2010).

The strategic harvesting of high hazard areas is another option for fuel hazard reduction. Harvesting, depending on the prescription can be used to manage the structural indicators of fire hazard, except that harvesting operations can increase ground fuels. Mechanical piling or prescribed fire can then be used to reduce ground fuels. Partial cutting prescriptions can reduce the structural indicators in order to lower the hazard classification. Clear-cutting would remove the indicators completely. Harvesting operations would also require access roads if none already exist. The roads should be strategically planned as fire breaks, and to provide better access when wildfire occurs. Harvesting pine stands that have been damaged by mountain pine beetle is a good option, and the merchantable timber can be sold to offset the costs of the operation. It may

be possible to sell a portion of the smaller diameter materials to bioenergy operations, or into pulp market as a recovery loss option. Potential sites should be strategically chosen, based on the results of field assessments. For areas on provincial crown land, license holders should be included in the planning process and encouraged to participate in fuel reduction operations within their forest development units. In areas that are economically infeasible for harvesting due to poor wood quality, funding should be sought to supplement the harvesting operations.

It may be difficult to harvest within the interface zone because of negative public perception. Harvesting operations may be looked at as opportunistic, and if clear-cutting is prescribed, the issues around visuals may make it unpopular and require focused consultation and education with the public to prove that it is part of an integrated approach, with the goal of improving public safety.

Prescribed fire is an effective fuel reduction method, especially for reducing ground fuels and low ladder fuels such as brush (Richie et al. 2007). Re-introducing fire into the interface zone can also have the benefit of ecosystem restoration (Anderson and Neal 2010). The use of prescribed fire can also be used in tandem with the other methods of treatment, especially to reduce the debris that had been moved to the ground from those treatments (Gray et al. 2010). Thinning followed by prescribed burning has been shown to be effective at mitigating wildfire severity (Ritchie et al. 2007). The use of prescribed fire can be challenging because the smoke produced may result in non-compliance with the Open Burning Smoke Control Regulation if operations occur within 10km of populated areas (Queens Printer 1993). The safety and property damage risks from the possibility of escape, the short season burning season, and the scarcity of trained professionals to supervise the operations, are also challenges (Anderson and Neal 2010).

3.4 Integrating Fuel Hazard Reduction into Ecosystem Based Management

Forest management activities within the interface zone must still meet the objectives and requirements of plans such as Forest Stewardship Plans, Higher Level plans such as the Kootenay-Boundary Land Use Plan Implementation Strategy, and legislation such as the Wildfire Act and Species at Risk Act. Management of values; such as species at risk, visual quality objectives, water quality, Ungulate Winter Range, Old Growth Management objectives, and timber values, must be considered. Fuel reduction prescriptions must consider all values, and incorporate measures to address them. Using prescribed fire can fit well into landscape level planning because it meets the objectives of reducing fire hazard, and as an ecosystem restoration tool, which fits with ecosystem based management. An important part of choosing and evaluating a fuel reduction method is through the use of pilot projects. This also allows the results of an operation to be evaluated with respect to meeting other management objectives, and because it is on a small scale, the impact of undesired outcomes is minimal.

3.5 The Role of Forest professionals

Forest professionals have, and should have, an important role in wildfire protection planning, and the protection of human life and property from wildfires (Hipwell 2010). Forest professionals are in key positions within communities to provide leadership in writing and implementing CWPPs. Forest professionals have duties, found within the code of ethics, to practice good forest stewardship, and to consider public safety in everything that they do (ABCFP 2003). Forest professionals, acting professionally, are invaluable by having the skills and experience required to design and implement plans that will be successful. They can tailor appropriate stand level prescriptions that meet these often conflicting objectives. Often, CWPPs are written by forest professionals. The concept of a 'Chain of Custody', where a number of forest professionals are part of a team, applies well to writing and implementing CWPPs. A lead

forest professional, such as a CWPP author, can play an initial role in the planning process and then pass down responsibility to another forest professional, such as a logging supervisor. This is a great opportunity for forest professionals to practice a strong level of professional reliance, bring forest professionals with complementing fields of practice together, while insuring that their professional duties have been fulfilled, and that the result is good forest stewardship.

3.6 Opportunities for Improving Community Wildfire Protection

There are at least three good opportunities for forest professionals to improve community wildfire protection in the context of forest management and fuel hazard management.

1. Forest professionals involved in a CWPP, or even just living in a community with a CWPP should work to keep public awareness for the need to continue fuel hazard management within the interface zone. Wildfire protection planning is an ongoing process because forests are continually growing, stand structures are changing, and fuels are accumulating. Public and local political support is absolutely necessary over the long-term.

2. Forest professionals have a responsibility to advocate for change to the Open Burning Smoke Control Regulation. Exemptions to the restrictive nature of the regulation would aid implementation of the use of fire as a fuel hazard management and ecosystem restoration tool. The regulation is designed to protect public health but the smoke created from a large fire, would likely have much more severe adverse health effects than small, controlled, prescribed burns.

3. An auditing program, with respect to the implementation of fuel management portions of CWWPs, should be set up in addition to the pilot programs. This will allow the long term results, after multiple fuel hazard reduction prescriptions have been completed, to be evaluated on the landscape. Objectives for fuel hazard reduction and other values can be monitored.

Adaptive management should be practiced where changes to prescriptions and operations ha
been identified.

4.0 Conclusion:

Public safety is closely linked to community wildfire protection, the successful implementation of CWPPs, and good forest stewardship with a focus on fuel hazard reduction. The identification and mapping of high fuel hazard areas is essential in successfully managing the interface zone at the landscape level. The careful pairing of high hazard areas and appropriate prescriptions, that meet management objectives, is essential to achieving good stewardship. Forest management within the interface zone must focus on more than just fuel hazard reduction. All relevant values must be considered for good stewardship to be achieved. Forest professionals have a legislated responsibility, and can provide the necessary leadership in planning, implementation and the operational aspects of a CWPP. The ultimate goal of improving public safety can be achieved if everyone involved supports the plan, and ensures that it is implemented indefinitely.

References:

Anderson, G., and Neal, A. 2010. Ecosystem Restoration: A Renewed Interest in Prescribed Fire in BC. BC Forest Professional. **17**(2):15, 18.

Association of BC Forest Professionals. 2003. Code of Ethics. Available at www.abcfp.ca/regulating_the_profession/bylaws/documents/ABCFPCodeOfEthics.pdf

Agee, J.K., and Skinner, C.N. 2005. Basic principles of forest fuel reduction treatments. Forest Ecology and Management **211**:83-96.

Cariboo Regional District, City of Williams Lake, and Fraser Basin Council. 2005. Williams Lake and Area Interface Fire Plan. Aug. Available at: www.williamslake.ca/index.asp?=p325

Farnden, C., Moss, I.S., and Earle, T. 2003. Field Guide for Identifying Stand Structure Classes in the Cariboo Forest Region. Prepared for Lignum Ltd., Williams Lake BC. 92 pp.

Filmon, G. 2004. Firestorm 2003 – Provincial Review. Province of British Columbia. 100 pp.

Gray, R.W., Przeczek, J., and Harrod, R. 2010. Reducing Fuel Hazards using Mechanical Mastication in the Wildland-Urban Interface. BC Forest Professional. **17**(2):18-19.

Hipwell, J. 2010. Fuel Management and the Role of Forest Professionals. BC Forest Professional. **17**(2):14, 22.

Ministry of Forests and Range. Glossary. Available at www.for.gov.bc.ca/hfd/library/documents/glossary

Page, W., and Jenkins, M.J. 2007. Predicted Fire Behaviour in Selected Mountain Pine Beetle-Infested Lodgepole Pine. For. Sci. **53**(6):662-674.

Queens Printer, 1993. Open Burning Smoke Control Regulation. Available at www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/34_145_93

Wildfire Management Branch. Fire Behaviour. British Columbia Forest Service. Available at www.bcwildfire.ca/FightingWildfire/behaviour.htm