Bioenergy as a Solution to British Columbia's Wildland–Urban Interface Fuels Problem: A Policy Analysis

Discussion Paper

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Abstract

Since British Columbia's pivotal fire season of 2003, municipal, provincial, and First Nations' governments have struggled with the task of wildfire hazard reduction in the wildland–urban interface (WUI). After spending almost $100 million on plans and fuel treatments, it is apparent that we need to look beyond government subsidies for solutions to this problem. The province's emerging bioenergy sector, especially if this sector focuses on the large volumes of low-value biomass that constitute the greatest component of the hazardous fuels problem, could potentially provide a feasible economic solution; however, several significant policy and market impediments must be addressed first. Any viable solution centred on the bioenergy sector should include six key elements: 1) allow local and/or First Nations government to manage the WUI buffer; 2) allow local government to set the spatial boundaries of the WUI buffer; 3) pool all fibre in the WUI and stress economic maximization; 4) place all revenues from the sale of WUI buffer forest products in a locally administered trust account dedicated to forest fuel reduction and stand maintenance operations; 5) remove all Crown forest stands within the buffer from the timber harvesting land base; 6) make forest stands in the WUI buffer eligible for carbon offsets. Implementing these recommendations would go a long way toward economically solving British Columbia's wildland-urban interface fuels problem.

KEYWORDS: bioenergy; hazardous fuels; wildfire; wildland-urban interface

Introduction

The year 2012 will be remembered as another terrible season for interface fires in western North America. The state of Colorado was plagued by fires, both prescribed and wild, that not only destroyed hundreds of homes and businesses but also resulted in numerous deaths. In 2011, fires burned over 350 homes and businesses in Slave Lake, Alberta, and later that year almost 2000 structures were destroyed in east Texas. In 2003, British Columbia saw a succession of wildfires that destroyed several hundred homes and businesses and killed three firefighters.

In the wake of these wildfires, the provincial government, in conjunction with the Union of BC Municipalities, developed the Strategic Wildfire Prevention Program Initiative (SWPPI; http://www.ubcm.ca/EN/main/funding/community-safety/strategic-wildfire-prevention.html) as a vehicle to help communities and regional districts deal with interface fires. This program focuses on community wildfire protection planning fol-

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lowed by operations to mitigate hazardous fuels. In addition, the Provincial Strategic Threat Assessment, a GIS-based model for spatially assessing wildfire threat, was developed to help communities identify where the hazardous fuels were located and also to help prioritize forest stands for treatment (Beck & Simpson 2007).

Both the Strategic Wildfire Prevention Program Initiative and the Provincial Strategic Threat Assessment stemmed from recommendations contained in *Firestorm 2003: Provincial Review,* a report commissioned by the provincial government in the wake of the 2003 fire season (Province of British Columbia 2004). The threat assessment model provided an estimate of the area in need of treatment and maintenance, while the SWPPI was intended as the vehicle for implementing hazard abatement. The model identified over 1.7 million ha of forests with significant hazardous fuel levels within 2 km of British Columbia communities. In the ensuing eight years since program initiation, approximately 43 000 ha have been treated in the wildland–urban interface (WUI) at a cost of over $100 million, funded primarily by a grant to the Union of BC Municipalities from the provincial government, with additional funding from Natural Resource Canada's Mountain Pine Beetle Initiative, the Community Adjustment Fund, the Job Opportunities Program, and financial contributions from individual communities. A recent analysis (2012) by the Association of British Columbia Forest Professionals indicates that the rate of operational treatment has actually declined over the last several years. Since the initiation of the program, some areas already treated will require further maintenance treatments. Therefore, in the absence of additional funding, the area of "new" hazardous fuels treated annually will start to decline, as already-treated areas require maintenance. Significant limitations also surround where funding may be applied. Under the *Community Charter*[1] and *Local Government Act*,[2] municipal funds cannot be used to support business ventures on Crown land outside the municipal boundary. With all federal and provincial grants structured as cost-sharing arrangements, few municipal governments pursue grants because most cannot provide the municipal contribution and are loath to contravene the two acts. Also, this funding can only be used on public land; no grant program exists that enables private landowners to treat their property, which represents 20% of the 1.7 million ha originally identified by the threat assessment model.

The cost of treatments is the most likely cause of the provincial program's lack of success. The Provincial Fuels Management Working Group (2010) estimated that the average cost per hectare for fuel treatments is over $9600. Over 1.7 million ha, this represents $16.3 billion, which does not include the long-term cost of maintenance. With a provincial deficit of approximately $1.5 billion and dozens of municipal governments in financial difficulties, traditional funding sources will never be able to subsidize hazard treatment at the required scale. Decades of successful fire exclusion, coupled with periods of drought and insect and disease infestations, have resulted in millions of hectares of overstocked, dead and dying forests throughout British Columbia and the Pacific Northwest. These forests constitute a very real wildfire threat. Resolving this threat at the stand-level would require dramatically thinning and removing the smaller-diameter, low-value trees, as well as removing any dead trees. Whether felling, piling, and burning hazardous fuels, or mechanically removing or masticating the fuels on-site, these treatments are expensive.

A key recommendation of the *Firestorm 2003* report (Province of British Columbia, 2004) was the need to add value to the fuels most responsible for wildfire hazard conditions (i.e., small-diameter, heavily tapered, non-preferred species that may be full of limbs or infected with decay). These trees (whether alive or dead) do not fit the raw-resource

profile of what the forest industry needs for either sawn timber or pulp and paper products. Fortunately, a market for this biomass exists in the bioenergy and bio-products sectors. Using woody biomass as a feedstock for bioenergy is not new; biomass boilers have been in existence for decades to produce heat and/or electricity at various scales. What is new is the need to produce large quantities of clean, renewable energy for an electricity-hungry society, and plastics and other chemicals from something other than petrochemicals.

Although this woody biomass offers us the opportunity to aggressively and economically treat our hazardous fuels problem, several policy and market impediments stand in the way of this bioenergy sector solution, the most prominent of which is our tenure system, followed by silviculture and stumpage regulations, land-use designations, current energy policy, and the regulation of carbon. What follows is a discussion of how we might best address these impediments, starting with a proposed solution and progressing through the more significant policy and practice issues we would expect to encounter along the way.

Proposed Solution

With the quantity of hazardous forest fuels around rural communities in North America estimated to be in the millions of tonnes (Perlack et al. 2005), encouragement of the bioenergy sector at the community or regional level could help address our wildland–urban interface problem; however, such a solution must be applied at the appropriate economies of scale to attract facility developers and investors. Undoubtedly, large-scale bioenergy facilities will be required in a few short decades, rather than over a century or more. Whether producing bio-coal or bio-diesel, these facilities require sizeable quantities of feedstock to make the initial multimillion-dollar infrastructure investment economically feasible, and investors will not risk such an investment without a secured feedstock supply over a project's projected life span. Quite simply, without this level of investment, we will not see an economical solution to our WUI fire problems. Therefore, any viable solution centred on the bioenergy sector must include the following key elements:

- Allow local and/or First Nations government to manage the WUI buffer.
- Allow local government to set the spatial boundaries of the WUI buffer.
- Pool all fibre in the WUI and stress economic maximization.
- Place all revenues from the sale of WUI buffer forest products in a locally administered trust account dedicated to forest fuel reduction and stand maintenance operations.
- Remove all Crown forest stands within the buffer from the timber harvesting land base.
- Make forest stands in the WUI buffer eligible for carbon offsets.

Allow local and/or First Nations government to manage the WUI buffer

Placing management of the WUI buffer in the hands of local government will undoubtedly meet resistance from the forest industry and the Ministry of Forests, Lands and Natural Resource Operations; however, as we have seen, current measures and arrangements are clearly not working. Meanwhile, climate change and fire science experts tell us the wildfire threat to our communities, timber supply, and power infrastructure is only going to get worse. The provincial government has created a series of licences aimed at "kick-starting" the bioenergy sector (e.g., Receiving, Salvage, Non-Renewable Forest, and Community Forest licences, as well as the new Small Wood licence), although none have been targeted specifically at the WUI wildfire problem. More importantly, none of these licences consider

the bioenergy infrastructure investor's need for a predictable, guaranteed supply of feedstock. Also, several of these licences assume that a two-pass system (i.e., separate harvests of merchantable wood and biomass fibre) is economical, a point not supported by research into the economics of bioenergy feedstock harvest.

Some forest licensees have co-operated with communities but, as the treatment statistics show, not enough focus has been placed on operations in the WUI. Although the reasons for this are varied, the most common issues are:

- poor wood quality and low volumes of merchantable wood (areas around communities have been intensively harvested numerous times since the mid-1800s);
- high costs associated with planning and development next to urban centres;
- increased costs associated with post-harvest fuel hazard abatement; and
- expensive and difficult silviculture obligations (i.e., re-stocking marginally productive sites in the Southern Interior on the faulty assumption that these areas will contribute significantly to the allowable annual cut); significant areas of WUI are in licensee chart areas that will never be treated because of low productivity, but to remove them would penalize licensees by reducing their allowable cut.

In summary, licensees will not treat the WUI because no incentives exist for them to do so, and provincial government licences aimed at encouraging biomass utilization are inadequate, uneconomical, and not focused on solving the WUI problem.

Allow local government to set the spatial boundaries of the WUI buffer

The area of hazard around communities needs to be flexible and delineated by the community (Municipality/Regional District/First Nations). The megafires of the last decade have taught us that a 2-km wide buffer is insufficient to mitigate fire behaviour and provide a safe work environment for firefighters when a high-intensity landscape fire spreads toward a community. In the United States, communities designate their own buffer distances and shapes in Community Wildfire Protection Plans; in Alberta, the buffer distance is set at 10 km. The Provincial Strategic Threat Assessment was a good initial approach for setting spatial boundaries and prioritizing the disbursements of limited fuels management funds; however, some issues with this approach have since become apparent. In the case of Community Wildfire Protection Plans, for example, partial funding goes to field-test the threat assessment model, often revealing significant accuracy issues. Another problem with the assessment model is its static nature—as areas are treated (or as climate change progresses), it becomes very difficult to update the model. Instead of focusing solely on "extreme" or "high" hazard stands, a "whole landscape" approach to managing interface fuels would solve several planning and economic concerns, for example, by:

- reducing liability exposure in the event the hazard is not identified properly;
- improving bioenergy economics by making large quantities of feedstock available; and
- improving economics of treatment through increased economies of scale (reduced access costs, ability to combine stands for treatment, treat larger stands, etc.).

Above all, the primary goals when setting WUI buffer boundaries are to provide: 1) adequate protection for the community and firefighters, and 2) an economical way to manage the hazardous fuels.

Pool all fibre in the WUI and stress economic maximization

A significant objective of WUI buffers is to reduce wildfire hazard by treating as much of any stand or as many stands as possible. The simple economics of biomass use dictate that

a single-pass harvest system is the only way to economically remove this low-value material. Currently, no bioenergy end product is of high enough value to cover the full cost of harvesting, grinding, and transporting only waste biomass products from the forest. To make access cost effective, waste biomass must be removed during the harvest of traditional forest products. This system relies on the value of merchantable wood to partially subsidize the removal of low-value biomass. Although many other variables will obviously enter the equation (e.g., volume of biomass, value of merchantable wood, and willingness to pay for waste biomass), the critical economic variable is total commercial volume, without which there is no economic chance of accessing waste biomass. Conversely, if a bioenergy market exists, then more merchantable volume will become available from marginal stands. When a single WUI buffer manager can pool both merchantable timber and waste biomass and auction this volume to the highest bidder, then several economic and policy advantages will accrue. For example, poor-quality stands can be combined with higher-quality stands, making more of the landscape and the total volume in the buffer economically accessible. Auctioning the merchantable wood to the highest bidder would also allay any fears of running afoul of the Canada–United States Softwood Lumber Agreement. As a concession to the existing licensees, merchantable volumes could be offered (as a right of first refusal) to the licensee under whose chart the wood originated and, provided it is market-priced wood, it could also be offered off-quota.

An additional advantage of this approach would be evident in how fuel hazards are addressed on private lands. Much of the private land that constitutes a wildfire hazard in British Columbia contains low to moderate volumes of marginal-quality wood, reducing the financial incentive of hazard reduction. Private landowners would be more interested in hazard treatments if a bioenergy market existed that paid a satisfactory price for biomass, supplementing the traditional markets for sawn timber. By establishing a favourable environment for the bioenergy industry, local government could create opportunities to solve the private land hazardous fuels issue. For example, using a classic "carrot-and-stick" approach, local bylaws could be developed that penalize property owners who do not treat their land; however, without a suitable financial incentive, such an approach would not be feasible.

Current access to fibre by pulp and paper plant co-generation facilities could potentially result in significant conflict between new biomass industries and existing forest licensees. In an effort to bolster the economic viability of pulp and paper operations, the federal and provincial governments provided grants to the industry to install co-generation plants at their facilities. In most cases, these plants were built to both provide cheap power for the plant and feed the regional power grid, providing pulp and paper producers with a secondary source of revenue. The industry was also given preferential power-purchase rates;[3] however, even with these grants, preferred purchase rates, and other subsidies, co-generation facilities cannot afford to pay much more than grinding and short-haul transportation costs for waste biomass. With such tight margins, some provincial licensees with pulp and co-generation operations cannot access many of their chart-area stands because the resource profile contains large volumes of low-value biomass, and yet other biomass users, because of higher end-product values, could economically access those same stands. If the provincial government is serious about reducing wildfire threats to communities, then it should look for solutions that:

- maintain the existing pulp and paper industry, if possible;
- encourage new industry such as the bioenergy sector; and

- access more fibre on the landscape—especially in the WUI—at as low a cost to provincial taxpayers as possible.

This type of bargaining and direct involvement in the market place is not without precedent in British Columbia.

Place all revenues from the sale of WUI buffer forest products in a locally administered trust account dedicated to forest fuel reduction and stand maintenance operations

Another factor that has exacerbated the WUI fire problem in British Columbia is the lack of dedicated funding for fire and fuel management programs at the local level. Under the current SWPPI, local governments engage in short-term projects that are intended to solve a long-term issue. What is needed is a fully funded program in each community or region. Such programs could be funded through the collection of royalties from the sale of WUI buffer forest products. Placed in trust at the local level, the royalties could be used by municipal and provincial governments (e.g., the Wildfire Management Branch) to carry out a range of fuel management projects, including tree species conversion, prescribed burning, spacing, and/or manual treatment of stands that are inaccessible to mechanical treatment in the WUI. Both BC Parks and Parks Canada currently use a similar trust arrangement to deal with vegetation management issues. Under this approach, municipalities would be able to treat Crown land outside their municipal boundary, and not be in contravention of the *Community Charter* or the *Local Government Act*.

The WUI royalty trust account arrangement is unlikely to result in a revenue loss to the province. Currently, very little harvest activity occurs in the WUI, in spite of stumpage rates set at zero or $\$0.25/m^3$. Meanwhile, federal, provincial, and municipal governments have heavily subsidized forest management activity in the WUI to the tune of over $100 million. This proposed solution would increase forest management activity in the WUI and alleviate or significantly reduce the current subsidy, thereby augmenting government revenue per hectare of interface land through increased receipt of goods and services tax and income tax. Other economic advantages include lower contractor costs through longer-term employment, retention of skilled labour currently lost to other regions of the country (e.g., northern British Columbia, Alberta), and increased business activity for local government.

Remove all Crown forest stands within the buffer from the timber harvesting land base

Given the severity of the 2003 fire season, it is surprising that no forest policy changes relating to rural community wildfire protection were triggered. The overarching policy driving forest management in the WUI is still the maximization of timber volume, not community protection. In fact, wildlife habitat and recreation interests have had more impact on constraining forest management than community wildfire protection. To be successful in protecting communities and firefighters from wildfire in the WUI, communities must have the ability to manage forest stands in a low-hazard state into perpetuity. This could be accomplished through the withdrawal of WUI buffer areas from the timber harvesting land base, therefore removing the requirement that these lands contribute to the local allowable annual cut. Such a policy change would not preclude the growing of forest resources within the buffer; it simply removes the expectation of a predictable volume over time, and would facilitate, for example, conversion to deciduous species such as trembling aspen or black cottonwood. If such a conversion was ecologically appropriate, it could pro-

vide not only fire protection but also a source of cheap, fast-growing biomass for bioenergy. Similarly, growing low-density stands of western larch or ponderosa pine could provide numerous social, environmental, and economic benefits and not constitute a wildfire hazard.

Make forest stands in the WUI buffer eligible for carbon offsets

Areas surrounding communities that are treated to reduce wildfire hazard should be eligible for carbon offsets, thereby allowing communities to gain an added source of long-term revenue to fund initial fuel treatments and maintenance. Unfortunately, eligibility criteria set out by the provincial government in the *Protocol for the Creation of Forest Carbon Offsets in British Columbia* (Province of British Columbia 2011) and in the *Zero Net Deforestation Act*[4] do not consider areas of the interface managed to less than 25% canopy cover as "forest land." Ironically, lands currently meeting the definition of "forest land" only do so because of the significant negative changes in forest structure that resulted from fire exclusion, especially in many areas of the Southern Interior. Before the turn of the 20th century, the majority of these stands did not support a tree density that would yield greater than 25% canopy closure. To maintain healthy, resilient ecosystems, particularly in light of climate change predictions, these forests should be managed to a much lower density and a much lower canopy closure. Many forest stands in the WUI require thinning to less than 25% canopy cover and should be maintained as such to reduce the possibility of crown fires—one of our primary objectives in wildfire hazard reduction activities—and to enhance ecosystem resilience to wildfires. From a carbon lifecycle assessment perspective, these treated stands paradoxically pose a much lower risk of reversal than eligible "forest stands" managed to greater than 25% canopy cover, yet these stands are currently penalized because they do not fit an arbitrary definition of a forested stand. With climate change models suggesting that wildfires will become not only more common but also more severe, it makes sense to reward practices that result in resilient, less-dense forests rather than assuming greater wildfire risk with more heavily stocked forests.

Conclusions

Strategies applied since 2003 to reduce hazardous fuels in wildland–urban interface areas of British Columbia, although useful as stop gap measures, will not solve the problem. The funding supplied by federal, provincial, and municipal governments to subsidize the treatment and management of these fuels at the scale necessary is simply inadequate, and the need is only becoming greater as we begin to understand the implications of climate change on fuels and fire behaviour. The emerging bioenergy sector offers economical solutions for the disposal of massive quantities of low-value biomass, which is currently underutilized and over-subsidized, at a time when provincial and municipal revenues are suffering and rural unemployment and out-migration is increasing. To solve our interface fire and fuels problem economically, we need to begin a serious discussion on the policy, regulatory, and market impediments that currently restrict the emerging bioenergy sector.

Notes

1. *Community Charter*, SBC 2003, Chapter 26. http://www.bclaws.ca/Recon/document/ID/freeside/03026_00 (Accessed October 2013).
2. *Local Government Act*, RSBC 1996, Chapter 323. http://www.bclaws.ca/Recon/document/ID/freeside/96323_00 (Accessed October 2013).
3. This information is not in the public domain but is available through Freedom of Information requests.
4. *Zero Net Deforestation Act*, SBC 2010, Chapter 10. http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_10010_01 (Accessed October 2013).

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Test Your Knowledge

How well can you recall the main messages in the preceding article? Test your knowledge by answering the following questions.

Bioenergy as a solution to British Columbia's wildland–urban interface fuels problem: A policy analysis

1) Which of the following was a recommendation in the *Firestorm 2003 Provincial Review*?

   a. Clear a 2 km fuel-free buffer around all communities in the province

   b. Add value to the small-diameter and dead wood that constitutes the fuel hazard facing communities

   c. Purchase new fire apparatus for all rural fire departments in the province

2) Which of the following are considered to be impediments to solving the interface fire hazard issue in British Columbia?

   a. The existing system of forest tenures

   b. The lack of financial incentives for private landowners to treat their lands

   c. The provinces' forest carbon strategy

   d. All of the above

3) Why should the WUI buffer extend out more than 2 km from a community?

   a. To capture enough biomass (feedstock) to ensure bank financing for infrastructure investment

   b. To reduce fire behaviour far enough from the community to ensure adequate time to evacuate the community, if necessary

   c. To fire-harden values on the landscape around the community as well as in the community

   d. All of the above

ANSWERS: 1 = b; 2 = d; 3 = d