Kimberley Fuel Treatment Alternatives Workshop

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This report provides a summary of a workshop held January 25/26 in Kimberley, B.C. to evaluate alternative fuel treatments for the City of Kimberley. The workshop was held at the Fire Hall in downtown Kimberley. Participants included the Mayor of Kimberley and city council members, the Kimberley Fire Chief, technical consultants (fire experts) from Canada and the US, local and regional environmental interests, industry (Tembec Forest Industries), several members of the public, and representatives of B.C. government agencies (Ministry of Forests, Protection Branch; Ministry of Environment).

Background

The workshop was called in response to the recognized need for both short- and long-term actions to reduce the risks to the City of Kimberley from wildfires. This need was put into sharp focus, for residents and for responsible resource management and emergency services agencies, by the large wildfires in central British Columbia during the late summer of 2003. Kimberley is considered to be a particularly vulnerable area to wildfires due to a substantial buildup of excess forest fuels, its location, and the very hot and dry summers that characterize the area. In addition, central British Columbia currently is experiencing an infestation of mountain pine beetles, which are killing large numbers of lodgepole pine; these standing dead trees substantially increase the risk of a catastrophic fire. This is particularly significant to the City of Kimberley because, within the city boundaries (albeit on land owned by the Province), there is an unusually large (800 hectare) Nature Park. Although this area provides important environmental and recreational benefits to citizens of Kimberley, it also contains large numbers of vulnerable lodgepole pine and thus results in a substantial added fire risk to the community.

Studies have been undertaken over the past several years with the goal of reducing fire risks to the Kimberley community. A fire expert (Bob Gray) has been hired and, in collaboration with the City and with Tembec (which holds a cutting license for lands within the Nature Park), initial plans have been developed to reduce the danger of wildfires through additional thinning of the forest, habitat restoration, and prescribed burns. Thinning in approximately 250 hectares adjacent to the Nature Park occurred over the past year. However, at this time there does not exist a coordinated plan for addressing fire risks within the vicinity of Kimberley, one that has received approval from a diverse group of stakeholders. This is significant, because widespread community approval is a prerequisite for receipt of funding available from the province, via the Union of British Columbia Municipalities (UBCM), for protection activities. Hence the need for a workshop to pull together the key players and to see if a start could be made on development of a broadly supported fuel treatment plan.

Method

The method selected to guide the workshop is structured decision making, a process developed to address multi-issue, multi-party environmental management problems. The approach is based in decision analysis and probabilistic risk management. It combines methods from the decision and social sciences with techniques from engineering and

planning. Structured decision making (SDM) approaches have been widely applied, both in B.C. (e.g., development of guidelines for the Water Use Plan process; Gregory and Failing, 2002) and in Canada and other parts of the world, as a way to foster dialogue and to develop creative alternatives for multidimensional and complex management problems where there is substantial uncertainty. Interface fire management problems are a textbook example for the application of SDM approaches: there are typically multiple (and, at times, conflicting) environmental, economic, and social interests; there is uncertainty about fire behavior and timing as well as uncertainty about the effectiveness of treatments; timing and location of efforts both make a great deal of difference; and the sources of the problem are both controllable (e.g., fires caused by careless campers) and subject to external forces beyond our control (e.g., lightning, global climate change).

SDM approaches differ in several key ways from the more usual approaches to developing fuel treatment plans. One is the emphasis in SDM on what is referred to as "value-focused thinking" or the definition of clear objectives (Keeney, 1992). By identifying what matters to the different stakeholders in the context of a problem, SDM approaches maintain that management alternatives then can be better defined in terms of actions that satisfy these objectives – not just fire risk reductions, but also ways to maintain or improve the safety of fire fighters and other local residents, forest ecological health, public and private economic objectives, and a variety of social considerations including recreation and aesthetics. SDM also emphasizes that, to be operational, objectives must be defined in terms of performance measures or attributes: goals such as "reduce fire risk" or "maintain ecological health" must be defined in terms that clearly set out what this objective means, to facilitate communication and to enable the evaluation of alternatives in terms of these objectives. Another characteristic of SDM approaches is the specific attention given to uncertainty, both natural (e.g., wind direction and temperature and moisture levels at time of ignition) and human (e.g., the availability of fire fighting equipment at time of need). A third important aspect of SDM is its emphasis on tradeoffs across objectives and methods for using explicit tradeoffs as a basis for understanding the reasons for support of, or opposition to, various management initiatives. A tool used for understanding these tradeoffs is a consequence matrix, which combines objectives (in rows) and alternatives (in columns), with entries in the matrix therefore showing the consequences of each alternative in terms of what matters.

In the case of developing fuel treatments for Kimberley, SDM approaches have been paired with the insights of "FARSITE and FlamMap," two fire risk-reduction planning models that allow the placement of strategic fuel treatments on a landscape to observe how they affect fire behavior (Stratton, 2004). This focus on the **S**trategic **P**lacement **O**f **T**reatment**S** (or SPOTS) allows for the design of specific treatments, located spatially and temporally, to mitigate a problem fire (defined in terms of a fire of specific intensity and speed of movement, along with an ignition point and a designated wind speed). Fuels treatments are intended to slow the spread and intensity of a fire through proper spacing, orientation, and shaping of treatments on the landscape; differences in these variables can be followed through analyzing the results of different computer runs.

For the Kimberley workshop, Robin Gregory and Michael Harstone (specialists in SDM) were selected to facilitate the workshop and to serve as the lead analysts in development of a broadly acceptable strategy. Bob Gray, assisted by Amelia Needoba and Rick Stratton, served as the lead fire experts and were responsible for running the

fire models. Their intention was to keep technical jargon to a minimum and to work closely with the representative group of stakeholders, with the goal of developing an interface fuel hazard-reduction plan for the City of Kimberley (including, but not limited to, the Nature Park) that was responsive to technical requirements and also responsive to the multiple perspectives and concerns of stakeholders.

Workshop design

The workshop took place over two full days. An agenda for the workshop is included as Table 1. In brief, the workshop was divided into four parts:

Morning, Day 1: Introduction by participants, overview of the problem (why improved fire treatment is needed for Kimberley) and initial bounding (geographic, temporal), introduction to SDM methods and to the SPOTS modeling approach.

Afternoon, Day 1: Development of objectives for Kimberley fuel treatment and ways to measure these, along with an introduction to management alternatives.

Morning, Day 2: Discussion of the consequences of different treatment options and the key tradeoffs that have been highlighted, along with apparent areas of agreement and disagreement across participants.

Afternoon, Day 2: Review of leading treatment alternatives, search for agreement on key issues, review of institutional responsibilities and capabilities, discussion of next steps in light of timing/funding constraints.

An important topic, addressed at the start of the workshop, was the expectations of participants. Everyone recognized that the default option – the current level of fire safety in Kimberley – was not acceptable. Although several participants spoke to their desire for a consensus approach, it also was acknowledged that this workshop was unlikely, over two days, to develop a fuel treatment plan at the required level of temporal and spatial specificity -- in other words, more work would need to be done after the workshop, involving fire experts and provincial representatives as well as selected workshop participants. The facilitators therefore clarified that the goal of this first workshop was to lay the groundwork for a common understanding of the strengths and weaknesses of various fuel treatment plans and, if possible, to establish the outline of a workable and broadly acceptable plan. As noted in the concluding section, this more modest objective was successfully achieved.

Workshop results

The workshop was set up to combine open dialogue, about the perceived pros and cons of various treatment options to reduce risks of interface fire, with a more structured framework for the analysis of options and the explicit recognition of implementation considerations. On both counts, the two –day workshop was able to achieve its primary goals. Discussions were lively and involved all participants, with in-depth and frank yet respectful reviews of several key risk management and ecological topics of widespread concern. In addition, a sound analytical structure was developed for moving forward, including identification of a set of objectives and clear performance measures, the development of an initial comprehensive set of fuel treatment alternatives, organization of information about anticipated impacts of actions in terms of a consequence table, and establishment of a plan for moving ahead. These steps are summarized in this section and the next.

1. Objectives and measures: What matters?

A first step in the development of fuel treatment options was to consider the geographic area at risk from wildfires. This area includes the City of Kimberley and the (within city

limits) Nature Park. Participants agreed that, because the most likely source of a fire is from outside this area, it also is important to include areas immediately adjacent to the City. After some discussion, the area of analysis was designated as an area of approximately 5,000 hectares, comprised of a broad ring about 3 kms around the City of Kimberley. This coincides with the analysis area previously worked out between the City and its fire expert. A discussion also took place to clarify that the intended result of fuel treatments is to reduce, and not eliminate, the risk of wildfires: area treatments will act as speed bumps, interrupting and slowing down and (hopefully) redirecting the spread of a fire, but a residual risk will remain.

Objectives for Kimberley fuel treatment, developed over the course of a discussion that involved input from all participants, include a diverse set of environmental, economic, social, and health & safety concerns (summarized in Table 3). These objectives also include habitat used by a sensitive species, the Williamson's sapsucker (currently listed under SARA). Each of the main objectives (e.g., fire management, conservation) includes a number of sub-objectives. These were operationalized by developing performance measures (or attributes) for each sub-objective; the attributes needed to pass common-sense tests of being easily understandable, comprehensive, and unambiguous. In addition, information of reasonable quality needs to be available for each attribute, so as to enable the later comparisons across different alternatives. Although the importance of the different objectives was expected to vary, perhaps considerably, across the participants, everyone agreed that this set of objectives provided a sound basis for moving ahead. In addition, everyone agreed that any alternatives would need to meet certain objectives, including the fire safety requirement of being able to safely evacuate residents of Kimberley within an 8-hour period (this is the estimated time required to evacuate city residents in the event of a serious fire).

2. Alternatives: What are the possible management responses?

The discussion of alternatives yielded six different options, summarized in Table 4. The first, status quo option covers the existing scope of actions and, in the eyes of all participants, served only as a benchmark because it was considered to result in an unacceptable level of fire risks. The second option, involving substantial fuel treatments, involves both mechanical and manual harvest of trees and both overstory and understory fuel treatments. In the area of habitat protection for the endangered pair of Williamson's sapsuckers (referred to as "WISA"), only manual treatments would be allowed. Treatments also would be required on the Forest Crowne subdivision, which is privately owned land. The third option provides for a less invasive treatment plan, including no mechanical harvest and no treatment within WISA. A fourth plan focuses only on the Nature Park, again allowing manual treatments in WISA. The fifth plan would attempt to return the analysis area to something closer to the range of natural variability for forest structure and composition; it would require substantial understory fuel treatments and mechanical harvest as well as vegetation prescriptions. A sixth plan also focuses on the Nature Park but involves only manual treatments of the understory; two versions were discussed, one with all thinning occurring within the Park and a second involving creation of a buffer on Crown lands to the southwest of the Nature Park.

This discussion concluded at the close of the first day, and modeling continued throughout the evening to see what could be done to provide additional detail on how these alternatives would influence fire behavior. The modelers emphasized caution in the confidence placed on these results because the runs were done very quickly and

involved a narrow parameterization of input variables (e.g., one ignition point, one wind speed); furthermore, even with these same inputs, because the model runs are stochastic the resulting fire behavior might change somewhat based on additional runs. Given the constrained time limits, a decision was made to focus on the three most likely scenarios: status quo (#1), substantial fuel treatments (#2), and the manual Nature Park treatment (#3). These results were presented to the participants at the start of Day 2, followed by an extensive and lively discussion.

3. Consequences: How well do the alternatives measure up?

Attention on the second day of the workshop focused on the question of how well the different fuel treatment alternatives would meet the various objectives cited by participants. Results of the three model runs were presented and discussed. The conclusions of this discussion, noted below, set the tone for the rest of the workshop:

1. The second of the fuel treatment options -- involving substantial fuel treatments, both mechanical and manual harvest of trees from both the overstory and understory, prescribed burning,, and only manual treatments in the WISA area – was felt to provide a baseline for moving ahead. Even without extensive formal analysis, it was believed that the other treatments were likely to be either too expensive (#3), create too much disturbance over the short run (#5), or prove ineffective in terms of helping to slow down or redirect a problem wildfire (#4 or #6).
2. Specific steps to be involved as part of this treatment plan (which was shown to participants using projected maps) include:
    a) treat fuels, via prescribed burns, in the polygons already thinned by Tembec plus those identified for thinning by Tembec
    b) treat the shrub fuel type at Forest Crowne by a combination of thinning, mulching, grazing, and/or burning
    c) treat grass in Forest Crowne subdivision by grazing and/or burning
    d) treat ladder fuels (both crown and surface) on the north aspect portions of Myrtle Mountain and above Dipper Lake.
    e) rehabilitate aspen stands in the vicinity of Jimmy Russell Road (this will serve as a natural vegetation speed bump)
    f) do not treat on warm steep slopes (this would create an added expense but would be of benefit to ungulates in the Nature Park were it to occur)
    g) treatment of ladder fuels and surface fuels in WISA WHA through thinning, piling, and burning.
3. Having said this, questions were raised concerning the implementation of this treatment option and the estimation of its likely consequences. In particular, several participants were concerned about:
    a) the lack of detailed spatial information: exactly where would the treatments occur?
    b) the lack of detailed information about stand characteristics, so that when information about thinning was introduced it could be understood what this would mean in terms of characteristics such as stand density, aspect (e.g., north vs. south slope), and elevation. Without this additional information, it was not considered possible to proceed to recommendations of thinning to a desired stand density (e.g., 200 stems per hectare? 400? 600? 800?), which requires a balancing of fuel-reduction objectives and ecological/conservation objectives, along with cost and social considerations).

c) the lack of information about the extent to which treatments would result in a forest that exhibited historic ecological features and was subject to something closer to natural disturbance patterns.
d) the absence of detailed information on costs: what were the estimated costs of treatments and who would be responsible for these costs.
e) The lack of information on timing: when would treatments begin, over how long a time period would they occur, and what reductions in fire risk would take place in the short-run, medium-run, and long-term.

Participants also were concerned about the realism of workshop recommendations: how realistic was it that the recommended treatments would take place? It was agreed that all recommended alternatives should, at minimum, pass a 5-part test:

a) From a technical perspective, can the treatment be done?
b) Will the treatment achieve the required safety threshold?
c) Will the responsible parties (e.g., the professionals in charge of the prescriptions, the provincial authorities) sign off on the treatment?
d) Does the treatment have broad-based support in the community?
e) Will the needed funding be available, both in the short-run and over the medium- and long-term?

Next steps

Five key elements are associated with next steps in addressing ways to reduce fire hazard levels faced by the residents and City of Kimberley:

a) analysis of vulnerability: how vulnerable are different areas of Kimberley, including (but not limited to) the Nature Park, to fire events of different types and probabilities and magnitudes.
b) analysis of importance: how important is each of these components to the key services valued by the residents of Kimberley and summer or winter tourists visiting from out of town.
c) analysis of spatial location: efforts to reduce fire danger are meaningless until prescriptions can be placed in the context of spatial decisions. As a result, it is necessary to plan and to locate treatments within the context of the characteristics of a location: its slope, its elevation, the stand types both within it and surrounding it.
d) analysis of risk reduction potential and cost: how feasible is it (from a technical perspective) and how costly (dollars, time) to reduce fire risks for different areas of the Analysis Area, keeping in mind that different areas are likely to vary in importance with respect to objectives. This is a management question: how easy (in a relative sense), and how sensible, is it to fix the problem (keeping in mind that although the fire risk can be reduced, it cannot be eliminated – even the best program of fuel treatment cannot eliminate the threat of fire to Kimberley).
e) analysis of key tradeoffs: what are the important pros and cons of different management options, in light of what matters to different stakeholder groups? This analysis should include questions of timing, feasibility, and liability.

To achieve these tasks, it was agreed that the following steps needed to occur.

1. Establishment of a technical sub-group to provide guidance on questions of stand density and the spatial location of key attributes in light of the primary objectives: fire management, cost, social implications, and conservation. A four-

person committee was established – Chair Peter Holmes (MOE), Brian Dureski (Tembec), Greg Utzig (Kutenai Nature Investigations), Bob Gray (fire expert). A first (telephone) meeting of this group is scheduled for February 12.

2. Additional analysis of fuel management alternatives. This will include further runs of variants of the preferred alternative.
3. Additional work refining estimates of consequences. This will include incorporating input from various workshop participants. In light of concerns about the quality of data and the uncertainty that will characterize some of the estimates, it might be helpful for the SDM consultants to conduct some detailed interviews with key experts to develop and compare probability distributions of expected consequences and to develop estimates of the experts' confidence in their assessments.
4. Investigate in more depth the extent of funding available for implementation of fuel treatment programs. In light of this information, it might be necessary to modify a selected plan or to set a limit on the cost of plans.
5. Convene a second workshop, suggested for mid- or late-April, including all participants from the first workshop, in order to (a) clarify value tradeoffs across objectives, (b) prioritize treatment options, in light of funding and other constraints, (c) develop a workplan for implementation of a preferred fuel treatment plan, and (d) establish a basis for monitoring results and for adjusting the plan over time as more is learned and, in addition, in response to changing conditions (e.g., future development, climate change, etc).

Consultations between the City of Kimberley and the Province of B.C. will take place to discuss these steps and, in due time, report back to workshop participants.

Table 1: Agenda for City of Kimberley Fuel Treatment Workshop

Thursday, January 25

8:30	Welcome, Intro to goals and participants	Mayor Ogilvie, Councillor West-Sells, Robin
9:15	Intro to workshop methods	Robin, Michael
10:00	Break	
10:15	Overview of Kimberley Nature Park	Kent Goodwin
10:30	Overview of fuel treatment models	Bob Gray
12:00	Lunch	
1:00	Objectives for fuel treatments in Analysis Area: what matters? How can it be measured?	Robin, Michael
2:45	Break	
3:00	Initial discussion of alternatives: intro of strategy tables & consequence matrix	Robin, Michael
4:15 – 4:30	Review, next steps	Robin, Michael, Bob

Friday, January 26

8:30	Welcome. review, questions	Robin,Michael, Bob
9:00	Discussion of treatment impacts: consequence matrix, objectives ranking	Robin, Michael
10:00	Break	
10:15	Discussion of key tradeoffs	Robin, Michael
12:00	Lunch	
1:00	Review of leading fuel treatment alternatives: role of uncertainty	Robin, Michael
2:00	Identification of knowledge gaps, refinement of treatment options	Robin, Michael, Bob
3:00	Break	
3:15	Status check, search for consensus, review and discuss next steps	Robin, Michael, Bob
4:15 – 4:30	Review, close	Robin, Mayor Ogilvie

Table 2: Kimberley Fuel Treatment Workshop Participants

Participants
Jim Ogilvie, Mayor of Kimberley
Bob West-Sells, City Councilor
Allen Collinson, Fire Chief, City of Kimberley
Murray Houlind, MOFR Protection Branch
Ted Antifeau, (MOE)
Rob Beugling, MOFR Protection Branch
Tom Hedin MOFR, Cranbrook Forest District
Peter Holmes, (MOE)
Peter Hisch, MOFR, Protection Branch
Greg Anderson, MOFR Ecosystem Restoration Program
Brian Dureski, Tembec
Ian Stuart-Smith, Tembec
Kent Goodwin, Kimberley Nature Park Society
Bill Green, Kimberley Nordic Trails
John Bergenske, Wildsight
Greg Utzig, Wildsight

Support
Robin Gregory, Value Scope Research
Michael Harstone, Compass Resource Management
Bob Gray, R.W. Gray Consulting
Amelia Needoba, B.A. Blackwell and Associates
Rick Stratton, Systems for Environmental Management

Table 3: Objectives and measures

Area	Objective	Evaluation Criteria	Preliminary Interest Areas
Fire Risk	***Reduce Fire Risk to City of Kimberley*** ***Ensure safety of fire crews***	• Rate of Spread (ROS) • Flame Length (FL) • FF Safety access scale • Controllability	• Public Safety – Kimberley & surrounding area • Property Damage • Firefigher safety • Fire dept access • Lower fire intensity – slow rate of spread • Biomass reduction or orientation/isolation • Lower probability of ignition (humans) • Exception from stocking std (also conservation)
Forest / Tree Health	***Reduce risk of infestation*** ***Minimize mortality of trees from a wild fire***	• Probability of infestation • Reln stand specific fuel type & intensity & Flame length	• Mtn Pine Beetle – rate of spread • Exception from regulations (w/ mistletoe) • Forest resilience from wildfire
Conservation / Environment	***Protect conservation values within the Nature Park & Nordic Trail Area*** ***Protect Biodiversity***	• Weighted values conserved: e.g. Habitat attributes – spatial & temporal • Degree of ecological appropriate stand types • Status of breeding patch for Williamson Sapsucker (WHA& WTP)	• Maintain canopy as much as possible • Maintain natural ecological integrity • Protect breeding habitat WISA • Managing to a high conservation forest std (HCVF) • Control noxious/invasive weeds • Maintain Biodiversity – plant / animal • Support natural succession patterns • Preserving snags • Minimizing soil disturbance • Watershed integrity / Reln w/ Fire shed • Restricting recreational motorized access
Financial	***Short Term – Min Costs*** ***Long Term – Min Annual Maintenance*** ***Minimize adverse local economic impacts***	• $ • $/Year • $	• Resilience of Kimberley / Growth • Long term financial burden • Tourism $ • Cost sharing of Province / UBCM • Structures for community & Tourism

Area	Objective	Evaluation Criteria	Preliminary Interest Areas
Social	***Max Recreation Values – Quality/ Opportunity***	• Wt Recreation Days	• Tourism • Preserving History • Trail shading / maintenance– summer
	Max Aesthetic Quality	• Weighted Scale	• Smoke tolerance • Reduce Liability to kimberley
	Max Air Quality	• Weighted Scale	• Natural aesthetic look – scenic integrity landscape
	Providing education opportunities	• Weighted Scale	• Reduce coarse woody debris on forest floor
	Preserve History & Cultural Aspects	• # of sites	• Education value • Community recreation

Table 4: Fire treatment alternatives

1. Status quo

2. Maximum fuel treatment (unconstrained)
   - mechanical harvest,
   - overstory & understory fuel treatment
   - broadcast burn
   - manual treatment in WISA

3. Maximum fuel treatment:
   - no mechanical harvest
   - pile and broadcast burn.
   - No treatment in WISA

4. Harvesting + manual fuel treatment
   - entirely within Nature Park,
   - pile and broadcast burn
   - manual in WISA

5. Natural disturbance:
   - understory fuel treatment
   - mechanical harvest
   - broadcast burn,
   - manual treatment in WISA

6. Conservation (to disallow crown fire in NP/Nordic area):
   - manual understory fuel treatments
   - pile and broadcast burn
   - nothing in WISA,.
   - Two versions:

   6a) try with buffer in NP

   6b) buffer in SW crown lands

References

Gregory, R. & Failing, L. 2002. Using decision analysis to encourage sound decision deliberation: Water use planning in British Columbia, Canada. *Journal of Policy Analysis and Management* 21: 492-499.

Keeney, R. 1992 *Value-Focused Thinking: A Path to Creative Decisionmaking*. Harvard University Press, Cambridge Mass.

Stratton, R. 2004. Assessing the effectiveness of landscape fuel treatments on fire growth and behavior. *Journal of Forestry*, 32 - 40.

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