


B.C. BRANCH

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NO. 4 2003



BC PAGE

Canadian Institute of Public Health Inspectors

BC Burns 2003



The summer of 2003 is over, but will not be soon forgotten. The lack of moisture and above-normal temperatures produced a drying in the forests that was recognized even at this time last year. The extreme lack of moisture in the forest by summer produced fire behavior that was often described as both extreme and unprecedented. The result? Where British Columbia may experience one interface fire in a year, 2003 produced 8. This issue of the BC Page is devoted to the public health issues that arose during the fires, and is dedicated to the thousands of firefighters, military personnel, volunteers, citizens, and the staff of agencies too numerous to list, who stepped forward to help during a time of need. Thank you.

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Forest fires are not principally a health concern... Communities in crises are!

2003 By The Numbers:

Cariboo Fire Centre	383 Fires	34,000 Ha Burned
Kamloops Fire Centre	752 Fires	106,000 Ha Burned
South East Fire Centre	725 Fires	88,000 Ha Burned

FIRE LOG

Kootenay

Blairmore	Alberta
Lamb Creek	Cranbrook
Ingersol	Creston

Okanagan

Anarchist Mountain	Osoyoos
Cedar Hills	Falkland
Okanagan Mountain Park	Kelowna
Vaseaux Lake	Okanagan Falls

Thompson

McLure	McLure
Strawberry Hill	Kamloops
Chilko Lake	Williams Lake
McGillvray	Chase
Venables Valley	Ashcroft



Fire Size

Chilko Lake	29,000 Ha
McLure	26,500 Ha
Okanagan Mountain	26,000 Ha
McGillvray	12,000 Ha
Venables Valley	8,000 Ha

Above: smoke from the Strawberry Hills fire rises above Kamloops. The fire is about 45 minutes old.

Left: intense fire burning in the Thompson

Some Lessons Learned

- Hazard-specific emergency plans for water utilities should be reviewed when disaster is imminent. Utilities must be empowered to act quickly and independently in the event of power loss, disinfectant interruption, or catastrophic failure or damage to the distribution system.

- Expand cross-border relations with emergency officials in Alberta and USA. Evacuees from the fire that threatened Blairmore, Alberta, would logically have gone to Fernie; this proved difficult given the provincial boundary and Lethbridge (some distance further) was considered instead. Several fires that were burning in the United States neared the border - smoke from those fires drifted into Canada, and fire retardant was dropped on land that drained into Canada. There should be consistent messages between health agencies on both sides of the border.



- Medical Health Officers have clear responsibility for communicable disease issues in communities and fire camps. It may be necessary to communicate this if jurisdictional issues arise, or if there is interference from others.

- Strengthen off-season relationships with Nelson and Kamloops based Provincial Regional Emergency Operations Centres, and the Kamloops and South East Fire Centres.



All photos on page 4 and 5 are of the Okanagan Mountain Park Fire and the Kelowna area.

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- Establish financial emergency codes for budget and staff tracking. Costs associated with emergency response can be recouped from the Provincial Emergency Program; tracking and reporting these costs is much easier if the mechanisms to do so have already been established.

- Consider the toxicological impacts of fire and fire suppression. The MSDS for retardant should be available. Consider before hand the implications of fire suppression impacts in community watersheds or agricultural lands. Is there any risk to health by growing carrots on land coated with retardant?

- Update call-in roster and emergency numbers and don't change them mid-event. Emergency contact lists should be reviewed and updated semi-annually.

- Suspend routine operations and form teams of available staff to focus on issues in groups of two or more. The emergency may reach a magnitude that suspending routine operations is necessary to ensure that the response is adequately resourced – even at the expense or demand work such as permit applications. Placing staff in groups allows a focus on specific tasks while ensuring 24-hour coverage.



- Re-think evacuations in light of recent experience. For example, when 30,000 people were ordered out of their homes in Kelowna, approximately 7,000 were expected in Kamloops – 15 showed up. Many people have an RV, second home, or friends and family. It makes no sense to lodge people in emergency shelters when so many can make alternate arrangements, and the remainder could be placed in local hotels. In addition, it is easier to send people to local food establishments rather than set up a mass kitchen.



- Evacuate licensed facilities sooner rather than later. The clients have greater needs and are more susceptible to the early effects of an emergency - smoke, power outages etc. An early evacuation can be made to feel like a routine outing rather than an emergency, causing much less stress for the client. The need to evacuate must be considered carefully: some of the clients are so fragile that they may not survive it.




- Strengthen internal relations with Acute Care, Home and Continuing Care, Mental Health, Finance and Communications. Liaise often with Senior Executive and Chief Operating Officers.

- Re-think air quality advisories for unique circumstances and revisit prescribed burns. Agreement is necessary before the disaster on static air quality and emergency air quality advisories. In addition, a position must be taken with respect to prescribed burns: it may be necessary to accept some adverse health effects in order to prevent the greater disaster.
- Emergencies can be anticipated and emergency-specific messages prepared ahead of time, with agreement reached on such things as length of time to boil water. Off-the-shelf health advice and alerts for evacuations, boil water advisories, power loss, re-entry plans, and cleanup and rebuilding are essential. Stick with basic health protection messaging, i.e. hand washing, injury prevention and temperature abuse.
- Network with large camp operators and their home base health authorities in the off-season. An emergency is no time to discuss the location of a hand sink, or to be drafting food safety plans.
- Train more staff in Incident Command Systems (ICS) and Emergency Operations Centre (EOC) structure to help fill our roll externally.
- Develop sign-off procedures for emergency communications and limit the number of spokespeople. A communications protocol will ensure that a consistent message is provided
- Consider the impact on staff for critical incident stress debriefing and post-traumatic stress disorder. Staff may themselves be directly affected by the emergency even as they are called upon to help others. In addition, how are staff coping when faced with the stress of others?
- Obtain the necessary supplies and equipment including telecommunication equipment and prepare contingencies for when it doesn't work. For example, the Cedar Hills fire resulted in the loss of email for 37 hours. What is the back-up plan?
- Link local staff with local EOC and senior staff with regional and provincial operations. Local staff who know the area are the best ones to participate at the local EOC.
- Don't resist calling for help! To recognize that local staff can no longer cope with the demands of the emergency is not admitting defeat. Staff from other parts of the Health Authority and even other parts of the province should be called in sooner rather than later.
- Debrief, review and improve.

Fire Losses

McLure	40 + Homes
Okanagan Mountain	230 + Homes
McGillvray	20 + Homes

10 year average fire cost: \$56.4 M
2003 Costs: \$450 M plus




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What Was The Single Largest Health Impact?

Was it the poor air quality do to smoke? The impact of fires and the suppression efforts in watersheds? The trauma of massive evacuations and the unprecedented property losses? No. It was the loss of the Tolko mill at Louis Creek (pictured), a loss that has left 180 employees without jobs and a small community devastated with an uncertain future after Tolko announced that the mill would not be rebuilt. The mill was Louis Creek's largest employer.

According to the World Health Organization report, *Social Determinants of Health: The Solid Facts* (1998),

- Poor social and economic circumstances affect health throughout life. Disadvantages including insecure employment and trying to raise a family in difficult circumstances tend to concentrate among the same people and have a cumulative negative impact on health. The longer people live in stressful economic and social circumstances, the greater the physiological wear and tear they suffer, and the less likely that they will enjoy a healthy old age.
- Unemployment puts health at risk and the risk is higher in regions where unemployment is widespread. Evidence shows that, even after allowing for other factors, unemployed people and their families face a substantially increased risk of premature death.
- Social support and good social relations make an important contribution to health
- Drug use is both a response to social breakdown and an important factor in worsening the inequalities of health.

What is the future of Louis Creek? Clearly, the rate of unemployment and the collapse of established social support networks as residents leave to find work do not bode well for the long-term health of its residents.



Positive Outcomes

- The emergency and the resulting response strengthened the profile of Health Protection programs and capacity internally and externally
- The emergency proved that Public Health and Health Protection are an integral part of an overall health response.
- Post event relations with the Fire Commissioner, Provincial Emergency Program, Forest Service and BC Ambulance are stronger.

Acknowledgement

Many thanks to Ken Christian, Director of Health Protection, Interior Health, who prepared this information for his presentation, "Health Protection Forest Fire Debriefing" and made it available for this publication.



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Conflicts

- Tourism concerns around air quality: the tourism sector reacted negatively to health messaging, fearing it would have a negative affect at the height of the summer tourist season. The Health Authority must accept this conflict if the health advice is correct.
- Some need for role review within the Health Authority.
- Access issues to affected areas: if there is a transportation disruption (such as a highway closure), staff have a problem accessing affected areas.
- The role of volunteers: an emergency often results in an outpouring of public emotion, often expressed by people preparing food at home for the volunteers. Is there a nice way for the Health Authority to say thanks but no thanks?
- Gain quick consensus from key players within the Health Authority and stick with agreed messaging.

Recommendations

All Health Protection staff including PHIs, PHEs, LOs, DWOs and Administrative Support should have at least ICS 100 and EOC training.

One Health Protection staff member and a backup should be assigned liaison responsibilities to Provincial Regional EOCs in Kamloops and Nelson.

All Health Protection staff must liaise with all local emergency measures organizations in the respective geographic areas that they serve.

Health Protection should develop and update key public health messaging for emergency use in areas such as emergency water supplies, Health Protection advice for evacuation, re-entry and mass feeding.

Interior Health should strike an expert committee including respiratory physicians to review the impact of the fire season to revisit air quality advisories and recommendations for prescribed burns.



Emergency plans and emergency contact information should be automatically reviewed and updated quarterly. Consideration should be given to the concept of a duty manager and standby provisions for staff.

Effects Of Wildfire On Soils

Many thanks to Dr. David F Scott, FRBC Research Chair, Watershed Management, Okanagan University College, Kelowna. This material was taken from his presentation "The Effects of Fires on Soils & Erosion Risk: Debris Floods Explained", and his article with Robin Pike, "Wildfires and Watershed Effects in the Southern BC Interior" (Streamline, Volume 7, Number 3, Fall 2003).

What is the effect of wildfires on a watershed? The short answer is that it varies. Fire intensity refers to the amount and rate of energy release. Fire severity refers to the effects on the burned site. Severity depends on many factors: wildfires that consume high fuel loads and occur under extremely dry conditions are most likely to exhibit high intensity and severity. Conversely, fires that burn when the forest soils are moist are unlikely to consume all available fuel or remove most of the ground-covering litter because some of the fire's energy is expended vaporising moisture in the fuel before it is burned. These fires do not usually generate temperatures that will damage soil or kill trees. Low-severity conditions are used in prescribed burning, so the effects are significantly different than that of wildfires



Photo Above: Okanagan Mountain Park Fire - total loss of vegetation and the organic layer on soil

Generally, the greater the severity of the fire and the extent of the burn, the greater the hydrological effects.

What determines fire severity? There are several factors:

- What is the fuel load (potential energy)?
- What is the fuel type and wetness? (Determines the proportion consumed).
- What is the litter moisture content?
- Is the litter all consumed? If not, then the soil is insulated from heating during fire
If yes, then the soil is exposed to greater energy during fire

Forests & Water: a state of the art review for Colorado.

MacDonald & Stednick, Nov. 2003

"Wildfires pose the biggest threat to water quality and site productivity. In severely burned areas peak runoff rates can increase by a factor of 10 or more, while erosion rates can increase by 100 times relative to unburned areas."

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- What is the soil wetness level?
Moist soils: fire energy is expended to vaporisation; thermal capacity & conductivity are increased
Dry soils: all fire energy goes into heating soil; the heating is concentrated near the surface

If soil temperatures exceed 250°C, the organic matter in the soil is combusted (ashed). This results in a loss of soil aggregation and increased soil erodability (the soil resembles powder). Organic compounds in the soil are partially volatilized distilling onto cooler soil particles deeper in the soil profile, creating a water-repellent layer within the soil, a condition that may persist for 5-6 years. This has occurred in the soil damaged by the Okanagan Mountain Park Fire.

In addition to soil effects, wildfires can result in:

- Decreased loss of precipitation to evapotranspiration, resulting in more water available to flow through a watershed
- Loss of the organic layer on the forest floor eliminates the ability to delay and store precipitation before it enters the soil
- The loss of vegetation cover, causing deeper snowpacks that melt faster

The cumulative effect of soil damage and vegetation loss is peak flows that can increase by as much as 200 – 400%, causing significant erosion and sediment problems.



The effects of water repellent soils can clearly be seen in the above photos (Okanagan Mountain Park Fire). The footprint in a thin layer of mud reveals the dust below, indicating very shallow water penetration. The phrase “Dusty footprints in the mud” has been coined to describe this phenomenon. The photo at top right shows ponding caused by impeded percolation

Economic impacts of a fire's effects on hydrology (Denver Water)

Following the Hayman Fire, southeast of Denver in 2002:

- 26 Water treatment plants were closed
- Water treatment costs increased by \$250 million
- Significant costs to rehabilitate watersheds

Slope and Hydrologic Analysis Okanagan Mountain Park Fire

Following the Okanagan Mountain Park Fire, Dobson Engineering Ltd. was contracted to identify the slope and hydrologic hazards that are present or maybe present in the burned area, to identify the elements at risk from these hazards and to provide design criteria. Many thanks to Don Dobson for providing this information for the BC Page.



Hydrologic Hazards

- Debris-laden floods
- Floods
- Changes in frequency and magnitude of peak flows
- Increased runoff
- Increased sedimentation

This is caused by several factors that result from a fire:

- Hydrophobic (water repellent) soils, causing overland flow that results from the reduced infiltration, and higher stream flows as a result of reduced time of concentration for runoff to reach the stream channel.
- Reduced interception by the forest canopy and reduced evapotranspiration
- Redirection of runoff by fireguards and trails
- Increased snowmelt due to an increase in short term radiation

All of this results in risks to public safety, private property, infrastructure, the environment and water quality.



Above: Debris flow damage to house and yard. Left: Channel scouring and deposit from storm flow

Unfortunately, the theory of potential erosion from a storm was put to the test on the night of October 22, 2003, when an extreme storm event deposited between 12 and 20 mm of rain in a 20-45 minute period. This storm was very localized and, based on rain gauge measurements and stream flow heights, was a 100-year event. Runoff from this storm was exacerbated by the slope and vegetative conditions following the fire.

As a result of such an intense storm over watersheds recently damaged by fire, the following resulted:

- Significant erosion occurred in stream channels, dry gullies and on logging roads
- Debris laden floods were triggered
- In-stream debris flows initiated in a peat bog on Rembler Creek deposited debris up to 200 metres downstream
- Drainage structures and stream channels were overtopped on Rembler and Lebanon Creeks, impacting orchards, residences and infrastructure

The work done by Dobson Engineering has demonstrated that most of the existing culverts have insufficient capacity to handle the post-fire design flows. The City of Kelowna now must consider whether to upgrade channels and works to accommodate the new design flows, reduce downstream discharges, or do nothing. Detailed engineering will be required once an option is chosen.



Above: storm flows overwhelmed stream channels and culverts



Left: overland flow carved deep channels through what was once a dry depression.

Below: a temporary lake formed on the Thompson Fireguard, which was predominantly drained by Rembler Creek.



Firestorm 2003: Provincial Review

The Government of British Columbia commissioned an independent review of the forest fires of 2003, led by the Honourable Gary Filmon, former Premier of Manitoba. Some excerpts are contained here; the entire report can be viewed at their website www.2003firestorm.gov.bc.ca/.

“The summer of 2003 was the worst ever for forest fires in British Columbia. Abnormally hot, dry weather resulted in over 2,500 wildfire starts over a vast area, mostly in the Interior of the province. Interface fires, which occur in places where wildland meets urban development, were at an all-time record high.”

“The interface fires of last summer destroyed over 334 homes and many businesses, and forced the evacuation of over 45,000 people. The total cost of the Firestorm is estimated at \$700 million. The greatest cost of all was the loss of the lives of three pilots who died in the line of duty.”

“The conditions for BC’s summer of fire were four years in the making. Going into 2003, some areas along the Pacific Coast and in the southern interior were in the midst of their worst drought in 100 years... At some weather stations in the Interior, temperatures soared to 40C. In Kamloops, temperatures rose above 30C on 19 days in July and 20 days in August; normal for each month is 11. Kelowna recorded the driest June-July-August period since records began in 1899 and set a record with 44 consecutive rainless days. On the coast, Victoria had its driest summer since record keeping began in 1914 with a paltry 8.2mm of rain.”
(Environment Canada commentary, quoted in the report)

Daily Maximums:

Number of new fires 218 (763 fires over 6 days); 880 fires burning; 7,668 firefighters; 1,211 pieces of heavy equipment; \$9 million

Recommendations:

“The provincial government should lead the development of a strategic plan in cooperation with local governments to improve fire prevention in the interface through fuel management. The plan should focus on identification of those areas of the province where communities, infrastructure, and watersheds have the greatest potential to be impacted by large-scale fires.”

“The province should allow selective tree harvesting in provincial parks to reduce fuel build up.”

“The province should establish strictly controlled conditions for using prescribed burning as a fuel management tool.”

“Maintaining ICS accreditation over time should be dependent on a system of continuing education credits and participation in regularly scheduled, integrated simulations using ICS.”

“The provincial government, in partnership with local governments, should examine watershed restoration as soon as possible, to identify the areas of severe watershed destruction and develop a plan for the protection and rehabilitation of these areas.”

A final thought:

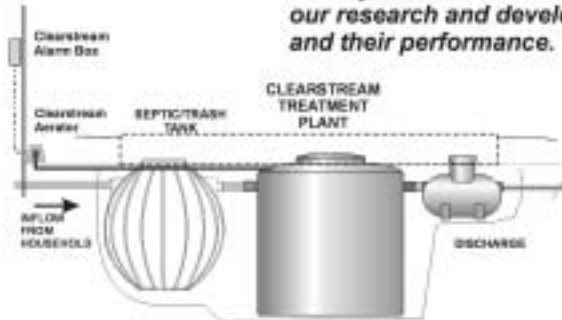
“We believe that governments have a once-in-a-lifetime opportunity to implement risk reduction policies and legislation while the devastation of Firestorm 2003 is fresh in the public’s mind and the costs and consequences of various choices are well understood.”

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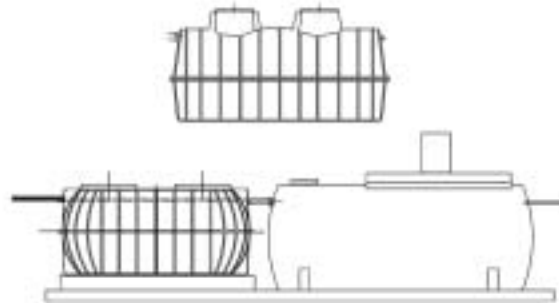


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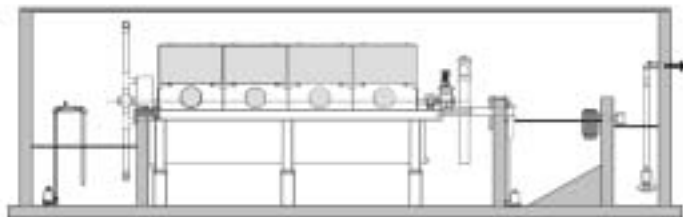


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