

Risk Analysis Procedure for Post-wildfire Natural Hazards in British Columbia

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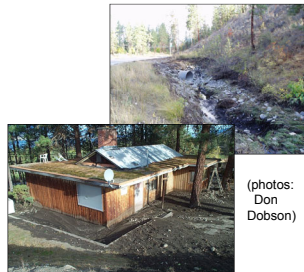
Background

The wildfire season of 2003 was exceptionally severe in southern British Columbia. A series of debris flow and flood events followed the 2003 wildfires, and caused significant damage to private property and infrastructure. As a result of these events, the BC Forest Service has developed a procedure to identify and analyse risks from flooding and landslides that can follow wildfire. The procedure is loosely based on the BAER program in the USA.



Kuskonook debris flow, August 2004

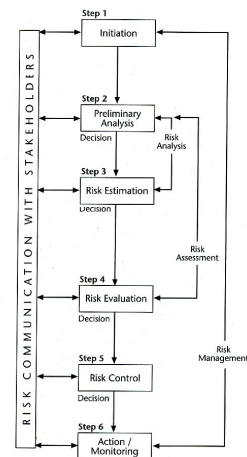
Rembler Creek, Kelowna, October 2003



(photos: Don Dobson)

The Risk Analysis Procedure

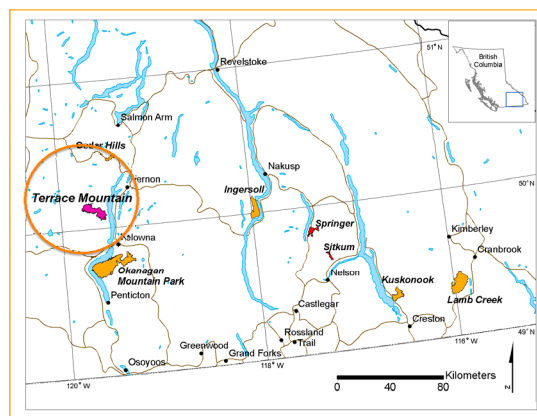
The procedure is based on the risk management framework of the Canadian Standards Association, which identifies six steps in the decision-making process:



If a wildfire is identified as having possible future risks to public safety or infrastructure, from post-wildfire hazards such as flooding or landslides, then Forest Service specialists or contractors carry out a *risk analysis*. The objective of this analysis is to identify risks, and to warn those affected. Treatment of burned areas is not a primary objective of the procedure.

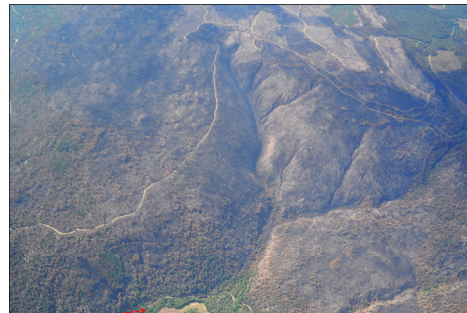
If the risk analysis finds high risks, then this information is passed on to affected parties, normally through the Provincial Emergency Program. The next step, which is typically undertaken by local government or landowners, is to evaluate the risks, and if appropriate, to recommend mitigation or other risk management strategies.

Example: the 2009 Terrace Mountain Fire



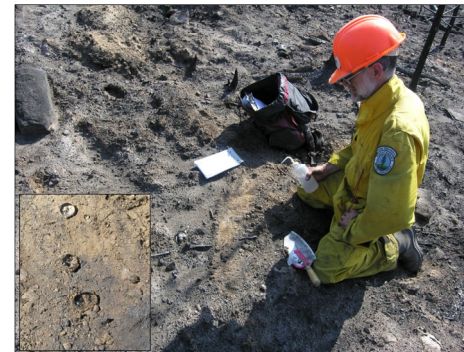
Risk Analysis Procedure – Methods

- Identify values at risk – in this case, rural residences in valleys to the north and east of the fire.
- Take oblique aerial photos from a helicopter, to identify severely burned areas, and plan field work.
- Conduct field inspections, to map soil burn severity, assess water repellency, and inspect stream channels and hazard features.
- Delineate watershed boundaries.
- Prepare a BARC (burned area reflectance classification) map from LANDSAT imagery, or a preliminary burn severity map, if imagery is not yet available.
- Tabulate burn severity areas by watershed, and assess potential hydrogeomorphic hazards in each watershed.

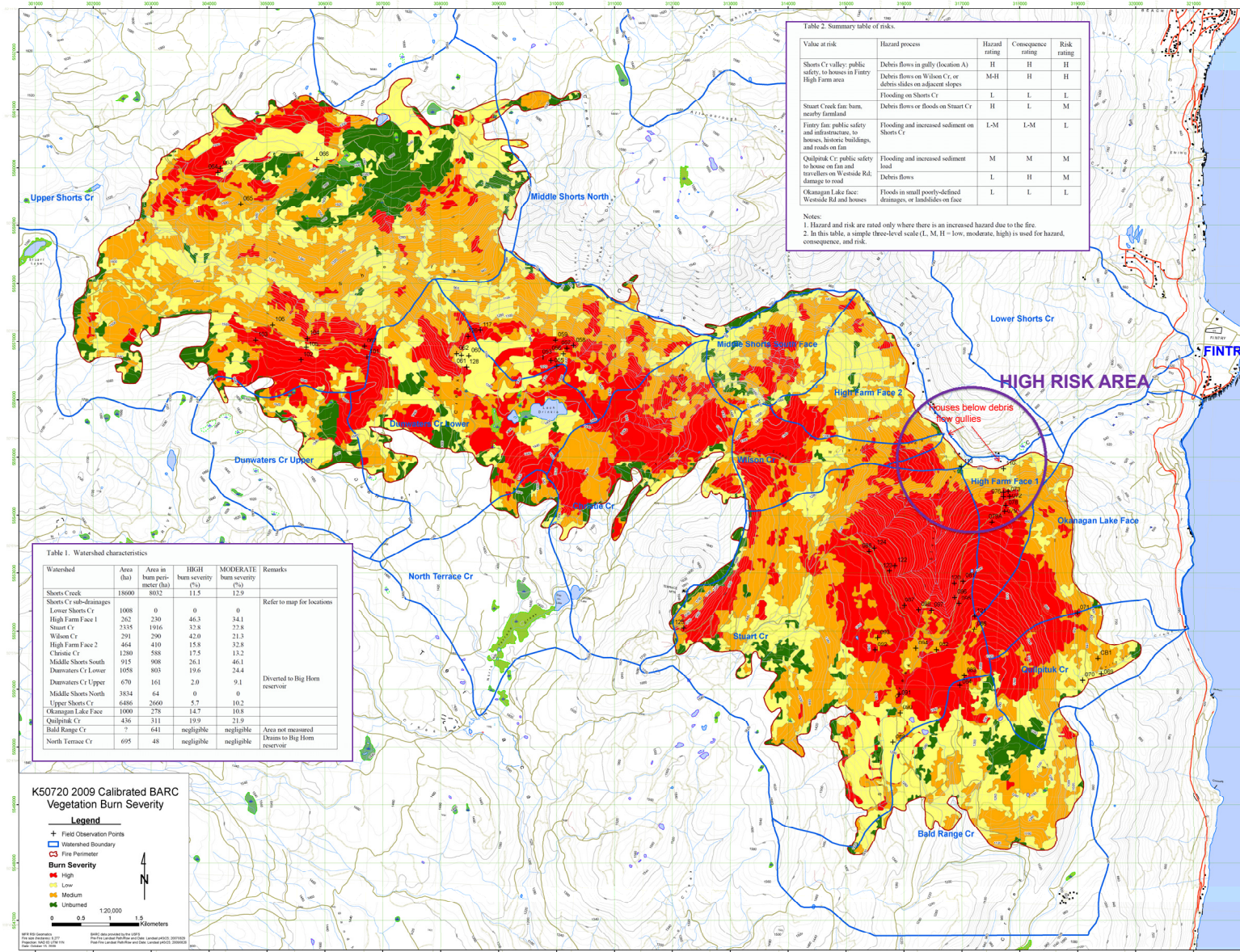


House below debris flow gully

Aerial photos help identify hazard locations. Terrace Mountain Fire; Terrace Main road and Stuart Creek; Shorts Creek valley at bottom.



Field inspections to assess soil burn severity. Inset: water repellency indicated by drops. Terrace Mountain fire, August 2009.



Risk Evaluation and Mitigation

At the Terrace Mountain fire, high risks from debris flows were identified, affecting several rural properties. The Wildfire Management Branch retained a geotechnical specialist to prepare a detailed risk evaluation and mitigation plan.



Berms constructed to protect houses from possible debris flows; October 2009.

Photos: Tim Smith, Westrek Geotechnical Services Ltd.



In late March of 2011, a small debris flow occurred in one of the gullies (left) during spring snowmelt. The berm successfully diverted the debris flow away from the house at the base of the slope.

Mitigation options fall into three general categories:

- Road engineering treatments – typically these are improvements to road drainage, such as new culverts, cross-ditches, or deactivation of abandoned roads and trails.
- Protective structures – dikes, berms, check-dams etc. to protect values at risk such as houses.
- Broadcast treatments – such as straw mulching, to reduce the likelihood of overland flow and to minimize soil erosion.

All of these options were employed on the Terrace Mountain fire, in a small, high-risk area of the fire (circled area on map).



Straw mulching of high burn severity area above the values at risk. In this case, the mulch was spread by hand, as road access was good.

Acknowledgments

The risk analysis field work was done by Mike Curran, Chuck Bulmer, and Peter Jordan. The BARC map was prepared by Will Burt. The detailed risk assessment and prescriptions were done by Tim Smith, Westrek Geotechnical Services Ltd. Ken Soneff supervised the straw mulching, which was done by BC Wildfire Management Branch fire suppression crews. (All are BC Forest Service staff except as noted.)

For further information

Please contact Peter Jordan or Ken Soneff for more information on this and related projects. Email: peter.jordan@gov.bc.ca, ken.soneff@gov.bc.ca. Risk analysis reports can be found at ftp://ftp.for.gov.bc.ca/RSI/external/publish/Wildfire_Risk_Analysis/

