

October 31, 2006

Re: Terrain Effects – 2006 Fires

MOFR conducted a review of the possible fire effects (2006 fire season) within the Kootenay Lake, Arrow/Boundary, Rocky Mountain, and Columbia Forest Districts. Most of the 2006 fires pose a low hazard to values at risk. Four of the fires are discussed briefly below (namely the Murphy Creek Fire, Davis Creek Fire, Mt. MacPherson Fire, and Duhamel Ck Fires). The reviews primarily consisted of helicopter overviews and are considered preliminary in nature. Stakeholders interested in refining the hazards and risks that the fires may pose with respect to slope instabilities, erosion, or flooding may consider more detailed mapping and on-the-ground field assessments by a professional engineer or geoscientist specializing in natural hazard assessment and risk management.



Murphy Creek

This burn is almost entirely in a cutblock, but the burn severity is high. Extensive water repellency was noted throughout the burn. The burn occupies most of the local drainage area on that hillside, and is above two levels of road near the base of the slope. If a major runoff event were to occur, water could be diverted down the road if cross-drain culverts were to plug. Sediment eroded from the road, or small landslides below the road adjacent to the creek, would probably have a significant impact on water quality and on sediment loads in the creek. Therefore, upgrading or backing up the drainage structures on the road is recommended.

There is apparently one water license on the creek (Birchbank Golf Club), and Highway 22 crosses near the mouth.

Davis Creek

The burn covers a large part of a tributary of Davis Creek, and a substantial area has high severity burn. The hazard of a debris flow in this tributary has probably increased

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significantly due to the burn. Davis Creek is a large watershed with a high level of geomorphic activity (snow avalanches, debris flows, landslides bordering the channel) and sediment loads are probably quite high during the spring freshet. The incremental effects on the channel of a debris flow from this tributary would be quite low. However, the period of greatest hazard would likely be mid-summer, from intense rain showers, which is a season when debris flow events and poor water quality would not be expected.

Duhamel Creek

The burn area covers 133 hectares in three separate fires located within 500m of each other along the south ridge of Duhamel Creek. The burn areas contain a significant proportion of high severity burn. Two gullies (one located below the southern most burn area and one located below the northern most burn area) have a higher likelihood of debris slides/flows as a result of the burn, however, the total high severity burn area located above each gully is in the order of 2 hectares which would likely contribute to only a low incremental hazard. The values at risk include the public road, FSR, and community watershed.

Mt. MacPherson fire

The burn covers 152 hectares on the north side of Mt. MacPherson most of which had a low severity burn. Values located below the burn area include the CPR mainline, some residential and industrial buildings and the Trans Canada Highway. In addition, 4 hectares burned over the ridge top and into the Dolan Creek drainage which is a community watershed. The likelihood of debris flows or floods as a result of the burn are considered low, however, there is an increased likelihood of avalanche activity in the main gullies in the western and central areas of the fire. These gullies have bare boulders and cobbles with some slide debris and slide alder. The gullies are located above the CPR mainline but the avalanche track areas are more than a few hundred metres horizontal distance from the Trans Canada Highway or any buildings.

Table 1 attached summarizes the fires reviewed and the preliminary risk results.

GENERAL INFORMATION ON WILDFIRE EFFECTS AND NATURAL HAZARDS

Due to the mountainous landscape in the Kootenays, natural hazards such as landslides and floods exist in a number of interface areas. Following a wildfire, the probability of a natural hazard event occurring is likely higher. The following summarises some of the possible effects of wildfire on watersheds.

The timing and magnitude of peak flow during freshet can be changed by wildfire due to factors such as:

- increased snow accumulation and snow pack melt rates due to the loss of canopy;
- the lowering of evapo-transpiration rates due to loss of canopy;
- decreased infiltration and soil storage due to loss of duff and;
- the possible presence of hydrophobic soils¹.

¹ Hydrophobic soil development is a phenomenon that occurs following wildfires. In certain conditions, the combustion of organic material leaves a waxy residue in the shallow soil layers that results in a barrier that can cause water to run off rather than be absorbed or infiltrate into the soil (hydrophobic conditions). This can increase proportion of surface water that runs off.

Consequently, flooding is more likely to occur. Even a drainage feature with little historical evidence of flow may experience runoff.

- The loss of protective vegetation and the duff layer may make the surficial material soils more erodible by removing protection from raindrop energy and exposing sediment and ash to erosion. Floodwater containing more sediment and debris can result in runoff that is more erosive (debris floods) or destructive (debris flows). This can change channel integrity or stability and / or lead to debris deposition on fans. Infrastructure on fans or adjacent to creeks or stream banks could be impacted.
- Groundwater levels may rise in some circumstances due to increased infiltration from greater snow pack accumulation and lower evapo-transpiration as a result of tree canopy loss. Landslides may be more likely to occur where groundwater seepage pressures increase or where there is increased shallow subsurface flow. Landslides that enter creeks or channelized drainage features (gullies) can trigger debris flows, which in the right circumstances have the potential to travel long distances, deposit debris on the fans, and plug/block stream crossing structures (culverts and bridges).
- Streams may respond to increased peak flows by eroding banks which may now be more prone to de-stabilization by the loss of riparian vegetation. Increased supply of burned large woody debris can change stream dynamics by causing logjams to develop and stream banks to erode.
- Rolling rock hazard (i.e. rock fall) may become an issue because of the loss of the protective nature of the forest, or where individual rocks were formerly supported or restrained by trees or stumps.

The above hazards summarise the potential impacts in extreme cases. The amount of change that occurs in a watershed following wildfire depends on many factors, including the proportion of the watershed that was burned, the severity of the burned proportion, and the geological and stream channel attributes of the watershed. Many natural hazards are weather-dependent and therefore are difficult to predict. It is possible that there may be no noticeable or significant impacts in some or all watersheds.

Yours truly,

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Wildfire Initial Screening - Nelson (SE fire centre)
Fires of concern as of: 6-Sep-2006

FIRE NO.	GEOGRAPHIC	DISCOVERYD	STATUS (Sept 6)	SIZE (H)	LATITUDE		LONGITUDE		Values at risk	Hazards	Water- shed	Field review?	Risk	Remarks
N10012	AboveElkoMill	25-Apr-06	out	20.0	49	17.7 03	115	4.96 0	none identified	none identified		no	L	Not really a wildfire, quite minor, low risk. (Info from Murray Houllind and Mike Morrow, Cranbrook fire zone)
N20409	Island Pond	29-Jul-06	out	62.0	50	1.00 0	115	46.0 00	none identified	none identified		no	L	No downslope risks identified. Apparently on private land. (Info from Cy McConnell, Invermere fire zone)
N20459	Skookumchuck	30-Jul-06	out	10.0	49	55.0 93	115	43.7 85	none identified	none identified		no	L	No downslope risks identified. Apparently on private land. (Info from Cy McConnell, Invermere fire zone)
N40411	Mt. MacPherson	27-Jul-06	active	82.0	50	58.8 38	118	16.6 39	CPR, Dolan Cr community watershed	possible increased avalanche hazard	Tum Tum Cr, Dolan Cr	Joe Alcock (air)	L	Low burn severity, however, increased hazard of avalanche activity
N50613	Murphy Creek	14-Aug-06	active	27.0	49	11.9 84	117	49.5 56	Water quality	Sediment from forest roads located below burn area	Murphy Cr (domestic)	Jordan (field)	L-M	Severe burn in cutblock - road drainage below may need upgrading - licensee notified
N70132	Howser Greek Girard area	04-Jul-06	out	12.0	50	22.3 46	117	2.76 0	houses and farms nearby	minimal		no	L	mostly in cutblock, near base of slope
N70278	Davis Creek North Side	24-Jul-06	active	258. 0	50	7.70 0	117	0.80 0	Water quality, highway crossing	Debris flow in tributary	Davis Cr	Jordan (air)	M	Water quality in Davis Creek community watershed could be affected by debris flow in tributary. Low risk to highway.
N70285	Shroeder Crk	24-Jul-06	active	35.0	50	1.43 0	116	57.1 57	Highway crossing, water quality	Possible rockfall, small debris flows	Shroeder Cr	Jordan (air)	L	Fire is on rocky ridges - debris flow/slide hazard is low

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N70295	Mobbs Creek	24-Jul-06	active	100. 0	50	28.9 07	117	20.1 49	Fish	minimal	Mobbs Cr	no	L	Fire is on high ridges far up the creek
N70516	Fry Creek	05-Aug-06	active	77.0	50	3.74 0	116	48.2 03	Creek channel (bridge, trail)	minimal	Fry Creek	Jordan (air)	L	Mostly low severity. Visuals and local erosion also of interest (in park), but appears very low risk.
N70761	Duhamel Crk	28-Aug-06	active	133. 0	49	36.3 50	117	16.2 90	Water quality (community watershed), public road, FSR	possible debris flow in gullies	Duhamel Cr	Jordan, Nicol (air)	L	Low hazard of debris flow in two gullies located above public road, FSR, and community watershed.
N70358	Tye	25-Jul-06	out	12.0	49	21.9 20	116	47.5 90	CPR	minimal		no	L	In Darkwoods private tree farm

Table 1 Wildfire Initial Screening - Nelson (SE fire centre)