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Hi Tom
I have the following comments to offer regarding the proposed harvesting for interface management in Dumont Creek. After reviewing the information you provided I can understand the rational for some wildfire interface management to protect people and property up Dumont Creek. The hazard associated with wildfire is of particular concern with the projected trend of increased occurrence of warmer, drier summers with global climate change over the next several decades.

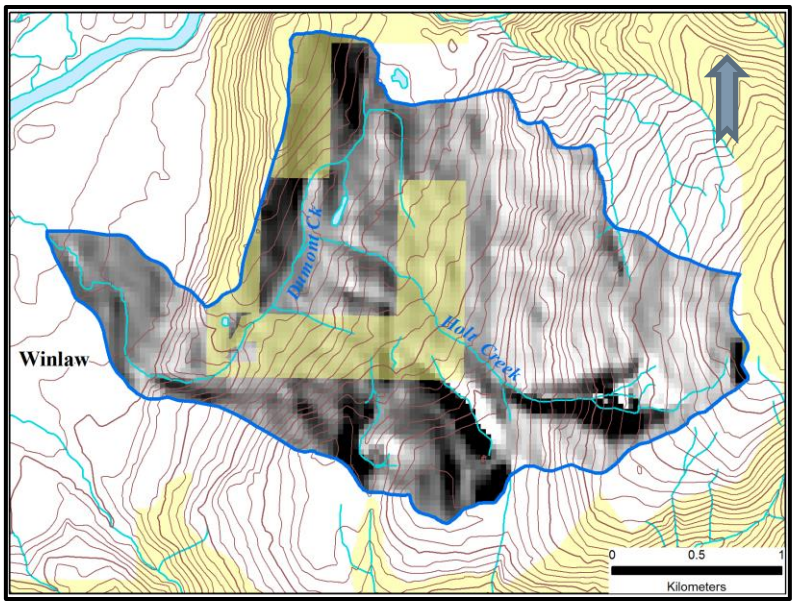

Figure 1. Hillshade of Dumont Creek with proposed SIFCo treatment areas in yellow.

In order to provide these comments I have undertaken a limited geospatial analysis of the raster coverages you provided and I have plotted the available discharge data for Dumont Creek in an effort to understand the potential hydrological response to additional

harvesting. Four years of daily discharge data are available for Dumont Creek from 1982 to 1985.

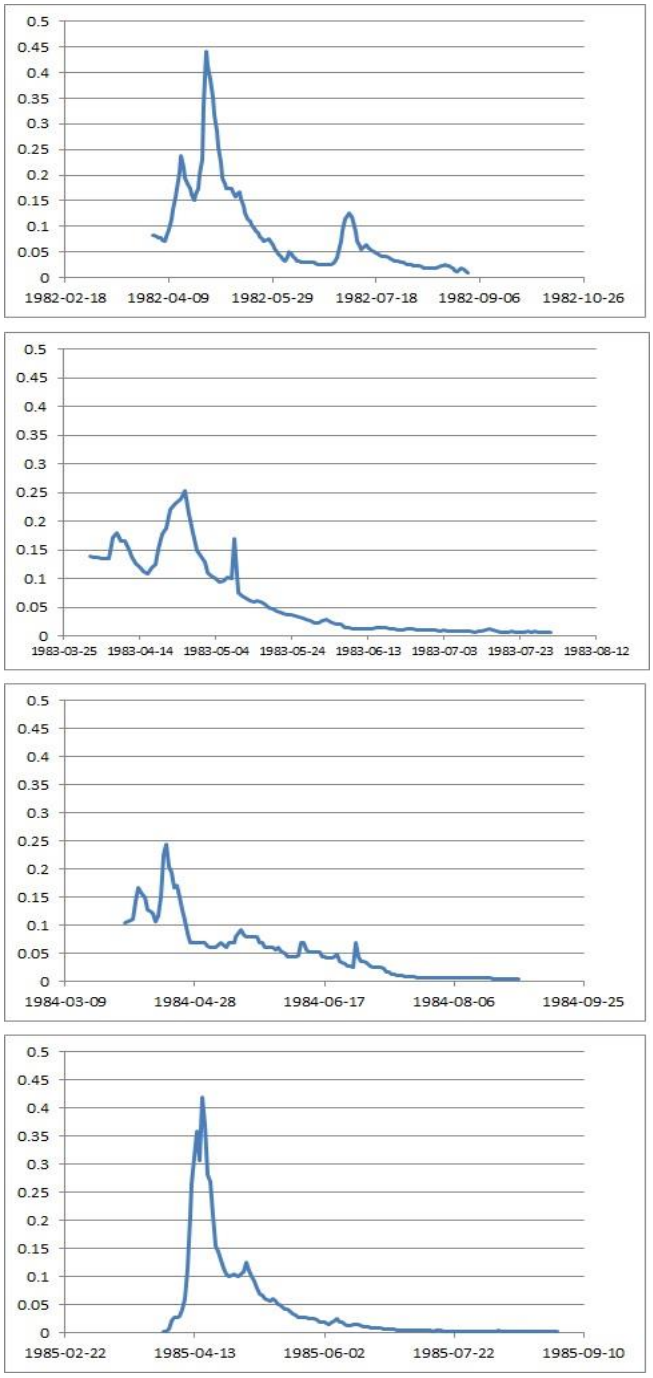

Figure 2. Hydrometric data for Dumont Creek. Daily discharge was recorded between April 1 and Sept 30 for four years (1982-1985).

The daily discharge data for Dumont Creek suggests that flows rise rapidly in early April or late March. A preliminary investigation of climate records for the same time (New Denver) indicate that discharge increases in Dumont Creek generally correspond to rising daily maximum temperatures however the climate station is not close enough to determine the influence of rainfall. The later peaks in June and later likely correspond to localized rainfall events. The relatively simple hydrograph that consists of one or two major peak events indicates that there is limited desynchronization of snowmelt runoff from the watershed.

The geospatial analysis reveals that Dumont Creek is primarily a single aspect watershed with the main slope aspect between 260^{o} and 320^{o} (west-northwest). In addition, Duhamel Creek has a relatively low slope gradient with the majority of slopes less than about 50% gradient (Figure 3a,b). The combination of predominantly single aspect slopes and low slope gradients in Dumont Creek likely results in a short duration of snowmelt across the relatively uniform region of west-northwest facing slopes above about 1000 meters elevation. The result of of such a melt pattern is a hydrograph with one or two main peak events during the freshet period.

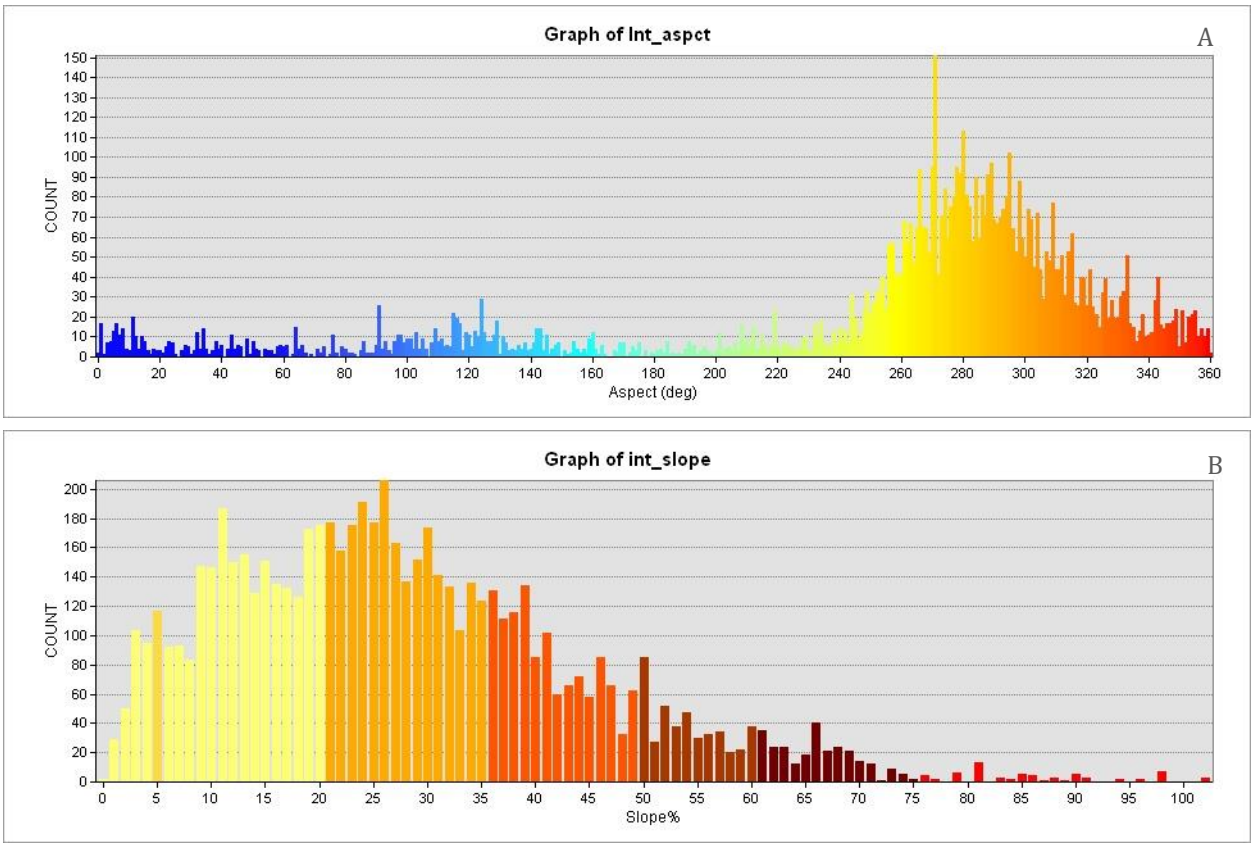

Figure 3. (a) aspect distribution for Dumont Creek reveals primarily west-northwest aspect slopes. (b) the majority of slopes in Dumont Creek are less than 50%.

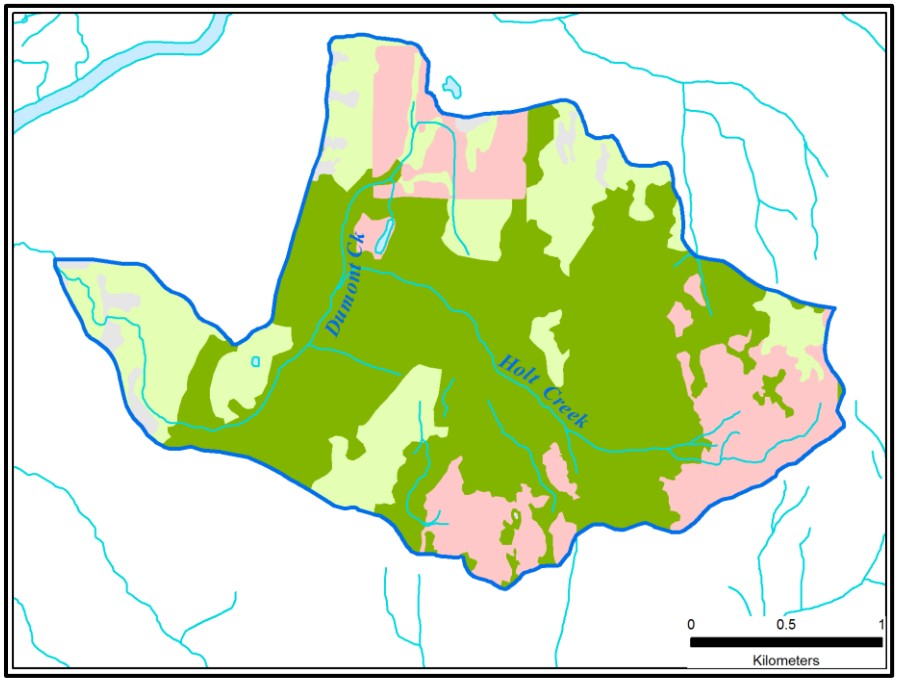

Figure 4. Summary of forest disturbance that shows areas of least hydrological recovery in pink (0%) and light green (60%). Darker green areas are >80% hydrological recovery.

The detailed equivalent clearcut (impact) areas calculation you provided (I have

summarized in Figure 4) indicates that currently about 33% of the Dumont Creek area is in a hydrologically disturbed condition. Of this, about 67 hectares of the 623 hectare watershed (11%) situated in the upper headwater region is in a fully cleared condition due to a pine beetle epidemic and harvesting (pink areas, Figure 4).

Forest harvesting is known to cause increased snow accumulation as well as increased rates of snow melt runoff, both of which contribute to increased peak flows in the spring snowmelt period. Modeling studies undertaken in a small watershed in the Okanagan (Schnorbus and Alila, 2013) have shown that cutting in the upper elevations advances the melt from these areas so that it melts off at the same time as the middle elevations resulting in increased peak flows in the watershed. A separate analysis done in the same watershed by FLNO Research Hydrologist Dr. Rita Winkler determined that high levels of forest harvesting (approx. 50%) in the mid to upper elevations of the watershed has resulted in increased water yields earlier in the spring runoff period but lower water yields in the later spring and summer months. This change in water yield is directly attributable to the advance of snowmelt runoff in the watershed (Rita Winkler, Personal Comm., April 2015).

Without the benefit of detailed hydrological modeling my opinion is that a small amount (less than 10% or 62 ha) undertaken on the west-aspect slopes below about 1000m elevation will not compound any existing changes to the peak flows and could possibly act to reduce any increases in peak flows associated with the high elevation clearing. This opinion holds only if there is no additional harvesting proposed in the area above 1000m. In addition, harvesting below the 1000m elevation is unlikely to affect the timing or duration of low flows because it is downslope from the areas that likely contribute the majority of slope runoff that eventually enters the stream channel via the slower process of soil water percolation in the later summer months.

With respect to the longer-term implications of additional harvesting when climate change is considered I have the following opinion. Given the projected change in climate it is likely that Dumont Creek, which is a low elevation (below 1461m), predominantly, single aspect watershed will experience lower snowpacks that melt off earlier in the spring (mid-March to mid-April) resulting in a longer occurrence of low flows through the late spring and summer months. The greatest potential for causing further advances in melt and potentially contributing to prolonged low flows would most likely result from harvesting the western-northwestern aspect slopes between 1000 meters and 1460 meters elevation, because, as discussed above, snowmelt from these slopes contribute to both the peak flows (from the rapid surface runoff) and the low flows (through slower soil water percolation) in Dumont Creek. With changing climate, the area below 1000 meters elevation is likely to become a transient snow zone where snow accumulates and melts off in successive events through the winter months. Openings created by harvesting in this area are likely to result in

increased snow accumulation through the winter period and potentially, increased soil moisture in the early spring months due to decreased evapotranspiration.

I hope I have answered your questions. If you have any further questions please do not hesitate to contact me.

Sincerely

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Literature Cited:

Schnorbus, M., and Y. Alila (2013), Peak flow regime changes following forest harvesting in a snow-dominated basin: Effects of harvest area, elevation, and channel connectivity, Water Resour. Res., 49, doi:10.1029/2012WR011901