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Fire size distribution and level of protection for the Canadian boreal forest

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As in many other forested areas of the world, the fire size distribution in the boreal forest of Canada is extremely skewed; an often used statistic for the country is that only 3% of the fires burn 97% of the area, though these percentages can vary from region to region. Analyses from other regions around the world have found that the upper tail of the fire size distribution can be modelled reasonably over many orders of magnitude by the power law or Weibull family of curves. Initial analysis of fire records from boreal ecoregions across Canada has shown that the shape of the fire size distribution varies significantly across the country. This presentation discusses an analysis that tested the hypothesis that some of the variation in fire size distribution from region-to-region can be explained by level of protection, which varies across the country and is generally highest in areas with higher population or forests of significant commercial value. Measures quantifying the level of protection that fire management organizations deliver to forests are presented and, using data extracted from historical fire records, shown to vary spatially across the boreal forest region of Canada. These measures were found to be consistent with established provincial fire management zone boundaries. These same fire records were also used to examine the fire size distribution across the boreal forest regions of the provinces of Alberta to Quebec. The lower end (left tail) of the fire size distribution was cut off at a size of 4 ha, as it was felt that, over the study period (which was generally from 1980 onward), all fires growing past this size were detected and recorded in the provincial fire archives. Results show that there is a significant effect of level of protection on the shape of the fire size distribution across the country: lower level of protection leads to a less

skewed fire size distribution, meaning that higher level of protection tends to result in greater numbers of smaller fires and reduced numbers of large fires on the landscape. A subset of individual ecoregions, split by provincially defined fire management zone boundaries, was also examined to attempt to provide some control for the influence of forest type and climate differences on variation in the fire size distribution. Again, significant differences in the shape of the fire size distribution are observed across the fire management zone sub-divisions of each of these ecoregions, implying a significant effect due to level of protection exists. The influence of fire weather and forest type on fire occurrence and spread are discussed in terms of the inclusion of these factors in a future, more comprehensive, analysis.