Fire is the dominant disturbance that precipitates ecosystem change in burned regions, and fire is largely under the control of climate. For the largest forested region of the world, the boreal forests of North America, Asia, and Russia hold 23% of the global burned forests. Fire frequency, fire severity, area burned, and fire season length are predicted to increase in boreal regions under climate change scenarios. Therefore, to predict the fire weather and ecosystem change, we must understand the factors that influence fire regimes and at what scale these variables are viable. In previous work, we demonstrated the viability of large-scale fire weather data to assess fire weather and damage. Therefore, to predict fire weather and ecosystem change, we must understand the factors that influence fire regimes and at what scale these variables are viable. In previous work, we demonstrated the viability of large-scale fire weather data to assess fire weather and damage.

The objective of this research is to assess the utility of large-scale (1°) data to be used as fire weather and fire danger, and for these data to be confidently used to predict future fire regimes using large-scale fire weather data, the risk associated with large International Panel of Climate Change (IPCC) climate change scenarios.

Specifically, in this paper, we relate large-scale fire weather, area burned, and the amount of fire-induced ecosystem change.

**Methods/Design**

First, we demonstrate the similarity in NASA Langley Research Center (LaRC)-derived fire weather indices (FWI) and Natural Resources Canada (NRCan) National Climatic Data Center (NCDC) surface-station-derived FWI. Both of these are calculated using the Canadian Forest Service (CFS) FWI, which is based on local-noon surface-air temperature, relative humidity, wind speed, and daily mean-noon rainfall. The LaRC’s FWI product uses NASA-Goddard Earth Observing System version 4 (GEOS-4/GPCP) n × n resolution and Natural Resources Canada Precipitation-Climatology Project (GEOS-4/GPC-4) data to calculate FWI. NASA’s Natural Resources Canada uses interpolated station data and calculate FWI. FWIs are compared spatially and temporally with satellite-derived fire counts. Then, the fraction of grid boxes that burn in each FWI class (very low, low, moderate, high, extreme) are compared for the fire season from April through October for the years 1999, 2002, and 2004. These are classified by International Geosphere-Biosphere Programme (IGBP) t = t°,” vegetation type categories to determine and compare fire regimes in each FWI/ecosystem class. On days with the counts, the domain total of 1° grid boxes with and without daily fire counts and area burned are tabulated. The fraction of 1° grid boxes with the counts and area burned to the total number of 1° grid boxes having any FWI category and vegetation type are accumulated, and a daily mean for the burning season is calculated. The LaRC and the CFS domain extend from 59°N-88°N latitude and 70°E-170°W longitude.

**Results**

In the adjacent plots for 1999, 2002, and 2004, the LaRC-derived GEOS-4/GPCP FWI and CFS NCDC FWI show a similar fraction of 1° grid boxes that show zero, one, two, three, or four FWI categories in the total number of 1° grid boxes that are burned in each FWI class. CFS NCDC FWI shows an increase in the higher FWI categories for the majority of the vegetation types (Table 1).

**Conclusion**

The ultimate goal of this research is to assess the viability of using large-scale (1°) data to analyze fire weather and fire danger for the regions. Understanding the quantitative relationships between large-scale weather and fire frequency is required to assess the likely impact of potential future weather and climate change to fire regimes and severity. Specifically, in this paper, we related large-scale fire weather, area burned, and the amount of fire-induced ecosystem change. We showed large-scale fire weather data can be used to assess fire frequency trends. Both the LaRC and CFS FWI showed increases in the fraction of grid boxes with fire counts and area burned with increasing FWI category, with a larger increase in the higher FWI categories for the majority of the vegetation types. Our analysis showed that a direct correlation exists between increased fire activity and increased FWI, and these are evident using large-scale meteorological data. During both normal and extreme fire seasons, the fraction of the counts and area burned per 1° x 1° grid boxes increases with increasing FWI rating.