PAYNE INSTITUTE COMMENTARY SERIES: **COMMENTARY**

Satellite Data Reveals the Start of Canada's Wildfire Season

By Mikhail Zhizhin, Kristin Ziv, Christopher Elvidge, and Morgan Bazilian

On the heels of one of the worst Canadian wildfire seasons on record last year, the 2024 season is off to an ominous start. As of May 14, 2024, there are 143 active wildfires in Canada, and 39 are out of control, according to Canadian experts and officials. In the U.S., plumes of smoke from Canada have wafted over large portions of the upper Midwest, Montana, and the Great Lakes region, triggering air quality alerts.

The Earth Observation Group at the Payne Institute for Public Policy, Colorado School of Mines, has calculated the temperatures and spatial extent of active burning across Canada with their Nightfire algorithm applied to data collected by NOAA's Visible Infrared Imaging Spectrometer Suite (VIIRS). The VIIRS data reveal the locations of both flaming and non-flaming combustion, a capability unique to the nightfire data product, as shown in Figure 1.

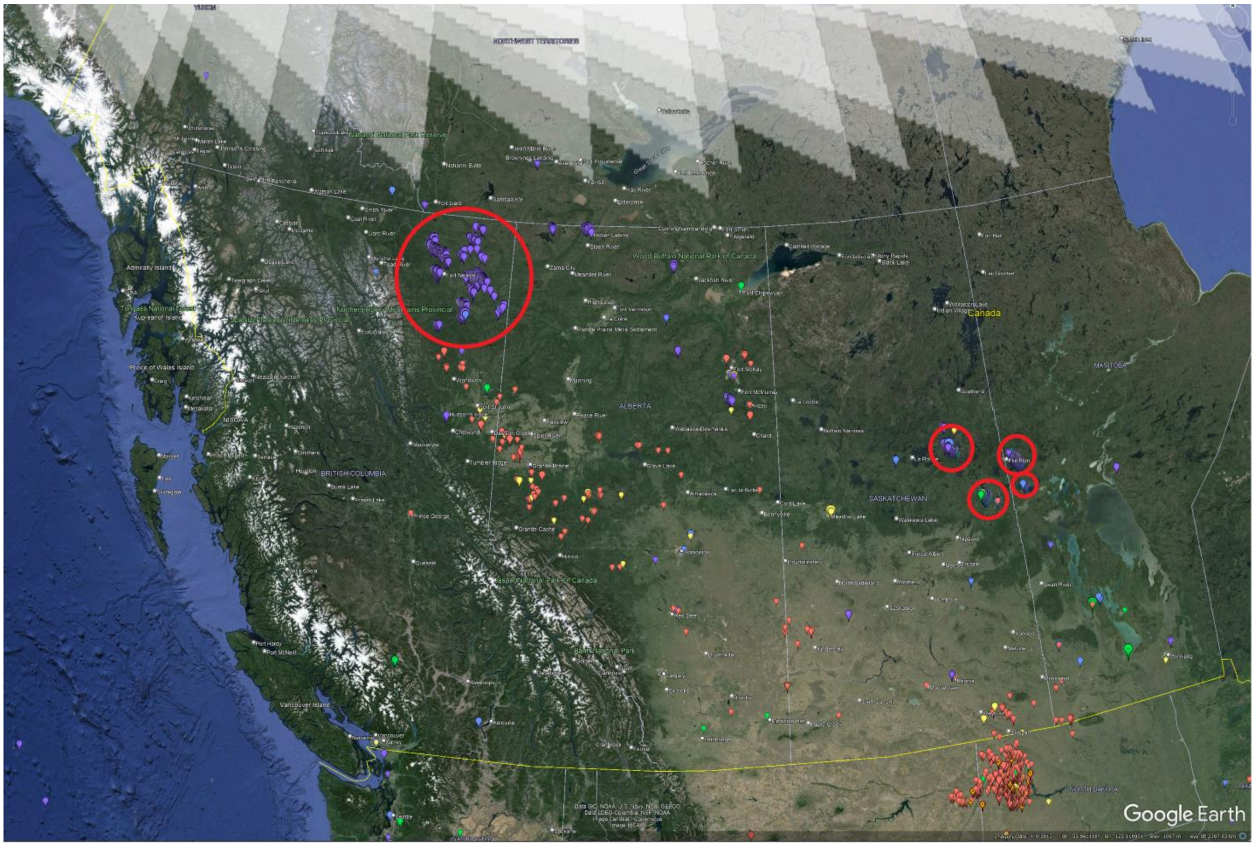

Figure 1: Satellite imagery from Payne Institute for Public Policy, May 13, 2024

The map shows the largest cluster of wildfires centered around Fort Nelson (population approximately 5,000) in northeastern British Columbia, forcing thousands of residents to evacuate over the weekend. A persistent drought and high winds are fueling the wildfires, which extend about 20 square miles in that area.

Additionally, hundreds of residents of Fort McMurray, Alberta (pop. about 68,000), in the Athabasca Oil Sands region, have been ordered to evacuate this week. The satellite imagery also shows significant wildfire activity farther east, in east central Saskatchewan and west central Manitoba.

Pin colors on the map correspond to temperature ranges. Red-orange indicates the hottest temperatures, around 2500 Kelvin, while purple indicates the coolest, between 400K and 1000K. Green pins are the most prevalent on the map, indicating temperatures in the 1200K – 1400K range (between 927 and 1127 degrees Celsius).

* Notes: VIIRS is the Visible Infrared Imaging Radiometer Suite which is flown jointly by NASA and NOAA. The VIIRS design was set by meteorologists, but other valuable products are also produced from VIIRS data. The Earth Observation Group developed the Nightfire algorithms in 2012 for quantifying natural gas flaring and biomass burning. It is the only global fire detection product that calculates fire temperatures, source sizes and heat output using physical laws.

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ABOUT THE AUTHORS

Mikhail Zhizhin
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Mikhail Zhizhin, M.Science in mathematics from the Moscow State University in 1984, Ph.D. in computational seismology and pattern recognition from the Russian Acad. Sci. in 1992. Research positions from 1987 to 2012 in geophysics, space research and nuclear physics at Russian Acad. Sci., later at NOAA and CU Boulder. Currently he is a researcher at the Earth Observation Group at Colorado School of Mines. His applied research fields evolved from high performance computing in seismology, geodynamics, terrestrial and space weather to deep learning in remote sensing. He is developing new machine learning algorithms to better understand the Nature with Big Data.

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After receiving a master's degree in journalism from Northwestern University's Medill School, Kristin worked as a public relations professional in Chicago. She has both agency and non-profit experience. After raising a family, she campaigned for and was elected to public office, serving a term as a Village Trustee in Winnetka, IL, before moving to Colorado in 2019.

Christopher Elvidge
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Christopher D. Elvidge has decades of experience with satellite low light imaging data, starting in 1994. He pioneered nighttime satellite observation on visible lights, heat sources including gas flares and wildfires, as well as bright lit fishing vessels. He led the development of these nighttime remote sensed products with images from DMSP, JPSS, and Landsat satellites. These data are very popular and used globally in both public and private sectors. As of February 2018, he has more than 11,000 scholarly publication citations.

Morgan Bazilian
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Morgan Bazilian is the Director of the Payne Institute and a Professor of public policy at the Colorado School of Mines. Previously, he wD.as lead energy specialist at the World Bank. He has over two decades of experience in the energy sector and is regarded as a leading expert in international affairs, policy and investment. He is a Member of the Council on Foreign Relations.

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The mission of the Payne Institute at Colorado School of Mines is to provide world-class scientific insights, helping to inform and shape public policy on earth resources, energy, and environment. The Institute was established with an endowment from Jim and Arlene Payne, and seeks to link the strong scientific and engineering research and expertise at Mines with issues related to public policy and national security.

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