Understanding our Fire Regime

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Bulkley Morice WILDFIRE RESILIENCE PROJECT

WHAT IS THE BULKLEY-MORICE WILDFIRE RESILIENCE PROJECT?

INDEPENDENT, SCIENCE-BASED
We are an independent science-based project funded by the Moore Foundation, administered by the BV Research Centre

COLLABORATIVE
A multi-year project designed to engage input from knowledge holders, with touchpoints throughout the process

ACTION ORIENTED
Provide tools and support to planning tables, management decisions, and response to wildfires

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INTRODUCTION

Effectively managing for wildfire resilience requires a deep understanding of the local fire regime. A fire regime encompasses the patterns of wildfires within an ecosystem over time, including key attributes such as fire size, severity, frequency, seasonality, and ignition sources. These attributes are critical for assessing wildfire risk, identifying potential imbalances in fuel loads and forest composition, and determining the capacity of forests to recover and adapt to changing conditions.

KEY CONCEPTS - BURN RATE & FIRE CYCLE

The Burn Rate represents the proportion of an area burned each year and depends on both the frequency and size of fires. The Fire Cycle is the inverse of the burn rate and refers to the number of years required for wildfire to burn an area equivalent to the entire area of interest.[1] The Burn Rate plays a pivotal role in shaping wildfire hazard, as well as forest structure and composition. The Burn Rate is commonly used in Canada in wildfire science when assessing fire regimes and Fire Cycle is commonly used by BC resource managers since the publication of the Biodiversity Guidebook.[2]

Due to limited long-term studies, it is challenging to accurately describe historical fire regimes. Fire frequency has been studied in select locations, but reliable burn perimeter mapping for British Columbia only exists from the 1950s onward, with less dependable mapping extending back to 1919.

METHODS AND APPROACH

Developing a comprehensive understanding of both historical and contemporary fire regimes requires integrating results from various methodologies, across different time periods and datasets. The Bulkley Morice Wildfire Resiliency Project undertook a review of existing studies and data to identify disturbance patterns within the study area. The project team conducted two additional assessments of both historic and current fire regimes, and summarized findings on disturbance zones and burn rate trends for the region.

MAPPED WILDFIRES & BURN RATE TRENDS

Based on recorded fire mapping, Burton (2025) evaluated burn rates across the study area.[3] From 1919 to 1932, moderate burn rates were observed at 0.54% per year. This rate then declined to 0.03% per year between 1933 and 2003, followed by an increase to 0.73% per year after 2003. Higher burn rates, ranging from 0.51% to 0.95% per year, were recorded in the SBPS and drier SBS zones. Intermediate rates (0.34% per year) were found in the SBSmc, while lower burn rates (0.16%–0.21% per year) were observed in the ESSF subalpine forests.

STAND AGE ROLLBACKS

Daust and Price (2025) applied modified 2010 forest inventory data to estimate stand origins by biogeoclimatic unit within the Sub-Boreal Spruce (SBS) zone,[4] using Steventon's (2002) methods[5] and 20-year age classes. Their research identified 1930 as the approximate transition between historic and modern fire regimes.

The results demonstrated a substantial lengthening of the fire cycle, and thus a decline in burn rate, across the B.C. Central Interior after 1930.

For example, in the SBSdk, the fire cycle was 63 years (burn rate of 1.59% per year) from 1890 to 1930, but increased to 307 years (0.33% per year) between 1930 and 2010. Similarly, in the SBSmc, the fire cycle extended from 105 to 596 years (burn rate dropped from 0.95% to 0.17% per year) over the same periods. These patterns were also evident in the SBSwk and SBSdw units.

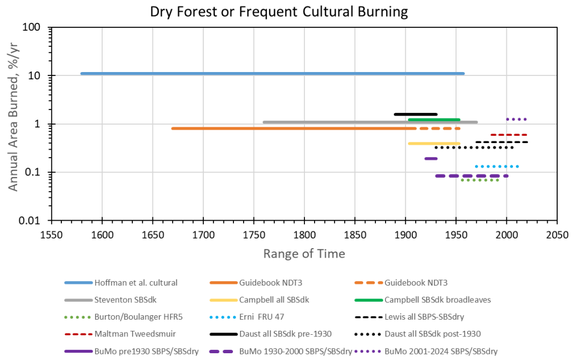
REFERENCES

1 *Canadian Interagency Forest Fire Centre (CIFCC). Canadian Wildland Fire Glossary (Version 2023-04-24). https://ciffc.ca/sites/default/files/2020-12/Canadian%20Wildfire%20Glossary%202021%20-%20English.pdf*
2 *Danneyrolles, V., Chavardès, R.D., Girardin, M.P., et al. (2025). "Contextualizing Recent Increases in Canadian Boreal Wildfire Activity: Decadal Burn Rates Still within Historical Variability of the Two Past Centuries." Canadian Journal of Forest Research 55: 1–12. https://doi.org/10.1139/cjfr-2024-0216.*
3 *Burton, P. (2025). Disturbance Ecology of the Bulkley-Morice. Presented 21 May 2025 to the Bulkley Valley Research Centre, Smithers, B.C.*
4 *Daust, D. and Price, K. (2025). Preliminary Analysis of Disturbance Frequency in SBS Ecosystems in BC. Report prepared for the Bulkley-Morice Pilot Project, Bulkley Valley Research Centre, Smithers, BC. 6 p.*
5 *Steventon, D. (2002). Historic Disturbance Regimes of the Morice and Lakes Timber Supply Areas. Draft Discussion Paper. Prince Rupert Forest Region, BC Ministry of Forests, Smithers, B.C. 22 p.*

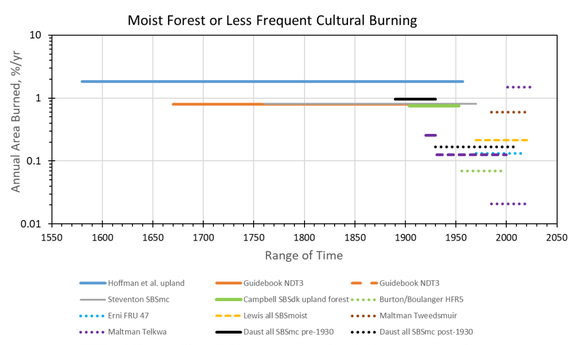
DISTURBANCE REGIME ZONES

The Bulkley-Morice study area can be distinctly categorized into three primary disturbance regime zones, each characterized by burn rates that reflect underlying climatic gradients:

- **Zone 1: Drier forests and lower elevation areas with evidence of frequent cultural burning**, including the SBPS and drier SBS subzones. These areas have historically experienced the highest burn rates. Fire frequency was particularly elevated before European settlement, driven by both natural ignitions and frequent cultural burning linked to Indigenous land stewardship. Since the mid-twentieth century, this zone has experienced the most significant decline in fire frequency within the plan area.



- **Zone 2: Moist forests with less frequent cultural burning**, represented mainly by the SBSmc subzone. This zone exhibits intermediate burn rates. The reduction in fire activity is notable, but less dramatic compared to the dry forest zone, reflecting both climatic moderation and less frequent historical cultural burning.

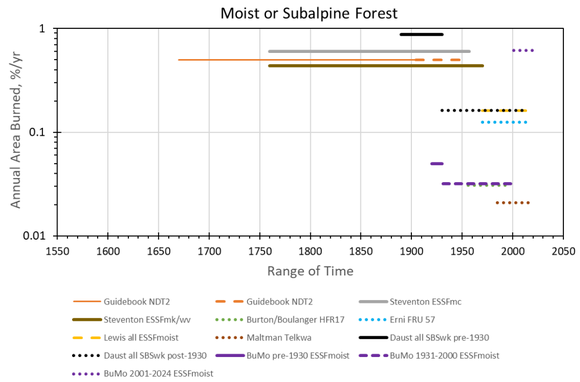


Graphical Representation

The three figures show graphical representations of burn rate estimates from different studies, illustrating trends across each disturbance regime zone and multiple time periods. Each line in the figures corresponds to a specific time span and represents the average burn rate for that period. It is important to note that these averages do not capture short-term fluctuations or anomalous years, and conclusions about long-term fire regime trends should consider this limitation.

Burton (2025) provides an in-depth analysis of fire regimes using advanced spatial modelling techniques and incorporates Lewis's (2023) classification of biogeoclimatic units. This refined classification enhances the accuracy of zone delineation, and together, these methodologies contribute to more robust and reliable burn rate estimates, clarifying patterns and transitions in fire activity across the study area.

- **Zone 3: Subalpine forests with cold and moist conditions**, comprising subalpine ESSF forests. These areas have the lowest burn rates and experienced smaller proportional changes in the twentieth century, due to colder, wetter conditions and limited evidence of sustained cultural burning.



DISCUSSION

Despite uncertainties and methodological differences, all available sources agree on general trends across the three zones. Compared to the historical period, there has been a marked increase in the fire cycle (i.e., a reduction in burn rate) in the contemporary period. The 1930s represent a clear inflection point, with the period from 1930 to 2000 witnessing a much lower burn rate than earlier decades.

Several factors contributed to this reduction, including the cessation of cultural burning, fire suppression efforts, and changes in land use and forest management. Additionally, the climate became cooler and wetter, which further limited wildfire occurrence.

In contrast, the past two decades have seen a resurgence in fire activity, driven by fuel accumulation, bark beetle outbreaks, a warming climate, and historical forest management practices.

These shifts have affected forest age class structure, carbon storage, wildlife habitat, and fuel accumulation.

NEXT STEPS

The complete results will be detailed in a Knowledge Report scheduled for release in early 2026.
This report will be shared with governments and local knowledge holders to support planning efforts. Further refinement of the analysis is planned to establish benchmarks that will inform a wildfire resilience assessment for the region.