

Living Lab Program for Climate Change and Conservation - Final Report



Project title: Drivers and dynamics of wildfires and encroachment in Churn Creek Protected Area

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Research findings

We focus our reporting around Project 4. This was a new project for 2024/2025. Analyses and findings are still being conducted for Projects 1 and 2 with update provided last year. We will complete a vegetation remeasurement for Project 3 in Summer 2025.

- Project 4: Field work was completed in May 2024.
- We collected 25 partial and full cross-sections from fire scarred trees and processed 20 of these for tree-ring analyses and fire event dating (Figure 1).
- These samples have added new fire years prior to 1600, extending the fire history chronology to ~ 1450 (Figure 2).
- We are using these samples together with preexisting datasets to now map areas affected by past wildfires dating back to 1620.
- We collected 58 cores from 29 trees in the Churn Creek Protected Area and built a chronology spanning 500 years. These samples were processed for tree-ring analyses and crossdated.
- We assessed climate-growth relationship of Douglas-fir and found that growth was positively related to growing season precipitation and drought (Climate moisture index; CMI) and negatively related to growing season maximum temperature (Figure 3). We explored the temporal stability of these relationship over the past 120 years and found the sensitivity of tree growth to June conditions has increased over the past 100 years, with a decreasing sensitivity to July conditions. This finding may indicate that growing seasons are commencing earlier over the past 40 years compared to the earlier portion of the 20th century.
- We are working to prepare one of the fire-scarred tree cross sections to give to the SXFN for display.

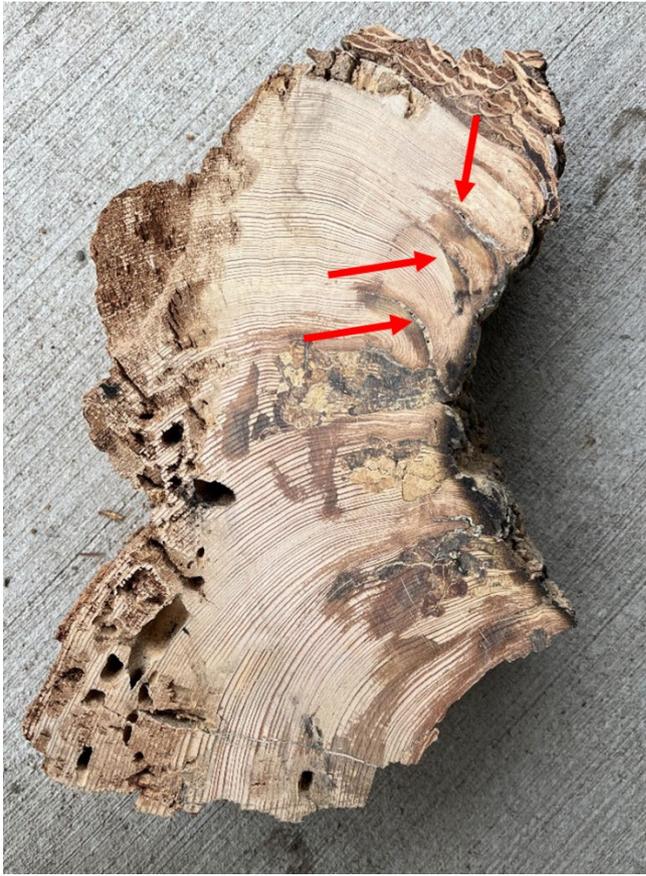


Figure 1. Fire-scarred Douglas-fir (*Pseudotsuga menziesii* var. *glauca*) sample. Arrows indicate fire scars. Photo by Sophia van Varseveld.

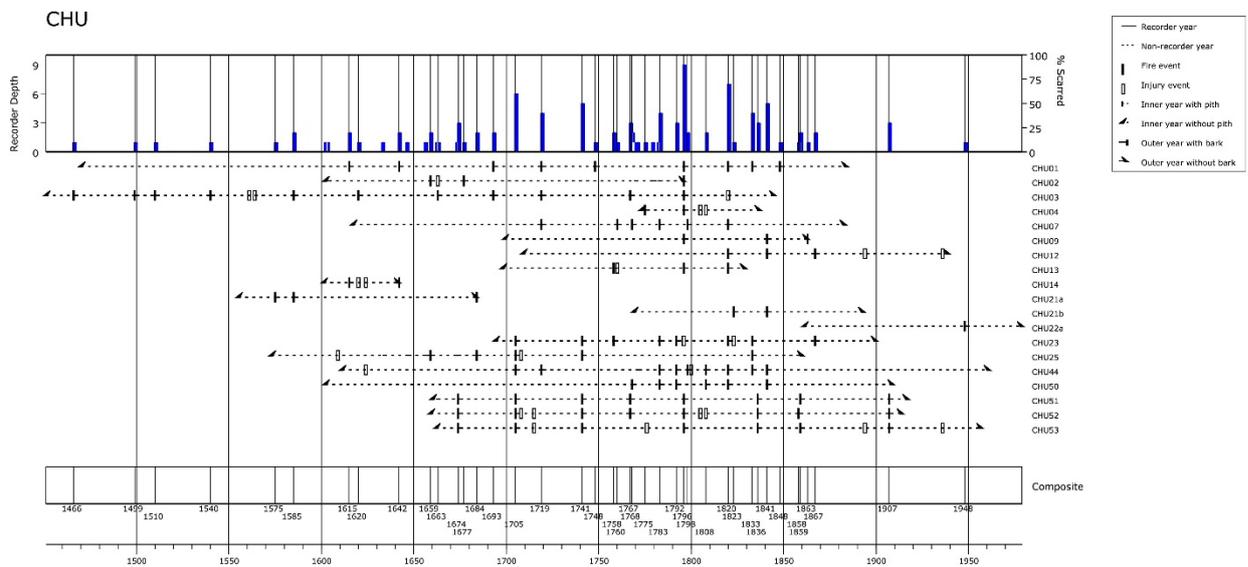


Figure 2. New fire history data for Churn Creek. Timeline of historical fire events and fire injuries within the Churn Creek Protected Area from 1466-1948 with associated recording samples.

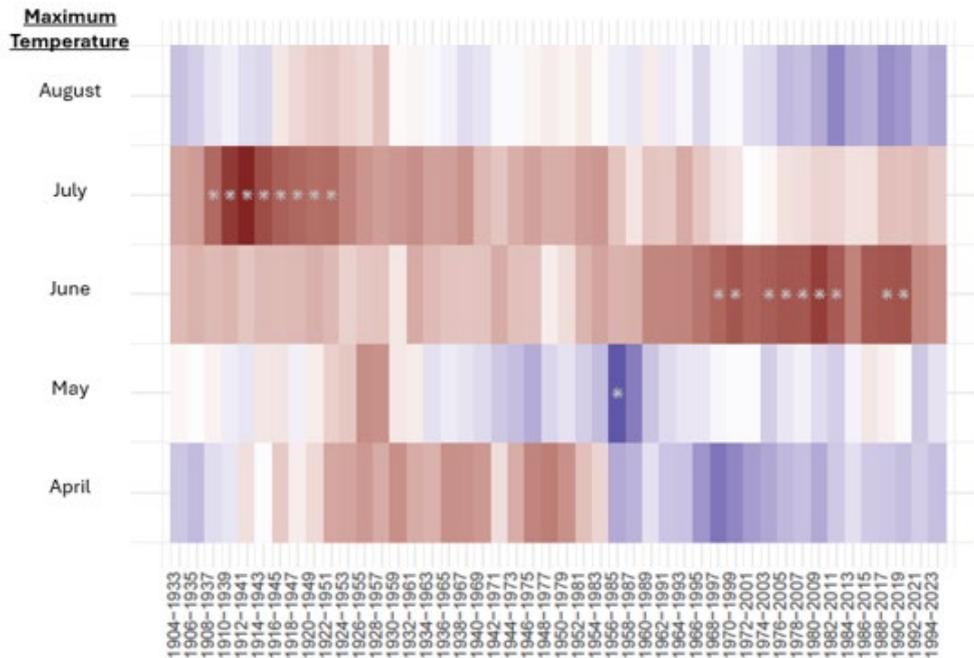


Figure 3. Moving window correlation coefficients for the relationship between monthly maximum temperature compared against the master tree-ring width chronology. The values represent the results of a 30-year moving window. Red values represent negative correlations, and blue values represent positive correlations. Values with * are significant at the $p < 0.05$ level.

Methods summary (Project 4)

- Fire scar samples: We surveyed the study site on foot and opportunistically sampled fire-scarred trees with the oldest and best-preserved potential records.
- Fire scar samples: These samples were air dried and sanded to a fine polish with progressively finer grits. Ring widths were measured with WinDendro software, crossdated visually and statistically. Fire events were determined based on the position of the scar tip in the annual ring.
- Tree cores: We surveyed the study site on foot and opportunistically sampled the oldest Douglas fir trees. Twenty-nine trees were sampled, with 56 cores taken. All cores were air dried and sanded to a fine polish with progressively finer grits. Ring widths were measured with WinDendro software, crossdated visually and statistically. Ring width series were detrended and a chronology of all cores was constructed. We then correlated this chronology with climate variables including monthly sums of precipitation, monthly maximum temperature and monthly CMI over the 1901-2023 interval. We also assessed the stability of these correlations in 30-year windows (overlapping by 2 years) from 1901 to 2023 (Figure 3).

Key outcomes for BC Parks

- Drought and wildfire effects are evident across the protected area
- Management strategies need to be informed by up-to-date research and include culturally appropriate actions to mitigate future wildfire risk and promote ecological integrity in BC's largest protected grassland in the context of climate change

- Conservation of forest-grassland ecotones are important for supporting mule deer winter range, promoting native plant communities, reducing wildfire risk, among many other recreational, cultural, and ecological uses
- There may be evidence of earlier spring onset of vegetation activity

Relevance to BC Parks management

- Continue the mechanical treatment and/or hand removal of young Douglas-fir as they encroach into the grasslands
- Support for the fire management plan and prescribed/cultural burning practices to become more prolific under the right conditions.
- Continuation of collaboration with the local first nations and Friends of Churn Creek Society for further restoration efforts
- Consider how these practices can be used to further decolonize and increase reconciliation efforts
- Public engagement with the Friends of Churn Creek Society and other groups discussing the importance of managing our fire-prone ecosystems for the future among climate change. This could include updating information at the visitor centre.

Project's challenges/opportunities

- The potential records of historical fires are rapidly disappearing through wildfire and decay. It is important to prioritize the collection and curation of these datasets.
- Douglas fir trees over 500 years old are rare. Senescence, increased susceptibility to insects, rot and disease appear to be affecting the large veteran trees on this landscape.
- The effects of high-severity wildfire on these ecosystems that were previously maintained by high frequency, low severity wildfire are not known. Our work for Project 3 this summer (2025) will provide further information on how these ecosystems are responding.

Conclusions/next steps

- Continuing to collect data from this area will provide valuable insight into the parks ecology and wildfire history to help establish baseline knowledge and support conservation of these endangered ecosystems
- Projects 1 and 2 will form two manuscripts to be submitted for publication in summer 2025.
- Analyses of initial regeneration measurements in Project 3 formed the basis of an undergraduate capstone project at TRU and will be remeasured this summer.
- Project 4 supported two very successful undergraduate research projects.