

# Living Lab Program for Climate Change and Conservation - Final Report



**Project title: Reconstructing historic fire activity and whitebark pine distributions in Tweedsmuir Provincial Park, British Columbia**

Lead researchers: Dr. Lori Daniels, Dr. Kira Hoffman, and Dr. Alana Clason

## Research findings

- We completed the first fire history reconstruction in Tweedsmuir Provincial Park
- This was a collaborative research project with BC Parks, The University of British Columbia, and The Bulkley Valley Research Centre with support from the Cheslatta Carrier First Nation.
- We reconstructed 25 fire events over 250 years (1711-1957) and created an 850 year fire history chronology across 11 sites in North Tweedsmuir Park using fire-scarred whitebark pine trees.
- Multiple lines of evidence suggest that prior to a century of fire exclusion (lightning and cultural), low- and mixed-severity fires occurred regularly in the park (on average every 10 years across sites) and were likely a component of millennia of Indigenous fire stewardship.
- Almost half of Tweedsmuir Park burned under severe fire weather conditions in the 2017 and 2018 wildfire seasons, but these severe wildfire events represent a significant departure from the historic fire regime.
- The use of controlled fire, continued modified response to wildfire events, and support for Indigenous-led fire stewardship may assist with the future restoration of fire dependent landscapes, especially those with endangered whitebark pine.

## Methods summary

- We collected 65 fire scar samples and over 100 increment cores from living whitebark pine trees that were sanded, scanned, and measured using skeleton plotting with a microscope and Coo Record/CDendro tree ring computer software to determine the age of samples and years of fire events.
- Fire events were determined when a minimum of two fire-scarred trees recorded the same fire event through cross-dating validation of living and dead tree samples.
- Our fire history reconstruction extended to 1150 (850 years) with reliable evidence (greater than 2 samples recording fire events) from 1711-1957.
- The last cultural fire in the park likely coincides with the establishment of the park in 1937, although two lightning-ignited fire events were recorded in 1953 and 1957.
- We were able to determine the seasonality of fire scars with a microscope, with the majority of fire events occurring in the late summer and early fall.

- There was no statistical relationship between fire events and drought using a superposed epoch analysis of years preceding and in the year of fire events with drought indices (tree ring reconstructions for the palmer drought severity index).

### Key outcomes for BC Parks

- Our fire history establishes that low- and mixed-severity fire was once an important component of the ecology and cultural history of the park.
- Our research suggests that the probably routine application of low-severity ground fire in combination with lightning ignitions resulted in ecosystems with reduced fuel loads that were managed by Indigenous peoples for thousands of years for cultural values.
- During our fieldwork, we sampled a large, living whitebark pine tree that is currently under review for UBC's Big Tree Database.

### Relevance to BC Parks management

- Tweedsmuir park may benefit from establishing a controlled fire program that reflects cultural, ecological, and fire management values. This may include the application of prescribed and cultural fire near important cultural resource sites.
- Although Tweedsmuir lost almost half of its forested area to wildfire in the last 10 years, there is much to learn regarding the fire history of the park and fire-scarred trees are important to document before more habitat is lost to severe wildfire events.

### Project's challenges/opportunities

- This project was well supported by BC Parks and UBC. We were able to have experts (Carmen Scott, BC Park Ranger), Mark Parminter (Tweedsmuir Area Supervisor), Jodi Axelson (Lead Silviculture Specialist and Entomologist from the Province of BC) assist with the completion of fieldwork.
- This project allowed for a greater understanding of fire, whitebark pine, and cumulative disturbances.
- As this is the first fire history reconstruction within the Park, more research is required to understand the spatial and temporal aspects of historic fire activity, specifically in lower elevation sub-boreal spruce forests in both the northern and southern portions of Tweedsmuir Park.

### Conclusions/next steps

- We plan share our research findings with the Cheslatta Nation and Tweedsmuir Park staff in early April, 2022 and look for further opportunities to assess changes in fire activity in Tweedsmuir Provincial Park.
- Our abstract has been accepted for an oral presentation at the AmeriDendro conference in Montreal in June 2022.

### References and links

- Our manuscript "Historic fire regimes in western whitebark pine ecosystems in Tweedsmuir Provincial Park" will be submitted for publication in the journal *Ecosphere* in April 2022.

## Checklist

- Have you submitted a short blog for BC Parks' website? If not, a blog summarizing your project in no more than 400-600 words is due no later than 30 days after the end of the term of your agreement. We welcome photos or images too to support the blog.
- Have you added any relevant Living Lab project data or reports to the BC Data warehouse and/or EcoCat? Please contact Jen Grant or Stephen Ban for assistance.
- Invoice submitted? An invoice is required to receive the final instalment of your Living Lab transfer agreement funds. The invoice should include:
  - the university address,
  - the Transfer Payment number (as per your agreement),
  - a one-line description of what the project is about,
  - the amount due (you may need to send this via your financial arm) and indicate that this is the final instalment. The invoice should follow or accompany the completion of this final report template of which both are due on or before March 21st, 2022. **If we do not receive an invoice from you by this date, we will not be able to issue your final payment.**