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Living Lab Program for Climate Change and Conservation - Final Report



BC Parks
Living Lab
Program

Project title: Forest encroachment drivers and dynamics in Churn Creek Protected Area

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Research findings

- Field work was completed in June and October 2023. Processing of samples and analyses is underway as part of a graduate student research project.
- Preliminary findings indicate understory plant diversity has increased following thinning and prescribed fire treatments in grassland-forest ecotones
- Forthcoming analyses will answer questions: (Q1) How do treatments including thinning and prescribed fire alter grassland species composition and sensitivity of tree growth to climate, and (Q2) What are the drivers and dynamics of tree encroachment into grasslands?
- Additionally, partial or full cross-section sample were collected from eight fire-scarred trees. Preliminary dating of past fire events are aligned with the existing fire history chronology (Harvey et al. 2017) and will extend the fire history for Churn Creek back to ~1500.
- A further objective of this research was to establish a network of long-term monitoring plots in the 2021 wildfire. 30 plots were established and initial measurements taken with SXFN Guardians. These data will seek to answer (Q3) What are the understory recovery dynamics following high severity wildfire over the next 20 years?

Methods summary

Three projects were designed to answer Q1-Q3 (above):

Project 1 (Q1)

- Twenty plots were established in the legacy stand (Dry Farm Restoration Area), 20 plots in an adjacent encroached stand (untreated), and 10 plots in an adjacent grassland where species ID and percent canopy cover were collected in 3.99 m radius plots.

- Two tree core samples were extracted with increment borer were taken from the closest two Douglas-fir trees to each plot centre (treated and encroached plots; n=40).
- Eight fire scar samples were collected in the treated and encroached areas using a chainsaw from down and dead Douglas-fir trees.
- Processing of tree core and fire scar samples is underway: sanding with progressively finer sand paper to a fine polish, tree ring measuring and crossdating using Windendro/COFECHA software.
- Tree growth will be correlated to climate to assess changes in growth-climate relationships before and after treatments and compare drought sensitivity between treated and encroached stands.
- Fire years will be assigned to events assigned to crossdating ring width series on fire scarred trees. These fire years will be compared to existing regional chronologies of historical wildfires.

Project 2 (Q2)

- Two 1 ha plots were established in a forest-grassland ecotone over a gradient (forested to non-forested)
- All Douglas-fir trees within the plots were sampled: > 10cm DBH trees were cored, <10cm DBH and >1.3m tall were felled and basal disks (“cookies”) collected
- An (x, y) coordinate within the plots were collected for each tree sampled to look at the spatial relationships between trees as evidence of biotic facilitation
- Seedlings and saplings were tallied for both plots
- Twenty 1 m radius plots were completed for understory species ID and percent cover across the grassland-forest transition
- Processing of tree core and basal disc samples is underway: sanding with progressively finer sand paper to a fine polish, tree ring measuring and crossdating using Windendro/COFECHA software.
- Pulses of establishment will be identified in records of tree age and compared to climate and other historical records to assess drivers of encroachment.
- Tree growth-climate relationships will be constructed using correlation analysis and compared across age and size classes. These insights will be used to assess drought sensitivity of encroached trees.
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Project 3 (Q3)

- We measured burn severity (Composite Burn Index; CBI) at 30 plots within the 2021 fire perimeter in low, mid, and high severity burned areas.
- At each plot we placed permanent plot markers and in 3.99 m radius plots recorded regenerating species ID and percent cover.
- We will revisit these plots every 2-3 years for the next 20 years.

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

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

- Positive collaboration with Stswecem'c Xget'tem (SXFN) and BC Parks will allow for future research opportunities and continuation of this project
- Further work has been identified to gather information on the effects of drought on old-growth Douglas-fir within the protected area
- This area is at risk from high severity wildfire, and opportunities to collect more fire scar samples have presented themselves; it is important to collect this data before it is lost to disturbance or decay

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 early 2025.
- Analyses of initial regeneration measurements in Project 3 formed the basis of an undergraduate capstone project at TRU
- Community visit occurred on March 11th-12th 2024