Background
Fires were once common natural disturbances in the Rocky Mountain forests of western Canada. Historic fire suppression has, however, resulted in forest stands that are now densely stocked and prone to high severity lethal crown fires. Site specific reference conditions, based on historic fire regime information, create effective management directives to return forests to their natural range of variability and reduce the risk of wildfires. For this study, an integrative approach was used to identify the processes that previously operated to maintain pre-historical stand structures in Kootenay National Park. Two hypotheses were proposed: either the stand was maintained by indigenous burning, or the stand was maintained by lightning ignited fires.

Study Site
The study site is located in the Sinclair Restoration Area in Kootenay National Park, near the town of Radium Hot Springs, British Columbia.

Comparative images of study site:

1922

Historical: The study site in 1922, 33 years after the last fire event. The area was characterized by an open canopy of mature Douglas-fir trees and a grass-dominated understory. (Image courtesy of Library and Archives Canada/Morrison Parsons Bridgland/BRI9222-822-177)

2009

Present Day: The study site in 2009, 120 years after the last fire event. Ongoing fire suppression has resulted in a dense understory of small Douglas-fir trees. (Image courtesy of Mountain Legacy Project)

Methods: Fire Scars and Fire History
When low severity surface fires pass through an area, heat from the fire can be concentrated on one face of the tree, resulting in focused cambial death and the creation of a fire scar. Scars are prone to further damage during subsequent fire events, allowing a tree to record multiple events. Fire scars retrieved from the Sinclair Restoration Area were pattern matched using annual growth rings of trees to identify individual fire years and the seasons when they occurred.

Results: Fire Events and Climate
Light grey bars are used to indicate years in which the climate was significantly correlated to fires in the Sinclair Restoration Area. The findings show that fires generally occurred in hot, dry summers, most likely after the ground fuels had dried.

Results: Indigenous Burning or Lightning Ignited Fires?
It is difficult to determine whether the pre-historical stand structure of the Sinclair Restoration Area was maintained by repetitive indigenous burning, or was a result of lightning. Below findings are bolded, whereas those that could not be tested due to the variability of results are in italics.

Hypothesis | Fire Return Interval | Record of Indigenous Use | Seasonality | Climate | Modern stand encroachment
---|---|---|---|---|---
A) stand maintained by indigenous burning | Shorter than other interior Douglas-fir stands | Use of fire | Use of area | Fires occur during traditional burning seasons | Fire events are correlated to climate | Cessation with colonization
B) Stand maintained by lightning fires | Comparable to other interior Douglas-fir stands | None | No use of area | Fires occur during lightning season | Fire events are correlated to climate | Cessation with fire suppression

Sources of Data
- Regional fire scar records
- Indigenous
- Parks Canada archaeological survey
- Tree rings; fire scar seasonality

Conclusions and Management Suggestions
- Although the mechanisms of ignition cannot be discerned, fire was once a common disturbance in the Sinclair Restoration Area with a return interval of approximately 24 years. These high frequency, low severity, fires helped to maintain open grasslands with mature Douglas-fir trees.
- The area has not experienced a fire in 120 years and is outside the natural range of variability. The forest is densely stocked with trees and has a thick duff layer capable of sustaining a high severity fire, a significant hazard to the town of Radium Hot Springs.
- To reduce this hazard and restore the forest to its natural range of variability, thinning of the forest is required in conjunction with low severity prescribed burns.

References