Determining the historical influence of climate on wildfire occurrence in Jasper National Park, Alberta: A paleoecological perspective

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Wildfires play an important role in maintaining the health of our boreal forest. In Canada, two of the main drivers of fire events are climate and vegetation composition. Contemporary fire management strategies, which include active fire suppression and whose influence may override these factors, can have negative effects on the landscape. In order to properly manage wildfires in our present-day forests, a long-term understanding of the regional fire dynamics is needed that allows researchers to situate the present fire regime within the context of past events. The purpose of my research is to extend the known wildfire record of Jasper, AB, Canada to cover the past 2000 years. The two primary research questions posed here are; **1)** What has been the variation in the frequency of wildfires in Jasper National Park during the past 2000 years? and **2)** What has been the influence of climate on wildfires, particularly during the Little Ice Age and Medieval Climate Anomaly? Answering these questions will provide a better understanding of the natural variation in the frequency of wildfires throughout the late Holocene.

Little Trefoil Lake, Jasper, AB

A paleoecological approach that employs three types of proxy records will be used throughout the course of this research. Paleolimnology, the study of lake sediments, is a field of research that involves retrieving sedimentary material from lake bottoms in the form of sediment cores. This research will make use of sediment collected from Little Trefoil Lake, in Jasper, AB. By analyzing physical indicators preserved within the core, such as air-born charcoal from fire events, we will be able to ascertain when fires have occurred through time. Macroscopic charcoal analysis involves tallying the amount of charcoal particles found at various depths within the sediment; peaks in charcoal accumulation can be linked to wildfire occurrences. Dendrochronology, the study of tree rings, will be used to reconstruct the short-term (500-600 years) fire history around Little Trefoil Lake. This method allows us to determine the precise year in which a fire occurred. Once the dates of recent fires are known, peaks in the charcoal record, which correspond to these events, can be anchored in time, improving the temporal precision of the fire record. Finally, pollen analysis will be used to gain a better understanding of how the vegetation surrounding the lake, which is influenced by and responds to wildfire events, has changed in response to shifting fire and climatic regimes. The position of Little Trefoil Lake within Jasper National Park makes it a site of interest due to the implications of wildfires within the Park where fire management is an important issue; Jasper is home to approximately 4000 year-round residents and is visited by several thousand tourists annually. A major challenge in wildfire management is addressing the ecosystem's need for fire while protecting the public and their property from harm.

Due to the management implications of this project, it is important that the results of this research be communicated with the appropriate parties upon the completion of the project. The stakeholders implicated in this project include park officials, forest managers, the residents of Jasper and the visiting public, as well as research groups in the area such as the Alberta Foothills Research Institute. Beyond the completion of my Master's thesis, the results of this research will be communicated through publications, and presentations at academic conferences and at the study site.