



Climate Change and Archaeological Resources

Introduction

Archaeological resources do not derive significance from artifacts themselves, but rather from the place and context in which artifacts were deposited. The Chilkoot Trail is a unique, living, outdoor museum that allows visitors to view archaeological resources in their original context. It is one thing to view a gold rush wagon wheel in a museum, but it is an entirely different experience to see its broken remains discarded on the side of a historical gold rush wagon road. Many of these artifacts have been preserved due to climatic and environmental conditions that discourage deterioration. The increasingly warmer and wetter climate will encourage the decay and destruction of cultural resources, threatening the mission of the NPS to preserve resources for the enjoyment, education and inspiration of current and future generations. The impacts of climate change on cultural resources present new challenges to the preservation mission of the NPS that will require innovative solutions for adaptation.

Melting Ice Patches

Ice and permanent snow make excellent conservers of artifacts. The spatial extent of ice patches are determined by a balance of winter snow accumulation and summer melting. The trend of decreasing winter snow accumulation and increasing summer melting has resulted in irregular ice patch shrinkage and loss. As these ice patches disappear, artifacts preserved within are newly exposed to atmospheric elements that can rapidly destroy and degrade artifacts. There are 277 ice patches within Park boundaries. Archaeologists are currently conducting ice patch surveys to determine the rate and extent of melting, as well as document and preserve any artifacts melting out of the ice.

Early Snow Melt

The summit of the Chilkoot Pass has historically been snow covered for 10 months out of the year. This has resulted in the preservation of organic Gold Rush era materials like leather and canvas. With increased warming in the winter and summer months, these organic materials are more often exposed to conditions that encourage decomposition and decay. These artifacts have been considered stable, but in a warming climate archaeologists will have to closely monitor these artifacts to ensure their preservation or to document their decomposition. Preservation may not be the favorable option because it requires the objects be removed from their original context and **visitor accessibility**.

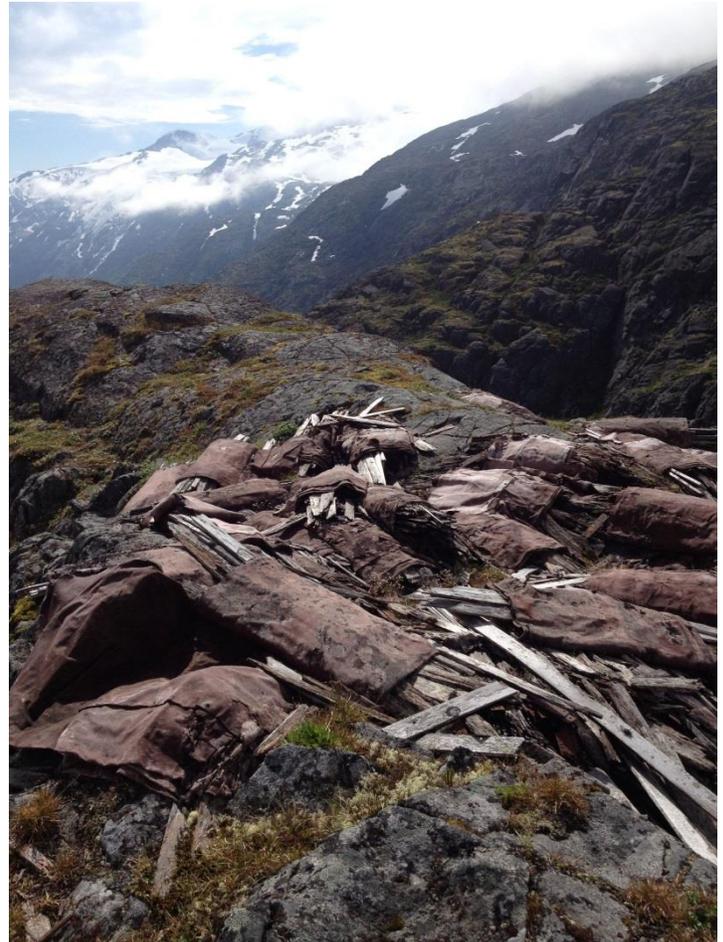


Figure 1. Gold Rush era “knockdown” boats abandoned at the top of the Chilkoot Pass (top). Gold Rush era shoes leather shoes abandoned at the Scales (bottom). These artifacts have been preserved by the presence of semi-permanent snow. Earlier snow melt associated with climate change will negatively impact the preservation conditions. These objects will either be removed for conservation or their degradation will be documented and shared through interpretation on the effect of climate change on cultural resources.

Glacial Outburst Floods

Retreating glaciers increase water volume in pro-glacial lakes, increasing the hazard level of a glacial outburst flood. Additionally, many pro-glacial lakes are dammed by earthen material with an ice core. Climate change is pushing the hazard risk of glacial outburst floods to critical levels by increasing lake volume and melting the ice-cores of lake dams. Three pro-glacial lakes; Nourse Lake, Hanging Lake, and West Creek Lake have the potential to destroy archaeology resources if dam failure occurs. A failure of the Nourse glacier lake dam would have more catastrophic consequences for the archaeological record than West Creek Lake and Hanging Lake dam failures because a glacial outburst flood from Nourse would impact Canyon City, Finnegan's Point, Kinney Bridge, and Dyea. An outburst flood from West Creek would only impact Dyea, while an outburst flood from Hanging Lake would only impact Canyon City.

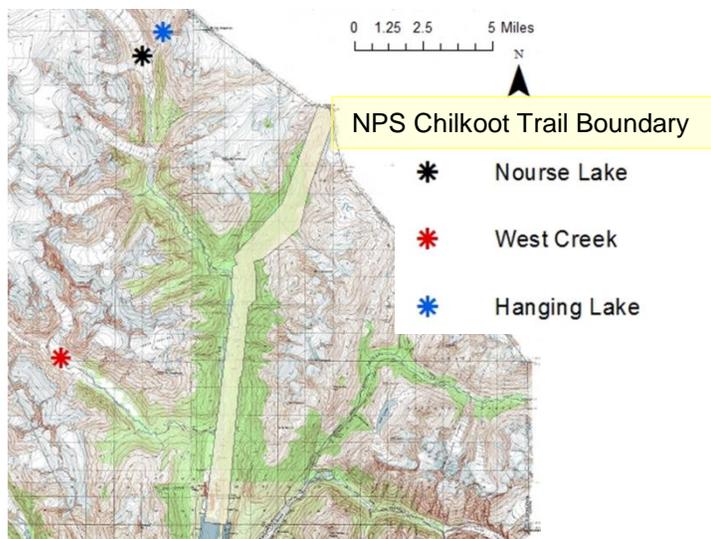
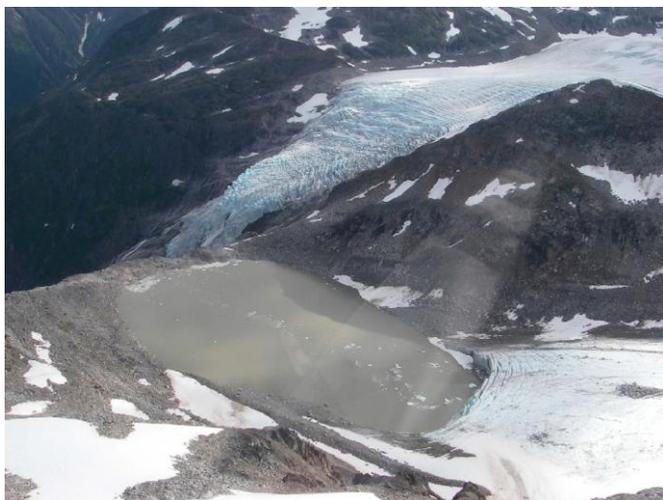


Figure 2. Example of a pro-glacial lake in KLGON region (top). Locations of pro-glacial lakes with potential impacts to archaeological resources on the Chilkoot Trail (bottom). A dam failure of Nourse Lake has the potential to damage the most cultural resources along the Chilkoot Trail. Although Hanging Lake is in the same general location as Nourse Lake, the smaller size of Hanging Lake makes it less of a threat to cultural resources. A flood from West Creek would only impact resources in the Dyea Townsite.

Fluvial Channel Instability

Archaeologists have been monitoring Taiya River migrations near the Dyea Historical town site since the 1970s. The lower Taiya River has been responding to a lowering of base level due to a process called isostatic rebound. Isostatic rebound is the rise of land that used to be depressed by the mass of glaciers. Around Dyea, isostatic rebound rates average 1.8cm/yr. In response to this change in base level due to isostatic rebound, the Taiya is incising its meandering channel. Taiya channel instability has already resulted in the loss of cultural resources in Dyea. Engineering options to stabilize the Taiya have been rejected because of cost and potential negative impacts on natural resources. In 2011, archaeologists noticed the Taiya River was eroding the site of Kinney Bridge. After monitoring the erosion, archaeologists determined that excavation was necessary to save information from the site before it was washed away in the river. Today the river continues to erode Kinney Bridge at an average rate of 2-4 meters per year. Archaeologists must continue to monitor and document these sites closely to ensure resources are not in immediate risk of loss.

Adaptation Options

The loss and destruction of many cultural resources along the Chilkoot Trail in Klondike Gold Rush National Historical Park due to climate change impacts is inevitable. The Park must make decisions on how it would like to adapt to climate change impacts. To ensure that information is not lost from resources currently being threatened by river erosion as well as those that could potentially be destroyed by catastrophic floods, thorough documentation must be completed. New archaeological resources are being exposed as ice patches continue to melt. Archaeologists will continue to survey around ice patches to record and document new resources. A warmer and wetter climate will have destructive impacts for organic artifacts that have long been preserved in snow patches near the scales and summit of the Chilkoot Pass. The park must decide whether to remove the artifacts for conservation or to leave them in place and document their decomposition. Documentation of the destruction of these artifacts will provide an interpretative experience for visitors to learn about the impacts of climate change on cultural resources.

Additional References

- <https://www.nps.gov/subjects/climatechange/adaptationforculturalresources.htm>
- <https://www.nps.gov/subjects/climatechange/upload/CulturalResourceBriefMar2013.pdf>
- <http://www.georgewright.org/321rockman.pdf>

More Information

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