How do beaver dams affect water temperature in Cripple Creek, Alaska?

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Abstract

A lack of prolonged winter cold snaps has resulted in rising beaver populations and expansion across Northern Alaska, altering hydrologic systems and thermal regimes in the Alaskan landscape (Tape et al., 2018; Jones et al., 2020). Studies have observed the tendency of flowing water to more rapidly dissipate heat. The introduction of ponded areas by beavers may result in the development of a greater heat sink (Majerová et al., 2020); leading to potential alterations in ecosystem health and dynamics based on elevated water temperature, as well as cause thermokarst in permafrost rich areas. Samples for this study were taken above and below two beaver dams in Cripple Creek, located in Fairbanks, AK. The results showed no variation in surface water temperature above and below beaver dams, in freezing conditions during late fall. However, due to a limited sample size and timing of data collection, these results represent only the possible impact of beavers at freeze-up and not the overall impact of beaver dams in Northern Alaska.

Introduction

Beavers are reshaping stream ecosystems across northern Alaska as warmer winters and the absence of prolonged cold snaps have allowed their populations to expand north of the Alaska Range during the past decades (Tape et al., 2018; Jones et al., 2020). As a result, beavers are creating new drainages and altering hydrologic and thermal regimes across the tundra and boreal landscapes (Glass et al., 2025). In streams like Cripple Creek in Fairbanks, new and expanding beaver dams and lodges can contribute to the change of the thermal stream environment. Stream temperature governs many biological and ecological processes, including fish metabolism and spawning success. Understanding how proximity to beaver dams can affect stream temperature will give further insight into the compounding effects climate change is having on our landscapes and waters. Studies have shown that flowing water has a tendency to dissipate heat more rapidly; whereas slower moving and larger water bodies, such as beaver ponds, have a greater potential heat sink and are better able to thermoregulate (Majerová et al., 2020). But this research was done in temperate areas, and comparable data in interior and northern Alaska is scarce. Understanding how beaver activity alters water temperature helps evaluate whether increasing dam density will enhance water retention and habitat complexity or risk warming stream reaches that support salmonids and other fish vital to local subsistence harvests and community livelihoods.

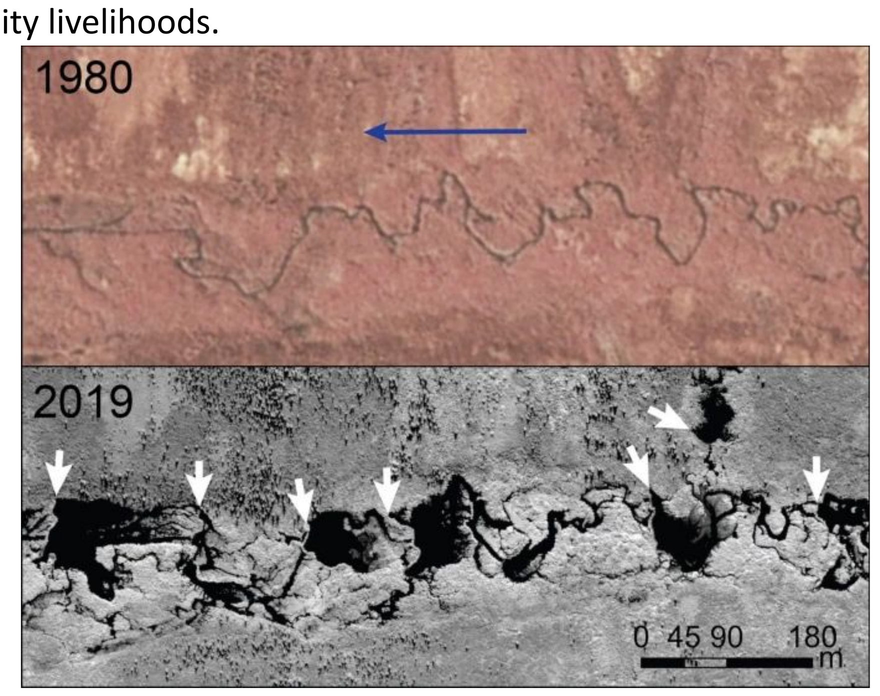

Image 1: satellite image showing construction of beaver dams and formation of ponds along a tundra stream near the treeline on the Seward Peninsula. (Tape et al., 2022)

Methods

Data collection: Water and air temperature was measured following GLOBE water and air temperature protocols at three sites along Cripple Creek in Fairbanks, Alaska on October 26, 2025. Paired alcohol-filled thermometers were equilibrated for three minutes until readings were stabilized and recorded. Site locations were documented using GPS coordinates and later mapped using ArcGIS Pro.

Analysis: Temperature data from sites with varying beaver activity will be compared to assess thermal impacts of beaver damming.

Image 2: Map of Cripple Creek study sites

Results

Data collection was performed to evaluate the influence of beaver dams on water temperature along Cripple Creek Fairbanks, AK. Both water temperature and air temperature measurements were taken at sample sites. A total of 6 water temperature measurements were taken at three sampling sites: at each site two measurements were taken below the beaver dams (control sites) and two in ponded areas above the dams (impact site).

Sites 1&2: Cripple creek near human made gravel impoundment with mixed deciduous forest and underbrush associated with permafrost influence. Large amounts of ponding above beaver dam. A thick layer of ice was present above the beaver dam in the ponded area, as well as a limited presence of ice beginning to form along the shore below the dam.

Site 3 (Downstream): Cripple creek along Chena Pump Rd with mixed deciduous forest and underbrush associated with permafrost influence. The dam was located in a steep gully, approximately 20 feet deep. Limited ponding was present above beaver dam. This site had ice present both above and below the dam

Current findings represent initial observations gathered during a late fall sampling. Conditions at all sites was a mean air temperatures of -3°C, overcast, and snow on the ground. Mean water temperature was consistently at 0°C across all sites. These results suggest that beaver dams have no influence on surface water temperature in freezing conditions. However, the limited sample size suggests a great potential for error.

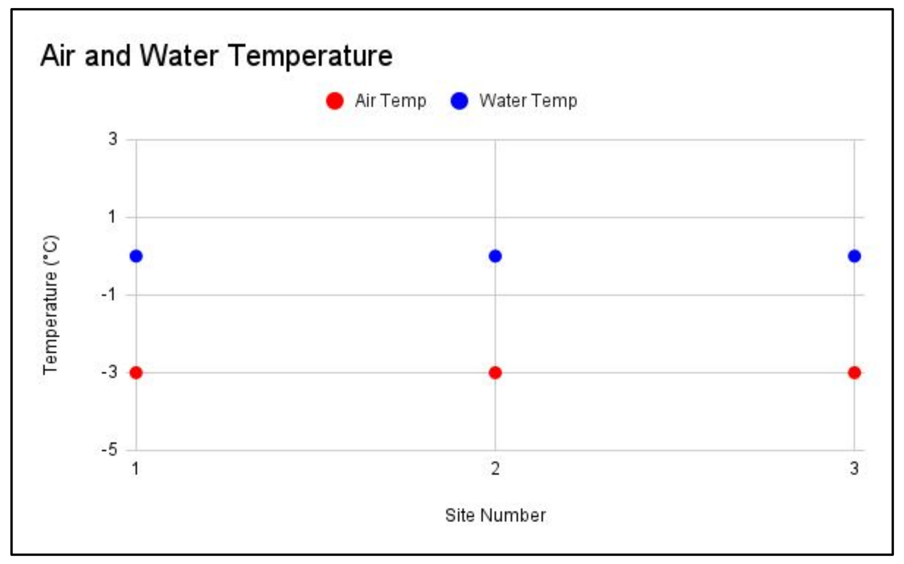

Chart 1: The water and air temperature recorded for each site is shown. The air temperature was -3℃ and water temperature was 0℃ at all three sites.

Image 3: Water temperature at site 1

Results

Image 4: Micah collecting water temperature

Conclusions

This study focused on answering whether beaver activity affects surface water temperature in cripple creek during late fall. Despite the theoretical expectations that stagnant or slow moving water in beaver ponds might lose heat quicker than their faster moving counterparts, all water temperature, both above and below the dams, was observed at 0°C.

These findings suggest that during freezing conditions in late fall, beaver dams do not significantly affect water temperature in Alaska's Interior. However, because of the limited sample size, restricted seasonal conditions, and rudimentary measurement techniques, these results are not sufficient to determine the overall impact of beaver activity on the thermal profile of these streams. Further research should measure across different seasons, with larger sample sizes, continuous monitoring throughout the season, and should consider different parameters including dissolved oxygen, flow rate, and depth to better assess how beaver activity may affect these streams, the health of their ecosystems, and potential permafrost thaw in the watersheds of Alaska.

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