

Using tree core samples to understand avalanche frequency in Juneau, Alaska

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Introduction

Juneau receives its electrical power supply through a powerline that goes along the Thane Road. Thane Road has high avalanche risk which can take down the powerlines in avalanche pathways. Avalanches have had an impact of traditional living locations, shown by the lack of Long houses historically in the area. With avalanche data and research being recently developed, there is limited data on frequency of avalanches in the community of Juneau. Using tree cores are a method of better understanding the frequency of avalanches, because trees date back longer than newly created methods of recording avalanche data. Many have used tree cores to get data on avalanches throughout the years (Carrara, 1979). Tree ring aging is helpful for both areas with and without recorded data on avalanches (Peitzsch et al., 2021). Juneau receives hydroelectric power from south of town, making the Thane Road access a necessity to power the city of Juneau.

Hypothesis

Cores from different trees in the Thane avalanche runway will show that avalanches are less common in more recent years due to climate change reducing the amount of snowfall.

Methods

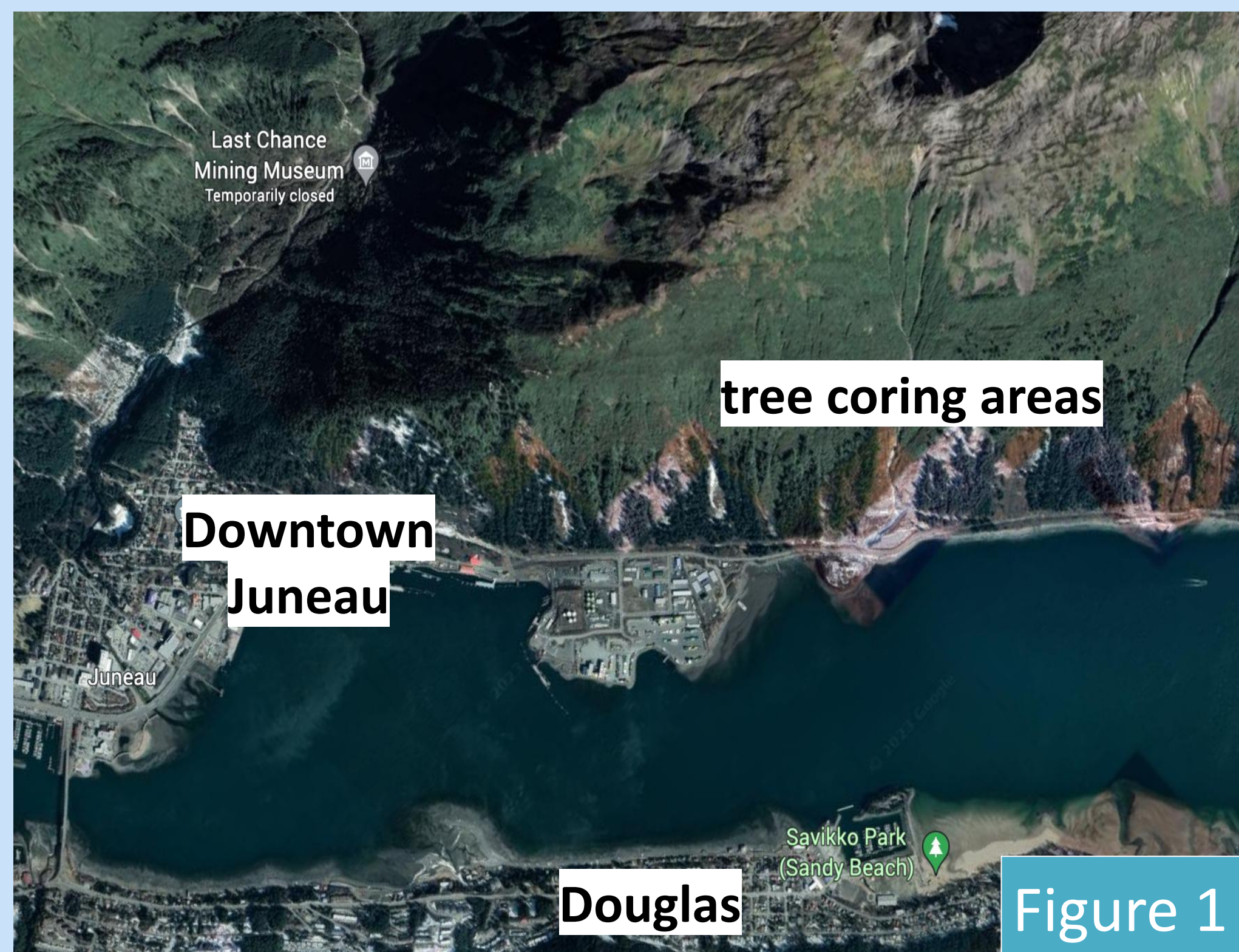


Figure 1



Figure 2

Figure 1. Map of study site in relation to downtown Juneau.

Figure 2. Testing snowpack levels on a moderately steep slope to stimulate what could happen in an avalanche zone.

In January through April 2023 tree cores were collected, along the bottom of avalanche chutes, near Thane road in Juneau Alaska. A borer tool was used to screw into a part of the tree, aiming to find the core of the tree. It was often challenging to find the core because every tree has its own tilt, and placement for the core. Then the tree core samples were glued to another stick that was sanded down to half of the tree core, to view the rings more clearly. Then tree cores were analyzed and aged.

References:
Peitzsch, E., Hendriks, J., Stahle, D., Pederson, G., Birkeland, K., and Fagre, D.: A regional spatiotemporal analysis of large magnitude snow avalanches using tree rings, Nat. Hazards Earth Syst. Sci., 21, 533–557, <https://doi.org/10.5194/nhess-21-533-2021>, 2021.
Carrara, P. The determination of snow avalanche frequency through tree-ring analysis and historical records at Ophir, Colorado. GSA Bulletin 1979;; 90 (8): 773–780. doi: [https://doi.org/10.1130/0016-7606\(1979\)90<773:TDOSAF>2.0.CO;2](https://doi.org/10.1130/0016-7606(1979)90<773:TDOSAF>2.0.CO;2)

Results

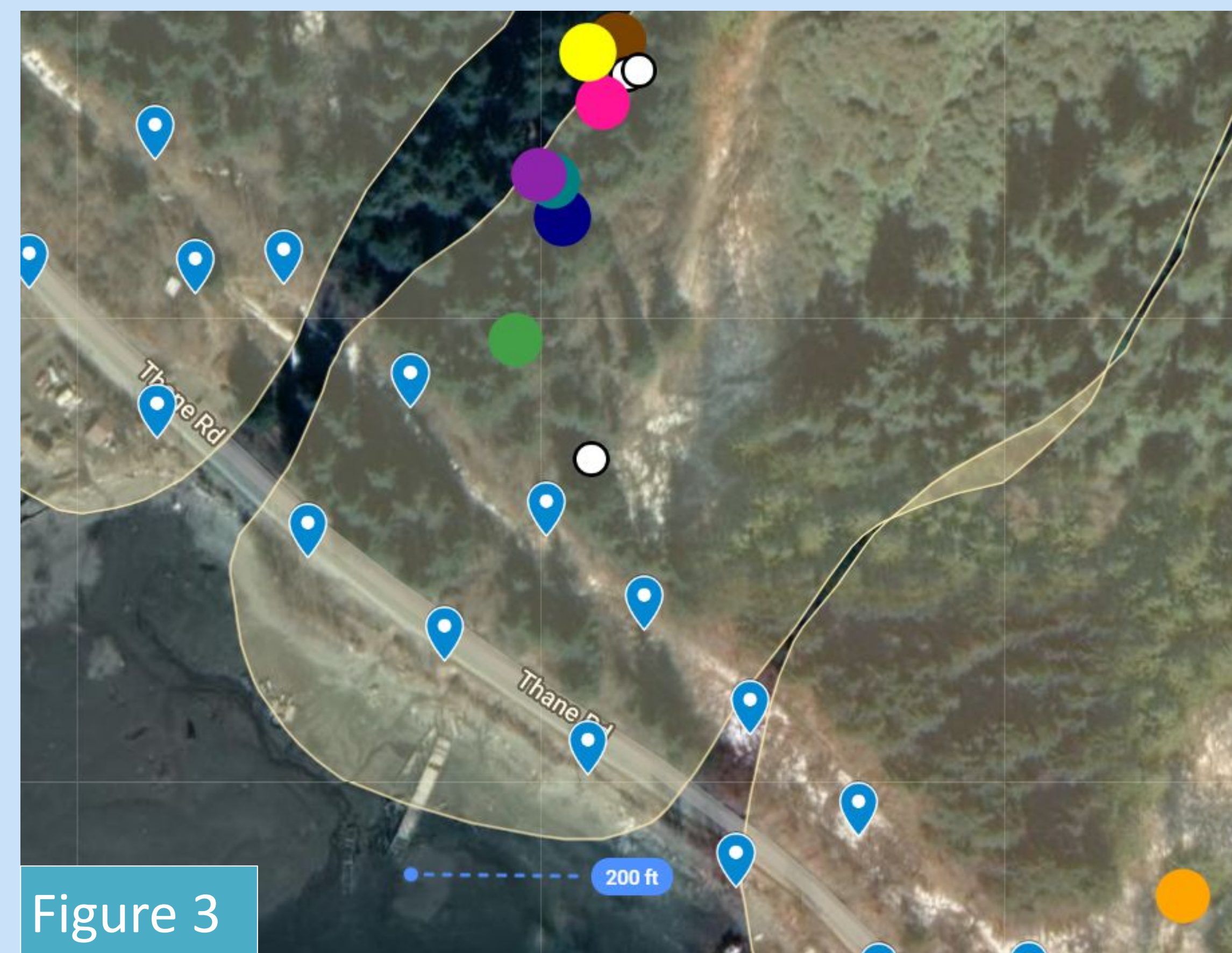


Figure 3

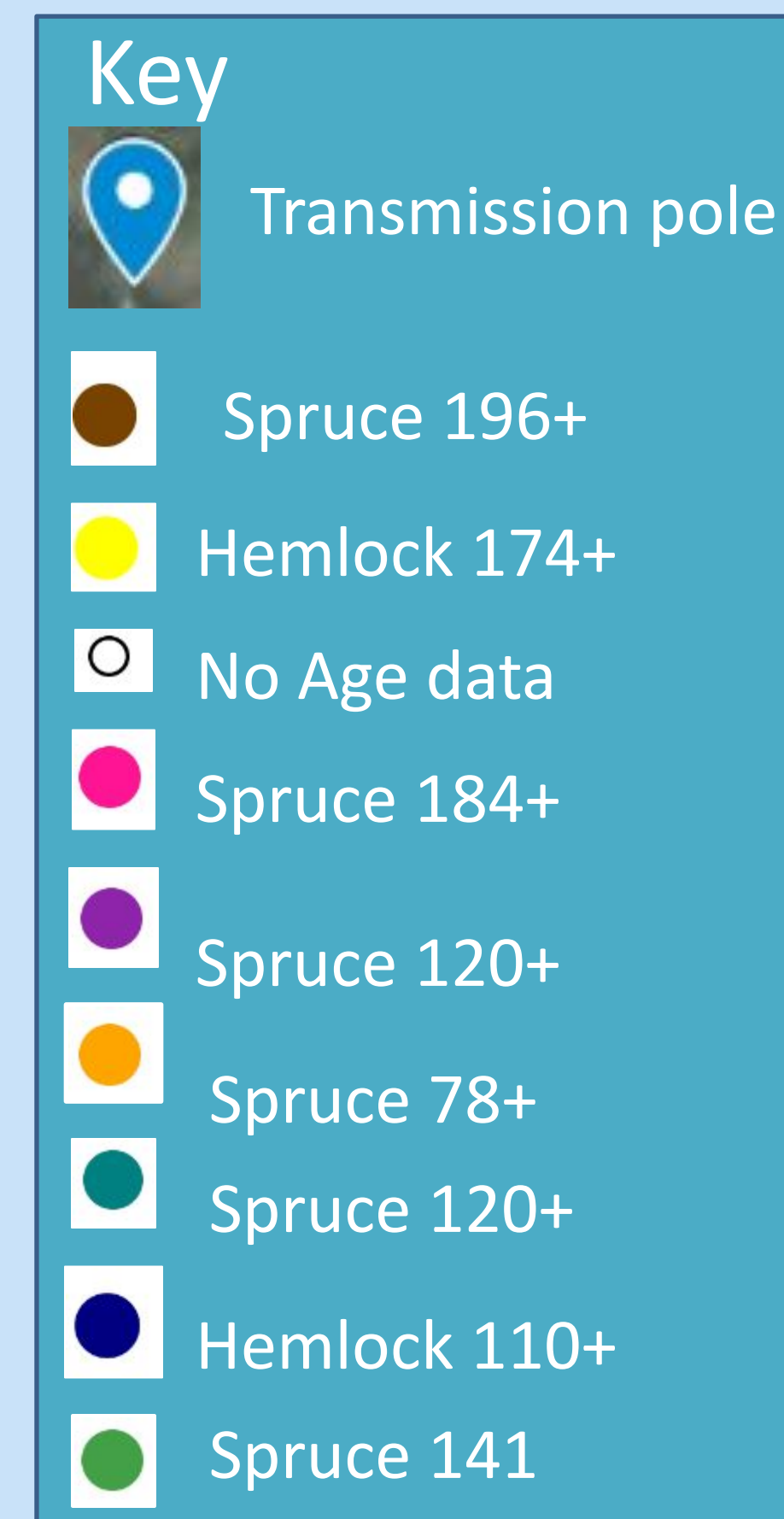


Figure 4



Figure 5

Figure 3. Map of where samples are from along Thane Road

Figure 4. Photo of drilling into the tree with a borer to retrieve a tree core

Figure 5. Image showing the sanding down process of tree cores in order to analyze the rings.

- Within the tree core data we have found trees dating as far back as approximately 190 years.
- Hemlocks have a different growth rate than Spruce trees. Hemlocks have a slower growth rate in size compared to the Spruce trees.
- Average minimum age was 140 years.

Discussion

Our data demonstrates that tree cores have the potential to provide information about avalanches within the last one hundred years. We did not have enough data to support our hypothesis. To test this hypothesis, we would need to get more samples in the surrounding areas of the pathways and analyze the tree cores not only for ages, but for damage throughout the years. The trees we sampled were along the avalanche pathways, but we did not walk right on the avalanche path, nor did we test directly on the path, because of the danger of avalanche risks. Avalanche paths like Snowslide Creek, which is the most frequent path within Juneau, carry history not only through tree core samples, but through ancient knowledge, and storytelling history. The Tlingit people knew about the the avalanche dangers, which is why they never permanently settled in the Thane Road area. The Tlingit people have known the impacts of an avalanche through animals, and plants, shown by the Tlingit place names along Snowslide Creek.

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