

## **Chilkat River Valley/Haines Highway Cold Air Damming**

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**Overview:** The Chilkat and Klehini river valleys north of Haines, AK are one of the snowiest areas of southeast Alaska. Wedged between mountain ranges to the SW and NE with the 4000ft Chilkat pass at the north end and the northern end of Lynn Canal at sea level in the south it provides a good case for cold air damming in southerly flow. WFO Juneau has recorded several instances where the town of Haines, AK, at the southern end of the valley has had only rain while up the Haines highway (an elevation gain of only 300 ft) the US customs station has had over a foot of snow. The depth of the cold air can have an effect as well. In the stronger cases, the air mass has been so cold that major snow episodes have been recorded at Haines (upwards of 20 to 30 inches) while surrounding sites observe significantly less accumulation (6 to 10 inches at Skagway, Gustavus, and Juneau).

**Synoptic Situation:** Typically during the winter months cold arctic air drains into the valley when there is a deep arctic air mass in place in the Canadian interior. This situation can last for days before a Gulf of Alaska storm comes into the panhandle. Ahead of these systems is usually southerly flow that terrain forces up Chatham strait, Lynn Canal and into the Chilkat valley. With the high terrain behind it the cold air has nowhere to go. So the warm moist air from the gulf hits it and then goes over top of it creating an overrunning snow event that can drop several inches of snow. In these cases we usually see the wind observation at Haines airport switch around to SE from a light NW while the temperatures start to warm up above freezing. The winds at the RWIS sites up the Haines highway however continue to show a light NW to calm winds with temperatures still below freezing and Haines customs is beginning to see snow which rapidly starts falling at an increasing rate. In stronger cases the wind switch does not occur at Haines and the town gets several inches of snow itself.

The snow continues until the precipitation stops or the cold air is eroded away. Whichever occurs first depends on the depth of the cold air in the valley and the strength of the southerly flow. Strong southerly flow will erode the cold air much quicker than weaker flow.

**Model and Forecast Considerations:** Most of the models in this situation routinely erode the cold air much too quickly. This results in temperatures and snow levels that are too high and snow accumulations that are too low in the Chilkat valley. There is also a lack of observations, there is no radar coverage (terrain issues, as well as distance from the radar), there are only two working real-time weather stations at the moment (an asos at Haines airport and a rwis at mile 18 on the Haines highway), beyond that are the web cameras (not very much help in the winter thanks to our 6 hours of daylight) and our coops/spotters. These constraints play havoc with the forecast for the Haines zone which covers the area from Haines to the Canadian border. Especially, since it could be raining in Haines and just a few miles up the highway we have winter storm warning conditions. Usually in the forecast, we lower the temperatures in the Chilkat valley and raise the snow amounts. For Snow accumulations, especially in Haines, we look to a tool in wxd called "snow" which gives us guidance for snow accumulation from

various models based on qpf and on the overrunning index. Beyond that we rely on our spotters to keep up with the changing conditions

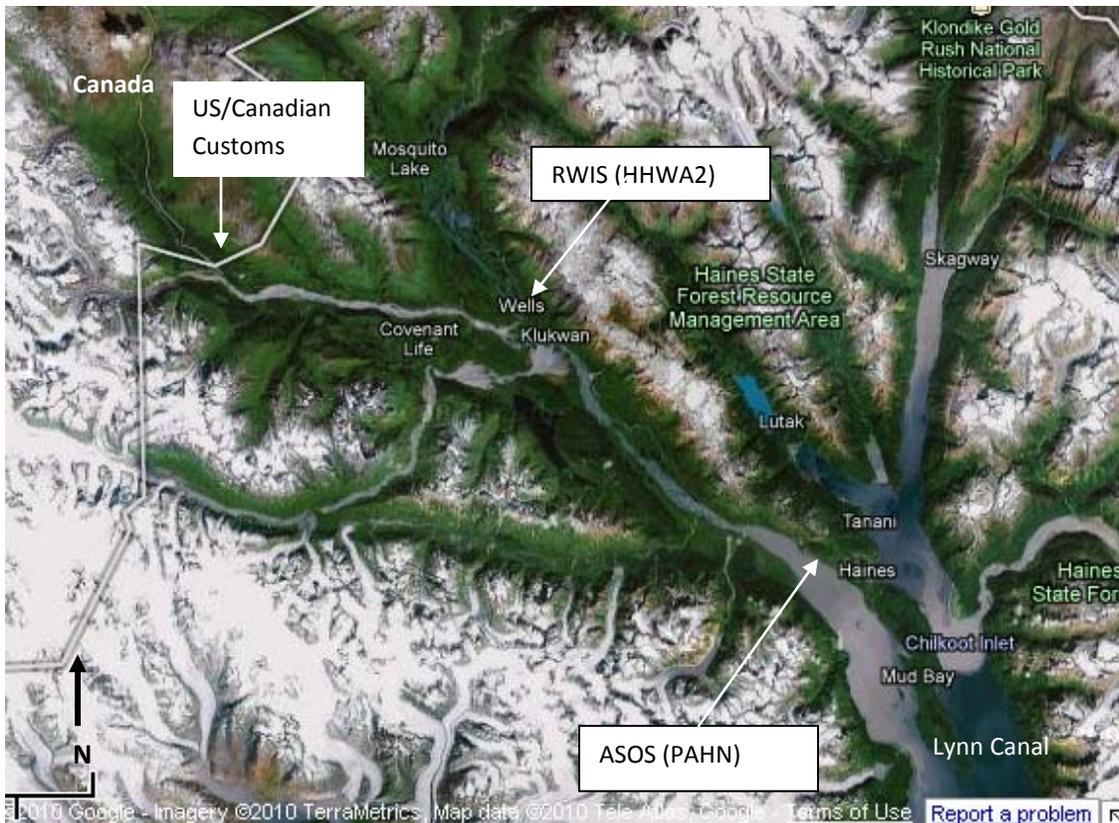
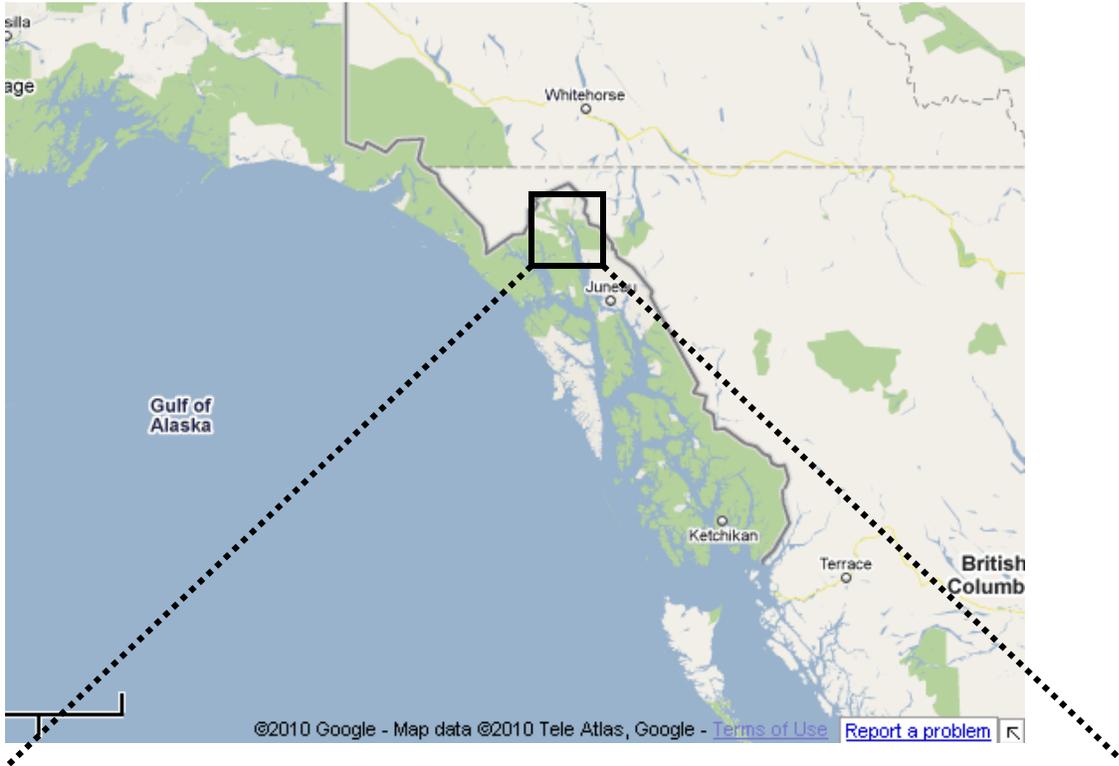


Figure 1: Map of area around the Haines highway including the various weather observation sites (note: the US customs station is a Coop/spotter location only). Road follows river valley from Haines to Klukwan and continues past Customs. 1"=8 miles