Assessing Regional River Flow

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1 Introduction

The purpose of this lab is to examine how flow properties change with respect to regional climate. In order to evaluate the change in flow properties, we have used data gathered by Environment Canada.

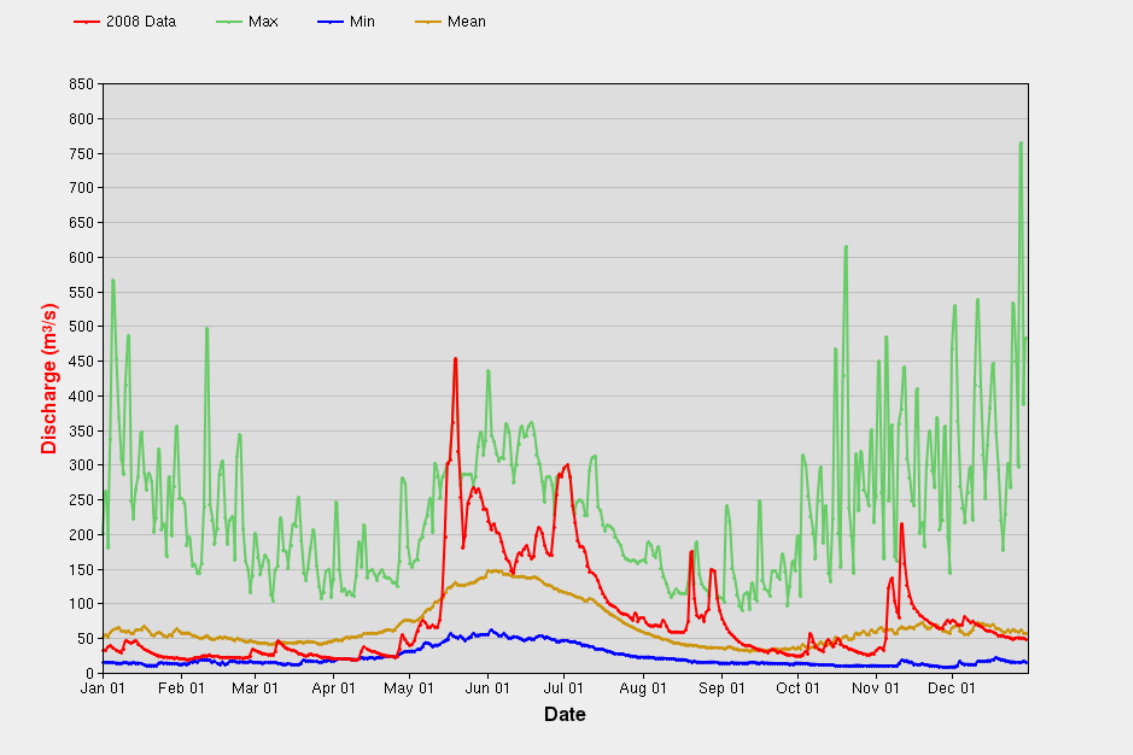
2 Data and Methods

Using climate.weather.gc.ca, the information about Abbotsford A station was retrieved. Using wateroffice.ec.gc.ca, the information about the Chilliwack River at Vedder Crossing station was retrieved. With the data that was retrieved, a graph was plotted using a bar and line chart that details the Total Monthly Precipitation and the Monthly Mean Discharge from the stations.

The general geography of the region from the stage and up to the river's source starts with the Vedder river flowing out into the Fraser river. As the Vedder river starts, it has an initial intake branch from the Sumas river that flows from the southwest while the Vedder's main source comes from the southeast. The Vedder's stage is in mostly flat farmland in the southwestern Chilliwack region, but as it progresses towards the coordinates that Environment Canada supplied that reference the Vedder station, it becomes a more developed area with a mountain to the south. There is an inlet river called the Sweltzer river that sources from Cultus Lake and comes from the south to connect to the Vedder. As we follow the Vedder river more towards its source, it continues up into more mountainous terrain and finally sourcing from Chilliwack Lake. Along the whole path of the Vedder river, it is followed by Chilliwack Lake Rd that connects to various service and logging roads and ends by the Vedder's source at Chilliwack Lake Provincial Park.

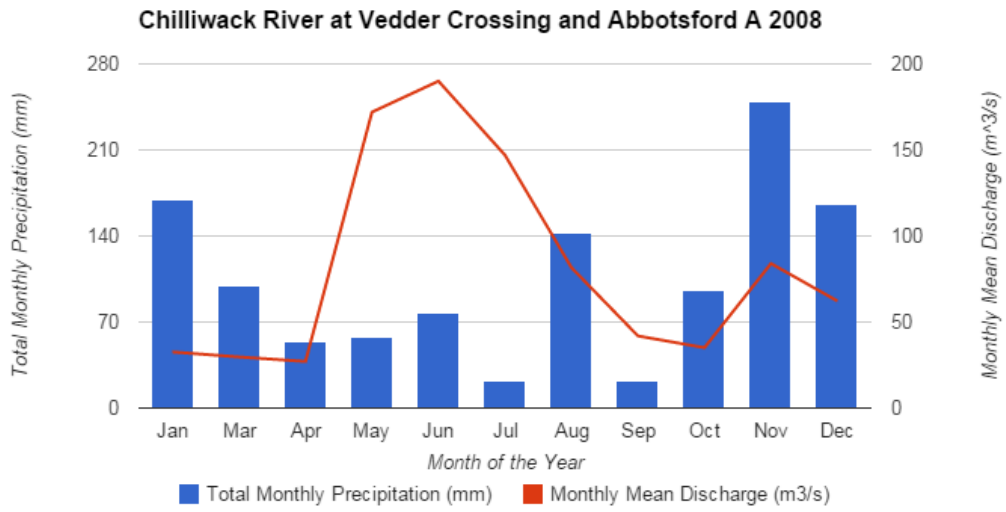
3 Results

3.1 Historical River Discharge Plot



The months where the 2008 daily discharge exceeded the historical mean daily discharge for at least half the month were May, June, July,and August. The months where the 2008 daily discharge equaled or exceeded the historical mean daily discharge for one or more days were March, May, June, July, August, September, October, November,and December. Based on the min/max/mean data, it seems that throughout the summer months there is on average more discharge. I am noticing that during May, June,and July there is an increase in discharge that follows with the current mean trend such that in 2008, discharge hit a new maximum at 3 different points during those months. It seems that the beginning months of the year seem to have significantly less discharge compared to usual, even such that it hit a number of new minimums. Only to then have it discharged in excess during the summer months. August was an anomaly as it seemed to have had abnormally high discharge rates by hitting two new maximums during 2008.

3.2 Monthly Mean River Discharge and Precipitation



Sources:

- wateroffice.ec.gc.ca
- climate.weather.gc.ca

A pattern that is observed in the Chilliwack River at Vedder Crossing and Abbotsford A 2008 plot are that there is a significant increase in Monthly Mean Discharge during the summer months of April, May, June,and July, whereas during those same months, there is a visible decrease in Total Monthly Precipitation compared to the rest of the year. The visible difference in discharge while having minimal precipitation during the summer months is likely due to melting of snow from the winter and glacial runoff from the nearby mountains. The months where the total monthly precipitation exceeded 90mm were January, March, August, October, November, and December. The months where the mean monthly discharge exceeded 60m^3/sec were May, June, July, August, November, and December. A high monthly discharge corresponded to a high monthly precipitation in the months of August, November, and December. The months where a high average discharge did not correspond to a high monthly total precipitation were May, June, and July. The month of August did not fall into the summer month pattern of a high discharge rate while having a very low precipitation rate, while instead it was high for both values, yet only to drop in precipitation dramatically in the following month of September.

4 Discussion

The patterns observed from the data collected point out some main key points such as that during the summer months, regardless of the quantity of precipitation, there has been consistently higher discharge rates compared to the rest of the year. The higher discharge rates during the summer are likely due to the higher temperatures that cause snow and glacier melting on nearby mountain peaks which flows into the Vedder River.

Based on the Köppen-Geiger climate classification chart, the Vedder River region is a Cfb which is specifically a Temperate climate without a dry season and has warm summers. Because the area surrounding the Vedder river falls into the Cfb classification, there is going to be rainfall throughout the year but more during the winter months. There won't be much snow during the winter due to the temperate climate but there will likely be a significant snowfall in the higher elevations on the surrounding mountain ranges. With the significant snowfall in the surrounding mountains, it creates a lot of water storage which will be melted during the summer to cause the huge increase in river discharge.

The storm patterns in this area are mostly rainclouds that form from the coastline to the west and travel over the flat farm-plains in Chilliwack to then dissipate over the mountains near the Vedder river and the Fraser river. The rainfall is apparent due to the lush vegetation on the surrounding mountainsides. The Vedder river's flow is likely quite quick up in the mountainous regions and near its source due to the elevation changes, but as it progresses down the hill, it widens out and slows down in the more populated areas and farmland. The slow-moving water near the farmland allows for lots of ground-water to seep in and help irrigate the nearby soil.

The historical averages for the river are somewhat different than the values obtained in 2008. In 2008, there was an abnormally low discharge rate during the winter months of January, February, March, and April, and there was subsequently an abnormally high discharge rate during the summer. The cause associated with this may be due to a somewhat colder 07/08 winter than usual which allowed for a larger snow buildup and thus less rainfall that would increase discharge rate. Instead, when the summer came, all the snow that was built up then melted to create an unusually high discharge rate during the summer. This chain of events created new minimums from the beginning of 2008 to new maximums during the summer for the observed discharge rates.