

Streamflows Of North Saint Vrain Creek, Rocky Mountain Front Range, Colorado

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Abstract. A common 'rule-of-thumb' among hydrologist is that ten years of daily streamflow data is adequate for most purposes. In the mountains of the South Platte Basin the rule of thumb is probably true if the goal is to have a good estimate of the annual discharge of a stream or to be able to determine the flood discharges. A record of ten years is probably not adequate for understanding the channel formation process. The reasons for these conclusions are examined using data for North Saint Vrain Creek in the Front Range of Colorado. The watershed is mountainous with the elevation at the gage being 8,280 feet and the maximum elevation of the watershed slightly over 13,000 feet. The period of record includes water years 1926-1930, and 1987-1997 for a total of 15 years. The median of the annual flows is 56.6 cfs. Three other gages could be used to develop a longer record of annual flows. The data for the nearby streams can be used to explain between 68 and 94 percent of the variation of the annual discharge of the North Saint Vrain Creek. The annual flows generated using the annual flows of the Big Thompson for the 1951-1997 period has a median value of 54.1 cfs. The maximum annual discharges for the same gages can be used with the North Saint Vrain data to develop a reasonably good flood frequency function for the gage location. An index (Channel Formation Capacity Index - CFCI) to the ability of the streams to modify or maintain their channels has been developed. There is little to no relation between the index on North Saint Vrain Creek and the Big Thompson River. A Monte Carlo type analysis using data for the Saint Vrain Creek at Lyons was made to demonstrate the range in ten year averages of the CFCI, maximum annual discharge, and the average annual discharge possible for Front Range streams. The ratio of the maximum and minimum to the median of 100 ten year periods is given below.

		<i>Annual</i>	<i>Annual</i>
	CFCI	Maximum	Discharge
maximum/median	2.51	2.85	2.70
minimum/median	0.003	0.97	1.55

The range in the CFCI is much more than the range in the maximum and average annual discharges and demonstrates the adequacy of using 10 years of record for determining the maximum and average annual discharges and the inadequacy of 10 years for the understanding of channel processes. If the objective is to understand the channel formation process more data is needed or a good watershed model developed.