Executive Summary: A water demand and supply analysis under changing climate conditions for the Chapman Creek water system on the Sunshine Coast, BC

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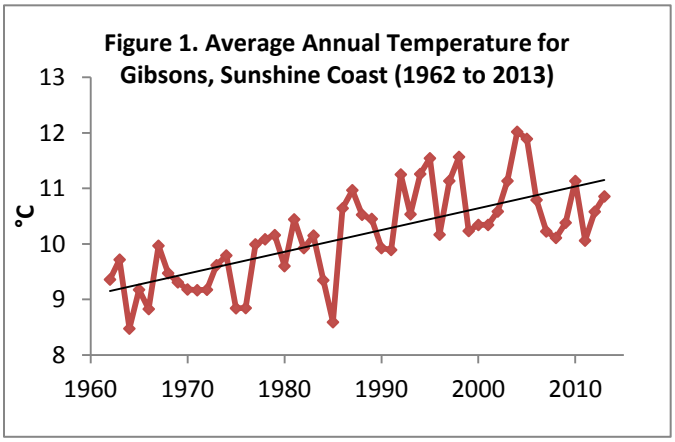
INTRODUCTION

Chapman Creek is the main potable water source on the Sunshine Coast, BC, and services approximately 22,000 people. Concerns have been expressed that increasing water demand due to population growth and increasing climatic variability might lead to water shortages during the summer season and insufficient summer streamflow to maintain a healthy aquatic environment. As a result, a water demand and supply analysis was conducted for the Chapman water system to determine how climate change might impact water consumption and future water supply. The analysis was developed by reviewing historic temperature, precipitation, discharge, and water consumption data to determine historic trends. Relationships between climate and water consumption were examined to provide insight into the potential impacts from climate change on water supply and demand during the summer season. The data were analyzed and used to conduct a sensitivity analysis by developing water consumption scenarios for business as usual demand (0% reduction in demand), moderate demand management (12% reduction in demand) and intensive demand management (20% reduction in demand) under a 1,2, and 3 °C increase in average summer temperatures with and without drought conditions.



KEY FINDINGS

Since 1962, there is clear evidence that average annual temperatures have increased by 2.2 °C (Figure 1) and total annual precipitation has decreased by 24mm on the Sunshine Coast. Annual streamflow patterns in Chapman Creek have changed between 1962 and 2003 (period of record) and the trends suggest that spring peak flows are occurring earlier in the year. Major concerns were noted for the winter and summer seasons as the warming temperatures and decreasing precipitation during the winter indicates that the annual snowpack is decreasing, which affects the amount of water available for the summer season. The changes in temperature and precipitation during the summer season indicate that the final snow melt is occurring earlier in the year and recharge to the lake storage reservoirs from precipitation may

be becoming less frequent. These changing climate and streamflow patterns suggest that summer water availability for the Chapman water system is depleting over time.

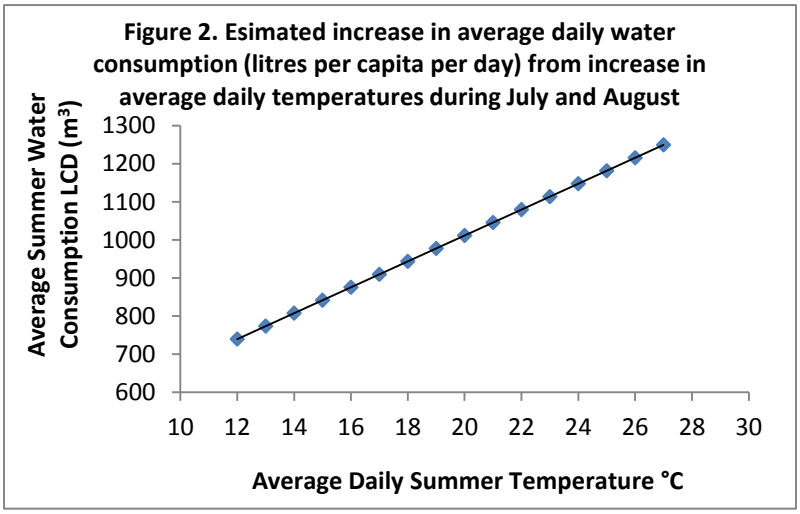


Figure 2. Esimated increase in average daily water consumption (litres per capita per day) from increase in average daily temperatures during July and August

Changing climate patterns on the Sunshine Coast were also linked to summer water demand. It was estimated that for every one degree °C increase to average daily temperatures in July and August, water consumption increases by 34 litres per capita per day (LCD) (Figure 2), which is estimated to increase total daily consumption by 748,000 L at today's population and under business as usual water demand. It was further estimated that for every decrease in one mm of total average rainfall during July and August, water consumption will increase by an average of 1.75 LCD, which during drought conditions can increase water consumption by 50 to 60 LCD under business as usual water demands. This is an increase of total daily water consumption of about 1 million litres of water per day.

KEY CONCLUSIONS

All of the factors that influence water supply and water consumption will eventually cause the current thresholds in the Chapman water system to be exceeded for daily water consumption and total water availability. These sensitivities in the Chapman water system were highlighted in the sensitivity analysis, which provided two key projections: (1) the current daily capacity of the existing water treatment plant could be regularly exceeded during the summer within the next 5 years and (2) total water consumption during the summer could regularly exceed the equivalent to the available water supply in the next 10 years if population grows by 2% annually, water demand is business as usual, mean summer temperatures increase by an average of 1 °C, and a prolonged drought is experienced (see table below). Recognizing these sensitivities in the Chapman water system, **it is crucial that the entire community explore ways of reducing their water consumption, especially during the summer, in order to adapt to uncertainties in climate change.**

Scenario (with no rain)	Average daily consumption > 26,900 m^3			Total July and August consumption > 1.8 M m^3		
	1 °C	2 °C	3°C	1 °C	2 °C	3°C
BAU	2018	2016	2015	2022	2020	2019
12%	2024	2022	2020	2028	2026	2024
20%	2028	2026	2024	2032	2030	2028

The table above shows the years that average daily consumption and the equivalent to the total water supply for the Chapman water system may be exceeded at different levels of water consumption if average summer temperatures increase and a major drought is experienced

For question or comments or to request the full report please contact Monte Staats at monte.staats@gmail.com.