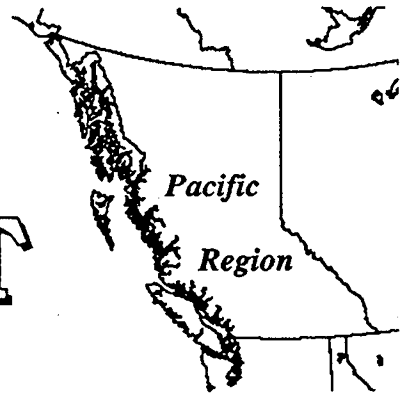
SCIENTIFIC SERVICES DIVISION

REPORT



WARM AND COOL PERIODS IN THE SOUTHERN INTERIOR OF BRITISH COLUMBIA

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INTRODUCTION

In the construction of future climate change scenarios, it is useful to identify those events in the past when the average temperature was extremely warm or cool. This paper determines the warmest and coolest years and pentads from 1916-1988 in the southern interior of British Columbia. In addition, the mean annual and seasonal temperature record is examined for any long term trends.

METHODOLOGY

The areal averaged temperature was used to define the temperature of the southern interior and was calculated using the Thiessen polygon method (Thiessen, 1911). This method is generally used for weighting rainfall data over a watershed with a non-uniform distribution of rain gauges. Weights were calculated for each climate station using a computerized technique described by Louis (1977) to determine Thiessen weights.

Table I shows the sites and calculated Thiessen weights for each of the six climate sites used in this study. Figure 1 shows the location of these sites and the boundaries of the southern interior.

Table I Sites used in calculation of areal averaged temperatures.

SITE	LOCATION	WEIGHT
Summerland	49 34'N 119 39'W	.0922
Kamloops	50 42'N 120 27'W	.3821
Princeton	49 28'N 120 31'W	.0259
Cranbrook	49 36'N 115 47'W	.1462
Golden	51 18'N 116 59'W	.1926
Kaslo	49 55'N 116 55'W	.1610

In some cases the temperature time series did not cover the entire 1916-1988 period due to changes in the climate observing program (eg. climate stations closing or being replaced by another in the same community). In these cases two (or more) times series of adjacent climate stations were linked to produce a complete time series. Adjustments were made to the older time series by calculating average differences between the two times series where they overlapped. No other adjustments (for example, to account for urban effects) were made.

RESULTS

The warmest (and coolest) years and pentads based solely on annual average temperature are shown in Tables II and III based on the annual temperature time series shown in Figure 2. Table II excludes the warm period at the end of the time series shown in Figure 2 because the 1987 and 1988 running means are based on less than 5 years' data. Therefore, the warmest pentad, based on 5 year annual temperature averages, were centred on 1940. The coolest was centred on 1918. The warmest single year was 1958 and the coolest 1916.

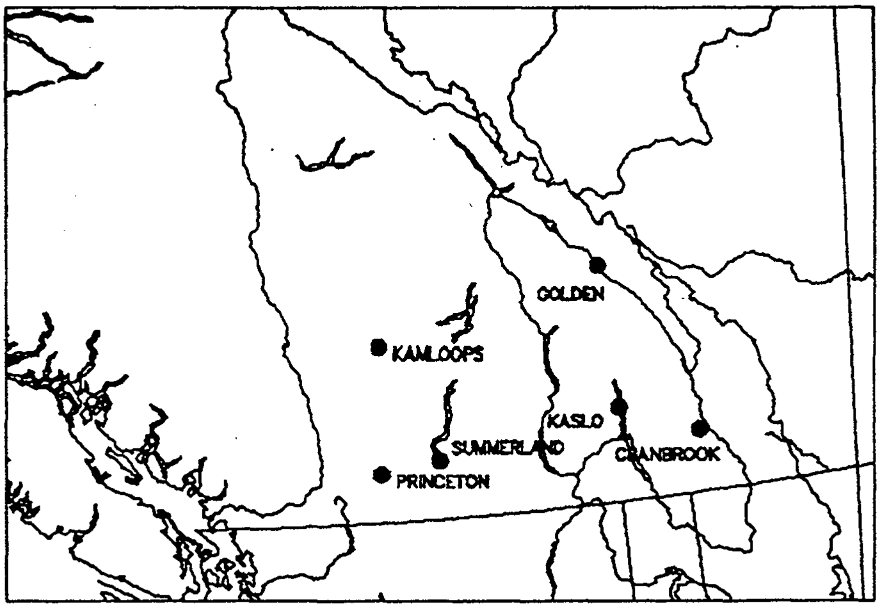

Figure 1 Six climate stations used in the calculation of areal averaged temperature in the southern interior of British Columbia. The boundaries of the southern interior used in the averaging technique are shown.

Table II Three warmest and coolest five year mean annual average temperatures in the southern interior.

Centre Year	Five Year Mean Temp. (C)
1940	7.81
1960	7.37
1981	7.30
1931	6.39
1950	6.22
1918	5.95

Table III Three warmest and coolest mean annual average temperatures in the southern interior.

Year	Annual Mean Temp. (C)
1958	8.67
1987	8.57
1941	8.42
1922	5.61
1955	5.18
1916	4.48

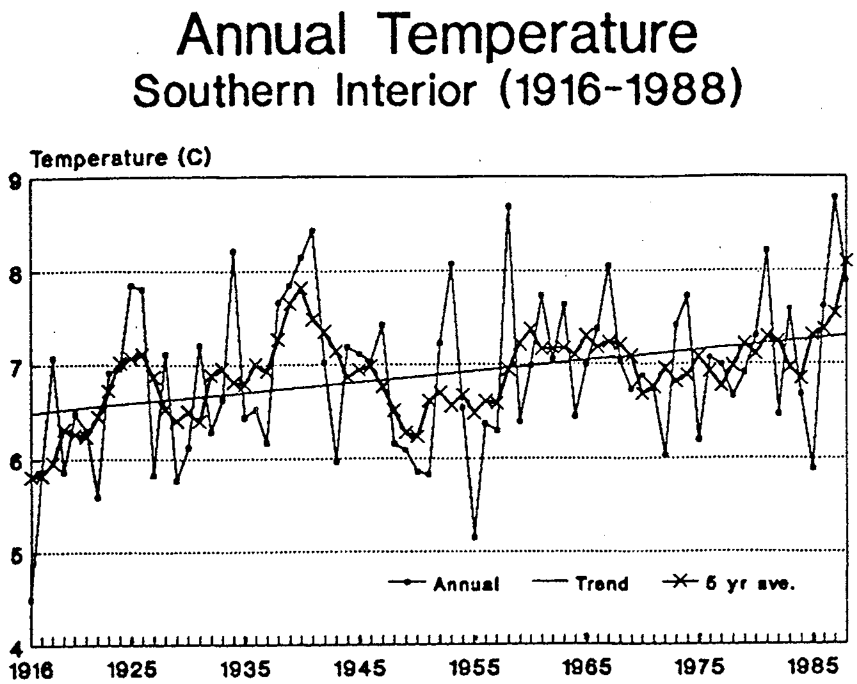

Figure 2. Areal averaged annual temperature for the southern interior based on data from 6 climate stations. Annual mean, five-year mean, and the overall trend is shown.

Figures 3 to 6 show the seasonal temperatures for the southern interior for the period 1916-1988. In this study seasons are defined as follows:

January - March:	Winter	April - June:	Spring
July - September:	Summer	October - December:	Autumn

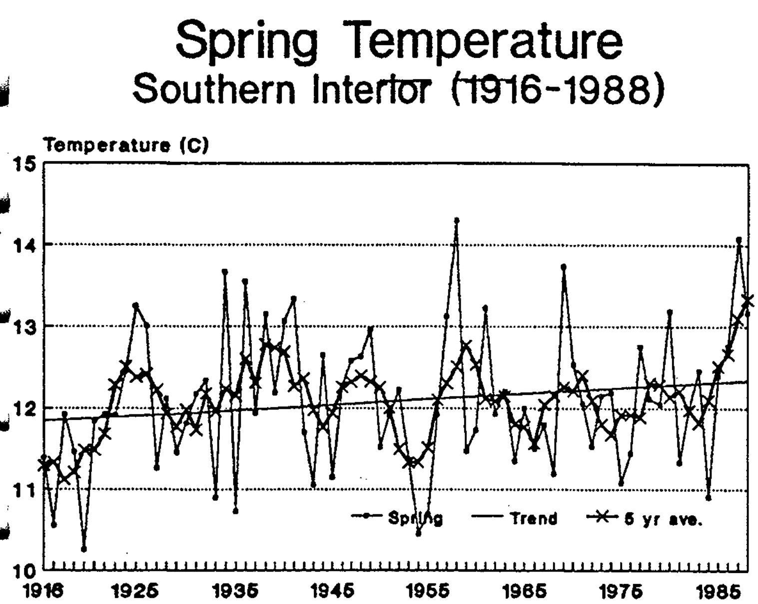

Figure 3. Areal averaged spring (April-June) temperatures for the southern interior.

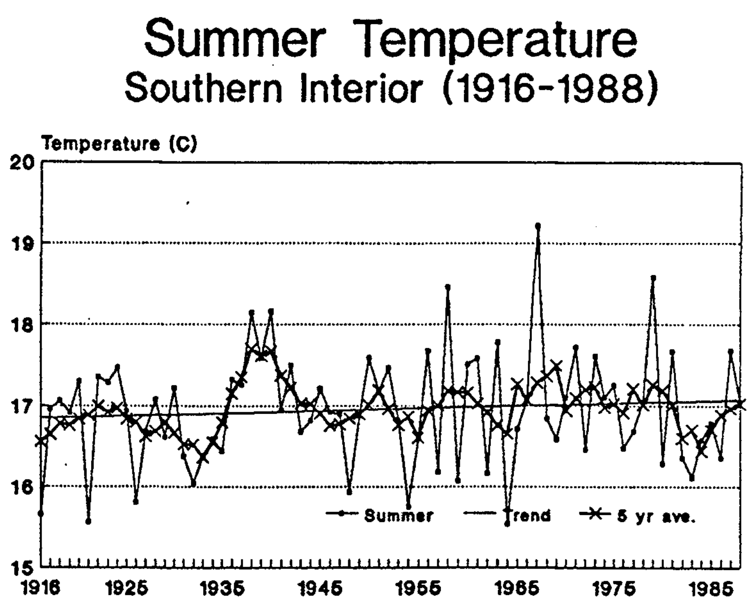

Figure 4. Areal averaged summer (July-September) temperatures for the southern interior.

Autumn Temperature
Southern Interior (1916-1988)

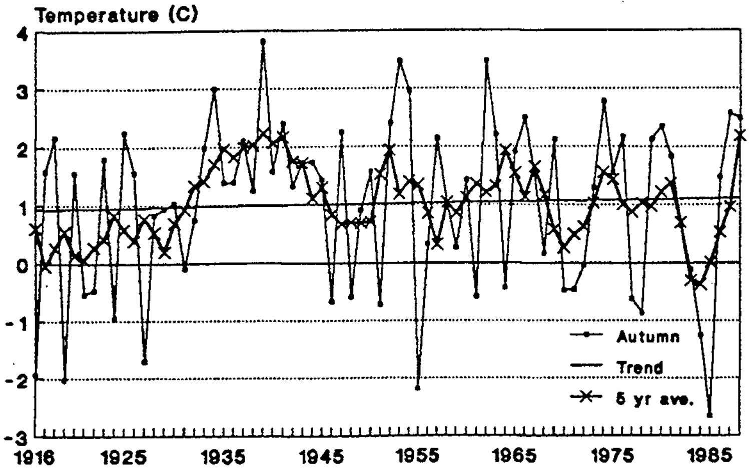

Figure 5. Areal averaged autumn (October-December) temperatures for the southern interior.

Winter Temperature
Southern Interior (1916-1988)

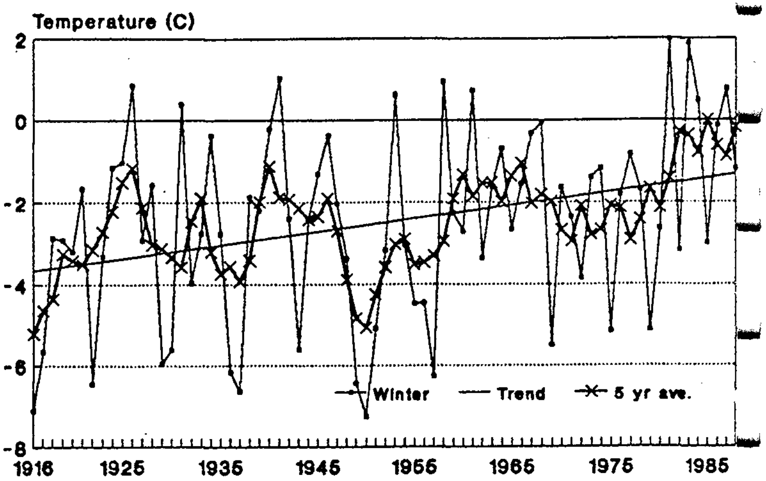

Figure 6. Areal averaged winter (January-March) temperatures for the southern interior.

ANALYSIS OF TEMPERATURE TREND

The annual average temperature shows an approximate 0.7 C increase over the 72 years from 1916-1988. The seasonal temperature trends, however, shows that warming is most evident in winter, with little or no warming in other seasons. The long-term annual temperature rise can therefore be attributed mainly to increasing winter temperatures. This warming may be a result of climate variation, urban heat island effects or increasing low cloud (possibly due to a rise in airborn particulate concentration).

CONCLUSION

Using an areal averaging technique, mean annual temperatures were calculated for the southern interior for the period 1916-1988. The warmest three years were 1987, 1958 and 1941. The coolest three years were 1916, 1955 and 1922. Using five-year averages, the warmest pentads were centred on 1940, 1960, and 1986. The coolest pentads were centred on 1918, 1950 and 1931. There has been a 0.7 C annual warming for the period, mostly attributable to warming during the winter months (January-March).

REFERENCES

1. Thiessen, A.H., Precipitation Averages for Large Areas, Monthly Weather Review, 39, 1082-1084, 1911.

2. Louis, P.Y.T., Thiessen Polygon Coefficients by a Grid Mesh Technique, Atmospheric Environment Service internal publication, 1977.