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DEPARTMENT OF TRANSPORT - METEOROLOGICAL BRANCH

# THE CLIMATE OF VANCOUVER

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## ACKNOWLEDGMENT

The form of this paper is similar in many respects to that used by Richmond W. Longley in his booklet, "The Climate of Montreal". We would like to acknowledge our debt to Mr. Longley for granting permission to base the plan of our work upon his.

We would also like to thank Mr. J. R. Hamilton, Port Meteorological Officer in Vancouver, and custodian of the original weather records for the city, for his co-operation in making available and assisting us with these records.

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## HISTORY OF WEATHER OBSERVATIONS AT VANCOUVER

Weather records for the City of Vancouver began in November 1899. However, from that date until April 1905 the information lacks completeness and continuity. For the period November 1899 to February 1904, inclusive, three observers in turn set up their instruments at three separate locations. These were:

Dr. F. T. Underhill, 1373 Barclay Street,
Mr. J. T. Brown, 812 Richards Street,
Mr. A. Ufford, corner of Cordova and Carrall Streets.

The exact dates on which these men began and ended their observations are not certain. Many of the observations themselves are not complete, and some are missing altogether for considerable stretches of time. Notwithstanding, these records have provided much useful data on temperature and rainfall for those early years.

A lengthy gap occurs between the months of March 1904 and March 1905, during which no observations at all were recorded.

Complete and continuous records date back to April 1905. At that time Mr. T. S. H. Shearman was officially appointed as weather observer for the City of Vancouver. He set up his instruments at 2163 West 5th Ave., and began to record observations twice daily, at 8:00 a.m. and 5:00 p.m. His instruments included a mercury barometer, ordinary rain gauge, wet and dry bulb thermometers, and maximum and minimum thermometers mounted in a Stevenson Screen. A sunshine recorder was installed in August 1908, and an automatic rain gauge and recording anemometer to measure the wind were added in November 1914. In 1911, Mr. Shearman began transmitting weather reports by telegraph to the Central Meteorological Office in Toronto, and observation times were changed to 5:00 a.m. and 5:00 p.m.

Mr. E. B. Shearman took over from his brother the duties of official weather observer in 1915, and continued until his retirement in 1948. There was no change of location, however, until November 24, 1934, when the instruments were moved to a new site at 2060 Comox Street. Here the station was a little more sheltered than the old one. Because it was a little closer to the mountains of the North Shore the precipitation was a little heavier. Temperatures, however, changed very little. Observations continued from this address until May 1945, when the station was closed.

Some years earlier Mr. Shearman had opened an office in downtown Vancouver to serve the needs of the public, newspapers, and business. He gave out weather reports and climatological information on request. His first office was located in the Post Office Building but was moved to the Exchange Building at 553 Granville Street in March 1928. It was moved again in 1932 to the top floor of the Bower Building, 543 Granville Street. It was to this latter location that Mr. Shearman moved his instruments in May 1945, when he closed his office on Comox Street. However, due to the unsuitability of the location, the measurement of temperature was discontinued. Records of precipitation and sunshine were continued and have turned out to be little different from the values for the previous locations.

Mr. E. B. Shearman continued as official observer until his retirement in 1948. He was awarded the British Empire Medal in October 1947, in recognition of his long and faithful service. He died in Vancouver on November 15, 1955, at the age of 82 years.

Following Mr. Shearman's retirement, Mr. C. H. Bromley took over the duties until October 1950. Then he was succeeded by Mr. R. F. Kennett who moved the office from the Bower Building to the Winch Building, 739 West Hastings Street, in November 1950. Mr. Kennett left the Service in December 1952, and was followed by a relief man until the appointment of Mr. J. R. Hamilton in May 1953. Mr. Hamilton still keeps records of rainfall and hours of sunshine from the roof of the Winch Building, and at the same time acts as Port Meteorological Office for Vancouver.

In 1938 the Meteorological Service of Canada opened a District Aviation Forecast Office at Vancouver Airport to serve the need of the gradually expanding aviation industry. At the same time the airport office assumed the official duties of weather observing for the Vancouver area. Since that time complete records of temperature, pressure, wind direction and speed, and precipitation have been maintained. Temperature records for the airport agree fairly closely with those of the downtown locations, but there is a marked variation in the amount of precipitation and sunshine.

## TOPOGRAPHY AND CLIMATE OF GREATER VANCOUVER

The City of Vancouver is located on a narrow peninsula lying between the north arm of the Fraser River on the south, the Strait of Georgia on the west, and Burrard Inlet on the north. Greater Vancouver includes the city proper and the city of New Westminster to the east; the municipality of Richmond, occupying both Sea Island and Lulu Island between the north and south arms of the Fraser River; Burnaby to the east; and North and West Vancouver across Burrard Inlet to the north.

The land over the Greater Vancouver area (Fig. 1) slopes gradually from south to north. However, the rise becomes very rapid from Burrard Inlet to the top of the ridge of mountains along the north shore. Lulu and Sea Islands to the south are almost flat and only a few feet above mean sea level. The city proper slopes gradually from the

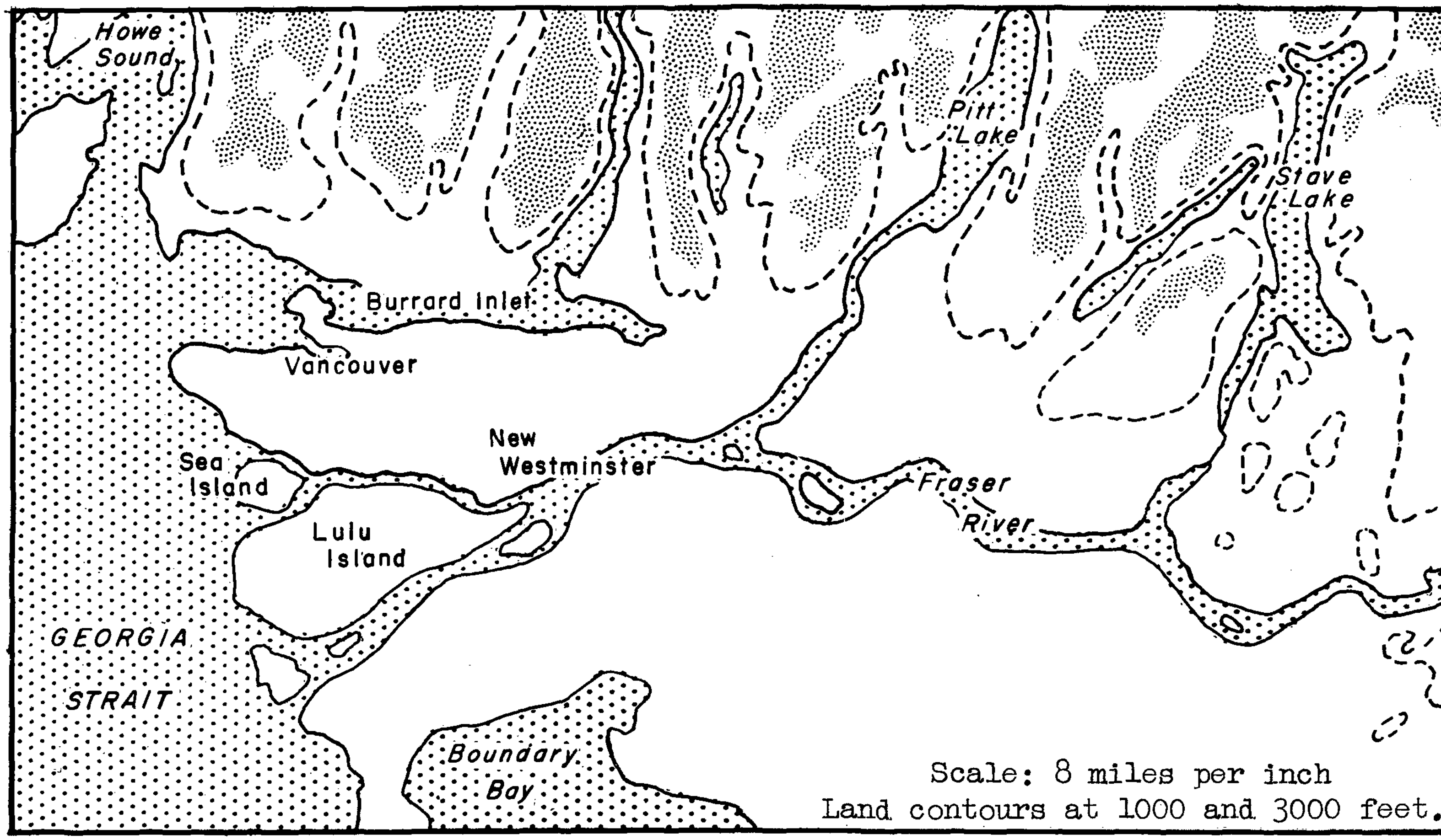


FIGURE 1 - THE LOWER FRASER VALLEY

Fraser on the south upward to the ridge of land between the Fraser and Burrard Inlet. This height of land varies from about three hundred to five hundred feet and contains several small crests or peaks, such as Little Mountain and Burnaby Mountain. To the north of Burrard Inlet the mountain peaks of the north shore rise to heights in excess of three thousand feet just a few miles from tidewater.

The geographical location of Vancouver on the southern mainland of British Columbia accounts for the maritime nature of its climate. It is sheltered from the Pacific Ocean by the mass of Vancouver Island, but its proximity to this ocean keeps its climate moderate throughout the year.

The mountains of Vancouver Island, and, to a lesser extent, the Olympic Mountains of northwest Washington, protect Vancouver from the direct onslaught of storms moving off the north Pacific Ocean. However, the Coast Mountains beyond the city give a further lift to the moisture laden air, so that rainfall over the area is plentiful.

The coastal mountains of the mainland provide protection to the city from outbreaks of Arctic air during winter. Only the major surges are able to overcome this mountain barrier. Then, cold northerly winds sweep down the Fraser valley, through the valley of the Harrison, or out through Howe Sound. Generally such a development brings a spell of clear cold winter weather. However the retreat of the cold air in advance of a new Pacific storm usually results in a fall of snow which, in most cases, turns to rain as the warmer air moves closer.

## EXPLANATION OF TABLES AND GRAPHS

The following pages describe the weather conditions for Vancouver. Included are tables and graphs giving average and extreme conditions for each month. Figures for temperature are based on records from the period April 1905 to December 1944, - that is until temperature records were discontinued in the downtown area of the city. Precipitation figures begin with the commencement of regular observations in April 1905, and continue to the end of December 1955. The sunshine recorder was not installed until August 1, 1908, so that records from that date until December 1955 are used.

Airport values for precipitation and sunshine are given below corresponding figures for the city for comparison. Airport precipitation amounts were recorded from January 1938, and sunshine from September 1946. Fog data for the airport only are given, since no figures are available for the downtown area. All records available to the end of November 1956 are used. Temperature data for the airport are not given, however, since the airport figures agree closely with downtown values.

The tables are arranged month by month so that a complete picture of Vancouver weather during any particular month can be obtained. The third column gives the mean or average condition to be expected during the month. The first and fourth columns indicate the extremes that have occurred and the second and fifth columns, respectively, show the years in which these extremes were recorded. Thus, in the January table we find that on the average we can expect 10.7 inches of snow during the month but that on several Januarys in the past no snow at all has fallen. On the other hand over 55 inches of snow fell in January 1913.

Near the bottom of the tables, under the heading "Extreme Values", are given lowest and highest figures for any one day during the month. Thus the lowest January temperature ever recorded in Vancouver City was 2° on January 15, 1907, while the highest temperature occurred twice, on January 28, 1941 and on January 30, 1935, when the thermometer climbed to a pleasant 59°.

The last column, headed "Limits of 50% Range", indicates the range of most likely values that may occur during the month. These figures are so chosen as to include within their limits the middle 50 per cent of all recorded values. Thus on one half of all Januarys the mean temperature ranged between 33.8 and 39.8 degrees. In the case of temperature these figures were determined from the frequency distribution of actual temperatures. For precipitation and number of days of rain, frost, thunder, etc., the limits were obtained by actual count.

On the graphs are plotted six lines or curves.

Two of these, (2) and (5), show the variation of the average daily maximum and average daily minimum temperature from day to day through the months as determined from the forty years of temperature readings in Vancouver. The other four lines, (1), (3), (4), and (6), represent, respectively, the highest maximum, the lowest maximum, the highest minimum, and the lowest minimum temperatures which have been recorded on each day of the month during the period of records for the city.

To illustrate, - on January 1 the mean maximum temperature is 41° while the mean minimum is 33°. On this day, however, at one time during the period of observations, maximum temperature reached 54° while in another year it was only 21°. Similarly, in one year the minimum dropped only to a mild 50° overnight but in another year it fell to a cold 11°.

These graphs in effect catalogue the normal and extreme variation of temperature in Vancouver and, since they are based on forty years of observations, it can reasonably be assumed that they give a guide to what might be expected in the future.

## UNITS

Throughout this paper, temperature is given in degrees Fahrenheit. Rainfall and snowfall are given in inches. Total precipitation is given in inches of rain and melted snow. In the latter case snowfall is converted into water equivalent by assuming that 10 inches of snow equals one inch of rain. In the records of 24-hour precipitation, the day is considered to last from 4:30 a.m. to 4:30 a.m. Pacific Standard Time.

In computing the number of days with frost, the method of the Meteorological Service of Canada was followed. A day with frost was a day on which the minimum temperature fell to 32.5° or lower. Rain days include all days on which one hundredth of an inch or more of rain was recorded, but exclude those days on which some small amount fell but did not amount to the required one hundredth of an inch.

Sunshine is given in hours per month. However, no figure is given for cloud amount since this element has never been measured in the downtown area. Wind data for the airport are discussed toward the end of this paper, to give some indication of the wind regime over the area. However, application of these data to other sections of the city must be done with caution because of the extreme variability of this element with topography and exposure.

## VANCOUVER'S WEATHER MONTH BY MONTH

In the following section the weather in Vancouver City is discussed in detail with a table of climatic elements for each month. In addition, there are graphs showing the variation of temperature day by day throughout the year. The tables include mostly data for the city but figures for precipitation, sunshine, and fog for the Airport have been added to round out the city picture.

January.

January is normally the most severe month in Vancouver, its mean temperature being 2° below those for December and February. The temperature, as reflected by both the daily mean maximum and daily mean minimum curves, normally reaches its low point during the middle two weeks of the month. The extreme low temperatures for the year, 2° above zero in the city and zero at the Airport, have been recorded in January. In general, however, the temperatures for the month reflect the mild character of Vancouver's climate. In many years the mercury does not fall below 20 degrees, and in one year freezing temperatures were recorded on only two days during the month.

Snowfall is heaviest in January. The average for the month is 11 inches but the variation is great with many Januarys having no snow at all, although in January 1913 over 55 inches fell. While snowfall normally reaches its maximum in this month the average total precipitation figures are actually below those of December. However, the extreme values for daily and monthly rainfall, snowfall and total precipitation have all occurred in January.

Normally rather more sunshine can be expected in January than in December, but for the most part, particularly in milder Januarys, the skies are dull and dreary. Some of this increase in sunshine can be attributed to the longer days but it is true that periods of bright though often colder weather are more common in this month than in December.

Fog can be a problem in January but it is unusual for it to be as dense or persistent as it can be in November or December. The average occurrence at the Airport is 10 days per year but the greatest number of days of fog in any one January is only 14, considerably less than the high values for the last two months of the year.

## JANUARY

## MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 26.0 | 1916 | 36.8 | 43.5 | (1931 (1941 | 33.8-39.8 |
| Mean Maximum Temp. | 31.0 | 1916 | 41.1 | 49.0 | 1941 | 38.4-43.8 |
| Mean Minimum Temp. | 21.0 | (1907 (1916 | 32.4 | 40.0 | 1931 | 29.0-35.8 |
| Total Precipitation | 0.84 | 1949 | 8.28 | 20.65 | 1935 | 6.35-10.14 |
| (A)* | 0.72 | 1949 | 5.24 | 9.43 | 1953 | |
| Rainfall | 0.66 | 1937 | 7.20 | 16.84 | 1935 | 4.64-9.38 |
| (A) | 0.34 | 1949 | 4.51 | 9.09 | 1953 | |
| Snowfall | 0 | Sev'l | 10.7 | 55.4 | 1913 | 0.7-18.4 |
| (A) | 0 | Sev'l | 7.3 | 37.0 | 1950 | |
| Precipitation Days | 7 | 1949 | 20 | 28 | Sev'l | 17-24 |
| Rain Days | 4 | (1916 (1949 | 18 | 28 | (1931 (1953 | 15-22 |
| Snow Days | 0 | Sev'l | 5 | 15 | 1952 | 1-7 |
| Frost Days | 2 | 1931 | 13 | 30 | 1937 | 8-17 |
| Days with Fog (A) | 2 | 1946 | 10 | 14 | 1943 | |
| Hours of Sunshine | 8.9 | 1952 | 45.5 | 100.7 | 1930 | 34.9-54.1 |
| (A) | 17.8 | 1952 | 56.5 | 120.0 | 1949 | |

* Data for Airport

## EXTREME VALUES FOR JANUARY

| | Low | Year | High | Year |
|---|---|---|---|---|
| Maximum Temperature | 13/7th | 1909 | 59/28th<br>30th | 1941<br>1935 |
| Minimum Temperature | 2/15th | 1907 | 51/2nd | 1918 |
| 24-Hr. Precipitation | | | 3.73/21st | 1935 |
| 24-Hr. Snowfall | | | 17.5/20th | 1935 |

February.

February, in most years, is a transitional month between winter and spring. The upswing in temperature which begins during the last week of January accelerates in February, so that by the end of the month the average maximum temperature is nearly 48°, while the average minimum temperature has risen to 35°. With the maximum temperature quite frequently reaching the fifties during the day, growth begins, and it is not uncommon to see the hardier spring bulbs beginning to bloom in city gardens by the end of the month. Night frosts continue to occur quite frequently, particularly in the first half of the month, but very low temperatures are infrequent. In fact, a temperature below 10° has occurred only once in February during the 40 years examined in this survey. In recent times, though, a minimum of 3.4° was registered at the Airport in the severe winter of 1949-50.

Precipitation continues to be heavy and occurs frequently through the month, though snowfall totals are less than in January. On the average, seventeen days have precipitation in one form or another, while snow can be expected on three days each month. Usually, as during other winter months, the snow falling in the city is wet, often changing to rain before the period of precipitation ends.

Sunshine shows a marked increase through February with the average reaching nearly three hours per day. Of particular interest is the minimum value of 42 hours set in February 1946, as contrasted to the minimum value of nine hours for January set in 1952. By the time February has arrived the very dull and dreary weather usually common to the coastal winter is drawing to an end.

## FEBRUARY

### MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 31.0 | 1936 | 39.3 | 44.5 | 1924 | 36.7-40.9 |
| Mean Maximum Temp. | 38.0 | 1936 | 44.8 | 51.0 | (1934<br>(1941 | 42.0-47.6 |
| Mean Minimum Temp. | 24.0 | 1936 | 33.8 | 41.0 | 1924 | 31.6-36.0 |
| Total Precipitation | 1.21 | 1920 | 6.08 | 10.51 | 1918 | 4.66-7.60 |
| (A)* | 1.94 | 1942 | 4.70 | 8.07 | 1950 | |
| Rainfall | 1.21 | 1920 | 5.44 | 9.95 | 1950 | 3.75-6.88 |
| (A) | 1.94 | 1942 | 4.22 | 7.92 | 1950 | |
| Snowfall | 0 | Sev'l | 6.6 | 36.5 | 1916 | 0-10.8 |
| (A) | 0 | 1945 | 4.8 | 23.9 | 1949 | |
| Precipitation Days | 7 | 1920 | 17 | 25 | (1909<br>(1924 | 14-19 |
| Rain Days | 7 | 1920 | 16 | 25 | (1909<br>(1924 | 13-19 |
| Snow Days | 0 | Sev'l | 3 | 15 | 1937 | 0-4 |
| Frost Days | 1 | (1915<br>(1924 | 11 | 25 | 1936 | 8-15 |
| Days with Fog (A) | 4 | Sev'l | 7 | 14 | (1941<br>(1943 | |
| Hours of Sunshine | 42.0 | 1946 | 79.2 | 148.4 | 1920 | 61.4-94.4 |
| (A) | 54.5 | 1950 | 88.5 | 109.2 | 1947 | |

* Data for Airport

### EXTREME VALUES FOR FEBRUARY

| | Low | Year | High | Year |
|---|---|---|---|---|
| Maximum Temperature | 19/13th | 1923 | 61/3rd | 1941 |
| Minimum Temperature | 8/7th | 1936 | 51/5th | 1934 |
| 24-Hr. Precipitation | | | 3.35/29th | 1916 |
| 24-Hr. Snowfall | | | 14.5/14th | 1923 |

March.

By the calendar and by the weather, March is the month of spring in Vancouver. This arrival is not marked by the spectacular changes that are expected in more continental climates, but rather by a slow acceleration of vegetative growth beginning in February and reaching a climax in April. By the month's end all the spring flowers are in full bloom while the buds of the earlier deciduous trees have broken.

Temperatures rise through the month with the average daily maximum and the average daily minimum rising about five degrees through the month. Maximum temperatures reach the sixties quite often while frost occurs infrequently. In some years, in fact, frost does not occur, though in three different years there have been sixteen days on which temperatures fell to the frost point or lower. The absolute minimum for March both at the Airport and in the City is 15°.

Precipitation continues quite heavy, with the average over five inches and the average number of days of precipitation 17. Snow falls occasionally although the average total for the month is less than one inch. Once in a while snow in March presents problems, as it did in 1951, when a total of 23.2 inches fell during eight consecutive days.

The sunshine total is well up from the total for February with the average daily sunshine for March nearly four hours.

## MARCH

### MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 39.0 | 1917 | 43.5 | 49.5 | 1941 | 41.9-45.1 |
| Mean Maximum Temp. | 45.0 | (1913<br>(1917 | 50.2 | 58.0 | 1941 | 48.3-52.1 |
| Mean Minimum Temp. | 32.0 | 1907 | 36.8 | 41.0 | (1915<br>(1940<br>(1941 | 35.3-38.3 |
| Total Precipitation | 0.89 | 1912 | 5.16 | 14.56 | 1916 | 3.41-6.59 |
| (A)* | 1.66 | 1944 | 3.60 | 6.79 | 1950 | |
| Rainfall | 0.89 | 1912 | 4.92 | 14.09 | 1916 | 3.15-6.36 |
| (A) | 1.66 | 1944 | 3.47 | 6.79 | 1950 | |
| Snowfall | 0 | Sev'l | 0.2 | 23.2 | 1951 | 0-4.3 |
| (A) | 0 | Sev'l | 1.3 | 16.2 | 1951 | |
| Precipitation Days | 7 | 1912 | 17 | 25 | 1932 | 14-20 |
| Rain Days | 7 | 1912 | 16 | 25 | 1932 | 13-19 |
| Snow Days | 0 | Sev'l | 1 | 8 | (1917<br>(1951 | 0-2 |
| Frost Days | 0 | (1915<br>(1940<br>(1941 | 7 | 16 | (1907<br>(1912<br>(1943 | 4-10 |
| Days with Fog (A) | 0 | 1945 | 3 | 13 | 1941 | |
| Hours of Sunshine | 63.0 | 1950 | 124.1 | 233.8 | 1912 | 104.0-148.3 |
| (A) | 76.2 | 1950 | 125.8 | 177.9 | 1954 | |

* Data for Airport

### EXTREME VALUES FOR MARCH

| | | | | |
|---|---|---|---|---|
| Maximum Temperature | 32/19th | 1913 | 68/30th | 1941 |
| Minimum Temperature | 15/14th | 1906 | 52/28th | 1939 |
| 24-Hr. Precipitation | | | 3.57/8th | 1916 |
| 24-Hr. Snowfall | | | 7.1/12th | 1917 |

April.

Through April the trend toward warmer weather proceeds at a rapid pace with the average daily maximum temperature rising from 53° at the beginning of the month to 61° at the end. The average daily minimum also moves upward, but at a slower rate, increasing only 4° during the month. Frost occurs on the average about twice in April, with most occurrences early in the month. However, frost has been recorded as late as April 30, this being the latest date for the last spring frost in the years examined. The average date for the last frost is the first day of April.

Precipitation continues to decrease with the average amount below four inches, falling on less than fifteen days. Of more significance is the fact that extended periods without rain may be expected in April. Of the dry periods that do occur over 20 per cent can be expected to last for five days or more. In April 1951 there were only four days with rain. While snow has been known to occur early in the month it does not remain on the ground because of the mild temperatures.

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## APRIL

### MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 45.0 | (1909 (1911 | 49.0 | 54.5 | 1934 | 47.3-50.7 |
| Mean Maximum Temp. | 52.0 | 1917 | 57.1 | 64.0 | 1934 | 55.1-59.1 |
| Mean Minimum Temp. | 35.0 | 1909 | 40.9 | 45.0 | (1934 (1940 (1941 | 39.2-42.6 |
| Total Precipitation | 0.53 | 1933 | 3.41 | 8.20 | 1917 | 2.36-4.25 |
| (A)* | 0.54 | 1956 | 2.34 | 5.00 | 1946 | |
| Rainfall | 0.53 | 1933 | 3.38 | 8.20 | 1917 | 2.34-4.21 |
| (A) | 0.54 | 1956 | 2.34 | 5.00 | 1946 | |
| Snowfall | 0 | Sev'l | 0.3 | 9.7 | 1929 | |
| (A) | 0 | Sev'l | 0 | 0.9 | 1955 | |
| Precipitation Days | 4 | 1951 | 14 | 23 | 1917 | 11-17 |
| Rain Days | 4 | 1951 | 14 | 23 | 1917 | 11-17 |
| Snow Days | | | | 3 | 1929 | |
| Frost Days | 0 | Sev'l | 2 | 10 | 1909 | 0-4 |
| Days with Fog (A) | 0 | Sev'l | 1 | 3 | (1941 (1949 | |
| Hours of Sunshine | 79.0 | 1937 | 169.2 | 290.0 | 1951 | 142.5-191.6 |
| (A) | 142.9 | 1953 | 194.6 | 294.1 | 1951 | |

* Data for Airport

### EXTREME VALUES FOR APRIL

| | | | | |
|---|---|---|---|---|
| Maximum Temperature | 40/13th | 1922 | 79/20th | 1934 |
| Minimum Temperature | 27/3rd 19th | 1936 1927 | 55/24th 26th | 1934 1934 |
| 24-Hr. Precipitation | | | 2.21/27th | 1951 |
| 24-Hr. Snowfall | | | 5.5/8th | 1929 |

May.

With the average temperature up to 55° and the average maximum over 63°, winter is forgotten as May arrives. Neither frost nor snow has ever occurred during the month, though overnight temperatures in the low thirties have been recorded. Afternoon temperatures rise into the eighties on occasion after the first week of the month, and in some years the highest temperature of the year has been recorded in May.

Precipitation continues to decrease, with the average for the month down to 2.7 inches, falling on twelve days. Following the trend set in April, the wet spells continue to become shorter while the average length of the dry spells continues to increase. Of the dry spells, 30 per cent last five days or more while only 14 per cent of the wet spells reach five days in length. Since rain can be expected to fall on about one day in three at this season of the year, there is usually enough moisture available to support the heavy growth of spring. But in some years May will be dry with only light rains at widespread intervals. In such years drought becomes a reality in May and irrigation is necessary both in city gardens and in the farming areas lying near the city.

With the arrival of the warmer weather thunderstorms become more frequent though they are usually mild. In the years 1905-55, there have been thunderstorms recorded on forty-two different days in May, an average of less than one per month.

## MAY

## MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 51.0 | 1909 | 54.8 | 58.0 | (1928<br>(1931<br>(1934<br>(1940 | 53.5-56.1 |
| Mean Maximum Temp. | 59.0 | (1908<br>(1911 | 63.4 | 68.0 | (1915<br>(1928<br>(1931<br>(1934 | 61.7-65.1 |
| Mean Minimum Temp. | 42.0 | (1909<br>(1920 | 46.0 | 49.0 | (1936<br>(1940 | 44.8-47.2 |
| Total Precipitation* | 0.31 | 1924 | 2.70 | 6.05 | 1948 | 1.74-3.56 |
| (A) | 0.33 | 1946 | 1.81 | 4.76 | 1948 | |
| Precipitation Days | 3 | (1935<br>(1946 | 12 | 22 | 1933 | 10-13 |
| Days with Fog (A) | 0 | Sev'l | 1 | 6 | 1948 | |
| Hours of Sunshine | 140.0 | 1942 | 223.4 | 313.1 | 1938 | 191.4-252.4 |
| (A) | 173.6 | 1948 | 249.2 | 322.5 | 1956 | |

* Data for Airport

## EXTREME VALUES FOR MAY

| | | | | |
|---|---|---|---|---|
| Maximum Temperature | 47/8th | 1911 | 83/14th | 1934 |
| Minimum Temperature | 33/18th | 1905 | 58/24th | 1934 |
| 24-Hr. Precipitation | | | 1.73/8th | 1911 |

June.

June weather is often disappointing in Vancouver. The average rainfall continues quite heavy, being down only one half inch from the May average. It is interesting to note that, based on fifty years of records, there is apparently a 10 per cent better chance of rain on any given day of the middle two weeks than in the first or last week of the month.

Temperatures continue upward with the average mean temperature approaching 65° by the end of the month. Maximum temperatures will occasionally reach the eighties and once in a while the nineties. More frequently though, with wet, cool weather persisting, the afternoon temperatures will fail even to reach the 60° mark.

In spite of the higher temperatures in June thunderstorm activity remains about the same as in May, with an average of one to be expected each June. The greatest number of thunderstorms recorded in any June was four in 1928.

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## JUNE

## MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 56.5 | 1906 | 59.9 | 62.5 | (1926 (1927 (1932 | 58.7-61.1 |
| Mean Maximum Temp. | 65.0 | (1910 (1917 (1939 | 69.0 | 73.0 | (1926 (1932 (1934 | 67.5-70.5 |
| Mean Minimum Temp. | 47.0 | 1906 | 50.8 | 54.0 | (1936 (1941 | 49.7-51.9 |
| Total Precipitation | 0.17 | 1922 | 2.22 | 6.14 | 1937 | 1.05-3.04 |
| (A)* | 0.18 | 1951 | 1.82 | 4.49 | 1956 | |
| Precipitation Days | 3 | (1938 (1940 (1951 | 11 | 19 | 1946 | 10-11 |
| Days with Fog (A) | 0 | Sev'l | 1 | 2 | Sev'l | |
| Hours of Sunshine | 101.6 | 1953 | 219.2 | 329.2 | 1940 | 187.9-250.7 |
| (A) | 150.1 | 1953 | 225.9 | 328.3 | 1951 | |
| Thunderstorms | | | 1 | 4 | 1928 | |
| Maximum 80° or more | | | 1 | 7 | 1932 | |

* Data for Airport

## EXTREME VALUES FOR JUNE

| | Low | Year | High | Year |
|---|---|---|---|---|
| Maximum Temperature | 51/7th | 1914 | 92/25th | 1925 |
| Minimum Temperature | 40(1st<br>(2nd<br>(3rd<br>(9th<br>(10th | 1933<br>1907<br>1918<br>1933<br>1906, 1933 | 63/25th | 1926 |
| 24-Hr. Precipitation | | | 1.98/7th | 1914 |

July.

July is usually the most pleasant month of the year in Vancouver with moderate temperatures, long periods of sunshine and only a little rain. The average temperatures vary little through the month with the highest values being reached after the middle of the month. In a typical July the mercury will climb to 80° or higher about four times though twice in the past this figure has been exceeded nine times. On the other hand, there have been many years when the temperatures have failed to reach 80 in July.

The average precipitation for the month is low, averaging only a little more than an inch. There is considerable variation, for in some years the month is rainless, while in others amounts in excess of five inches have fallen. Based on the records it would seem that in three years out of four the total rainfall for July will be less than two inches, while in one year out of four this total will amount to only one half inch or less.

The thunderstorm pattern remains similar to that of May and June with infrequent storms of a mild nature. In 1920 there were four during the month, the greatest total to date in any July.

Sunshine reaches its maximum duration during this month with the average of nine hours per day. As in the case of rainfall, the total sunshine in July can vary widely, ranging from a low of 145 hours, or an average of five hours per day in 1916, to a high of 380 hours, or an average of over 12 hours per day in 1931.

JULY

MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 60.5 | (1909<br>(1916 | 63.4 | 67.0 | (1941<br>(1942 | 62.9-64.9 |
| Mean Maximum Temp. | 68.0 | 1916 | 73.6 | 77.0 | (1906<br>(1926<br>(1931 | 72.2-75.0 |
| Mean Minimum Temp. | 52.0 | Sev'l | 53.2 | 58.0 | (1941<br>(1942 | 53.2-55.2 |
| Total Precipitation | 0.01 | 1951 | 1.37 | 5.32 | 1932 | 0.47-2.03 |
| (A)* | 0.00 | 1951 | 1.10 | 1.94 | 1948 | |
| Precipitation Days | 1 | (1922<br>(1930<br>(1951 | 7 | 17 | 1932 | 4-9 |
| Days with Fog (A) | 0 | Sev'l | 1 | 3 | 1943 | |
| Hours of Sunshine | 145.5 | 1916 | 279.2 | 381.2 | 1931 | 246.5-316.7 |
| (A) | 237.2 | 1955 | 300.7 | 377.5 | 1956 | |
| Thunderstorms | 0 | Sev'l | 1 | 4 | 1920 | 0-2 |
| Maximum 80° or more | 0 | Sev'l | 4 | 9 | (1906<br>(1911 | 2-6 |

* Data for Airport

EXTREME VALUES FOR JULY

| | Low | Year | High | Year |
|---|---|---|---|---|
| Maximum Temperature | 54/16th | 1916 | 91/12th | 1926 |
| Minimum Temperature | 43/19th<br>43/29th | 1909<br>1908 | 72/18th | 1941 |
| 24-Hr. Precipitation | | | 1.63/17th | 1916 |

August.

After the middle of August the effect of the shortening day in the northern hemisphere becomes evident in the climate of Vancouver as temperature starts a downward trend while precipitation figures begin to move upward. Otherwise, the characteristics of the weather in August are rather similar to those of the weather in July.

Considering all facets of the climatic records for Vancouver it becomes obvious that in most years the period from mid-July to mid-August has the most pleasant weather. For a summer vacation in Vancouver this is the preferred time.

## AUGUST

### MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 59.5 | (1907 (1909 | 63.2 | 66.5 | 1942 | 62.1-64.3 |
| Mean Maximum Temp. | 69.0 | Sev'l | 72.8 | 77.0 | 1930 | 71.2-74.4 |
| Mean Minimum Temp. | 50.0 | Sev'l | 53.7 | 57.0 | 1942 | 52.6-54.8 |
| Total Precipitation | 0.07 | 1930 | 1.67 | 5.86 | 1912 | 0.78-2.11 |
| (A)* | 0.11 | 1955 | 1.25 | 2.97 | 1948 | |
| Precipitation Days | 1 | 1955 | 7 | 16 | 1948 | 5-10 |
| Days with Fog (A) | 0 | 1940 | 5 | 12 | 1938 | |
| Hours of Sunshine | 130.6 | 1948 | 251.8 | 348.2 | 1917 | 224.6-297.7 |
| (A) | 153.8 | 1948 | 250.9 | 321.6 | 1955 | |
| Thunderstorms | 0 | Sev'l | 1 | 5 | 1918 | |
| Maximum 80° or more | 0 | Sev'l | 3 | 10 | (1929 (1933 | 1-5 |

* Data for Airport

### EXTREME VALUES FOR AUGUST

| | Low | Year | High | Year |
|---|---|---|---|---|
| Maximum Temperature | 56/12th 17th | 1912 1924 | 92/18th | 1908 |
| Minimum Temperature | 39/24th | 1910 | 62/Sev'l | |
| 24-Hr. Precipitation | | | 2.35/31st | 1927 |

September.

The trend toward lower temperatures which begins after the middle of August accelerates in September. The mean daily maximum temperature, in particular, demonstrates this with a decrease of eight degrees through the month. Precipitation, both in frequency of rain days and amount of fall, increases as the month proceeds, with the most marked increase normally in the last week. In general the weather in September varies considerably from year to year. There may be warm temperatures and very few days of rain or the rains may begin early and temperatures drop sharply to fall values.

With cooler and longer nights and more moisture available in the air, fog becomes more prevalent. It is not usual, however, to have either dense or prolonged fogs at this season of the year.

Frost has occurred late in September but the occurrences are infrequent and never severe. The date of the earliest killing frost in the city is September the 23rd although the lowest recorded September temperature is only 30°. Snow has not been recorded in September during the past fifty years.

## SEPTEMBER

## MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 54.0 | 1908 | 57.6 | 62.0 | 1940 | 56.4-58.8 |
| Mean Maximum Temp. | 60.0 | 1914 | 65.8 | 70.0 | (1918<br>(1940<br>(1943<br>(1944 | 64.0-67.6 |
| Mean Minimum Temp. | 46.0 | (1908<br>(1926 | 49.5 | 54.0 | 1940 | 48.4-50.6 |
| Total Precipitation | 0.30 | 1918 | 3.41 | 10.37 | 1920 | 1.76-4.54 |
| (A)* | 0.16 | 1942 | 2.06 | 4.75 | 1941 | |
| Precipitation Days | 2 | 1918 | 10 | 20 | (1931<br>(1933<br>(1941 | 7-13 |
| Days with Fog (A) | 7 | 1953 | 11 | 17 | 1944 | |
| Hours of Sunshine | 79.4 | 1914 | 179.2 | 294.9 | 1909 | 153.9-204.0 |
| (A) | 124.1 | 1954 | 190.5 | 223.2 | 1949 | |
| Thunderstorms | | | 1 | 5 | 1905 | |
| Maximum $80^{\circ}$ or more | | | 1 | 4 | 1944 | |

* Data for Airport

## EXTREME VALUES FOR SEPTEMBER

| | Low | Year | High | Year |
|---|---|---|---|---|
| Maximum Temperature | 51/27th<br>30th | 1905<br>1919 | 86/11th | 1944 |
| Minimum Temperature | 30/24th<br>25th | 1908<br>1908 | 63/2nd | 1923 |
| 24-Hr. Precipitation | | | 3.41/5th | 1906 |

October.

In October the rainy season returns to Vancouver with an average of sixteen days of rain. Along with the increase in number of days of rain the intensity or rate of fall also increases - the greatest 24-hour amount being 4.25 inches in 1909. Snow has fallen only once in October, this also in 1909, when 3.8 inches was recorded on the 28th.

Temperatures continue to drop steadily through the month with the mean daily maximum lowering to 52° and the mean daily minimum to 40 by the month's end. By the last week in October growth for the year is nearing an end and most trees are losing their leaves, though late blooming flowers continue far into November. Frosts become more common but are not severe - the lowest temperature ever recorded in the city in October being 21° on the 31st in 1935.

With the shorter days and the return of the wet weather sunshine totals drop sharply, averaging only about 110 hours per month.

Consistent with the longer and colder nights in October and the higher moisture content of the air, fog becomes a problem. If the month is rainy fog is infrequent but if clear skies prevail, fog usually forms during the night. If a situation favourable for fog continues, the fog usually becomes thicker and more persistent each night but will usually dissipate during the day.

## OCTOBER

## MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 44.5 | 1905 | 50.5 | 54.0 | (1940 (1944 | 49.0-52.0 |
| Mean Maximum Temp. | 52.0 | (1919 (1920 | 56.7 | 61.0 | 1944 | 55.1-58.3 |
| Mean Minimum Temp. | 36.0 | 1905 | 44.3 | 48.0 | 1940 | 42.7-45.9 |
| Total Precipitation | 1.76 | 1907 | 6.11 | 10.85 | 1940 | 4.59-7.51 |
| (A)* | 1.39 | 1952 | 4.58 | 8.10 | 1956 | |
| Rainfall | 1.76 | 1907 | 6.09 | 10.85 | 1940 | 4.59-7.51 |
| (A) | 1.39 | 1952 | 4.58 | 8.10 | 1956 | |
| Snowfall | | | | 3.8 | 1919 | |
| Precipitation Days | 8 | 1952 | 16 | 23 | 1920 | 14-18 |
| Snow Days | | | | 1 | 1919 | |
| Frost Days | 0 | Sev'l | 1 | 12 | 1905 | |
| Days with Fog (A) | 4 | 1947 | 13 | 24 | (1944 (1952 | |
| Hours of Sunshine | 55.0 | 1950 | 109.5 | 153.1 | 1952 | 96.7-123.8 |
| (A) | 65.0 | 1950 | 112.8 | 158.3 | 1952 | |
| Thunderstorms | | | | 2 | 1933 | |

*Data for Airport

## EXTREME VALUES FOR OCTOBER

| | Low | Year | High | Year |
|---|---|---|---|---|
| Maximum Temperature | 35/5th 17th | 1930 1930 | 77/9th | 1934 |
| Minimum Temperature | 21/31st | 1935 | 60/19th | 1940 |
| 24-Hr. Precipitation | | | 3.13/17th | 1940 |
| 24-Hr. Snowfall | | | 3.8/28th | 1919 |

November.

November is neither the wettest nor the coldest month in Vancouver but it can be classed as a typical winter month. It rains heavily and often, so that the average precipitation for the city amounts to nearly eight inches and falls on about twenty days of the month. Snow falls occasionally and is usually wet. The average snow total for the month amounts to less than two inches, although in 1911 a total of 27 inches was recorded.

As the days continue to shorten temperatures drop with the average daily maximum down to 45 by the end of the month. The mean daily minimum also continues to drop with the 5th of November being the average date of the first fall frost. It is unusual to have extremely low temperatures in November but a record for the city of 10 degrees was registered on November 11, 1911, while at the airport a figure of 10° was set in 1955, when an early week-long cold spell caused widespread frost damage to the area.

Sunshine totals continue sharply downward, partly because of the shorter day, and partly because of the more persistent cloud cover. The average for the city of only 51 hours for the month is less than half of the October average, while in the best year on record the total sunshine barely exceeded 100 hours.

Fog is even more of a problem this month forming frequently and becoming denser and more persistent once it has formed. It often lasts throughout the day and presents a serious handicap to regular city life. On the average the airport will have 11 days with fog each November but the variation is considerable. In 1945 there were only two days with fog but in 1943 the total amounted to 20 days.

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## NOVEMBER

### MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 39.9 | (1911<br>(1916 | 43.6 | 43.0 | 1926 | 42.1-45.1 |
| Mean Maximum Temp. | 45.0 | (1916<br>(1919 | 48.2 | 53.0 | (1939<br>(1941 | 46.7-49.7 |
| Mean Minimum Temp. | 34.0 | 1916 | 38.9 | 44.0 | (1917<br>(1939 | 37.2-40.6 |
| Total Precipitation | 1.84 | 1936 | 7.98 | 16.10 | 1954 | 5.23-10.46 |
| (A)* | 1.31 | 1952 | 5.61 | 11.10 | 1954 | |
| Rainfall | 1.84 | 1936 | 7.82 | 16.10 | 1954 | 5.23-10.17 |
| (A) | 1.31 | 1952 | 5.50 | 11.10 | 1954 | |
| Snowfall | 0 | Sev'l | 1.6 | 27.0 | 1911 | |
| (A) | 0 | Sev'l | 1.1 | 6.0 | 1955 | |
| Precipitation Days | 11 | 1952 | 20 | 27 | (1914<br>(1927<br>(1945 | 18-23 |
| Snow Days | 0 | Sev'l | 1 | 4 | (1911<br>(1945<br>(1950 | |
| Frost Days | 0 | Sev'l | 5 | 13 | 1916 | 2-7 |
| Days with Fog (A) | 2 | 1945 | 11 | 20 | 1943 | |
| Hours of Sunshine | 19.4 | 1912 | 51.4 | 96.8 | 1931 | 38.6-61.0 |
| (A) | 53.5 | 1954 | 67.0 | 84.2 | 1948 | |

* Data for Airport

### EXTREME VALUES FOR NOVEMBER

| | | | | |
|---|---|---|---|---|
| Maximum Temperature | 27/10th | 1911 | 63/5th | 1941 |
| Minimum Temperature | 10/11th | 1911 | 56/4th | 1908 |
| 24-Hr. Precipitation | | | 4.25/27th | 1909 |
| 24-Hr. Snowfall | | | 15.0/8th | 1911 |

December.

In December the wet season reaches its peak with an average rainfall of nine inches. Few of the days of this month pass without some form of precipitation. Between 20 and 25 days with precipitation must be expected each December while three times in the past rain has fallen on a total of 28 out of the possible 31 days.

Snow also falls more frequently as the depth of winter nears, but the average for the month is still rather low. Possibly the main characteristic of the snowfall in this month, as in other months, is its variability. Many Decembers will pass with no snow at all - others will have considerable, as in 1927 when 27.1 inches were recorded. An average fall of five inches can be expected, while in three years out of four the total will be less than 11 inches. Only in two years in ten can Christmas be expected to be white.

The temperature trend is downward with the average daily maximum close to 41° and the average daily minimum close to the freezing point as the year ends. As in November, extremely low temperatures occur infrequently but minima below 10 have been recorded. In both the city and at the airport the extreme low for December is the same, 8° above zero, registered in the city on the 17th, 1924 and at the airport on the 31st, 1951. Maximum temperatures ranging about the monthly mean of 43° degrees have a considerable variation - the lowest ever recorded being 23°, registered on three occasions, and the highest 60°.

Sunshine for the month is very low, averaging less than 40 hours, while in December 1907 a total of only 11 hours was recorded during the whole month. Even in the sunniest Decembers the total sunshine barely runs to 25 per cent of the possible for the time of year.

Fog statistics for this month are very similar to those for November but the fogs are usually denser, dirtier and more persistent than those occurring in earlier months. On occasion a swirling, smoke-filled fog virtually paralyzes transportation facilities.

## DECEMBER

## MONTHLY AVERAGES FOR VANCOUVER CITY AND AIRPORT

| | Low | Year | Average | High | Year | Limits of 50% Range |
|---|---|---|---|---|---|---|
| Mean Temperature | 33.0 | 1927 | 39.0 | 46.0 | 1939 | 37.0-41.0 |
| Mean Maximum Temp. | 37.0 | (1909<br>(1916 | 43.0 | 51.0 | 1939 | 41.0-45.0 |
| Mean Minimum Temp. | 29.0 | 1927 | 34.9 | 41.0 | (1925<br>(1939 | 32.9-36.9 |
| Total Precipitation | 2.84 | 1914 | 8.87 | 15.88 | 1923 | 7.11-10.67 |
| (A)* | 2.44 | 1944 | 6.42 | 9.00 | 1947 | |
| Rainfall | 2.79 | 1914 | 8.36 | 15.23 | 1923 | 6.64-10.43 |
| (A) | 2.44 | 1944 | 6.05 | 8.95 | 1947 | |
| Snowfall | 0 | Sev'l | 5.2 | 27.1 | 1927 | 0-10.9 |
| (A) | 0 | (1940<br>(1941<br>(1943 | 3.7 | 17.4 | 1951 | |
| Precipitation Days | 13 | 1914 | 22 | 28 | (1920<br>(1931<br>(1933 | 20-24 |
| Rain Days | 11 | 1914 | 21 | 28 | 1920 | 18-24 |
| Snow Days | 0 | Sev'l | 3 | 9 | (1948<br>(1949<br>(1951 | 1-5 |
| Frost Days | 1 | 1920 | 9 | 19 | (1909<br>(1927 | 6-12 |
| Days with Fog (A) | 6 | (1939<br>(1954 | 11 | 24 | 1943 | |
| Hours of Sunshine | 10.7 | 1925 | 36.9 | 73.5 | 1919 | 24.2-46.5 |
| (A) | 31.7 | 1947 | 42.9 | 63.0 | 1955 | |

* Data for Airport

## EXTREME VALUES FOR DECEMBER

| | Low | Year | High | Year |
|---|---|---|---|---|
| Maximum Temperature | 12th<br>23/16th<br>31st | 1922<br>1924<br>1927 | 60/3rd | 1940 |
| Minimum Temperature | 8/17th | 1924 | 52/31st | 1917 |
| 24-Hour Precipitation | | | 3.52/15th | 1923 |
| 24-Hr. Snowfall | | | 10.3/26th | 1937 |

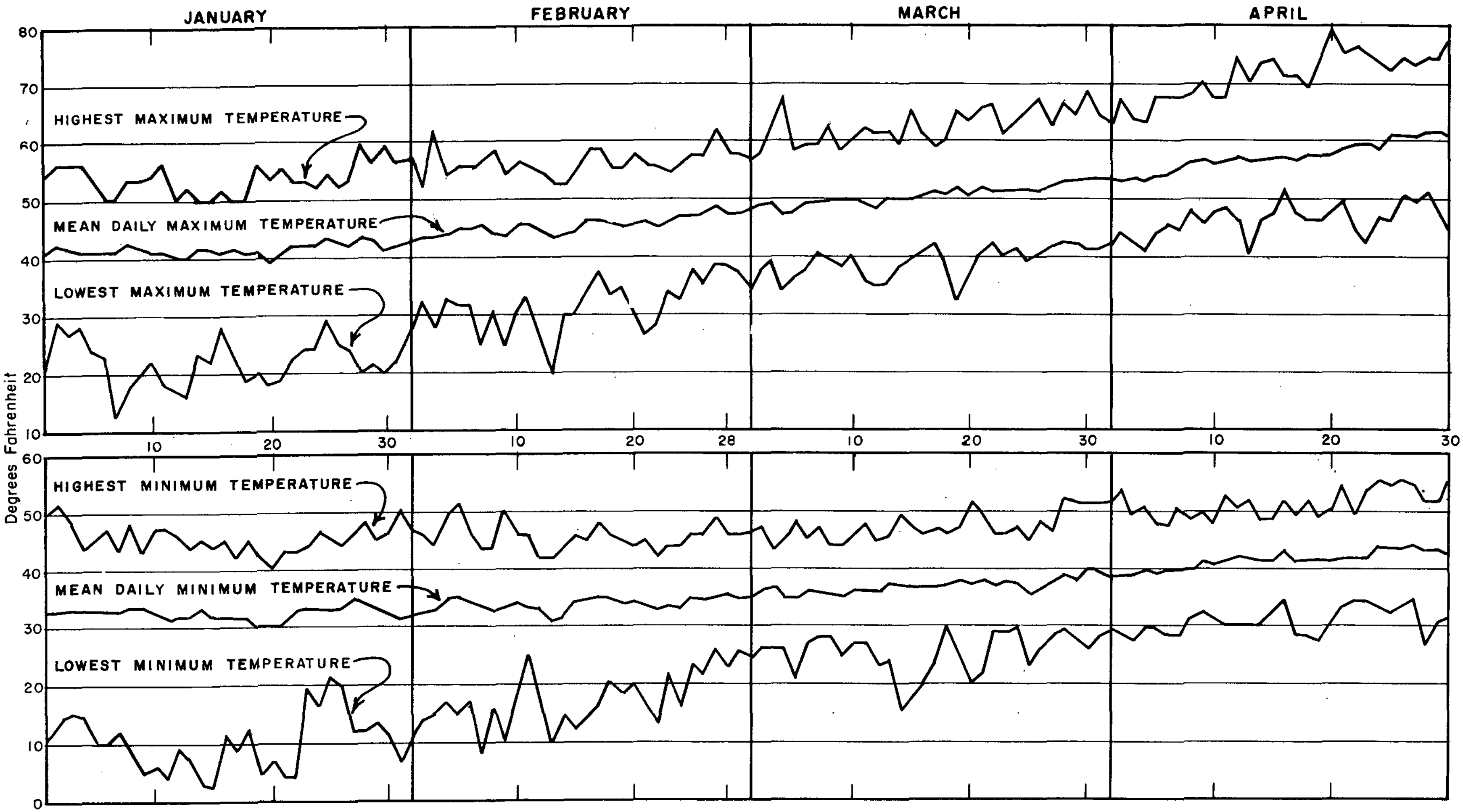


Figure 2 VANCOUVER CITY (1906-1944)

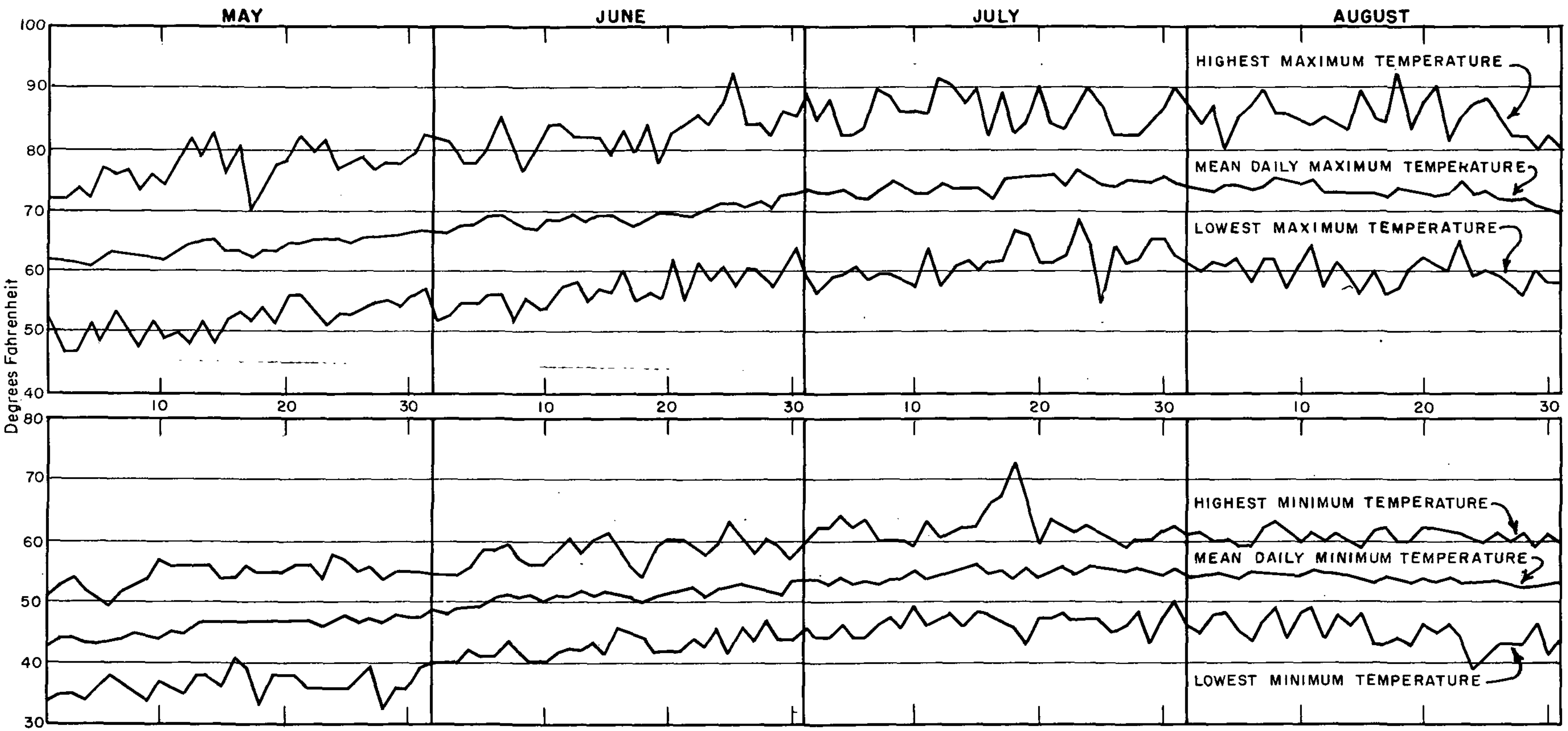


Figure 3 VANCOUVER CITY (1906-1944)



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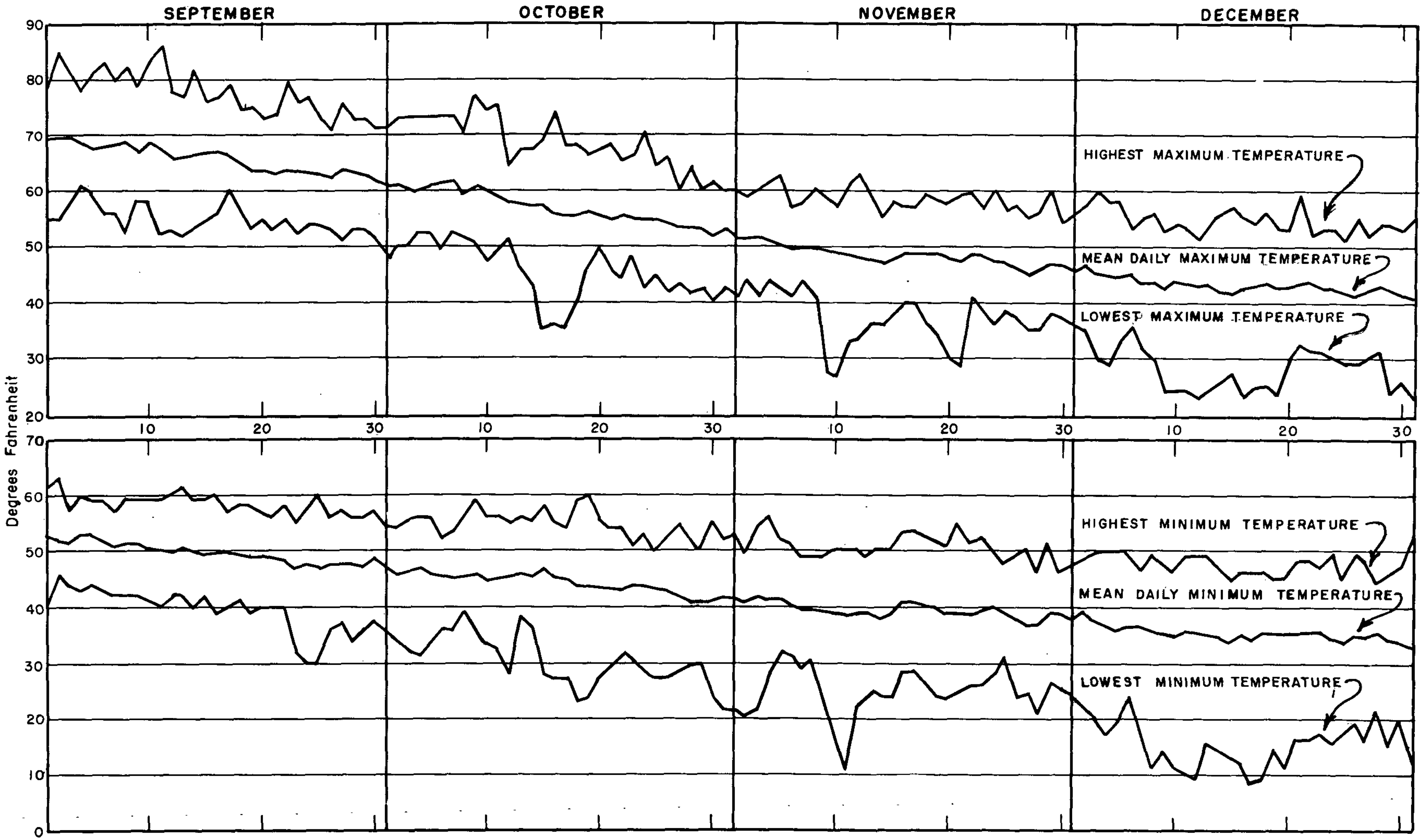


Figure 4 VANCOUVER CITY (1906-1944)

## PRECIPITATION

The occurrence of precipitation in Greater Vancouver shows two well defined forms of variation - one due to topographical effects and the other due to seasonal changes.

In the next few paragraphs the precipitation patterns through the different months will be examined. In order to avoid confusion it must be pointed out that a day with precipitation as used in this paper can mean that either rain, or snow, or both have fallen in measurable quantity. Similarly a dry day means that measureable precipitation has not fallen. Following from this a wet period is defined as a series of successive days with precipitation while a dry period is a succession of dry days.

To illustrate the distribution of annual precipitation in Greater Vancouver, Fig. 5 has been prepared. This map shows the lines of equal annual precipitation based on the records of rainfall stations that exist or have existed throughout the city. It shows that the annual precipitation varies from about 40 inches per year near the mouth of the Fraser River to over 100 inches on the North Shore. Of particular note is that the increase as the mountains are approached from the south is not steady, but becomes more rapid after Burrard Inlet is reached. Also, it should be noticed that, while precipitation amounts throughout the city are fairly uniform considering distances from the mountains, there is, in general, a marked variation on the North Shore. It appears that those stations which lie in the valleys and draws leading back into the mountains from the south and southwest will have greater amounts of rain and snow each year than those stations which are exposed at elevations along the more open mountainside.

In addition to this variation in amount of rainfall throughout the city, there is also a difference in the total number of days with precipitation each year. Between the airport on Sea Island and downtown Vancouver this difference amounts to twenty days.

Again there is usually a marked difference in the rate of fall of rain as the mountains are approached. It is this increased rate of fall rather than the greater number of days of precipitation that accounts for the heavier annual precipitation near the mountains. The greater rate of fall is particularly noticeable during periods of heavy rain. As an example, during a two-day period of heavy rain in November 1955, a total of 3.60 inches of rain was measured at the airport while one station on the North Shore recorded 7.49 inches. In Table 13 the rate of fall of rain for various time intervals is summarized for the different months. This abstract is based on the records from an automatic rain gauge which was in operation in the city from January 1914 to April 1945. The figures can be considered as valid for those areas of the city near the southern shores of Burrard Inlet but are considered to be too low for areas north of the Inlet, and too high for southern sections of the city near the Fraser River.

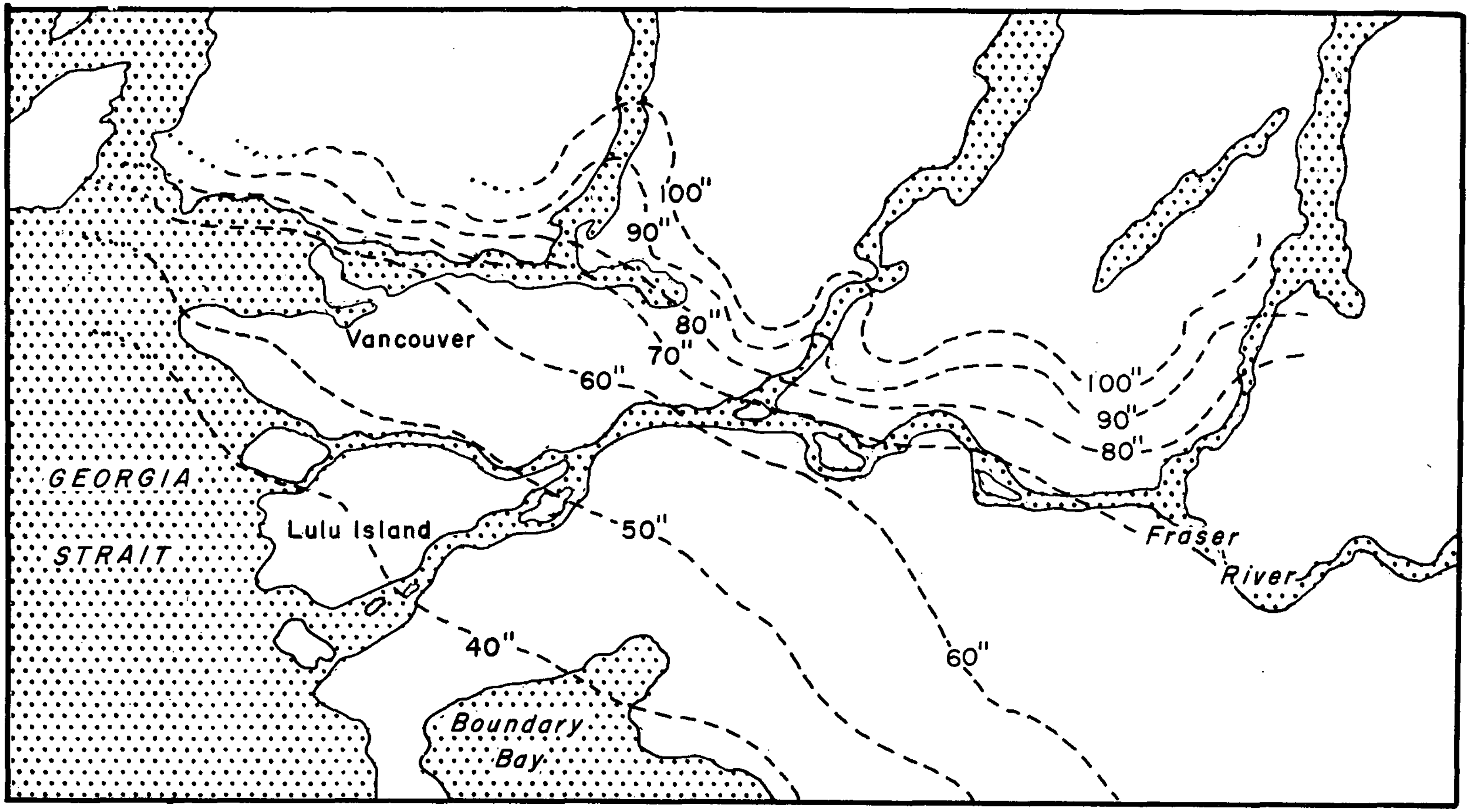


FIGURE 5 - LINES OF EQUAL PRECIPITATION

Note: Precipitation in the mountains north of Burrard Inlet and the Fraser River varies greatly with geographical location. For this reason, positioning of the lines of annual precipitation in the mountain areas must be considered as being approximate only.

The seasonal variation of precipitation in Vancouver is also remarkable. Normally the summers are dry with only a few days of rain. The winters are the exact opposite with many days of rain in each month. As a means of showing this variation through the year Fig. 6 has been prepared. Data for the graph were obtained by tabulating the occurrences of precipitation for each day of the fifty-year period for which observations are available in downtown Vancouver. This gave the total number of times that precipitation had fallen on each and every day of the year during the period. Using these data, averages for each day were computed by taking the figures for a week, centred over the day, totalling and dividing by 7. This method tends to smooth out fluctuations due to chance. Assuming that what has happened in the past fifty years may be used as some measure of what will happen in the future, this graph will then give the chance that rain will fall on any particular day. For example, we can see that in December, on any day we can expect it to rain in seven years out of 10, or, in other words, for the day there is a 70 per cent chance that it will rain. This chance of rain on any day decreases fairly steadily once January is reached with the low point being in mid-summer. The most favoured time for dry days in Vancouver is during late July and early August when there are less than two chances in 10 that it will rain on any particular day. In fact, it was found that for July 21st there has been rain on only four occasions in 50 years.

Table 13. PRECIPITATION MEASUREMENTS (IN INCHES) SHOWING GREATEST RAINFALL FOR FOLLOWING PERIODS:

| | MINUTES | | | | | HOURS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 10 | 15 | 20 | 30 | 1 | 2 | 6 | 12 | 24 |
| Jan. | 0.05 | 0.10 | 0.14 | 0.18 | 0.21 | 0.37 | 0.58 | 1.35 | 2.11 | 3.12 |
| Feb. | 0.04 | 0.07 | 0.09 | 0.11 | 0.16 | 0.30 | 0.53 | 1.42 | 2.48 | 3.38 |
| Mar. | 0.08 | 0.11 | 0.13 | 0.15 | 0.20 | 0.37 | 0.75 | 1.48 | 2.60 | 4.07 |
| Apr. | 0.12 | 0.16 | 0.19 | 0.24 | 0.27 | 0.31 | 0.51 | 0.79 | 1.20 | 1.33 |
| May | 0.15 | 0.26 | 0.29 | 0.30 | 0.35 | 0.52 | 0.82 | 1.11 | 1.28 | 1.58 |
| June | 0.16 | 0.24 | 0.30 | 0.35 | 0.36 | 0.51 | 0.59 | 1.25 | 1.91 | 2.07 |
| July | 0.19 | 0.29 | 0.32 | 0.32 | 0.44 | 0.50 | 0.63 | 1.09 | 1.59 | 1.85 |
| Aug. | 0.18 | 0.24 | 0.28 | 0.30 | 0.33 | 0.56 | 0.90 | 1.61 | 1.97 | 2.08 |
| Sep. | 0.13 | 0.18 | 0.22 | 0.25 | 0.38 | 0.53 | 0.97 | 2.08 | 2.59 | 2.74 |
| Oct. | 0.10 | 0.20 | 0.30 | 0.34 | 0.38 | 0.65 | 0.68 | 1.27 | 2.30 | 3.25 |
| Nov. | 0.09 | 0.15 | 0.20 | 0.25 | 0.29 | 0.43 | 0.69 | 1.30 | 2.23 | 3.64 |
| Dec. | 0.07 | 0.11 | 0.13 | 0.15 | 0.20 | 0.37 | 0.62 | 1.55 | 2.69 | 4.23 |

The probability of rain on any particular day in Vancouver has been further explored in a somewhat different direction. The results are outlined in Table 14. Here is shown for the different months the probability that any day will be dry if the preceding day was either dry or wet. In winter, for example, the chances are about even that the following day will be dry, but in mid-summer the probability rose to 80 per cent or more. After a wet day in winter the chances are about 1 in 4 that the next will be dry but in summer the chances are about even that a wet day will be followed by a dry day.

Table 14. PROBABILITY OF A DRY DAY IN PER CENT

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Following a Dry Day | 51 | 57 | 57 | 61 | 72 | 74 | 80 | 83 | 77 | 59 | 46 | 50 |
| Following a Wet Day | 28 | 27 | 24 | 33 | 39 | 38 | 50 | 44 | 40 | 28 | 23 | 22 |

Considering the normal occurrence of precipitation in Vancouver it is to be expected that there would be fairly long wet and dry periods at the different seasons of the year. Table 15, showing the average length of wet and dry periods, bears this out. The wet spells, on the average, vary in length from 5.6 days in December to two days in July, while the average length of dry spells vary from a maximum of 7.3 days in July to a minimum of two days in November.

Table 15. AVERAGE LENGTH OF WET AND DRY PERIODS (IN DAYS)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dry Spells Average length | 2.4 | 2.9 | 2.7 | 3.2 | 4.2 | 4.5 | 7.3 | 6.5 | 4.6 | 2.9 | 2.1 | 2.2 |
| Wet Spells Average length | 4.2 | 3.8 | 3.4 | 2.6 | 2.5 | 2.4 | 2.0 | 2.2 | 2.6 | 3.6 | 4.6 | 5.6 |

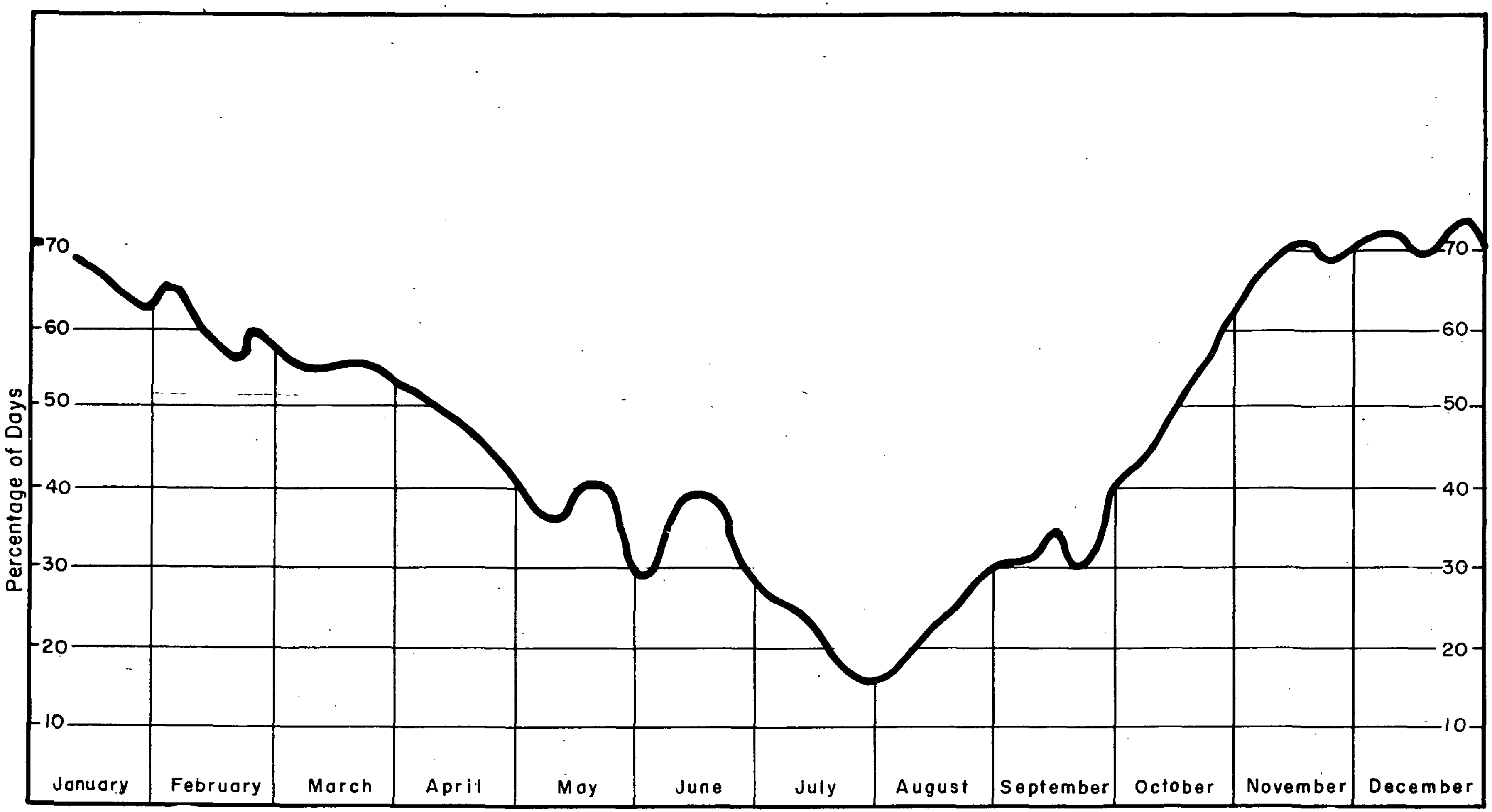


FIGURE 6 - PERCENTAGE OF DAYS WITH MEASURABLE PRECIPITATION - VANCOUVER CITY (1906-1955)
(7-day running mean)



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Table 16.

PERCENTAGE OF ALL DRY PERIODS WHICH ARE OF GIVEN LENGTHS

| Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 50 | 42 | 42 | 39 | 28 | 25 | 20 | 17 | 23 | 40 | 54 | 50 |
| 2 | 20 | 22 | 20 | 20 | 21 | 14 | 16 | 17 | 19 | 22 | 21 | 25 |
| 3 | 12 | 13 | 12 | 13 | 11 | 15 | 8 | 11 | 14 | 14 | 10 | 11 |
| 4 | 7 | 4 | 7 | 8 | 10 | 14 | 5 | 5 | 10 | 6 | 6 | 6 |
| 5-6 | 7 | 7 | 10 | 8 | 10 | 12 | 12 | 13 | 12 | 8 | 7 | 5 |
| 7-9 | 3 | 7 | 6 | 8 | 9 | 10 | 16 | 14 | 8 | 6 | 2 | 1 |
| 10 or over | 1 | 5 | 3 | 4 | 11 | 10 | 23 | 23 | 14 | 4 | * | 2 |

PERCENTAGE OF ALL WET PERIODS WHICH ARE OF GIVEN LENGTHS

| Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 28 | 30 | 23 | 34 | 39 | 38 | 50 | 43 | 40 | 29 | 23 | 22 |
| 2 | 15 | 21 | 29 | 24 | 25 | 28 | 26 | 26 | 27 | 25 | 20 | 14 |
| 3 | 15 | 13 | 15 | 20 | 15 | 12 | 14 | 16 | 12 | 11 | 14 | 8 |
| 4 | 8 | 9 | 7 | 10 | 7 | 10 | 5 | 7 | 8 | 12 | 6 | 10 |
| 5-6 | 12 | 14 | 13 | 8 | 10 | 11 | 4 | 6 | 7 | 9 | 11 | 14 |
| 7-9 | 10 | 7 | 9 | 3 | 3 | 1 | 1 | 2 | 3 | 7 | 14 | 16 |
| 10 or over | 12 | 6 | 4 | 1 | 1 | * | Nil | Nil | 3 | 7 | 12 | 16 |

* Less than 0.5 per cent

Table 16 gives a more realistic picture of the actual length of the different wet and dry periods in Vancouver. Here the periods beginning in the different months have been classified by percentages according to their length. It shows that in general summer dry spells are longer than winter wet spells and also that even in winter there can be periods of considerable length without rain.

To complete the discussion of wet and dry periods, Table 17 gives the longest period of each which has been recorded in Vancouver in each month during the past fifty years. It should be noted here that the different periods were assigned to the months in which they began, and, in some cases, the greatest number of days in the periods actually were recorded in the following month. This is particularly true of the transitional months of spring and fall where the chance of rain is decreasing or increasing quite rapidly with the passage of time.

Table 17. LONGEST WET AND DRY SPELLS ON RECORD

| Month | Wet Spells | Year | Length | Dry Spells | Year | Length |
|---|---|---|---|---|---|---|
| Jan. | Jan 6-Feb 3 | 1953 | 29 | Jan 6-Jan 27 | 1930 | 22 |
| Feb. | Feb 3-Feb 25 | 1950 | 23 | Feb 22-Mar 11 | 1943 | 18 |
| Mar. | Mar 21-Apr 8 | 1932 | 19 | Mar 30-Apr 17 | 1951 | 19 |
| Apr. | Apr 17-Apr 28 | 1916 | 12 | Apr 29-May 24 | 1946 | 26 |
| May | May 1-May 13 | 1911 | 13 | May 18-Jun 7<br>May 6-May 26 | 1935)<br>1928) | 21 |
| June | Jun 13-Jun 23 | 1937 | 11 | Jun 7-Jul 8 | 1940 | 32 |
| July | Jul 10-Jul 17 | 1932 | 8 | Jul 13-Aug 21 | 1936 | 40 |
| Aug. | Aug 27-Sep 3 | 1912 | 8 | Aug 3-Sep 15 | 1930 | 34 |
| Sep. | Sep 8-Sep 19 | 1941 | 12 | Sep 8-Sep 28 | 1912 | 21 |
| Oct. | Oct 23-Nov 18 | 1945 | 27 | Oct 4-Oct 17 | 1907 | 14 |
| Nov. | Nov 13-Dec 4<br>Nov 6-Nov 27<br>Nov 21-Dec 12 | 1920)<br>1937)<br>1946) | 22 | Nov 17-Nov 29 | 1952 | 13 |
| Dec. | Dec 18-Jan 18 | 1922-23 | 32 | Dec 25-Jan 6 | 1941-42 | 13 |

## WIND

Due to the rather frequent change in location of the observing station and to the difficulty in obtaining a well exposed location for the wind instruments, the downtown summaries of wind reports are not generally representative of the city area.

Much better and more consistent observations began with the establishment of the airport station. Since 1936 a regular wind observing program has been in effect. Hence in the twenty years, 1936 to 1955, a fairly complete supply of information has been gathered. For this reason the following tables are summarized from the airport records and used to represent, as well as possible, the wind field over the whole city area. One must remember that caution should be used in applying the information to other locations throughout the city since large variations may occur in short distances in a city with the topography of Vancouver.

Table 18 gives the percentage frequency of winds month by month according to direction. Calm winds are added at the bottom and a percentage for the year is given in the right hand column. A glance at the table shows preponderance of winds from the east. This is true not only for the year as a whole but for every month of the year. Noticeable too is the fact that southeast, west and northwest winds rank next in order. Another interesting fact is that the large number of east and southeast winds during the winter months gradually falls off as the summer approaches, while the west and southwest winds increase from winter to summer. This is accounted for by the fact that in dull cloudy weather the wind is almost invariably from the east and southeast while in clear weather during daylight hours a sea breeze blows from the neighbouring Strait of Georgia eastward over the airport and into the Fraser Valley region. Calm winds occur rather infrequently throughout the whole year.

Table 18. PERCENTAGE FREQUENCY OF WIND AT VANCOUVER AIRPORT

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 4 | 3 | 3 | 3 |
| Northeast | 9 | 8 | 7 | 6 | 5 | 5 | 4 | 4 | 6 | 7 | 10 | 9 | 7 |
| East | 47 | 40 | 32 | 27 | 24 | 25 | 27 | 29 | 28 | 35 | 41 | 44 | 33 |
| Southeast | 17 | 15 | 16 | 17 | 18 | 21 | 24 | 23 | 16 | 15 | 16 | 17 | 18 |
| South | 6 | 6 | 7 | 8 | 6 | 8 | 7 | 5 | 4 | 4 | 6 | 6 | 6 |
| Southwest | 4 | 5 | 7 | 10 | 9 | 8 | 9 | 6 | 5 | 5 | 4 | 4 | 6 |
| West | 5 | 9 | 12 | 13 | 17 | 16 | 14 | 13 | 16 | 11 | 8 | 7 | 12 |
| Northwest | 7 | 12 | 15 | 15 | 18 | 14 | 12 | 16 | 20 | 17 | 10 | 8 | 14 |
| Calm | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 1 |

Table 19. AVERAGE WIND SPEED AT VANCOUVER AIRPORT IN MILES PER HOUR (BY DIRECTION)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North | 3.7 | 4.0 | 4.3 | 4.1 | 3.5 | 3.5 | 3.5 | 3.5 | 3.4 | 3.4 | 3.3 | 3.4 | 3.6 |
| Northeast | 6.9 | 6.7 | 6.8 | 6.3 | 5.9 | 5.7 | 5.7 | 4.9 | 4.8 | 5.6 | 6.6 | 6.9 | 6.1 |
| East | 7.9 | 8.2 | 8.0 | 7.5 | 7.0 | 6.9 | 6.6 | 6.7 | 6.4 | 7.2 | 7.8 | 8.0 | 7.4 |
| Southeast | 8.3 | 8.6 | 9.2 | 8.9 | 8.2 | 8.1 | 7.7 | 7.6 | 7.4 | 8.5 | 9.6 | 10.3 | 8.5 |
| South | 10.6 | 10.4 | 10.1 | 9.7 | 7.8 | 7.3 | 6.7 | 6.6 | 6.6 | 9.5 | 11.0 | 11.0 | 8.9 |
| Southwest | 9.0 | 8.6 | 9.6 | 9.2 | 7.8 | 7.0 | 6.5 | 6.0 | 6.3 | 7.3 | 8.5 | 9.8 | 8.0 |
| West | 9.9 | 9.5 | 11.4 | 10.0 | 9.7 | 9.2 | 8.3 | 8.0 | 8.5 | 8.4 | 9.2 | 10.0 | 9.3 |
| Northwest | 11.0 | 10.1 | 11.8 | 11.3 | 11.8 | 11.9 | 11.5 | 11.2 | 10.5 | 9.8 | 8.7 | 9.7 | 10.8 |
| Average | 8.4 | 8.3 | 8.9 | 8.4 | 7.7 | 7.4 | 7.1 | 6.8 | 6.7 | 6.5 | 8.1 | 8.6 | |

Table 19 gives the average wind speed month by month according to the principle directions. Here it may be seen that winds from the northwest are stronger than those from any other direction. Also wind speeds do not vary greatly from month to month on the average although they are slightly stronger during the month of March and reach a low point in October.

The previous two tables give the percentage frequency of winds and the average wind speed by directions but give no information concerning strong winds. Table 20 gives a summary of the average and maximum number of occurrences of strong winds together with the peak velocities attained month by month. It should be noted that these occurrences do not refer to a peak gust of wind but only to average conditions over a period of an hour.

The first three columns give in order the average number of days during the month on which wind speeds greater than 18 miles per hour, 25 miles per hour, and 31 miles per hour may be expected. Immediately below each number is given the maximum number of times that strength of wind has occurred. Thus, it can be seen that strong winds occur with greater frequency during the winter and spring months than during the summer.

The last three columns give maximum wind values for the period of one hour, 10 minutes, and finally the peak gust. The direction is given first, followed by the speed in miles per hour. Beneath is given the date of the month and the year on which that peak velocity occurred. In a few cases the same peak was attained twice and so two dates have been entered. Once again the fact is apparent that strongest winds occur during the winter months. Another point of interest is that in most cases the strong wind is from the west or northwest quadrant. The strongest gust so far recorded at the Vancouver Airport occurred on January 30, 1947 when the wind hit 72 miles per hour from the northwest.

Table 20. AVERAGE AND EXTREME NUMBER OF DAYS WITH STRONG WINDS AT VANCOUVER AIRPORT

| | | Number of Days with Wind for One Hour Greater than: | | | Maximum Recorded Wind for Period of: | | |
|---|---|---|---|---|---|---|---|
| | | 18 MPH | 25 MPH | 31 MPH | 1 Hour | 10 Min. | Gust |
| Jan | Av | 8 | 3 | 1 | NW 57 | NW 63 | NW 72 |
| | Max | 14 | 6 | 5 | 30/1947 | 30/1947 | 30/1947 |
| Feb | Av | 8 | 2 | 0 | NW 45 | W 53 | W 63 |
| | Max | 13 | 6 | 2 | 18/1948 | 18/1948 | 18/1948 |
| Mar | Av | 9 | 2 | 1 | W 44 | WNW 60 | NW 71 |
| | Max | 19 | 10 | 4 | 31/1945<br>NW 44<br>15/1951 | 31/1945 | 31/1945 |
| Apr | Av | 8 | 2 | 0 | NW 34 | SSE 50 | SSE 58 |
| | Max | 15 | 5 | 2 | 30/1944<br>6,19/1952 | 23/1943 | 23/1943 |
| May | Av | 6 | 2 | 0 | W 42 | W 45 | WNW 56 |
| | Max | 10 | 9 | 2 | 17/1938 | 17/1938 | 7/1955 |
| Jun | Av | 6 | 1 | 0 | NW 36 | NW 45 | NW 50 |
| | Max | 10 | 5 | 2 | 29/1948<br>15/1951 | 15/1951 | 15/1951 |
| Jul | Av | 5 | 1 | 0 | W 32 | NW 39 | NW 46 |
| | Max | 18 | 3 | 1 | 2/1945 | 21/1946 | 21/1946 |
| Aug | Av | 4 | 1 | 0 | W 29 | NW 35 | NW 40 |
| | Max | 9 | 3 | 0 | 19/1955 | 18/1945<br>WNW 35<br>19/1955 | 18/1945<br>WNW 40<br>19/1955 |
| Sep | Av | 5 | 2 | 0 | NW 35 | W 44 | SE 54 |
| | Max | 9 | 5 | 2 | 18/1945 | 17/1945 | 15/1949 |
| Oct | Av | 7 | 2 | 0 | NW 40 | NW 45 | WNW 60 |
| | Max | 13 | 4 | 2 | 23/1939<br>25/1946 | 25/1946 | 13/1947 |
| Nov | Av | 8 | 3 | 1 | W 48 | WNW 53 | WNW 71 |
| | Max | 17 | 7 | 3 | 10/1955 | 10/1955 | 10/1955 |
| Dec | Av | 9 | 4 | 1 | NW 38 | S 50 | NW 60 |
| | Max | 15 | 8 | 4 | 8/1938 | 22/1940 | 2/1938<br>SSW 60<br>5/1953 |

## THE HEATING SEASON

The amount of heat required to provide reasonable comfort throughout the year depends on a number of weather factors among which may be listed temperature, humidity, and wind strength. However, in investigating these factors, engineers have found that temperature alone will give a reasonable estimate of heat requirements. The measure used is called "degree-days" which are defined as the number of degrees that the mean temperature for the day is below 65 degrees. Hence, for example, a mean daily temperature of 50 degrees would be equivalent to 15 degree-days. For days when the mean temperature remains above 65$^{\circ}$ it is assumed that no heat is required. A running total of degree-days is kept during the month and this total will give an indication of the percentage of the season's heat used through the period of tabulation.

The prepared table (Table 21) gives the degree-day data for Vancouver city. The table is arranged to conform to the normal heating season - that is, it begins with September and carries through the winter months and on through the following summer. In general practice the heating season is considered as lasting from the 1st of September until the end of May but, as the table shows, heating is occasionally required in the June-August period. For this reason day-degree data have been included in the table for all months of the year.

The table begins with the average monthly total of degree-days followed by the per cent of the season's total for each month. In the next two columns are cumulative totals of degree-days and percentages from the beginning of September up to and including the given month. The last four columns give the highest and lowest values on record and hence some idea of the possible variation from the average for any given month.

It can be seen at a glance that January and February are the two greatest heating months. It can be seen, too, that September, on the average, requires only one per cent more heat than June, while July and August may be considered as non-heating months. Another point of interest of the table is that, on the average, about 50 per cent of the heating season in Vancouver is over by January 20, and 90 per cent by the end of April.

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Table 21. MONTHLY SUMMARY OF DEGREE-DAYS BELOW 65°F.

| Month | Deg.-Days for Month | Per Cent of Total | Cumulative Total to Month's End | Per Cent of Season's Total | Extremes of Record | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Highest | Date | Lowest | Date |
| Sep. | 219 | 4 | 219 | 4 | 324 | 1908 | 102 | 1940 |
| Oct. | 447 | 8 | 666 | 12 | 639 | 1905 | 329 | 1940 |
| Nov. | 643 | 12 | 1309 | 24 | 762 | 1916 | 486 | 1939 |
| Dec. | 805 | 15 | 2114 | 39 | 992 | 1927 | 589 | 1939 |
| Jan. | 871 | 16 | 2985 | 55 | 1203 | 1916 | 676 | 1931 |
| Feb. | 723 | 13 | 3708 | 68 | 980 | 1936 | 582 | (1926 (1941 |
| Mar. | 668 | 12 | 4376 | 80 | 806 | 1917 | 484 | 1941 |
| Apr. | 480 | 9 | 4856 | 89 | 600 | (1909 (1911 | 306 | 1934 |
| May | 317 | 6 | 5173 | 95 | 422 | (1908 (1909 (1920 | 217 | 1928 |
| Jun. | 154 | 3 | 5327 | 98 | 258 | 1906 | 69 | 1926 |
| Jul. | 40 | 1 | 5367 | 99 | 140 | 1909 | 0 | Sev'l |
| Aug. | 57 | 1 | 5424 | 100 | 267 | 1909 | 0 | Sev'l |
| Season | 5424 | | 5424 | | 6401 | 1908-09 | 4268 | 1939-40 |

## STORMS

Storms of a violent nature are uncommon in Vancouver. Very warm, humid air which originates in the Tropics never reaches to the latitude of Vancouver along the west coast of North America. As a result, although thunderstorms can occur at any time of the year, hurricanes, tornadoes, and the like are unknown.

Winds associated with mid-latitude disturbances moving off the Pacific Ocean during the fall, winter and spring can be troublesome, but compared to the damage that can be caused by a hurricane, for example, the effects of these storms are minor.

Prolonged periods of heavy rain in the winter season have been the main cause of damage due to weather in Vancouver. These rains occur infrequently, sometimes preceded by a fall of heavy wet snow, and are marked by two, occasionally three, and in the extreme by four or five days of heavy rain. The classic example of a storm of this nature occurred in January 1935. The precipitation figures for the city during this storm are as follows:

| | | |
|---|---|---|
| January 20 | 17.5 | inches of Snow |
| 21 | 3.73 | inches of Rain |
| 22 | 2.86 | " " " |
| 23 | 2.36 | " " " |
| 24 | 1.57 | " " " |

This storm completely isolated the city from the interior of the province, caused extensive structural damage due to the tremendous loads of saturated snow that accumulated, and caused widespread flooding. While this is an extreme case, similar periods of heavy rain have caused serious floods in recent times.

## HEAT AND HUMIDITY

Hot, oppressive weather is not a problem in Vancouver. Although temperatures will rise occasionally into the 80's, and very infrequently into the 90's, the moisture content of the air is never such as to cause extreme discomfort. Also those periods of warm weather that do develop are normally of short duration, seldom lasting more than a day or two before an influx of cooler air from the ocean drops the temperature to more normal values.

## DROUGHT

The rain in the Vancouver area falls mostly during the late fall, winter and early spring. For the remainder of the year the city and surrounding area suffer from drought. If the spring rains continue into the summer, as they do in some years, drought will not be serious or may not develop at all. But normally it is necessary to irrigate in city gardens and in the farming areas of the Fraser Delta if crops are to be grown successfully. In winter, drought is very uncommon, though not unknown. A prolonged flow of dry cold air off the continent will prevent precipitation on the coast, with the result that utility companies dependent for water in storage areas in the coastal mountains may be handicapped.

## FROST

Frost, like other climatic elements, varies considerably throughout Greater Vancouver. Figures available for the downtown area will, on the average, apply to most of the city, but sections that are farther from the modifying effect of the ocean will likely have frost a little more frequently and have a shorter frost-free period than indicated by those figures.

Information for Vancouver city, abstracted from Climatic Summaries, Volume III - Frost Data, published by the Meteorological Service of Canada is as follows:

| | | |
|---|---|---|
| Frost-free Periods: | Average Length | 218 days |
| | Longest | 269 " |
| | Shortest | 152 " |
| Last (Spring) Frost: | Average Date | Apr 1 |
| | Earliest | Feb 19 |
| | Latest | Apr 30 |
| First (Fall) Frost: | Average Date | Nov 5 |
| | Earliest | Sep 23 |
| | Latest | Dec 5 |

## SUPPLEMENTARY INFORMATION

Meteorological data for Vancouver are regularly published in a number of publications of the Meteorological Branch. These include:

(a) Monthly and Annual Meteorological Summaries for Vancouver.
(b) Monthly Weather Map for Canada.
(c) Monthly Record of Meteorological Observations in Canada.
(d) General Summary of Hourly Weather Observations in Canada - Part I, (contains data with particular reference to aviation).
(e) The Climate of British Columbia - (issued annually by the British Columbia Department of Agriculture in collaboration with the Meteorological Branch, Department of Transport, Canada).

General climatic data for representative stations in Canada, including Vancouver, are contained in the following publications:

(a) Climatic Summaries for Selected Meteorological Stations in Canada, Vol. I - Temperature, Precipitation and Sunshine.
(b) Climatic Summaries for Selected Meteorological Stations in Canada, Vol. II - Wind and Humidity.
(c) Climatic Summaries for Selected Meteorological Stations in Canada, Vol. III - Frost.
(d) The Climate of British Columbia and the Yukon Territory by W. G. Kendrew and D. Kerr.
(e) The Climatological Atlas of Canada by M. K. Thomas.

APPROVED,

Andrew Thomson,
Director.

Attachs.
CCB:eo