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# ANNUAL AND SEASONAL TEMPERATURE AND PRECIPITATION TRENDS IN BRITISH COLUMBIA SINCE 1890

BY

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# ANNUAL AND SEASONAL TEMPERATURE AND PRECIPITATION TRENDS IN BRITISH COLUMBIA SINCE 1890.

by J. M. Powell

## 1. INTRODUCTION

This paper discusses the annual and seasonal trends and fluctuations of temperature and precipitation for a number of stations and regions in British Columbia. It is part of a larger project to investigate the relationship between climate and population trends of the bark beetle, Dendroctonus ponderosae Hopkins.

Studies of world climate have indicated that from the late nineteenth century to 1940 there was a rise of about 1°F in annual world temperature (Lysgaard, 1949; Willett, 1950; Shapley, 1953; Lamb and Johnson, 1959, 1961; Callendar, 1961). Changes of Canadian climate have been investigated mostly in terms of temperature (Thomson, 1935; Hare, 1951; Thomas, 1953, 1955, 1957; Currie, 1954; Longley, 1954a,b,c; Crowe, 1958; Edmond and Anderson, 1960; Carder, 1962). Longley (1954a) reported a trend of rising temperatures for Canada as a whole until about 1946, after which the western part of the country experienced a cooling trend. Crowe (1958) noted a 1 to 2°F temperature rise for coastal British Columbia in the first half of the century, with a decreasing or levelling-off trend since 1940. Most of the temperature

rise occurred during the winter.

There appears to be no evidence of a world-wide change in precipitation north of 40° latitude (Kraus, 1960). Investigations of precipitation in Canada appear to have been purely regional (Currie, 1954; Kendall and Thomas, 1956; Thomas, 1957; Crowe, 1960; Carder, 1962). Crowe (1960) reported that the annual precipitation for coastal British Columbia had increased since the middle 1940's, although the summer precipitation on the south coast was lower in the second quarter of the century than in the first quarter.

## 2. METHODS

The chief physiographic features of British Columbia have a general northwest-southeast trend, approximately at right angles to the prevailing warm, moisture laden westerly winds. The resulting distinct climatic regions form the basis for a discussion of variations in climate within the Province. The following regions are recognized (Fig. 1):

| Coast area | Interior area |
|---|---|
| I. Outer Coast | V. Southwest Interior |
| II. Northern Inner Coast | VI. Southeast Wet Interior |
| III. Southern Inner Coast | VII. Southeast Dry Interior |
| IV. Southwest Coast | VIII. Central Interior |
| | IX. Northern Interior |
| | X. Northeast Interior |

These regions closely approximate those proposed by Chapman (1952), Chapman and Turner (1956), and Kerr (1952) and those used by G.P. Thomas (1958), and the nomenclature is similar to that of Chapman and Turner (1956). Deviating from the above proposals the Inner Coast and Cascade-Coast Mountain Regions were combined and redivided into the Northern Inner Coast and Southern Inner Coast Regions, as long-recording stations are lacking in the Cascade-Coast Mountain Region. The Southeast Interior Region was subdivided into the Southeast Wet Interior and Southeast Dry Interior, corresponding roughly to the Shuswap-Kootenay Lakes area and the Rocky Mountain Trench. The Northern and Northeast Interior Regions had few stations with extensive records—thus no regional values are given, but graphs of the individual stations are included in the figures.

Mean monthly and annual temperature for 84 stations, and monthly and annual precipitation for 107 stations were extracted from the "Monthly Record" (Canada Department of Transport, Meteorological Branch), and from "Climate of British Columbia" (British Columbia, Department of Agriculture). All stations considered are listed in the Appendix. On the basis of their long records and representativeness 43 stations for temperature and 44 stations for precipitation were selected for the study (Fig. 1). Whenever possible stations lacking homogeneity and continuity were not selected to reduce climatic differences resulting from artificial modifications of the local environment or changes in the locations of recording instruments (Mitchell, 1953). The known major location changes are listed in the Appendix. Lack of homogeneity

and continuity of individual stations became less significant when their records were combined with those of other stations in the region. Minor gaps in the records of some stations were adjusted by entering a mean value so that the existing ten or eleven months of data could be used.

Winter was defined as December to February, spring as March to May, summer as June to August and autumn as September to November. Five-year running means were calculated for annual and seasonal temperature and precipitation from 1890 to 1960, and these were plotted on the mid-point of the period. Thirty-year averages, calculated at pentad intervals, were used to give an estimate of annual and seasonal temperature and precipitation changes. Fluctuations were thus smoothed and trends became more obvious. Where there were one or two years' data missing, averages for shorter periods than 30-yrs were established. Cumulative regional changes of temperature and precipitation were obtained by calculating, at pentad intervals, the amount of change of the 30-yr averages from the 1901-30 period at each station within a region. A comparison was made of temperature and precipitation changes between regions, and between the coast and interior. Average values of change for the coast, interior, and for the Province (south of 56° lat. N) were obtained by giving equal weight to the appropriate values for each region.

## 3. TEMPERATURE

### 3.1. Annual Temperatures

The cumulative change in 30-yr averages of annual temperatures from 1901 to 1960 for each region is given in Table I. All regions indicated a positive change throughout the period but many have decreased since 1921-1950. The greatest change occurred in the Outer Coast and Southeast Wet Interior Regions. The increase for the coast and for the interior was similar throughout the period.

The 30-yr averages of annual temperatures for the 43 stations indicate the individual station trends (Fig. 2). Thirty-five of these stations experienced an upward trend, ranging from 0.2°F at Kamloops to a 2.1°F increase at Clayoquot. The maximum 30-yr average occurred in 1916-45, 1921-50 or 1931-60. The remaining eight stations recorded a downward trend, with a maximum of 1°F occurring at Alberni.

The short-term fluctuations of annual temperatures at the 43 stations are illustrated by 5-yr running means (Fig. 2). Most stations had an upward trend which began within the 1910-1918 period and continued until 1940-42. A rapid decrease followed from the early 1940's to 1950, continuing at some stations until 1955. The increase in the 1950's was pronounced at all stations except those in the Outer Coast and Southeast Interior Regions. Secondary maxima were recorded at most stations around 1925-27, and at some stations in the Central Interior and Northern Inner Coast Regions these maxima were higher than those of the early 1940's. Stations in the Southwest Interior

and Southeast Dry Interior recorded a secondary maximum in 1933. The periods of minima were quite variable from one station to another with no obvious regional patterns. Most station minima were recorded around 1908-11, 1918-20, 1950 or 1955.

### 3.2 Winter Temperatures

Cumulative regional changes in the 30-yr averages of winter temperatures at pentad intervals are given in Table II. All regions except the Southern Inner Coast and Southwest Coast increased 1°F or more, the Southeast Wet Interior had the greatest increase (1.8°F). The increase for the interior was almost twice that of the coast, and the average increase for the Province was 1°F.

Thirty-year averages of winter temperatures rose considerably at all southern interior stations (Fig. 3). In the Central Interior there was more variation, with a rise until 1926-55 at most stations. There was no obvious trend at most coast stations, but at Victoria and Agassiz there was a fairly steady rise and at Alberni, Nanaimo and Steveston there was a downward trend throughout the period.

The fluctuations of the 5-yr running means of winter temperatures were similar for the 43 selected stations although the magnitude varied (Fig. 3). Higher winter temperatures were experienced around 1900 and in the early 1940's, with secondary maxima in most areas in 1925, 1933 and 1953. Generally the coldest winters were around 1909-11, 1918 and 1950, with secondary minima at some stations around 1921, 1931 and 1935. The range of fluctuations between years was greater in the interior, where stations lack the maritime influence and are more

frequently affected by invasions of cold polar air.

### 3.3. Spring Temperatures

Cumulative regional changes in the 30-yr averages of spring temperatures at pentad intervals are given in Table III. Increases were less marked than for the winter season; only in the Southeast Wet Interior was there an increase of more than 1°F. The increase for the coast and interior was the same. The maximum of the 30-yr averages occurred in 1921-50 for all regions except the Outer Coast where an increase continued throughout the period.

There were no general trends in 30-yr averages of spring temperatures (Fig. 4). Stations in the Southwest Coast experienced a rise until 1921-50 followed by a slight downward trend. In other coast regions there was much variation; e.g. in the Outer Coast, Quatsino and Clayoquot experienced upward trends to 1931-60, but Masset experienced a downward trend until 1911-40 and an upward trend only during the last two pentad intervals. Of the interior stations only five had a fairly constant rise during the 1901-60 period, although the temperature increase at these stations levelled off during the last decade.

The 5-yr running means of spring temperatures (Fig. 4) fluctuated considerably although much smaller than those experienced in winter. At most stations the maximum occurred around 1940, with a secondary maximum between the years 1925 to 1928. There was a general downward trend from 1940 until 1953, after which there have been marked increases at all stations except Clayoquot. At many stations

the minimum of 1953 was similar to that experienced in the cool springs of 1918-21. Temperatures from long recording stations indicated that springs around 1900 were equally cool.

### 3.4 Summer Temperatures

Cumulative regional changes in the 30-yr averages of summer temperatures are given in Table IV. Increases were most marked in the Outer Coast and Southeast Interior. A slight decrease occurred after 1921-50 in the Southern Inner Coast and Southwest Interior. A decrease in 1926-55 was common to all regions except the Outer Coast. Maximum 30-yr averages occurred in 1921-50 in all regions except the Outer Coast. Increases were only slightly higher for the interior than for the coast.

Station 30-yr averages varied considerably (Fig. 5). Most coast stations decreased during the last two pentad intervals, but a few, such as those in the Outer Coast increased. Some stations in the Northern and Southern Inner Coast had downward trends. The greatest increase in summer temperatures on the coast occurred at Clayoquot (1.4°F) and Steveston (1.5°F). Of the Southwest Interior stations, Kelowna increased 1.3°F, but several decreased. The trends also varied between stations in the Southeast Interior. Downward trends generally occurred in the Central Interior, except at Fort St. James which recorded the largest summer increase of any station (2.2°F).

Five-year running means (Fig. 5) generally increased from 1900 to 1940 at most stations, then decreased to 1955 followed by an increase. At a few stations, the increase from 1900 was continued until

1945 or 1950. Most coast and Central Interior stations recorded a maximum around 1925 and only a secondary maximum in 1940. Some stations recorded a minimum around 1901, and many stations recorded a minimum around 1910. Between 1918-20 and 1930-35 further cool summers occurred at most coast and several interior stations. The magnitude of fluctuations of summer temperatures between years was generally smaller than those occurring in winter and spring.

### 3.5 Autumn Temperatures

Cumulative regional changes in the 30-yr averages of autumn temperatures are given in Table V. The greatest increase occurred in the Outer Coast (1.6°F) and Southeast Interior (1.0°F). Only in these regions was the increase continuous. There was a decrease of 0.3°F in the Central Interior Region. The Southwest and Central Interior Regions recorded maximum 30-yr averages in 1916-45 but the maxima occurred during different periods in the coast regions. The increase for the coast was almost twice that of the interior, the autumn increase being the largest of the seasonal increases on the coast.

Thirty-year averages of autumn temperatures (Fig. 6) increased at most coast stations. At some stations the trend has levelled off or shown a slight decrease since 1926-55. The greatest increase (2.2°F) on the coast occurred at Clayoquot and Agassiz, and temperatures at most stations in the Outer Coast and Southwest Coast increased more than 1°F. Some southern interior stations had similar increases. A downward trend occurred at Big Creek and Grand Forks in the Southwest Interior and at all stations in the Central Interior

except Fort St. James.

The maximum of 5-yr running means of autumn temperatures was around 1940, with secondary maxima in some regions in the 1900's and early 1950's (Fig. 6). Many coast and interior stations had minima around 1911-13, and 1957, and most stations in the southern interior also had minima in 1929. Some stations in the Central Interior and Atlin in the Northern Interior recorded a minimum in 1920.

## 4. PRECIPITATION

### 4.1 Annual Precipitation

Only the Outer Coast region had a decrease of annual precipitation for the period 1901-30 to 1931-60 (Table VI). The greatest increase (6.59 in.) occurred in the Northern Inner Coast Region. The greatest increase in the interior occurred in the Central Interior, the only region to experience a continuous increase. The maximum annual precipitation for all regions, except the Outer Coast, occurred in 1931-60. The average increase for the coast was slightly higher than for the interior.

The 30-yr averages at pentad intervals for the 44 selected stations are illustrated in Fig. 7. On the coast many stations had a decrease until 1916-45 and then an increase. Several interior stations recorded continuous increases but others recorded increases only after the 1911-40 or 1916-45 periods.

There were no synchronized patterns of change in 5-yr running means of annual precipitation for the Province, but some regional patterns existed (Fig. 7). Precipitation was generally high on the coast around 1900 and even higher at several stations in the early 1930's and early 1950's. At many stations in the southern coast regions minimal precipitation occurred around 1926-28, and several stations also had low amounts in the early 1940's. Other stations had minima around 1910, 1920 or 1950. In the southern interior maxima precipitation years were recorded in the late 1940's, and in the Central and Northeast Interior Regions in the years 1955-58. Most stations in the southern interior had minima in 1927-34. In the Central Interior low precipitation years occurred around 1900, 1914-16, and 1929-30.

## 4.2 Winter Precipitation

The cumulative regional changes in 30-yr averages of winter precipitation at pentad intervals are given in Table VII. All regions, except the Outer Coast, had increases, the largest of which occurred in the Northern Inner Coast. The Central Interior was the only region in which the increase was continuous. All regions except the Outer Coast and Northern Inner Coast recorded their maximum during 1931-60. The average increase for the coast was higher than for the interior.

The 30-yr averages for most coast stations increased, but few were continuous (Fig. 8). All interior stations, except Kamloops, had increases in winter precipitation, although some were small.

The 5-yr running means varied considerably (Fig. 8). Most coast stations had maxima around 1925, in the early 1930's or around 1952. Most southern coast stations recorded minima around 1927-30 and 1943-44. Minima at other coast stations occurred around 1909, 1915, and 1950-52. Most interior stations had a maxima around 1950-52, and secondary maxima in the mid-1920's or late 1930's. Most stations had a minima between 1928-31 and many had a secondary minimum in 1942-43.

## 4.3 Spring Precipitation

The regional cumulative change in 30-yr averages of spring precipitation at pentad intervals is given in Table VIII. There was an increase in all regions except the Outer Coast and Southeast Wet Interior. Only in three coast regions did the changes amount to more than 1 inch. The only major change in the interior occurred in the Central Interior where a continuous increase amounted to 0.6 inches. The average increase for the coast was twice that of the interior. The maximum spring precipitation for most regions occurred in 1931-60.

The trends of the 30-yr averages varied considerably between stations (Fig. 9). Most coast stations recorded an increase although only a few experienced a continuous increase. Four coast stations recorded a decrease. Most of the southern coast stations but few of the northern ones had increases during the last pentad interval. Nearly all interior stations recorded continuous increases. At most stations the maximum occurred in 1931-60.

The 5-yr running means of spring precipitation are illustrated in Fig. 9. Most coast stations recorded maxima around 1900 or

1917-18, and secondary maxima in 1940. The mid-1920's was a period of minimum precipitation at most of these stations, and many recorded secondary minima between 1954-56. Periods of high precipitation in the interior were recorded in the late 1910's and early 1940's at most stations. Low precipitation at most southern interior stations occurred around 1910, in the mid-1920's, and in the late 1930's. Periods of low precipitation in the Central Interior varied from station to station.

4.4 Summer Precipitation

The regional cumulative change in 30-yr averages of summer precipitation is given in Table IX. Only the Outer Coast and Southwest Interior recorded decreases throughout, although several regions recorded decreases for most of the periods. Their minima occurred during the 1916-45 or 1921-50 period. The Southwest Coast and Central Interior Regions recorded increases throughout the 1901-60 period. The increase for the coast was only about half that of the interior.

The trends of the station 30-yr averages were fairly uniform (Fig. 10). Most coast stations recorded decreases until 1916-45 or 1921-50, then steady increases until 1931-60. Some interior stations also recorded slight decreases until 1916-45, followed by increases. Several stations in the Central Interior had increases throughout the 1901-60 period.

The 5-yr running means are illustrated in Fig. 10. Summer precipitation fluctuated less between years than that of other seasons. Many coast stations had low precipitation around the early 1920's,

with steady increases to a maximum around 1955, followed by slight decreases. Several stations also recorded high precipitation around 1910, and in the late 1940's. Several northern coast stations experienced low precipitation around 1952-53. Most of the interior stations recorded maxima around 1955-56, and secondary maxima around 1900, early 1910's and late 1940's. Most stations had low precipitation during the 1920's. Stations in the southern interior recorded low precipitation in the 1930's. Stations in the Central Interior recorded low precipitation during the 1890's and early 1950's.

4.5 Autumn Precipitation

The regional cumulative change in 30-yr averages of autumn precipitation at pentad intervals is given in Table X. The Outer Coast and Southern Inner Coast recorded decreases. The greatest change (more than 2 in.) occurred in the Outer Coast and Northern Inner Coast. The largest cumulative decreases occurred for most regions in 1916-45; since then all regions experienced increases. All regions except the Outer Coast and Southern Inner Coast recorded maxima in 1931-60. The coast had a small average decrease, and the interior a small increase.

A general decrease occurred in 30-yr averages for most coast and interior stations until 1916-45, followed by an increase to 1931-60 (Fig. 11). A few scattered stations had consistent increases, and at some stations in the Southwest Interior, precipitation averages remained unchanged.

Five-year running means for many coast stations decreased until the 1920's and then increased until 1960 (Fig. 11). Station maxima were recorded during the 1900's, around 1920, in 1933-34, around

1950 and in 1955-57. The minima for the coast were in 1917, in the 1920's, around 1945 and in 1950. In the interior the most consistent pattern of change was a decrease from about 1947 to 1954, followed by an increase. Several stations recorded maxima around 1920 and during the 1930's. Low precipitation occurred at most stations in the early 1950's, and at several stations around 1900, 1916, 1923 and 1930.

## 5. DISCUSSION

The annual temperature trend, as determined in the present study, agreed in general with the trend found by Longley (1954a), except for the first two decades of the century. Longley's graphs for British Columbia, masked some regional variations as he used only five coast and four interior stations. These included Alberni and Barkerville which were found in the present study to have a reverse trend from most other stations. Longley's study indicated a decreasing trend from the mid-1940's to 1952, but since his study there has been a general temperature increase at most stations. The temperature increase which began between 1910 and 1920 was still continuing in 1960 at some stations in the Outer Coast, Northern Inner Coast, and southern interior, although the increase has generally levelled off. Crowe (1958), concluded from a study of six coast stations, that there had been a 1° to 2°F rise in mean annual temperature from 1901 to 1950 but that the increasing trend may have begun to level off or to have ended. In the present study the mean annual temperature rise of 30-yr averages from

1901 to 1960 was generally less than 1°F for the Province, and the warming trend was continuing only in the Outer Coast, and southern interior. Crowe (1958) also concluded that mean winter temperatures at Agassiz rose twice as much as mean summer temperatures with spring and autumn values intermediate, although all the values of his Table III do not seem to support this. In the present study, Agassiz was included in the Southern Inner Coast Region where autumn temperatures increased about twice as much as winter and spring temperatures; a small decrease was recorded in summer temperatures. This was true of the coast generally except that summer temperatures increased slightly. The greatest seasonal increase for the Province occurred in winter and was least in summer, supporting the view that world-wide seasonal changes have been greatest in the winter (Willett, 1950). Doubts have been expressed that the warming trend of the northern hemisphere has continued in the past two decades. Callendar (1961) reported a downward temperature trend for the sub-arctic zone in the 1950's, but little indication of this decrease in temperate latitudes. The present study indicates that the rising trend of annual temperatures in British Columbia has levelled off since 1921-50. Seasonally, the rising trend of winter temperatures continued to 1931-60, spring and summer temperatures decreased after 1921-50, and autumn temperatures were unchanged from 1916-45 to 1931-60.

Crowe (1960) made a study of annual precipitation fluctuations for five coast stations, including Agassiz, and of seasonal trends for the latter. He concluded that there had been no significant changes in

the total annual precipitation during the first half of the century. The present study indicates an average increase of more than 2 in. for the Province between 1901-30 and 1931-60, with the majority of this increase occurring in the last pentad interval, a period not covered by Crowe. Similarly the present study supports the findings of Crowe concerning summer precipitation but differs for other seasons. Two further studies of precipitation support the results of the present study. Wallis (1961) listed the five years of lowest and highest precipitation at 27 stations in the Fraser River basin for the period 1921 to 1959. Years of low precipitation occurred most frequently in the period 1926 to 1930 and high precipitation in 1933, 1948 and 1954. In a study of drought periods between 1921 and 1960 in British Columbia (Powell, unpublished data), the most widespread drought years occurred in 1925, 1930, 1938, 1942 and 1952. Other years with important drought periods in the south of the Province occurred in 1922, 1924, 1928, 1929, 1944 and 1951.

Kerr (1950) and Longley (1952) have discussed the variability of precipitation in British Columbia, therefore no separate analysis of this feature of precipitation was made for the present study. Longley indicated that variability, when expressed as the coefficient of variation, tends to be greater where the precipitation is least, though the relationship is not close. Both Kerr and Longley found that annual precipitation at most stations varied around 20 per cent, but seasonal variation was often more than 60 per cent.

Evidence from other sources supported the temperature and precipitation trends noted here. Schulman's (1946/7) dendrochronological studies at six locations in interior British Columbia, showed a correlation between amounts of precipitation for October to May and tree-ring growth. Slow tree growth generally coincided with low precipitation and increased growth with high precipitation.

Raudsepp (1956) and Collier (1958) discussed annual and seasonal runoff characteristics of the Columbia and Kootenay Rivers at a number of points in southern British Columbia. They indicated a decade of low stream flow between 1935 and 1945, and periods of high stream flow between 1915-24, 1932-34 and 1946-55. The high flow periods were associated with weather conditions which resulted in a rapid snow melt following a cool spring. From the present study, cool springs in the southeast interior were recorded in each of the high flow periods, but the springs of 1932-34 and 1946-55 were generally followed by cool summers. The runoff minimum around 1940 coincided with warmer springs and summers, and with a period of low winter precipitation.

Studies of twelve Rocky Mountain glaciers (Field, 1949; Field and Heuser, 1954; Heuser, 1956) indicated a marked ice recession between 1910 and 1950. Collier (1958) gave data showing glacial recession from 1945 to 1956 for glaciers in the Rocky Mountain and Selkirk Ranges. Bray and Struik (1963) reported a marked increase in rate of recession of the Yoho Glacier after 1921, with the greatest recession occurring between 1951 and 1960. A study of the Commander Glacier in the Purcell Range indicated a period of marked recession from 1915 to 1947, then a

period of little change from 1948 to 1954, followed by a period of advance (West, 1955; West and Maki, 1961). They also reported that some of the glaciers in the Selkirk Range showed signs of incipient advance. Golden and Revelstoke, two of the closest stations to the Commander Glacier, recorded downward trends of annual temperatures after the mid-1940's, and this along with an increase in winter precipitation may help to account for the recent advance of this glacier and the thickening of nearby glaciers. It is also quite possible that this glacier is more sensitive than some other glaciers to short-term climatic variations, as it has only a small accumulation field, unlike the larger glaciers in the Rocky Mountains. In coastal British Columbia, Munday (1936), Taylor (1938) and Mathews (1951) found glaciers had receded fairly steadily for an estimated one hundred years or more. The general ice recession in all these areas agrees with the general rising trend of annual temperatures until 1940 or later. In the areas where these glaciers are situated the summer temperatures at nearby stations increased by 0.9 to 1.2°F, and this caused higher rates of ablation.

Brink (1959) found that most trees invading the subalpine heath of Garibaldi Park between 5,000 and 6,300 feet were established between 1920 and 1940, with very few established during the 1950's. He attributed this to recent climatic shifts, affecting the amount and duration of snow cover. The present study indicates that marked increases in spring temperatures took place between 1930 and 1940 in this area, and that winter precipitation increased from a minimum in

the early 1940's. This supports the view that in the 1930's at least, the lower winter precipitation and higher spring temperatures would give a longer snow-free period which would aid the establishment of subalpine tree species near their altitudinal limit for growth.

The question arises, whether there has been a close relationship between changes in temperature and precipitation. The changes in 30-yr averages of temperature (Tables I-V) and precipitation (Tables VI-X) were compared. When there was a decrease in annual temperature there was always an increase in annual precipitation, but when increases in annual temperature occurred only on about a third of the occasions was there a decrease of annual precipitation. Seasonally when there was a decrease of temperature there was usually an increase of precipitation for all seasons except winter. When there was an increase of spring, summer or autumn temperatures there was an equal chance that precipitation would increase, but when winter temperatures increased there was a 70 per cent chance that precipitation would increase. The 5-yr running means indicated a tendency for warm and dry, or cool and wet periods to occur together, but there was considerable overlap, showing that the relationship was not close.

## 6. SUMMARY

All available records of 107 weather stations in British Columbia were examined for 5-yr fluctuations and 30-yr trends of annual and seasonal temperature and precipitation. Forty-four stations

were selected for homogeneity, length of record, and for their representativeness of the four coast and six interior climatic regions used in the study. Graphs of the data for selected stations and tables of averages for regions and the Province (south of 56°N lat.) are given.

There was an increase in 30-yr averages of annual temperatures for the Province of 0.7°F between 1901-30 and 1931-60, with little difference between the coast and interior. The 5-yr running means increased from the turn of the century until 1940 at most stations, decreasing until 1950, followed by an increase until 1960.

The greatest seasonal temperature increases, between 1901-30 and 1931-60, occurred in winter. The average for the Province was 1.0°F with the increase for the interior being about twice that of the coast. The coast and the interior had the same increase (0.7°F) in spring. The smallest seasonal increase occurred in summer with little difference between the coast (0.4°F) and interior (0.5°F). The autumn increase for the coast (0.9°F) was almost twice that of the interior (0.5°F). The rising trend of 30-yr averages of winter temperatures continued to 1931-60, spring and summer temperatures decreased after 1921-50, and autumn temperatures were unchanged from 1916-45 to 1931-60.

There was an annual precipitation increase of 2.31 in. in the 30-yr averages for the Province, with a slightly higher increase for the coast. Periods of maximum precipitation for the coast were around 1900, 1930 and 1952, and for the interior in the 1930's and around 1948-50. Minima for the coast were around 1928 and 1943, and for the interior around 1900 and between 1926 and 1930.

The greatest seasonal precipitation increase occurred in winter, with an average for the Province of 1.45 in. The increase was greater for the coast than for the interior. The spring increase for the coast (0.56 in.) was twice that of the interior (0.24 in.). The increase in summer was 0.32 in. for the Province, with a greater increase for the interior. The smallest seasonal increase occurred in autumn (0.13 in.); precipitation in the interior increased by 0.30 in. and decreased by 0.04 in. on the coast. Thirty-year averages of winter precipitation generally increased to 1931-60. Spring precipitation decreased in the 1906-35 and 1921-50 periods, and summer and autumn precipitation decreased until 1916-45.

Five-year running means indicated a tendency for warm and dry periods, or cool and wet periods to occur together. Some evidence from dendrochronology, river runoff rates, glacial activity, and changes in floral distribution associated with climatic change is discussed.

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Table I. Cumulative regional changes in 30-yr averages of annual temperatures (°F), calculated at pentad intervals with 1901-30 as base.

| Regions | 1906 -1935 | 1911 -1940 | 1916 -1945 | 1921 -1950 | 1926 -1955 | 1931 -1960 |
|---|---|---|---|---|---|---|
| Coast | | | | | | |
| Outer | 0.2 | 0.3 | 0.6 | 0.8 | 1.0 | 1.1 |
| Northern inner | 0.2 | 0.4 | 0.7 | 0.8 | 0.7 | 0.7 |
| Southern inner | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 |
| Southwest | 0.2 | 0.5 | 0.7 | 0.7 | 0.6 | 0.6 |
| Average | 0.2 | 0.4 | 0.6 | 0.6 | 0.6 | 0.6 |
| Interior | | | | | | |
| Southwest | 0.1 | 0.3 | 0.6 | 0.6 | 0.4 | 0.4 |
| Southeast Wet | 0.3 | 0.5 | 0.9 | 1.1 | 1.1 | 1.2 |
| Southeast Dry | 0.0 | 0.4 | 0.6 | 0.8 | 0.8 | 0.9 |
| Central | -0.1 | 0.2 | 0.4 | 0.4 | 0.3 | 0.2 |
| Average | 0.1 | 0.4 | 0.6 | 0.7 | 0.7 | 0.7 |
| Province Average | 0.1 | 0.4 | 0.6 | 0.7 | 0.6 | 0.7 |

Table II. Cumulative regional changes in 30-yr averages of winter temperatures (°F), calculated at pentad intervals with 1901-30 as base.

| Regions | 1906 -1935 | 1911 -1940 | 1916 -1945 | 1921 -1950 | 1926 -1955 | 1931 -1960 |
|---|---|---|---|---|---|---|
| Coast | | | | | | |
| Outer | -0.1 | 0.2 | 0.6 | 0.5 | 0.8 | 1.1 |
| Northern inner | 0.3 | 0.9 | 1.2 | 1.2 | 1.4 | 1.0 |
| Southern inner | 0.1 | 0.2 | 0.4 | 0.3 | 0.3 | 0.4 |
| Southwest | 0.1 | 0.3 | 0.5 | 0.3 | 0.3 | 0.3 |
| Average | 0.1 | 0.4 | 0.7 | 0.6 | 0.7 | 0.7 |
| Interior | | | | | | |
| Southwest | 0.1 | 0.4 | 0.9 | 0.9 | 1.1 | 1.3 |
| Southeast Wet | 0.4 | 0.5 | 0.9 | 1.1 | 1.5 | 1.8 |
| Southeast Dry | -0.2 | 0.0 | 0.2 | 0.3 | 0.9 | 1.0 |
| Central | 0.0 | 0.0 | 0.7 | 0.9 | 1.2 | 1.2 |
| Average | 0.1 | 0.2 | 0.7 | 0.8 | 1.2 | 1.3 |
| Province Average | 0.1 | 0.3 | 0.7 | 0.7 | 0.9 | 1.0 |

Table III. Cumulative regional changes in 30-yr averages of spring temperatures (°F), calculated at pentad intervals with 1901-30 as base.

| Regions | 1906 -1935 | 1911 -1940 | 1916 -1945 | 1921 -1950 | 1926 -1955 | 1931 -1960 |
|---|---|---|---|---|---|---|
| Coast | | | | | | |
| Outer | 0.2 | 0.3 | 0.4 | 0.6 | 0.8 | 0.9 |
| Northern inner | -0.2 | 0.2 | 0.3 | 0.7 | 0.4 | 0.5 |
| Southern inner | 0.3 | 0.3 | 0.2 | 0.7 | 0.4 | 0.4 |
| Southwest | 0.3 | 0.6 | 0.8 | 1.0 | 0.8 | 0.8 |
| Average | 0.2 | 0.4 | 0.4 | 0.8 | 0.6 | 0.7 |
| Interior | | | | | | |
| Southwest | 0.2 | 0.3 | 0.4 | 0.7 | 0.4 | 0.4 |
| Southeast Wet | 0.4 | 0.7 | 0.9 | 1.4 | 1.1 | 1.2 |
| Southeast Dry | -0.1 | 0.4 | 0.4 | 0.9 | 0.6 | 0.7 |
| Central | 0.1 | 0.4 | 0.4 | 0.8 | 0.4 | 0.3 |
| Average | 0.2 | 0.5 | 0.5 | 1.0 | 0.6 | 0.7 |
| Province Average | 0.2 | 0.4 | 0.5 | 0.9 | 0.6 | 0.7 |

Table IV. Cumulative regional changes in 30-yr averages of summer temperatures (F°), calculated at pentad intervals with 1901-30 as base.

| Regions | 1906 -1935 | 1911 -1940 | 1916 -1945 | 1921 -1950 | 1926 -1955 | 1931 -1960 |
|---|---|---|---|---|---|---|
| Coast | | | | | | |
| Outer | 0.0 | 0.0 | 0.2 | 0.5 | 0.7 | 0.8 |
| Northern inner | 0.0 | 0.2 | 0.2 | 0.4 | 0.3 | 0.3 |
| Southern inner | 0.1 | 0.2 | 0.2 | 0.2 | 0.0 | -0.1 |
| Southwest | 0.3 | 0.6 | 0.7 | 0.8 | 0.5 | 0.5 |
| Average | 0.1 | 0.3 | 0.3 | 0.5 | 0.4 | 0.4 |
| Interior | | | | | | |
| Southwest | 0.1 | 0.2 | 0.3 | 0.3 | -0.1 | -0.2 |
| Southeast Wet | 0.3 | 0.7 | 1.0 | 1.1 | 0.9 | 0.9 |
| Southeast Dry | 0.2 | 0.8 | 1.0 | 1.2 | 1.1 | 1.2 |
| Central | 0.1 | 0.4 | 0.5 | 0.6 | 0.4 | 0.2 |
| Average | 0.2 | 0.5 | 0.7 | 0.8 | 0.6 | 0.5 |
| Province Average | 0.1 | 0.4 | 0.5 | 0.6 | 0.5 | 0.5 |

Table V. Cumulative regional changes in 30-yr averages of autumn temperatures (F°), calculated at pentad intervals with 1901-30 as base.

| Regions | 1906 -1935 | 1911 -1940 | 1916 -1945 | 1921 -1950 | 1926 -1955 | 1931 -1960 |
|---|---|---|---|---|---|---|
| Coast | | | | | | |
| Outer | 0.2 | 0.5 | 1.1 | 1.2 | 1.5 | 1.6 |
| Northern inner | 0.2 | 0.6 | 0.9 | 0.7 | 0.5 | 0.4 |
| Southern inner | 0.2 | 0.5 | 0.7 | 0.7 | 0.8 | 0.7 |
| Southwest | 0.2 | 0.5 | 0.9 | 0.8 | 0.8 | 0.7 |
| Average | 0.2 | 0.5 | 0.9 | 0.9 | 0.9 | 0.9 |
| Interior | | | | | | |
| Southwest | 0.0 | 0.2 | 0.5 | 0.5 | 0.4 | 0.2 |
| Southeast Wet | 0.1 | 0.1 | 0.6 | 0.7 | 0.9 | 1.0 |
| Southeast Dry | 0.1 | 0.3 | 0.7 | 0.9 | 1.0 | 1.0 |
| Central | -0.2 | 0.1 | 0.1 | -0.2 | -0.2 | -0.3 |
| Average | 0.0 | 0.2 | 0.5 | 0.5 | 0.5 | 0.5 |
| Province Average | 0.1 | 0.4 | 0.7 | 0.7 | 0.7 | 0.7 |

Table VI. Cumulative regional changes in 30-yr averages of annual precipitation (in.), calculated at pentad intervals with 1901-30 as base.

| Regions | 1906 -1935 | 1911 -1940 | 1916 -1945 | 1921 -1950 | 1926 -1955 | 1931 -1960 |
|---|---|---|---|---|---|---|
| Coastal | | | | | | |
| Outer | -5.12 | -6.07 | -7.83 | -7.83 | -7.22 | -4.55 |
| Northern inner | 3.71 | 4.22 | 3.96 | 4.56 | 5.04 | 6.59 |
| Southern inner | 0.94 | 0.97 | 0.23 | 0.39 | 1.17 | 3.62 |
| Southwest | 0.76 | 0.50 | 0.05 | 0.86 | 2.25 | 4.05 |
| Average | 0.07 | -0.10 | -0.90 | -0.51 | 0.31 | 2.43 |
| Interior | | | | | | |
| Southwest | -0.13 | -0.68 | -0.34 | 0.21 | 0.46 | 0.73 |
| Southeast Wet | 0.63 | 0.40 | 0.32 | 0.88 | 1.95 | 2.94 |
| Southeast Dry | ---- | 0.09 | -0.16 | 0.09 | 0.57 | 1.17 |
| Central | 0.84 | 1.18 | 1.75 | 2.55 | 3.09 | 3.95 |
| Average | 0.43 | 0.25 | 0.39 | 0.93 | 1.52 | 2.20 |
| Province Average | 0.23 | 0.08 | -0.25 | 0.21 | 0.91 | 2.31 |

Table VII. Cumulative regional changes in 30-yr averages of winter precipitation (in.), calculated at pentad intervals with 1901-30 as base.

| Regions | 1906 -1935 | 1911 -1940 | 1916 -1945 | 1921 -1950 | 1926 -1955 | 1931 -1960 |
|---|---|---|---|---|---|---|
| Coastal | | | | | | |
| Outer | -1.12 | -1.22 | -1.88 | -2.17 | -2.56 | -1.73 |
| Northern inner | 2.13 | 3.27 | 3.20 | 3.62 | 4.06 | 4.04 |
| Southern inner | 0.48 | 1.41 | 1.18 | 1.43 | 1.75 | 2.76 |
| Southwest | 0.58 | 0.91 | 0.73 | 0.75 | 1.22 | 1.93 |
| Average | 0.52 | 1.09 | 0.81 | 0.91 | 1.12 | 1.75 |
| Interior | | | | | | |
| Southwest | -0.02 | 0.09 | 0.17 | 0.27 | 0.25 | 0.37 |
| Southeast Wet | 0.81 | 1.24 | 1.16 | 1.41 | 1.67 | 2.12 |
| Southeast Dry | ---- | 0.12 | 0.14 | 0.07 | 0.30 | 0.74 |
| Central | 0.39 | 0.65 | 0.65 | 1.02 | 1.16 | 1.39 |
| Average | 0.39 | 0.53 | 0.53 | 0.69 | 0.85 | 1.16 |
| Province Average | 0.46 | 0.81 | 0.67 | 0.80 | 0.98 | 1.45 |

Table VIII. Cumulative regional changes in 30-yr averages of spring precipitation (in.), calculated at pentad intervals with 1901-30 as base.

| Regions | 1906 -1935 | 1911 -1940 | 1916 -1945 | 1921 -1950 | 1926 -1955 | 1931 -1960 |
|---|---|---|---|---|---|---|
| Coastal | | | | | | |
| Outer | -1.21 | -0.92 | -0.62 | -1.24 | -1.37 | -1.14 |
| Northern inner | 0.87 | 1.98 | 1.84 | 1.93 | 2.15 | 1.91 |
| Southern inner | -0.23 | -0.06 | 0.43 | -0.03 | 0.18 | 0.43 |
| Southwest | 0.09 | 0.37 | 0.48 | 0.48 | 0.74 | 1.03 |
| Average | -0.12 | 0.34 | 0.53 | 0.29 | 0.43 | 0.56 |
| Interior | | | | | | |
| Southwest | -0.06 | -0.17 | -0.02 | -0.01 | 0.07 | 0.08 |
| Southeast Wet | -0.24 | -0.50 | -0.39 | -0.49 | -0.21 | -0.05 |
| Southeast Dry | ---- | -0.06 | 0.08 | 0.07 | 0.23 | 0.31 |
| Central | 0.11 | 0.32 | 0.37 | 0.47 | 0.57 | 0.60 |
| Average | -0.06 | -0.10 | 0.01 | 0.01 | 0.17 | 0.24 |
| Province Average | -0.10 | 0.12 | 0.27 | 0.15 | 0.30 | 0.40 |

Table IX. Cumulative regional changes in 30-yr averages of summer precipitation (in.) calculated at pentad intervals with 1901-30 as base.

| Regions | 1906 -1935 | 1911 -1940 | 1916 -1945 | 1921 -1950 | 1926 -1955 | 1931 -1960 |
|---|---|---|---|---|---|---|
| Coastal | | | | | | |
| Outer | -0.29 | -0.54 | -0.59 | -0.42 | -0.42 | -0.21 |
| Northern inner | 0.03 | -0.12 | -0.17 | -0.34 | -0.23 | 0.06 |
| Southern inner | -0.20 | -0.29 | -0.40 | -0.36 | -0.22 | 0.20 |
| Southwest | 0.10 | 0.22 | 0.10 | 0.34 | 0.55 | 0.87 |
| Average | -0.09 | -0.18 | -0.27 | -0.20 | -0.08 | 0.23 |
| Interior | | | | | | |
| Southwest | -0.19 | -0.27 | -0.37 | -0.17 | -0.07 | -0.02 |
| Southeast Wet | -0.42 | -0.68 | -0.70 | -0.55 | -0.08 | 0.15 |
| Southeast Dry | ---- | 0.09 | -0.08 | 0.09 | 0.17 | 0.14 |
| Central | 0.05 | 0.17 | 0.43 | 0.72 | 1.01 | 1.39 |
| Average | -0.19 | -0.17 | -0.18 | 0.02 | 0.26 | 0.42 |
| Province Average | -0.12 | -0.18 | -0.22 | -0.11 | 0.09 | 0.32 |

Table X. Cumulative regional changes in 30-yr averages of autumn precipitation (in.), calculated at pentad intervals with 1901-30 as base.

| Regions | 1906 -1935 | 1911 -1940 | 1916 -1945 | 1921 -1950 | 1926 -1955 | 1931 -1960 |
|---|---|---|---|---|---|---|
| Coastal | | | | | | |
| Outer | -1.62 | -2.64 | -3.59 | -3.31 | -2.70 | -2.02 |
| Northern inner | 1.11 | 0.57 | 0.64 | 0.81 | 1.07 | 2.13 |
| Southern inner | 0.20 | -0.88 | -1.53 | -1.38 | -0.98 | -0.44 |
| Southwest | -0.16 | -1.01 | -0.99 | -0.60 | -0.19 | 0.19 |
| Average | -0.12 | -0.99 | -1.37 | -1.12 | -0.70 | -0.04 |
| Interior | | | | | | |
| Southwest | 0.05 | -0.08 | -0.08 | 0.09 | 0.13 | 0.18 |
| Southeast Wet | 0.18 | -0.10 | -0.03 | 0.11 | 0.24 | 0.36 |
| Southeast Dry | ---- | -0.15 | -0.17 | 0.01 | -0.01 | 0.13 |
| Central | 0.47 | 0.15 | 0.41 | 0.40 | 0.33 | 0.53 |
| Average | 0.23 | -0.05 | 0.03 | 0.15 | 0.17 | 0.30 |
| Province Average | 0.03 | -0.52 | -0.67 | -0.48 | -0.26 | 0.13 |

## APPENDIX

Stations used in the study of temperature and precipitation trends in British Columbia. Selected regional stations are indicated by an asterisk.

| Station | Latitude North | Longitude West | Elevation in feet | Period of Record | Temperature Recorded | Precipitation Recorded |
|---|---|---|---|---|---|---|
| Adra | 49°44' | 119°35' | 3289 | 1929-53 | | x |
| *Agassiz | 49°14' | 121°31' | 52 | 1889-1960 | x | x |
| *Alberni (Beaver Creek) | 49°16' | 124°49' | 300 | 1894-1959 | x | x |
| (McCoy Lake) | 49°17' | 124°53' | 140 | 1959-60 | x | x |
| *Alert Bay | 50°35' | 126°56' | 169 | 1924-60 | | x |
| Armstrong | 50°27' | 119°12' | 1187 | 1912-1960 | x | x |
| Ashcroft | 50°43' | 121°17' | 1180 | 1924-1960 | | x |
| *Atlin | 59°35' | 133°38' | 2240 | 1905-45 | x | x |
| Babine Lake | 55°19' | 126°37' | 2260 | (1908-36) (1944-60) | x | x |
| *Barkerville | 53°04' | 121°31' | 4180 | 1888-1960 | x | x |
| Beaverdell | 49°27' | 119°08' | 3000 | 1925-39 | | x |
| *Bella Coola | 52°40' | 126°54' | 150 | 1898-1931 | x | x |
| | 52°20' | 126°52' | 10 | 1932-59 | x | x |
| | 52°23' | 126°36' | 60 | 1959-60 | x | x |
| *Big Creek | 51°40' | 123°00' | 3100 | 1904-60 | x | x |
| Blue River | 52°09' | 119°17' | 2243 | 1929-60 | x | x |
| Bridge River | 50°51' | 122°26' | 2000 | 1924-32 | | x |
| | 50°48' | 122°15' | 830 | 1935-51 | | x |

| Station | Latitude North | Longitude West | Elevation in feet | Period of Record | Temperature Recorded | Precipitation Recorded |
|---|---|---|---|---|---|---|
| Brisco | 50°51' | 116°16' | 2587 | 1924-32 | | x |
| | 50°49' | 116°16' | 3000 | 1932-55 | | x |
| | 50°49' | 116°16' | 2700 | 1956-60 | | x |
| *Britannia Beach | 49°39' | 123°11' | 160 | 1914-60 | x | x |
| Canal Flats | 50°09' | 115°49' | 2653 | 1924-50 | | x |
| Carmi | 49°30' | 119°05' | 4084 | 1942-60 | x | x |
| Chinook Cove | 51°14' | 120°10' | 1260 | 1914-39 | x | x |
| | 51°15' | 120°11' | 1324 | 1939-56 | x | x |
| *Clayoquot | 49°09' | 125°55' | 25 | 1900-58 | x | x |
| Cowichan (Tzouhalem) | 48°25' | 123°42' | 170 | 1904-24 | x | x |
| Cowichan Lake | 48°49' | 124°03' | 545 | 1925-47 | x | x |
| | 48°49' | 124°08' | 580 | 1949-60 | x | x |
| *Cranberry Lake | 52°50' | 119°20' | 2460 | 1914-58 | x | x |
| | 52°50' | 119°15' | 2600 | 1958-60 | x | x |
| *Cranbrook | 49°30' | 115°50' | 2990 | 1909-12 | x | x |
| | 49°30' | 115°50' | 3014 | 1912-36 | x | x |
| | 49°30' | 115°47' | 3060 | 1936-39 | x | x |
| | 49°32' | 115°46' | 3013 | 1939-60 | x | x |
| Creston | 49°06' | 116°31' | 1990 | 1912-60 | x | x |
| Duncan | 48°47' | 123°41' | 50 | 1926-60 | x | x |
| Eagle Bay | 50°56' | 119°13' | 1200 | 1924-60 | | x |
| Fauquier | 49°54' | 118°04' | 1460-1600 | 1909-60 | x | x |
| Fernie | 49°30' | 115°04' | 3305 | 1914-60 | x | x |

| Station | Latitude North | Longitude West | Elevation in feet | Period of Record | Temperature Recorded | Precipitation Recorded |
|---|---|---|---|---|---|---|
| Field | 51°23' | 116°15' | 4064 | 1923-37 | x | x |
| *Fort St. James | 54°28' | 124°12' | 2280 | 1894-1960 | x | x |
| *Fort St. John (Baldonnel) | 56°12' | 120°49' | 2500 | 1927-60 | x | x |
| Glacier | 51°14' | 117°29' | 3778-4094 | 1908-57 | x | x |
| *Grand Forks | 49°02' | 118°28' | 1746 | 1909-60 | x | x |
| Greenwood | 49°05' | 118°41' | 2400 | 1911-29 | x | x |
| | 49°05' | 118°41' | 2466 | 1929-55 | x | x |
| | 49°05' | 118°41' | 2490 | 1956-60 | x | x |
| *Golden | 51°16' | 116°55' | 2550 | 1902-29 | x | x |
| | 51°18' | 116°58' | 2583 | 1930-60 | x | x |
| Hedley | 49°35' | 120°10' | 1771 | 1904-60 | x | x |
| *Hudson Hope | 56°05' | 121°55' | 1606 | 1916-44 | x | x |
| Invermere | 50°30' | 116°02' | 2650 | 1913-48 | x | x |
| *Kamloops | 50°41' | 120°29' | 1262 | 1890-1943 | x | x |
| | 50°41' | 120°21' | 1133 | 1943-50 | x | x |
| | 50°43' | 120°25' | 1133 | 1951-60 | x | x |
| Kaslo | 49°52' | 117°00' | 1752-77 | 1912-39 | x | x |
| | 49°55' | 116°54' | 1930 | 1939-60 | x | x |
| *Kelowna | 49°52' | 119°28' | 1160-1200 | 1899-1960 | x | x |
| Keremeos | 49°15' | 120°00' | 1372 | 1920-39 | x | x |
| | 49°12' | 119°47' | 1165 | 1939-60 | x | x |
| Kimberley | 49°44' | 115°47' | 3016 | 1944-60 | x | x |

| Station | Latitude North | Longitude West | Elevation in feet | Period of Record | Temperature Recorded | Precipitation Recorded |
|---|---|---|---|---|---|---|
| Kingsgate | 49°00' | 116°11' | 2690 | 1924-60 | | x |
| Kleena Kleene | 52°03' | 124°54' | 27-2900 | 1933-42 | | x |
| | 51°59' | 124°59' | 2950 | 1942-60 | x | x |
| Lillooet | 50°41' | 121°56' | 740 | 1917-56 | x | x |
| | 50°42' | 121°56' | 950 | 1956-60 | x | x |
| Lytton | 50°16' | 121°34' | 566 | 1926-49 | x | x |
| | 50°14' | 121°34' | 574 | 1949-60 | x | x |
| Mabel Lake | 50°22' | 118°46' | 1300 | 1925-60 | | x |
| Maclure Lake | 54°35' | 127°03' | 1600 | 1924-58 | | x |
| | 54°44' | 127°04' | 1880 | 1959-60 | | x |
| Malakwa | 50°56' | 118°48' | 1215-1400 | 1924-60 | | x |
| Mamit Lake | 50°23' | 120°48' | 3300 | 1924-60 | | x |
| *Masset | 54°02' | 132°08' | 10-30 | 1897-1960 | x | x |
| McCulloch | 49°48' | 119°12' | 4100 | 1924-60 | x | x |
| Merritt | 50°06' | 120°47' | 1970 | 1919-52 | x | x |
| *Mill Bay | 55°00' | 129°45' | 10 | 1915-59 | x | x |
| Moha | 50°53' | 122°16' | 1800 | 1924-47 | | x |
| Nadina River | 54°01' | 126°26' | 2650 | 1935-60 | | x |
| *Nanaimo | 49°10' | 123°57' | 85-125 | 1913-56 | x | x |
| | 49°03' | 123°52' | 104 | 1956-60 | x | x |
| *Nelson | 49°29' | 117°21' | 1760 | 1904-21 | x | x |
| | 49°29' | 117°21' | 2230-2235 | 1922-42 | x | x |
| | 49°29' | 117°21' | 2035 | 1942-55 | x | x |
| | 49°30' | 117°17' | 1980 | 1955-60 | x | x |

| Station | Latitude North | Longitude West | Elevation in feet | Period of Record | Temperature Recorded | Precipitation Recorded |
|---|---|---|---|---|---|---|
| New Denver | 49°59' | 117°23' | 1850 | 1924-60 | | x |
| *Newgate | 49°02' | 115°10' | 2370-2800 | 1918-60 | x | x |
| *New Hazelton | 55°15' | 127°35' | 1150 | 1914-60 | x | x |
| *New Westminster | 49°13' | 122°54' | 23-330 | 1894-1960 | x | x |
| Nicola Lake | 50°09' | 120°39' | 2120 | 1896-1918 | x | x |
| *Ocean Falls | 52°23' | 127°40' | 16 | 1924-60 | x | x |
| Oliver | 49°10' | 119°34' | 995-1020 | 1924-60 | x | x |
| Osprey Lake | 49°42' | 120°11' | 3606 | 1927-52 | | x |
| Peachland | 49°47' | 119°50' | 1800 | 1925-43 | | x |
| *Pemberton Hatchery | 50°22' | 122°33' | 840 | 1908-14 | x | x |
| *Pemberton Meadows | 50°29' | 122°40' | 730-800 | 1914-60 | x | x |
| Penticton | 49°29' | 119°35' | 1200 | 1907-40 | x | x |
| | 49°28' | 119°36' | 1121 | 1941-60 | x | x |
| *Powell River | 49°53' | 124°34' | 105-176 | 1924-60 | x | x |
| *Prince George | 53°55' | 122°41' | 1867 | 1912-43 | x | x |
| | 53°53' | 122°41' | 2218 | 1943-60 | x | x |
| *Prince Rupert | 54°18' | 130°18' | 100-170 | 1908-21 | x | x |
| | 54°17' | 130°23' | 170 | 1922-60 | x | x |
| *Princeton | 49°29' | 120°29' | 1650 | 1893-1926 | x | x |
| | 49°29' | 120°29' | 2111 | 1926-1932 | x | x |
| | 49°26' | 120°30' | 1975 | 1932-37 | x | x |
| | 49°26' | 120°30' | 2075 | 1937-41 | x | x |
| | 49°29' | 120°31' | 2283 | 1941-60 | x | x |

| Station | Latitude North | Longitude West | Elevation in feet | Period of Record | Temperature Recorded | Precipitation Recorded |
|---|---|---|---|---|---|---|
| *Quatsino | 50°32' | 127°40' | 8 | 1895-1960 | x | x |
| *Quesnel | 52°59' | 122°30' | 1750 | 1895-1960 | x | x |
| Radium Hot Springs | 50°40' | 116°02' | 3460 | 1955-60 | x | x |
| *Revelstoke | 51°00' | 118°06' | 1746 | 1898-1929 | x | x |
| | 51°00' | 118°12' | 1497 | 1929-60 | x | x |
| Rock Creek | 49°04' | 119°01' | 2000 | 1912-47 | | x |
| *Rossland | 49°05' | 117°48' | 3305-3400 | 1905-1960 | x | x |
| *Salmon Arm | 50°44' | 119°12' | 1157 | 1911-49 | x | x |
| | 50°44' | 119°12' | 2000 | 1950-54 | x | x |
| | 50°42' | 119°14' | 1660 | 1954-60 | x | x |
| Sechelt | 49°29' | 123°46' | 10 | 1927-60 | | x |
| *Shawnigan Lake | 48°37' | 123°41' | 535 | 1911-39 | x | x |
| | 48°39' | 123°38' | 455 | 1939-60 | x | x |
| Sidmouth | 50°45' | 117°58' | 1410 | 1949-59 | x | x |
| Sinclair Pass | 50°38' | 115°55' | 3840 | 1935-55 | x | x |
| Sooke Lake | 48°31' | 123°42' | 567 | 1913-60 | | x |
| Sorrento | 50°52' | 119°28' | 1160 | 1924-60 | | x |
| *Stave Falls | 49°16' | 122°23' | 243 | 1909-56 | x | x |
| | 49°14' | 122°21' | 174 | 1957-60 | x | x |
| *Steveston | 49°06' | 123°11' | 10 | 1896-1956 | x | x |
| | 49°08' | 123°10' | 10 | 1957-60 | x | x |
| *Stewart | 56°01' | 130°01' | 10-215 | 1910-55 | x | x |
| | 55°57' | 129°58' | 150 | 1956-60 | x | x |

| Station | Latitude North | Longitude West | Elevation in feet | Period of Record | Temperature Recorded | Precipitation Recorded |
|---|---|---|---|---|---|---|
| Stuie | 52°20' | 126°15' | 460 | 1932-47 | x | x |
| Summerland | 49°34' | 119°40' | 1135 | 1907-20 | x | x |
| | 49°34' | 119°40' | 1300 | 1921-45 | x | x |
| | 49°34' | 119°40' | 1600 | 1945-57 | x | x |
| | 49°34' | 119°39' | 1491 | 1957-60 | x | x |
| Tappen | 50°45' | 119°20' | 1158-1450 | 1913-1960 | x | x |
| Tatlayoko Lake | 51°38' | 124°35' | 2700 | 1929-53 | x | x |
| | 51°39' | 124°23' | 2780 | 1954-60 | x | x |
| Telkwa | 54°42' | 126°55' | 2000 | 1922-60 | x | x |
| *Terrace | 54°42' | 128°35' | 200-225 | 1912-52 | x | x |
| | 54°28' | 128°35' | 719 | 1953-60 | x | x |
| Tranquille | 50°41' | 120°29' | 1142 | 1909-49 | x | x |
| | 50°43' | 120°31' | 1180 | 1949-53 | x | x |
| Vanderhoof | 54°04' | 124°00' | 2093 | (1916-31; 1935-42; 1952-60) | x | x |
| *Vavenby | 51°42' | 119°45' | 1450 | 1913-45 | x | x |
| | 51°35' | 119°42' | 1545 | 1945-60 | x | x |
| Vernon | 50°16' | 119°15' | 1250-1383 | 1920-60 | x | x |
| Vernon (Coldstream) | 50°14' | 119°12' | 1582 | 1893-1960 | x | x |
| *Victoria | 48°25' | 123°19' | 85 | 1883-1915 | x | x |
| | 48°25' | 123°19' | 228 | 1915-60 | x | x |
| Wasa | 49°46' | 115°43' | 2300 | 1924-56 | | x |
| | 49°52' | 115°38' | 3050 | 1956-60 | | x |
| Westwold | 50°29' | 119°45' | 2025 | 1921-60 | x | x |
| Wilmer | 50°34' | 116°14' | 3300 | 1909-25 | x | x |
| *Wistaria | 53°47' | 126°15' | 2900 | 1926-60 | x | x |

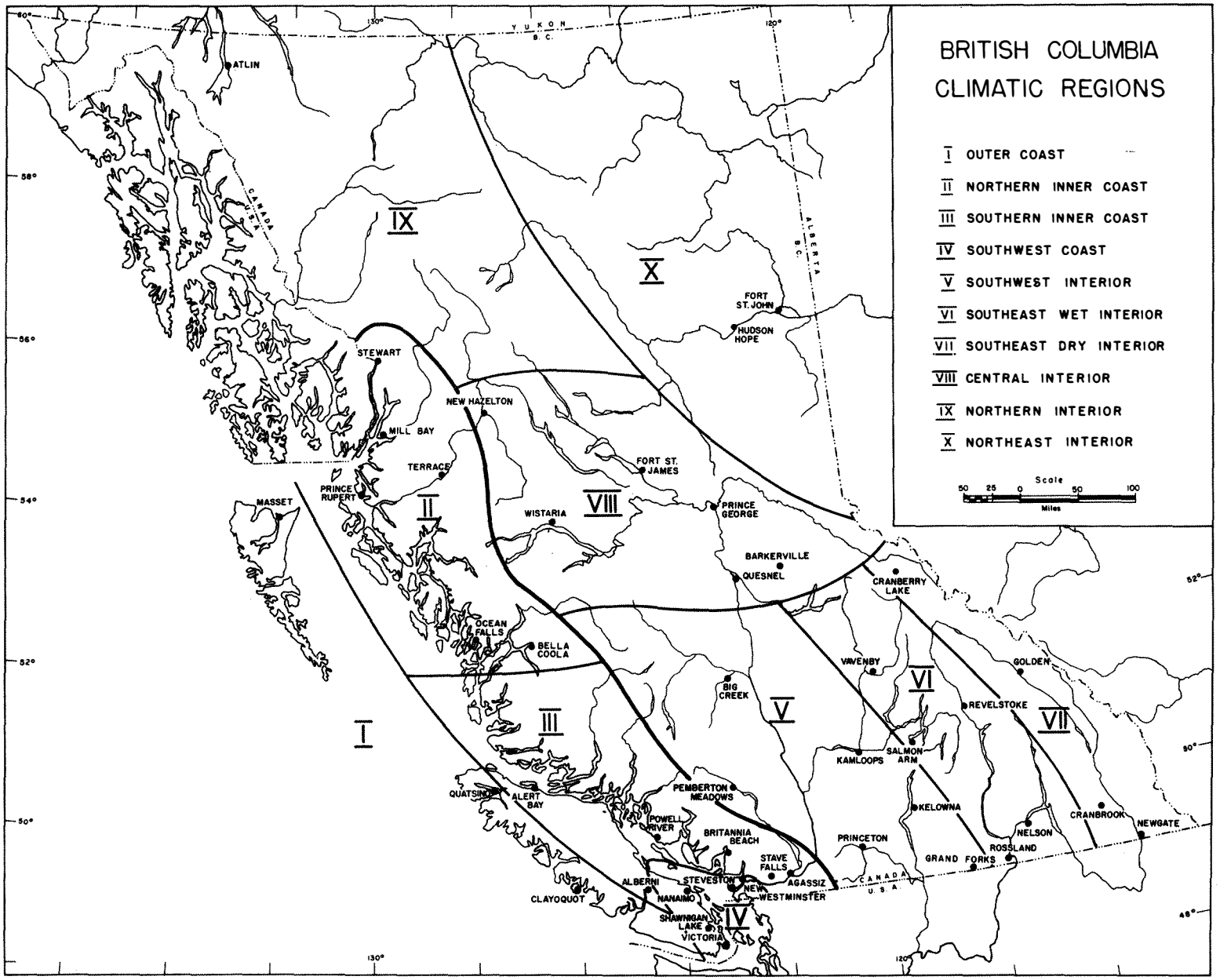



Fig. 1. Location of climatic regions and selected temperature and precipitation stations in British Columbia.

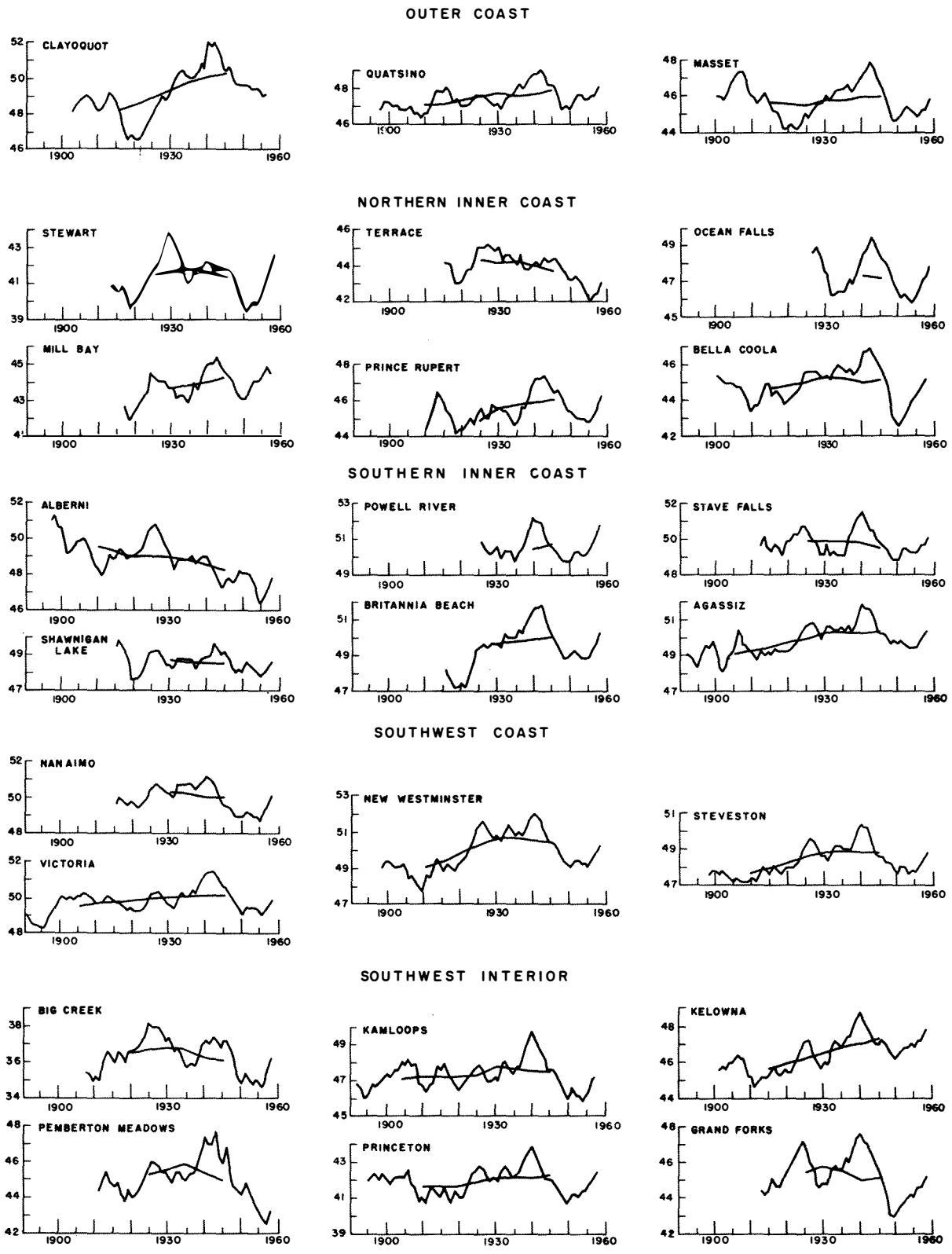



Fig. 2. Five-year running means and 30-yr averages of annual temperatures ($^{o}$F) for selected stations from 1890 to 1960.

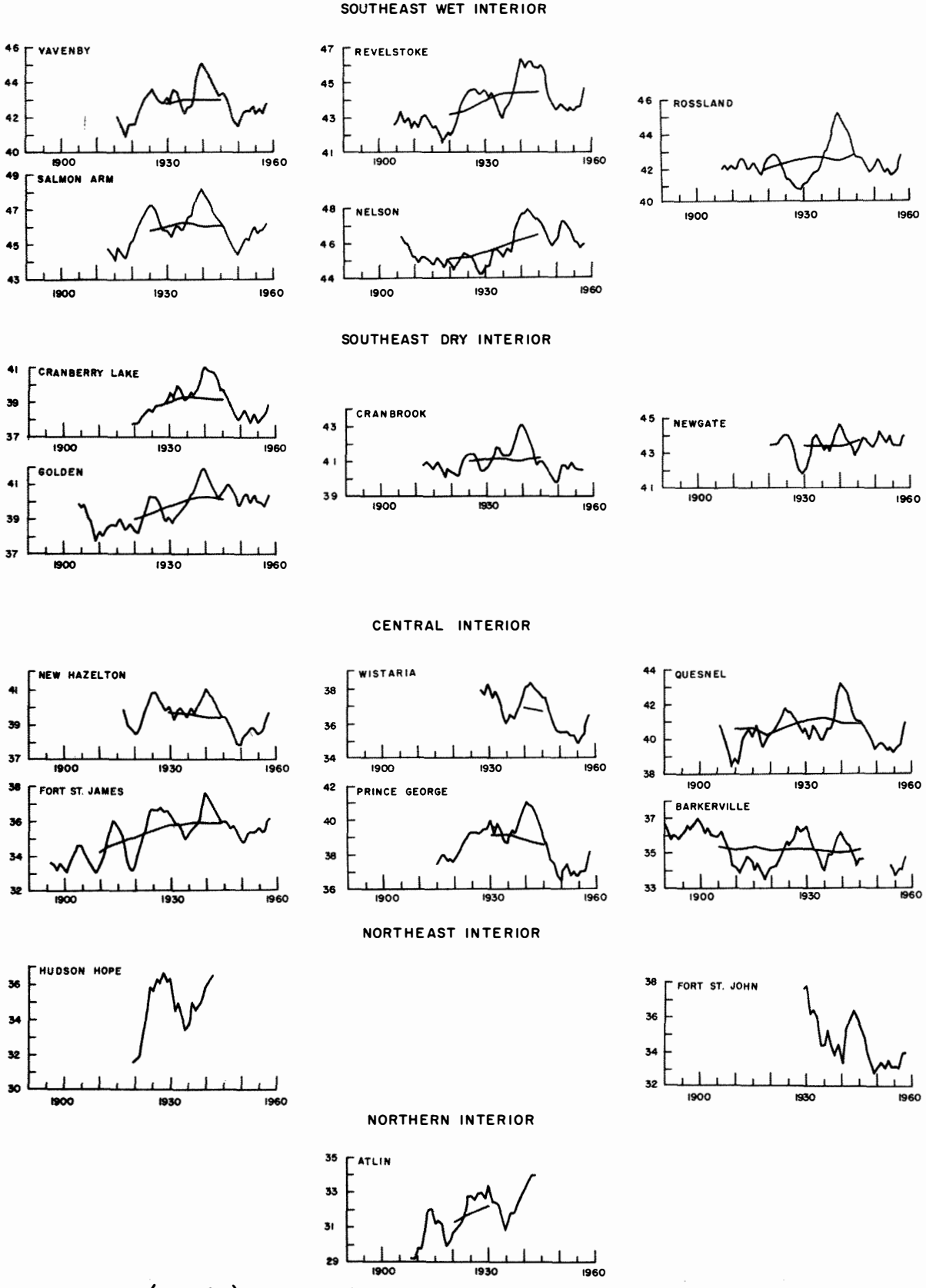



Fig. 2. (Cont'd) Five-year running means and 30-yr averages of annual temperatures (°F) for selected stations from 1890 to 1960.

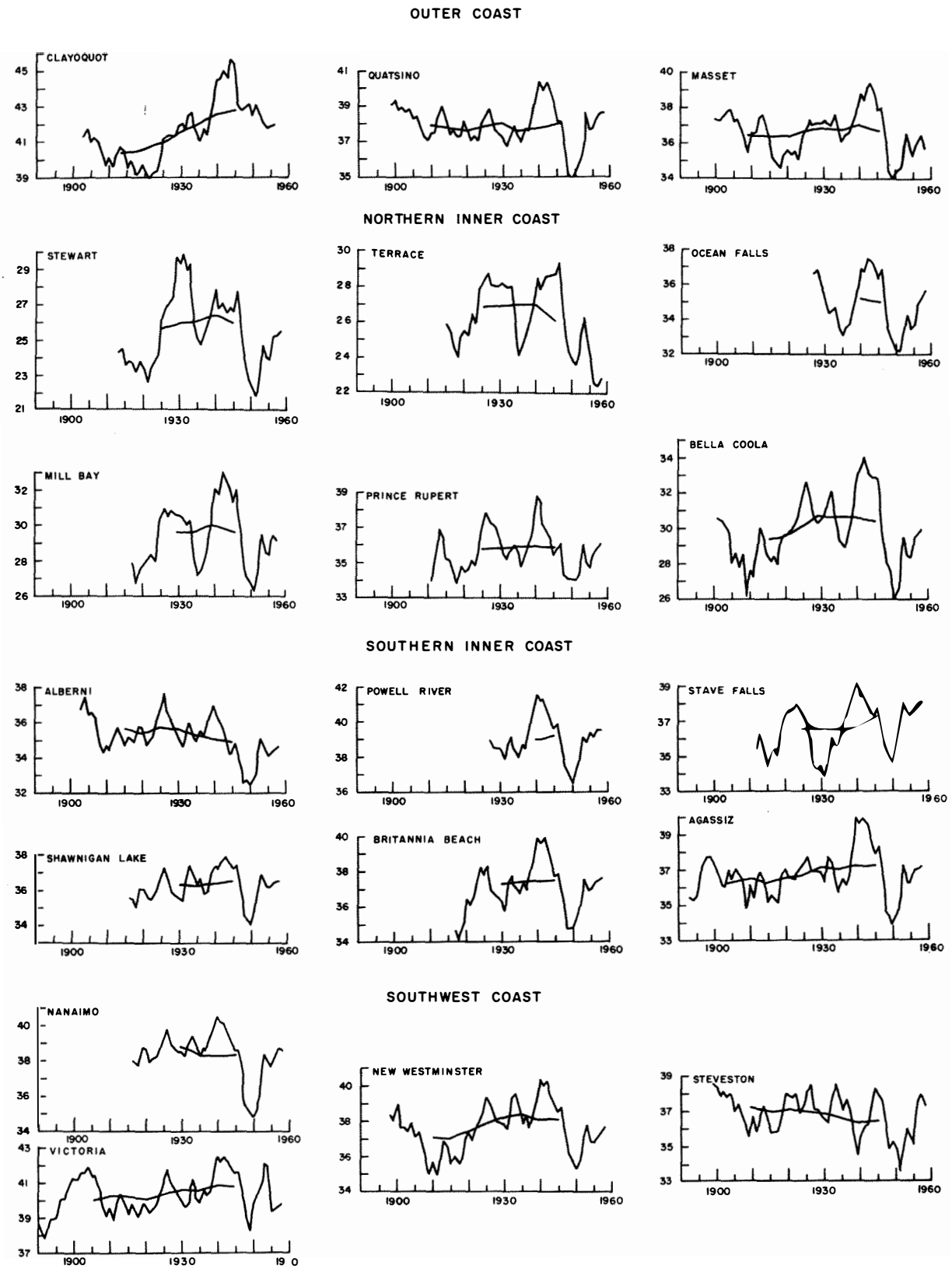



Fig. 3. Five-year running means and 30-yr averages of winter temperatures (°F) for selected stations from 1890 to 1960.

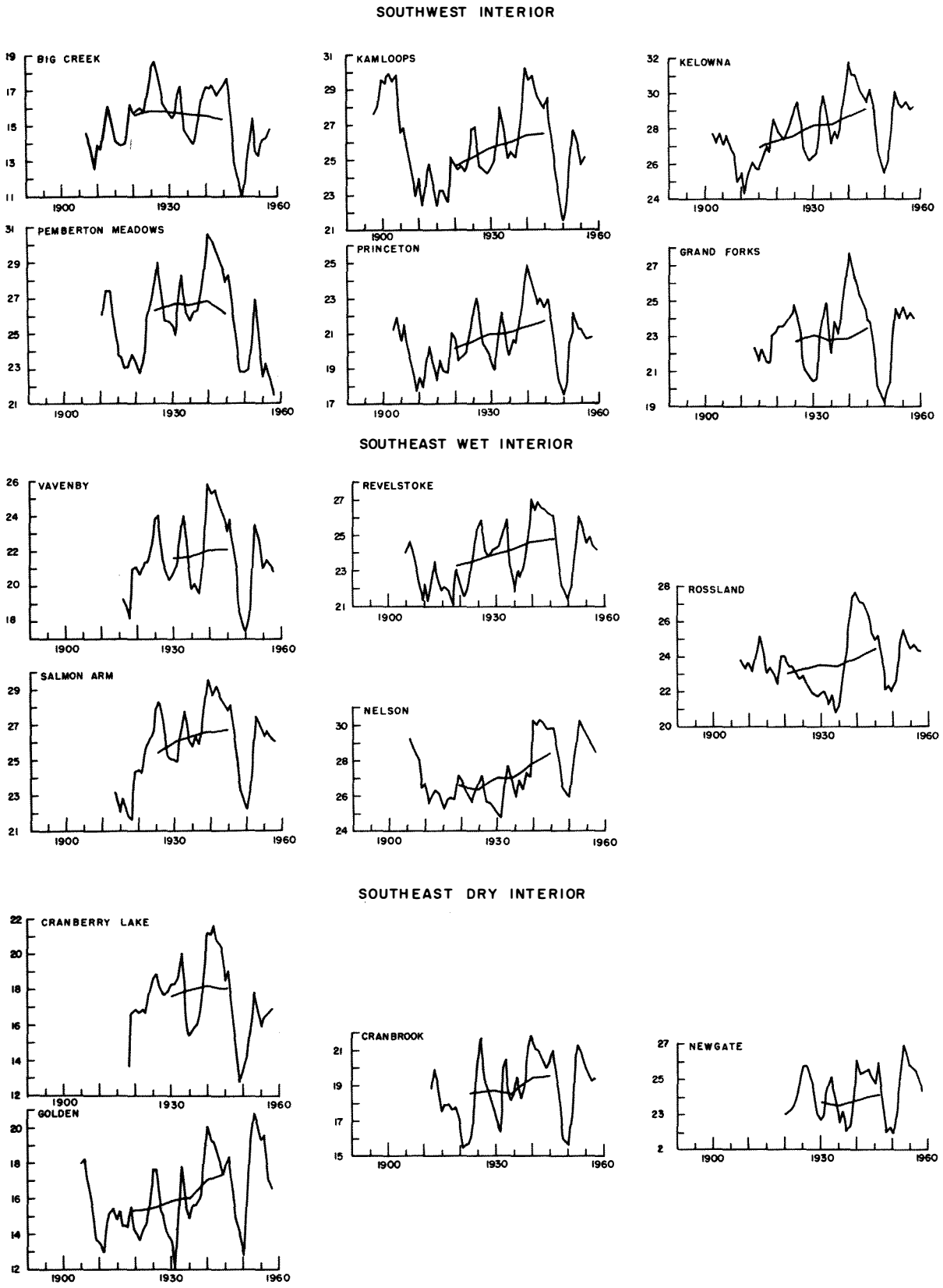



Fig. 3. (Cont'd) Five-year running means and 30-yr averages of winter temperatures (°F) for selected stations from 1890 to 1960.

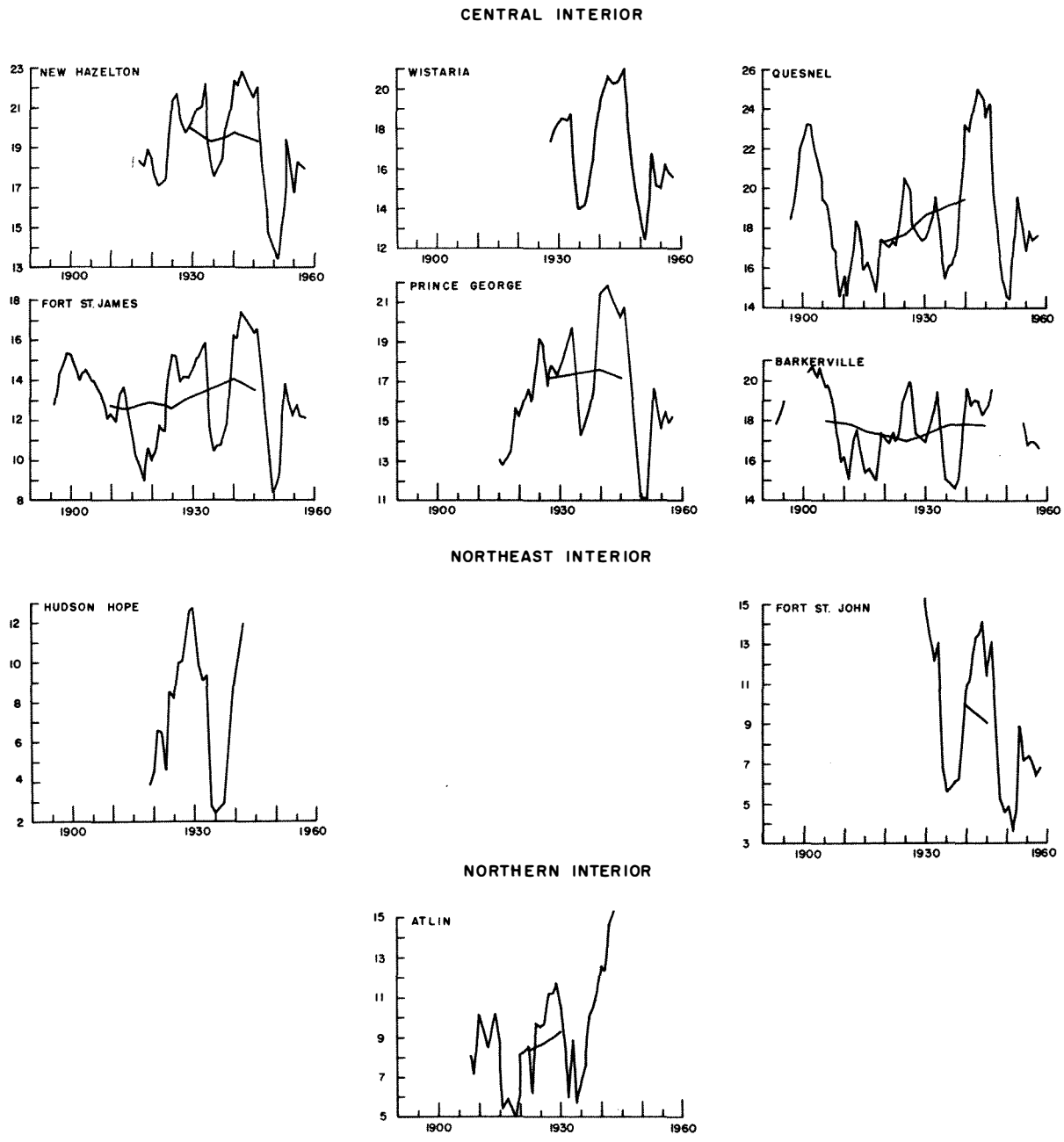



Fig. 3. (Cont'd) Five-year running means and 30-yr averages of winter temperatures ($^{o}$F) for selected stations from 1890 to 1960.

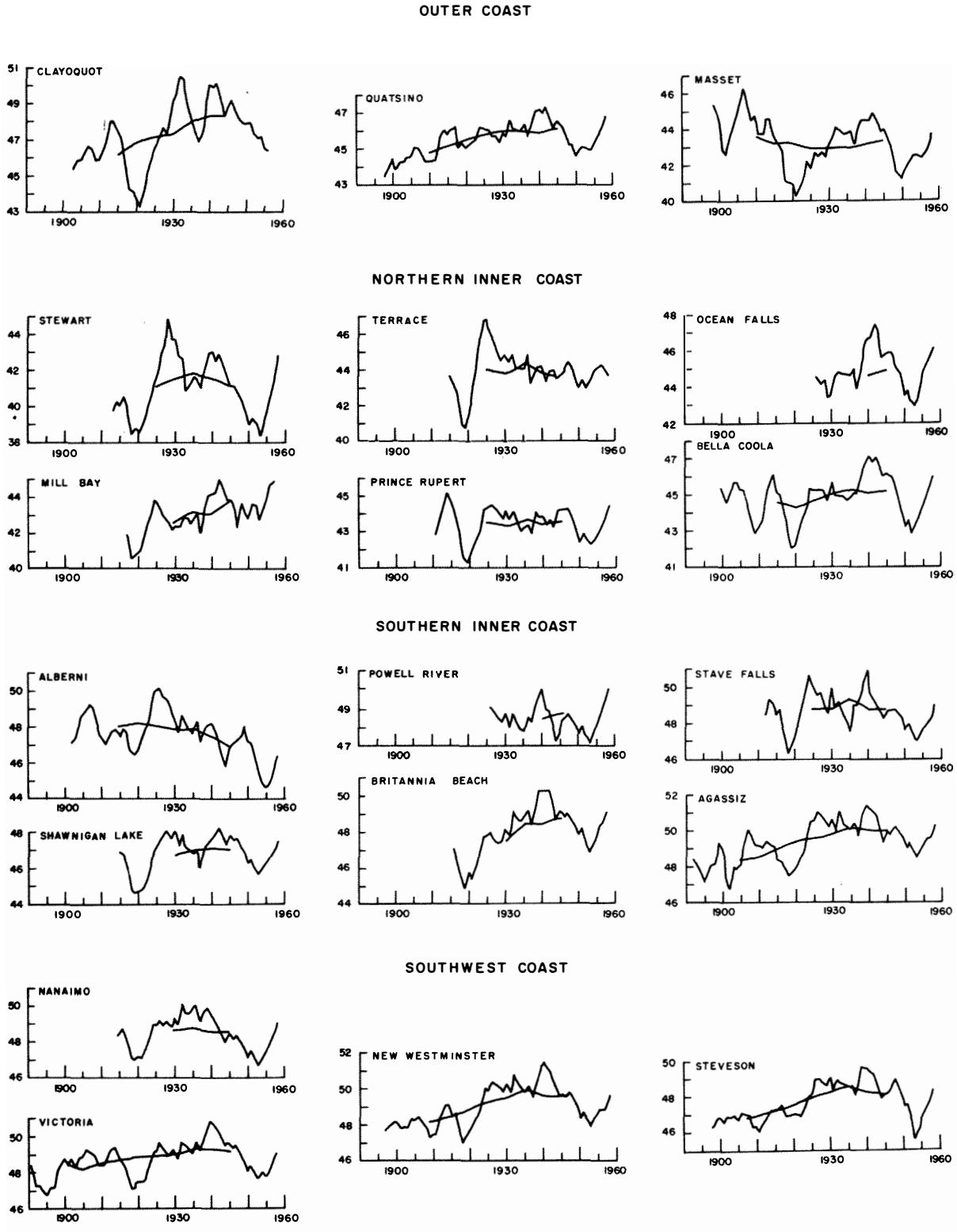



Fig. 4. Five-year running means and 30-yr averages of spring temperatures (°F) for selected stations from 1890 to 1960.

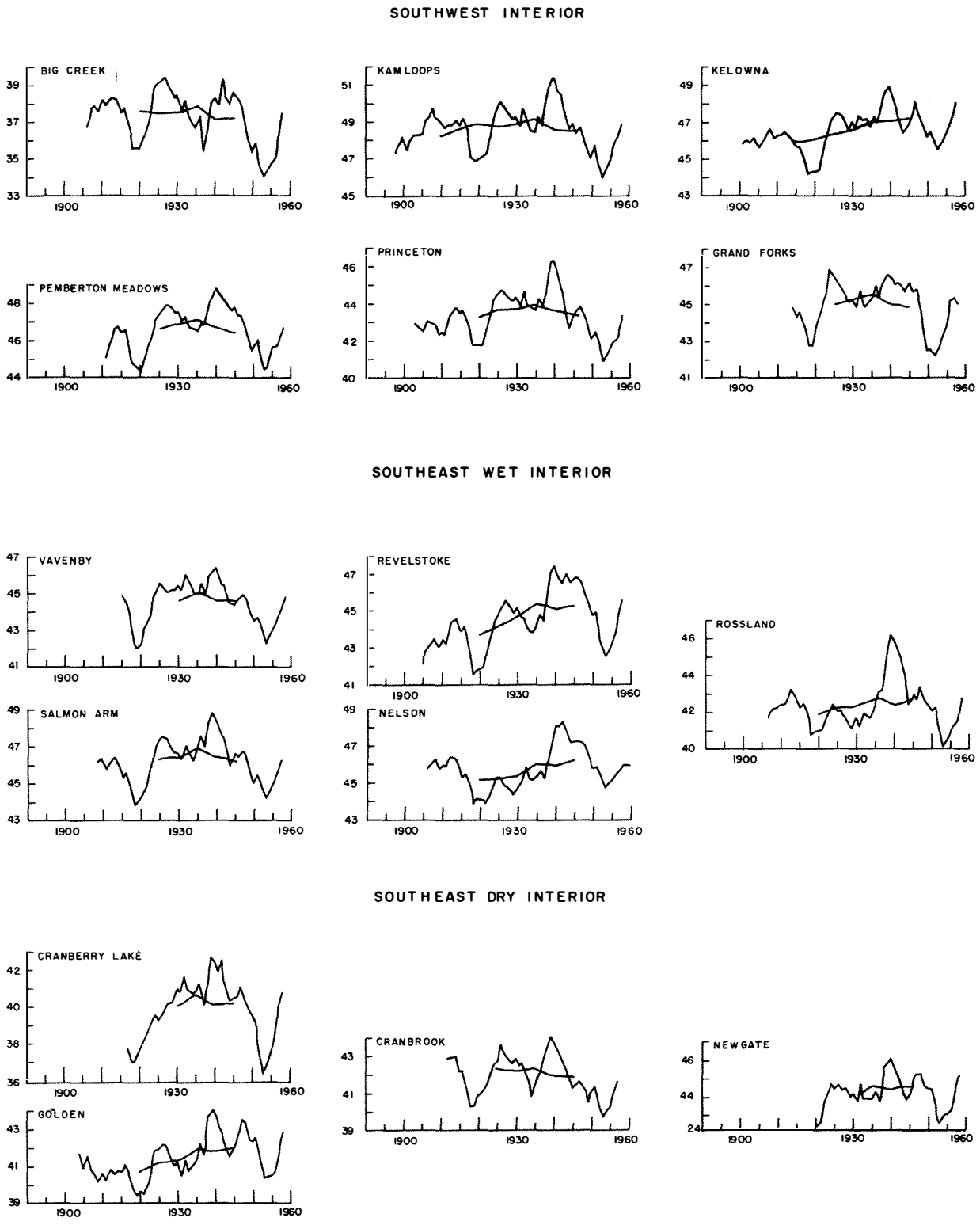



Fig. 4. (Cont'd) Five-year running means and 30-yr averages of spring temperatures (°F) for selected stations from 1890 to 1960.

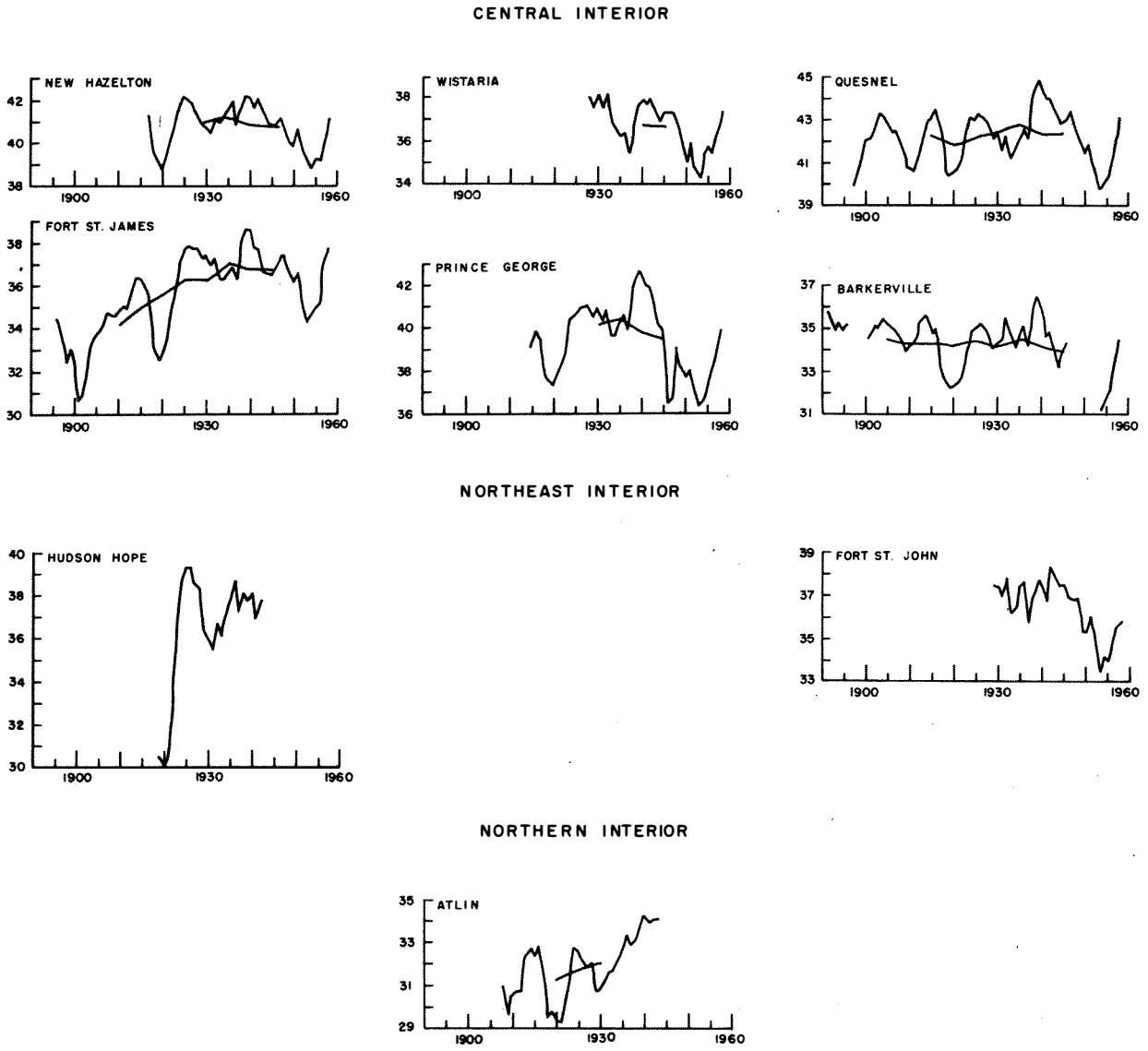



Fig. 4. (Cont'd) Five-year running means and 30-yr averages of spring temperatures ($^{o}$F) for selected stations from 1890 to 1960.

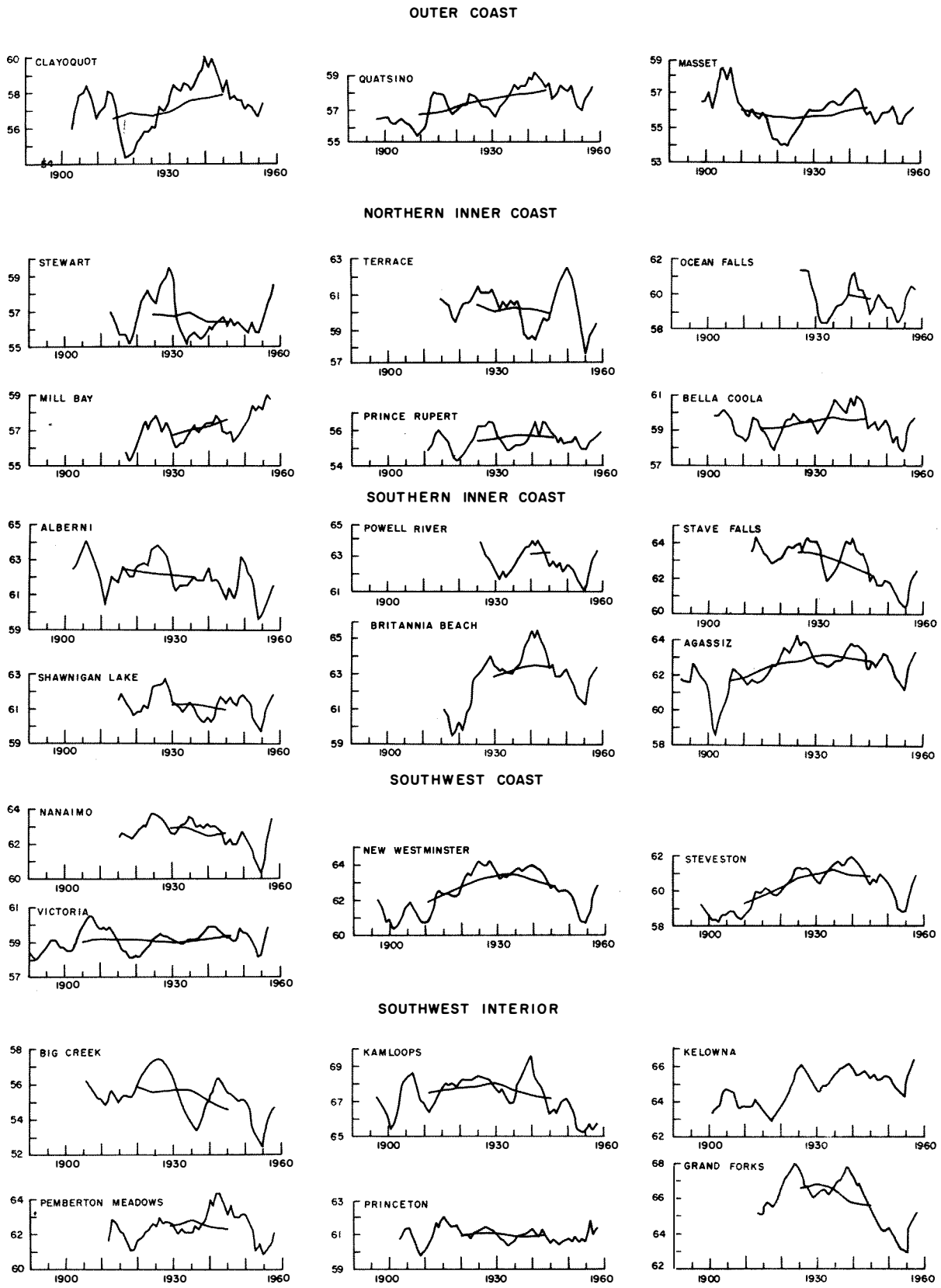



Fig. 5. Five-year running means and 30-yr averages of summer temperatures (°F) for selected stations from 1890 to 1960.

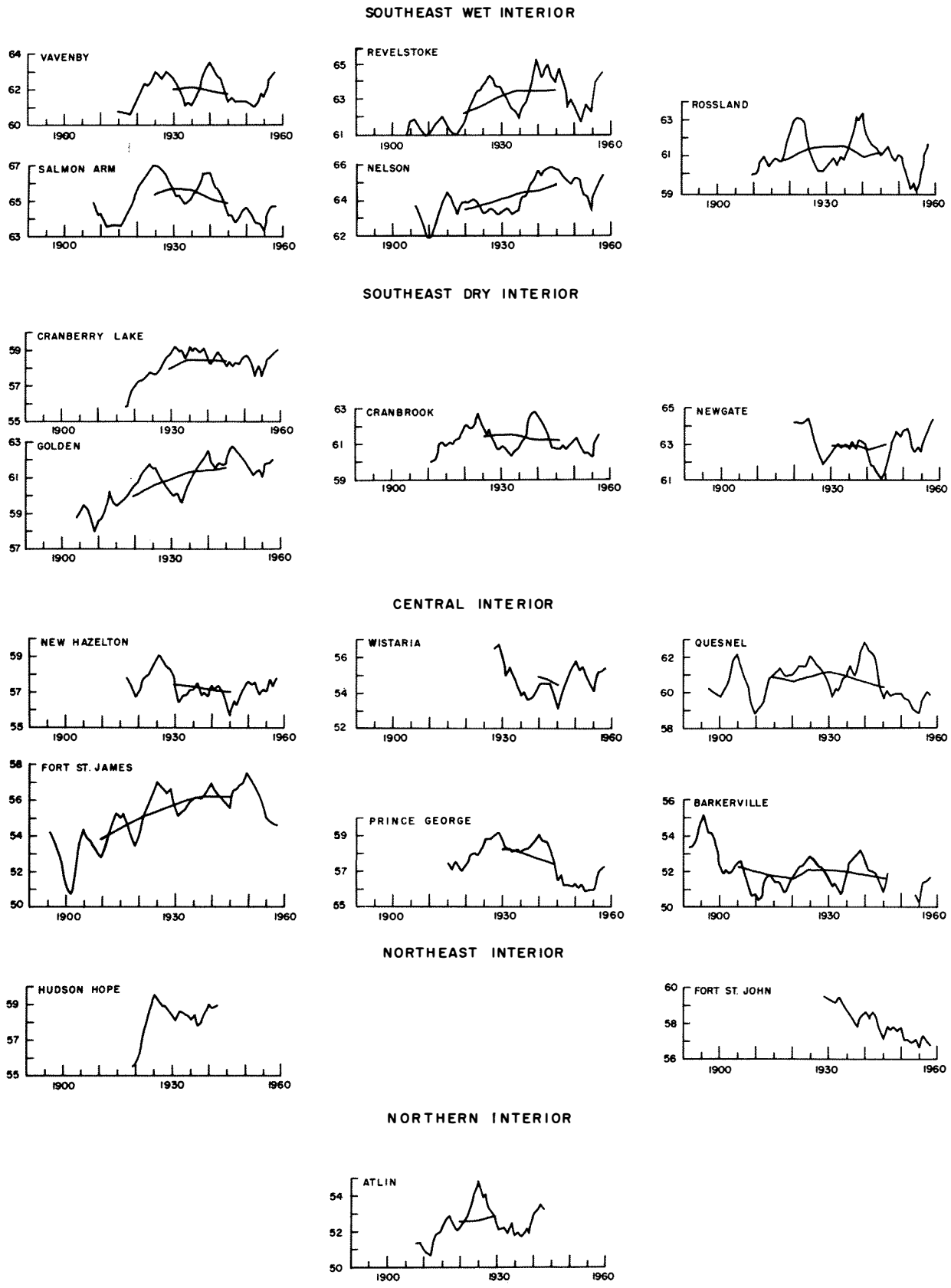



Fig. 5. (Cont'd) Five-year running means and 30-yr averages of summer temperatures ($^{o}$F) for selected stations from 1890 to 1960.

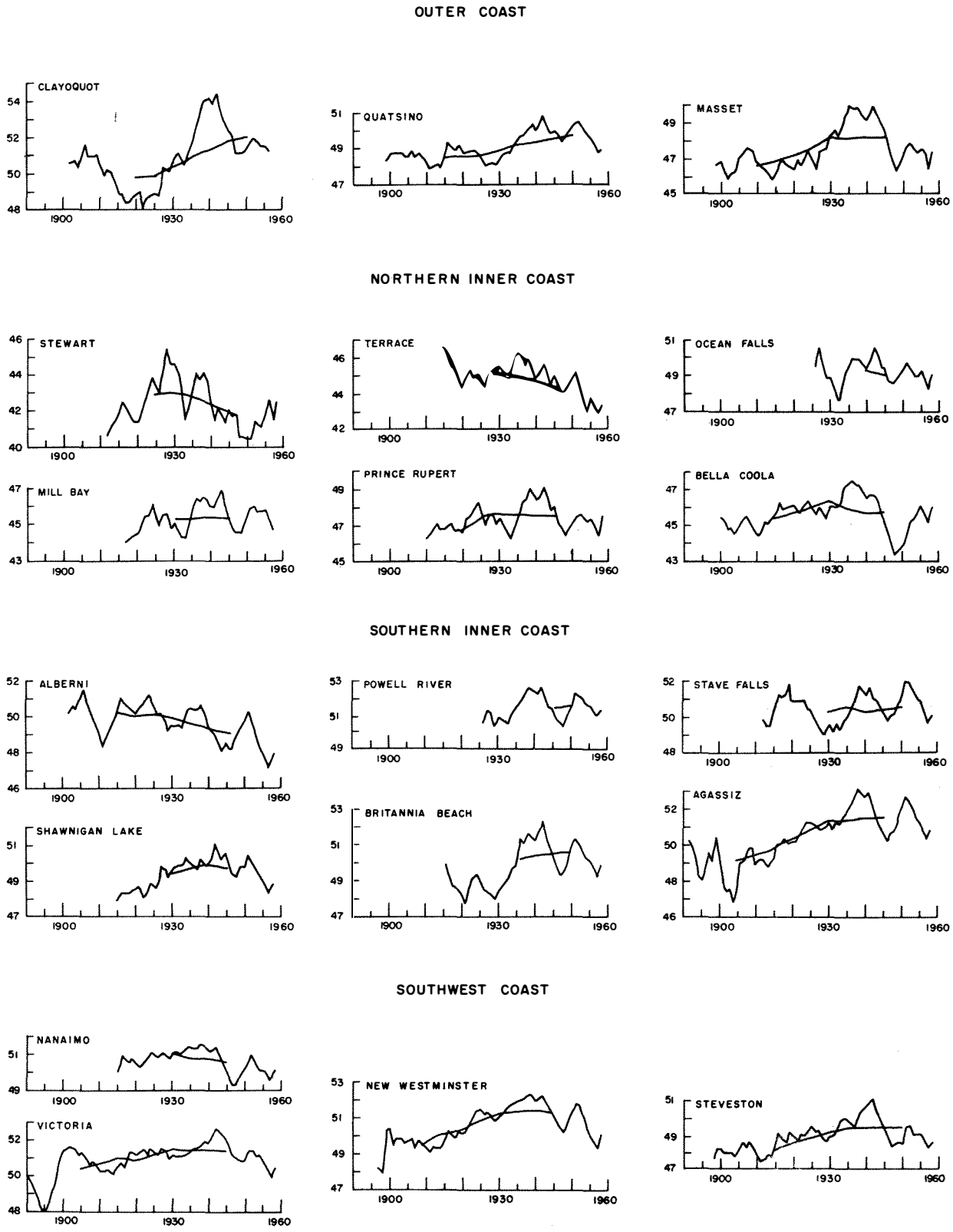



Fig. 6. Five-year running means and 30-yr averages of autumn temperatures ($^{o}$F) for selected stations from 1890 to 1960.

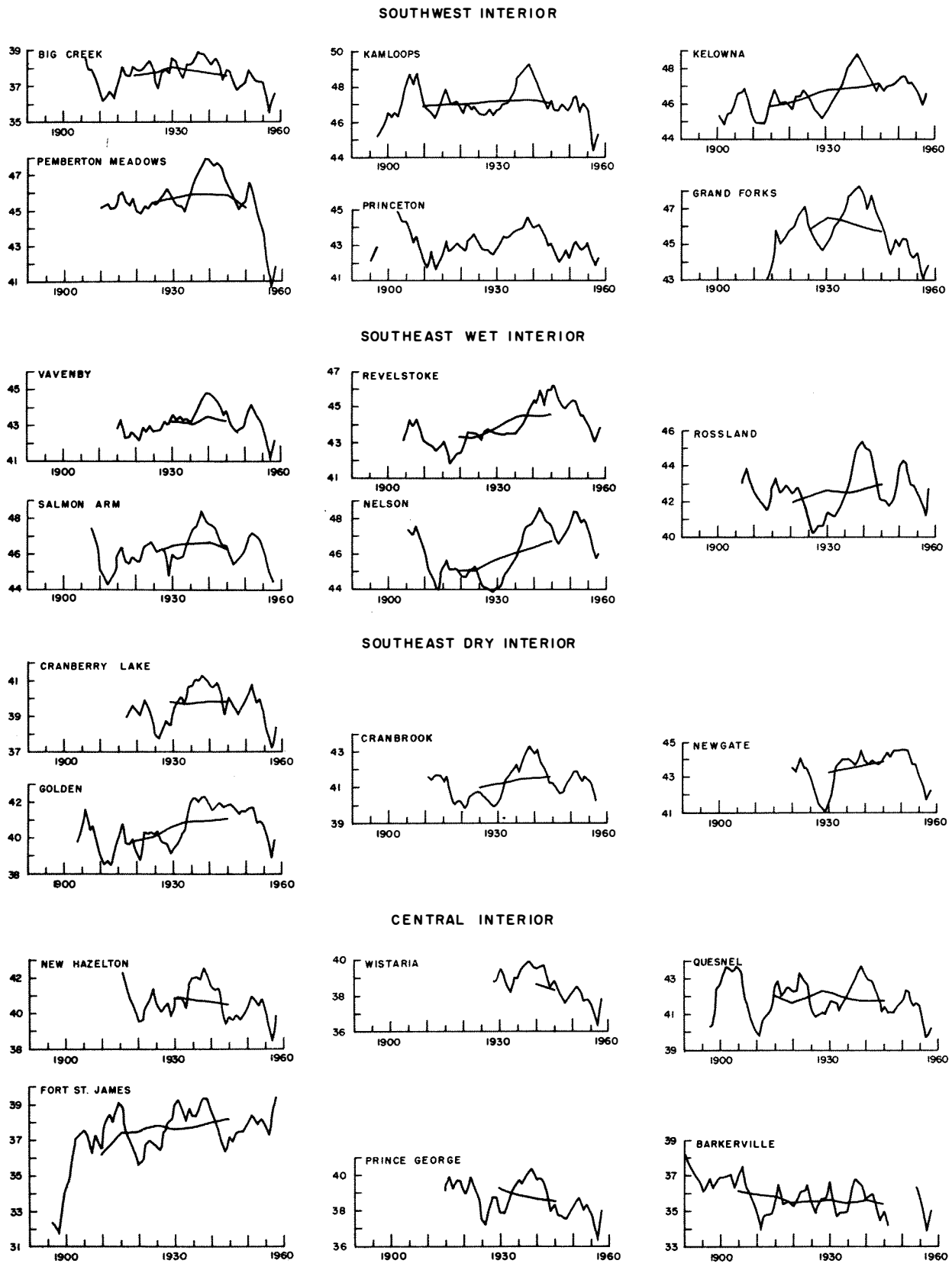
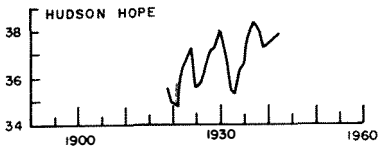
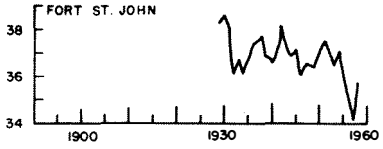



Fig. 6. (Cont'd) Five-year running means and 30-yr averages of autumn temperatures ($^{o}$F) for selected stations from 1890 to 1960.

NORTHEAST INTERIOR




NORTHERN INTERIOR

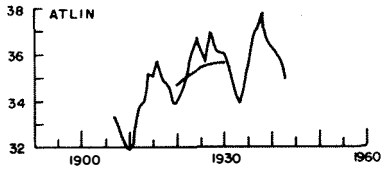



Fig. 6. (Cont'd) Five-year running means and 30-yr averages of autumn temperatures ($^{o}$F) for selected stations from 1890 to 1960.

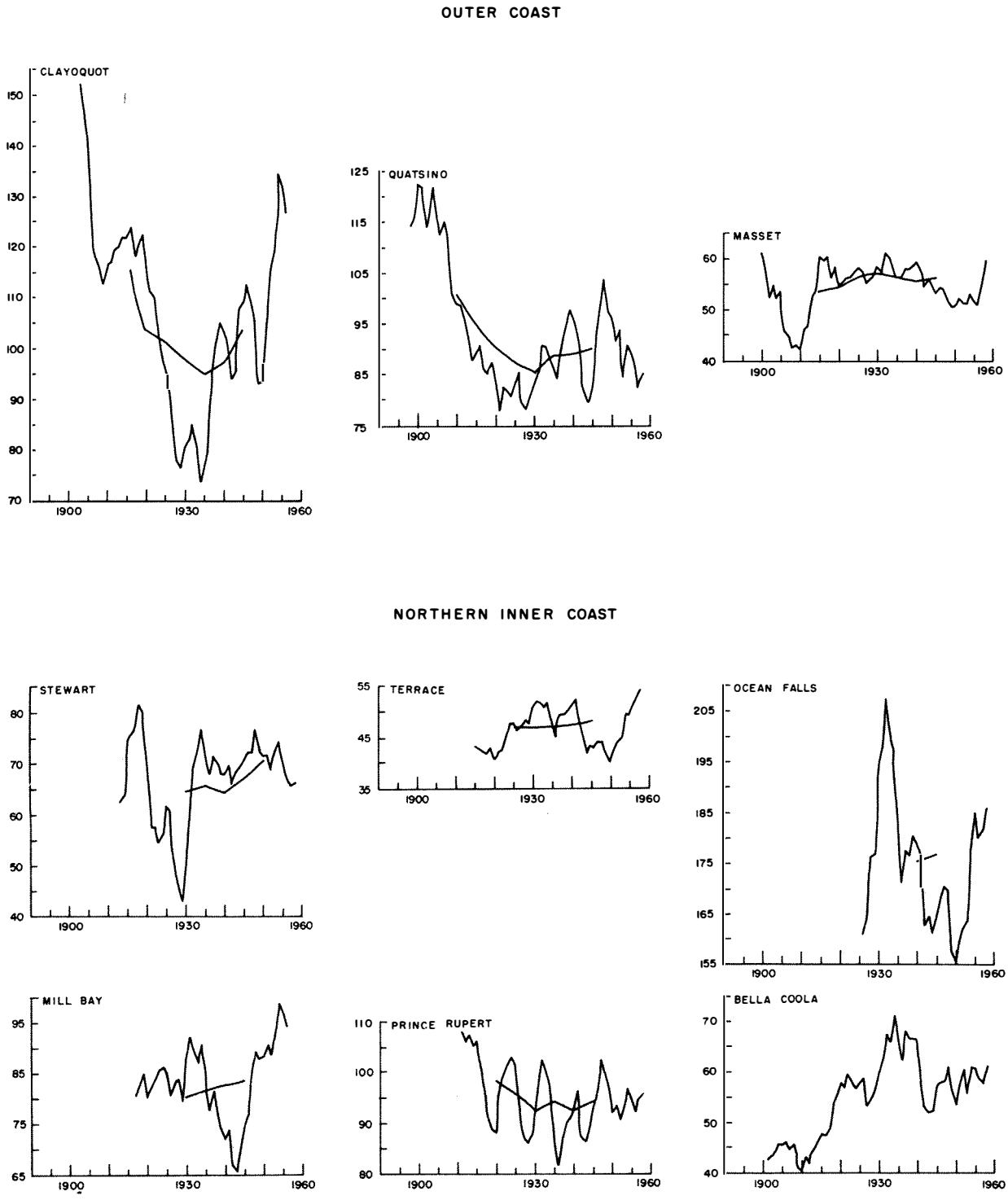



Fig. 7. Five-year running means and 30-yr averages of annual precipitation (in.) for selected stations from 1890 to 1960.

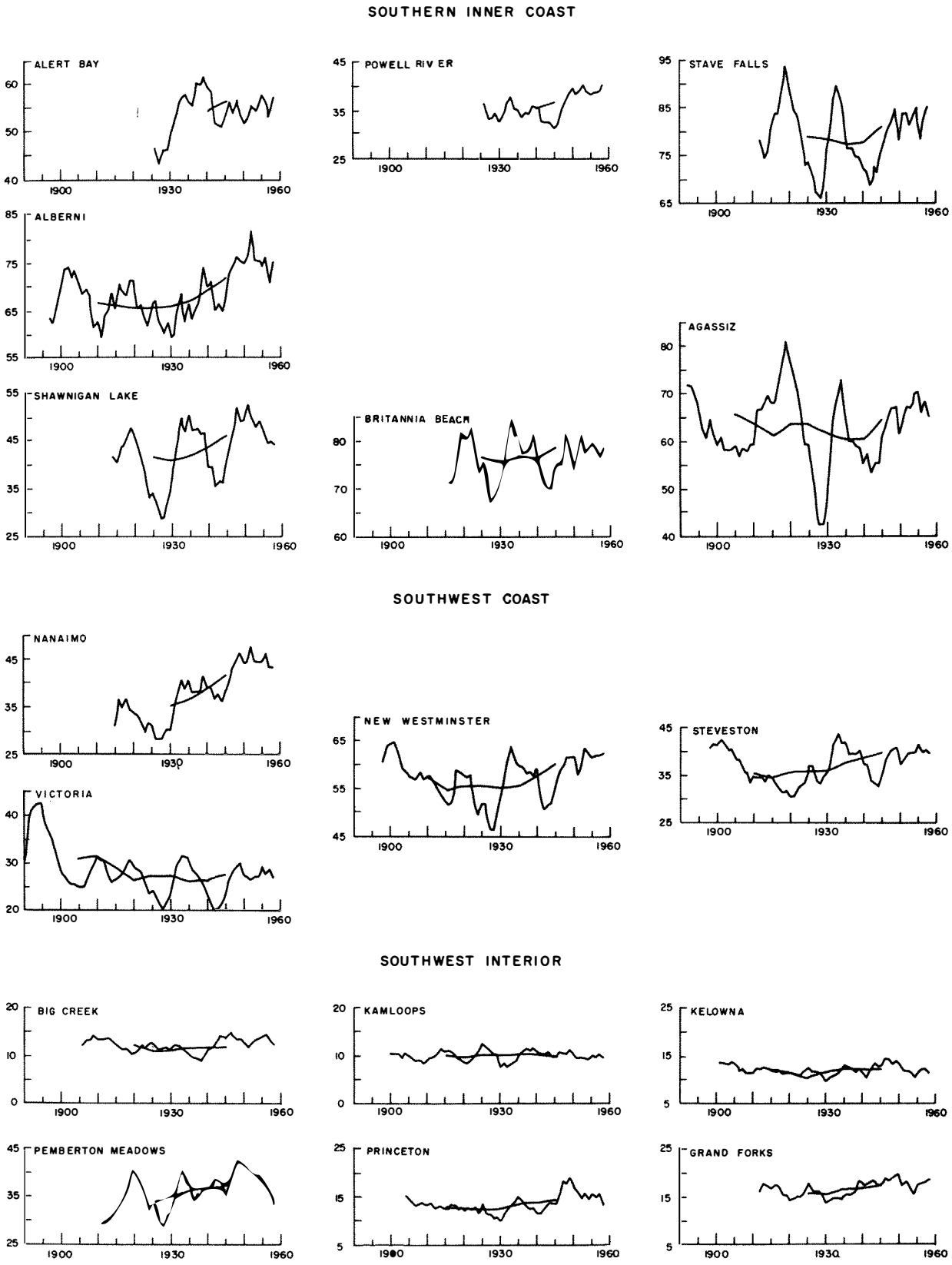



Fig. 7. (Cont'd) Five-year running means and 30-yr averages of annual precipitation (in.) for selected stations from 1890 to 1960.

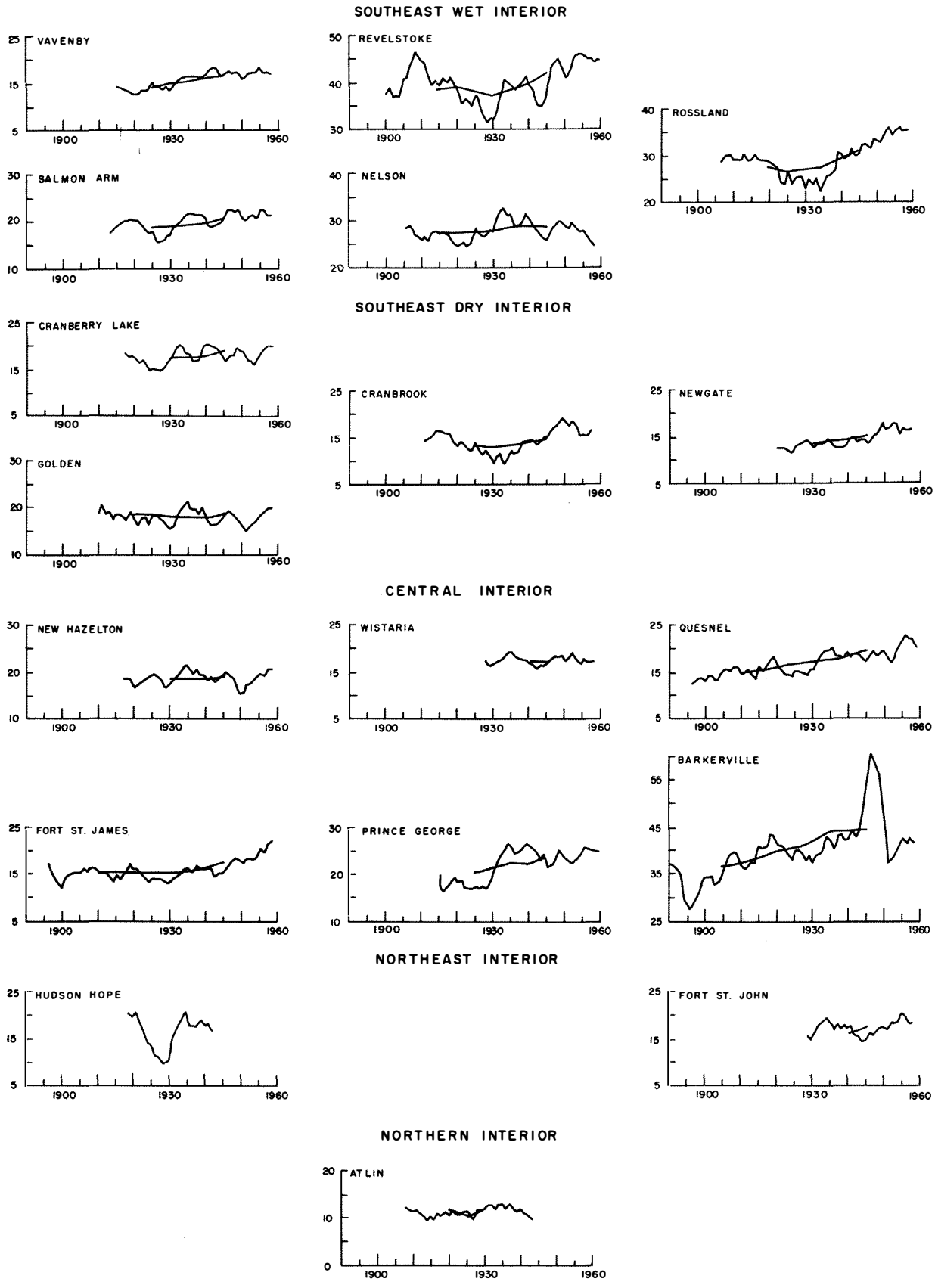



Fig. 7. (Cont'd) Five-year running means and 30-yr averages of annual precipitation (in.) for selected stations from 1890 to 1960.

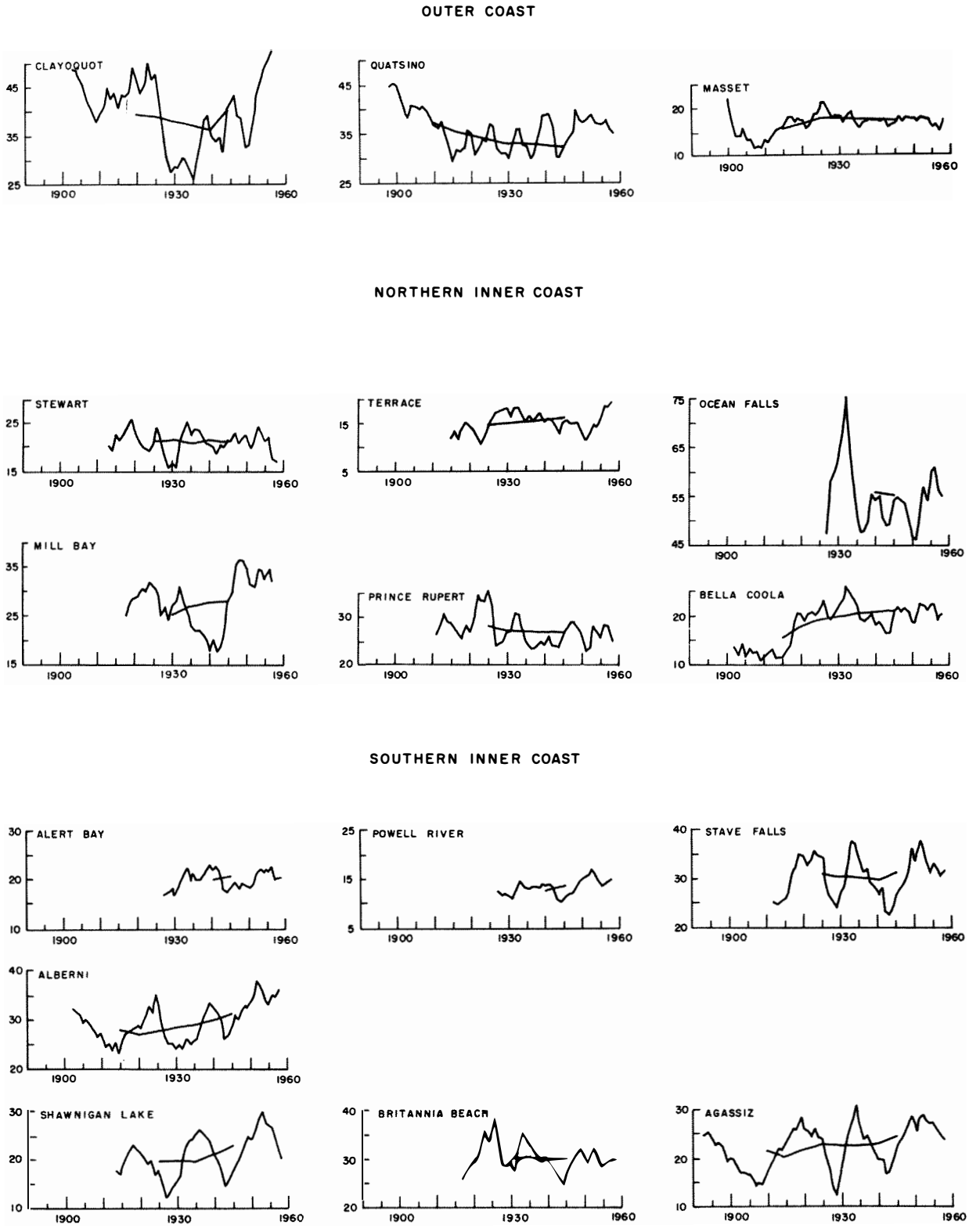



Fig. 8. Five-year running means and 30-yr averages of winter precipitation (in.) for selected stations from 1890 to 1960.

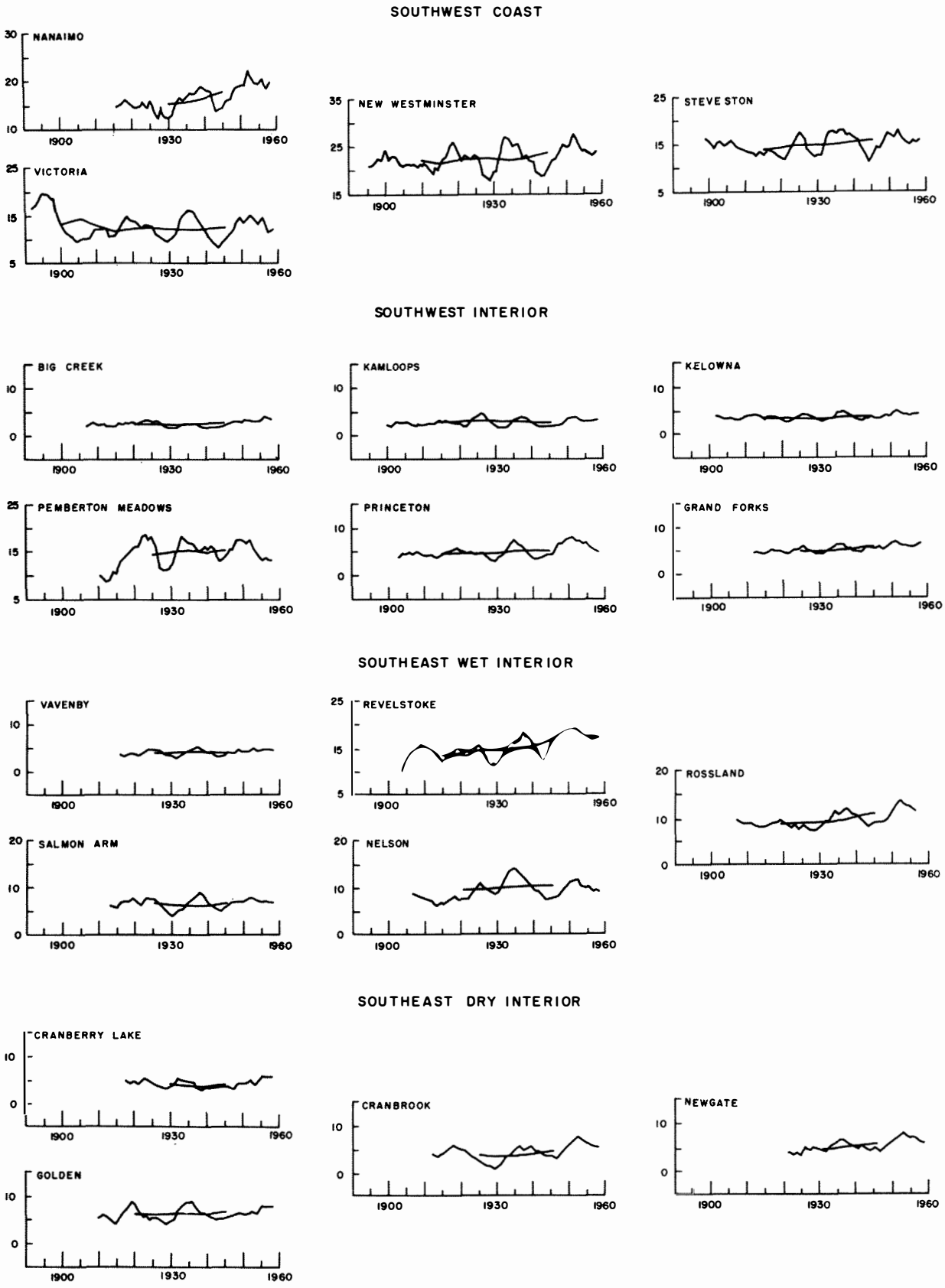



Fig. 8. (Cont'd) Five-year running means and 30-yr averages of winter precipitation (in.) for selected stations from 1890 to 1960.

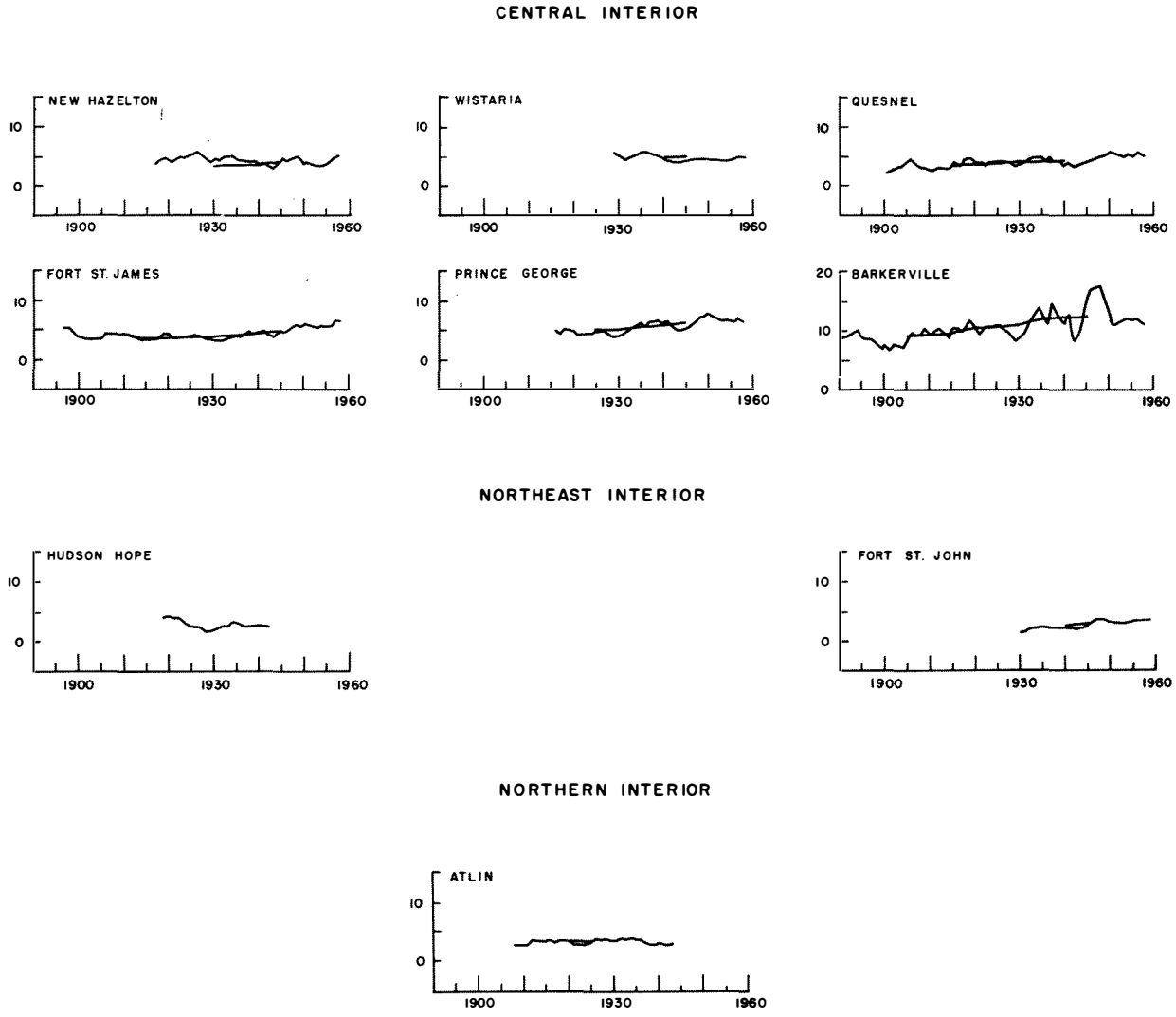



Fig. 8. (Cont'd) Five-year running means and 30-yr averages of winter precipitation (in.) for selected stations from 1890 to 1960.

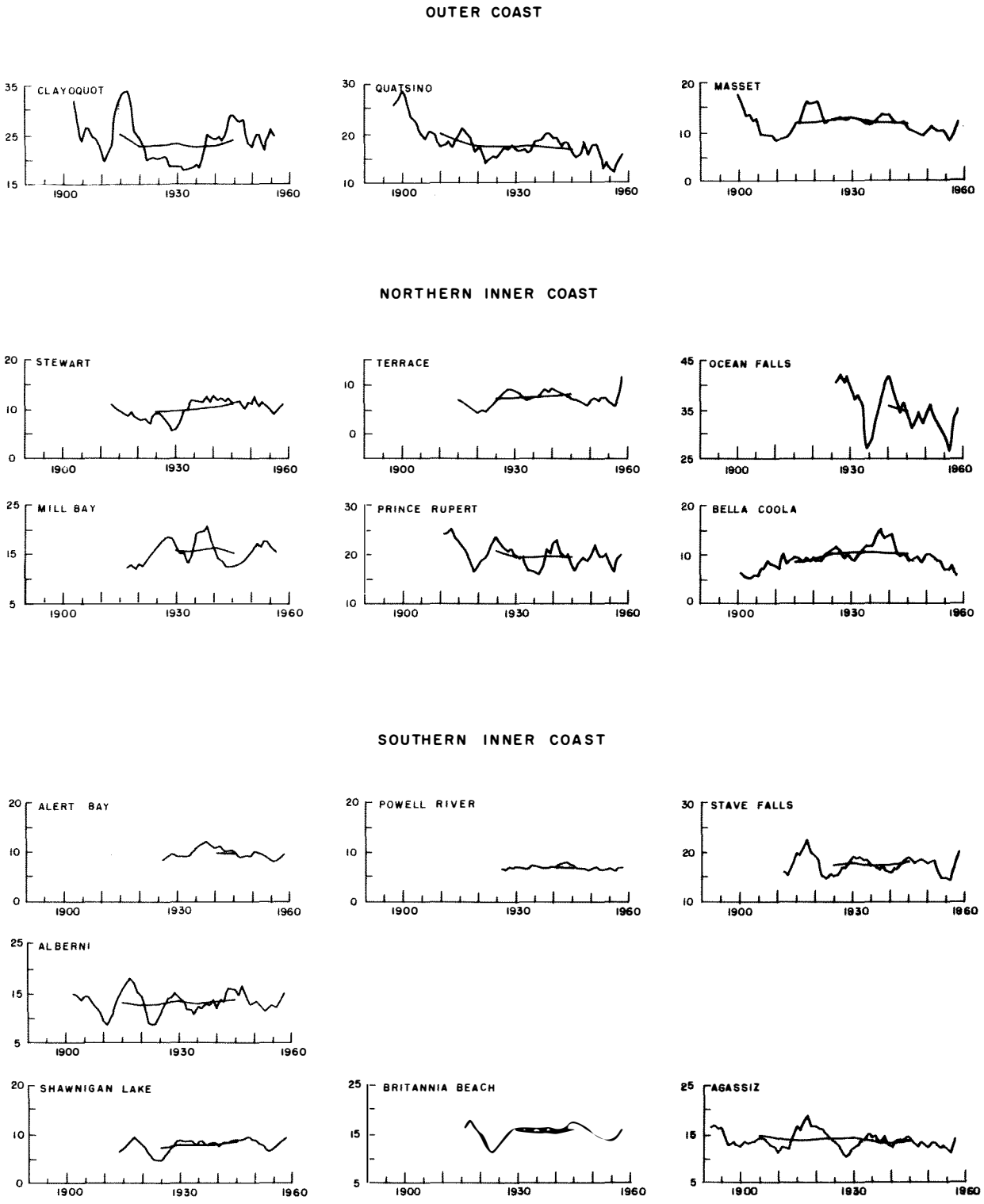



Fig. 9. Five-year running means and 30-yr averages of spring precipitation (in.) for selected stations from 1890 to 1960.

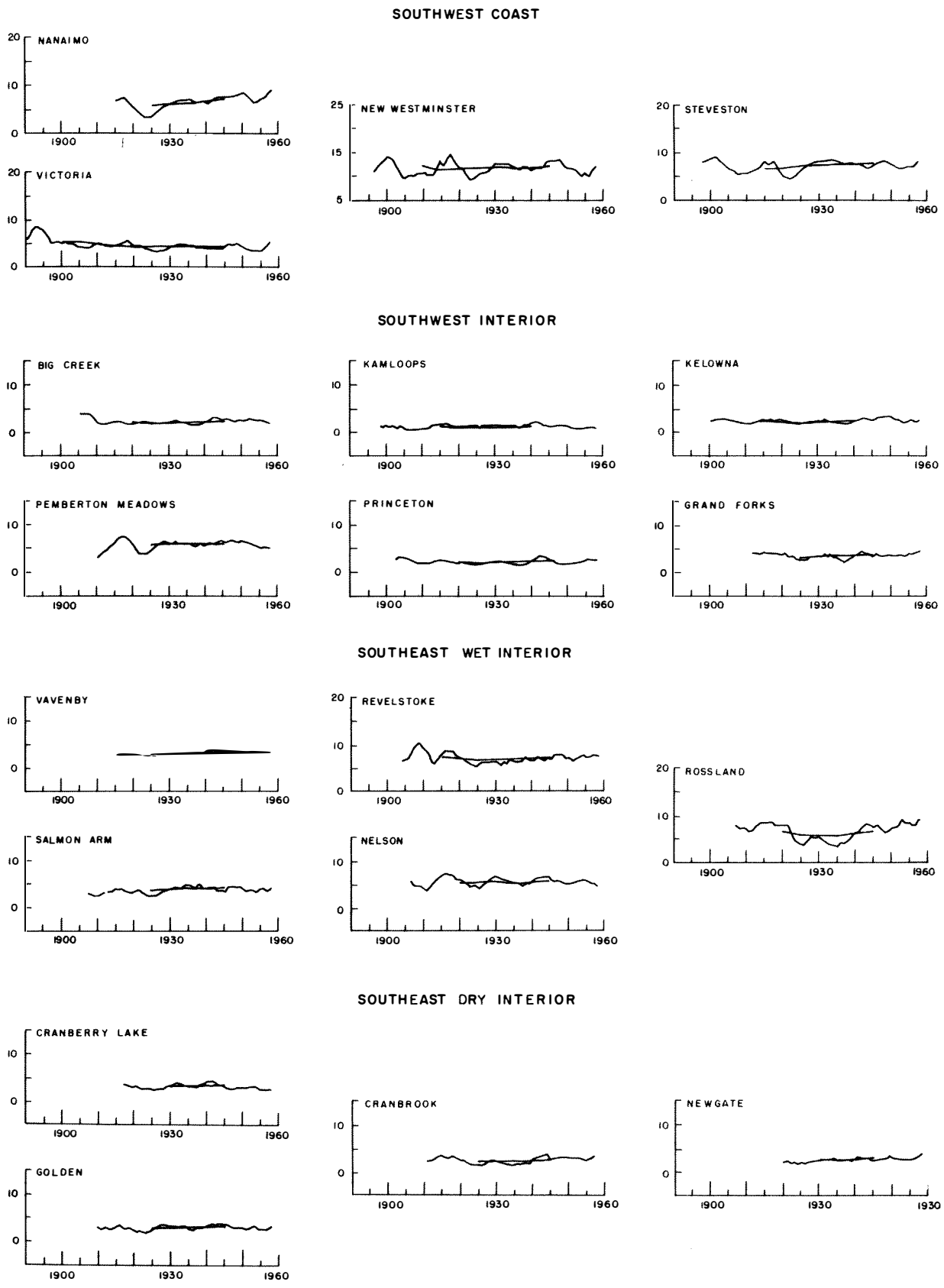



Fig. 9. (Cont'd) Five-year running means and 30-yr averages of spring precipitation (in.) for selected stations from 1890 to 1960.

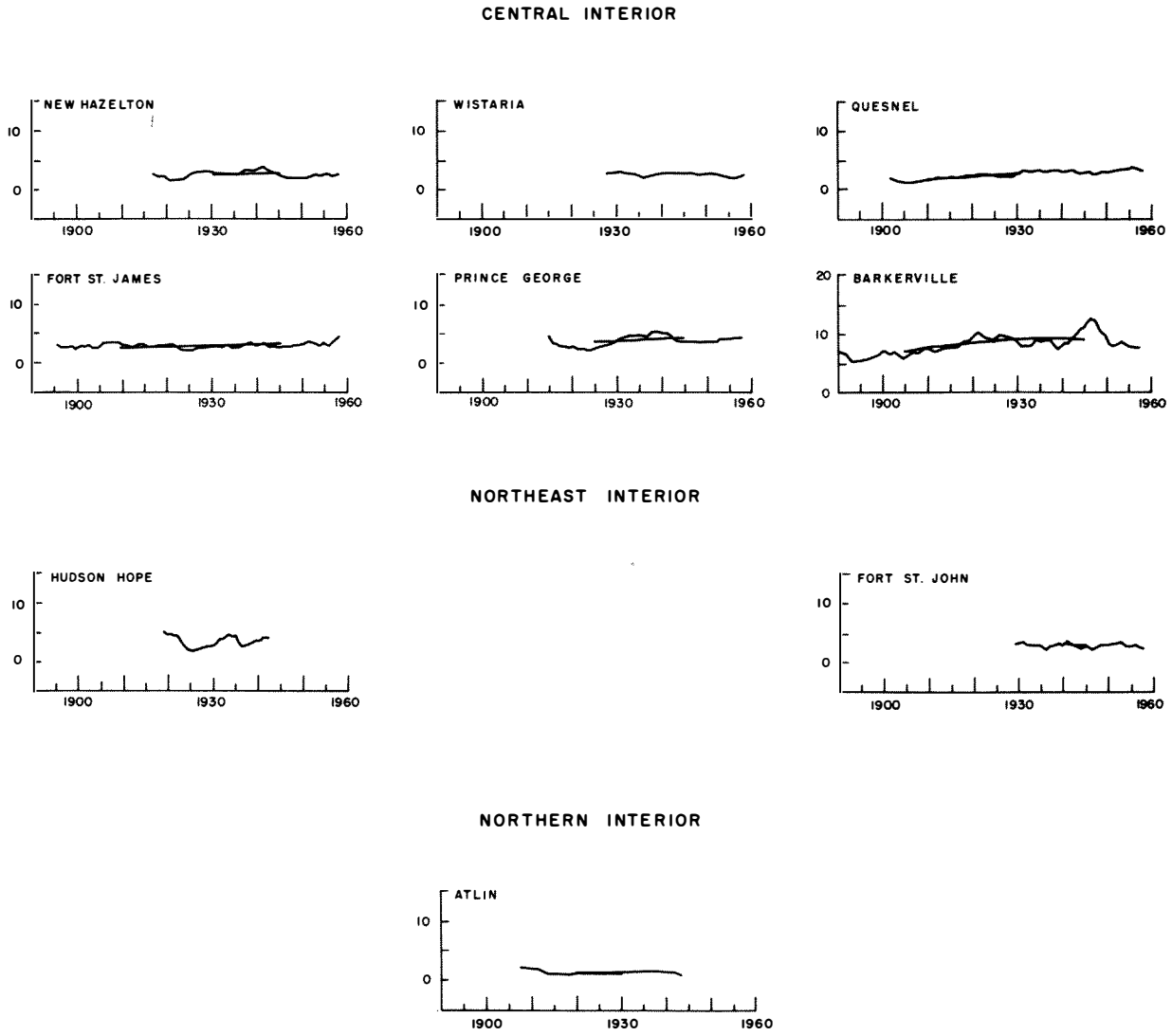



Fig. 9. (Cont'd) Five-year running means and 30-yr averages of spring precipitation (in.) for selected stations from 1890 to 1960.

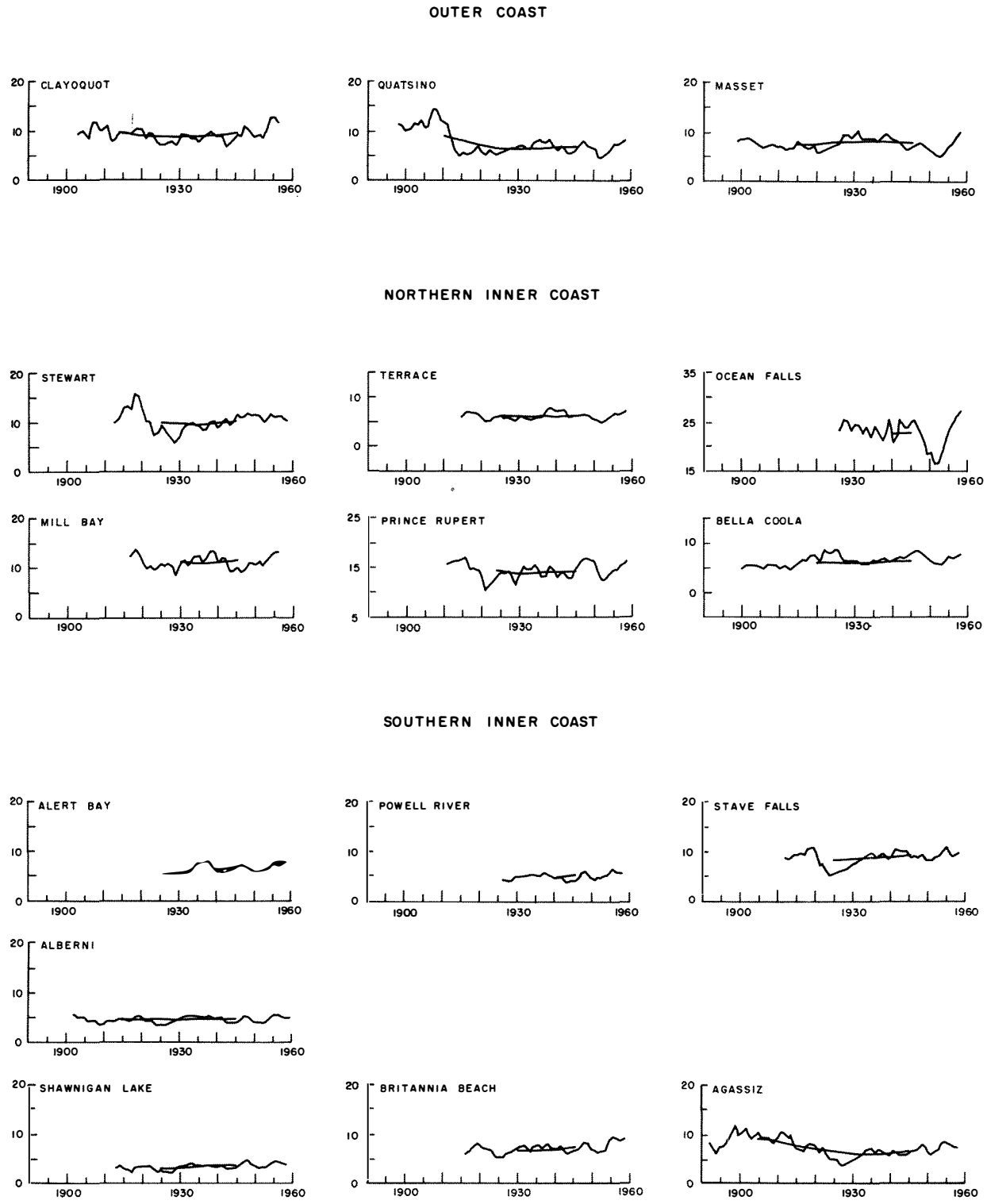



Fig. 10. Five-year running means and 30-yr averages of summer precipitation (in.) for selected stations from 1890 to 1960.

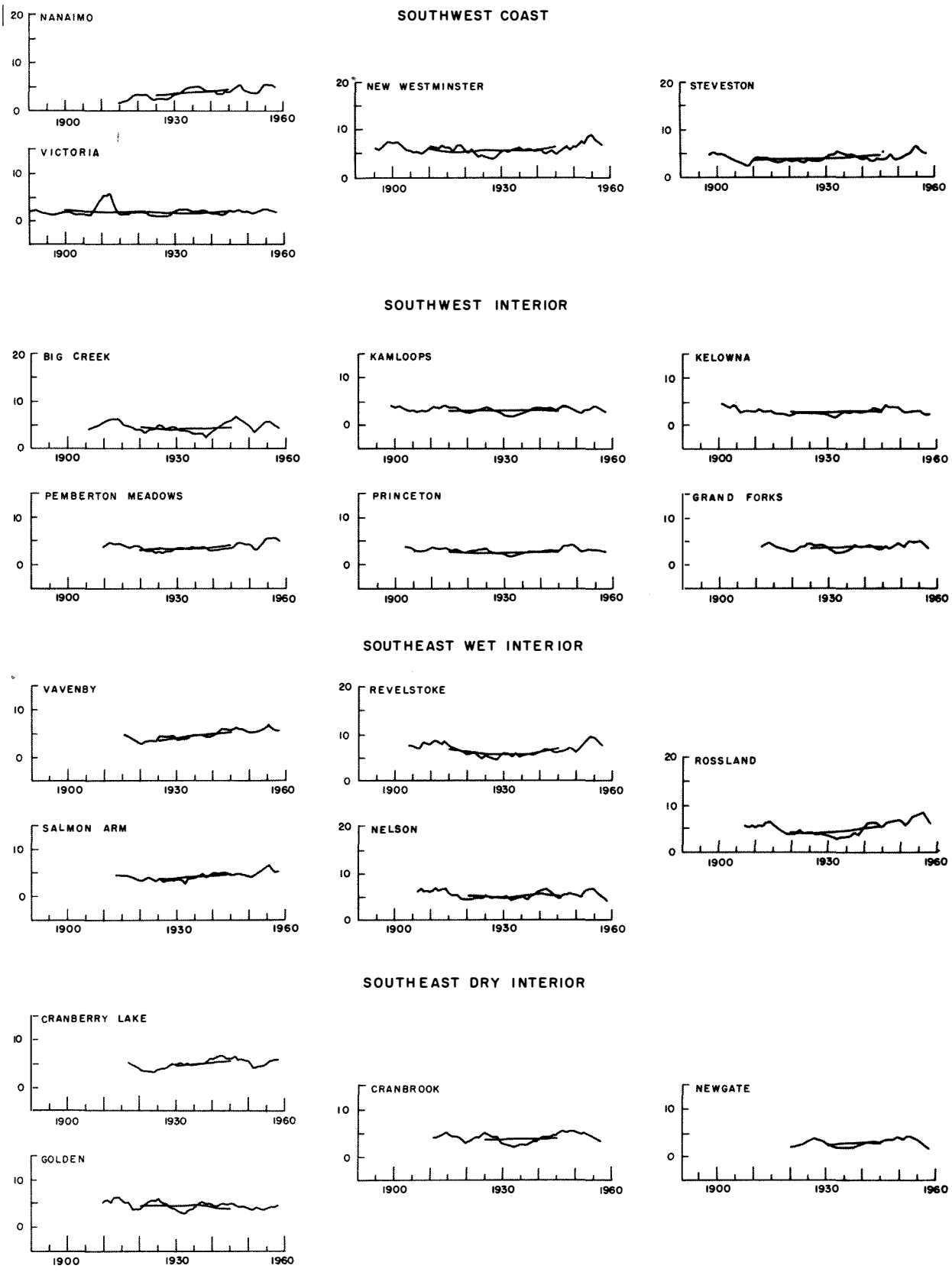



Fig. 10. (Cont'd) Five-year running means and 30-yr averages of summer precipitation (in.) for selected stations from 1890 to 1960.

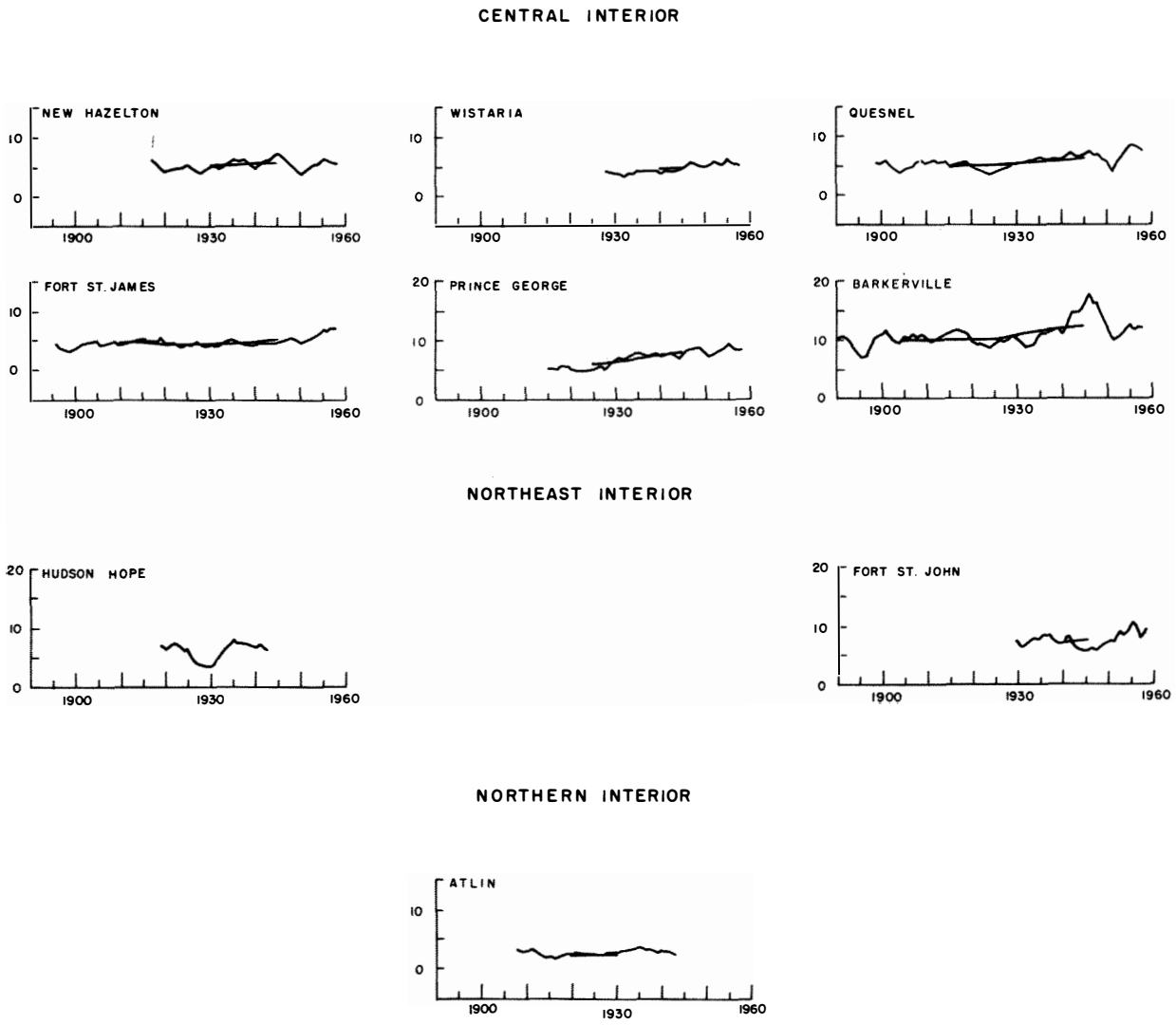



Fig. 10. (Cont'd) Five-year running means and 30-yr averages of summer precipitation (in.) for selected stations from 1890 to 1960.

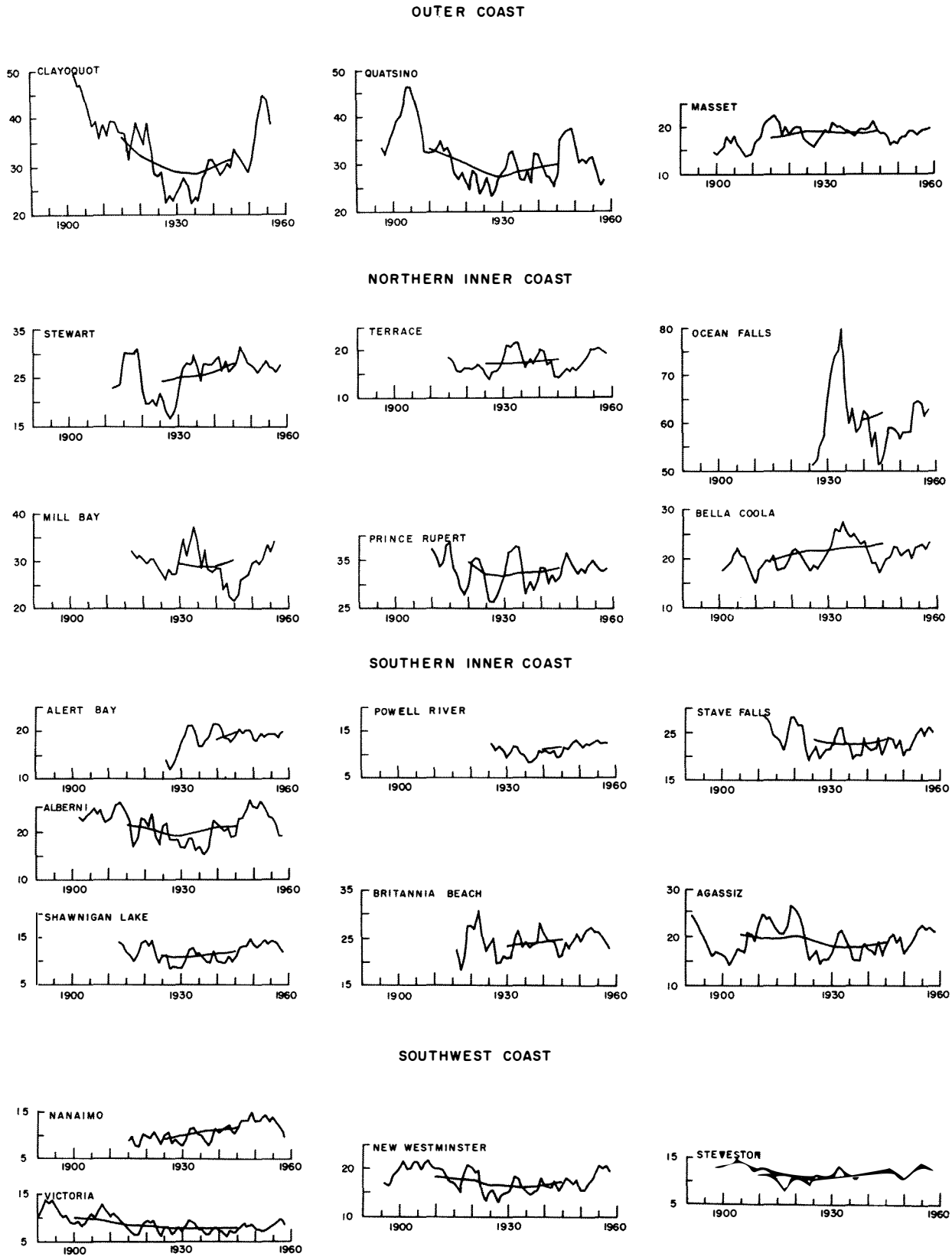



Fig. 11. Five-year running means and 30-yr averages of autumn precipitation (in.) for selected stations from 1890 to 1960.

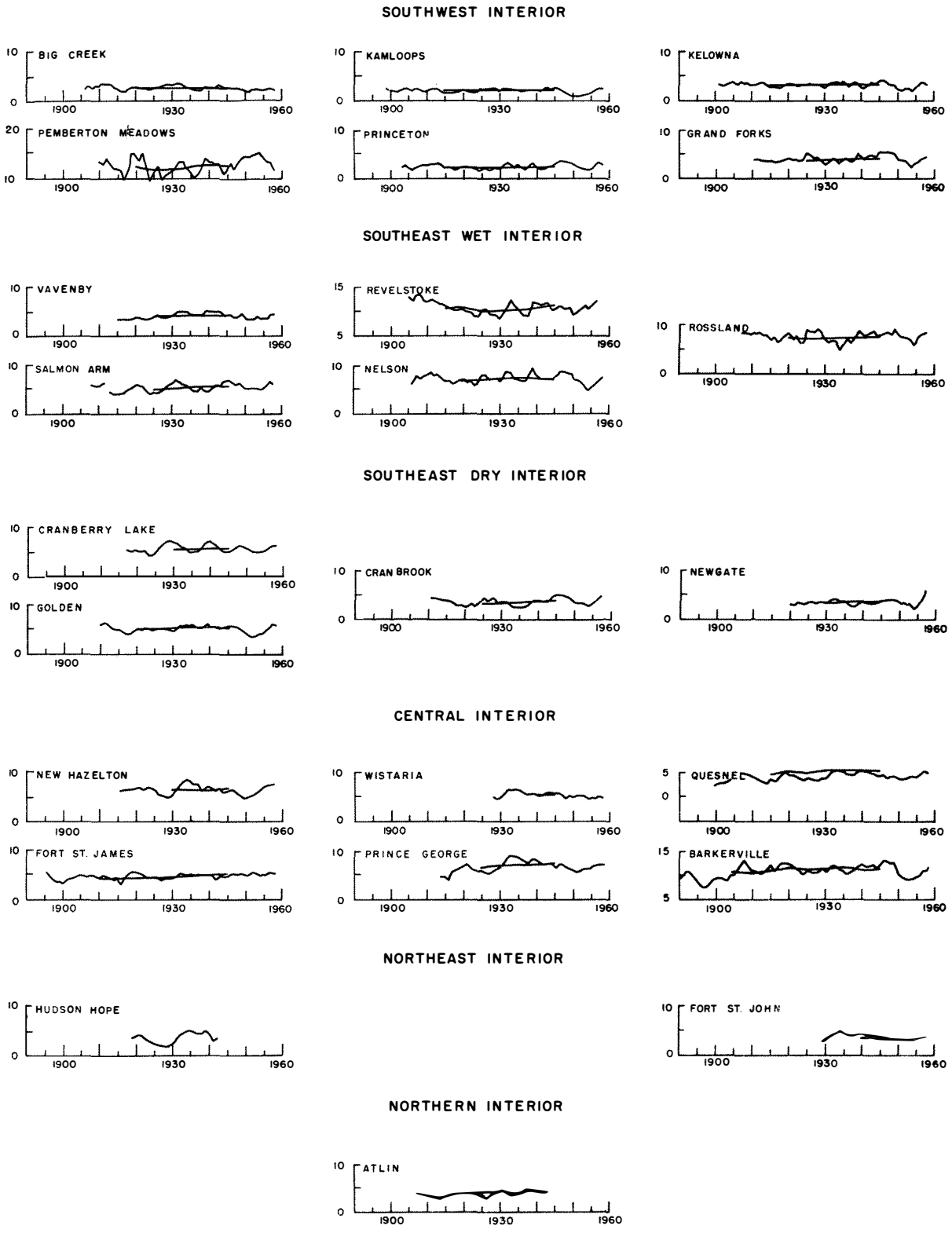



Fig. 11. (Cont'd) Five-year running means and 30-yr averages of autumn precipitation (in.) for selected stations from 1890 to 1960.