HISTORY OF WEATHER OBSERVATIONS
SANTA CRUZ, CALIFORNIA
1873-1948

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Prepared By
Glen Conner
9216 Holland Road
Scottsville, Kentucky

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ACKNOWLEDGEMENTS

Dedicated people recorded the climate of Santa Cruz for more than one hundred thirty-three years. There followed scores of people who later cleaned out their files but chose not to throw away those data, notes, photographs, and other materials that we now find so valuable. There are now scores of people who seek to preserve those documents and to identify their stations' histories. All of these people made this study possible and, to them, thank you.

Thanks to Joyce Strand for providing the Global Positioning System capability to determine latitude, longitude, and elevation of the observation sites.

Thanks to Cynthia Jahns, the Map Librarian in the Science & Engineering Library of the University of California at Santa Cruz. Without her help, the street name changes might not have been unraveled.

Perhaps someone will read this study when it is a hundred years old. If so, to you, thanks for continuing the thread of interest in climate history.

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HISTORY OF WEATHER OBSERVATIONS
Santa Cruz, California
1873–1948

Glen Conner
Kentucky State Climatologist Emeritus

INTRODUCTION

Santa Cruz was incorporated in 1866 about sixteen years after California was granted statehood. Growth had been slow since the Mission Santa Cruz was established in 1791 and only reached 8,746 by 1870. More rapid growth occurred in more recent times rising from 16,896 in 1940 to 54,593 in 2000. The city occupies an important location in the study of climate. It has been 134 years since A. L. Taylor made the first weather observations in what is now downtown Santa Cruz. The records that he and his successors maintained may help us understand the variations in climate witnessed by them.

Location

The County of Santa Cruz occupies a narrow strip between the Pacific Ocean and the crest of the Santa Cruz Mountains that parallel the coast about ten miles or so inland. The marine influence exerted by the onshore winds produces relatively uniform temperatures throughout the year.

Figure 1. The Pacific From Santa Cruz
Source: Author

Russell (1926) recognized a third division of the Mediterranean Climate that is usually divided into the cool summer and the hot summer types in California. The third type was a fog belt dominated by the Redwood and the California Laurel, trees that prefer cool and moist conditions. Precipitation in the Santa Cruz Mountains is moderate to heavy with seasonal rainfall reaching 60 inches in some areas (Tyler, 1976 and Elford, 1967).

Climate can differ over relatively small changes in distance from the ocean or in altitude above sea level. However, Santa Cruz weather observation sites have never moved more than two miles from the original site. It has produced one of the most consistent records as to its environment and its location.

Dr. C. L. Anderson wrote about Santa Cruz climate in 1879 (Elliott, 1879).

> Out-door life is practicable at all seasons and almost every day in the year. Oppressive heat is seldom felt, and nothing colder than a slight freeze during the coldest morning of winter.

He extolled Santa Cruz as having a near perfect climate. Weather records had been kept in Santa Cruz for only six year at the time of his writing but his opinion was accepted then and is still widely held.

Record

The first observations in Santa Cruz were made in 1873 as part of the Smithsonian Institution's climate network. The U.S. Army's Signal Service was created in 1871 by Congress to organize and operate a climate network. That network supplanted the Smithsonian one. It began with fifty-two weather stations but, by 1884, it received data from 458 weather stations, one of which was the ex-Smithsonian Voluntary Observer at Santa Cruz. In 1892, the station became part of the newly formed Weather Bureau that later morphed into the National Weather Service. Observations continue to made and the climate record is being extended year by year.

During the entire period of record, the growth of the town did not spawn the urbanization that would have contaminated the record with the heat that large cities generate. It represents an important location for studies of long-term climate variability.

Goal of the Study

The goal of this study was to document the weather observational history of Santa Cruz, California. The climatic data, and information from the observations made there, are readily available for the entire period of record. They may be accessed through the National Climatic Data Center, the Western Regional Climate Center, and the State Climatologist of California. The challenge of this study was to identify the role of Santa Cruz in the development of a federal weather observational program and where it fit in the route that followed from the Smithsonian Institution Observers, the Signal Service Observers, and the Weather Bureau meteorologists, to

the current National Weather Service Forecasters and their extensive observational and forecast network of today.

LOCATION OF OBSERVATIONS

The consistency of the location of observation sites in Santa Cruz during the 134 years since the first records began is remarkable. In addition, only the location of the first year of observations is known imprecisely. More remarkable is that for the period 1931 through 2006, the station only occupied three locations, all within less than two blocks of each other.

Latitude, Longitude, and Elevation

Table 1. Latitude and Longitude of Station Locations

Location	Period	Latitude	Longitude	Elevation
Taylor's Home	1 Jan 1873–31 Jan 1874	37˚ N	122˚ W'	25 Ft MSL
Pacific Ocean House*	1 Feb 1874–31 Aug 1878	36˚ 58' N	122˚ 01' W	125 Ft MSL
Springer Home**	1 Sep 1878–Mar 1890	36˚ 57' N	122˚ 01' W	20 Ft MSL
Springer Home***	1 Apr 1890–31 Oct 1931	36˚ 57' N	122˚ 01' W	20 Ft MSL
Burton Home	1 Nov 1931–31 Jul 1947	36˚ 59' N	122˚ 01' W	125 Ft MSL
House Home	1 Aug 1947–31 Aug 1950	36˚ 58' N	122˚ 01' W	125 Ft MSL
Burton Home	1 Sep 1950–31 Jul 1976	36˚ 59' N	122˚ 01' W	125 Ft MSL
MacDonald Home	1 Aug 1976–present	36˚ 59' N	122˚ 01' W	130 Ft MSL

* Location approximate, measured by author
** No extant daily data, monthly data only. Longitude listed incorrectly in some sources as 122˚ 02' W
*** Daily data

Street Addresses

Table 2. Street Addresses of Observation Sites

Location	Period	Street Address
Taylor's Home	1 Jan 1873–31 Jan 1874	Unknown*
Pacific Ocean House	1 Feb 1874–31 Aug 1878	Pacific Ave
Springer Home	1 Sep 1878–Mar 1890	87 Garfield St
Springer Home	1 Apr 1890–31 Oct 1931	87 Garfield St
Burton Home	1 Nov 1931–31 Jul 1947	74 McIntyre Rd
House Home	1 Aug 1947–31 Aug 1950	155 Fairland Way
Burton Home	1 Sep 1950–31 Jul 1976	1187 Prospect Heights**
MacDonald Home	1 Aug 1976–present	1103 Prospect Heights

* Presumed to be on Pacific Avenue near the Pacific Ocean House location
** Renumbered house, not a new location

Weather data were published frequently in the Santa Cruz Surf newspaper without attribution of the observer or the location. There was an article on crops and weather on 29 May 1858 and one about temperatures on 29 January 1859. An article on 6 July 1860 mentioned data collected by Colbert A. Canfield who was the observer in Monterey. That may mean that the earlier and subsequent data that were not attributed in the Surf came from him as well.

Observation Sites

Smithsonian Institution Sites
1 Jan 1873–Jan 1874

The first extant records were made at 37˚ N and 122˚ W. The elevation for the first month was entered as 15 feet MSL but thereafter was entered as 25 ft MSL However, whether that represents a move or an error was not identified. The rounded degrees appear to have located it in what was then the downtown area.

Feb 1874–Sep 1874

The new observer in February 1878 may have been near or at the original site. This second location was well documented. It was at the Pacific Ocean House, a luxury hotel built in 1865. In 1879, it was advertised as having two lines of streetcars passing every 15 minutes for the beach. The hotel (Figure 2) grew and eventually had a theater, ballroom, banquet hall, roller skating rink, bar, billiard hall, bathhouse, tennis courts and croquet grounds.

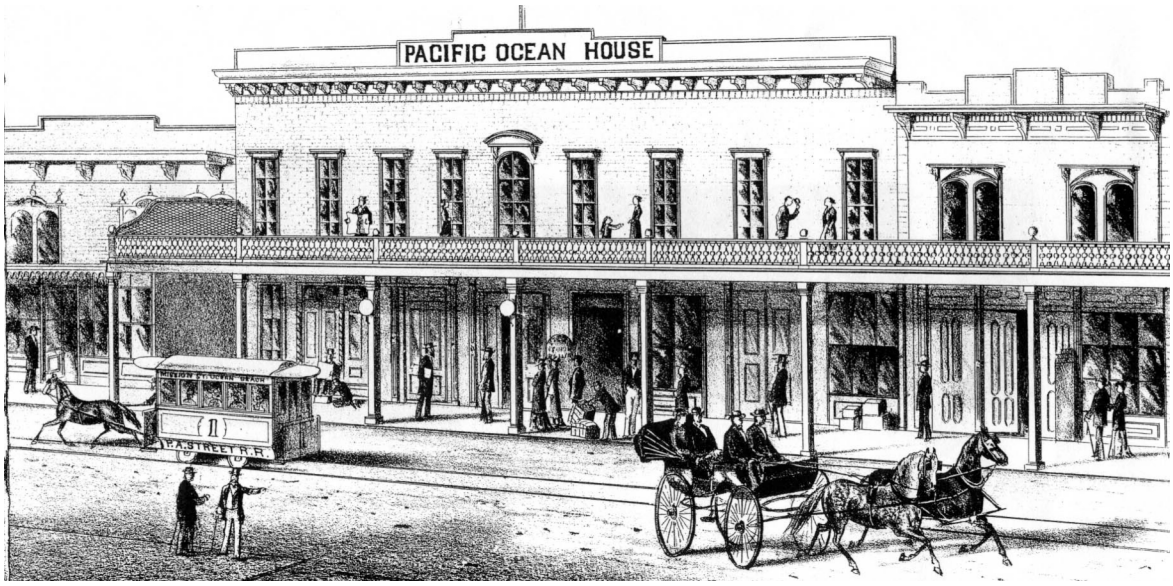

Figure 2. Pacific Ocean House
Source: Elliott, 1879

The observer owned the Pacific Ocean House (Figure 3) at a time when it had 100 rooms.

Figure 3. Pacific Ocean House, Santa Cruz
Source: Library of Congress Photograph Collection, # LC-USZ62-27641

The Pacific Ocean House was located on the west side of Pacific Avenue[1] just south of the intersection with Front in the heart of Santa Cruz (Figure 4).

[1] The avenue then was first called Willow Street but was changed to Pacific Ave in 1866.

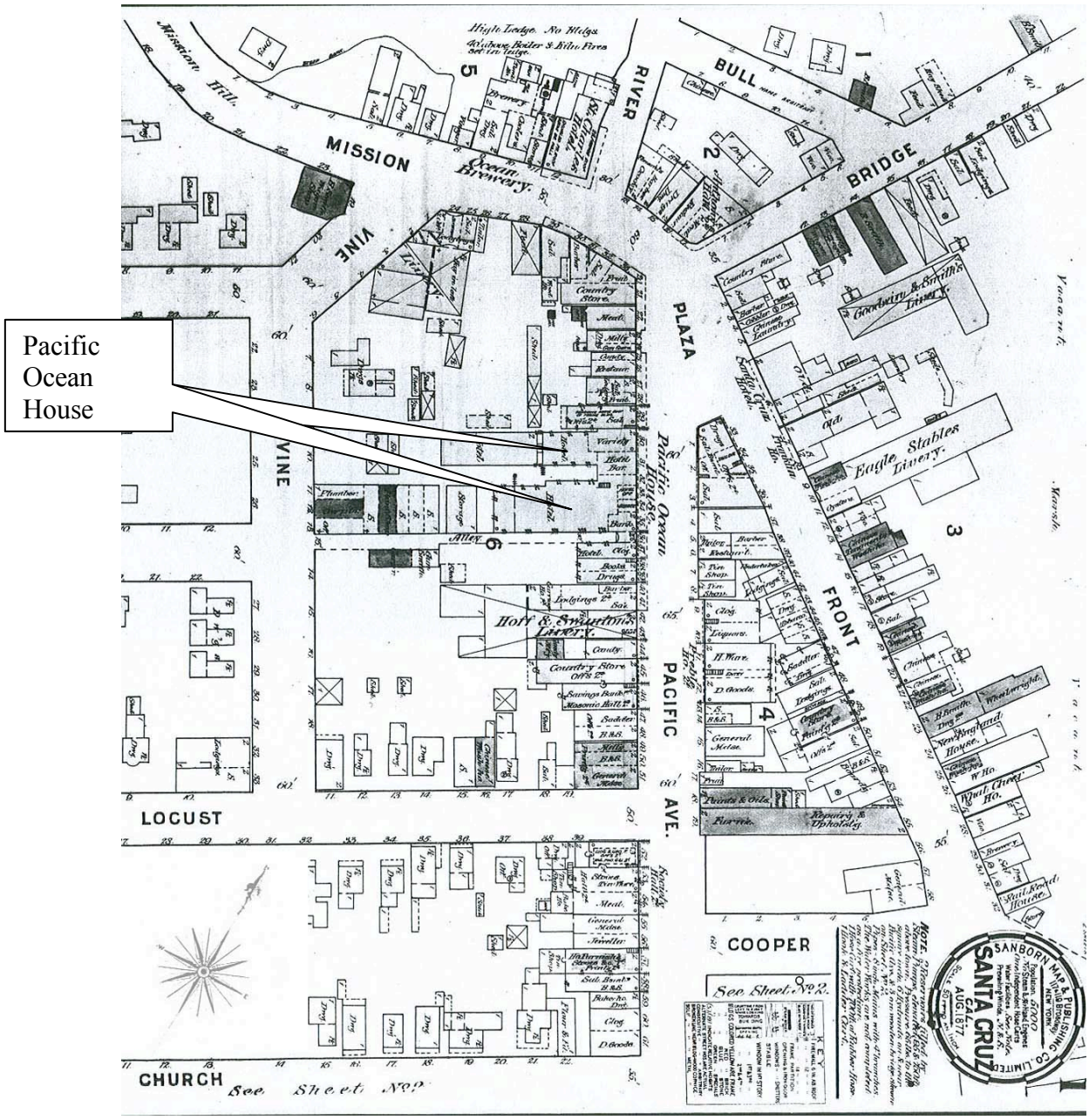

Figure 4. Pacific Ocean House Location
Source: Sanborn Map of Santa Cruz , 1877

Signal Service Sites

Oct 1874–Aug 1878

In October 1874, the site joined the network operated by the U.S. Army's Signal Service. They had inherited the Smithsonian Institution's observations network. The Santa Cruz site became one of those former Smithsonian sites that provided monthly reports. The location of the observations was unchanged.

Sep 1878–May 1890

There are no extant observer daily records from the period September 1878 through May 1890. Fire may have destroyed them in March 1906 according to the Substation History Form 530 (Appendix 1) prepared in 1956. The monthly total precipitation for the period 1878–1931 (Appendix 2) were recorded at the same address as those extant observational records in June 1890 described in the following paragraph.

Jun 1890–May 1891

The earliest extant observational record after the gap was for June 1890. It was from a site at 87 Garfield Street at the intersection of Garfield and Dakota across the San Lorenzo River from the Pacific Ocean House location. The geographic grid location was 36˚ 57' N and 122˚ 02' W at an elevation of 20 feet MSL. The observations were taken in the backyard (Figure 5) of the observer's residence.

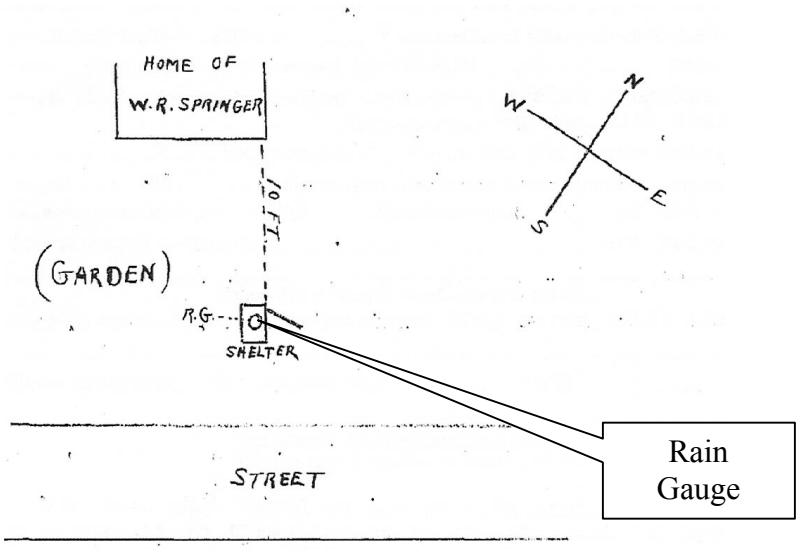

Figure 5. Diagram of the Springer Observation Site, 1917
Source: National Climatic Data Center

The Description of Cooperative Observer's Station and Instruments dated 10 September 1917 had an entry that is confusing. "Station is at 87 Garfield Street; Santa Cruz river, a small stream, is ¼ mile north; Monterey Bay is immediately south." The river seems to have been the Branciforte Creek on the Sanborn map of that same year (Figure 6) and it was south of the

station, not north of it. The "immediately south" was true only in a general context, the Substation History in 1956 listed it as being about 1 mile south.

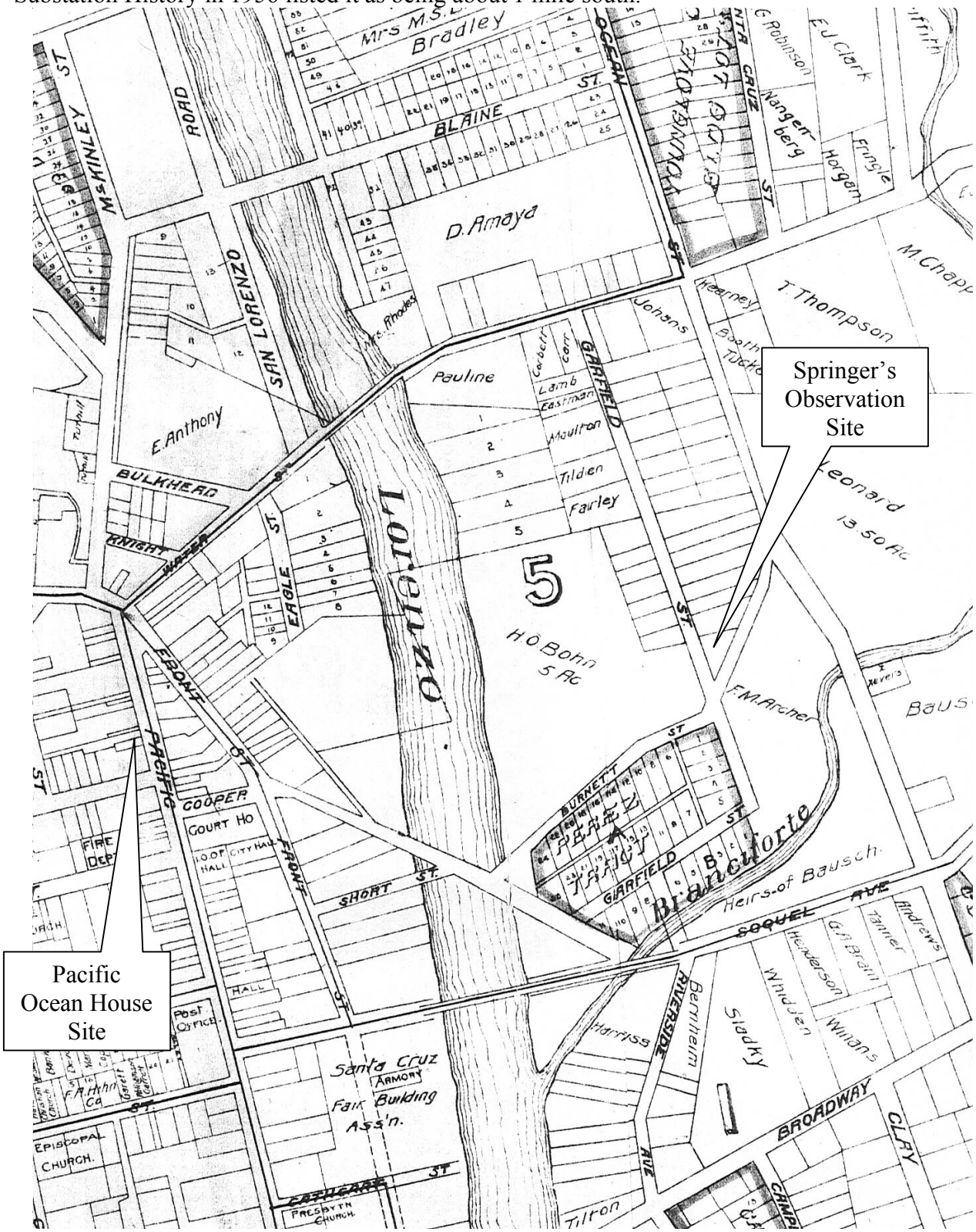

Figure 6. Springer's Observational Site on Garfield Street
Source: Adapted from Sanborn Map of Santa Cruz, 1917

Weather Bureau Sites

The Signal Service observational network was absorbed by the newly created Weather Bureau in October 1890. There was no change in location or observer at Santa Cruz.

Jun 1891–Oct 1931

The station continued at the same location through October 1931 but as a Weather Bureau Cooperative Observer site.

Nov 1931–Jul 1947

The station was relocated about two miles north of the previous location and began observations in November 1931. The residence of the observer was at 74 McIntyre Road at 36˚ 55' N and 122˚ 01' W at an elevation of 125 feet MSL according to the Inspection of Substation dated 25 March 1941. The land sloped away from northwest toward the southeast. Observations were taken in the backyard (Figure 7) of the residence.

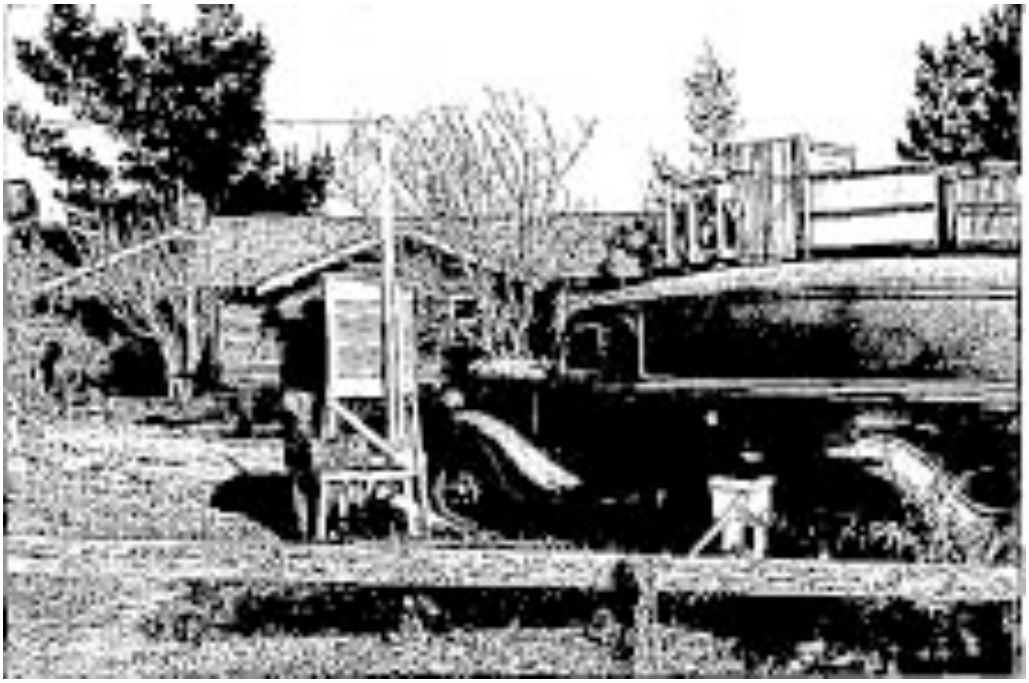

Figure 7. Burton's Observation Site 1941
Source: National Climatic Data Center

The observations were made at the Burton residence for sixteen years until August 1947 when a new observer assumed the responsibilities of recording the weather in Santa Cruz.

Aug 1947-August 1950

The station was relocated and began reporting in August 1947 from 155 Fairland Way at 36˚ 58' N and 122˚ 01' W at an elevation of 125 feet MSL according to the Report of Substation dated 11 January 1949. However, the move was one of only 300 feet from the previous location. The new observation site at 155 Fairland (Figure 8) described in the Report on Substation on 11 January 1949 was active though August 1950.

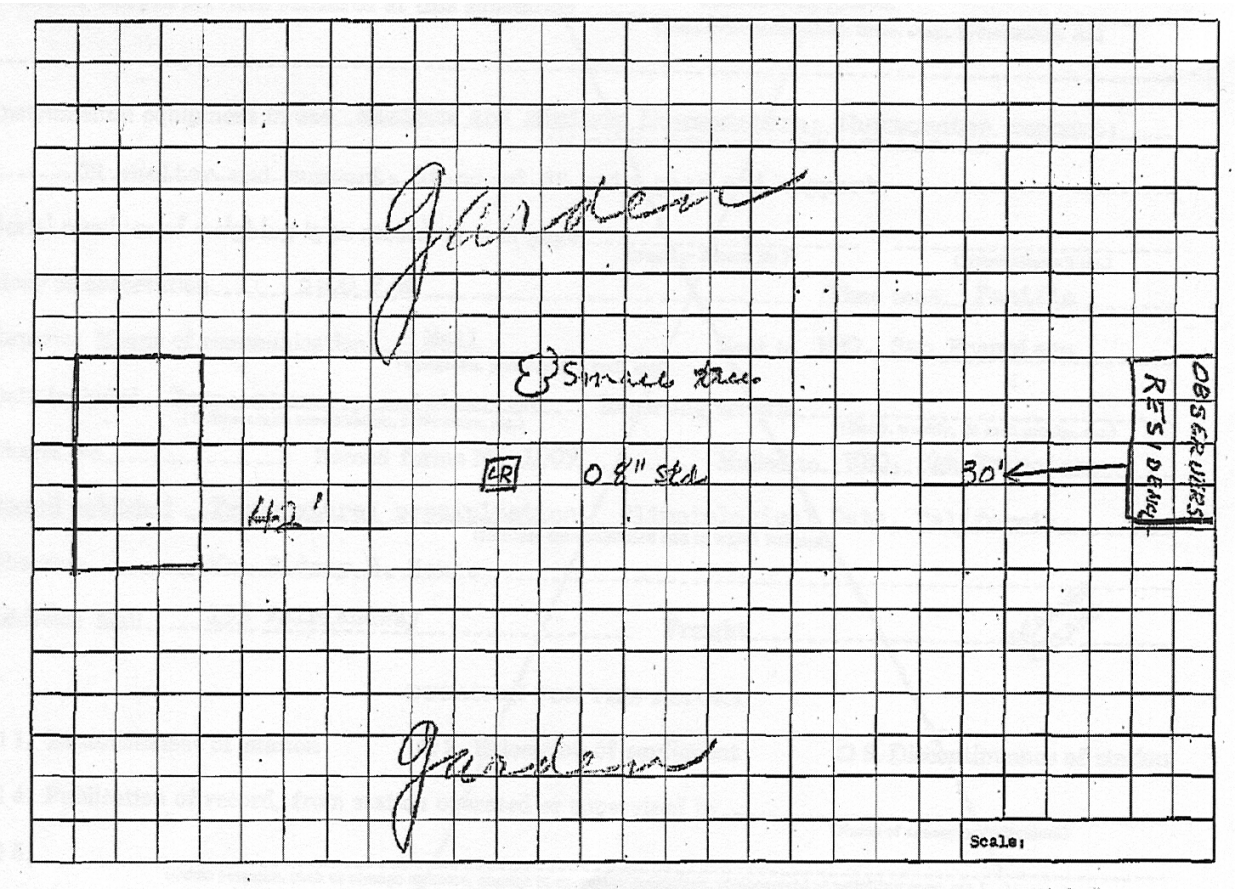

Figure 8. House's Observation Site, 1949
Source: National Climatic Data Center

Sep 1950–Jul 1976

In September 1950, the station was moved back to the location it occupied from 1931-1947, the Burton residence—a move of 300 feet. There had been a change during its short absence and before its return. The address of the Burton residence had changed to 1187 Prospect Heights rather than 74 McIntyre. The Burton residence had not moved, rather the street name

McIntyre (Figure 9) had been replaced by the name Prospect Heights. The application of the name Prospect Heights was extended eastward over what had been McIntyre and the house was renumbered accordingly.

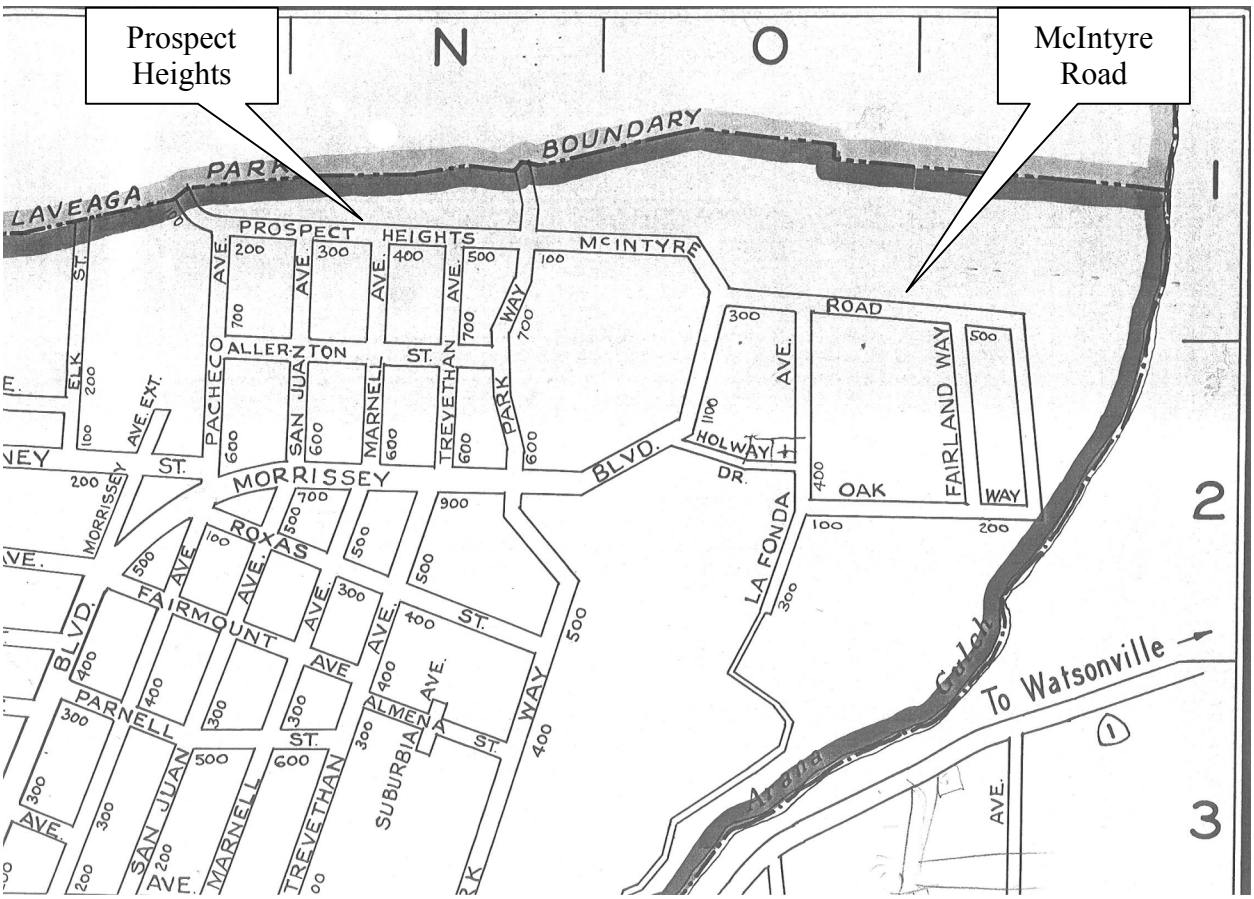

Figure 9. Prospect Heights and McIntyre Streets
Source: Adapted from Thomas Brothers Map of Santa Cruz, 1947

When the site was reestablished, the Weather Bureau re-accomplished the Report on Substation on 31 January 1951. That form included a detailed drawing (Figure 10) of the observation site. Although the study period for this paper ends with 1948, the drawing is included here because the location was the same as it had been since 1931.

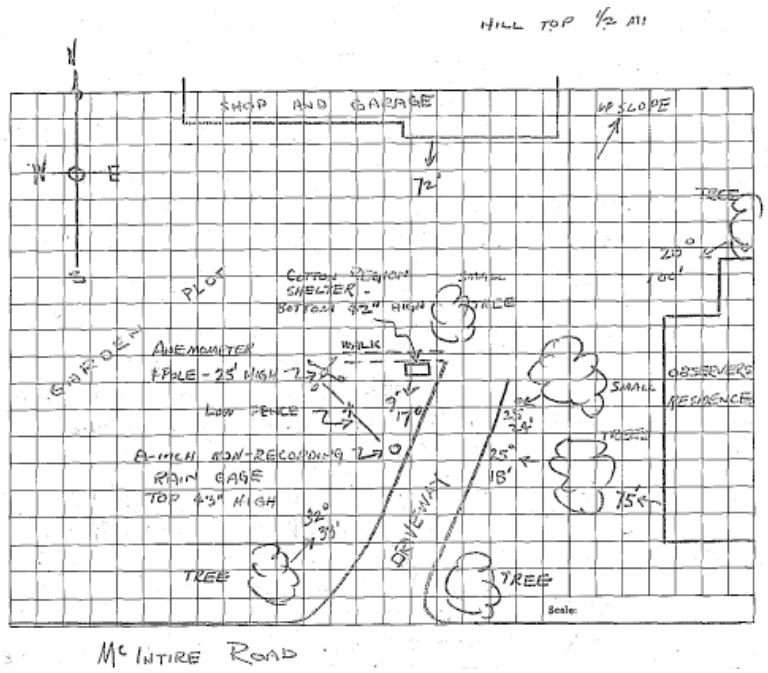

Figure 10. Burton's Observation Site ,1951
Source: National Climatic Data Cent

The form was revised and simplified on 14 July 1961 (Figure 11).

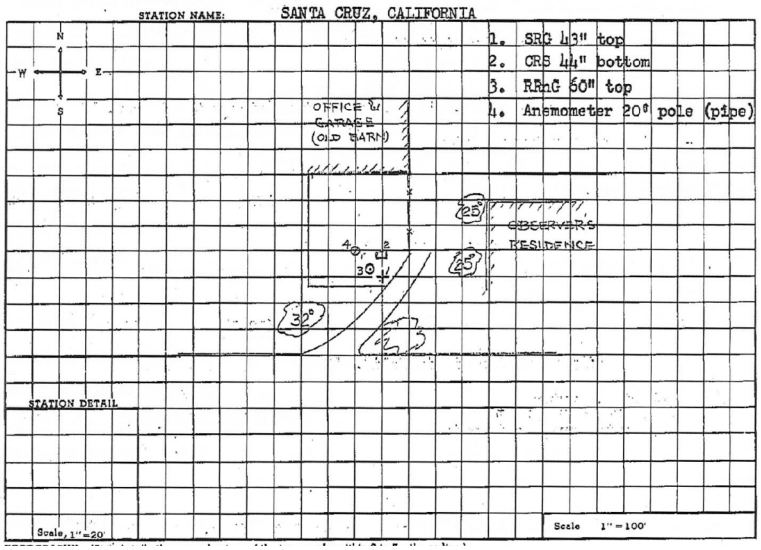

Figure 11. Burton's Observation Site, 1961
Source: National Climatic Data Center

Aug 1976 to date

The Burton site was relocated to 1103 Prospect Heights, a move of only about 150 feet. The new site was at 36˚ 59' N and 122˚ 01' W at an elevation of 30 feet MSL. It remains there to date at the corner of Prospect Heights and Miramonte Drive. Figure 12 shows the observation site layout on 15 July 1976 as described on the Report of Substation dated 15 July 1976.

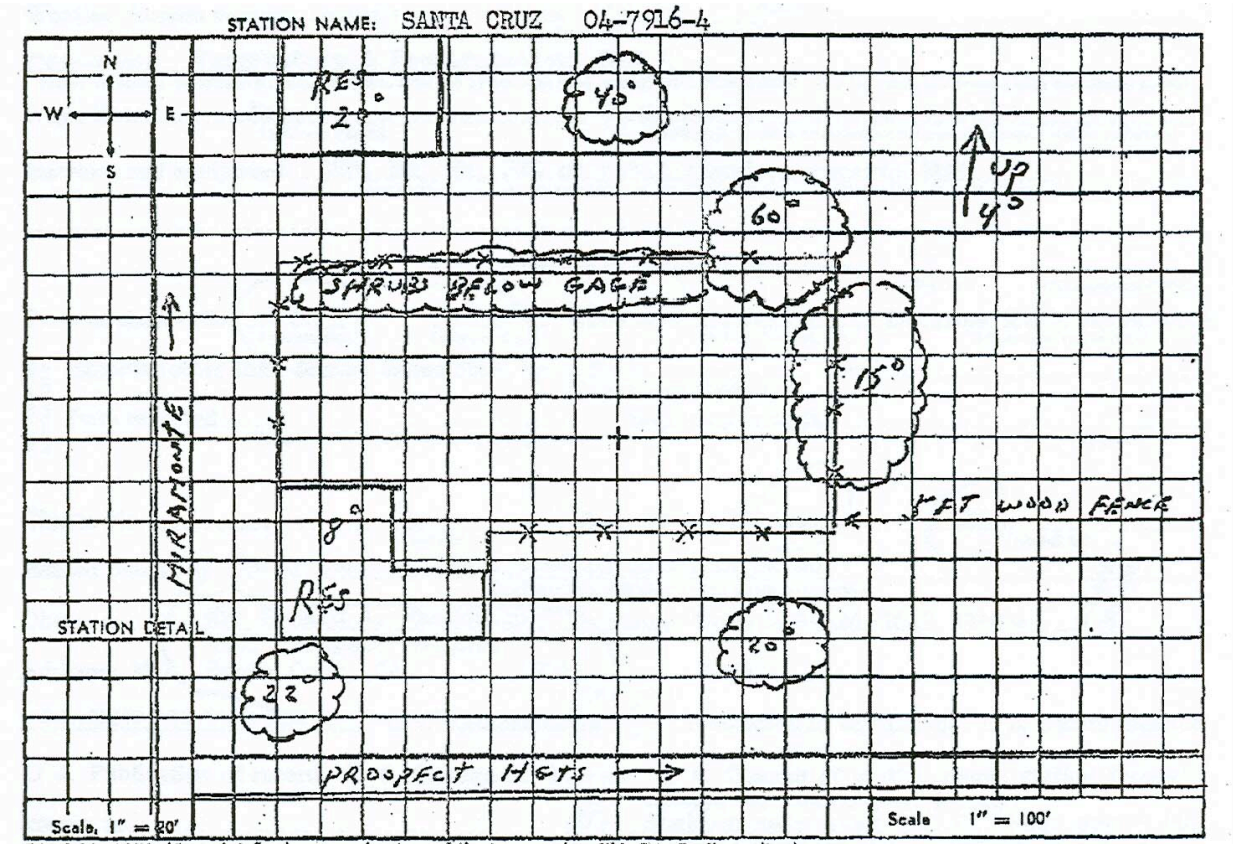

Figure 12. MacDonald Observation Site, 1976
Source: National Climatic Data Center

The last three observation sites were clustered as shown in Figure 13, a cluster representing a remarkable 76 years period at essentially the same location.

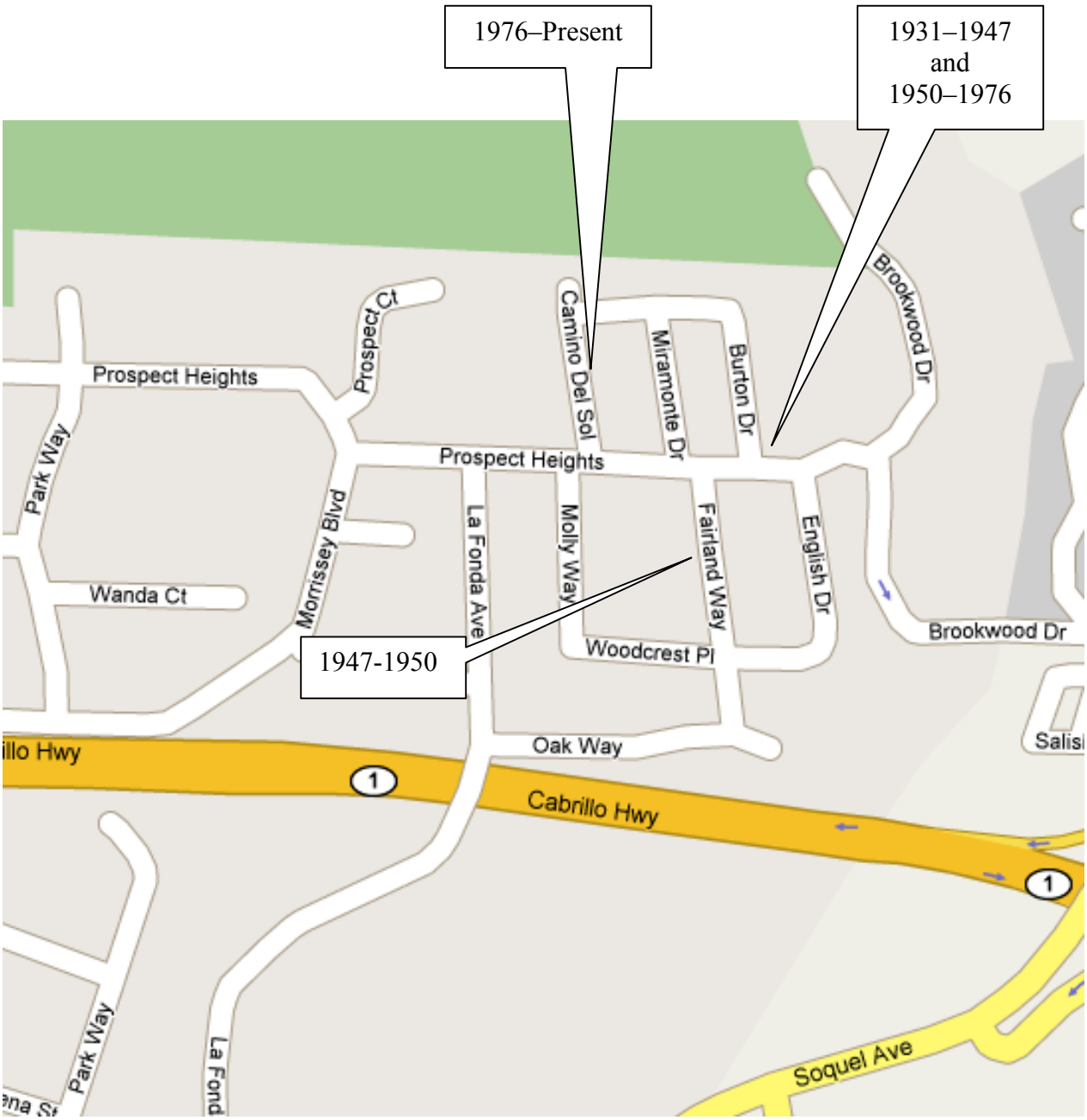

Figure 13. Observation Sites 1931–Present
Source: Adapted from Google Maps

SANTA CRUZ INSTRUMENTATION

Thermometer

The first temperature measurements for the Smithsonian Institution were made by a thermometer three times per day in January 1873. The type of thermometer was not recorded.

In October 1874, temperature reports were submitted to the Signal Service using maximum and minimum thermometers. The exact instrument type was not recorded but the standards of that day were made by J. M. Green and may have resembled the ones shown in Figure 14.

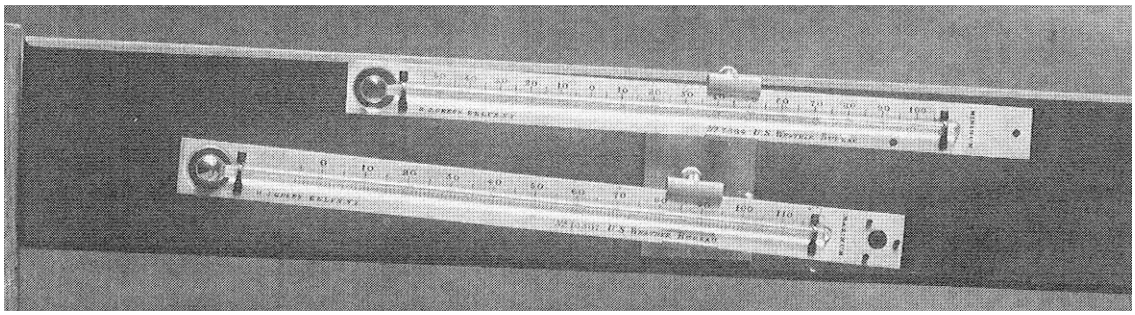

Figure 14. Green Maximum and Minimum Thermometers on a Townsend Mount
Source: National Archives and Records Administration

The Green Maximum Thermometer had a small constriction just above the bulb that broke the column of mercury as it contracted from cooling. The column remained at its highest point until it was forced through the constriction by spinning the thermometer.

The Green Minimum Thermometer had alcohol instead of mercury. Within the column of alcohol was a glass index. As the column shrank with cooling, it dragged the index downward with it. When the temperature rose, the alcohol flowed around the index leaving it at its lowest point. It was reset each day by tilting the thermometer downward toward its top, until the index slid to the top of the column.

An inspection dated 7 February 1906 reported the use of self-registering thermometers. That term referred to what was described in 1917 as the standard maximum and minimum thermometers.

The standard maximum and minimum thermometers were in still in use during a 1931 inspection.

The 1939 inspection reported that a "1.5˚ separation removed from minimum." The maximum thermometer was broken during the inspection and replaced by a new one.

The new location had maximum and minimum thermometers in 1949.

Barometer

The first barometer readings were included in the inspection report of October 1876. The type of barometer was an aneroid and its manufacturer was not recorded. However, the standard issue Type 2[2] aneroid barometer provided by the Signal Service is shown in Figure 15. The manufacturer was W. H. Walmsley.

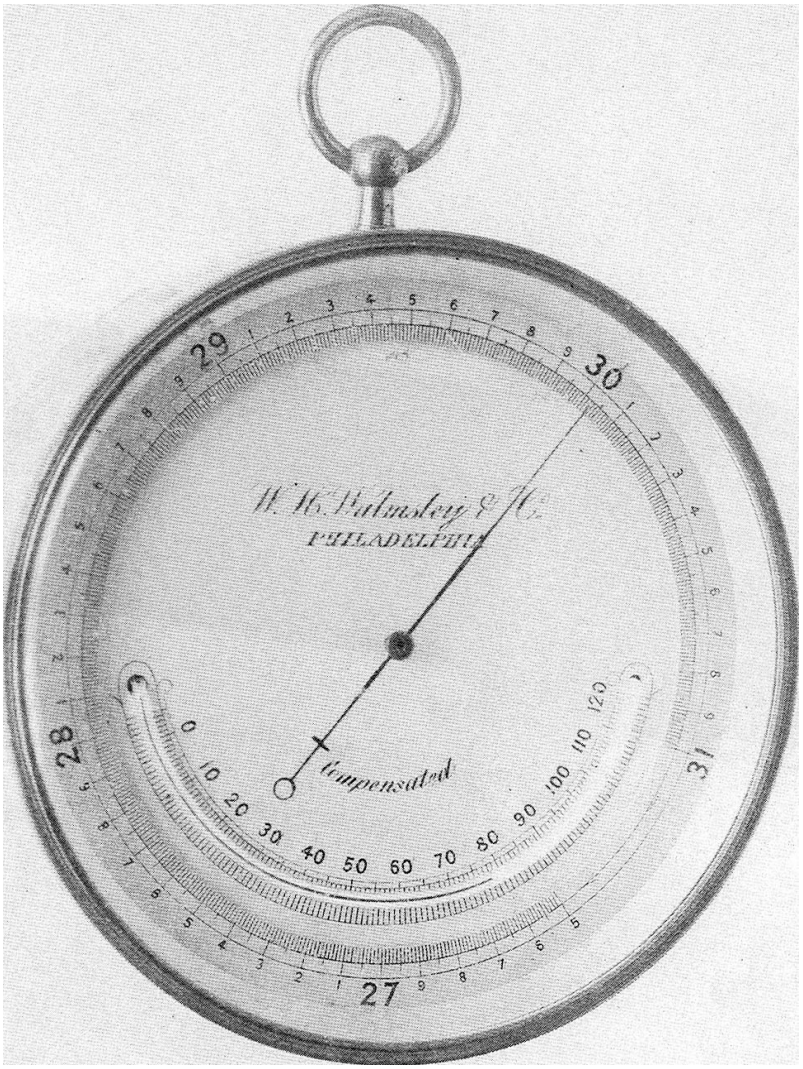

Figure 15. Type 2 Aneroid Barometer used by the Signal Service
Sourec: National Archives and Records Administration

[2] The type 1 aneroid barometer was for use at high altitude stations

Shelter

The first documentation of a shelter was in the Substation History dated 11 April 1956 that mentions a Cotton Region Shelter that was in use beginning on 1 December 1891. Both the Smithsonian Institution and the Signal Service used shelters and that would seem to indicate that shelters were in use even earlier than 1891 but no documentation supports that notion.

The Cotton Region Shelter was the standard one used by the Weather Bureau. The Santa Cruz shelter would have looked like the one in Figure 16.

Figure 16. Cotton Region Shelter
Source: National Archives and Records Administration

A "government shelter" was in use during the 1906 inspection. It was located over cultivated ground with the door opening toward the north. The floor of the shelter was 3.5 feet above ground.

In 1917, the shelter was facing northeast and the floor was two feet above the garden surface. The shelter was painted in 1917 and a new floor was placed into it. The shelter stood over turf. The observer's home, a low frame building, was ten feet away.

The inspection on 18 April 1922 reported that the shelter was repainted again. It was unmoved otherwise from the previous inspection.

A cotton region shelter was in use at the new location on 21 November 1931. It was over cultivated ground that adjoined a large lawn. Small shrubs surrounded the lawn was but none were within 25 feet. The door opened toward the north and the floor of the shelter was four feet above the ground. There was no higher object within thirty feet.

The shelter and its supports were painted on 20 March 1939. The shelter is visible in a 1941 photograph seen in Figure 7.

The new location in 1949 had a cotton region shelter with supports.

Rain Gauge

In 1906, the rain gauge was a U.S. Government pattern, located over cultivated ground.

The 1917 inspection described it as being mounted on top of the instrument shelter. That made the top of the gauge seven feet above ground. The inspector said that no other exposure was available. The gauge itself was not standard but rather was three inches in diameter and twelve inches deep. The Inspector asked the Instrument Division about the accuracy of readings made from that gauge. An 8 inch rain gauge replaced the 3-inch one that same year.

The rain gauge at the new location in 1931 was a standard 8-inch gauge mounted on the ground.

A standard 8-inch rain gauge was in use when the next inspection occurred on 18 April 1922 as a replacement for the old 3-inch one. Like the old one, it was mounted on top of the shelter. In 1926, the Inspector noted that the observer owned the rain gauge.

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In 1939, the top of the rain gauge at the new location was three feet above ground level and contained within a box support perhaps like the one shown in Figure 17.

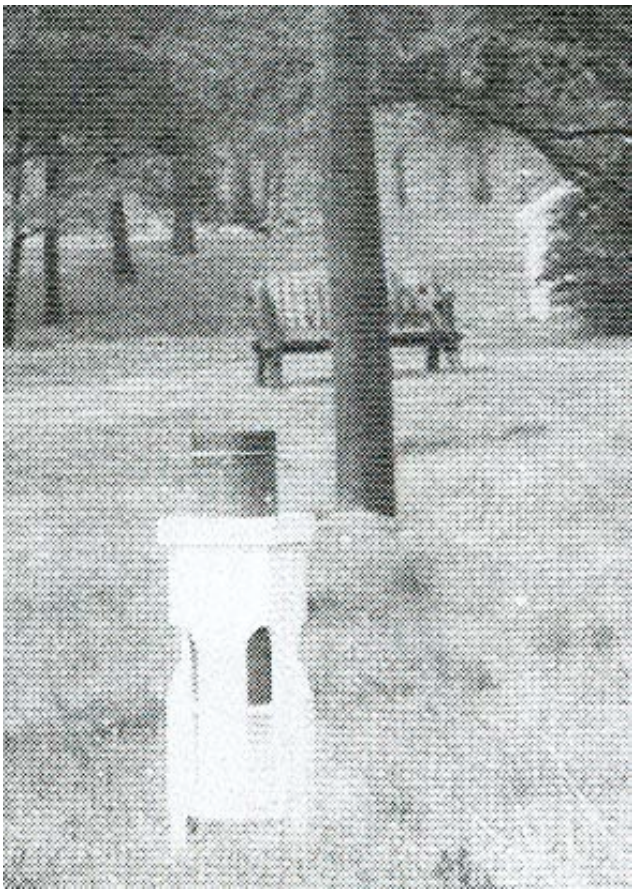

Figure 17. Rain Gauge with Wooden Support
Source: National Archives and Records Administration

The Inspector provided the observer with two new measuring sticks in March 1941.

An 8-inch standard rain gauge with box support was used at the new location in 1949.

In 1950 a recording rain gauge was installed as part of the County Flood Control network.

Anemometer

An anemometer was mentioned in the inspection report of 25 March 1941 but no additional information was provided.

When the Burton location was used for the second time, the anemometer was identified as an “airway type” that was the property of the Weather Bureau.

Psychrometer

The 1941 inspection reported a psychrometer at the site but no description was included.

SANTA CRUZ OBSERVERS

The number of observers at Santa Cruz since 1873 was remarkably few compared to other stations of a similar length of record. The virtually unbroken record was a product of the continuity of dedicated service that was evident among them.

Smithsonian Observers

Jan 1873 – Jan 1874
A. L. Taylor

A. L. Taylor was the earliest official observer in Santa Cruz. His earliest observations were in January 1873. The Santa Cruz Daily Surf 11 Jun 1897 1:1 quoted from the Monthly Weather Review of March 1897 that referred to Taylor and his two successors (Hoadley and Springer) as having been the observers in Santa Cruz.

According to Greely (1891), Taylor was the Pacific Railway System's observer in Santa Cruz.[3]

Feb 1874 –Sep 1974
James H. Hoadley

James H. Hoadley made his first observations for the Smithsonian Institution in February 1874. He was listed in the 1870 U.S. Census as a 39 years-old lumber manufacturer living in Meadow Lake, Nevada, California. In Santa Cruz, he owned a hotel called the Pacific Ocean House. He observed the weather from that location.

Hoadley bought the Santa Cruz Sentinel newspaper in 1873. He sold a partnership to H. G. Shaw. That partnership with Shaw was dissolved when Hoadley sold his shares in that newspaper in May 1897.

Signal Service Voluntary Observers

Oct 1874
James H. Hoadley

James H. Hoadley made his first observations for the Signal Service from Santa Cruz in October 1874 after that agency had replaced the Smithsonian Institution as the national network. He continued to report to them through August 1878,

He may have moved away about that time because the 1880 U.S. Census listed his residence as being in San Francisco.

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[3] The Central Pacific Railroad Company provided a large number of observers in California including ones in Aptos, Soquel, Boulder Creek, Felton, and Laurel in Santa Cruz County

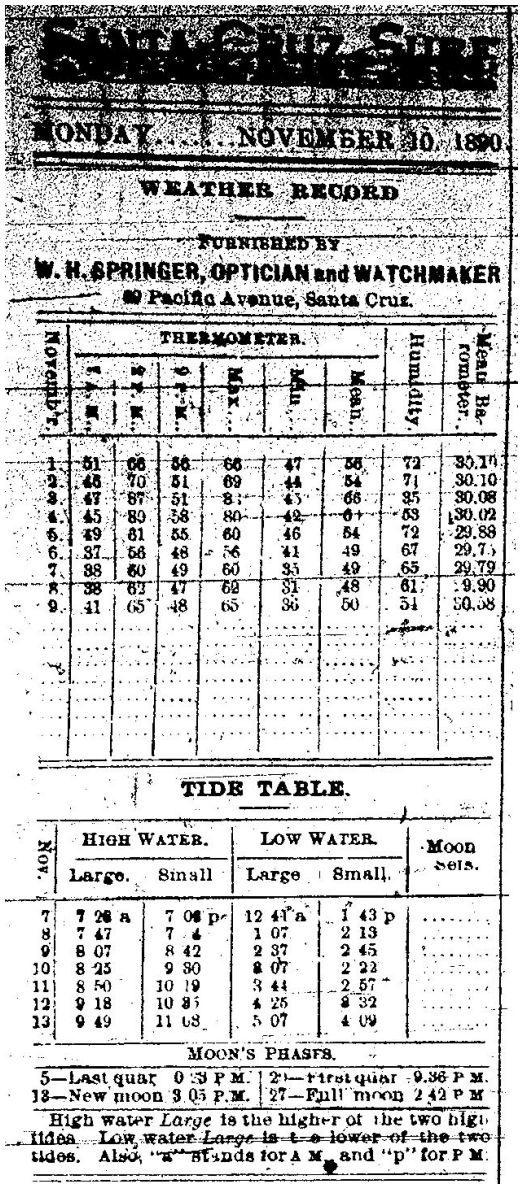
According to his obituary in the Santa Cruz Daily Surf of 25 Mar 1890 3:3, Hoadley died in Arizona on 21 March 1890.

Gap in Record from Sep 1878 through May 1890

Daily weather records for the period September 1879 through May 1890 could not be found. They may have burned in an accidental fire. However, the observer, W. Ralph Springer kept a monthly total precipitation record for that period. Those monthly precipitation data are included as Appendix 2.

Jun 1890-Dec 1892
Wilson Ralph Springer

W. Ralph Springer was the third observer in Santa Cruz. The earliest extant daily records from him were sent to the Signal Service for June 1890 and. In November 1890 he submitted observations to the Santa Cruz Surf for the first time (Figure 18). The attribution of the data was listed as W. H. Springer, Optician and Watchmaker whose business address was 89 Pacific Avenue. However, the observations were made at his home at 87 Garfield Street.



SANTA CRUZ SURF

MONDAY . . . . NOVEMBER 10, 1890

WEATHER RECORD

FURNISHED BY

W. H. SPRINGER, OPTICIAN and WATCHMAKER

89 Pacific Avenue, Santa Cruz.

November.	Thermometer. 7 A.M.	2 P.M.	9 P.M.	Max.	Min.	Mean.	Humidity.	Mean Barometer.
1.	51	66	56	66	47	56	72	30.10
2.	46	70	51	69	44	54	71	30.10
3.	47	87	51	8[illegible]	45	66	35	30.08
4.	45	89	58	80	42	61	53	30.02
5.	49	61	55	60	46	54	72	29.88
6.	37	56	48	56	41	49	67	29.75
7.	38	60	49	60	35	49	65	29.79
8.	38	62	47	62	31	48	61	29.90
9.	41	65	48	65	36	50	54	30.58

TIDE TABLE.

Nov.	High Water. Large.	High Water. Small	Low Water. Large	Low Water. Small.	Moon Sets.
7	7 26 a	7 06 p	12 41 a	1 43 p	.....
8	7 47	7 4[illegible]	1 07	2 13	.....
9	8 07	8 42	2 37	2 45	.....
10	8 25	9 30	3 07	2 22	.....
11	8 50	10 19	3 44	2 57	.....
12	9 18	10 35	4 25	3 32	.....
13	9 49	11 03	5 07	4 09	.....

MOON'S PHASES.

5—Last quar 0 [illegible]3 P.M. | 2[illegible]—First quar 9.36 P.M.
13—New moon 3.05 P.M. | 27—Full moon 2.42 P.M.

High water *Large* is the higher of the two high tides. Low water *Large* is the lower of the two tides. Also, "a" stands for A.M. and "p" for P.M.

Figure 18. Weather Data from Santa Cruz, 1–9 November 1890
Source: Santa Cruz Daily Surf, 10 November 1890

Weather Bureau Observers

On 1 October 1890, Congress passed an act that transferred the weather service from the Signal Service to the Weather Bureau. The Bureau was formed within the Department of Agriculture. By 1891, the Weather Bureau's network of voluntary weather observers across the country had grown to 2,000 stations.

Springer was mentioned in the March 1897 issue of the Monthly Weather Review, on page 98.

> It would be a valuable contribution to climatology if our voluntary observers and the directors of State weather services would acquaint themselves with the locations in their neighborhood where temperature and rainfall records have been previously kept and would stimulate or provide for the renewal of those records for a period of time long enough to establish clearly the relation between the climates at those spots and at the neighboring locations where records are now kept.
>
> We desire also to commend to our observers the wisdom of the action recently taken by Mr. W. R. Springer, Voluntary Observer at Santa Cruz, Cal., who states that he and his son Ralph[4] hope to make a long record for that locality, and that to that end, although his son is only 14 years old, yet he desires to be appointed local observer, and by beginning at so early an age and, by having the advantage of his father's oversight, expects that the future records will be homogeneous with the earlier ones.
>
> Mr. Schott's tables of precipitation publish the rainfall record kept at Santa Cruz by A. L. Taylor and J. H. Hoadley from November 1873, to December 1874. Mr. W. R. Springer's record extends from June 1890, to February 1897: Mr. Ralph Springer's record begins with March, 1897, and we hope that the people of Santa Cruz will see that it is maintained for a long time. Owing to the great irregularities in the local distribution of rainfall and the great varieties of soil on which the rain falls, it is desirable that there be several rain stations in every township.

In November 1898, Springer ran for Tax Collector and, according to the Santa Cruz Surf on 4 November 1898, made these campaign comments.

> Wherever we have spoken I have the reputation of being the best speaker, the reason for which is that I have the least to say. For nine years, I have been in business here, and have furnished your rain, your sunshine and your tides to you. Now I have forecasted your weather for you all these years without monetary compensation and I come before you tonight asking for something that there is pay in.

Springer was listed in the Santa Cruz County Directory of 1923–24 as an attorney. He was a City Council member from 1909 to 1910. In the 1930 U.S. Census, he was 81 years old and his occupation was Police Judge. His son Raymond was still living with him.

---

[4] The U.S. Decadal Censuses listed the son's name as Raymond James Springer. In the 1923–24 Directory of Santa Cruz, Raymond Springer was a Post Office Carrier. There is no indication that he observed the weather.

Nov 1931-Jul 1947
Robert E. Burton

Robert E. Burton (Figure 19) became the fourth observer at Santa Cruz and submitted his first observations for November 1931 to the Weather Bureau. He was 41 years old, a native of New Jersey, and science teacher at Santa Cruz High School

Figure 19. Robert E. Burton, 1947
Source; Santa Cruz High School Cardinal, 1947 Yearbook

The Weather Bureau was transferred from the Department of Agriculture to the Department of Commerce on 1 July 1940. This reassignment would cause the move of many city locations to their respective airports but not in Santa Cruz. Because the observations were being made by a Cooperative Observer, neither the observer nor the location was changed.

The Santa Cruz High School Yearbook for 1945 contained Burton's biographical sketch. It said that he came to Santa Cruz in 1916. He served in both World War I and World War II. During World War II he served as an agricultural advisor in the Far East. At the High School he organized a forestry class that featured field trips to study the trees and their environment. He included water and water conservation in that study and it seems likely that he would have incorporated some meteorology into it as well.

Aug 1947–Aug 1950
Sidney B. House

Sidney B. House became the fifth observer and submitted his first report in August 1947. He was a neighbor of Burton. The reason for the change could not be determined. He continued observations through August 1950 after which he resigned.

Sep 1950–Jul 1976
Robert E. Burton

Robert E. Burton resumed the observational duties in September 1950. It appears that he served as a member of the Santa Cruz City Council from 1953 to 1960.

Jul 1976 to present
Ronald A. MacDonald

Ronald A. MacDonald, a neighbor of Burton, became the observer on 1 July 1976 and continues in that capacity to the present time.

SANTA CRUZ OBSERVATIONS

Smithsonian Years
Jan 1873–Sept 1874

The Smithsonian Institution's observation form was used for the first observations in Santa Cruz in January 1873. It contained entries for temperature at 7 a.m., 12 p.m. (rather than the prescribed 2 p.m.), and 9 p.m. The amount of cloudiness in tenths was recorded at that time also. No other data entries were made.

The new observer in February 1874 reported the temperature, cloudiness in tenths, the direction from which the clouds were moving, wind direction, the barometer readings, and the psychrometer readings (dry and wet bulb thermometers) at 7 a.m., 2 p.m. (as prescribed) and 9 p.m. He also reported the amount of precipitation with beginning and ending times each day.

Signal Service Years
Oct 1874–1892

In October 1874, the Signal Service's Form 22 was placed into use. Four years earlier, on 9 February 1870, a resolution for a national weather network was passed by Congress and signed into law by President Ulysses S. Grant. The purpose of the new network was to develop and implement a capability to forecast storm events. The data collected from the nationwide network of reporting stations would form the basis for those predictions.

The Signal Service was formed within the Army Signal Corps because they had the telegraph network necessary to collect the data and to transmit the forecasts and because "military discipline would probably secure the greatest promptness, regularity, and accuracy in the required observations." Brevet Brigadier General Albert J. Myer. General Myer gave this new national weather service its first name: The Division of Telegrams and Reports for the Benefit of Commerce. It quickly became the Signal Service.

At 7:35 a.m. on November 1, 1870, the first systematized and synchronous meteorological observations were taken by observer-sergeants at 24 stations in the new agency. Those observations, which were transmitted by telegraph to the central office in Washington, D.C., were the basis for the first national forecasts.

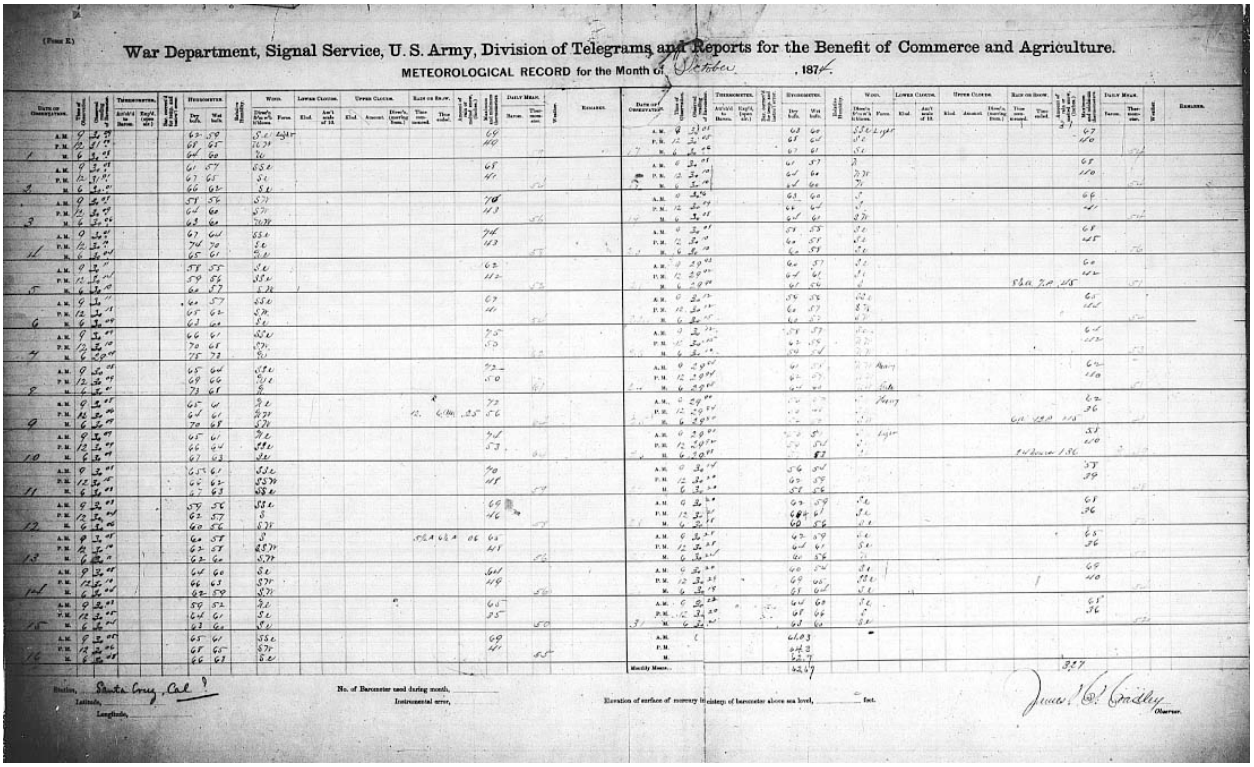
The Signal Service incorporated reports from the observers who had previously provided observations to the Smithsonian Institution. The observer at Santa Cruz sent copies of his October 1874 observations to the Signal Service for the first time. The Voluntary Observers, as the Signal Service called them, played a vital role in the Signal Service network. Santa Cruz, for example, was providing data from a part of the country that was sparsely represented in national data set, one vital to the assessments on which forecasts were based.

By 1878, the total number of Signal Service reporting locations had increased to seventy-eight nationwide. Three times each day (usually 7:35 a.m., 4:35 p.m., and 11:35 p.m.), each

Signal Service station telegraphed their own observations to Washington, D.C. Those observations consisted of:

> Barometric pressure and its change since the last report.
> Temperature and its 24-hour change.
> Relative humidity. Wind velocity.
> Pressure of the wind in pounds per square foot.

To those data were added the data provided by the Voluntary Observers to form the climate data base. The first Form 22 (Figure 20) submitted from Santa Cruz in October 1874 contained spaces for temperature, dry and wet bulb temperatures, wind direction and force, upper and lower cloud type and coverage in tenths, beginning and end times of rain or snow, amount of rain or snow, maximum and minimum temperatures, weather, daily mean barometer reading, daily mean temperature, and remarks. The time of observations at Santa Cruz were 9 a.m., 12 p.m., and 6 p.m.


(Form E.)

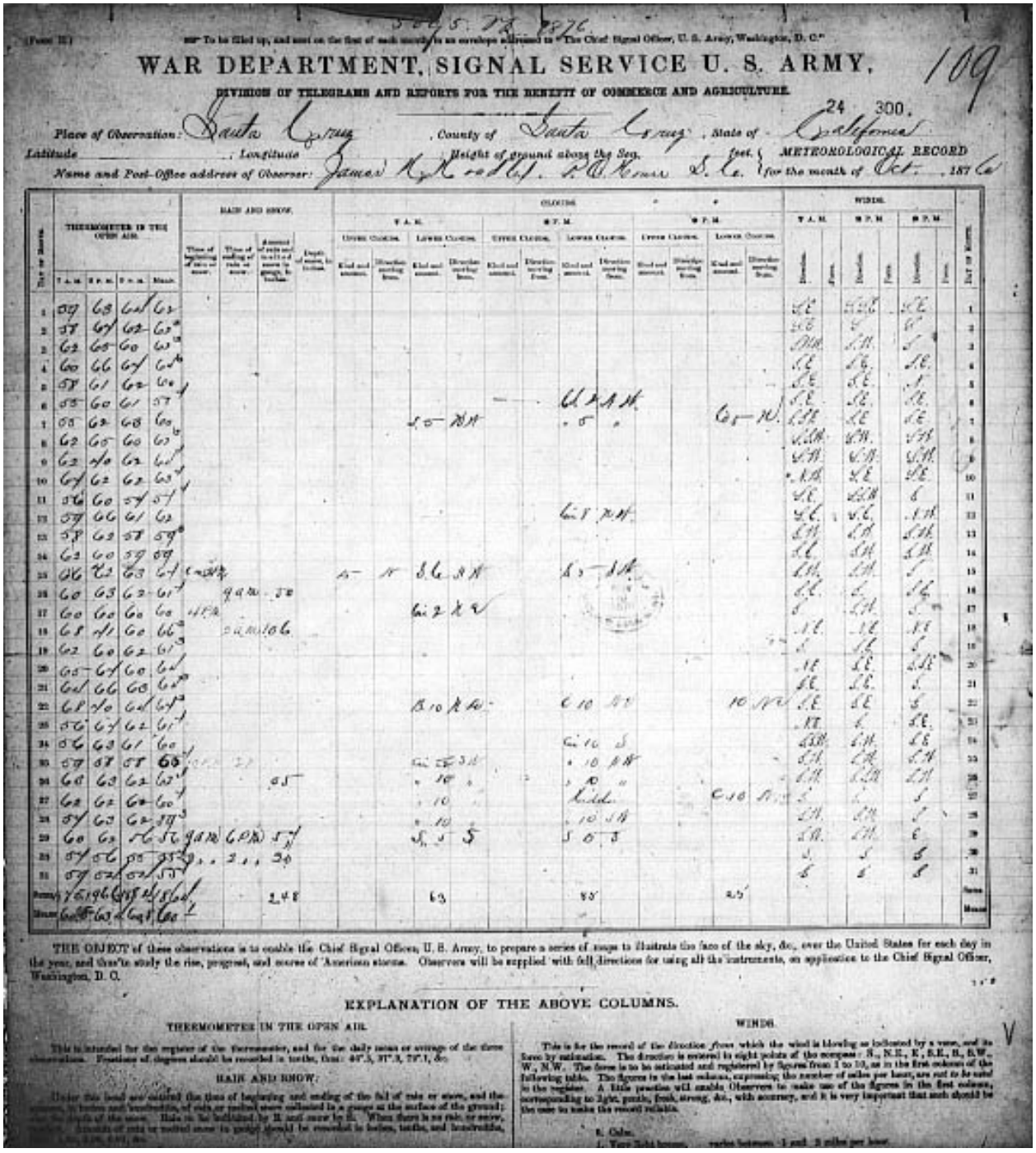
War Department, Signal Service, U. S. Army, Division of Telegrams and Reports for the Benefit of Commerce and Agriculture.

METEOROLOGICAL RECORD for the Month of October, 1874.

Figure 20. First Form 22 Sent to the Signal Service from Santa Cruz, October 1874
Source: National Climatic Data Center

In October 1876, a new observation form was used. It was the Signal Service Form H. The front side of the form (Figure 21) had space for entries at 7 a.m., 2 p.m., and 9 p.m. of the temperature, upper and lower cloud type and direction, wind direction and force. It also had the

beginning and ending times of rain or snow events, the amount of rain or melted snow, and the depth of snow in inches.



(Form H.) To be filled up, and sent on the first of each month in an envelope addressed to "The Chief Signal Officer, U. S. Army, Washington, D. C."

WAR DEPARTMENT, SIGNAL SERVICE U. S. ARMY.

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DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

24 300.

Place of Observation: Santa Cruz, County of Santa Cruz, State of California

Latitude _____; Longitude _____; Height of ground above the Sea, _____ feet. METEOROLOGICAL RECORD

Name and Post-Office address of Observer: James M. Roadley, P. O. Honor S. C. for the month of Oct., 1876

THE OBJECT of these observations is to enable the Chief Signal Officer, U. S. Army, to prepare a series of maps to illustrate the face of the sky, &c., over the United States for each day in the year, and thus to study the rise, progress, and course of American storms. Observers will be supplied with full directions for using all the instruments, on application to the Chief Signal Officer, Washington, D. C.

EXPLANATION OF THE ABOVE COLUMNS.

THERMOMETER IN THE OPEN AIR.

This is intended for the register of the thermometer, and for the daily mean or average of the three observations. Fractions of degrees should be recorded in tenths, thus: 46°.5, 31°.3, 79°.1, &c.

RAIN AND SNOW.

Under this head are entered the time of beginning and ending of the fall of rain or snow, and the amount, in inches and hundredths, of rain or melted snow collected in a gauge at the surface of the ground; and the depth of the snow. Rain to be indicated by R and snow by S. When there is no rain or snow, [illegible] amounts of rain or melted snow in gauge should be recorded in inches, tenths, and hundredths, [illegible]

WINDS.

This is for the record of the direction from which the wind is blowing as indicated by a vane, and its force by estimation. The direction is entered in eight points of the compass: N., N.E., E., S.E., S., S.W., W., N.W. The force is to be estimated and registered by figures from 1 to 10, as in the first column of the following table. The figures in the last column, expressing the number of miles per hour, are not to be used in the register. A little practice will enable Observers to make use of the figures in the first column, corresponding to light, gentle, fresh, strong, &c., with accuracy, and it is very important that such should be the case to make the record reliable.

8. Calm.

1. Very light breeze, varies between 1 and 3 miles per hour.

Figure 21. Front Side of First Form H Sent to the Signal Service October 1876
Source: National Climatic Data Center

The reverse side of the Form H (Figure 22) provided space for barometer readings, dry and wet bulb temperatures entries at 7 a.m., 2 p.m., and 9 p.m. There was a section for the monthly summary and a sizable space for remarks about "casual phenomena."

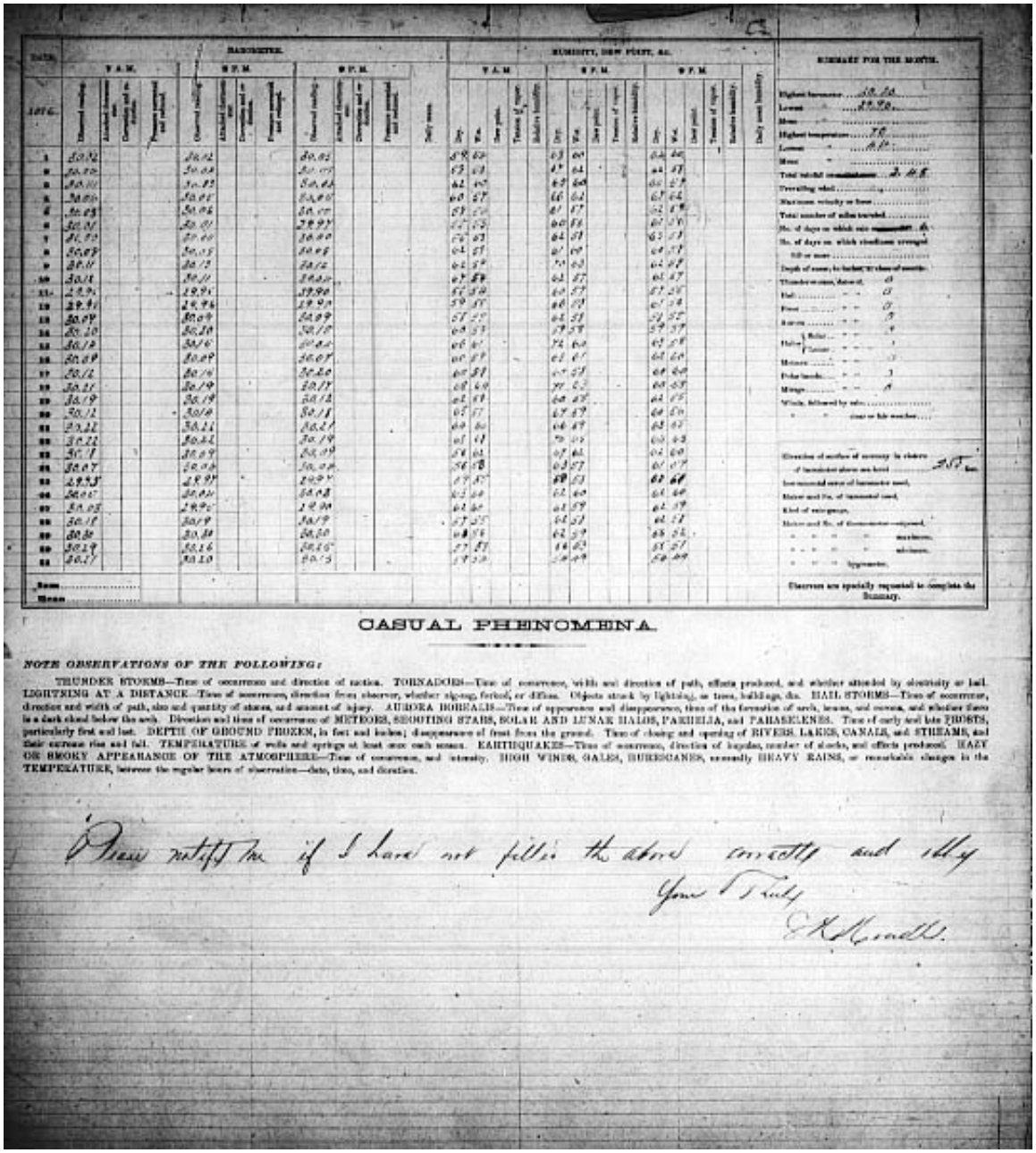

Figure 22. Back of First Form H Sent to the Signal Service from Santa Cruz, October 1876
Source: National Climatic Data Center

There was a gap in the extant daily observation forms from September 1878 through May 1890. See Appendix 2 for monthly data from that period.

One weather event made the newspaper (Gerrish). The clipping from an unidentified newspaper reported snow in Santa Cruz on 7 February 1884.

> It hailed last night and the sidewalks were covered this morning. At 7 a.m. it commenced snowing and continued over an hour. Snow has fallen at a lower altitude that had been known for the past twelve years. The lower hills just back of town are white with it.

The record continued in June 1890 using the Signal Service Form 122 B. The front side of the form (Figure 23) had space for entries at 7 a.m., 2 p.m., and 9 p.m. of the dry and wet bulb temperatures, the dew point, relative humidity, wind direction and force, and cloud coverage in tenths, upper and lower cloud type and direction, wind direction and force. It also had daily entries for the maximum and minimum temperatures, the beginning and ending times of rain or snow events, the amount of rain or melted snow, and the depth of snow in inches.

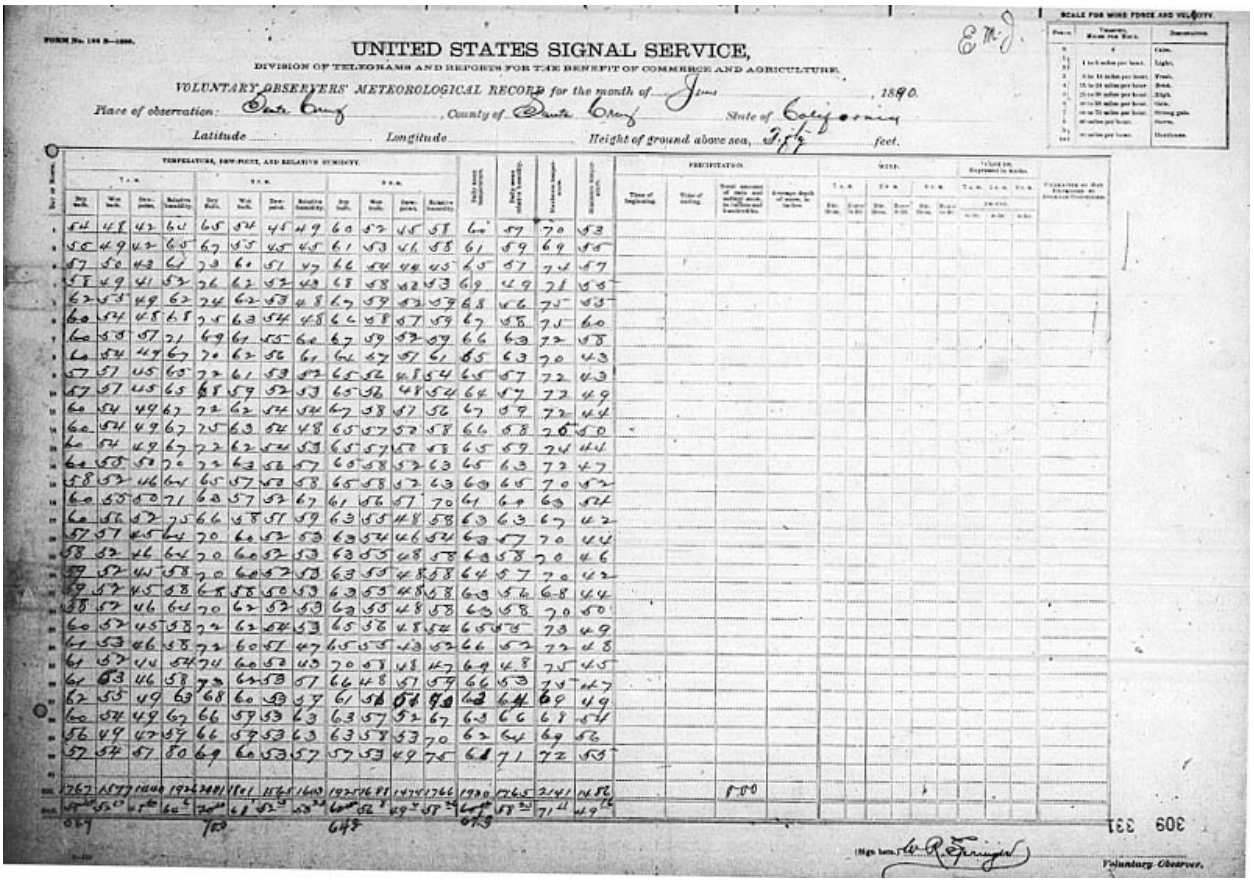

Figure 23. Front side of Form 122 Sent to the Signal Service from Santa Cruz, June 1890
Source: National Climatic Data Center

The back side of the Form 122 (Figure 24) had entries at 7 a.m., 2 p.m., and 9 p.m. of the readings of the barometer and the attached thermometer. The monthly summary and the instructions for filling out the form were on the back side as well.

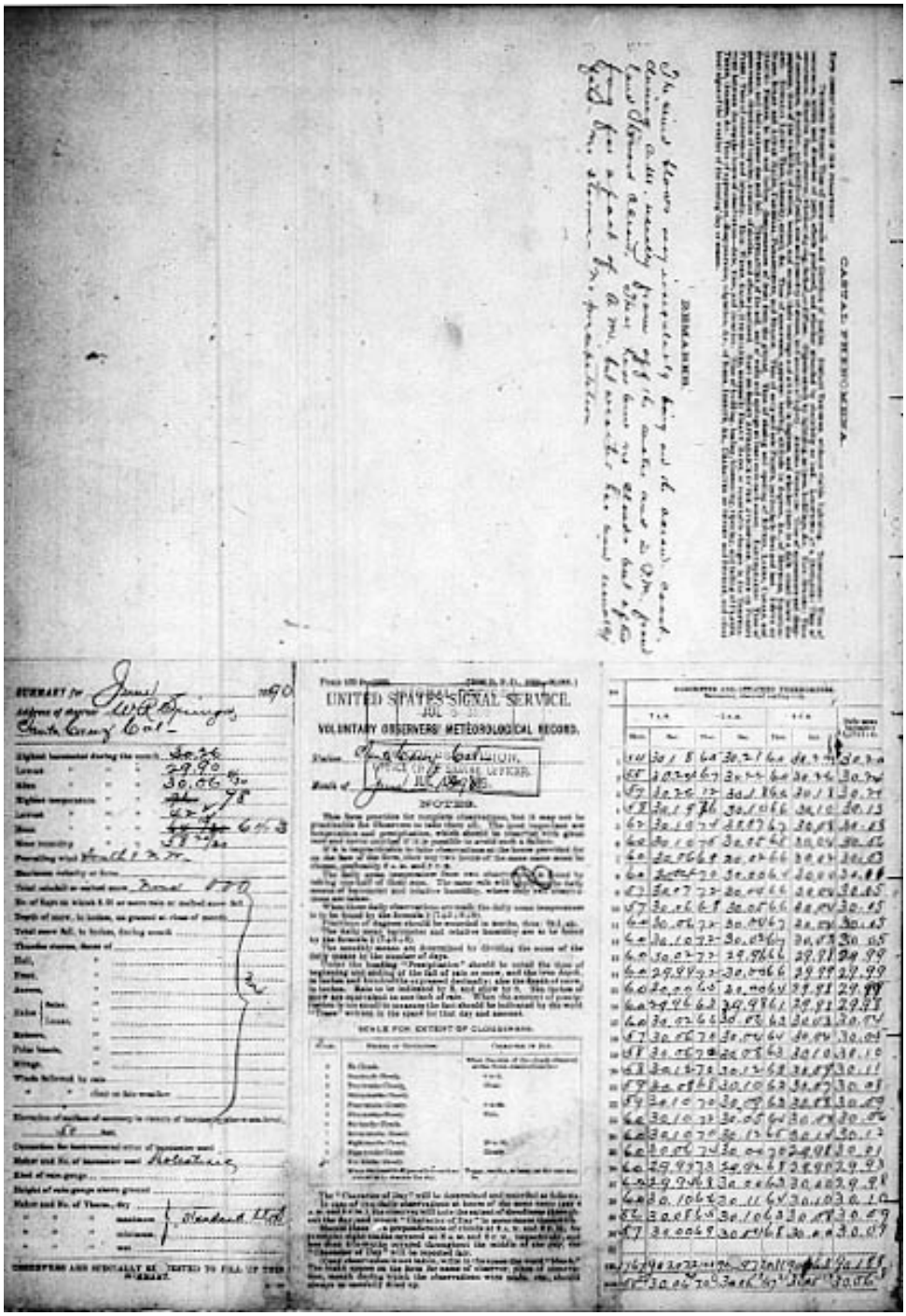

Figure 24. Back Side of First Form 122 Sent to the Signal Service from Santa Cruz, June 1890
Source: National Climatic Data Center

The Monthly Bulletin of the California Weather Service was first issued for September 1891. It and subsequent editions included data from the observer in Santa Cruz.

Weather Bureau Years
Aug 1892–Dec 1948 (end of study period)

Observations were sent to the newly formed Weather Bureau beginning in August 1892 and the observer was listed as one of their Voluntary Observers. The report was submitted using the Weather Bureau Form 1025 Met'l. For unknown reasons, the daily data were not entered on the form. Only the monthly summary was included.

Publications of Data

Observational data were published monthly in the Monthly Bulletin of the California State Weather Service beginning in September 1891. The first issue contained the data from 48 Voluntary Observers in California. However, the greatest volume of data was coming from the Southern Pacific Railroad climate network. That network had a long history in California with 83 stations reporting three times per day in 1877. That number had grown to 163 by 1891 providing most of the climate data used by the Weather Bureau and the citizens of California.

The Southern Pacific Railroad Company (SPRR) had established an extensive climate network for its railroad operation. It became clear that the use of the data had broader applications. The agents made the three times per day observations and forwarded them to the Weather Bureau at the end of each month. In addition, the SPRR recognized its value to the agricultural community to select crops that would increase productivity. Research showed that citrus, olives, rice, sugar beets, and a wide variety of other crops could be grown. The SPRR encouraged the University of California to experiment using the climate data that they had collected.

The University of California established a farm school at Davis and the relationship between the SPRR and the University grew. The benefit to the agricultural community was enormous and the SPRR of course profited from the increased use of the railroad to transport the agricultural production.

The Monthly Review of the California Section of the Climate and Crop Service became the official climate summary in July 1896. The publication was renamed in February 1906 as the report of the California Section of the Climatological Service of the Weather Bureau. It evolved into the Climatological Data for California that has existed for over eighty years.

The early years of the Weather Bureau affiliation saw frequent contributions to the newspapers in addition to formal publication of the data. Some, like the one in Figure 25 from 1890, were published monthly and contained detailed summaries of the weather.

SANTA CRUZ SURF

WEATHER RECORD

FURNISHED BY

W. R. SPRINGER, OPTICIAN and WATCHMAKER

89 Pacific Avenue, Santa Cruz.

November.	THERMOMETER.						Humidity.	Mean Barometer.
	7 A. M.	2 P. M.	9 P. M.	Max.	Min.	Mean.		
1.	51	66	56	66	47	56	72	30.10
2.	46	70	51	69	44	54	71	30.10
3.	47	87	51	83	45	66	35	30.08
4.	45	80	58	80	42	60	53	30.02
5.	49	61	55	69	46	54	72	29.88
6.	37	56	48	56	41	49	67	29.75
7.	38	60	49	60	35	49	65	29.79
8.	38	62	47	62	31	48	61	29.90
9.	41	65	48	65	36	50	54	30.58
10.	40	68	49	68	37	51	57	30.17
11.	45	72	53	74	39	57	58	30.15
12.	47	76	56	76	39	58	30	30.14
13.	41	69	53	69	39	54	36	30.08
14.	42	70	48	70	39	52	37	30.02
15.	43	66	51	66	39	52	55	30.10
16.	41	66	50	66	37	51	52	30.10
17.	40	70	48	71	37	51	61	30.06
18.	48	74	53	74	39	57	37	29.99
19.	48	73	55	73	42	57	32	30.07
20.	45	74	52	75	41	55	40	30.15
21.	51	74	51	74	41	57	40	30.14
22.	50	76	56	76	48	59	51	30.18
23.	50	70	56	72	46	58	51	30.07
24.	52	70	54	70	47	57	55	30.02
25.	57	65	57	65	53	59	69	30.05
26.	49	72	53	72	45	56	63	30.09
27.	49	73	55	74	44	59	49	30.10
28	49	76	60	76	46	61	37	30.08
29.	47	76	55	76	47	58	38	30.09
30.	49	72	52	73	46	56	45	30.08

FORECAST FOR TODAY.

Fair weather.

November Weather.

Summary of the weather for November:

Highest barometer, 22d	30.22
Lowest barometer, 6th	29.74
Mean barometer	30.06
Monthly variation	.48
Greatest daily barometer on 7th	.17
Least daily variation barometer,	.00
Highest temperature, 3d	85°
Lowest temperature, 8th	34°
Mean monthly temperature	55.3°
Monthly variation of temperature	51°
Greatest daily variation on 3d	40°
Least daily variation of temp., 25th	12°
Coldest day of month, 7th	48°
Hottest day of month, 3d	61.5°
Dampest day, 2d	.71%
Dryest days, 12th and 18th	.31%
Mean humidity for month	.54%
Total cloudy days	1
Partial cloudy days	6
No. of fair days	23
Rain, on 6th	.02

Frost in exposed places; no storms; the month was characterized by fair weather and excessive dryness of the atmosphere.

Figure 25. Springer's Observations for November 1890
Source: Santa Cruz Surf, 1 December 1890

Other Observations in or near Santa Cruz

Evidence of other observations in Santa Cruz was discovered during this research. Although they were not in the lineage leading to the present Cooperative Observer, they should be recognized for contributing to the climate record.

Jan-Dec 1876
Rev. Dr. Willey

According to Dr. C. L. Anderson's discussion of climate (Elliott, 1879), Dr. Willey provided observations of air and water temperature at Santa Cruz during 1876 (Figure 26).

1876.	Jan.....	Feb.....	March..	April..	May.....	June.....	July....	Aug.....	Sept....	Oct.....	Nov.....	Dec.....
SANTA CRUZ.												
Air.....	54.4	54.9	52 2	58.6	59.2	60.2	61.8	63.0	61.3	59.4	52.8	55.2
Water	52.1	52.7	52 2	57.2	57.2	58.2	60.4	60.2	60.0	56.3	54 7	53.3

Figure 26. Santa Cruz Temperature for 1876
Source: Elliott, 1879

Those water observations were taken at depths of 8 to 10 feet between 9 a.m. and 11 a.m.

Jan 1873–Dec 1890
A. L. Taylor and J. H. Hoadley

The Greely and Glassford study (1891) of California climate listed A. L. Taylor and J. H. Hoadley as observers from the Southern Pacific Railroad Company in Santa Cruz who forwarded information to the Signal Service. Their monthly temperature data (Figure 27) and precipitation data (Figure 28) are included here because they encompass the period for which daily data have not survived.

SANTA CRUZ, CAL.

1873	56.0	51.9	57.0	58.9	62.4	64.7	63.2	66.0	61.3	58.4	55.3	[53.2]	[59.0]
1874	[51.6]	54.0	55.2	62.0	64.7	66.1	66.6	66.8	65.4	57.1	62.8	50.9	[60.3]
1875	50.0	54.4	49.5	60.4	65.2	64.4	.....	68.7	.....	.....	58.5	55.7	.....
1876	54.4	54.9	52.2	58.6	59.2	60.2	61.8	63.0	61.3	59.4	52.8	55.2	57.8
1877	56.4	57.6	60.6	61.7	.....	.....	.....	.....	.....	.....	.....	.....	.....
1878	54.6	55.2	56.1	59.5	61.4	63.8	61.4	59.8	61.1	59.0	53.6	48.5	57.8
1879	46.7	54.9	57.4	57.9	58.8	62.5	64.5	65.5	64.5	60.4	53.2	48.2	57.9
1880	46.3	47.8	49.9	55.4	60.0	62.7	62.7	63.5	61.7	61.3	54.1	54.3	56.6
1881	54.1	57.9	58.2	62.9	63.9	62.9	64.5	66.8	60.8	57.4	54.9	52.1	59.7
1882	48.7	47.0	53.2	55.6	51.4	62.3	64.0	63.7	62.2	60.0	54.1	53.6	56.3
1883	49.1	49.7	56.4	56.8	59.5	65.4	64.7	64.2	65.5	58.7	54.9	54.1	58.2
1884	52.5	53.5	55.7	57.7	62.6	63.9	65.1	66.1	62.6	60.1	56.3	52.7	59.1
1885	52.7	54.5	58.6	60.6	62.4	64.5	66.6	65.6	64.7	62.5	53.4	[53.2]	[60.4]
1886	53.6	57.8	53.7	57.8	62.4	66.4	66.6	65.0	59.7	56.7	55.7	54.9	59.2
1887	52.2	49.3	58.2	57.7	59.7	63.9	61.9	62.3	65.1	64.4	55.7	53.0	58.6
1888	49.2	53.1	54.8	59.3	59.3	67.5	66.4	64.4	65.8	66.3	58.0	57.1	60.1
1889	50.9	52.9	56.3	59.7	59.3	63.6	67.1	65.2	67.5	61.9	[55.9]	55.0	[59.4]
1890	49.6	52.0	54.5	58.1	62.6	61.9	.....	.....	.....	.....	.....	.....	.....
Means	51.6	53.2	55.4	58.9	60.9	63.9	64.5	64.8	63.3	60.2	55.9	53.2	58.8

Figure 27. Mean Temperature Santa Cruz 1873–1890
Source: Greely and Glassford, 1891

SANTA CRUZ, CAL.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1873	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.14	.....	.....
1874	[5.37]	1.51	3.72	1.60	0.38	0.15	0.00	0.00	0.14	3.27	[3.20]	0.19	[19.53]
1875	6.73	0.50	1.67	0.10	0.27	0.66	.....	0.00	.....	.....	13.81	1.71	.....
1876	10.86	6.42	.....	.....	0.00	.....	.....	.....	.....	2.48	.....	.....	.....
1877	3.17	1.90	1.41	1.02	.....	.....	.....	.....	.....	.....	.....	5.04	.....
1878	10.56	14.71	4.04	2.06	0.00	0.00	0.00	0.00	1.27	2.75	0.30	1.34	37.03
1879	4.79	4.42	3.64	2.14	1.41	0.05	0.00	0.00	0.00	1.06	3.76	2.50	23.77
1880	1.44	1.04	2.12	5.60	0.70	0.00	0.00	0.00	0.00	0.00	0.40	12.59	23.89
1881	9.38	3.28	1.74	2.26	0.00	0.99	0.00	0.00	0.39	1.64	0.96	5.58	26.22
1882	3 08	3.04	5.57	2.26	0.24	0.07	0.00	0.00	0.65	2.47	2.28	1.41	21.07
1883	3.57	0.76	3.65	1.63	3.18	0.02	0.00	0.00	0.54	1.42	0.95	1.07	16.79
1884	3.30	5.27	8.76	6.78	0.11	2.48	0.00	0.10	0.33	1.37	0.32	8.91	37.73
1885	2.11	0.41	0.47	2.43	0.05	0.00	0.08	0.00	0.07	0.10	10.25	2.90	18.87
1886	7.60	0.80	3.05	7.60	0.30	0.00	0.00	0.00	0.00	0.79	1.10	2.20	23.44
1887	1.01	9.62	0.53	1.90	0.02	0.00	0.00	0.00	0.42	0.42	1.21	4.58	19.71
1888	8.00	1.93	4.61	0.57	1.08	0.09	0.00	0.00	0.37	0.00	6.17	5.07	27.89
1889	0.99	1.37	6.76	0.84	1.78	0.00	0.00	0.00	0.00	9.50	[3.20]	20.38	[44.82]
1890	9.40	4.90	5.58	1.06	1.22	0.00	.....	.....	.....	.....	.....	.....	.....
Means	5.37	2.88	3.58	2.49	0.67	0.30	0.01	0.01	0.32	1.95	3.20	5.03	25.81

Figure 28. Total Precipitation, Santa Cruz 1873–1890
Source: Greely and Glassford, 1891

Jan 1945–Apr 1966
John A. Cruze

The Collett (1966) collection of data from Santa Cruz county contain data from John A. Cruze. The address was 1155 17th Avenue at an elevation of 60 feet. Those data are shown in Figure 29.

PRECIPITATION

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN'L
1945	1.81	9.38	7.19	.63	1.00	.05	T	T	.00	2.44	4.25	13.87	40.62
1946	2.38	3.75	4.20	.06	1.75	.00	.00	.00	.06	.51	7.24	3.35	23.30
1947	.88	3.44	4.32	.31	.56	.13	.00	.00	.00	4.06	.62	2.51	16.83
1948	1.21	3.05	4.86	6.25	1.82	.00	T	T	T	.31	.50	10.94	28.94
1949	2.50	3.63	9.20	.00	.12	.00	.00	T	.00	.00	2.75	5.25	23.45
1950	13.32	6.63	2.44	2.25	.13	.00	T	T	.25	1.75	8.50	9.63	44.90
1951	4.93	3.38	4.50	1.06	1.00	.00	.00	.00	.00	1.50	3.00	15.66	35.03
1952	12.63	3.76	6.09	1.43	.34	.50	.00	.00	.00	.10	3.83	7.20	35.88
1953	3.06	.00	3.35	4.66	.59	.23	.00	.14	.03	.22	3.61	.76	16.65
1954	3.99	3.31	7.09	2.69	.60	.48	.00	.41	T	.06	5.39	4.66	28.68
1955	6.93	1.84	.27	4.02	.79	.00	.01	.00	.00	.00	3.63	18.94	36.43
1956	9.27	1.27	.28	1.50	1.38	.00	.09	T	.24	1.51	.00	.77	16.31
1957	5.84	4.90	2.78	1.83	5.51	.14	.04	.02	.24	5.41	.92	5.64	33.27
1958	7.56	14.54	10.04	5.67	.44	.41	T	T	.32	.12	.27	.88	40.25
1959	9.45	7.19	.66	.30	.07	.00	0	.04	3.86	T	.00	.74	22.31
1960	7.38	6.53	2.55	1.50	.38	.07	T	.00	.12	.13	3.67	1.27	23.60
1961	3.97	1.54	4.05	1.23	.74	.15	0	.18	.22	.20	3.80	2.20	18.28
1962	3.89	11.93	4.04	.67	.09	.27	.00	.00	.38	2.65	.60	3.75	28.27
1963	6.62	4.76	6.14	7.51	.75	.00	.02[e]	.07[e]	.20[e]	2.00[e]	7.51	.56	36.14
1964	6.09	.25	3.71	.12	.40	.00	.00	.24	.00	1.68	4.85	11.72	29.06
1965	3.50	1.70	3.50	3.51	.06	T	0	.11	T	.19	7.38	5.19	25.14
1966	2.01	4.83	.82	.75									
AVE.	5.44	4.62	4.19	2.18	.84	.12	.01	.06	.28	1.18	3.44	5.97	28.33
DIV.	22	22	22	22	21	21	21	21	21	21	21	21	SUM

[e]Estimated

Figure 29. John A. Cruze Precipitation Data 1945–1966
Source: Collett, 1966

Dr. Colbert A. Canfield

Dr. Colbert A. Canfield was the observer at Monterey and, in the years before observations began in Santa Cruz, provided weather data to the Pacific Sentinel newspaper. For example, page 2 column 4 of the Pacific Sentinel on 6 July 1860 printed his summary for the previous year. At other times, the newspaper printed weather data and information without attribution as to source. Dr. Canfield could be the source for some of those publications.

James W. Lewis

James W. Lewis was the agent for the Southern Pacific Railroad Company in Santa Cruz in March of 1890 when he submitted rainfall data to the newspaper. Some of the weather data that was not attributed may have come from him or other agents.

O. H. Bliss

O. H Bliss was a contributor of precipitation data to the Santa Cruz newspapers occasionally. It appeared that he lived outside of Santa Cruz, perhaps in the Ben Lomand area. His information (e.g., 18 January 1893 Santa Cruz Surf) appeared as a news item rather than as a table.

Digital Record

The data from Santa Cruz have been digitized from January 1893 to the present. To facilitate the use of digital data, station numbers have been assigned by the National Climatic Data Center

and must be used to access the data. The station number assigned for Santa Cruz is 047916.

APPENDIX 1

Santa Cruz Substation History

$ WB-530 states that distance and direction from Post Office is approximate

WB Form 530-1

KEY ID BY 10401

UNITED STATES DEPARTMENT OF COMMERCE
WEATHER BUREAU

SUBSTATION HISTORY

Office preparing form WBO, San Francisco, Calif.

Station SANTA CRUZ (Current name) County Santa Cruz State California Index No. 04-7916-4 Date prepared 04-11-56 1956

Location (a)	Latitude (b)	Longitude (c)	Sec. Twp. Rng. (d)	Elevation msl (e)	Direction and distance from Post Office (f)	Direction and distance from Prev. Location (f)	Station known as (g)	Description of exposure (h)
1st	36°58'N	122°02'W	- - -	20	Approx. E 0.4 mi. Santa Cruz $	-	Santa Cruz	In town, at residence, on ground; flat; ocean 1 mi S; hills begin 2 mi. N.
2nd	"	"	- - -	"	" $	same	"	" " "
3rd	"	122°01'W	- - -	125	ENE 2.6 miles, Santa Cruz	ENE 2.0 mi.	"	In town, at residence, in yard, on grnd small shrubs, no obstructions.
4th	"	"	- - -	"	ENE 2.5 miles, Santa Cruz	SW 300 ft.	"	" " "
5th	"	"	- - -	"	ENE 2.6 miles, Santa Cruz	NE 300 ft.	"	" " "
6th								

(Cont.) (a)	Instruments used (i)	Record: Original located (j)	Record: Where published (k)	Record: Dates 1st and last observations (l)	Observers and Dates (m)	Remarks (n)
1st 02/	DT 3" RG	WBO SF a/	CD BW b/	1-1-73 to 11-30-91	W.R.Springer, c/ to 11-30-91	Slight downslope NW to SE. 87 Garfield St. Actual establishment prob. 1-1-78.
2nd 04/	Mx Mn CRS SRG	San Francisco 4A "	"	12-1-91 to 10-25-31	W.R.Springer 12-1-91 to 10-25-31	"Self-registering" therm. described 2-7-06; Mx Mn 9-19-17; 3"SRG to 8" by 4-18-22.
3rd 04/	"	WBO SF	CD BW	11-17-31 to 7-31-47	Robert E.Burton, 11-17-31 to 7-31-47	On McIntire Road. Psy.A and fuel moisture indicator by 3-25-41. Obsvr. is H.S. science instructor.
4th 04/	"	"	"	8-1-47 to 8-31-50	Sidney B.House, 8-1-47 to 8-31-50	New location, new observer. At 155 Fairland Way.
5th 04/	"	"	"	9-1-50 to 9/19/1977	Robert E. Burton, 9-1-50 to	Relocated to location 3.
6th						

a/ Records prior to March 1906 destroyed by fire; precip. summary available begins 1/78, mean temps 1/73.

b/ Published in Monthly Bulletin, Calif. State Weather Service prior to CD (1/97); also published in Bulletin L.

c/ Beginning date of this observer unknown but prior to 1891. Bulletin L states SPRR records combined with Springer records.

NOTE: Records also kept at SPRR depot from 12/1/91 - 5/31/18, & published monthly in Bulletin of Calif. State Weather Service thru Dec. 1896.

WB Form 530-1

Source: National Climatic Data Center

APPENDIX 2

Springer Precipitation Data
1878–1931

STATION: Santa Cruz, 87 Garfield Street Elevation: 20 feet

PRECIPITATION

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AN'L
1878	10.56	14.71	4.04	2.06	.00	.00	.00	.00	1.27	2.75	.30	1.34	37.03
1879	4.79	4.42	3.64	2.14	1.41	.05	.00	.00	.00	1.06	3.76	2.50	23.77
1880	1.44	1.04	2.12	5.60	.70	.00	.00	.00	.00	.00	.40	12.59	23.89
1881	9.38	3.28	1.74	2.26	.00	.99	.00	.00	.39	1.64	.96	5.58	26.22
1882	3.08	3.04	5.57	2.26	.24	.07	.00	.00	.65	2.47	2.28	1.41	21.07
1883	3.57	.76	3.65	1.63	3.18	.02	.00	.00	.54	1.42	.95	1.07	16.79
1884	3.30	5.27	8.76	6.78	.11	2.48	.00	.10	.33	1.37	.32	8.91	37.73
1885	2.11	.41	.47	2.43	.05	.00	.08	.00	.07	.10	10.25	2.90	18.87
1886	7.60	.80	3.05	7.60	.30	.00	.00	.00	.00	.79	1.10	2.20	23.44
1887	1.01	9.62	.53	1.90	.02	.00	.00	.00	.42	.42	1.21	4.58	19.71
1888	8.00	1.93	4.61	.57	1.08	.09	.00	.00	.37	.00	6.17	5.07	27.89
1889	.99	1.37	6.76	.84	1.78	.00	.00	.00	.00	9.50	2.64	20.38	44.26
1890	9.40	4.90	5.58	1.06	1.22	.00	.00	.00	.80	.00	.00	2.34	25.30
1891	.77	10.68	1.35	2.57	.60	.10	.00	.00	.70	.45	.58	8.10	25.90
1892	1.40	4.60	2.82	1.83	3.95	.00	.00	.00	.25	.93	5.05	7.15	27.98
1893	5.30	4.25	9.95	1.65	.36	T	.00	.00	.25	.75	4.40	3.50	30.41
1894	7.02	8.60	1.64	.66	2.36	.72	.01	T	2.77	3.59	.40	13.71	41.48
1895	9.11	4.07	3.08	2.02	1.15	.00	.00	.00	.18	.49	1.89	2.15	24.14
1896	8.52	.25	3.69	3.07	1.66	T	.05	.73	.35	1.88	6.79	4.87	31.86
1897	3.72	4.96	4.86	.22	.24	.10	.00	T	.17	1.49	.54	2.13	18.43
1898	2.17	2.67	1.39	.52	1.35	.06	.00	T	2.21	.40	.86	2.24	13.87
1899	7.27	.45	9.31	1.21	.95	.14	.00	.05	.00	7.05	3.70	4.42	34.55
1900	5.49	.99	3.58	2.21	.94	T	T	T	.13	2.11	7.87	2.48	25.80
1901	4.30	5.91	.94	2.01	.52	T	T	.00	.64	.88	3.28	1.80	20.28
1902	2.31	14.74	3.23	1.83	.64	.00	.00	.00	.00	2.10	2.74	2.23	29.82
1903	6.25	2.07	11.06	.25	.00	.00	.00	.00	.00	.65	8.59	.35	29.22
1904	1.85	5.45	8.35	3.14	.02	T	.00	.50	4.70	3.63	2.37	2.11	32.12
1905	6.95	4.65	5.15	2.30	3.47	.05	.02	.00	.00	.00	2.50	2.09	27.18
1906	4.93	7.70	8.69	1.50	3.85	.98	.00	.00	.30	.00	2.30	8.53	38.78
1907	8.22	4.10	10.85	.10	.35	1.10	.00	T	.40	3.00	.00	5.50	33.62
1908	6.55	4.85	2.35	.40	.42	.00	.00	.00	.25	1.41	2.04	3.95	22.22
1909	19.90	9.35	4.60	.03	.00	.10	.00	.00	1.47	1.80	1.77	11.39	50.41
1910	5.15	2.62	6.50	.50	.00	.05	.00	.00	.04	1.21	.70	1.80	18.57
1911	16.03	5.63	5.71	1.63	.50	.25	T	.00	.00	.85	1.10	3.71	35.41
1912	4.46	.61	4.65	2.17	1.86	.45	.00	.00	.73	.77	1.82	1.13	18.65
1913	5.57	.37	2.05	.58	.82	.25	.35	.04	.00	.00	5.78	9.23	25.04
1914	9.41	5.64	1.03	2.27	.25	.65	.10	.02	.05	1.57	2.62	8.51	32.12
1915	10.05	10.23	2.17	1.63	5.55	.00	.10	.00	.02	.02	.55	4.45	34.69
1916	15.49	5.77	2.85	.07	.25	.00	.25	.00	.65	.70	1.35	6.75	34.13
1917	2.72	4.60	1.20	.75	.20	.00	.00	.00	.10	.00	1.25	1.55	12.37
1918	1.25	4.33	3.11	.44	T	.00	.00	.05	6.60	.46	4.20	2.40	22.84
1919	1.70	9.12	3.07	.04	.07	.00	.00	T	.60	.25	1.10	6.18	22.13
1920	2.90	2.00	5.57	1.95	.00	.30	.00	.10	.10	2.88	5.92	7.47	29.19
1921	5.82	3.30	1.65	.80	1.35	.00	.00	.00	.60	.50	1.60	10.10	25.72
1922	3.95	6.35	4.15	.78	.70	T	.00	.00	.00	2.02	3.25	8.70	29.90
1923	4.45	1.85	.00	6.60	.00	.60	.00	.00	.65	.25	.50	2.35	17.25
1924	3.15	1.10	2.55	.30	.00	.00	.00	.00	.00	2.45	2.95	3.95	16.45
1925	2.65	7.80	2.85	2.55	5.00	.00	.00	.00	.50	.50	2.20	2.10	26.15
1926	6.35	8.37	.25	5.60	.30	.00	.00	.00	.00	1.20	6.25	1.30	29.62
1927	4.75	10.45	2.75	2.10	.00	.35	.00	.00	.10	2.50	3.20	5.30	31.50
1928	1.85	3.30	5.30	.30	.25	.00	.00	.00	.00	.00	3.80	5.15	19.95
1929	1.05	1.90	1.65	1.95	.00	1.75	.00	.00	.35	.00	.00	3.20	11.85
1930	6.32	5.85	4.70	.75	.30	.00	.00	.00	.75	.25	2.50	.30	21.72
1931	3.90	1.60	1.80	.45	1.10	.50	.03	.02	.00	--	--	--	--
AVE.	5.49	4.72	3.94	1.83	.95	.23	.02	.03	.58	1.37	2.65	4.82	26.63
DIV.	54	54	54	54	54	54	54	54	54	53	53	53	SUM

Source: Collett, 1966

APPENDIX 3

Santa Cruz County Climate Data
Tables of Content

SANTA CRUZ METEOROLOGICAL RECORDS

Compiled by W. R. Springer and Robert E. Burton

VOLUME 1 — 1890 - 1909

p. 1 Seasonal Rainfall for the Seasons of 1891 to and including 1929-1930. [Includes 1890-1891 season, and 1930-1931 season.]

p. 2 Climatological Data for January. [From 1891 up to and including 1909]
- Temperature, in Degrees Fahrenheit
  - Monthly mean
  - Departure from normal
  - Highest
    - Date
  - Lowest
    - Date
  - Greatest daily range
  - Number of times above 90°
  - Number of times below 32°
- Precipitation, in inches.
  - Total
  - Departure from normal
  - Greatest in 24 hours
  - Total snowfall (unmelted)
- Number of rainy days
- Sky
  - Number of clear days
  - Number of partly cloudy days
  - Number of cloudy days
- Prevailing direction of wind
- Miscellaneous Phenomena (Such as auroras, frosts, thunderstorms, tornadoes, etc.)

p. 3 Daily Maximum Temperatures for January
[Includes "Mean" Temperatures for January 1891 thru 1909.]

p. 4 Daily Minimum Temperatures for January

p. 5 Daily Precipitation for January

p. 6 Climatological Data for February

[pp. 7 thru 49 cover same information as listed above for pp. 2 thru 5]

p. 50 Summary
- Mean Temperature
- Total Precipitation

p. 51 Total Rainfall for 29 years, Sept. 1, 1890 thru Aug. 31, 1919, with daily normal seasonal rainfall for each day.

SANTA CRUZ METEOROLOGICAL RECORDS

Compiled by W. R. Springer and Robert E. Burton

VOLUME 2 1910 - 1929

p. 1 Total, Daily and Normal Rainfall for 36 years beginning Sept. 1, 1890 - Aug. 31, 1927.

p. 2 Daily Normal Rainfall for 40 years, beginning on Sept. 1, 1890 - Aug. 31, 1930.

p. 3 Climatological Data for January
- Temperature, in Degrees Fahrenheit
  - Monthly mean
  - Departure from normal
  - Highest
    - Date
  - Lowest
    - Date
  - Greatest daily range
  - Number of times above 90°
  - Number of times below 32°
- Precipitation, in inches.
  - Total
  - Departure from normal
  - Greatest in 24 hours
  - Total snowfall (unmelted)
- Number of rainy days
- Sky
  - Number of clear days
  - Number of partly cloudy days
  - Number of cloudy days
- Prevailing direction of wind
- Miscellaneous Phenomena (Such as auroras, frosts, thunderstorms, tornadoes, etc.)

p. 4 Daily Maximum Temperatures for January

p. 5 Daily Minimum Temperatures for Jahuary

p. 6 Daily Precipitation for January

[pp. 7 thru 50 cover same information as listed above on pp. 3 thru 6, for February thru December.]

p. 51 Summary

p. 52 thru p. 58 Unusual Meteorological Phenomena

p. 59 Average Temperatures by Month for 40 years, beginning 1890.

p. 60 Total Rainfall, and the Daily Normal Rainfall for 36 [35] years beginning on the 1st day of September, 1890 and ending on the 31st of August, 1926, made by W. R. Springer, by daily observations.

SANTA CRUZ METEOROLOGICAL RECORDS

Compiled by W. R. Springer and Robert E. Burton

VOLUME 3 1930 - 1951

p. 1 . Climatological Data for January
Temperature, in Degrees Fahrenheit
Monthly mean
Departure from normal
Highest
Date
Lowest
Date
Greatest daily range
Number of times above 90°
Number of times below 32°

Precipitation, in inches.
Total
Departure from normal
Greatest in 24 hours
Total snowfall (unmelted)

Number of rainy days

Sky
Number of clear days
Number of partly cloudy days
Number of cloudy days

Prevailing direction of wind

Miscellaneous Phenomena (Such as auroras, frosts, thunderstorms, tornadoes, etc.)

[pp. 2 thru 48 cover same information as listed above for months of February thru December.]

p. 49 Summary

p. 50 & p. 51 Unusual Meteorological Phenomena

APPENDIX 4

Methodology

The primary sources of information for this study were the Santa Cruz observers' daily weather records themselves. Copies of their monthly reports and the data digitized from those reports were available from the Western Regional Climate Center in Reno, Nevada, or the National Climatic Data Center in Asheville, North Carolina. The monthly reports can be considered original sources because they were written by the observers and not altered by subsequent readers.

There were a variety of secondary sources that held information about Santa Cruz, its history, and its people. The author visited and collected information from the holdings of the National Climatic Data Center at Asheville, North Carolina; California State Library and California State Archives in Sacramento, California; Sacramento Public Library; the Library at the California Military Museum in Sacramento, California; the Santa Cruz Public Library; the Science and Engineering Library of the University of California Santa Cruz; the Santa Cruz Museum of Art and History; the National Archives and Records Administration in College Park, Maryland; the Smithsonian Institution Archives in Washington D.C.; and the Western Kentucky University Library, in Bowling Green Kentucky.

The tertiary sources were reference materials that are available on-line. Among those were the metadata prepared by the State Climatologist for California, the Western Regional Climate Center in Reno, Nevada, and the National Climatic Data Center in Asheville, North Carolina. In addition, substation histories previously prepared were consulted. Two genealogical research sources, Ancestry.com and Genealogy.com, were used to provide some of the personal information about the observers. For location analysis, the interactive maps available from TopoZone.com and Google Earth were used.

There was an attempt to glean information from all these sources that would allow a glimpse into the lives of the observers, the location of the observation site, and the historical environment that produced the climatic history of the Santa Cruz. Maps, drawings, and photographs were included when appropriate to illustrate the information.

Throughout the research for and preparation of this study, the objective was to produce a document that future studies can use to evaluate the validity of the data that were collected at Santa Cruz, judge the trustworthiness of the observers who collected them, and determine the climatological significance of the whatever variability may be discerned.

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