

RESOURCE INVENTORY

METEOROLOGY  
BIG BASIN REDWOODS STATE PARK  
DECEMBER 1998

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(minor revisions 9-19-01 by Roy W. Martin)

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## **INTRODUCTION**

Meteorological data for Big Basin Redwoods State Park are derived from published reports by the National Oceanic and Atmospheric Administration (NOAA), unit specific weather records, and other local sources. Unit specific weather records are short term, but general long-term trends can be extrapolated from National Weather Service reporting locations and other local sources in the Santa Cruz Mountains. Precipitation records for the Boulder Creek/Ben Lomond area of the central Santa Cruz Mountains are available from the 1888-1889 season to present. These records represent a series of various reporting locations. Temperature records listed in this inventory are specific for the park and date from 1981-1982 to the 1996-1997 season.

## **CLIMATE**

### **General Description**

Big Basin Redwoods State Park is at the extreme southern end of the Marine West Coast Climatic Zone. It also exhibits some characteristics of the Mediterranean Climatic Zone, which affects areas to the south and east. The park's climate is mesothermal, and thus not subject to severe seasonal change. This is due primarily to the moderating influence of the Pacific Ocean. The moderating influence is reflected in the relatively uniform temperature readings and high relative humidities that are characteristic of the area. Infrequently, offshore circulation patterns permit continental temperature regimes to become established in the park. Usually, these conditions persist for only one to two days. Cool temperatures and moderate to strong west and northwest winds dominate offshore waters and lower inland elevations during the summer. The effects of this marine intrusion are most pronounced along the immediate coast and in the valleys and passes during late afternoon and evening. Higher elevations are often above this layer of moist, marine air. A more continental type of climate prevails in inland areas well protected from the ocean, with warmer summers, colder winters, lower relative humidities, and greater daily and seasonal temperature ranges.

Temperatures in the park normally range from 30° to 40° F in the winter to 80° to 90° F in the summer. Winters are typically wet, with 90% of the precipitation falling between November and May. Although summers are dry, frequent fogs and relatively high humidities moderate these seasonal conditions.

A primary influence on the climate is the eastern North Pacific High (USDC 1977). This semi-permanent high pressure area intensifies and migrates northward during the summer months, keeping storm tracks well to the north. During this time of the year California receives little or no precipitation from Pacific storms. In winter, the North Pacific High decreases in intensity and

retreats southward, allowing north Pacific storms (i.e. low pressure centers) to move into and across the state. These storms are more frequent in the northern part of the state. Storms originating in the Gulf of Alaska are the major precipitation sources for the state. However, in winter, some precipitation arrives from the subtropics via the "Pineapple Express". Infrequent tropical storms may reach central California from northern Mexico during the summer and early fall. Such storms are more common in southern California, especially desert areas.

## **Temperature**

The average annual temperature for the Santa Cruz Mountains area ranges from 55 to 59° F. The overall range of temperature is about 25° to 102° F, with extremes occurring rarely. The warmest months are July, August, and September, with the coldest months being December, January, and February.

## **Precipitation**

Precipitation in Big Basin Redwoods State Park is quite variable, resulting from orographic effects produced by the Santa Cruz Mountains. Inland, higher elevations of the park are much wetter than the immediate coast at the mouth of Waddell Creek. The data that follows must be kept in perspective, since they are short-term records of less than 50 years at any one location. Comparisons of reporting locations are presented to give the reader a general sense of the local climate. Specific trends can not be deduced from such minimal records.

Average annual precipitation for park headquarters is 47.66 inches, based on a 14-year record from 1983 to the 1996-97 season (Table 1). This is comparable to the 49.70 inches of average precipitation recorded from 1888-1933 at a location within a few miles of park headquarters. A somewhat higher average of 54.88 inches was recorded in the nearby town of Ben Lomond from 1933 to 1964.

Undoubtedly, some of the ridgetops in the park receive more precipitation than headquarters area because of orographic influences. Reporting locations adjacent to the park along the ridgeline of Ben Lomond Mountain suggest this is the case. In the Eagle Rock area an annual average of 58.19 inches was recorded at the Locatelli Ranch from 1964 to 1973. Similarly, the nearby Lockheed Facility had an average annual precipitation of 55.76 inches from 1973 to 1983.

Records for the community of Swanton (Table 2) reveal considerably less precipitation at low elevations along the immediate coast. An annual average of 31 inches of precipitation has been recorded for the period of 1955 through 1997.

These data are representative of the mouth of Waddell Creek, which is located about four miles northwest of Swanton.

A comparison of the concurrent years 1983 to 1997 between Swanton and park headquarters is useful in highlighting the differences in precipitation totals. Over this 14-year period, 31 and 49.7 inches were recorded at Swanton and park headquarters, respectively. Based on these figures, precipitation totals average about 38% more at park headquarters as compared to the immediate coast.

The lowest total for annual precipitation at any inland location listed in Table 1 was 20.10 inches at the Lockheed Facility during the 1975-1976 season. This was followed by a meager 22.08 inches in the 1976-1977 season. Not surprisingly, a three-year drought occurred in most of California during this period. For Swanton, the lowest recorded total was 13 inches of precipitation during the same 1975-1976 period.

By contrast, the highest annual precipitation total of 124.26 inches was recorded at "Big Basin Valley" in 1889-1890. Other notable heavy precipitation years were 98.02 inches at Ben Lomond in 1940-1941 and 96.0 inches at the Lockheed facility (Eagle Rock area) in 1982-1983.

## **Wind**

During the summer and fall in the park the dominant air movements are those associated with differential heating and cooling of the ocean and adjacent land. The sea breeze generally begins in the morning and blows strongly during daylight hours as cooler and more dense sea air moves inland to displace heated, less dense air over the interior. At night, greater radiational cooling over the land causes the air over the interior to become cooler and denser than the air over the ocean.

Winter winds are predominantly from a southwesterly direction during storms, but typically shift to a northwesterly direction after passage of the cold front. In the spring winds usually blow from the northwest.

## **LOCAL CLIMATE**

This section describes localized weather conditions that differ significantly from general climate. Aspect, elevation, vegetation, steep slopes, and several other factors create localized climatic differences. Aspect determines solar exposure and the light, temperature, and water moisture characteristics of an area. South-facing slopes receive the greatest exposure to sunlight, experience the highest temperatures, and sustain the greatest moisture stress. In comparison, north-

facing slopes are cooler and moister. Typically, vegetation on south-facing slopes is less dense than that of north-facing slopes, and is composed of species that have a greater ability to withstand heat and moisture stress.

Microclimatic differences within Big Basin Redwoods State Park are readily apparent. More humid conditions prevail in drainages and stream bottoms, which is reflected by moisture-loving coniferous and riparian vegetation. South-facing slopes are drier and support more xeric vegetation such as chaparral, although soil substrate is an equally important determinant of plant life in these locations. This is true of the open knobcone pine forests that grow on nutrient poor ridgetop soils, in spite of an abundance of winter precipitation.

Elevation exerts its influence on local climate of the park by affecting precipitation. Precipitation accumulations rise with increasing elevation as moisture-laden clouds cool pass over mountainous areas and condense, falling as rain or snow.

## REFERENCES

Big Basin Redwoods State Park. Various dates. Precipitation and temperature records for the headquarters area.

Gilliam, Harold. 1962. Weather of the San Francisco Bay Region. University of California Press, Berkeley and Los Angeles. 72 pp.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration. 1977. Climate of California. Climatography of the United States No. 60. 12 pp.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Various dates. Precipitation records for several locations in the Santa Cruz Mountains.

**TABLE 1. Annual Precipitation Data in Inches for the Central Santa Cruz Mountains**

1888-89	49.05	1916-17	38.77	1944-45	52.81	1972-73	72.11
1889-90	124.26	1917-18	22.01	1945-46	40.26	1973-74	75.98
1890-91	61.27	1918-19	45.29	1946-47	34.60	1974-75	48.30
1891-92	47.73	1919-20	31.44	1947-48	39.75	1975-76	20.10
1892-93	77.15	1920-21	55.04	1948-49	44.92	1976-77	22.08
1893-94	46.68	1921-22	44.89	1949-50	44.58	1977-78	73.76
1894-95	82.45	1922-23	49.32	1950-51	67.93	1978-79	43.83
1895-96	50.41	1923-24	20.15	1951-52	87.52	1979-80	55.88
1896-97	52.36	1924-25	41.65	1952-53	56.85	1980-81	34.09
1897-98	24.25	1925-26	39.63	1953-54	45.82	1981-82	87.53
1898-99	55.84	1926-27	39.77	1954-55	47.29	1982-83	96.00
1899-00	45.44	1927-28	41.80	1955-56	72.70	1983-84	48.89
1900-01	54.49	1928-29	26.55	1956-57	42.05	1984-85	32.86
1901-02	54.40	1929-30	40.62	1957-58	87.46	1985-86	62.68
1902-03	48.47	1930-31	20.58	1958-59	40.99	1986-87	29.95
1903-04	57.61	1931-32	62.46	1959-60	40.54	1987-88	32.84
1904-05	62.26	1932-33	34.00	1960-61	31.09	1988-89	39.47
1905-06	72.89	1933-34	36.75	1961-62	52.31	1989-90	29.07
1906-07	64.25	1934-35	50.16	1962-63	76.41	1990-91	34.40
1907-08	33.49	1935-36	57.27	1963-64	37.24	1991-92	48.24
1908-09	73.63	1936-37	54.04	1964-65	68.72	1992-93	62.65
1909-10	42.45	1937-38	81.86	1965-66	40.00	1993-94	34.58
1910-11	57.83	1938-39	28.22	1966-67	82.43	1994-95	85.85
1911-12	31.54	1939-40	80.77	1967-68	40.77	1995-96	64.17
1912-13	21.92	1940-41	98.02	1968-69	80.70	1996-97	61.55
1913-14	69.34	1941-42	73.93	1969-70	56.60		
1914-15	68.25	1942-43	55.74	1970-71	55.41		
1915-16	53.01	1943-44	41.34	1971-72	26.95		

1888-1933 J. H. Aram. Southern Pacific Depot in Big Basin Valley.

1933-1964 Cress/Gleason. Cress Service Station, Ben Lomond.

1964-1973 Vince Locatelli Ranch, Eagle Rock area.

1973-1983 Lockheed Facility, Eagle Rock area.

1983-1997 Big Basin Redwoods State Park headquarters.



**TABLE 2. Annual Precipitation Data in Inches for Swanton, CA\***

1955-56	39	1969-70	30	1983-84	28
1956-57	22	1970-71	33	1984-85	28
1957-58	45	1971-72	21	1985-86	40
1958-59	14	1972-73	50	1986-87	23
1959-60	24	1973-74	45	1987-88	26
1960-61	18	1974-75	29	1988-89	25
1961-62	29	1975-76	13	1989-90	21
1962-63	36	1976-77	16	1990-91	22
1963-64	18	1977-78	40	1991-92	29
1964-65	34	1978-79	27	1992-93	43
1965-66	18	1979-80	36	1993-94	24
1966-67	35	1980-81	27	1994-95	50
1967-68	19	1981-82	51	1995-96	37
1968-69	43	1982-83	59	1996-97	32

\*Data are from Lud McCrary of Big Creek Ranch in Swanton, California. Swanton is located about 4 miles northwest of the mouth of Waddell Creek, with which it shares a nearly identical climate in terms of precipitation and temperature. Please note that these data have been rounded to the nearest whole number.