

## GEOGRAPHY AND ENVIRONMENT

This section relates to area, climatologic, topographic, hydrologic, noise and other geographic and environmental measurements of Hawaii.

The State consists of eight major islands and 124 minor islands with a total land area of 6,425 square miles and a general coastline of 750 miles. Honolulu is 214 miles from Hilo, 1,367 miles from Kure Atoll (the westernmost end of the State), and 2,397 miles from San Francisco. The highest peak in the State is Mauna Kea, 13,796 feet above sea level; the longest stream is Kaukonahua Stream, Oahu, 33 miles in length; the biggest lake is Halalii, on Niihau, 841 acres; and the highest named waterfall is Kahiwa, Molokai, a 1,750-foot cascade. Various measures of air pollution, such as suspended particulate matter, indicate that Honolulu is one of the cleanest cities in the nation. There is also relatively little water pollution: 24 out of 26 major Oahu beaches were rated "A" in 1977 (coliform not exceeding 50 per 100 ml.), only two were rated "B" (51-500), and none was rated "C" (501 or more). Climatologically, Hawaii is marked by remarkably balmy temperatures and wide variations in rainfall. The all-time temperature range in downtown Honolulu, for example, is from 57° to 88°F. Normal precipitation, however, ranges from 5.7 inches near Kawaihae, South Kohala, to 486 inches atop Waialeale. The longest volcanic eruption in Island history lasted 867 days, the worst earthquake attained 7.5 on the Richter scale, and the highest tsunami wave reached 56 feet. Water withdrawn for use in 1975 averaged 2.5 billion gallons per day, compared with 2.7 billion in 1970, 2.0 billion in 1965 and 1.5 billion in 1960. Among thirty neighborhoods on Oahu, median noise levels ranged from 44.7 decibels (in Pearl City) to 61.5 decibels (in Waikiki).

Important sources of data include the U.S. Geological Survey, National Ocean Survey, National Weather Service, U.S. Bureau of the Census Geography Division, the Division of Water and Land Development of the State Department of Land and Natural Resources, the State Department of Health, and the University of Hawaii Institute of Geophysics. Detailed information is given in *Hawai'i, the Natural Environment*, published by the Department of Planning and Economic Development in 1974. National data are reported in *Statistical Abstract of the United States: 1977*, Section 7.

**Table 78.—GREAT CIRCLE DISTANCES BETWEEN HONOLULU INTERNATIONAL AIRPORT AND SPECIFIED PLACES**

Place	Distance from Honolulu		Place	Distance from Honolulu	
	Statute miles	Kilometers		Statute miles	Kilometers
<b>Hawaiian Islands:</b>			<b>Other Pacific locations, con.:</b>		
Cape Kumukahi, Hawaii <sup>1</sup> . . . . .	236	380	Johnston Island . . . . .	820	1,319
Hilo, Hawaii <sup>2</sup> . . . . .	214	344	Kingman Reef . . . . .	1,073	1,726
Ka Lae (South Cape), Hawaii . . . . .	221	356	Manila, Philippines . . . . .	5,293	8,516
Kailua, Kona, Hawaii . . . . .	168	270	Pago Pago, Amer. Samoa . . . . .	2,606	4,193
Kahului, Maui . . . . .	98	158	Palmyra Island . . . . .	1,101	1,772
Lanai Airport . . . . .	72	116	Papeete, Tahiti . . . . .	2,741	4,410
Molokai Airport . . . . .	54	87	Suva, Fiji . . . . .	3,159	5,083
Lihue, Kauai . . . . .	103	166	Sydney (Port Jackson), Australia . . . . .	5,070	8,158
Puuwai, Niihau . . . . .	152	245	Tokyo, Japan . . . . .	3,847	6,190
Nihoa . . . . .	283	455	Wake Island . . . . .	2,294	3,691
Necker Island . . . . .	520	837	<b>North and South America:</b>		
French Frigate Shoals . . . . .	556	895	Anchorage, Alaska . . . . .	2,781	4,475
Gardner Pinnacles . . . . .	688	1,107	Cape Horn, Chile . . . . .	7,457	11,998
Maro Reef . . . . .	851	1,369	Chicago, Illinois . . . . .	4,179	6,724
Laysan Island . . . . .	936	1,506	Cristobal, Canal Zone . . . . .	5,214	8,389
Lisianski Island . . . . .	1,065	1,714	Los Angeles, California <sup>2</sup> . . . . .	2,557	4,114
Pearl and Hermes Atoll . . . . .	1,208	1,944	Miami, Florida . . . . .	4,856	7,813
Midway Islands . . . . .	1,309	2,106	New York, New York . . . . .	4,959	7,979
Kure Atoll <sup>1</sup> . . . . .	1,367	2,200	Portland, Oregon . . . . .	2,595	4,175
<b>Trust Territory of the Pacific Isl.:</b>			San Diego, California . . . . .	2,610	4,199
Majuro, Marshall Islands . . . . .	2,271	3,654	San Francisco, California <sup>2</sup> . . . . .	2,397	3,857
Kwajalein, Marshall Islands . . . . .	2,443	3,931	Seattle, Washington . . . . .	2,679	4,311
Kolonia, Ponape, E.C.I. . . . .	3,087	4,967	Vancouver, B.C. . . . .	2,709	4,359
Saipan, Mariana Islands . . . . .	3,704	5,960	Victoria, B.C. . . . .	2,668	4,293
Koror, Palau, W.C.I. . . . .	4,593	7,390	Tijuana, Mexico . . . . .	2,616	4,209
<b>Other Pacific locations:</b>			Washington, D.C. . . . .	4,829	7,770
Apra Harbor, Guam . . . . .	3,806	6,124	London, England . . . . .	7,226	11,627
Auckland, New Zealand . . . . .	4,393	7,068	Bombay, India . . . . .	8,010	12,888
Hong Kong . . . . .	5,541	8,915	Ghanzi, Botswana <sup>3</sup> . . . . .	12,417	19,979

<sup>1</sup> The great circle distance from Cape Kumukahi to Kure Atoll—the points farthest apart in the Hawaiian Archipelago and State of Hawaii—is 1,523 statute miles (2,451 kilometers). The distance from Kure Atoll to other extreme points in the United States is: West Quoddy Head, Maine, 5,788 miles (9,313 kilometers); Log Point, Elliot Key, Florida, 5,852 miles or 9,416 kilometers (Kure and Log Point are the points farthest apart in the fifty States). Kure is 2,486 miles (4,000 kilometers) from Tokyo, Japan.

<sup>2</sup> Hilo is 2,315 statute miles (3,725 kilometers) from San Francisco and 2,447 miles (3,937 kilometers) from Los Angeles.

<sup>3</sup> Ghanzi, Botswana is Honolulu's antipode, that is, the point precisely opposite to it on the globe.

Source: U.S. Department of the Interior, Geological Survey, *Elevations and Distances in the United States* (1970), and distance computations prepared for the Department of Planning and Economic Development.

**Table 79.—WIDTHS AND DEPTHS OF CHANNELS**

Channel	Location	Width		Maximum depth	
		Statute miles	Kilo-meters	Feet	Meters
Alenuihaha .....	Upolu Pt., Hawaii-Pulule Pt., Maui .....	29.5	47.5	6,120	1,870
Alalakeiki .....	Ule Pt., Kahoolawe-Nukele Pt., Maui .....	6.8	10.9	470	140
Kealaikahiki .....	Kamaiki Pt., Lanai-Ma Kaala, Kahoolawe .....	17.6	28.3	...	...
Auau .....	Kikoa Pt., Lanai-Lahaina, Maui .....	9.1	14.6	108	33
Kalohi .....	Wahi Pt., Lanai-Kamalo, Molokai .....	9.3	15.0	260	80
Pailolo .....	Lipoa Pt., Maui-Pohakuloa, Molokai .....	8.8	14.2	800	240
Kaiwi .....	Ilio Pt., Molokai-Makapuu Pt., Oahu .....	26.0	41.8	2,000	600
Kauai .....	Kaena Pt., Oahu-Kamilo Pt., Kauai .....	72.4	116.5	10,000	3,000
Kaulakahi .....	Kaunuopou Pt., Niihau-Mana Pt., Kauai .....	17.0	27.4	2,500	800

Source: Hawaii State Department of Planning and Economic Development, *Hawai'i, the Natural Environment* (1974), p. 20.

**Table 80.—AREA AND COASTLINE OF COUNTIES, ISLANDS, AND CITIES**

County, island, or city	Total area		Land area <sup>1</sup>		Inland water area <sup>2</sup>		General coastline <sup>3</sup>		Tidal shoreline <sup>4</sup>	
	Sq. mi.	Sq. km.	Sq. mi.	Sq. km.	Sq. mi.	Sq. km.	Statute miles	Km.	Statute miles	Km.
State total .....	6,450	16,707	6,425	16,642	25	65	750	1,207	1,052	1,693
Counties:										
Hawaii .....	4,038.0	10,458	4,037.0	10,456	1.0	3	266	428	313	504
Maui .....	1,161.1	3,007	1,160.3	3,005	0.8	2	} 210	338	343	552
Kalawao .....	13.3	34	13.3	34	—	—				
Honolulu .....	610.9	1,582	595.7	1,543	15.2	39	137	220	234	377
Kauai .....	627.1	1,624	619.1	1,603	8.0	21	137	220	162	261
Islands:										
Hawaii .....	4,038.0	10,458	4,037.0	10,456	1.0	3	266	428	313	504
Maui .....	728.8	1,888	728.2	1,886	0.6	2	120	193	149	240
Kahoolawe .....	45.0	117	45.0	117	—	—	29	47	36	58
Molokini .....	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )	—	—	...	...	...	...
Lanai .....	139.5	361	139.5	361	—	—	47	76	52	84
Molokai .....	261.1	676	260.9	676	0.2	1	88	142	106	171
Oahu .....	607.7	1,574	592.7	1,535	15.0	39	112	180	209	336
Kauai .....	553.3	1,433	548.7	1,421	4.6	12	90	145	110	177
Niihau .....	73.0	189	69.6	180	3.4	9	45	72	50	80
Lehua .....	0.4	1	0.4	1	—	—	...	...	...	...
Kaula .....	0.4	1	0.4	1	—	—	2	3	2	3
Northwestern Haw'n I. <sup>6</sup>	3.2	8	3.0	8	0.2	1	25	40	25	40
Cities:										
Hilo <sup>7</sup> .....	298.9	774	298.9	774	—	—	...	...	...	...
Honolulu <sup>8</sup> .....	88.7	230	86.6	224	2.1	5	...	...	...	...
On Oahu .....	85.5	221	83.6	217	1.9	5	...	...	...	...

<sup>1</sup> Dry land and land temporarily or partially covered by water, as marshland, swamps, etc.; streams and canals under one-eighth statute mile wide; and lakes, reservoirs, and ponds under 40 acres of area.

<sup>2</sup> Permanent inland water surface, such as lakes, reservoirs, and ponds having 40 acres or more of area; streams, sloughs, estuaries, and canals one-eighth of a statute mile or more in width; deeply indented embayments and sounds, and other coastal waters behind or sheltered by headlands or islands separated by less than 1 nautical mile of water; and islands having less than 40 acres of area.

<sup>3</sup> Figures are lengths of general outline of seacoast. Measurements were made with a unit measure of 30 minutes of latitude on charts as near the scale of 1:1,200,000 as possible. Coastline of bays is included to a point where they narrow to width of unit measure, and includes the distance across at such point. Figures for the four islands of Maui County are not consistent with the published county total.

<sup>4</sup> Figures obtained in 1939-1940 with a recording instrument on the largest-scale charts and maps then available. Shoreline of outer coast, offshore islands, bays, rivers, and creeks is included to the head of tidewater or to a point where tidal waters narrow to a width of 100 feet.

<sup>5</sup> The area of Molokini is 18.6 acres (0.03 square miles or 7.5 hectares).

<sup>6</sup> The Northwestern Hawaiian Islands, from Nihoa to Kure Atoll, but exclusive of the Midway Islands (which are part of the Hawaiian Archipelago but not legally part of the State of Hawaii).

<sup>7</sup> As defined in Hawaii Revised Statutes, Sec. 70-1. As defined for statistical purposes under provisions of Sec. 26-18, Hilo has a land area of 56.1 square miles or 145 square kilometers.

<sup>8</sup> As defined for statistical purposes under HRS, Sec. 26-18. Includes the Northwestern Hawaiian Islands from Nihoa to Kure Atoll, exclusive of the Midway Islands.

Source: Data from Geography Division, U.S. Bureau of the Census, and U.S. Coast and Geodetic Survey, cited in the Hawaii State Department of Planning and Economic Development, *Hawaii, the Natural Environment* (1974), pp. 9 and 13.

**Table 81.—MAJOR SUMMITS**  
[Elevation of the highest point on each island  
and other important peaks.]

Island and mountain	Elevation		Island and mountain	Elevation	
	Feet	Meters		Feet	Meters
Hawaii:			Oahu, continued:		
Mauna Kea <sup>1</sup> .....	13,796	4,205	Tantalus .....	2,013	614
Mauna Loa .....	13,677	4,169	Olomana .....	1,643	501
Hualalai .....	8,271	2,521	Diamond Head .....	760	232
Kohala .....	5,480	1,670	Punchbowl .....	500	152
Kilauea (Uwekahuna) .....	4,093	1,248	Koko Head .....	642	196
Kilauea (Halemaumau Rim) .	3,660	1,116			
			Kauai:		
Kahoolawe:			Kawaikini .....	5,243	1,598
Lua Makika .....	1,477	450	Waialeale .....	5,148	1,569
Maui:			Niihau:		
Haleakala (Red Hill) .....	10,023	3,055	Paniau .....	1,281	390
Haleakala (Kaupo Gap) .....	8,201	2,500			
Puu Kukui .....	5,788	1,764	Kaula .....	550	168
Iao Needle .....	2,250	686	Nihoa .....	910	277
			Necker Island .....	277	84
Lanai:			La Perouse Pinnacle .....	135	41
Lanaihale .....	3,370	1,027	Gardner Pinnacles .....	190	58
			Maro Reef .....	Awash	Awash
Molokai:			Laysan Island .....	35	11
Kamakou .....	4,970	1,515	Lisianski Island .....	20	6
Puu Nana .....	1,381	421	Pearl and Hermes Atoll .....	—	—
			Midway Islands <sup>3</sup> .....	12±	4±
Oahu:			Kure Atoll .....	20	6
Kaala .....	4,020	1,225	Kingman Reef <sup>3</sup> .....	3	1
Konahuanui <sup>2</sup> .....	3,150	960	Palmyra Islands <sup>3</sup> .....	6	2

<sup>1</sup> Includes 19 cones over 11,000 feet, five of them over 13,000.

<sup>2</sup> Two distinct peaks. The lower has an elevation of 3,105 feet.

<sup>3</sup> Not part of the State of Hawaii.

Source: U.S. Geological Survey data cited in the Hawaii State Department of Planning and Economic Development, *Elevations of Major Mountains in Hawaii* (Statistical Report 52, November 7, 1967), as revised by the U.S. National Cartographic Information Center, October 11, 1978.

**Table 82.—MAJOR STREAMS, BY ISLANDS**

Island	Feature or stream	Length or ave. discharge
Longest water feature (miles):		
Hawaii .....	Wailuku River .....	32.0
Maui .....	Kaliainui-Waiale Gulch .....	18.0
Kahoolawe .....	Ahupu Gulch .....	4.0
Lanai .....	Maunalei-Waiialala Gulch .....	12.9
Molokai .....	Wailau-Pulena Stream .....	6.5
Oahu .....	Kaukonahua Stream (So. Fork) .....	33.0
Kauai .....	Waimea River-Poomau Stream .....	19.5
Niihau .....	Keanaulii-Puniopo Valley .....	5.9
Largest perennial stream (miles): <sup>1</sup>		
Hawaii .....	Wailuku River .....	22.7
Maui .....	Palikea Stream .....	7.8
Molokai .....	Wailau-Pulena Stream .....	6.5
Oahu .....	Kaukonahua Stream .....	30.0
Kauai .....	Waimea River .....	19.7
Streams with greatest average discharge (million gal./day):		
Hawaii .....	Wailuku River .....	184.0
Maui .....	Iao Stream .....	54.1
Molokai .....	Pulena Stream .....	22.1
Oahu .....	Waikele Stream .....	25.7
Kauai .....	Hanalei River .....	151.0

<sup>1</sup> Estimated on basis of drainage area rather than stream runoff. Other major streams include Honokohau Stream, Maui (9.4 miles long); Halawa Stream (6.4), Waikolu Stream (4.7), and Pelekunu (2.3), all on Molokai; Waikele Stream (15.3), Kipapa Stream (12.8), and Waiakakalaua Stream (11.8), all on Oahu; and the Makaweli River (15.1), Wainiha River (13.8), Hanapepe River (13.3), and Wailua River (11.8), all on Kauai.

Source: Lengths from Hawaii State Department of Planning and Economic Development, *Hawai'i, the Natural Environment* (1974), p. 15; discharges from Hawaii State Department of Land and Natural Resources, Division of Water and Land Development, data supplied May 27, 1977.

**Table 83.—MAJOR DAMS: 1977**

Name	Location	Height (ft.)	Length (ft.)	Volume (cubic yds.)	Completed (year)	Volume of water impounded (acre ft.)
Wahiawa Dam .....	Wahiawa, Oahu ...	98	460	167,000	1906	7,776
Waita .....	Koloa, Kauai .....	27	3,050	(NA)	1905	7,350
Kualapuu .....	Kualapuu, Molokai..	58	3,900	1,267,000	1969	4,290
Alexander Dam .....	Kalaheo, Kauai .....	104	700	(NA)	1931	2,490

NA: Not available.

Source: Hawaii State Department of Land and Natural Resources, Division of Water and Land Development; information supplied March 11, 1977.

**Table 84.—DAMS: 1975**

Island	Hazard potential (number of dams)				Oldest dam (year built)	Highest dam (feet)	Max. capacity (acre feet)
	Total	High	Significant	Low			
State total .....	119	55	8	56	1885	105	9,200
Hawaii .....	10	5	1	4	1920	42	968
Maui .....	39	11	6	22	1885	48	260
Lanai .....	—	—	—	—	...	...	...
Molokai .....	1	1	—	—	1969	54	6,000
Oahu .....	19	13	—	6	1906	97	9,200
Kauai .....	50	25	1	24	1890	105	8,000
Niihau .....	—	—	—	—	...	...	...

Source: U.S. Department of the Army, Office of the Chief of Engineers, *National Program of Inspection of Dams*, Vol. II (May 1975), pp. F-12-1 to F-12-5.

**Table 85.—LARGEST LAKES, BY ISLANDS**

Island	Name of largest lake <sup>1</sup>	Category	Maximum depth (feet)	Altitude (feet)	Area (acres)	Shoreline (miles)
Hawaii .....	Waiakea Pond .....	Natural	(NA)	Sea level	27	2
	Lake Waiiau <sup>2</sup> .....	Natural	10	13,020	1.5	0.2
Maui .....	Kanaha Pond .....	Natural	(NA)	Sea level	41	2
Kahoolawe .....	None					
Lanai .....	None					
Molokai .....	Meyer Lake .....	Natural	5	2,021	6	1
Oahu .....	Wahiawa Reservoir	Man-made	85	842	333	11
Kauai .....	Waita Reservoir ...	Man-made	23	233	422	3
Niihau .....	Halulu Lake .....	Natural	(NA)	Sea level	182	3

NA Not available.

<sup>1</sup> 1 Excludes shoreline fish ponds and areas filled only during floods. The largest intermittent lake is Halalii Lake, Niihau (840.7 acres).

<sup>2</sup> Highest lake in the State and third highest in the United States.

Source: Hawaii State Department of Land and Natural Resources, Division of Water and Land Development, records.



Table 86.—MAJOR NAMED WATERFALLS, BY ISLANDS

Island	Waterfall <sup>1</sup>	Height (feet)		Horizontal distance (feet)	Average discharge (million gal./day)
		Sheer drop	Cascade		
Hawaii	Kaluahine	...	620	400	...
	Akaka	442	...	...	...
	Waiilikahi	320	...	...	6
	Hiilawe (3 falls)	...	300	200	...
	Rainbow	...	80	150	182
Maui	Honokohau	...	1,120	500	25
	Waihiimalu	...	400	150	...
	Waimoku	...	40	50	37
Molokai	Kahiwa	...	1,750	1,000	...
	Papalaua	...	1,200	500	...
	Wailele	...	500	150	...
	Haloku	...	500	200	...
	Hipuapua <sup>2</sup>	...	500	300	...
	Olupena	...	300	150	...
	Moaula <sup>2</sup>	...	250	200	20
Oahu	Kaliuwaa (Sacred) <sup>3</sup>	80	1,520	3,000	...
	Waihee (Waimea)	80	...	...	8
	Manoa	...	200	250	2
Kauai	Waipoo (2 falls)	...	800	600	...
	Awini	...	480	500	...
	Hinalele	280	...	...	...
	Kapakanui	280	...	...	...
	Manawaiopuna	280	...	...	...
	Wailua	80	...	...	76
	Opaekaa	40	...	...	...
	Puwainui	20	...	...	92

<sup>1</sup> Includes the largest named waterfall in each major island, either in height or average discharge; all other named falls 250 feet high or over; and well-known smaller falls. Many unnamed falls have sheer drops of 200 feet or more.

<sup>2</sup> Average discharge shown for Moaula includes flow from Hipuapua.

<sup>3</sup> Sheer drop refers to northernmost fall of a cascade of six falls.

Source: Heights from Map Information Office, U.S. Geological Survey, July-October 1969; average discharges from Division of Water and Land Development, Hawaii State Department of Land and Natural Resources, July 1977.

**Table 87.—MISCELLANEOUS GEOGRAPHIC STATISTICS, BY ISLANDS**

Island	Extreme length (miles)	Extreme width (miles)	Miles of sea cliffs with heights of —		Miles from coast of most remote point	Percent of area within 5 miles of coast
			100 to 999 ft.	1,000 ft. or more		
The State . . . . .	...	...	145	33	28.5	48.8
Hawaii . . . . .	93	76	50	4	28.5	30.0
Maui . . . . .	48	26	29	—	10.6	76.1
Kahoolawe . . . . .	11	6	14	—	2.4	100.0
Lanai . . . . .	18	13	13	1	5.2	100.0
Molokai . . . . .	38	10	15	14	3.9	100.0
Oahu . . . . .	44	30	3	—	10.6	79.0
Kauai . . . . .	33	25	14	11	10.8	67.0
Niihau . . . . .	18	6	7	3	2.4	100.0
Island	Percent of area with elevation —		Approximate mean altitude (feet)	Percent of area with slope —		
	Less than 500 feet	2,000 feet or more		Less than 10 percent	10 to 19 percent	20 percent or more
The State . . . . .	20.8	50.9	3,030	63.5	19.5	17.0
Hawaii . . . . .	12.0	68.4	3,950	76.0	20.0	4.0
Maui . . . . .	24.9	41.4	2,390	38.5	25.5	36.0
Kahoolawe . . . . .	38.9	0	600	60.0	31.0	9.0
Lanai . . . . .	24.8	6.3	1,140	61.0	23.0	16.0
Molokai . . . . .	37.3	17.8	1,150	53.0	21.0	26.0
Oahu . . . . .	45.3	4.6	860	42.5	12.0	45.5
Kauai . . . . .	35.6	24.0	1,380	33.5	16.0	50.5
Niihau . . . . .	78.2	0	530	68.0	19.5	12.5

Source: Hawaii State Department of Planning and Economic Development, *Hawai'i, the Natural Environment* (1974), p. 19; U.S. Geological Survey, *Elevations and Distances in the United States* (1978), pp. 4-5.

Table 88.—VOLCANIC ERUPTIONS: 1959 TO 1978

Volcano and date of outbreak	Repose period since previous eruption (months)	Duration (days)	Location	Altitude (feet)	Area (square miles)	Volume (1,000 cubic yards)
<b>Mauna Loa:</b>						
1975: July 5 .....	300	<1	Summit	13,000-12,100	5.2	39,200
<b>Kilauea:</b>						
1959: Nov. 14 .....	53.5	36	Kilauea Iki	3,500	0.24	51,000
1960: Jan. 13 .....	0.8	36	E. rift	100	4.1	155,000
1961: Feb. 24 .....	12.2	1	Halemaumau	3,150	0.02	30
Mar. 3 .....	0.2	22	Halemaumau	3,150	0.1	350
July 10 .....	3.5	7	Halemaumau	3,150	0.4	17,300
Sept. 22 .....	2.2	3	E. rift	2,600-1,300	0.3	3,000
1962: Dec. 7 .....	14.4	2	E. rift	3,250-3,100	0.02	430
1963: Aug. 21 .....	8.4	2	E. rift	3,150-2,700	0.06	1,100
Oct. 5 .....	1.4	1	E. rift	2,750-2,300	1.3	9,000
1965: Mar. 5 .....	17.0	10	E. rift	3,000-2,300	3.0	23,000
Dec. 24 .....	9.5	<1	E. rift	3,150-3,000	0.23	1,160
1967: Nov. 5 .....	23.3	251	Halemaumau	3,150	0.25	110,000
1968: Aug. 22 .....	1.3	5	E. rift	2,900-1,900	0.01	176
Oct. 7 .....	1.3	15	E. rift	3,00-2,400	0.8	9,000
1969: Feb. 22 .....	4.0	6	E. rift	3,100-2,900	2.3	22,000
May 24 .....	2.0	867	E. rift	3,150	19.3	242,000
1971: Aug. 14 .....	—	<1	Caldera	3,660-3,600	0.8	12,400
Sept. 24 .....	—	5	Caldera, SW rift	3,740-2,730	1.5	10,500
1972: Feb. 4 .....	4.3	455	E. rift	3,150	13.5	163,800
1973: May 5 .....	—	<1	E. rift	3,340-3,250	0.1	1,600
May 7 <sup>1</sup> .....	—	187	...	...	0.2	3,200
Nov. 10 .....	—	30	E. rift	3,250-2,900	0.4	3,700
Dec. 12 .....	1.1	203	E. rift	3,150	3.1	39,300
1974: July 19 .....	—	3	Caldera, E. rift	3,600-3,520	1.2	9,000
Sept. 19 .....	2.0	<1	Caldera	3,680	0.4	14,000
Dec. 31 .....	3.4	<1	Caldera	3,600	2.9	19,600
1975: Nov. 29 .....	11.0	<1	Caldera	3,600	0.05	330
1977: Sept. 13 .....	21.5	18	E. rift	1,600-2,080	3.0	45,000

<sup>1</sup> Listed by the Hawaiian Volcano Observatory staff but not by Macdonald and Hubbard (see source).

Source: Gordon A. Macdonald and Douglass H. Hubbard, *Volcanoes of the National Parks in Hawaii*, 7th edition (Hawaii Natural History Association, December 1974), pp. 14 and 29, as corrected by Dr. Macdonald, May 5, 1976, and updated by the staff of the Hawaiian Volcano Observatory, April 28, 1976, May 21, 1976, March 25, 1977, and February 8, 1978. Correct to February 8, 1978.

**Table 89.—EARTHQUAKES OF MAGNITUDE 5 OR GREATER:  
1957 TO 1977**

Date	Location	Magnitude (Richter Scale)
1957: Aug. 18 .....	E. of Hana, Maui .....	5.6
1961: Sept. 25 .....	Hawaii .....	5.75-6
1962: June 27 .....	Hawaii .....	6.1
June 28 .....	Hawaii .....	5.75
1963: Oct. 23 .....	Hawaii .....	5.4
1964: Oct. 11 .....	W. of S. Kona .....	5.3
Dec. 10 .....	Hawaii .....	5
1969: May 9 .....	Hawaii .....	5
1971: Aug. 1 .....	S.E. of Hawaii .....	4.5-5
1972: Dec. 23 .....	W. of Kona .....	5
1973: Apr. 26 .....	Hawaii .....	6.2
Oct. 9 .....	Hawaii .....	4.8-5
1974: Nov. 30 .....	Hawaii .....	5.5-6
1975: Jan. 1, 2:41 AM .....	Near Pahala, Hawaii .....	5.1
Jan. 1, 3:20 AM .....	Mauna Loa, Hawaii .....	5.1
Jan. 2 .....	Near Pahala, Hawaii .....	5.6
Jan. 5 .....	Mauna Loa, Hawaii .....	5.1
Nov. 29, 3:35 AM .....	Puna, Hawaii .....	5.7
Nov. 29, 4:47 AM .....	Puna, Hawaii .....	7.2
1977: Jan.22 .....	100 miles S. of Kauai .....	5.0

Source: Augustine S. Furumoto, N. Norby Nielsen, and William R. Phillips, *A Study of Past Earthquakes, Isoseismic Zones of Intensity and Recommended Zones for Structural Design for Hawaii* (University of Hawaii, Center for Engineering Research, June 15, 1972, pp. 16-19; Hawaii Institute of Geophysics, records. Complete to Aug. 31, 1977.

**Table 90.—TSUNAMIS WITH RUN-UP OF 2 METERS (6.6 FEET) OR MORE:  
1946 TO 1978**

[Correct to February 9, 1978]

Date	Maximum height in Hawaii		Deaths in Hawaii	Damage in Hawaii (dollars)
	Meters	Feet		
1946: April 1 .....	17.0	55.8	159	26,000,000
1952: Nov. 4 .....	6.1	20.0	—	1,000,000
1957: March 9 .....	16.0	52.5	—	5,000,000
1960: May 22 .....	10.5	34.5	61	23,000,000
1964: March 27 .....	4.8	15.7	—	67,590
1975: Nov. 29 .....	14.6	48.0	2	1,500,000

Source: George Pararas-Carayannis, *Catalog of Tsunamis in the Hawaiian Islands* (U.S. Coast and Geodetic Survey, May 1969); Robert C. Schmitt, "Catastrophic Mortality in Hawaii," *The Hawaiian Journal of History*, Vol. III (1969), pp. 66-86; Hawaii Institute of Geophysics, records; Harold G. Loomis, *The Tsunami of November 29, 1975 in Hawaii* (Hawaii Institute of Geophysics, December 1975), pp. 1 and 10; D.C. Cox and J. Morgan, *Local Tsunamis and Possible Local Tsunamis in Hawaii* (Hawaii Institute of Geophysics, Report HIG 77-14).

**Table 91.—WATER USE: 1965 TO 1975**  
 [In millions of gallons per day, unless otherwise specified.]

Subject	1965	1970	1975
Water withdrawn <sup>1</sup> .....	2,000	2,700	2,500
Ground water .....	820	920	870
Fresh .....	780	910	850
Saline .....	37	13	15
Surface water .....	1,200	1,700	1,600
Fresh .....	670	850	650
Saline .....	500	860	980
Reclaimed sewage .....	—	66	—
Withdrawn for irrigation .....	1,160	1,280	950
Conveyance losses .....	200	220	450
Used for hydroelectric power .....	360	330	200
Fresh water consumed .....	580	810	560
Per capita use (gallons per day) ....	2,800	3,500	1,900

<sup>1</sup> Excludes water used for hydroelectric power but includes irrigation conveyance losses.  
 Source: U.S. Geological Survey, *Estimated Use of Water in the United States* for 1965 (Circular 556, 1968), 1970 (Circular 676, 1972), and 1975 (Circular 765, 1977).

**Table 92.—AVERAGE DAILY WATER CONSUMPTION FROM COUNTY WATERWORKS: 1967 TO 1977**  
 [In millions of gallons. For years ended June 30.]

Year	Total	City of Honolulu	Rest of Oahu	Hawaii County	Kauai County	Maui County
1967 .....	(NA)	51.0	28.0	(NA)	3.05	6.22
1968 .....	95.3	51.5	29.1	5.38	3.28	6.06
1969 .....	106.2	56.3	33.5	5.94	3.44	7.06
1970 .....	115.5	59.8	37.0	6.67	4.11	7.94
1971 .....	117.9	60.4	37.7	7.16	4.06	8.55
1972 .....	125.1	62.4	40.7	8.02	4.34	9.63
1973 .....	135.7	67.2	44.4	8.99	4.66	10.45
1974 .....	133.6	65.6	43.0	9.32	5.04	10.69
1975 .....	138.3	65.3	45.9	9.63	5.20	12.29
1976 .....	149.5	68.8	50.9	10.20	5.93	13.56
1977 .....	156.5	70.6	52.9	11.30	5.99	15.75

NA Not available.

Source: Honolulu Board of Water Supply, *Annual Report and Statistical Summary* (annual), Hawaii County Department of Water Supply, *Annual Report* (annual) and records; Kauai County Department of Water, records; Maui County Department of Water Supply, *Annual Report* (annual) and records.

**Table 93.—WATER QUALITY AT OAHU BEACHES: 1975 TO 1977**

Beach	Number of samples			Fecal coliform density <sup>1</sup> (geometric mean, MPN/100 ml)		
	1975	1976	1977	1975	1976	1977
Ala Moana Park (Ewa) .....	38	35	33	8.2	11.2	3.8
Ala Moana Park (Center) .....	32	14	9	3.9	8.3	2.0
Ala Moana Park (Diamond Head) .....	35	20	9	11.1	12.4	2.2
Bellows Air Force Beach .....	9	—	—	12.0	(NA)	(NA)
Elks Club Beach .....	39	13	9	20.8	25.7	3.9
Ewa Beach .....	11	10	11	6.9	14.8	2.5
Fort DeRussy Beach .....	29	12	9	36.8	83.0	3.2
Gray's Beach .....	44	35	34	28.0	13.8	4.7
Haleiwa Park Beach .....	8	3	5	12.1	25.0	2.9
Hanauma Bay .....	11	9	10	4.8	4.7	4.0
Hauula Park Beach .....	10	8	4	6.4	23.4	6.3
Kaaawa Park Beach .....	10	8	4	17.6	18.2	21.4
Kahala Beach .....	9	—	—	46.2	(NA)	(NA)
Kahala Hilton Beach .....	9	—	—	22.4	(NA)	(NA)
Kahana Park Beach .....	10	8	4	228.6	160.5	81.4
Kahanamoku Beach .....	34	14	13	18.8	9.1	6.3
Kahanamoku Lagoon (Ewa) .....	24	—	—	288.7	(NA)	(NA)
Kahanamoku Lagoon (Diamond Head) ....	36	29	32	148.4	35.4	8.7
Kailua Park Beach .....	8	8	10	26.3	20.8	9.1
Kalama Beach .....	8	8	4	51.3	19.1	3.6
Kawela Bay .....	6	—	—	12.8	(NA)	(NA)
Kokokahi Pier .....	14	8	9	35.1	56.4	58.0
Kuhio Beach .....	41	14	11	41.7	45.5	19.3
Lanikai Beach .....	6	—	—	74.5	(NA)	(NA)
Makaha Beach .....	11	11	6	3.1	3.4	3.2
Nanakuli Park Beach .....	11	12	6	2.9	5.9	2.5
Public Bath Beach .....	43	33	33	6.9	6.9	2.4
Punaluu Park Beach .....	10	8	4	85.3	82.6	14.7
Sandy Beach (East) .....	11	9	10	3.8	22.4	2.6
Sandy Beach (West) .....	9	—	—	3.2	(NA)	(NA)
Tavern Beach .....	40	13	9	9.8	5.4	4.2
Waianae Park Beach .....	11	12	12	5.1	12.4	3.8
Waikiki Natatorium .....	29	—	—	4.9	(NA)	(NA)
Waimanalo Park Beach .....	10	10	10	6.0	21.5	8.5
Waimanalo Surfer's Beach .....	8	—	—	9.7	(NA)	(NA)

NA Not available.

<sup>1</sup> EPA criterion for bathing waters: Not to exceed a geometric mean of 200 fecal coliform bacteria per 100 ml. of water.  
Source: Hawaii State Department of Health, Pollution Investigation and Enforcement Branch, records.

**Table 94.—SUSPENDED PARTICULATE  
MATTER, FOR HONOLULU:  
1970 TO 1977**

[Sampling conducted from roof of Health Department  
Building. Annual mean levels over 80 micrograms  
per cubic meter may affect human health.]

Year	Mean micrograms per cubic meter
1970 .....	37
1971 .....	45
1972 .....	41
1973 .....	34
1974 .....	35
1975 .....	40
1976 .....	34
1977 .....	31

Source: Hawaii State Department of Health,  
*Statistical Report* (annual) and records.

**Table 95.—AIR POLLUTANT EMISSIONS, BY SOURCE AND COUNTIES: 1976**

[In tons per year; as of July.]

Counties and sources	Sulfur oxides	Particulates	Carbon monoxide	Hydrocarbons	Nitrogen oxides
Total .....	66,702	80,166	329,662	94,607	61,524
COUNTIES					
City and County of Honolulu .....	59,090	45,841	212,255	58,998	44,510
County of Hawaii .....	3,355	8,925	49,335	14,823	6,860
County of Kauai .....	1,194	7,291	32,088	10,207	3,710
County of Maui .....	3,063	18,109	35,984	10,579	6,444
SOURCES					
Transportation .....	2,761	4,004	239,843	44,471	26,612
Motor vehicles .....	780	2,402	219,038	35,128	20,644
Aircraft .....	310	1,122	6,252	3,904	1,584
Vessels .....	1,436	207	3,530	1,293	1,342
Off-highway fuel usage .....	235	272	11,023	1,203	3,042
Gasoline handling and evaporation ...	(N)	(N)	(N)	2,943	(N)
Fuel combustion in stationary sources ..	58,117	12,872	4,628	5,991	30,906
Residential, commercial, institutional .	1,044	228	99	73	716
Industrial and agricultural .....	14,403	9,936	3,725	5,484	6,545
Steam-electric utilities .....	42,670	2,708	804	434	23,645
Solid waste disposal .....	299	1,343	6,196	2,998	470
Open burning .....	41	698	3,704	1,309	262
Incineration .....	258	645	2,492	1,689	208
Industrial process losses .....	5,525	39,754	668	15,038	925
Agricultural field burning .....	(N)	22,193	78,327	26,109	2,611

N Negligible

Source: Hawaii State Department of Health, Pollution Investigation and Enforcement Branch, records.



**Table 96.—AEROMETRIC SURVEY DATA FOR SPECIFIED LOCATIONS: 1977**

Location	Particulate matter (micrograms per cubic meter)			Sulfur dioxide (micrograms per cubic meter)		
	Minimum	Maximum	Annual average	Minimum	Maximum	Annual average
<b>Oahu:</b>						
Ala Moana <sup>1</sup> .....	18	109	40	<5	<5	<5
Dept. of Health Bldg. <sup>2</sup> .....	14	51	31	<5	53	17
Kalihi Kai .....	26	81	60	<5	<5	<5
Pearl City.....	22	111	40	<5	38	<5
Barbers Point .....	25	134	54	<5	18	<5
Waimanalo.....	14	59	31	...	...	...
<b>Maui:</b>						
Kahului.....	47	177	73	<5	246	53
Kihei .....	23	133	60	...	...	...
<b>Hawaii:</b>						
Hilo.....	15	80	32	<5	<5	<5
<b>Kauai:</b>						
Lihue.....	12	84	34	<5	<5	<5

<sup>1</sup> Site moved from Sewer Pumping Station to McCoy Pavilion on February 28, 1977.

<sup>2</sup> Also surveyed for carbon monoxide, 1 hour (minimum of 0 milligrams per cubic meter and maximum of 19.6) and photochemical oxidants (minimum of 4 micrograms per cubic meter and maximum of 61).

Source: Hawaii State Department of Health, Pollution Investigation and Enforcement Branch, records.

**Table 97.—NOISE LEVELS IN VARIOUS NEIGHBORHOODS ON OAHU: 1974**

[Noise measurements were taken at 578 stations distributed over the populated areas on Oahu, except Waialua, Haleiwa and small communities along the north shoreline. Noise readings were not taken in these areas because previous noise measurements in these communities were similar to noise levels in Waimanalo and Olomana areas. The noise measurement stations were randomly distributed over the communities.

Since one of the objectives of this noise survey was to establish the existing ambient and residual noise levels of each community, the noise readings at each station were taken as far as possible away from all heavily used roads and freeways. Loud identifiable noise from nearby traffic, airplane passing overhead, dogs barking and noise from other sources were also measured. The noise readings at any location were taken on three or more widely separated days. This was done to avoid any abnormal noise conditions. In densely populated areas, the noise survey was conducted between the hours of 4:00 a.m. to 10:00 a.m., 9:00 a.m. to 5:00 p.m. and 4:00 p.m. to 2:00 a.m. In less populated areas west of Pearl City, Wahiawa and Mililani Town, the noise readings were taken during the daytime only.]

Neighborhood	Noise level (in decibels) exceeded —		
	10 percent of time	50 percent of time	90 percent of time
<b>HONOLULU</b>			
Aina Haina .....	53.5	45.0	40.0
Aina Koa .....	61.0	48.4	42.3
Downtown .....	67.0	58.0	50.5
Hawaii Kai .....	57.0	46.5	40.5
Kahala .....	56.7	45.5	42.0
Kaimuki .....	59.0	50.7	44.0
Kalihi .....	58.0	50.2	43.7
Kapahulu .....	55.0	49.7	44.0
Kapalama-Liliha .....	63.8	56.0	46.0
Kuliouou .....	53.5	46.3	40.5
Makiki .....	64.5	55.0	49.5
Manoa .....	58.7	45.3	40.0
Moiliili .....	62.0	55.0	50.0
Niu Valley .....	57.0	46.7	39.5
Nuuanu .....	63.0	50.1	45.4
Palolo .....	58.5	49.4	44.0
Pawaa .....	65.5	60.0	54.0
Waikiki .....	69.0	61.5	54.0
Waialae-Iki .....	60.0	50.5	41.5
Ward to Punchbowl .....	67.5	60.2	57.0
<b>REST OF OAHU</b>			
Aiea-Waimalu .....	57.5	47.3	40.5
Halawa Heights, Foster Village, Salt Lake, Aliamanu	57.5	54.5	48.7
Kailua .....	55.5	45.0	37.5
Kaneohe .....	54.0	45.5	40.5
Mililani Town .....	57.5	50.0	45.0
Pearl City .....	53.2	44.7	38.7
Wahiawa .....	62.5	50.5	46.0
Waianae .....	56.5	50.0	45.0
Waimanalo .....	54.5	50.0	44.5
Waipahu .....	59.0	51.0	45.5

Source: Survey conducted by Dr. Iwao Miyake for the Hawaii State Department of Health, and summarized by the Noise and Radiation Branch, Department of Health.

**Table 98.—CLIMATIC DATA FOR SELECTED PLACES**

Island and station	Ground elevation (feet)	Average temperature (°F)		Extreme temperature of record (°F)		Average annual precipitation (inches)	Average annual possible sunshine (percent)
		Coolest month	Warmest month	Lowest	Highest		
<b>Hawaii:</b>							
Hilo Airport .....	27	71.0	75.9	53	94	133.57	39
Hawaii Volcanoes Nat. Pk. Hq.	3,971	57.6	63.2	37	85	102.81	...
Kona (Kailua) .....	30	72.1	77.3	54	93	25.22	...
Puako <sup>1</sup> .....	10	73.1	79.8	52	98	9.47	...
Waimea (Kamuela) .....	2,670	62.3	66.8	34	90	40.05	...
Mauna Kea summit <sup>2</sup> .....	13,796	31.1	42.5	11	66	8.08	...
<b>Maui:</b>							
Hana .....	120	71.3	76.8	50	90	70.65	...
Haleakala summit .....	9,960	42.6	50.0	14	73	50.69	...
Kihei <sup>3</sup> .....	90	70.9	78.4	49	98	13.79	...
Kahului Airport .....	48	71.6	78.8	48	96	18.43	70
Lahaina .....	45	71.5	78.0	52	93	15.51	...
<b>Molokai:</b>							
Kaunakakai .....	12	...	...	...	...	14.08	...
Molokai Airport .....	450	70.2	77.6	48	90	29.21	...
<b>Lanai:</b>							
Lanai City .....	1,620	65.8	72.8	46	88	38.44	...
<b>Oahu:</b>							
Honolulu International Airport	7	72.3	80.7	53	92	22.90	67
Honolulu Federal Bldg. <sup>4</sup> ....	12	72.0	78.6	57	88	25.35	65
Waikiki <sup>5</sup> .....	10	71.9	80.6	51	93	27.32	...
Manoa (HSPA) .....	500	69.4	75.2	...	...	158.41	...
Kaneohe MCAS .....	10	72.9	79.1	58	90	43.88	...
Kahuku .....	25	71.6	78.8	49	95	41.10	...
Wheeler AFB .....	826	68.2	75.5	52	89	39.85	...
Waianae .....	20	72.1	79.7	45	96	20.31	...
<b>Kauai:</b>							
Kilauea .....	315	68.7	75.6	49	94	68.03	...
Kealia .....	9	70.2	78.0	44	93	43.28	...
Lihue Airport .....	103	71.2	79.1	50	90	44.18	56
Poipu (Makahuena Pt.) ....	52	72.4	79.4	50	93	36.39	...
Kokee (Kanalohuluhulu) ...	3,600	54.9	65.5	31	80	72.25	...
Waialeale .....	5,075	...	...	...	...	486.	...
<b>Northwestern Hawaiian Islands:</b>							
Midway .....	10	65.0	78.6	52	89	43.60	...

<sup>1</sup> Temperature data are for Mahukona.

<sup>2</sup> Based on incomplete and non-continuous data for 1966-1972.

<sup>3</sup> Temperature data refer to Puunene Airport.

<sup>4</sup> Temperature sensors are 87 feet above the ground.

<sup>5</sup> Located at Honolulu Zoo. Available only from 1965.

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service Pacific Region, data supplied March 17, 1976 and May 2, 1977.

**Table 99.—MONTHLY AND ANNUAL CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT**

Month	Normal temperature (°F.)			Extreme temperature (°F.) <sup>1</sup>		Precipitation (inches)			
	Daily maximum	Daily minimum	Monthly	Record highest	Record lowest	Normal total	Maximum monthly	Minimum monthly	Maximum in 24 hours
Jan. ....	79.3	65.3	72.3	85	53	4.40	14.74	0.48	6.72
Feb. ....	79.2	65.3	72.3	87	53	2.46	13.68	0.32	6.88
Mar. ....	79.7	66.3	73.0	87	55	3.18	20.79	0.01	17.07
Apr. ....	81.4	68.1	74.8	87	59	1.36	8.92	0.01	4.21
May ....	83.6	70.2	76.9	88	63	0.96	7.23	0.05	3.44
June ....	85.6	72.2	78.9	90	65	0.32	2.46	T	2.28
July ....	86.8	73.4	80.1	90	67	0.60	2.01	0.03	1.03
Aug. ....	87.4	74.0	80.7	92	67	0.76	3.08	T	2.35
Sept. ....	87.4	73.4	80.4	92	66	0.67	2.74	0.05	1.40
Oct. ....	85.8	72.0	78.9	91	64	1.51	5.83	0.11	2.81
Nov. ....	83.2	69.8	76.5	89	58	2.99	14.72	0.03	9.15
Dec. ....	80.3	67.1	73.7	89	54	3.69	12.09	0.06	8.14
Ann. ....	83.3	69.8	76.6	92	53	22.90	20.79	T	17.07

  

Month	Relative humidity (percent) <sup>2</sup>		Wind (miles/hour)		Percent of possible sunshine	Mean sky cover. sunrise to sunset <sup>3</sup>	Mean number of days		
	8 A.M.	2 P.M.	Mean speed	Fastest mile			Sunrise to sunset		Precip. .01 inch or more
							Clear	Cloudy	
Jan. ....	81	63	9.9	67	63	5.5	9	10	10
Feb. ....	76	59	10.8	63	65	5.7	7	9	10
Mar. ....	73	59	11.6	59	68	6.0	7	10	9
Apr. ....	70	58	12.2	40	66	6.3	6	11	9
May ....	66	54	12.3	35	69	6.0	7	10	7
June ....	65	53	12.9	39	70	5.6	6	7	6
July ....	65	51	13.7	34	73	5.3	8	6	8
Aug. ....	66	53	13.5	52	75	5.2	8	6	7
Sept. ....	65	52	11.7	36	74	5.1	9	6	7
Oct. ....	67	54	10.9	40	67	5.6	8	8	9
Nov. ....	73	58	11.1	65	60	5.7	7	9	10
Dec. ....	76	60	11.0	59	59	5.5	8	10	10
Ann. ....	70	56	11.8	67	67	5.6	90	102	102

T Trace, an amount too small to measure.

<sup>1</sup> For periods October 1962 through December 1964 and September 1971 through December 1977. At other times, temperatures as high as 93° and as low as 52° have been recorded at the Airport.

<sup>2</sup> Data for 1963, 1964, and 1972-1977.

<sup>3</sup> Sky cover is expressed in a range of 0 for no clouds or obscuring phenomena to 10 for complete sky cover.

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, *Local Climatological Data, Annual Summary With Comparative Data, Honolulu, 1977.*

**Table 100.—CLIMATIC DATA FOR THE PERIOD OF RECORD**

Subject	Date	Place	Magnitude
Long-term averages:			
Lowest monthly average minimum temp.(°F)	February .....	Mauna Kea summit .....	23.3
Lowest monthly average daily temp.(°F) ....	February .....	Mauna Kea summit .....	31.1
Highest monthly average maximum temp.(°F)	August .....	Waiawa, Kauai .....	89.7
Highest monthly average daily temp.(°F) ....	August .....	Puako, Hawaii .....	80.7
Lowest average annual rainfall (inches) .....	.....	N. of Kawaihae .....	5.7
Highest average annual rainfall (inches) .....	.....	Waialeale .....	486.
Single events:			
Lowest temperature of record (°F) .....	Feb. 11, 1973 .....	Mauna Kea summit .....	11.
Highest temperature of record (°F) .....	April 27, 1931 .....	Pahala, Hawaii .....	100.
Lowest annual rainfall of record (inches) .....	1953 .....	Kawaihae, Hawaii .....	0.2
Highest annual rainfall of record (inches) ...	1947-1948 .....	Waialeale .....	624.
Highest wind speed of record (m.p.h.) .....	Jan. 17-18, 1959 ..	Mauna Loa Obser. ....	105+

Source: U.S. Department of Commerce, National Weather Service, Pacific Region, data supplied March 14, 1973.

**Table 101.—TEMPERATURE AND RAINFALL, FOR SPECIFIED LOCATIONS: 1967 TO 1977**

Year	Average temperature (°F.): Honolulu Federal Bldg.			Extreme temps. (°F.) Honolulu Fed. Bldg.		Annual rainfall (inches)				
	Annual	February	August	Lowest	Highest	Honolulu Fed. Bldg.	Hilo Airport	Holualoa Beach	Lahaina	Koloa
1967 .....	76.0	73.5	79.6	60	87	37.63	154.00	31.10	28.48	86.23
1968 .....	77.0	73.0	80.9	63	88	36.24	134.14	48.86	25.87	84.00
1969 .....	74.8	71.9	78.7	59	86	26.71	173.23	32.89	10.09	72.42
1970 .....	75.5	71.7	78.9	59	85	18.35	153.98	20.78	11.95	64.45
1971 .....	75.4	73.5	78.5	59	85	28.61	140.69	37.61	15.93	75.33
1972 .....	75.0	71.2	78.8	61	88	26.72	98.85	33.22	20.21	66.72
1973 .....	74.8	70.8	78.1	62	85	18.66	107.97	14.85	10.13	66.78
1974 .....	75.9	73.8	79.0	63	86	28.24	117.34	40.49	13.01	86.35
1975 .....	74.6	72.1	77.5	61	85	24.63	99.93	25.97	12.19	49.91
1976 <sup>1</sup> .....	...	71.6	80.6	60	88	...	114.67	25.51	8.86	62.60
1977 .....	...	...	...	...	...	...	90.38	...	8.28	52.51

<sup>1</sup> Honolulu Federal Building observations discontinued in December.

Source: U.S. Department of Commerce, National Weather Service, Pacific Region, record.

**Table 102.—CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT: ANNUALLY, 1967 TO 1977**

Year	Average temperature (degrees F.)			Extreme temp. (°F.)		Precipitation (inches)
	Annual	Coolest month	Warmest month	Lowest	Highest	
1967.....	77.6	72.5	82.4	59	92	34.34
1968.....	77.9	73.0	82.9	59	92	37.26
1969.....	77.4	69.1	83.2	52	92	22.50
1970.....	78.2	73.3	83.8	58	92	15.49
1971.....	76.1	71.7	79.5	56	89	26.64
1972.....	76.2	70.4	81.1	53	90	26.94
1973.....	77.2	72.6	81.2	55	91	14.24
1974.....	77.5	74.0	81.2	58	92	24.02
1975.....	76.2	72.4	80.1	56	90	24.39
1976.....	76.8	72.0	80.8	53	91	12.90
1977.....	78.2	73.7	82.2	59	92	12.36

  

Year	Relative humidity (%)		Wind speed (miles/hour)		Percent of possible sunshine	Days with precipitation .01 inch or more
	8 A. M.	2 P. M.	Annual average	Fastest mile		
1967.....	71	58	10.0	34	58	138
1968.....	74	59	10.4	43	63	114
1969.....	73	57	12.8	40	68	96
1970.....	69	54	13.2	40	72	120
1971.....	72	57	13.3	34	70	110
1972.....	72	57	13.2	33	65	93
1973.....	70	54	12.7	33	63	110
1974.....	73	58	10.9	34	61	118
1975.....	72	56	12.2	36	62	82
1976.....	64	52	11.5	38	60	105
1977.....	71	55	12.2	37	68	81

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Center, *Local Climatological Data, Annual Summary With Comparative Data, Honolulu, Hawaii* (annual), as supplied by Hawaii State Department of Land and Natural Resources, Water Resources Information Center.

**Table 103.—AVERAGE WATER TEMPERATURES  
AT WAIKIKI BEACH**

Month	Morning (°F.)	Afternoon (°F.)
March .....	75	77
August .....	77	82

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, *Local Climatological Data, Annual Summary With Comparative Data, Honolulu, Hawaii, 1977.*

**Table 104.—SUNRISE, SUNSET, AND HOURS OF DAYLIGHT AT HILO, HONOLULU,  
AND LIHUE, FOR SELECTED DATES**  
[Hawaiian Standard Time.]

Place and date	Sunrise (A. M.)	Sunset (P. M.)	Hours of daylight
Hilo:			
June 21 .....	5:42	7:02	13:20
December 22 .....	6:51	5:47	10:56
Honolulu:			
January 1 .....	7:10	6:01	10:51
February 1 .....	7:09	6:22	11:13
March 1 .....	6:52	6:36	11:44
April 1 .....	6:25	6:47	12:22
May 1 .....	6:01	6:57	12:56
June 1 .....	5:49	7:10	13:21
June 21 .....	5:50	7:16	13:26
July 1 .....	5:53	7:18	13:25
August 1 .....	6:05	7:11	13:06
September 1 .....	6:15	6:48	12:33
October 1 .....	6:23	6:20	11:57
November 1 .....	6:35	5:56	11:21
December 1 .....	6:53	5:49	10:56
December 22 .....	7:05	5:55	10:50
Lihue:			
June 21 .....	5:55	7:23	13:28
December 22 .....	7:12	6:00	10:47

Source: Nautical Almanac Office, U.S. Naval Observatory, Tables of Sunrise and Sunset, No. 1083 and 1084 and records.

**Table 105.—TREES ALONG STREETS OR IN PARKS UNDER THE JURISDICTION OF THE CITY AND COUNTY OF HONOLULU: 1970 TO 1977**

Year (as of June 30)	City and County streets and highways <sup>1</sup>		Trees in City and County parks
	Length in miles	Trees	
1970.....	934	46,290	63,500
1971.....	958	54,146	64,500
1972.....	974	61,023	65,000
1973.....	987	70,497	65,500
1974.....	1,000	82,635	65,800
1975.....	1,022	88,654	68,300
1976.....	1,036	93,658	92,800
1977.....	1,050	97,865	93,800

<sup>1</sup> Excludes Federal, State, and private thoroughfares.

Source: Honolulu Department of Parks and Recreation, records.



**Table 106.—HAWAII AUDUBON SOCIETY BIRD COUNTS OF THE HONOLULU AREA:  
1958 TO 1977**

[Counts are made in late December, in a circle, 15 miles in diameter, centered near Nuuanu Pali.]

Year	Species	Individual birds	Species <sup>1</sup>	Individual birds
1958 .....	34	7,457	Endemic species:	
1959 .....	34	4,076	'Apapane .....	145
1960 .....	34	4,656	Oahu 'Amakihi .....	128
1961 .....	39	3,954	Hawaiian Stilt .....	106
1962 .....	39	2,969		
1963 .....	35	7,963	Indigenous species:	
1964 .....	34	10,139	Red-footed Booby .....	1,647
1965 .....	46	11,820+	Great Frigatebird .....	571
1966 .....	51	12,557		
1967 .....	51	22,641	Introduced species:	
1968 .....	49	11,024	Barred Dove .....	2,201
1969 .....	53	13,236	Common Myna .....	2,173
1970 .....	51	10,454	Cattle Egret .....	1,316
1971 .....	50	13,218	House Sparrow .....	1,112
1972 .....	52	14,559	Japanese White-eye .....	953
1973 .....	48	9,574	Spotted Dove .....	780
1974 .....	44	10,263		
1975 .....	54	12,008	Migratory species:	
1976 .....	55	16,393	Golden Plover .....	993
1977 .....	52	15,542	Ruddy Turnstone .....	134

<sup>1</sup> Endemic birds numbering more than 50 individuals, indigenous birds more than 100, introduced birds more than 750, and migratory species and stragglers more than 100. Endemic birds are those peculiar to a particular region, in this case Hawaii, and therefore found nowhere else in the world; indigenous birds are those native to a given region, in this case Hawaii, but with a total range of distribution encompassing a much wider area. The classification is that reported in Andrew J. Berger, *Hawaiian Birdlife* (1972).

Source: Hawaii Audubon Society, *The Elepaio* for February 1968-1978.

**Table 107.—ENDANGERED, THREATENED, AND EXTINCT SPECIES OF NATIVE HIGHER PLANTS: 1974**

Status	Species, subspecies, and varieties	Percent
Total native flora .....	2,200	100.0
Endangered, threatened, or extinct <sup>1</sup>	1,088	49.5
Endangered <sup>2</sup> .....	639	29.0
Threatened .....	194	8.8
Extinct .....	255	11.6
Not endangered, threatened, or extinct	1,112	50.5

<sup>1</sup> For the other 49 States, 2,099 (or 10.5 percent) of all 20,000 native higher plants are endangered, threatened, or extinct.

<sup>2</sup> A revised inventory, published June 16, 1976, listed 894 endangered Hawaiian species, out of a national total of 1,782 endangered species; see *Federal Register*, Vol. 41, No. 117 (June 16, 1976), pp. 24523-24572, and Harry Whitten, "Endangered Plants," *Honolulu Star-Bulletin*, September 5, 1977, p. A-15.

Source: 94th Congress, 1st Session, House Document No. 94-51, *Report on Endangered and Threatened Plant Species of the United States*, presented to the Congress of the United States of America by the Secretary, Smithsonian Institution, 15 December 1974, p. 11 (percentages recalculated by DPED).