

## Section 5

# 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), 2,397 miles from San Francisco, and 4,829 miles from Washington, D.C. 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: sixteen major Oahu beaches surveyed in 1979 were found to have coliform levels per 100 ml. ranging from 3.7 to 94.8, and all were well within EPA standards. More than 1,100 species, subspecies, and varieties of native flora were endangered, threatened, or extinct, according to a 1977 survey. Climatically, Hawaii is marked by remarkably balmy temperatures and wide variations in rainfall. The all-time temperature range at Honolulu International Airport, for example, was from 53° to 92°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 Water withdrawn for use in 1975 averaged 2.5 billion gallons per day, compared with 2.7 billion in 1970 and 2.0 billion in 1965. Among thirty neighborhoods on Oahu, median noise levels in 1974 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 Atlas of Hawaii, published by the University Press of Hawaii in 1973, and Hawai'i, the Natural Environment, issued by the Department of Planning and Economic Development in 1974. National data are reported in Statistical Abstract of the United States: 1979, Section 7.

Table 81.-- GREAT CIRCLE DISTANCES BETWEEN HONOLULU INTERNATIONAL AIRPORT AND SPECIFIED PLACES

Place	Distance from Honolulu	
	Statute miles	Kilometers
<b>Hawaiian Islands:</b>		
Cape Kumukahi, Hawaii .....	236	380
Hilo, Hawaii .....	214	344
Ka Lae (South Cape), Hawaii .....	221	356
Kailua, Kona, Hawaii .....	168	270
Kahului, Maui .....	98	158
Lanai Airport .....	72	116
Molokai Airport .....	54	87
Lihue, Kauai .....	103	166
Puuwai, Niihau .....	152	245
Nihoa .....	283	455
Necker Island .....	520	837
French Frigate Shoals .....	556	895
Gardner Pinnacles .....	688	1,107
Maro Reef .....	851	1,369
Laysan Island .....	936	1,506
Lisianski Island .....	1,065	1,714
Pearl and Hermes Atoll .....	1,208	1,944
Midway Islands .....	1,309	2,106
Kure Atoll .....	1,367	2,200
<b>Trust Territory of the Pacific Islands:</b>		
Majuro, Marshall Islands .....	2,271	3,654
Kwajalein, Marshall Islands .....	2,443	3,931
Kolonia, Ponape, E.C.I. ....	3,087	4,967
Saipan, Mariana Islands .....	3,704	5,960
Koror, Palau, W.C.I. ....	4,593	7,390
<b>Other Pacific locations:</b>		
Apra Harbor, Guam .....	3,806	6,124
Auckland, New Zealand .....	4,393	7,068
Avarua, Rarotonga .....	2,950	4,750
Funafuti, Tuvalu .....	2,550	4,106
Hong Kong .....	5,541	8,915
Johnston Island .....	820	1,319
Kingman Reef .....	1,073	1,726
Manila, Philippines .....	5,293	8,516
Nuku'alofa, Tongatapu .....	3,165	5,096
Nuku Hiva, Marquesas Islands .....	2,400	3,864
Pago Pago, American Samoa .....	2,606	4,193

Continued on next page.

Table 81.-- GREAT CIRCLE DISTANCES BETWEEN HONOLULU INTERNATIONAL AIRPORT AND SPECIFIED PLACES -- Con.

Place	Distance from Honolulu	
	Statute miles	Kilometers
Other Pacific locations, con.:		
Palmyra Island .....	1,101	1,772
Papeete, Tahiti .....	2,741	4,410
Suva, Fiji .....	3,159	5,083
Sydney (Port Jackson), Australia .....	5,070	8,158
Tokyo, Japan .....	3,847	6,190
Wake Island .....	2,294	3,691
North and South America:		
Anchorage, Alaska .....	2,781	4,475
Cape Horn, Chile .....	7,457	11,998
Chicago, Illinois .....	4,179	6,724
Cristobal, Canal Zone .....	5,214	8,389
Lima, Peru .....	5,950	9,580
Los Angeles, California .....	2,557	4,114
Miami, Florida .....	4,856	7,813
New York, New York .....	4,959	7,979
Portland, Oregon .....	2,595	4,175
San Diego, California .....	2,610	4,199
San Francisco, California .....	2,397	3,857
Seattle, Washington .....	2,679	4,311
Vancouver, B.C. ....	2,709	4,359
Victoria, B.C. ....	2,668	4,293
Tijuana, Mexico .....	2,616	4,209
Washington, D.C. ....	4,829	7,770
London, England .....	7,226	11,627
Bombay, India .....	8,010	12,888
Ghanzi, Botswana <sup>1/</sup> .....	12,417	19,979
Equator, due south of Honolulu .....	1,470	2,367
North Pole .....	4,740	7,631
South Pole .....	7,660	12,333

<sup>1/</sup> Ghanzi, Botswana, is Honolulu's antipode, that is, the point precisely opposite to it on the globe.

Source follows next table.

Table 82.-- GREAT CIRCLE DISTANCES FROM HILO AND KURE ATOLL

Places	Great circle distance	
	Statute miles	Kilometers
Hilo to --		
Honolulu, Oahu .....	214	344
Los Angeles, California .....	2,447	3,937
San Francisco, California .....	2,315	3,725
Kure Atoll to --		
Cape Kumukahi, Puna, Hawaii <u>1/</u> .....	1,523	2,451
Honolulu, Oahu .....	1,367	2,200
Log Point, Elliot Key, Florida <u>2/</u> .....	5,852	9,416
Tokyo, Japan .....	2,486	4,000
West Quoddy Head, Maine .....	5,788	9,313

1/ Cape Kumukahi and Kure Atoll are the points farthest apart in the Hawaiian Archipelago and State of Hawaii.

2/ Log Point and Kure Atoll are the points farthest apart in the fifty states.

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 83.-- WIDTHS AND DEPTHS OF CHANNELS

Channel	Location	Width		Maximum depth	
		Statute miles	Kilometers	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 84.-- GENERAL COASTLINE AND TIDAL SHORELINE OF COUNTIES AND ISLANDS

County and island	General coastline <u>1/</u>		Tidal shoreline <u>2/</u>	
	Statute miles	Kilo-meters <u>3/</u>	Statute miles	Kilo-meters <u>3/</u>
State total <u>4/</u> .....	750	1,207	1,052	1,693
Counties:				
Hawaii .....	266	428	313	504
Maui, including Kalawao .....	210	338	343	552
Honolulu .....	137	220	234	377
Kauai .....	137	220	162	261
Islands:				
Hawaii .....	266	428	313	504
Maui .....	120	193	149	240
Kahoolawe .....	29	47	36	58
Molokini .....	...	...	...	...
Lanai .....	47	76	52	84
Molokai .....	88	142	106	171
Oahu .....	112	180	209	336
Kauai .....	90	145	110	177
Niihau .....	45	72	50	80
Lehua .....	...	...	...	...
Kaula .....	2	3	2	3
Northwestern Hawaiian Islands <u>5/</u> .	25	40	25	40
Nihoa .....	3	5	3	5
Necker Island .....	2	3	2	3
French Frigate Shoals .....	6	10	6	10
Gardner Pinnacles .....	...	...	...	...
Maro Reef .....	...	...	...	...
Laysan Island .....	6	10	6	10
Lisianski Island .....	3	5	3	5
Pearl and Hermes Atoll .....	...	...	...	...
Kure Atoll .....	5	8	5	8

Footnotes and source on next page.

Table 84.-- GENERAL COASTLINE AND TIDAL SHORELINE OF COUNTIES AND ISLANDS -- Cont.

1/ 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 islands of Maui County are not consistent with the published county total.

2/ 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.

3/ Derived from data expressed in statute miles; independently rounded and accordingly may not add exactly to indicated totals and subtotals. 1 mi. = 1.609 km.

4/ Among the States and Territories, Hawaii ranks fourth in general coastline and seventeenth in tidal shoreline.

5/ Excludes the Midway Islands, which are part of the Hawaiian Archipelago but not legally part of the State of Hawaii. Midway has a general coastline of 20 miles and a tidal shoreline of 33 miles.

Source: U.S. Coast and Geodetic Survey, Coastline of the United States (April 1, 1961) and letter dated October 24, 1961.

Table 85.-- LAND AND WATER AREA WITHIN THE FISHERY CONSERVATION ZONE

[Land and water area within the 200 nautical mile Fishery Conservation Zone surrounding the Hawaiian Archipelago.]

Category	Square nautical miles	Square statute miles	Square kilometers
Total .....	634,023	839,623	2,174,626
Land area .....	4,852	6,425	16,641
Water area .....	629,171	833,198	2,157,985

Source: Charles E. Harrington, Chief Geographer, Marine Surveys and Maps, National Ocean Survey, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, information supplied September 15, 1978.

Table 86.-- LAND AND WATER AREA OF COUNTIES AND ISLANDS

County or island	Square miles			Square kilometers <u>1/</u>		Acres <u>1/</u>	
	Total area	Land area <u>2/</u>	Inland water <u>3/</u>	Total area	Land area <u>2/</u>	Total area	Land area <u>2/</u>
State total .....	6,450.4	6,425.4	25.0	16,706.5	16,641.7	4,128,256	4,112,256
Counties:							
Hawaii .....	4,038.0	4,037.0	1.0	10,458.4	10,455.8	2,584,320	2,583,680
Maui .....	1,161.1	1,160.3	0.8	3,007.2	3,005.2	743,104	742,592
Kalawao .....	13.3	13.3	-	34.4	34.4	8,512	8,512
Honolulu .....	610.9	595.7	15.2	1,582.2	1,542.9	390,976	381,248
Kauai .....	627.1	619.1	8.0	1,624.2	1,603.5	401,344	396,224
Islands:							
Hawaii .....	4,038.0	4,037.0	1.0	10,458.4	10,455.8	2,584,320	2,583,680
Maui .....	728.8	728.2	0.6	1,887.6	1,886.0	466,432	466,048
Kahoolawe .....	45.0	45.0	-	116.5	116.5	28,800	28,800
Molokini <u>4/</u> .....	0.0	0.0	-	0.1	0.1	19	19
Lanai .....	139.5	139.5	-	361.3	361.3	89,280	89,280
Molokai .....	261.1	260.9	0.2	676.2	675.7	167,104	166,976
Oahu .....	607.7	592.7	15.0	1,573.9	1,535.1	388,928	379,328
Kauai .....	553.3	548.7	4.6	1,433.0	1,421.1	354,112	351,168
Niihau .....	73.0	69.6	3.4	189.1	180.3	46,720	44,544
Lehua .....	0.4	0.4	-	1.0	1.0	243	243
Kaula .....	0.4	0.4	-	1.1	1.1	280	280
Northwestern Hawaiian Islands <u>5/</u> ..	3.2	3.0	0.2	8.2	7.7	2,036	1,895

Footnotes and source on next page.



Table 86.-- LAND AND WATER AREA OF COUNTIES AND ISLANDS -- Cont.

1/ Areas in square kilometers and acres were calculated directly from the figures shown for square miles (except for Molokini, Lehua, Kaula, and the Northwestern Hawaiian Islands, for which square miles calculated to three decimal places were used); these equivalents were independently rounded, and hence may not add exactly to the indicated totals and subtotals. 1 sq. mi. = 640 A. = 2.58999 sq. km.

2/ 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.

3/ 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 one nautical mile of water; and islands having less than 40 acres of area.

4/ More exactly, the area of Molokini is 18.6 acres (equivalent to 0.03 square miles or 0.075 square kilometers).

5/ Exclusive of the Midway Islands, which are part of the Hawaiian Archipelago but not legally part of the State of Hawaii. Islands included in the State and their land areas in square miles are: Nihoa, 0.298; Necker Island, 0.091; French Frigate Shoals, 0.088; Gardner Pinnacles, 0.004; Maro Reef, awash; Laysan Island, 1.312 (plus 0.220 of inland water, for a total area of 1.533); Lisianski Island, 0.675; Pearl and Hermes Atoll, 0.122; and Kure Atoll, 0.371.

Source: Data from U.S. Bureau of the Census, Geography Division, cited in the Hawaii State Department of Planning and Economic Development, Hawai'i, the Natural Environment (1974), pp. 9 and 10.

Table 87.-- 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 .....	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			
Kahoolawe:			Kauai:		
Lua Makika .....	1,477	450	Kawaikini .....	5,243	1,598
			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
Lanai:			Necker Island .....	277	84
Lanaihale .....	3,370	1,027	La Perouse Pinnacle ....	135	41
			Gardner Pinnacles .....	190	58
Molokai:			Maro Reef .....	Awash	Awash
Kamakou .....	4,970	1,515	Laysan Island .....	35	11
Puu Nana .....	1,381	421	Lisianski Island .....	20	6
Oahu:			Pearl and Hermes Atoll .	-	-
Kaala .....	4,020	1,225	Midway Islands <u>2/</u> .....	12±	4±
Konahuanui <u>1/</u> .....	3,150	960	Kure Atoll .....	20	6
			Kingman Reef <u>2/</u> .....	3	1
			Palmyra Islands <u>2/</u> .....	6	2

1/ Two distinct peaks. The lower has an elevation of 3,105 feet.

2/ 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 U.S. National Cartographic Information Center, October 11, 1978.

Table 88.-- MAJOR STREAMS, BY ISLANDS

Island	Feature or stream	Length or ave. discharge
Longest water feature (miles):		
Hawaii .....	Wailuku River .....	32.0
Maui .....	Kaliialinui-Waiale Gulch ....	18.0
Kahoolawe .....	Ahupu Gulch .....	4.0
Lanai .....	Maunalei-Waialala 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): <u>1/</u>		
Hawaii .....	Wailuku River .....	22.7
Maui .....	Palikeya 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

1/ 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 89.-- LARGEST LAKES, BY ISLANDS

Island	Name of largest lake <u>1/</u>	Category	Maximum depth (feet)	Altitude (feet)	Area (acres)	Shoreline (miles)
Hawaii .....	Waiakea Pond .....	Natural	(NA)	Sea level	27	2
	Lake Waiau <u>2/</u> .....	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.

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

2/ 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 90.-- MISCELLANEOUS GEOGRAPHIC STATISTICS, BY ISLANDS

Island	Extreme length (miles)	Extreme width (miles)	Miles of sea cliffs with heights 1,000 ft. or more	Miles from coast of most remote point	Percent of area within 5 miles of coast
The State ..	...	...	33	28.5	48.6
Hawaii .....	93	76	4	28.5	30.0
Maui .....	48	26	-	10.6	76.1
Kahoolawe .....	11	6	-	2.4	100.0
Lanai .....	18	13	1	5.2	100.0
Molokai .....	38	10	14	3.9	100.0
Oahu .....	44	30	-	10.6	79.0
Kauai .....	33	25	11	10.8	67.0
Niihau .....	18	6	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	20 percent or more
The State ..	20.8	50.9	3,030	63.5	17.0
Hawaii .....	12.0	68.4	3,950	76.0	4.0
Maui .....	24.9	41.4	2,390	38.5	36.0
Kahoolawe .....	38.9	0	600	60.0	9.0
Lanai .....	24.8	6.3	1,140	61.0	16.0
Molokai .....	37.3	17.8	1,150	53.0	26.0
Oahu .....	45.3	4.6	860	42.5	45.5
Kauai .....	35.6	24.0	1,380	33.5	50.5
Niihau .....	78.2	0	530	68.0	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 91.-- VOLCANIC ERUPTIONS: 1969 TO 1980

Volcano and date of outbreak	Repose period since previous eruption (months)	Duration (days)	Location <u>1/</u>	Elevation (feet)	Area (square miles)	Volume (1,000 cubic yards)
Mauna Loa:						
1975: July 5 ....	300	1	S	13,000-12,100	5.2	39,200
Kilauea:						
1969: Feb. 22 ...	4.0	6	ER	3,100-2,900	2.3	22,000
May 24 ....	2.0	867	ER	3,150	19.3	242,000
1971: Aug. 14 ...	-	1	C	3,660-3,600	0.8	12,400
Sept. 24 ..	-	5	C, SWR	3,740-2,730	1.5	10,500
1972: Feb. 4 ....	4.3	645	ER	3,150	13.7	167,000
1973: May 5 .....	-	1	ER	3,340-3,250	0.1	1,600
Nov. 10 ...	-	30	ER	3,250-2,900	0.4	3,700
Dec. 12 ...	0.1	203	ER	3,150	3.1	39,300
1974: July 19 ...	-	3	C, ER	3,600-3,520	1.2	9,000
Sept. 19 ..	2.0	1	C	3,680	0.4	14,000
Dec. 31 ...	3.4	1	C	3,600	2.9	19,600
1975: Nov. 29 ...	11.0	1	C	3,600	0.05	330
1977: Sept. 13 ..	21.5	18	ER	1,600-2,080	3.0	45,000
1979: Nov. 16 ...	26.3	1	ER	3,270-3,200	0.1	800

1/ C, caldera; ER, east rift; S, summit; SWR, southwest rift.

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 through March 18, 1980.

Table 92.-- EARTHQUAKES OF MAGNITUDE 5 OR GREATER: 1969 TO 1979

Date	Location	Magnitude (Richter Scale)
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
1979: Sept. 21 .....	Puna, Hawaii .....	5.5

Source: Augustine S. Furumoto, N. Norby Nielsen, and William R. Phillips, A Study of Past Earthquakes, Iseismic 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; U.S. Geological Survey, National Earthquake Information Service.

Table 93.-- TSUNAMIS WITH RUN-UP OF 2 METERS (6.6 FEET) OR MORE:  
1946 TO 1980

(Correct to April 15, 1980.)

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, November 1977).

Table 94.-- MAJOR DAMS: 1977

Name	Location	Height (ft.)	Length (ft.)	Volume (cubic yards)	Volume of water impounded (acre ft.)
Wahiawa Dam ...	Wahiawa, Oahu.....	98	460	167,000	7,776
Waita .....	Koloa, Kauai.....	27	3,050	(NA)	7,350
Kualapuu .....	Kualapuu, Molokai.	58	3,900	1,267,000	4,290
Alexander Dam..	Kalaheo, Kauai....	104	700	(NA)	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 95.-- 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 96.-- WATER SERVICES AND CONSUMPTION, FOR COUNTY WATERWORKS:  
1978 AND 1979

Geographic area	Number of services, June 30		Consumption (millions of gallons) <u>1/</u>	
	1978	1979	1978	1979
State total .....	166,821	170,542	55,100	54,628
City and County of Honolulu ..	120,172	122,067	42,466	42,446
Honolulu <u>2/</u> .....	57,091	57,574	24,191	24,271
Rest of Oahu .....	63,081	64,493	18,275	18,175
Hawaii County .....	20,470	21,380	4,229	4,088
Kauai County .....	9,289	9,684	2,454	2,444
Maui County .....	16,890	17,411	5,951	5,650
Maui .....	15,811	16,326	5,701	5,403
Molokai .....	1,079	1,085	250	246

1/ Year ended June 30.

2/ Maunalua to Moanalua.

Source: Honolulu Board of Water Supply, Annual Report and Statistical Summary for 1977-1978 and 1978-1979; Hawaii Department of Water Supply, 1978-1979 Annual Report; Kauai Office of the Mayor, Annual Report 1978: Departments and Agencies; Kauai Department of Water, records; Maui Department of Water Supply, Annual Report for the Fiscal Year Ended June 30, 1979.

Table 97.-- WATER QUALITY AT OAHU BEACHES: 1976 TO 1979

Beach	Number of samples				Fecal coliform density $\bar{1}$ / (geometric mean, MPN/100 ml)			
	1976	1977	1978	1979	1976	1977	1978	1979
Ala Moana Park (Ewa) .....	34	33	42	43	4.7	3.8	5.0	5.6
Ala Moana Park (Center) .....	14	9	12	12	6.0	2.0	3.2	3.7
Ala Moana Park (Diamond Head) ....	19	9	12	12	5.4	2.0	3.9	6.8
Elks Club Beach .....	13	8	12	12	17.0	4.2	5.0	15.8
Ewa Beach .....	10	11	10	12	6.2	2.5	6.2	4.5
Fort DeRussy Beach .....	12	9	12	11	24.3	3.1	4.2	18.5
Gray's Beach .....	34	34	41	43	6.2	4.7	6.6	6.9
Haleiwa Park Beach .....	3	5	-	-	9.9	2.9	(NA)	(NA)
Hanauma Bay .....	8	10	11	12	2.7	4.0	2.4	10.0
Hauula Park Beach .....	8	4	-	-	7.9	6.3	(NA)	(NA)
Kaaawa Park Beach .....	8	4	-	-	10.2	21.4	(NA)	(NA)
Kahana Park Beach .....	8	4	11	11	18.7	81.4	49.5	42.9
Kahanamoku Beach .....	14	13	12	12	4.6	6.3	4.2	17.3
Kahanamoku Lagoon (Diamond Head) .	28	32	42	43	12.5	8.7	84.9	94.8
Kailua Park Beach .....	8	10	11	12	6.6	9.1	6.7	17.8
Kalama Beach .....	8	4	-	-	6.6	3.6	(NA)	(NA)
Kokokahi Pier .....	8	9	11	12	33.1	58.0	30.3	45.6
Kuhio Beach .....	14	11	9	12	25.0	19.3	10.6	17.9
Makaha Beach .....	11	6	-	-	2.2	3.2	(NA)	(NA)
Nanakuli Park Beach .....	12	6	-	-	3.4	2.5	(NA)	(NA)
Public Bath Beach .....	32	33	40	43	4.5	2.4	3.6	4.3
Punaluu Park Beach .....	8	4	-	-	26.2	14.7	(NA)	(NA)
Sandy Beach (East) .....	8	10	-	-	7.5	2.6	(NA)	(NA)
Sandy Beach (West) .....	-	-	1	-	(NA)	(NA)	2.0	(NA)
Tavern Beach .....	13	9	15	12	3.5	4.2	10.1	8.9
Waianae Park Beach .....	12	12	-	-	3.1	4.1	(NA)	(NA)
Waimanalo Park Beach .....	9	10	-	-	9.4	8.5	(NA)	(NA)

NA Not available.

$\bar{1}$ / EPA criterion for bathing waters: Not to exceed a geometric mean of 200 fecal coliform bacteria per 100 ml. or water.

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

Table 98.-- SUSPENDED PARTICULATE  
MATTER FOR HONOLULU: 1970 TO 1979

(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
1978 .....	29
1979 .....	32

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

Table 99.-- 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 100.-- AEROMETRIC SURVEY DATA FOR SPECIFIED LOCATIONS: 1979

Location	Particulate matter (micrograms per cubic meter)			Sulfur dioxide (micrograms per cubic meter)		
	Minimum	Maximum	Annual average	Minimum	Maximum	Annual average
Oahu:						
Ala Moana 1/ .....	20	102	39	5	13	5
Dept. of Health Bldg. .	22	62	32	5	42	22
Kalihi Kai .....	25	112	56	5	16	5
Pearl City .....	20	48	34	5	63	8
Barbers Point .....	23	223	76	5	27	5
Waimanalo .....	12	54	30	...	...	...
Maui:						
Kahului .....	42	148	92	5	241	48
Kihei .....	12	120	49	...	...	...
Hawaii:						
Hilo .....	8	65	22	5	20	5
Honokaa 2/ .....	10	43	22	...	...	...
Kauai:						
Lihue .....	16	86	40	5	5	5

1/ Site discontinued December 5, 1979, and moved to Ft. DeRussy in Waikiki.

2/ Site established July 1, 1979

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

Table 101.-- NOISE LEVELS IN VARIOUS NEIGHBORHOODS 'ON OAHU: 1974

Neighborhood	Noise level (in decibels) exceeded --		
	10 percent of time	50 percent of time	90 percent of time
HONOLULU			
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	53.3	40.0
Moiliili .....	52.0	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
REST OF OAHU			
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 102.-- 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		
Hawaii:							
Hilo Airport .....	26	71.0	75.9	53	94	133.57	40
Hawaii Volcanoes Nat. Park Hdq. .	3,971	57.6	63.2	37	85	102.81	...
Kailua .....	30	72.1	77.3	54	93	25.22	...
Puako 1/ .....	10	73.1	79.8	52	98	9.47	...
Waimea (Kamuela) .....	2,670	62.3	66.8	34	90	40.05	...
Mauna Kea summit 2/ .....	13,796	31.1	42.5	11	66	8.08	...
Maui:							
Hana .....	120	71.3	76.8	50	90	70.65	...
Haleakala summit .....	9,960	42.6	50.0	14	73	50.69	...
Kihei 3/ .....	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	...
Molokai:							
Kaunakakai .....	12	...	...	...	...	14.08	...
Molokai Airport .....	450	70.2	77.6	48	90	29.21	...
Lanai:							
Lanai City .....	1,620	65.8	72.8	46	88	38.44	...
Oahu:							
Honolulu International Airport ..	7	72.3	80.7	53	93	22.90	68
Honolulu Federal Bldg. 4/ .....	12	72.0	78.6	57	88	25.35	65
Waikiki 5/ .....	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	...

Continued on next page.



Table 102.-- CLIMATIC DATA FOR SELECTED PLACES -- Con.

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>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	...

1/ Temperature data are for Mohukona.

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

3/ Temperature data refer to Puunene Airport.

4/ Temperature sensors are 87 feet above the ground.

5/ 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, and National Climatic Center, Local Climatological Data, Annual Summary With Comparative Data, 1979 for Hilo, Kahului, Honolulu, and Lihue.

Table 103.-- MONTHLY AND ANNUAL CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT

Month	Normal temperature (°F.)			Extreme temperature (°F.) <u>1/</u>		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	87	53	4.40	14.74	0.34	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	88	55	3.18	20.79	0.01	17.07
Apr. .	81.4	68.1	74.8	89	59	1.36	8.92	0.01	4.21
May ..	83.6	70.2	76.9	90	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	91	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	93	64	1.51	11.15	0.11	7.57
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	93	53	22.90	20.79	T	17.07

Continued on next page.

Table 103.-- MONTHLY AND ANNUAL CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT  
 -- Con.

Month	Relative humidity (percent) <u>2/</u>		Wind (miles/hour)		Percent of possible sun- shine	Mean sky cover, sunrise to sun- set <u>3/</u>	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. ...	80	63	10.0	67	63	5.5	9	9	10
Feb. ...	77	60	10.7	63	64	5.7	7	9	10
Mar. ...	73	58	11.6	59	68	5.9	7	10	9
Apr. ...	69	57	12.1	40	67	6.3	6	11	9
May ....	67	55	12.2	35	69	6.1	6	10	7
June ...	67	53	12.9	39	70	5.7	6	7	6
July ...	66	51	13.7	34	74	5.3	8	5	7
Aug ....	67	54	13.5	52	75	5.3	8	6	7
Sept. ...	66	52	11.7	36	75	5.2	9	6	7
Oct. ...	68	55	10.9	40	68	5.7	7	8	9
Nov. ...	74	59	11.1	65	60	5.7	7	9	10
Dec. ...	77	60	11.0	59	59	5.6	8	10	10
Ann. ...	71	56	11.8	67	68	5.7	88	100	101

T Trace, an amount too small to measure.

1/ For periods October 1962 through December 1964 and September 1971 through December 1979.

2/ Data for 1963, 1964, and 1972-1979.

3/ 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, 1979.

Table 104.-- 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 105.-- RAINFALL, FOR SPECIFIED LOCATIONS: ANNUALLY, 1969 TO 1979

(In inches.)

Year	Hawaii		Maui		Oahu: Hono- lulu 1/	Kauai	
	Hilo 2/	Kona 3/	Kahului 2/	Lahaina		Lihue 2/	Koloa
1969 ..	173.23	32.89	25.21	10.09	26.71	34.17	72.42
1970 ..	153.98	20.78	18.61	11.95	18.35	39.18	64.45
1971 ..	140.69	37.61	20.13	15.93	28.61	49.62	75.33
1972 ..	98.85	33.22	15.71	20.21	26.72	43.54	66.72
1973 ..	107.97	14.85	10.27	10.13	18.66	35.27	66.78
1974 ..	112.92	40.49	18.68	13.01	28.24	45.60	86.35
1975 ..	99.93	25.97	13.74	12.19	24.63	35.52	49.91
1976 ..	114.67	25.51	12.83	8.86	...	32.83	62.60
1977 ..	90.38	...	11.50	8.28	...	40.34	52.51
1978 ..	119.09	26.29	19.15	11.97	25.63	39.11	70.64
1979 ..	158.77	...	26.82	20.85	24.78	37.09	55.98

1/ Old Federal Building (South King St. and Richards St.). Observations suspended November 26, 1976 - March 31, 1977.

2/ Airport data.

3/ Holualoa Beach. Observations incomplete for 1977 and discontinued after December 31, 1978.

Source: U.S. Department of Commerce, National Climatic Center, Local Climatological Data, Annual Summary with Comparative Data, 1979 for Hilo, Kahului, and Lihue; U.S. Department of Commerce, National Weather Service, Pacific Region, records; and Hawaii State Department of Land and Natural Resources, Division of Water and Land Development, records.

Table 106.-- CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT: ANNUALLY,  
1969 TO 1979

Year	Average temperature (°F.)			Extreme temp. (°F.)		Precipitation (inches)
	Annual	Coolest month	Warmest month	Lowest	Highest	
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
1978 ...	76.8	72.4	80.5	57	91	25.05
1979 ...	77.0	69.9	81.1	57	93	16.93

  

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		
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
1978 ...	74	58	11.9	34	69	90
1979 ...	74	57	11.4	34	68	89

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).

Table 107.-- TRADE WINDS, HIGH SURF, AND TEMPERATURES IN HAWAIIAN WATERS,  
BY MONTHS

Month	Trade wind frequency <sup>1/</sup> (percent)	Expected days of strong trade winds <sup>2/</sup>	Highest surf <sup>3/</sup> (average number of $\bar{x}$ days)		Water temperature (°F.)	
			Flat or 1 foot	6 feet or more	Mean maximum	Mean minimum
Jan. ...	42	9	1	19	74.7	71.1
Feb. ...	55	7	1	16	75.6	70.3
March ..	61	10	1	12	76.5	71.8
April ..	74	10	3	7	77.7	73.0
May ....	86	7	8	3	79.5	74.7
June ...	91	7	15	-	81.1	77.7
July ...	95	10	16	-	81.1	78.3
Aug. ...	94	7	15	-	81.9	79.2
Sept. ..	83	4	10	2	81.9	78.4
Oct. ...	71	4	1	12	81.1	77.2
Nov. ...	64	8	-	19	79.3	74.5
Dec. ...	57	9	-	20	75.9	71.4
Ann. ...	65	92	71	110	78.6	74.8

1/ Mean monthly frequency of trade winds in Hawaiian waters.

<sup>2/</sup> Expected number of hazardous days in Hawaiian waters due to strong trade winds.

<sup>3/</sup> Observations at Sunset Beach, Oahu. Annual averages were: flat or 1 foot, 71 days; 2-5 feet, 184 days; 6-10 feet, 71 days; 11-15 feet, 26 days; 16 feet or higher, 13 days.

<sup>4/</sup> Observations at Kaneohe, Oahu. The mean ranged from 73.0 in January and February to 80.2 in August. Absolute maximums and minimums were respectively 84 (in July, August, and October) and 68 (December and February).

Source: Paul Haraguchi, Weather in Hawaiian Waters (Honolulu: Pacific Weather, Inc., 1979), pages 14, 22, 56, and 74.

Table 108.-- AVERAGE WATER TEMPERATURES AT WAIKIKI BEACH

(°F)

Month	Morning	Afternoon
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, 1979.

Table 109.-- SUNRISE, SUNSET, AND HOURS OF DAYLIGHT AT HILO, HONOLULU, AND LIHUE, FOR SELECTED DATES

(Hawaiian Standard Time)

Subject	March 21	June 21	Sept. 23	Dec. 22
Sunrise (A.M.):				
Hilo .....	6:24	5:42	6:09	6:51
Honolulu .....	6:35	5:50	6:21	7:05
Lihue .....	6:41	5:55	6:26	7:12
Sunset (P.M.):				
Hilo .....	6:32	7:02	6:16	5:47
Honolulu .....	6:43	7:16	6:27	5:55
Lihue .....	6:49	7:23	6:33	6:00
Hours of daylight:				
Hilo .....	12:08	13:20	12:07	10:56
Honolulu .....	12:08	13:26	12:06	10:50
Lihue .....	12:08	13:28	12:07	10:48

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



Table 110.-- TREES ALONG STREETS OR IN PARKS UNDER THE JURISDICTION  
OF THE CITY AND COUNTY OF HONOLULU: 1978 AND 1979

Location	June 30, 1978	June 30, 1979
Along City and County streets and highways <u>1/</u> ...	101,021	104,499
In City and County parks .....	94,800	95,600

1/ Excludes Federal, State, and private thoroughfares.

Source: City and County of Honolulu, Department of Parks and Recreation, records.

Table 111.-- ENDANGERED, THREATENED, AND EXTINCT SPECIES OF NATIVE  
HIGHER PLANTS: 1977

Status	Species, subspecies, and varieties	Percent
Total native flora .....	2,200	100.0
Endangered, threatened, or extinct <u>1/</u> ...	1,113	50.6
Endangered .....	646	29.4
Threatened .....	197	8.9
Extinct .....	270	12.3
Not endangered, threatened, or extinct .	1,087	49.4

1/ For the other 49 States, 2,140 (or 10.7 percent) of all 20,000 native higher plants are endangered, threatened, or extinct.

Source: Edward S. Ayensu and Robert A. DeFilipps, Endangered and Threatened Plants of the United States (Smithsonian Institution and the World Wildlife Fund, Inc., 1978), p. xiii.

Table 112.-- HAWAII AUDUBON SOCIETY BIRD COUNTS OF THE HONOLULU AREA:  
1970 TO 1979

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

Species <sup>1/</sup>	Annual averages		1978	1979
	1970- 1974	1975- 1979		
All species:				
Species .....	49	54	55	55
Individual birds ..	11,614	15,811	16,204	18,909
Endemic species:				
'Apapane .....	35	135	114	243
Hawaiian Coot .....	69	35	20	31
Hawaiian Stilt .....	112	128	116	164
Oahu 'Amakihi .....	42	132	74	182
Indigenous species:				
Great Frigatebird .....	614	597	585	861
Red-footed Booby .....	1,463	1,401	1,669	1,200
Introduced species:				
Barred Dove .....	1,468	2,216	2,389	2,843
Cattle Egret .....	759	1,156	1,445	1,393
Common Myna .....	2,567	2,241	2,616	2,274
House Sparrow .....	1,373	1,155	1,216	1,537
Japanese White-eye .....	450	1,165	723	1,091
Red-vented Bulbul .....	31	503	548	557
Spotted Dove .....	586	1,091	1,044	1,413
Migratory species:				
Golden Plover .....	564	1,138	1,422	1,562
Ruddy Turnstone .....	97	165	223	237

<sup>1/</sup> Separate data are shown for endemic birds averaging more than 25 individuals in 1975-1979, indigenous birds more than 200, introduced birds more than 500, 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 in Andrew J. Berger, Hawaiian Birdlife (1972).

Source: Hawaii Audubon Society, The 'Elepaio (monthly).