

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: seventeen major Oahu beaches surveyed in 1978 were found to have coliform levels per 100 ml. ranging from 2.0 to 84.9, and all were well within EPA standards. 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 Water withdrawn for use in 1975 averaged 2.5 billion gallons per day, compared with 2.7 billion in 1970 and 2.0 billion in 1965.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 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: 1978, Section 7.

Table 64.-- GREAT CIRCLE DISTANCES BETWEEN HONOLULU INTERNATIONAL AIRPORT AND SPECIFIED PLACES

Place	Distance from Honolulu	
	Statute miles	Kilometers
Hawaiian Islands:		
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
Trust Territory of the Pacific Islands:		
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
Other Pacific locations:		
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
Palmyra Island	1,101	1,772
Papeete, Tahiti	2,741	4,410
Suva, Fiji	3,159	5,083

Table 64.-- GREAT CIRCLE DISTANCES BETWEEN HONOLULU INTERNATIONAL AIRPORT AND SPECIFIED PLACES -- Con.

Place	Distance from Honolulu	
	Statute miles	Kilometers
Other Pacific locations, con.:		
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 ^{1/}	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

^{1/} Ghanzi, Botswana, is Honolulu's antipode, that is, the point precisely opposite to it on the globe.

Source follows next table.

Table 65.— GREAT CIRCLE DISTANCES FROM HILO AND KURE ATOLL

Places	Great circle distance	
	Statute miles	Kilo- meters
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 66.-- 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 67.-- 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 67.-- 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 68.-- 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 kilo-meters
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 69.-- 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 69.-- 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 70.-- 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 71.-- MAJOR STREAMS, BY ISLANDS

Island	Feature or stream	Length or ave. discharge
Longest water feature (miles):		
Hawaii	Wailuku River	32.0
Maui	Kalialinui-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): <u>1/</u>		
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

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 72.-- 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 Waiiau <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 73.-- 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 74.-- VOLCANIC ERUPTIONS: 1969 TO 1979

Volcano and date of outbreak	Repose period since previous eruption (months)	Duration (days)	Location	Altitude (feet)	Area (square miles)	Volume (1,000 cubic yards)
Mauna Loa:						
1975: July 5	300	<1	Summit	13,000-12,100	5.2	39,200
Kilauea:						
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 ¹ / ₁	-	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

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

Source: Gordon A. Macdonald and Douglas 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, February 8, 1978, and March 9, 1979. Correct to March 9, 1979.

Table 75.-- EARTHQUAKES OF MAGNITUDE 5 OR GREATER: 1969 TO 1978

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 a.m.	Near Pahala, Hawaii	5.1
Jan. 1, 3:20 a.m.	Mauna Loa, Hawaii	5.1
Jan. 2	Near Pahala, Hawaii	5.6
Jan. 5	Mauna Loa, Hawaii	5.1
Nov. 29, 3:35 a.m. ...	Puna, Hawaii	5.7
Nov. 29, 4:47 a.m. ...	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 December 31, 1978.

Table 76.-- TSUNAMIS WITH RUN-UP OF 2 METERS (6.6 FEET) OR MORE: 1946 TO 1978

[Correct to December 31, 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, November 1977).

Table 77.— 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 78.-- WATER USE: 1965 TO 1975

[In millions of gallons per day, unless otherwise specified.]

Subject	1965	1970	1975
Water withdrawn <u>1/</u>	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

1/ 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 79.-- WATER SERVICES AND CONSUMPTION, FOR COUNTY WATERWORKS:
1977 AND 1978

Geographic area	Number of services, June 30		Consumption (millions of gallons) <u>1/</u>	
	1977	1978	1977	1978
State total	162,877	166,821	57,136	55,100
City and Co. of Honolulu	118,243	120,172	45,080	42,466
Honolulu <u>2/</u>	56,946	57,091	25,761	24,191
Rest of Oahu	61,297	63,081	19,319	18,275
Hawaii County	19,541	20,470	4,123	4,229
Kauai County	8,838	9,289	2,186	2,454
Maui County	16,255	16,890	5,747	5,951
Maui	15,200	15,811	5,528	5,701
Molokai	1,055	1,079	220	250

1/ Years ended June 30.

2/ Maunalua to Moanalua.

Source: City and County of Honolulu, Board of Water Supply, Annual Report and Statistical Summary for 1976-1977 and 1977-1978; County of Hawaii, Department of Water Supply, records; County of Kauai, Office of the Mayor, Annual Report: Departments and Agencies for 1977 and 1978 and records; County of Maui, Department of Water Supply, Annual Report for the Fiscal Year Ended June 30, 1977 and records.

Table 80.-- WATER QUALITY AT OAHU BEACHES: 1975 TO 1978

Beach	Number of samples				Fecal coliform density <u>1</u> / (geometric mean, MPN/100 ml)			
	1975	1976	1977	1978	1975	1976	1977	1978
Ala Moana Park (Ewa)	40	34	33	42	4.2	4.7	3.8	5.0
Ala Moana Park (Center)	30	14	9	12	2.6	6.0	2.0	3.2
Ala Moana Park (Diamond Head) ...	36	19	9	12	5.3	5.4	2.0	3.9
Bellows Air Force Beach	9	-	-	-	9.7	(NA)	(NA)	(NA)
Elks Club Beach	39	13	8	12	9.4	17.0	4.2	5.0
Ewa Beach	11	10	11	10	3.1	6.2	2.5	6.2
Fort DeRussy Beach	30	12	9	12	12.2	24.3	3.1	4.2
Gray's Beach	43	34	34	41	8.7	6.2	4.7	6.6
Haleiwa Park Beach	8	3	5	-	9.6	9.9	2.9	(NA)
Hanauma Bay	10	8	10	11	3.2	2.7	4.0	2.4
Hauula Park Beach	10	8	4	-	2.4	7.9	6.3	(NA)
Kaaawa Park Beach	10	8	4	-	5.2	10.2	21.4	(NA)
Kahala Beach	9	-	-	-	12.4	(NA)	(NA)	(NA)
Kahala Hilton Beach	8	-	-	-	3.5	(NA)	(NA)	(NA)
Kahana Park Beach	10	8	4	11	44.9	18.7	81.4	49.5
Kahanamoku Beach	34	14	13	12	6.5	4.6	6.3	4.2
Kahanamoku Lagoon (Ewa)	24	-	-	-	288.7	(NA)	(NA)	(NA)
Kahanamoku Lagoon (Diamond Head)	36	28	32	42	14.7	12.5	8.7	84.9
Kailua Park Beach	8	8	10	11	12.9	6.6	9.1	6.7
Kalama Beach	8	8	4	-	22.2	6.6	3.6	(NA)
Kawela Bay	6	-	-	-	8.9	(NA)	(NA)	(NA)
Kokokahi Pier	11	8	9	11	39.5	33.1	58.0	30.3
Kuhio Beach	41	14	11	9	19.4	25.0	19.3	10.6
Lanikai Beach	6	-	-	-	19.1	(NA)	(NA)	(NA)
Makaha Beach	11	11	6	-	2.6	2.2	3.2	(NA)
Nanakuli Park Beach	11	12	6	-	2.0	3.4	2.5	(NA)
Public Bath Beach	43	32	33	40	3.7	4.5	2.4	3.6
Punaluu Park Beach	10	8	4	-	23.4	26.2	14.7	(NA)
Sandy Beach (East)	11	8	10	-	2.4	7.5	2.6	(NA)
Sandy Beach (West)	9	-	-	1	2.0	(NA)	(NA)	2.0
Tavern Beach	40	13	9	15	4.9	3.5	4.2	10.1
Waianae Park Beach	10	12	12	-	3.2	3.1	4.1	(NA)
Waikiki Natatorium	35	-	-	-	3.4	(NA)	(NA)	(NA)
Waimanalo Park Beach	10	9	10	-	4.2	9.4	8.5	(NA)
Waimanalo Surfer's Beach	8	-	-	-	9.7	(NA)	(NA)	(NA)

NA Not available.

1/ 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 81.-- SUSPENDED PARTICULATE
MATTER FOR HONOLULU: 1970 TO 1978

[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

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

Table 82.-- 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 83.-- AEROMETRIC SURVEY DATA FOR SPECIFIED LOCATIONS: 1978

Location	Particulate matter (micrograms per cubic meter)			Sulfur dioxide (micrograms per cubic meter)		
	Minimum	Maximum	Annual average	Minimum	Maximum	Annual average
Oahu:						
Ala Moana	21	79	38	<5	5	<5
Dept. of Health Bldg..	14	53	29	<5	44	18
Kalihi Kai	27	80	46	<5	7	<5
Pearl City	20	81	37	<5	74	15
Barbers Point	22	127	48	<5	40	<5
Waimanalo	15	61	29	...	...	...
Maui:						
Kahului	44	154	74	<5	273	63
Kihei	16	160	54	...	...	...
Hawaii:						
Hilo	13	169	34	<5	45	<5
Kauai:						
Lihue	22	124	37	<5	<5	<5

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

Table 84.-- 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	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
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 85.-- 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	39
Hawaii Volcanoes Nat. Park Hdq.	3,971	57.6	63.2	37	85	102.81	...
Kona (Kailua)	30	72.1	77.3	54	93	25.22	...
Puako <u>1/</u>	10	73.1	79.8	52	98	9.47	...
Waimea (Kamuela)	2,670	62.3	66.8	34	90	40.05	...
Mauna Kea summit <u>2/</u>	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 <u>3/</u>	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	92	22.90	67
Honolulu Federal Bldg. <u>4/</u>	12	72.0	78.6	57	88	25.35	65
Waikiki <u>5/</u>	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 85.-- 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		
Kauai:							
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.	...
Northwestern Hawaiian Islands:							
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.

Table 86.-- 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	89	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	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	92	53	22.90	20.79	T	17.07

Continued on next page.

Table 86.-- 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	62	9.9	67	63	5.5	9	9	10
Feb. ...	76	59	10.7	63	65	5.7	8	8	9
Mar. ...	72	58	11.6	59	68	6.0	7	10	9
Apr. ...	69	57	12.2	40	66	6.3	6	11	9
May	67	55	12.2	35	69	6.1	7	10	7
June ...	66	54	12.9	39	70	5.7	6	7	6
July ...	66	51	13.7	34	73	5.3	8	5	8
Aug. ...	67	53	13.5	52	75	5.3	8	6	7
Sept. ...	66	52	11.7	36	75	5.2	8	6	7
Oct. ...	68	55	10.9	40	68	5.6	8	8	9
Nov. ...	74	59	11.0	65	60	5.7	7	9	10
Dec. ...	77	60	11.1	59	59	5.6	8	10	10
Ann. ...	71	56	11.8	67	68	5.7	90	99	101

T Trace, an amount too small to measure.

1/ For periods October 1962 through December 1964 and September 1971 through December 1978. At other times, temperatures as high as 93° and as low as 52° have been recorded at the Airport.

2/ Data for 1963, 1964, and 1972-1978.

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, 1978.

Table 87.-- 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 88.-- RAINFALL, FOR SPECIFIED LOCATIONS: ANNUALLY, 1968 TO 1978

[In inches]

Year	Hawaii		Maui		Oahu:	Kauai	
	Hilo <u>2/</u>	Kona <u>3/</u>	Kahului <u>2/</u>	Lahaina	Honolulu CBD <u>1/</u>	Lihue <u>2/</u>	Koloa
1968 ..	134.14	48.86	34.73	25.87	36.24	68.89	84.00
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

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

2/ Airport data.

3/ Holualoa Beach. Data for 1977 are incomplete.

Source: U.S. Department of Commerce, National Climatic Center, Local Climatological Data, Annual Summary With Comparative Data, 1978 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 89.-- CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT: ANNUALLY,
1968 TO 1978

Year	Average temperature (degrees F.)			Extreme temp. (°F.)		Precipitation (inches)
	Annual	Coolest month	Warmest month	Lowest	Highest	
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
1978 ...	76.8	72.4	80.5	57	91	25.05

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		
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
1978 ...	74	58	11.9	34	69	90

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 90.-- 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, 1978.

Table 91.-- 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 92.-- TREES ALONG STREETS OR IN PARKS UNDER THE JURISDICTION OF THE CITY AND COUNTY OF HONOLULU: 1977 AND 1978

Location	June 30, 1977	June 30, 1978
Along City and County streets and highways <u>1/</u>	97,865	101,021
In City and County parks	93,800	94,800

1/ Excludes Federal, State, and private thoroughfares. The 1978 figure is provisional.

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

Table 93.-- 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 94.— HAWAII AUDUBON SOCIETY BIRD COUNTS OF THE HONOLULU
AREA: 1977 AND 1978

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

Species <u>1/</u>	1977	1978
All species:		
Species	52	55
Individual birds	15,542	16,204
Endemic species:		
Hawaiian Stilt	106	116
'Apapane	145	114
Oahu 'Amakihi	128	74
Indigenous species:		
Red-footed Booby	1,647	1,669
Great Frigatebird	571	585
Introduced species:		
Common Myna	2,173	2,616
Barred Dove	2,201	2,389
Cattle Egret	1,316	1,445
House Sparrow	1,112	1,216
Spotted Dove	780	1,044
Japanese White-eye	953	723
Spotted Munia (Ricebird)	747	702
Migratory species:		
Golden Plover	993	1,422
Ruddy Turnstone	134	223

1/ Separate data shown for endemic birds numbering more than 70 individuals in 1978, indigenous birds more than 100, introduced birds more than 600 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 March 1979.