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Section 5

GEOGRAPHY AND ENVIRONMENT

This section relates to land and water areas, physical geography, climate, air and water quality, and other geographic and environmental measurements of Hawaii. Most statistics on land use and ownership, however, appear in Section 6.

Important sources of data include the U.S. Geological Survey, the National Ocean Survey, the National Climatic Data Center, the Division of Water Resource Management of the Hawaii State Department of Land and Natural Resources, the Hawaii State Department of Health, and the University of Hawaii Institute of Geophysics. Detailed information is given in *Atlas of Hawaii* , 3rd edition, published by the University of Hawaii Press in 1998. National data are reported in the *Statistical Abstract of the United States: 2011* , Section 6.

Table 5.01-- GREAT CIRCLE DISTANCES BETWEEN SPECIFIED PLACES

Places	Statute miles	Nautical miles	Kilometers
DISTANCES FROM HONOLULU INTERNATIONAL AIRPORT			
Hawaiian Islands locations			
Hilo, Hawaii	214	186	344
Kailua, Kona, Hawaii	168	146	270
Kahului, Maui	98	85	158
Lanai Airport	72	63	116
Molokai Airport	54	47	87
Lihue, Kauai	103	90	166
Puuwai, Niihau	152	132	245
Nihoa	283	246	455
Necker Island	520	452	837
French Frigate Shoals	556	483	895
Gardner Pinnacles	688	598	1,107
Maro Reef	851	739	1,369
Laysan Island	936	813	1,506
Lisianski Island	1,065	925	1,714
Pearl and Hermes Atoll	1,208	1,050	1,944
Midway Islands	1,309	1,137	2,106
Kure Atoll	1,367	1,188	2,200
Other Pacific locations			
Apra Harbor, Guam	3,806	3,307	6,124
Auckland, New Zealand	4,393	3,817	7,068
Baker Island	1,900	1,649	3,058
Hong Kong	5,541	4,815	8,915
Howland Island	1,900	1,649	3,058
Jarvis Island	1,560	1,354	2,511
Johnston Atoll	820	713	1,319
Kingman Reef	1,073	932	1,726
Kiritimati (Christmas Island), Kiribati	1,344	1,168	2,163
Majuro, Marshall Islands	2,271	1,973	3,654
Manila, Philippines	5,293	4,599	8,516
Nuku Hiva, Marquesas Islands	2,400	2,086	3,864
Pago Pago, American Samoa	2,606	2,265	4,193
Palmyra Atoll	1,101	957	1,772
Papeete, Tahiti	2,741	2,382	4,410
Suva, Fiji	3,159	2,745	5,083
Sydney (Port Jackson), Australia	5,070	4,406	8,158
Tokyo, Japan	3,847	3,343	6,190
Wake Island	2,294	1,993	3,691

Continued on next page.

Table 5.01-- GREAT CIRCLE DISTANCES BETWEEN SPECIFIED PLACES -- Con.

Places	Statute miles	Nautical miles	Kilometers
DISTANCES FROM HONOLULU INT. AIRPORT--Con.			
North and South American locations			
Anchorage, Alaska	2,781	2,417	4,475
Cape Horn, Chile	7,457	6,480	11,998
Chicago, Illinois	4,179	3,631	6,724
Cristobal, Canal Zone	5,214	4,531	8,389
Los Angeles, California	2,557	2,222	4,114
Miami, Florida	4,856	4,220	7,813
New York, New York	4,959	4,309	7,979
Portland, Oregon	2,595	2,255	4,175
San Diego, California	2,610	2,268	4,199
San Francisco, California	2,397	2,083	3,857
Seattle, Washington	2,679	2,328	4,311
Vancouver, B.C.	2,709	2,354	4,359
Tijuana, Mexico	2,616	2,273	4,209
Washington, D.C.	4,829	4,196	7,770
London, England	7,226	6,279	11,627
Bombay, India	8,010	6,960	12,888
Ghanzi, Botswana 1/	12,417	10,790	19,979
Equator, due south of Honolulu	1,470	1,277	2,367
North Pole	4,740	4,119	7,631
OTHER DISTANCES			
Hilo to --			
Los Angeles, California	2,447	2,126	3,937
San Francisco, California	2,315	2,012	3,725
Kure Atoll to --			
Cape Kumukahi, Puna, Hawaii 2/	1,523	1,323	2,451
Log Point, Elliot Key, Florida 3/	5,852	5,085	9,416
Tokyo, Japan	2,486	2,160	4,000
West Quoddy Head, Maine	5,788	5,030	9,313

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

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

3/ Log Point and Kure Atoll are the points farthest apart in the 50 states.

Source: U.S. Geological Survey, *Elevations and Distances in the United States* (1980), pp. 22-23, and records; E. H. Bryan, Jr., *American Polynesia and the Hawaiian Chain* (1942), pp. 38, 42, and 134.

Table 5.02-- LATITUDES AND LONGITUDES OF SELECTED PLACES

Island and place	Latitude (North)	Longitude (West)
Hawaii		
Hilo (International Airport)	19°43'	155°04'
Cape Kumukahi	19°31'	154°49'
Ka Lae	18°56'	155°41'
Keahole Point	19°44'	156°04'
Upolu Point	20°16'	155°51'
Geographic center of State (off Maui)	20°15'	156°20'
Maui		
Wailuku	20°53'	156°30'
Kahului (Airport)	20°54'	156°26'
Hana	20°45'	155°59'
Cape Hanamanioa	20°35'	156°25'
Lahaina	20°52'	156°41'
Kahoolawe		
Puu Moaulanui	20°34'	156°34'
Lanai		
Airport	20°48'	156°57'
Molokai		
Kaunakakai	21°05'	157°02'
Laau Point	21°06'	157°19'
Cape Halawa	21°10'	156°43'
Oahu		
Honolulu: International Airport	21°20'	157°55'
Aloha Tower	21°19'	157°52'
Kaena Point	21°35'	158°17'
Kahuku Point	21°43'	157°59'
Makapuu Point	21°19'	157°39'
Diamond Head	21°16'	157°49'
Kauai		
Lihue (Kauai Airport)	21°59'	159°21'
Mana	22°02'	159°46'
Kilauea Point	22°14'	159°24'
Niihau		
Puuwai	21°54'	160°12'
Kure Atoll	28°25'	178°22'

Source: U.S. Board on Geographic Names, *Gazetteer No. 24, Hawaiian Islands* (1956); U.S. Geological Survey, *Elevations and Distances in the United States* (1980), pp. 17 and 22-23; U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center, *Local Climatological Data, Annual Summary with Comparative Data, 1984* for Hilo, Kahului, Honolulu, and Lihue; Bernice P. Bishop Museum, records; Hawaii State Department of Accounting and General Services, Survey Division, records.

Table 5.03-- TIME DIFFERENCES BETWEEN HONOLULU AND SELECTED CITIES

[Standard time]

City	Country	Day	Hour	Time difference
Honolulu	United States	Same	9:00 a.m.	-
Anchorage	United States	Same	10:00 a.m.	+1
Vancouver	Canada	Same	11:00 a.m.	+2
Los Angeles	United States	Same	11:00 a.m.	+2
Las Vegas	United States	Same	11:00 a.m.	+2
Denver	United States	Same	12:00 p.m.	+3
Houston	United States	Same	1:00 p.m.	+4
Winnipeg	Canada	Same	1:00 p.m.	+4
Chicago	United States	Same	1:00 p.m.	+4
Atlanta	United States	Same	2:00 p.m.	+5
Miami	United States	Same	2:00 p.m.	+5
Toronto	Canada	Same	2:00 p.m.	+5
Lima	Peru	Same	2:00 p.m.	+5
New York City	United States	Same	2:00 p.m.	+5
Santiago	Chile	Same	3:00 p.m.	+6
Buenos Aires	Argentina	Same	4:00 p.m.	+7
Sao Paulo	Brazil	Same	4:00 p.m.	+7
London	United Kingdom	Same	7:00 p.m.	+10
Madrid	Spain	Same	8:00 p.m.	+11
Paris	France	Same	8:00 p.m.	+11
Frankfurt	Germany	Same	8:00 p.m.	+11
Rome	Italy	Same	8:00 p.m.	+11
Johannesburg	South Africa	Same	9:00 p.m.	+12
Jerusalem	Israel	Same	9:00 p.m.	+12
Moscow	Russia	Same	10:00 p.m.	+13
Baghdad	Iraq	Same	10:00 p.m.	+13
Kabul	Afghanistan	Same	11:30 p.m.	+14.5
Calcutta	India	Next	12:30 a.m.	+15.5
Bangkok	Thailand	Next	2:00 a.m.	+17
Singapore	Singapore	Next	3:00 a.m.	+18
Hong Kong	China	Next	3:00 a.m.	+18
Beijing	China	Next	3:00 a.m.	+18
Manila	Philippines	Next	3:00 a.m.	+18
Taipei	Taiwan	Next	3:00 a.m.	+18
Seoul	Korea	Next	4:00 a.m.	+19
Tokyo	Japan	Next	4:00 a.m.	+19
Sydney	Australia	Next	5:00 a.m.	+20
Auckland	New Zealand	Next	7:00 a.m.	+22

Source: 2009 HYP Media Finance LLC., *The Official Hawaiian Telcom White Pages O'ahu 2009*, pp. 20-23, and "Time Zone Converter" at <http://www.timezoneconverter.com/cgi-bin/tzc.tzc> accessed November 26, 2008.

Table 5.04-- WIDTHS AND DEPTHS OF CHANNELS

Channel 1/	Width 2/		Depth 3/	
	Statute miles	Kilometers	Feet	Meters
Alenuihaha (Hawaii-Maui)	29.6	47.6	6,810	2,076
Alalakeiki (Kahoolawe-Maui)	6.7	10.8	822	251
Kealaikahiki (Kahoolawe-Lanai)	17.8	28.6	1,086	331
Auau (Lanai-Maui)	9.5	15.3	252	77
Kalohi (Lanai-Molokai)	9.2	14.8	540	165
Pailolo (Maui-Molokai)	8.8	14.2	846	258
Kaiwi (Molokai-Oahu)	25.8	41.5	2,202	671
Kauai (Oahu-Kauai)	72.1	116.0	10,890	3,319
Kaulakahi (Kauai-Niihau)	17.2	27.7	3,570	1,088
Niihau-Kaula	21.5	34.6	5,364	1,635
Niihau-Nihoa	133.9	215.5	14,550	4,435
Nihoa-Necker I.	179.6	289.0	12,600	3,840
Necker I.-French Frigate Shoals	100.3	161.4	12,780	3,895
French Frigate Shoals-Gardner Pinnacles	137.0	220.5	11,448	3,489
Gardner Pinnacles-Maro Reef	155.5	250.3	12,300	3,749
Maro Reef-Laysan I.	65.9	106.1	8,280	2,524
Laysan I.-Lisianski I.	137.4	221.1	16,830	5,130
Lisianski I.-Pearl and Hermes Atoll	162.6	261.7	17,400	5,304
Pearl and Hermes Atoll-Midway Islands	86.9	139.9	15,840	4,828
Midway Islands-Kure Atoll	57.1	91.9	12,960	3,950

1/ Listed in geographic order, from east to west. The channels between major islands were measured between the following points:

Alenuihaha: Upolu Pt., Hawaii, to Puhilele Pt., Maui;

Alalakeiki: Lae o ka Ule, Kahoolawe, to Nukuele Pt., Maui;

Kealaikahiki: Makaalae, Kahoolawe, to Kamaiki Pt., Lanai;

Auau: Kikoa Pt., Lanai, to Lahaina, Maui;

Kalohi: Wahie Pt., Lanai, to Kamalo, Molokai;

Pailolo: Lipoa Pt., Maui, to Pohakuloa, Molokai;

Kaiwi: Ilio Pt., Molokai, to Makapuu Pt., Oahu;

Kauai: Kaena Pt., Oahu, to Kamilo Pt., Kauai;

Kaulakahi: Mana Pt., Kauai, to Kaunuopou, Niihau.

2/ Width measured in statute miles between designated points on National Ocean Survey and Coast and Geodetic Survey charts. Width in kilometers calculated from miles (1 mile = 1.60934 km.).

3/ Depths given are the deepest soundings noted at or near the line joining the two designated points, on National Ocean Survey and Coast and Geodetic Survey charts. Depths measured in fathoms and converted to feet and meters (1 fathom = 6 feet = 1.8288 meters).

Source: Compiled by Lee S. Motteler, Geography and Map Division, Bernice P. Bishop Museum, in November 1980.

Table 5.05-- GENERAL COASTLINE AND TIDAL SHORELINE OF COUNTIES AND ISLANDS

County and island	General coastline 1/		Tidal shoreline 3/	
	Statute miles	Kilometers 2/	Statute miles	Kilometers 2/
State total	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 4/				
Hawaii	266	428	313	504
Maui	120	193	149	240
Kahoolawe	29	47	36	58
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
Kaula	2	3	2	3
Northwestern Hawaiian Islands 5/	25	40	25	40
Nihoa	3	5	3	5
Necker Island	2	3	2	3
French Frigate Shoals	6	10	6	10
Laysan Island	6	10	6	10
Lisianski Island	3	5	3	5
Kure Atoll	5	8	5	8

1/ Figures are lengths of general outline of seacoast. Data for the four islands of Maui County are not consistent with the reported county total.

2/ 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.

3/ 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.

4/ Data are not available for five minor islands: Molokini, Lehua, Gardner Pinnacles, Maro Reef, and Pearl and Hermes Atoll.

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. Department of Commerce, National Ocean Survey, *The Coastline of the United States* (1975) and records.

Table 5.06-- 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]

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

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

Table 5.07-- LAND AREA OF COUNTIES: 2010

[See maps]

Measurement unit and type of area	State total	Hawaii	Maui	Kalawao	Honolulu	Kauai
Square miles	6,422.6	4,028.4	1,161.5	12.0	600.7	620.0
Square kilometers	16,634.5	10,433.6	3,008.3	31.1	1,555.9	1,605.7

Source: U.S. Census Bureau, 2010 Census Redistricting Data (Public Law 94-171) Summary File (February 2011); calculations by the Hawaii State Department of Business, Economic Development & Tourism, Hawaii State Data Center.

Table 5.08-- LAND AREA OF ISLANDS: 2000

Island	Square miles	Square kilometers
STATE OF HAWAII	6,422.6	16,634.5
Hawaii	4,028.0	10,432.5
Maui	727.2	1,883.5
Molokini	0.036	0.093
Kahoolawe	44.6	115.5
Lanai	140.5	364.0
Molokai	260.0	673.4
Oahu	596.7	1,545.3
Kauai	552.3	1,430.4
Niihau	69.5	179.9
Lehua	0.444	1.149
Kaula	0.247	0.640
Northwestern Hawaiian Islands 1/	3.108	8.049
Nihoa	0.271	0.701
Necker Island	0.071	0.183
French Frigate Shoals	0.096	0.249
Gardner Pinnacles	0.009	0.024
Maro Reef	Awash	Awash
Laysan Island	1.588	4.114
Lisianski Island	0.601	1.556
Pearl and Hermes Atoll	0.139	0.359
Kure Atoll	0.333	0.862

1/ Exclusive of the Midway Islands, which are part of the Hawaiian Archipelago but not legally part of the State of Hawaii.

Source: U.S. Census Bureau, Census 2000 Redistricting Data (P.L. 94-171) Summary File, and unpublished records.

Table 5.09-- MAJOR AND MINOR ISLANDS IN THE HAWAIIAN ARCHIPELAGO

Classification	Number of islands		Land area (square miles)
	Total	Inhabited, 1990 1/	
All named islands	137	12	6,427.0
Major islands	8	7	6,419.4
Named minor islands 2/	129	5	7.6
Offshore of major islands	96	3	2.6
Northwestern Hawaiian Islands 3/	33	2	4.9
Part of State	28	1	2.9
Not part of State (Midway Islands)	5	1	2.0

1/ For populations, see present volume, table 1.05.

2/ For individual data, see DPED Report GN-6, pp. 3-7.

3/ Includes individual islets in the 10 Northwestern Hawaiian Islands.

Source: Hawaii State Department of Planning and Economic Development, *Geographic Names Approved, Second Quarter 1969* (Report GN-6, July 8, 1969), p. 8; *Data Book 1986,* table 152.

Table 5.10-- AREA AND DEPTH OF SELECTED CRATERS

Island and crater	Area (acres)	Maximum depth (feet)
Hawaii		
Kilauea Caldera	2,319	476
Mokuaweoweo Crater 1/	2,221	572
Maui		
Haleakala Crater 2/	12,575	3,028
Oahu		
Diamond Head Crater	255	562
Koko Crater	133	968
Punchbowl Crater	62	140

1/ Data exclude North and South Pits.

2/ Data exclude Koolau and Kaupo Gaps.

Source: Measured from U.S. Geological Survey maps by the Hawaii State Department of Business, Economic Development & Tourism.

Table 5.11-- ELEVATIONS OF MAJOR SUMMITS

[Elevation of the highest point on each island and other important peaks]

Island and summit	Feet	Meters
Hawaii		
Mauna Kea 1/	13,796	4,205
Mauna Loa	13,679	4,169
Hualalai	8,271	2,521
Kaumu o Kaleihoohie	5,480	1,670
Kilauea (Uwekahuna)	4,093	1,248
Kilauea (Halemaumau Rim)	3,660	1,116
Kahoolawe		
Puu Moaulanui	1,483	452
Puu Moaulaiki	1,434	437
Molokini	160	49
Maui		
Haleakala (Red Hill)	10,023	3,055
Haleakala (Kaupo Gap)	8,201	2,500
Puu Kukui	5,788	1,764
Iao Needle	2,250	686
Lanai		
Lanaihale	3,366	1,026
Molokai		
Kamakou	4,961	1,512
Olokui	4,606	1,404
Kalaupapa Lookout	1,600	488
Mauna Loa (Kukui)	1,430	436
Oahu		
Kaala	4,003	1,220
Puu Kalena	3,504	1,068
Konahuanui	3,150	960
Tantalus	2,013	614
Olomana	1,643	501
Koko Crater (Kohelepelepe)	1,208	368
Nuuanu Pali Lookout	1,186	361
Diamond Head	760	232
Koko Head	642	196
Punchbowl	500	152

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Table 5.11-- ELEVATIONS OF MAJOR SUMMITS -- Con.

Island and summit	Feet	Meters
Kauai		
Kawaikini	5,243	1,598
Waialeale	5,148	1,569
Kalalau Lookout	4,120	1,256
Haupu	2,297	700
Sleeping Giant (Nonou)	1,241	378
Niihau		
Paniau	1,250	381
Lehua	699	213
Kaula	548	167
Nihoa		
Millers Peak	903	275
Necker Island		
Summit Hill	276	84
French Frigate Shoals		
La Perouse Pinnacles	120	37
Gardner Pinnacles	190	58
Maro Reef	Awash	Awash
Laysan Island	40	12
Lisianski Island	40	12
Pearl and Hermes Atoll	10	3
Midway Islands	12	4
Kure Atoll	20	6

1/ According to the *1995 Guinness Book of Records* (p. 147), "The world's tallest mountain measured from its submarine base (3,280 fathoms) in the Hawaiian Trough to its peak is Mauna Kea ... with a combined height of 33,480 ft., of which 13,796 ft. are above sea level."

Source: Hawaii State Department of Accounting and General Services, Survey Division, data provided April 21, 1992; U.S. National Cartographic Information Center, data provided October 11, 1978; U.S. Geological Survey topographic maps, 1981-1984; Hawaiian Government Survey (for Nihoa and Molokini); U.S.S. Tanager survey, 1923 (for Necker Island, French Frigate Shoals, Laysan, Lisianski, Pearl and Hermes Atoll and Kure Atoll.)

Table 5.12-- MAJOR NAMED WATERFALLS, BY ISLAND

Island	Waterfall	Height (feet)		Horizontal distance (feet)
		Sheer drop	Cascade	
Hawaii	Kaluahine	(NA)	620	400
	Akaka	442	(NA)	(NA)
	Waiilikahi	320	(NA)	6
Maui	Honokohau	(NA)	1,120	500
	Waihiumalu	(NA)	400	150
Molokai	Kahiwa	(NA)	1,750	1,000
	Papalaua	(NA)	1,200	500
	Wailele	(NA)	500	150
Oahu	Kaliuwaa (Sacred)	1/ 80	1,520	3,000
Kauai	Waipoo (2 falls)	(NA)	800	600
	Awini	(NA)	480	500
	Hinalele	280	(NA)	(NA)
	Wailua	200	(NA)	(NA)

NA Not available.

1/ Refers to the northernmost fall of a cascade of six falls.

Source: U.S. Geological Survey, records; Hawaii State Department of Land and Natural Resources, Commission on Water Resource Management, records; "Tall Falls", *The Honolulu Advertiser,* June 25, 1995, pp. A17 and A20.

Table 5.13-- MAJOR STREAMS, BY ISLAND

Island	Feature or stream	Length or average discharge
Longest water feature (miles)		
Hawaii	Wailuku River	32.0
Maui	Kalialinui-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) 1/		
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	180
Maui	Waihee River	50
Molokai	Wailau Stream	30
Oahu	Waikele Stream	2/ 26
Kauai	Hanalei River	129

1/ Estimated on basis of drainage area rather than stream runoff. Other major streams include Wailoa River, Hawaii (1/2-mile long); Honokohau Stream (9.4 miles long) and Iao Stream (5), both on Maui; Halawa Stream (6.4), Waikolu Stream (4.7), and Pelekunu (2.3), all on Molokai; Waikele Stream (15.3), Kipapa Stream (12.8), Waiakakalaua Stream (11.8), Nuuanu Stream (4), and Ala Wai Canal (1.9), 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.

2/ Most of discharge is from nearby groundwater outflow.

Source: Longest water feature from U.S. Geological Survey, records; other data from Hawaii State Department of Land and Natural Resources, Commission on Water Resource Management, records.

Table 5.14-- LAKES AND LAKE-LIKE WATERS, BY ISLAND

Island and lake	Type	Elevation (feet)	Area 1/ (acres)	Maximum depth (feet)
Hawaii				
Green Lake	Lake	3	2	20
Lake Waiau 2/	Lake	13,020	2	10
Waiakea Pond	Tidal pond	(3/)	27	7
Maui				
Kanaha Pond	Marsh	(3/)	41	3
Kealia Pond	Marsh	(3/)	500	(NA)
Waieleele	Pond	6,690	0.5	21
Molokai				
Kauhako	Pool	(3/)	0.9	814
Kualapuu Reservoir	Reservoir	821	100	50
Meyer Lake	Impoundment	2,021	6-10	5
Oahu				
Ho'omaluhia	Reservoir	202	90	90
Kaelepulu Pond	Lake	(3/)	198	(NA)
Kawainui Marsh	Marsh	(3/)	1,000	(NA)
Wahiawa Reservoir	Reservoir	842	302	85
Kauai				
Nomilu Fishpond	Pond	(3/)	20	66
Waita Reservoir	Reservoir	241	424	23
Niihau				
Halalii Lake	Playa	(3/)	841-865	(NA)
Halulu Lake	Playa	(3/)	182-371	(NA)
Laysan				
Laysan Lagoon	Closed lagoon	(3/)	161	16

NA Not available.

1/ Ranges shown for Meyer Lake, Halalii Lake, and Halulu Lake reflect differences in estimates between sources.

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

3/ Sea level.

Source: J.A. Maciolek, *Lakes and Lake-like Waters of the Hawaiian Archipelago* (Bernice P. Bishop Museum, Occasional Papers, Vol. XXV, No. 1, April 30, 1982); Hawaii State Department of Land and Natural Resources, Commission on Water Resource Management, May 18,1994.

Table 5.15-- LENGTH AND WIDTH OF SELECTED BEACHES

[Includes the longest white sand beach on each inhabited island, plus other important beaches]

Island and beach	Length (miles)	Width 1/ (feet)
Hawaii		
Hapuna	0.5+	200+
Maui		
Spreckelsville	2+	(NA)
Kaanapali	1.5	60-80
Lanai		
Polihua	1.5+	(NA)
Molokai		
Papohaku	2+	300
Oahu		
Waikiki	2	(NA)
Waimanalo	3.5-4.5	(NA)
Sunset	2-3+	200
Kauai		
Polihale to Kekaha	15	300
Polihale	3	300
Niihau		
Keawanui	3.5	175

NA Not available.

1/ Summer averages. Many beaches in Hawaii are seasonally reduced in width by winter storms.

Source: Hawaii State Department of Planning and Economic Development, *Hawaii's Shoreline* (1965), pp. 33, 47, 55, 62, 68, and 100; John R. K. Clark, *Beaches of the Big Island* (1985), p. 132, *The Beaches of Maui County* (1980), pp. 10, 62, 84-85, and 114, *The Beaches of O'ahu* (1977), pp. 45, 125, and 177, and *Beaches of Kaua'i and Ni'ihau* (1990), pp. 48-49 and 84.

Table 5.16-- MISCELLANEOUS GEOGRAPHIC STATISTICS, BY ISLAND

Island	Extreme length (miles)	Extreme width (miles)	Miles of sea cliffs with heights 1,000 ft. or more 1/	Miles from coast of most remote point	Percent of area within 5 miles of coast
State total	(X)	(X)	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	65.0
Niihau	8	6	3	2.4	100.0

	Percent of area with elevation			Percent of area with slope	
Island	Less than 500 feet	2,000 feet or more	Approximate mean altitude (feet)	Less than 10 percent	20 percent or more
State total	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	0.0	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	0.0	530	68.0	12.5

X Not applicable.

1/ According to Lee S. Motteler, Geography and Map Division, Bernice P. Bishop Museum, the sea cliffs along the northeastern coast of Molokai between Umilehi Point and Puukaoku Point drop 3,250 feet at an average slope of 58 degrees. These cliffs have been described by *The Guinness Book of Records* (1995 edition, p. 154) as "the highest sea cliffs in the world."

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 5.17-- VOLCANIC ERUPTIONS: MAUNA LOA 1950 TO 1984, KILAUEA 1969 TO 2010

[As of December 31, 2010. Four volcanoes have erupted in historical times: Haleakala, last active in 1460; Hualalai, last active in 1801; Mauna Loa, last active in 1984; Kilauea, still active]

Volcano and date of outbreak	Repose period since previous eruption (months)	Duration (days)	Location 1/	Altitude of main vent (meters)	Area covered (km2)	Volume (km3)
Mauna Loa						
1950: June 1	17.0	23	S, SWR	3,840-2,380	112.0	0.3760
1975: July 5	301.0	<1	S	3,900	13.5	0.0300
1984: March 25	104.6	22	S, NER	4,030-2,870	48.0	0.2200
Kilauea						
1969: Feb. 22	4.0	6	ER	930-870	6.0	0.0161
May 24	2.0	874	ER	940	50.0	0.1850
1971: Aug. 14	-	<1	C	1,100-1,080	3.1	0.0091
Sept. 24	-	5	C, SWR	1,120-820	3.9	0.0077
1972: Feb. 3	4.3	900	ER	940	46.0	0.1620
1973: May 5	-	<1	ER	1,000-980	0.3	0.0012
Nov. 10	-	30	ER	980-870	1.0	0.0027
1974: July 19	-	3	C, ER	1,080-980	3.1	0.0066
Sept. 19	2.0	<1	C	1,100	1.0	0.0102
Dec. 31	3.4	<1	SWR	1,080	7.5	0.0143
1975: Nov. 29	11.0	<1	C	1,080-1,060	0.3	0.0002
1977: Sept. 13	21.5	18	ER	620-480	7.8	0.0329
1979: Nov. 16	26.3	1	ER	980-960	0.3	0.0006
1982: April 30	29.5	<1	C	1,080	0.3	0.0005
Sept. 25	4.8	<1	C	1,080	0.8	0.0030
1983: Jan. 3	3.3	2/ 10,224	ER	900	2/ 123.2	3.5000
2008: March 19	-	2/ 1,017	C	1,080	(3/)	(3/)

1/ C, summit caldera; ER, east rift zone; NER northeast rift zone; S, summit area; SWR, southwest rift zone.

2/ Revised from previous *Data Book*.

3/ Primarily explosive with very little material produced.

Source: Gordon A. Macdonald, Agatin T. Abbott, and Frank L. Peterson, *Volcanoes in the Sea: The Geology of Hawaii,* 2nd ed. (1986), pp. 80-81; U.S. Geological Survey, Hawaiian Volcano Observatory <http://hvo.wr.usgs.gov/kilauea/history/historytable.html> accessed April 7, 2009; records.

Table 5.18-- MAJOR EARTHQUAKES: 1838 TO 2010

[As of December 31, 2010. Includes all earthquakes with magnitudes of 6.0 or greater, 1838 to 1983, and 5.0 or greater, 1984 to present. Except for the earthquake of April 2, 1868, magnitudes of earthquakes prior to 1929 are conjectural]

Date and time (HST)	Location	Magnitude (Richter scale)
1838: December 12	Hawaii	6.0
1841: April 7	Hawaii	6.0
1852: March 31	Hawaii	6.0
1868: March 28	Mauna Loa, south flank, Hawaii	6.5-7.0
April 2	Mauna Loa, south flank, Hawaii	7.5-8.1
1871: February 19	Molokai or Maui	6.5
1875: November 23	Hawaii	6.0
1887: January 24	Hawaii	6.0
1913: October 25	Hawaii	6.5
1918: November 1	Hawaii	6.5
1919: September 14	Hawaii	6.5
1929: October 5	Hualalai, Hawaii	6.5
1938: January 23	North of Pauwela Point, Maui	6.8
1940: June 17	Hawaii	6.0
1941: September 25	South east of Mauna Loa, Kaoiki fault zone, Hawaii	6.0
1950: May 29	Mauna Loa, south west rift, Hawaii	6.2
1951: April 22	Kilauea, Hawaii	6.3
August 21	Kona, Hawaii	6.9
1952: May 23	Kona, Hawaii	6.0
1954: March 30	Kilauea, south flank, Hawaii	6.5
1961: September 25	Hawaii	5.75-6.0
1962: June 27	South east of Mauna Loa, Kaoiki fault zone, Hawaii	6.1
1973: April 26	North of Hilo, Honomu, Hawaii	6.2
1975: Nov. 29, 4:47 AM	Kilauea, south flank, Kalapana, Hawaii	7.2
1983: Nov. 16, 6:13 AM	South east of Mauna Loa, Kaoiki fault zone, Hawaii	6.7
1984: June 8, 5:34 PM	80 miles south of Honolulu, Oahu	5.3
1986: April 26, 7:19 AM	28 miles north east of Maui	5.1
1987: Feb. 3, 4:22 PM	26 miles south of Kahoolawe	5.0
1989: June 25, 5:27 PM	Kilauea, south flank, Kalapana, Hawaii	6.2
1994: Feb. 1, 12:01 AM	12 miles south of Kilauea, offshore, Hawaii	5.2
1997: June 30, 5:47 AM	5 miles west of Kalapana, Hawaii	5.2
1999: April 16, 2:56 PM	4 miles north of Pahala, Hawaii	5.6
2000: April 1, 8:18 PM	7 miles south east of Kilauea Summit, Hawaii	5.0
2003: August 26, 8:24 PM	6 miles north west of Kaena Point, Oahu	5.0
2005: May 13, 12:06 AM	27 miles south of Naalehu near Loihi, Hawaii	5.0
2005: July 15	49 miles north of Hilo, Hawaii	5.2
2005: July 17, 9:15 AM	near seamount Loihi, Hawaii	5.2

Continued on next page.

Table 5.18-- MAJOR EARTHQUAKES: 1838 TO 2010 -- Con.

Date and time (HST)	Location	Magnitude (Richter scale)
2006: October 15, 7:07:49 AM	just offshore of Kiholo Bay, Hawaii	6.7
2006: October 15, 7:14:12 AM	6 miles west of Mahukona, Hawaii	6.0
2006: November 23, 9:20:10 AM	just offshore of Kiholo Bay, Hawaii	5.1
2007: August 13, 7:38 PM	Kilauea, south flank, Hawaii	5.4
2009: April 14, 12:44 PM	9 miles south of Volcano, Hawaii	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, Engineering Bulletin, June 15, 1972); information supplied by Wm. Mansfield Adams and Augustine S. Furumoto, Institute of Geophysics, University of Hawaii; Hawaii Institute of Geophysics, records; U.S. Geological Survey, National Earthquake Information Service; U.S. Geological Survey, Hawaiian Volcano Observatory, records; U.S. Geological Survey, Earthquake Hazards Program, <http://earthquake.usgs.gov/eqcenter/eqinthenews/> accessed on June 3, 2010 and records.

Table 5.19-- EARTHQUAKES WITH INTENSITIES ON OAHU OF V OR GREATER: 1859 TO 2010

[As of December 31, 2010]

Date	Epicentral location	Magnitude	Oahu average intensity (Modified Mercalli Scale 1/)
1861: Dec. 5	Molokai-Lanai vicinity (?)	(NA)	Mid V
Dec. 15	Molokai-Lanai vicinity (?)	(NA)	Lower V - mid V
1868: Apr. 2	SE coast of Hawaii	7.5	Upper IV - lower V
Apr. 4	Maui group vicinity (?)	(NA)	Lower V
1870: Aug. 7	Near Molokai	≥ 6	V
1871: Feb. 19	S coast of Lanai	7.0	Upper VI - lower VII
1881: Sep. 30	Maui vicinity	≥ 6	IV - V
1887: Jan. 13	Oahu vicinity	(NA)	V
1890: Aug. 6	Hawaii	(NA)	IV - V
1895: Dec. 8	Oahu vicinity (?)	(NA)	Mid V
1926: Mar. 19	N of Kohala, Hawaii	(NA)	Upper IV - lower V
1938: Jan. 22	N of Maui	6.8	Upper V - lower VI
1940: June 16	N of Hawaii	6.0	IV - V
1948: June 28	S coast of Oahu	4.8	Mid VI
1964: Oct. 11	Ka Lae, Hawaii	5.5	Upper IV - lower V
1973: Apr. 26	Hamakua coast, Hawaii	6.2	Mid V
1975: Nov. 29	Kalapana, Hawaii	7.2	V
1981: Mar. 5	Kalohi Channel	5.0	Mid V
2006: Oct.15	Just offshore of Kiholo Bay, Hawaii	6.7	V

NA Not available.

1/ Modified Mercalli Scale of 1931, 1956 abridged version further simplified. This scale, which extends from I to XII, reads in part:

IV. Hanging objects swing. Vibration like passing of heavy trucks or sensation of a jolt. Standing autos rock. Windows, dishes, doors rattle. Crockery clashes. In the upper part of range wooden construction creaks.

V. Felt outdoors; direction estimated. Sleepers wakened. Liquids distributed, some spilled. Small unstable objects displaced or upset. Doors, shutters, pictures swing. Pendulum clocks stop.

VI. Felt by all. Many frightened, run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books thrown off shelves, pictures off walls. Furniture moved, overturned. Weak plaster and masonry cracked. Small bells ring. Trees, bushes noticeably shaken.

VII. Difficulty in standing. Noticed by drivers of autos. Hanging objects quiver. Furniture broken. Damage to weak masonry. Weak chimneys broken at roof line. Fall of plaster, loose bricks, etc. Some cracks in ordinary masonry. Waves on ponds. Small slides on sand and gravel banks. Large bells ring. Irrigation ditches damaged.

Source: Doak C. Cox, "Earthquake Experience in Honolulu", *The Hawaiian Journal of History,* Vol. 21 (1987), pp. 98-109; U.S. Department of the Interior, U.S. Geological Survey, U.S. Geological Survey Bulletin 2006, *Isoseismal Maps, Macroseismic Epicenters, and Estimated Magnitudes of Historical Earthquakes in the Hawaiian Islands* (1992), table 4; U.S. Geological Survey, Hawaiian Volcano Observatory, records.

Table 5.20-- TSUNAMIS WITH RUN-UP OF 2 METERS (6.6 FEET) OR MORE: 1812 TO 2011

Date	Place of observation	Source	Maximum height in Hawaii		Deaths in Hawaii	Damage in Hawaii
			Meters	Feet		
1812: Dec. 21 1/	Hookena, Hawaii	California	2.5	8	-	Hut flooded
1819: April 12	W. Hawaii	Chile	2.0	7	-	Houses destroyed
1837: Nov. 7	Hilo, Hawaii	Chile	6.0	20	16	100 houses destroyed
1841: May 17	Hilo,Hawaii	Kamchatka	4.6	15	-	Unknown
1860: Dec. 1	Maliko Bay, Maui	N. Pacific 2/	3.6	12	-	Houses, wharf destroyed
1868: April 2	Keauhou Landing, Hawaii	Ka'u	13.7	45	47	Severe in Puna and Ka'u
1868: Aug. 13	Hilo, Hawaii	Chile	4.6	15	-	Houses, bridges destroyed
1869: Aug. 24	S.E. Puna	S. Pacific 2/	8.2	27	-	Houses destroyed, roads washed out
1877: May 10	Hilo, Hawaii	Chile	4.8	16	5	Severe in Hilo
1878: Jan. 10	Maliko Bay, Maui	N. Molokai 2/	3.6	12	-	Scattered flooding, N. Maui, N. Oahu
1896: June 15	Keauhou, Hawaii	Japan	5.5	18	-	Houses, wharfs, stores destroyed
1903: Nov. 29	Pelekunu,Molokai	N. Molokai	4.5	15	-	Houses destroyed on Maui, railroad washed out on Oahu
1906: Aug. 17	Maalaea, Maui	Chile	3.6	12	-	Piers damaged
1919: Oct. 2	Hoopuloa, Hawaii	S. Kona	4.3	14	-	Wharf damaged, car swept away
1922: Nov. 11	Hilo, Hawaii	Chile	2.1	7	-	Fishing boats swept away
1923: Feb. 3	Hilo, Hawaii	Kamchatka	6.1	20	1	$1,500,000
1933: March 2	Keauhou, Hawaii	Japan	3.2	10	-	Boathouses, walls destroyed in Kona
1946: April 1	Waikolu valley, Molokai	Aleutian Islands	16.4	54	159	$26,000,000
1952: Nov. 4	Kaena, Oahu	Kamchatka	9.1	30	-	$1,000,000
1957: March 9	Haena,Kauai	Aleutian Islands	16.1	53	-	$5,000,000
1960: May 22	Hilo, Hawaii	Chile	10.5	34	61	$23,000,000
1964: March 27	Waimea Bay, Oahu	Alaska	4.9	16	-	$68,000
1975: Nov. 29	Keauhou Landing, Hawaii	S. Puna	14.3	47	2	$1,500,000
2011: March 11	Kahului, Maui	Japan	2.0	7	-	(NA)

NA Not available.

1/ Earliest tsunami for which definite information exists.

2/ Probable source.

Source: George Pararas-Carayannis, *Catalog of Tsunamis in the Hawaiian Islands* (U.S. Coast and 'Geodetic Survey, May 1969); 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); Doak C. Cox, *Tsunami Casualties and Mortality in Hawaii* (University of Hawaii, Environment Center, June 1987), *p. 39;* James F. Lander and Patricia A. Lockridge, *United States Tsunamis (Including United States Possessions) 1690-1988*, Publication 41-2, National Geophysical Data Center, August 1989, pp.17-77; U.S. Geological Survey, Hawaiian Volcano Observatory, records; Pacific Tsunami Warning Center, records; National Oceanic and Atmospheric Administration, National Geophysical Data Center, Tsunami Runup database <http://www.ngdc.noaa.gov/nndc/struts/form?t=101650&s=167&d=166> accessed on June 22, 2011.

Table 5.21-- MAJOR DAMS

[Includes all dams whose maximum storage exceeds 800 acre-ft.]

Dam name	Nearest city	Purpose	Year completed	Height (ft.)	Length (ft.)	Maximum storage (acre-ft.)	Normal storage (acre-ft.)
Waita Reservoir	Koloa, Kauai	Irrigation	1906	23	3,250	9,900	3,400
Wahiawa Dam	Wahiawa, Oahu	Irrigation, recreation	1906	88	660	9,200	7,761
Kualapuu Reservoir	Kualapuu, Molokai	Irrigation, water supply	1969	57	7,100	5,082	3,685
Ho'omaluhia Dam	Kaneohe, Oahu	Flood control, recreation	1980	83	2,200	4,500	260
Nuuanu Dam No. 4	Honolulu, Oahu	Flood control, recreation	1910	66	1,730	3,600	242
Alexander	Kalaheo, Kauai	Irrigation, hydroelectric, water supply	1931	112	600	2,540	1,070
Puukapu Dam	Waimea, Hawaii	Flood control	1965	12	4,340	1,450	(NA)
Kaloko Reservoir	Kilauea, Kauai	Irrigation	1890	44	1,800	1,400	(NA)
Wailua Reservoir	Wailua, Kauai	Irrigation	1920	40	1,080	1,223	(NA)
Kitano Reservoir	Kekaha, Kauai	Irrigation	1928	38	720	1,120	110
Kapaia Reservoir	Hanamaulu, Kauai	Irrigation, water supply	1910	50	1,050	1,114	1,105
Ku Tree Reservoir	Wahiawa, Oahu	Other	1925	97	550	1,085	(NA)
Papuaa Reservoir	Omao, Kauai	Irrigation	1920	43	2,000	921	(NA)
Puu Lua Reservoir	Kekaha, Kauai	Fish & Wildlife, other	1925	105	640	888	(NA)

NA Not available.

Source: Hawaii State Department of Land & Natural Resources/Engineering Division, Flood Control & Dam Safety Section, records and <http://www.hidlnr.org/eng/dam/Inventory.aspx> accessed on April 6, 2011.

Table 5.22-- FRESH WATER USE, BY TYPE, BY COUNTY: 2000

[Million gallons per day]

Use	State total	Hawaii	Honolulu	Kalawao	Kauai	Maui
Total	628.43	53.41	216.91	0.09	45.20	312.82
Ground water	428.00	44.55	208.84	0.09	25.83	148.69
Public supply 1/	242.83	31.16	164.81	0.09	14.94	31.83
Industrial	14.50	0.04	12.93	-	0.27	1.26
Thermoelectric	-	-	-	-	-	-
Irrigation	170.67	13.35	31.10	-	10.62	115.60
Surface water	200.43	8.86	8.07	-	19.37	164.13
Public supply 1/	7.60	2.50	-	-	-	5.10
Industrial	-	-	-	-	-	-
Thermoelectric	-	-	-	-	-	-
Irrigation	192.83	6.36	8.07	-	19.37	159.03

1/ Includes water withdrawn by public and private water systems for use by cities and military bases. Water withdrawn by these facilities may be delivered to users for domestic, commercial, industrial, and thermoelectric purposes, or may be used for water and wastewater treatment, pools, parks and city buildings.

Source: U.S. Geological Survey, Water Resources, records.

Table 5.23-- WATER SERVICES AND CONSUMPTION, FOR COUNTY WATERWORKS: 2008 TO 2010

[Services as of June 30; consumption during the year ending June 30]

Geographic area	Number of services			Consumption (million gallons)		
	2008	2009	2010	2008	2009	2010
State total	267,771	(NA)	(NA)	80,287	(NA)	(NA)
City and County of Honolulu	171,281	173,377	174,046	53,297	50,396	52,060
Honolulu District 1/	66,771	67,680	67,969	23,837	22,627	23,063
Rest of Oahu	104,510	105,697	106,077	29,460	27,769	28,997
Hawaii County	41,089	41,209	41,409	9,530	9,171	9,505
Kauai County	19,957	(NA)	(NA)	4,663	(NA)	(NA)
Maui County	35,444	35,540	35,611	12,797	12,074	12,214
Maui	33,789	33,876	33,947	12,510	11,794	11,916
Molokai	1,655	1,664	1,664	287	280	298

NA Not available.

1/ Maunalua to Moanalua.

Source: Data compiled by Hawaii State Department of Business, Economic Development & Tourism from City and County of Honolulu Board of Water Supply, County of Hawaii Department of Water Supply, County of Kauai Department of Water, and County of Maui Department of Water Supply.

Table 5.24-- WATER WITHDRAWALS BY SOURCE AND MAJOR USE, FOR THE UNITED STATES AND HAWAII: 2000

[Withdrawal signifies water physically withdrawn from a source. Includes fresh and saline water]

Subject	U.S. 1/	Hawaii
Water withdrawals, total, millions of gallons per day	408,000	641
Source, percent		
Ground water	20.7	67.7
Surface water	79.2	32.4
Selected major uses, percent		
Public supply	10.6	39.0
Irrigation	33.6	56.8

1/ Includes Puerto Rico and Virgin Islands.

Source: U.S. Geological Survey, as cited in U.S. Census Bureau, *Statistical Abstract of the United States: 2007,* table 355 <http://www.census.gov/compendia/statab/2007edition.html> accessed March 15, 2007.

Table 5.25-- TOP 25 WATER USERS ON OAHU: MAY 2009 TO APRIL 2010

[Estimated monthly average]

Rank	User	Gallons (1,000)
1	Marine Base in Kaneohe	54,091
2	Chevron USA INC	39,107
3	Hilton Hotels - 2003 Kalia Rd	21,405
4	Airport Maintenance- 2980 Aolele St	19,976
5	University of Hawaii - 2566 Dole	12,474
6	Honolulu Zoo	12,236
7	Halekoa Hotel Ilima Tower	11,725
8	Airport Maintenance - 530 Paiea St	11,492
9	Hawaii Kai Golf Course	11,150
10	Hawaiian Cement	10,142
11	Dole Food Co Hawaii - Waialua	9,844
12	Sheraton Waikiki Htl	9,544
13	United Laundry Svc	8,251
14	Kapiolani Park	7,954
15	Sand Island Treatment Plant	7,650
16	Terraza-Corte Bella Associates	7,585
17	Halawa Security Facility	7,480
18	University of Hawaii - 2444 Dole	7,411
19	Magic Island Park	7,258
20	Hyatt Regency Waikiki	7,195
21	Halekoa Hotel Maile Tower	6,304
22	Kuhio Park Terrace Tower B	6,080
23	Ala Wai Golf Course	5,769
24	Mayor Wright Housing	5,721
25	McKinley High School	5,708

Source: Honolulu Board of Water Supply, records.

Table 5.26-- HAZARDOUS WASTE SITES, THREATS AND CONTAMINANTS ON OAHU

[Sites on the National Priorities List for the Superfund Program]

Sites with threats and contaminants	Location	Final Listing 1/	Deletion
Del Monte Corp. (Oahu Plantation) 2/	Kunia	12/16/94	3/ (NA)
Naval Computer & Telecommunications Area 4/	Pearl Harbor	5/31/94	(NA)
Pearl Harbor Naval Complex 5/	Pearl Harbor	10/14/92	(NA)
Schofield Barracks (US Army) 6/	Wahiawa	8/30/90	8/30/00

NA Not available.

1/ After the proposed listing, site was added on this date to the National Priorities List.

2/ Soil and shallow groundwater at the site have been contaminated with the fumigants EDB, DBCP and DCP, the solvents TCP and benzene and the pesticide lindane. Deep groundwater is contaminated with EDB, DBCP and TCP. People who touch or ingest contaminated groundwater or soil could be at risk.

3/ Partial deletion, EPA delisted the Poamoho section of the Site from NPL list on January 13, 2004.

4/ The Navy's Installation Restoration Program (IRP) is addressing the sites at NCTAMS EASTPAC. The sites are primarily land disposal areas that are no longer in use and PCB transformer sites. Soil contamination depends on the site but generally the chemicals of concern are PCBs, volatile organics, semi-volatile organics and metals.

5/ Soil, groundwater and sediment are contaminated with metals, organic compounds and petroleum hydrocarbons. There is a potential human health and ecological risk with contact or accidental ingestion with the contaminated media.

6/ Groundwater contain trichloroethylene (TCE). People who drink or come into direct contact with contaminated groundwater could be at risk.

Source: U.S. Environmental Protection Agency, *National Priorities List Sites in Hawaii* <http://www.epa.gov/region9/cleanup/pacific.html> accessed May 24, 2011.

Table 5.27-- TOXIC CHEMICAL RELEASES IN 2008, HAZARDOUS WASTE SITES IN 2008, AND HAZARDOUS WASTE GENERATED, SHIPPED, AND RECEIVED IN 2007

Category	Unit
Toxic chemical releases in 2008 1/	3.2
On-site releases 2/	2.9
Point source air emissions	2.3
Off-site releases, transfers to disposal	0.2
Hazardous waste sites in 2008 3/	3
Federal	2
Non-federal	1
Hazardous waste generated, shipped, and received in 2007 4/ 5/	
Generated	1.1
Shipped	1.1
Received	0.2

1/ In millions of pounds.

2/ Includes other types of release not shown separately.

3/ As of December 31. Includes both proposed and final sites listed on the National Priorities List for the Superfund program as authorized by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986.

4/ In thousands of tons. Covers hazardous wastes regulated under the Resource Conservation and Recovery Act (RCRA) of 1976 as amended. Generation quantities exclude hazardous waste received from off site for storage/bulking and subsequently transferred off site for treatment or disposal is excluded from generation quantities.

5/ Revised from previous *Data Book*.

Source: U.S. Environmental Protection Agency, as cited in U.S. Census Bureau, *Statistical Abstract of the United States: 2011,* tables 379, 380 and 381.

Table 5.28-- WATER QUALITY AT PUBLIC BEACHES, BY ISLAND: 2009 AND 2010

Island	Number of locations	Number of samples	Enterococci density 1/			
			Lowest 2/	Highest 3/	Number over 4/	Mean 5/
2009						
State total	276	6,279	2.3	138.1	74	5.0
Hawaii	59	1,431	2.3	24.9	13	4.8
Hilo Shoreline	31	1,009	2.3	24.9	10	5.4
Kona Shoreline	28	422	2.3	27.1	3	3.8
Maui	65	1,096	2.3	43.3	9	4.0
Lanai	-	-	(X)	(X)	(X)	(X)
Molokai	-	-	(X)	(X)	(X)	(X)
Oahu	134	2,986	2.3	138.1	45	4.9
Kauai	18	766	2.3	91.8	7	7.1
2010						
State total	186	4,669	2.3	106.3	5	4.7
Hawaii	57	1,741	2.3	13.8	-	3.9
Hilo Shoreline	30	979	2.3	16.9	-	5.3
Kona Shoreline	27	762	2.3	13.8	-	3.9
Maui	62	1,170	2.3	103.6	1	3.8
Lanai	-	-	(X)	(X)	(X)	(X)
Molokai	-	-	(X)	(X)	(X)	(X)
Oahu	23	865	2.3	7.0	-	4.2
Kauai	44	893	2.3	106.3	4	6.9

X Not applicable.

1/ Geometric mean, number per 100 ml. The geometric mean standard for Enterococci density was 7 per 100 ml. in 2009 and 35 per 100 ml. in 2010.

2/ The lowest reported average value for 2009 was shared by 69 stations, one of which was Hapuna Beach on the island of Hawaii. The lowest reported average value for 2010 was shared by 41 stations, one of which was Sunset Beach on the island of Oahu.

3/ The highest average value in 2009 was reported for Kaluanui Beach, on the island of Oahu. The highest average value in 2010 was reported for End of Weke Road Beach on the island of Kauai.

4/ Refers to number of samples over the geometric mean standard for Enterococci density which was 7 per 100 ml. in 2009 and 35 per 100 ml. in 2010.

5/ Not weighted by number of samples.

Source: Hawaii State Department of Health, Clean Water Branch, records.

Table 5.29-- WATER QUALITY AT SELECTED PUBLIC BEACHES: 2009 AND 2010

Island and beach	Number of samples		Enterococci density 1/	
	2009	2010	2009	2010
Hawaii	1,431	1,741	(X)	(X)
Hilo Shoreline	1,009	979	(X)	(X)
Hilo Bay (Canoe Beach)	90	90	7.6	5.6
Honolii Cove (Ocean)	90	90	8.7	6.1
Kona Shoreline	422	762	(X)	(X)
Anaehoomalu Bay	59	88	2.9	3.1
Kahaluu Beach Park	67	18	3.6	4.6
Spencer Beach Park	5	18	4.1	4.6
Maui	1,096	1,170	(X)	(X)
Hukilau Hotel shoreline	84	90	5.6	4.5
Kamaole Beach #1	81	90	3.3	3.0
Kihei (south)	82	90	3.8	4.1
Spreckelsville Beach	84	90	3.5	3.5
Wailea Beach	78	88	3.2	2.8
Oahu	2,986	865	(X)	(X)
Ala Moana Park (center)	111	70	8.7	6.3
Hanauma Bay	114	45	3.7	2.9
Kailua Beach Park	114	23	5.4	4.7
Kuhio Beach	114	58	9.0	7.0
Makaha Beach	101	27	3.0	4.9
Sunset Beach	100	17	3.6	2.3
Waimea Beach	101	17	5.7	6.3
Kauai	766	893	(X)	(X)
Hanapepe Salt Pond	89	87	3.3	3.2
Kalapaki Beach (middle)	89	86	7.7	8.4
Kekaha (Oomano Point)	-	21	(NA)	4.6
Lydgate Park (wading pool)	89	86	7.0	5.0
Poipu Beach Pavilion	89	87	3.8	3.5

X Not applicable.

NA Not available.

1/ Geometric mean, number per 100 ml. The geometric mean standard for Enterococci density was 7 per 100 ml. in 2009 and 35 per 100 ml. in 2010.

Source: Hawaii State Department of Health, Clean Water Branch, records.

Table 5.30-- REFUSE AND SEWAGE STATISTICS FOR OAHU: 1997 TO 2010

[Fiscal year ending June 30]

Year	Tons of municipal solid waste delivered 1/			Sewage treated 2/ (millions of gallons)
	Total	City and County refuse vehicles	Other vehicles	
1997	945,081	302,078	643,003	42,616
1998	861,831	295,117	566,714	41,289
1999	830,035	284,007	546,028	40,750
2000	868,588	298,207	570,381	41,444
2001	955,019	326,696	628,323	40,369
2002	897,068	300,833	596,235	40,025
2003	890,275	344,786	545,489	40,524
2004	933,028	350,298	582,730	44,472
2005	952,703	368,288	584,415	40,975
2006	937,726	363,233	574,493	42,275
2007	909,587	433,962	475,625	38,345
2008	883,365	447,972	435,393	39,217
2009	824,633	377,562	447,071	38,018
2010	777,069	326,201	450,868	38,549

Year	Sewage pumped 2/ (millions of gallons)	Miles of sewers 2/	City and County pump stations	City and County treatment plants
1997	54,197	1,940	63	8
1998	50,605	1,940	64	8
1999	49,379	1,970	65	8
2000	49,623	2,230	65	8
2001	48,626	2,230	65	8
2002	49,851	2,399	65	8
2003	50,497	3/ 2,205	65	8
2004	50,969	2,212	65	8
2005	44,476	2,268	66	8
2006	44,168	2,268	66	8
2007	43,388	3/ 2,105	67	9
2008	49,538	2,105	67	9
2009	50,093	2,105	69	9
2010	47,051	2,105	72	9

1/ Excludes small landfill controlled by armed forces.

2/ Data limited to system maintained by the City and County of Honolulu, Department of Environmental Services.

3/ GIS editing for more accurate dimensions resulted in a reduction of lateral length.

Source: City and County of Honolulu, Department of Environmental Services, records.

Table 5.31-- AIR QUALITY IN DOWNTOWN HONOLULU: 1988 TO 2010

[Annual arithmetic means, in micrograms per cubic meter ($\mu g/m^3$), for particulate matter 10 microns or less in diameter (PM_{10}) and in parts per million (ppm) for carbon monoxide (CO). Sampling is conducted about 46 feet above ground on the roof of the State Health Department building (Kinau Hale), 1250 Punchbowl Street, Honolulu, Hawaii]

Year	PM_{10} ($\mu g/m^3$) 1/	CO (ppm) 2/	Year	PM_{10} ($\mu g/m^3$) 1/	CO (ppm) 2/
1988	-	1.7	2000	14	0.7
1989	-	1.8	2001	16	0.6
1990	-	1.5	2002	15	0.6
1991	-	1.7	2003	15	0.6
1992	-	1.6	2004	13	0.6
1993	13	1.8	2005 3/	14	0.6
1994	14	0.8	2006 4/	13	0.4
1995	14	0.8	2007	14	0.5
1996	14	0.8	2008	14	0.5
1997	8	0.8	2009	13	0.4
1998	9	0.8	2010	12	0.4
1999	14	0.6			

1/ The State Ambient Air Standard for PM_{10} annual average is 50 $\mu g/m^3$. The Federal standard was revoked by the U.S. Environmental Protection Agency effective December 17, 2006.

2/ There is no annual standard for CO. The State Ambient Air Standard for 1-hour CO is 9 ppm and the Federal standard is 35 ppm.

3/ Represents data until July 14, 2005, when the monitoring station was closed for roof repairs.

4/ Represents data from August 5, 2006, after completion of roof repairs.

Source: Hawaii State Department of Health, Environmental Management Division, Clean Air Branch, records.

Table 5.32-- AIR QUALITY AT SPECIFIED LOCATIONS: 2010

[24-hour average]

Sampling station	PM_{10} ($\mu g/m^3$) 1/			Sulfur dioxide (ppm) 2/		
	Annual range		Annual arithmetic average	Annual range		Annual arithmetic average
	Minimum	Maximum		Minimum	Maximum	
Oahu						
Downtown Honolulu	1	3/ 63	12	-	0.004	0.001
Pearl City	7	3/ 70	19	(X)	(X)	(X)
Kapolei	3	59	16	-	0.004	0.001
West Beach	1	92	14	-	0.003	0.001

X Not applicable.

1/ Particulate matter up to 10 microns in diameter. The State and Federal Ambient Air Standard for 24-hr PM10 is 150 $\mu g/m^3$.

2/ The State Ambient Air Standard for 24-hr SO_2 is 0.14 ppm. Federal standard for SO_2 is now a 1 hour average not to exceed 75 ppb (0.075 ppm).

3/ Probably due to New Year's fireworks.

Source: Hawaii State Department of Health, Environmental Management Division, Clean Air Branch, records.

Table 5.33-- RELEASE OF TOXICS: 1999 TO 2009

[In pounds]

Year	Release 1/					
	Total	Air	Water	On-site Land	Under-ground injection	Off-site
1999	1,681,101	1,584,809	2,721	38,163	5,070	50,338
2000	1,311,611	1,057,090	1,224	31,833	7,284	214,180
2001	3,108,521	2,379,969	29,770	224,400	2,071	472,311
2002	3,688,240	2,495,256	454,684	228,634	2,241	507,425
2003	3,163,057	2,131,959	364,067	249,267	2,670	415,094
2004	3,170,737	2,358,741	296,415	227,719	6,601	281,261
2005	3,102,730	2,311,635	522,217	89,734	2,736	176,408
2006	3,022,392	2,254,027	358,266	174,678	4,743	230,678
2007	2/ 3,015,602	2/ 2,266,925	446,948	143,011	2,670	156,048
2008	2/ 3,245,929	2/ 2,277,988	549,838	2/ 169,076	3,471	245,556
2009	2,947,461	2,228,566	222,963	147,530	4,477	343,925

1/ Release is defined as the amount of a toxic chemical released on-site (to air, water, underground injection, landfills, and other land disposal), and the amount transferred off-site for disposal.

2/ Revised from previous *Data Book.*

Source: U.S. Environmental Protection Agency, *Hawaii Report: Toxics Release Inventory* (annual) <http://www.epa.gov/region9/toxic/tri/report/09/TRI-2009HawaiiReport.pdf> accessed June 8, 2011.

Table 5.34 -- RELEASE OF PERSISTENT, BIOACCUMULATIVE AND TOXIC (PBT) CHEMICALS: 2000 TO 2009

[In pounds; for dioxin and dioxin-like compounds in grams]

Year	Total on- and off-site disposal or other releases 1/						
	Lead	Lead compounds	PAC's 2/	Mercury compounds	Mercury	Benzo (g,h,i) perylene	Dioxin 3/
2000	(NA)	(NA)	2,592	101	(NA)	0.92	5.893
2001	120,024	9,443	1,476	200	(NA)	0.89	6.110
2002	83,854	8,058	1,407	317	-	0.95	6.330
2003	106,067		1,533	203		1.18	5.129
2004	131,952		1,786	187		9.84	5.390
2005	46,192		1,683	211		213.00	5.100
2006	90,131		1,467	127		7.00	5.000
2007	84,110		1,271	203		6.00	5.080
2008	4/ 91,106		1,288	293		6.00	4/ 0.010
2009	107,927		2,276	192		16.00	0.009

NA Not available.

1/ Release is defined as the amount of a toxic chemical released on-site (to air, water, underground injection, landfills, and other land disposal), and the amount transferred off-site for disposal.

2/ Polycyclic aromatic compounds.

3/ Dioxin and dioxin-like compounds (in grams).

4/ Revised from previous *Data Book.*

Source: U.S. Environmental Protection Agency, *Region 9: Toxics Release Inventory* (annual) <http://www.epa.gov/region9/toxic/tri/report/09/TRI-2009HawaiiReport.pdf> accessed June 8, 2011.

Table 5.35-- ATMOSPHERIC CARBON DIOXIDE MEASUREMENTS AT MAUNA LOA: ANNUAL MEAN VALUES, 1958 TO 2010

[Average carbon dioxide mixing ratio, parts per million]

Year	Annual average	Year	Annual average	Year	Annual average
1958	1/ 315.17	1976	332.04	1994	358.51
1959	315.83	1977	333.79	1995	360.62
1960	316.75	1978	335.35	1996	362.40
1961	317.49	1979	336.73	1997	363.54
1962	318.30	1980	338.72	1998	366.61
1963	318.83	1981	340.12	1999	368.33
1964	2/ 319.04	1982	341.21	2000	369.62
1965	319.87	1983	342.87	2001	371.20
1966	321.21	1984	344.48	2002	372.99
1967	322.02	1985	345.85	2003	375.82
1968	322.83	1986	347.21	2004	377.54
1969	323.93	1987	348.98	2005	379.97
1970	325.27	1988	351.34	2006	381.89
1971	326.17	1989	352.89	2007	383.86
1972	327.26	1990	354.26	2008	385.61
1973	329.45	1991	355.45	2009	387.33
1974	1/ 329.72	1992	356.58	2010	389.82
1975	3/ 331.14	1993	357.01		

1/ Based on data for 8 months.
2/ Based on data for 9 months.
3/ Based on data for 11 months.

Source: National Weather Service, Pacific Region, Honolulu (for 1958-1991); Mauna Loa Observatory (for 1992-1999); U.S. Department of Commerce, National Oceanic & Atmospheric Administration (NOAA), Cooperative Global Air Sampling Network, Global Monitoring Division, Earth Systems Research Laboratory (ESRL), records.

Table 5.36-- TEMPERATURES AND PRECIPITATION FOR SELECTED PLACES

[Updated through December 2010]

Island and station	Ground elevation (feet)	Average temperature 1/ (°F)		Extreme temperature of record (°F)		Average annual precipitation (inches)
		Coolest month	Warmest month	Lowest	Highest	
Hawaii:						
Hilo Airport	38	66.4	81.2	53	94	2/ 127.51
Hawaii Volcanoes Nat. Park Hdq.	3,970	52.7	69.2	34	89	2/ 107.68
Naalehu	800	65.8	79.4	50	93	2/ 47.77
Kailua	700	57.4	76.3	46	88	118.88
Puako 3/	5	68.3	83.8	52	92	2/ 10.11
Waimea (Kamuela)	2,670	(NA)	(NA)	34	95	49.77
Honokaa	1,080	(NA)	(NA)	(NA)	(NA)	2/ 79.44
Mauna Kea summit 4/	13,796	31.3	42.5	11	66	7.36
Maui:						
Hana Airport 5/	75	67.4	80.8	50	94	80.76
Haleakala summit 6/	10,025	38.9	54.6	14	73	36.52
Kihei 7/	85	70.9	78.4	49	98	15.20
Kahului Airport	51	67.4	83.8	48	97	2/ 18.44
Lahaina 8/	45	65.9	84.8	52	97	13.77
Molokai:						
Kaunakakai	12	(NA)	(NA)	(NA)	(NA)	2/ 13.89
Molokai Airport	450	2/ 67.6	81.4	46	96	2/ 25.47
Lanai:						
Lanai City 9/	1,620	62.4	75.4	47	92	2/ 34.68

Continued on next page.

Table 5.36-- TEMPERATURES AND PRECIPITATION FOR SELECTED PLACES -- Con.

Island and station	Ground elevation (feet)	Average temperature 1/ (°F)		Extreme temperature of record (°F)		Average annual precipitation (inches)
		Coolest month	Warmest month	Lowest	Highest	
Oahu:						
Honolulu International Airport	7	2/ 70.4	84.0	52	96	2/ 20.37
Waikiki (Honolulu Zoo)	10	2/ 69.2	84.6	42	95	23.64
Manoa (Lyon Arboretum)	500	2/ 66.6	2/ 79.0	49	96	2/ 151.41
Kaneohe (State Hospital)	60	71.5	83.0	58	96	54.70
Kahuku 10/	15	68.9	80.8	51	99	40.86
Wheeler AFB 11/	820	68.2	75.5	52	89	38.46
Kauai:						
Kilauea (town)	320	67.1	2/ 79.5	50	90	2/ 67.92
Lihue Airport	103	69.8	81.1	50	90	2/ 40.81
Poipu (Makahuena Pt.) 6/	50	69.3	82.6	50	95	34.35
Kekaha 12/	9	64.5	84.8	44	95	20.66
Kokee (Kanalohuluhulu)	3,600	2/ 51.1	67.3	29	90	2/ 66.26
Northwestern Hawaiian Islands:						
Midway 13/	10	65.0	78.6	52	89	44.00

Continued on next page.

Table 5.36-- TEMPERATURES AND PRECIPITATION FOR SELECTED PLACES -- Con.

NA Not available.
1/ For some stations, data represent 30-year normals.
2/ Revised from previous *Data Book.*
3/ Data available through 1976. Temperature data are for Mahukona.
4/ Based on incomplete and non-continuous data for 1966-1972.
5/ Data available through 2005.
6/ Data available through 1976.
7/ Temperature data available through 1953, refer to Puunene Airport.
8/ Data available through 2001.
9/ Data available through 2008, then restarted since June 2010.
10/ Data available through 1975.
11/ Data available through 1949.
12/ Data available through 2000.
13/ Data available through 1991, not confirmed.
Source: Hawaii State Department of Land and Natural Resources, Commission on Water Resource Management, records; University of Hawaii at Manoa, School of Ocean and Earth Science and Technology, Department of Meterology, records.

Table 5.37-- ENVIRONMENTAL INDICATORS: 2004 TO 2006

Indicator	Unit	2004	2005	2006	Score 1/
Electric utility sales	Mil. kwh	10,477	10,550	(NA)	(NA)
Electric utility sales per capita	kwh	7,614	7,563	7,508	(NA)
Estimated greenhouse gas emissions	Mil. Tons 2/	21.88	21.11	20.56	53
Municipal water consumption 3/	Mil. gal	78,345	77,171	80,106	39
Wastewater reuse 4/	Percent	15.7	15.7	16.4	66
Municipal solid waste diverted 5/	Percent	32.5	36	(NA)	48
Hazardous waste generated 4/	Tons	(NA)	1,458	1,519	59
Beaches posted as unsafe due to pollution	Days	33	121	529	(NA)
Oil and chemical spills 4/	Number	357	379	352	72
Safe drinking water 6/	% population served	99.5	99.1	99.6	98
State environmental expenditures 3/	$ millions	56	85	201	(NA)
Noise complaints	Number	432	453	517	54
Bikeways	Miles	214	214	(NA)	17
Bus boardings (Oahu)	Millions	61.3	67.4	71.2	57

NA Not available.

1/ In percent. Latest data equal to or better than desired level = 100. Latest data equal to undesirable level = 0.

2/ Carbon dioxide equivalent.

3/ Fiscal year ending June 30.

4/ Fiscal year ending September 30.

5/ Fiscal year ending September 30. Municipal solid waste recycled or composted. Does not include waste sent to H-Power for incineration and power generation.

6/ Fiscal year ending September 30. Below 1994 maximum microbiological and chemical contaminant levels.

Source: State of Hawai'i, Environmental Council, *Environmental Report Card* (annual); <http://oeqc.doh.hawaii.gov> accessed June 30, 2009.

Table 5.38-- CLIMATIC NORMALS, MEANS, AND EXTREMES FOR HILO, KAHULUI, HONOLULU, AND LIHUE AIRPORTS: 2010

[Normals are 30-year averages (1971 - 2000)]

Subject	Hilo	Kahului	Honolulu	Lihue
Temperatures (°F)				
Normal daily maximum, annual	81.0	84.3	84.7	81.1
Highest daily maximum	94	97	95	90
Month and year of occurrence	May 1966	Aug 1994	Sep 1994	Sep 1995
Normal daily minimum, annual	66.7	67.3	70.2	70.3
Lowest daily minimum	53	22	53	50
Month and year of occurrence	Feb 1962	Jan 2004	Jan 1998	Jan 1969
Normal dry bulb (temperature of ambient air)				
Coolest	71.4	71.8	73.0	71.7
Month	Jan	Jan	Jan, Feb	Jan, Feb
Warmest	76.3	79.5	81.8	79.7
Month	Aug	Aug	Aug	Aug
Annual	73.9	75.8	77.5	75.7
Normal no. days with maximum 90°F and above	1.2	25.9	35.5	0.3
Normal relative humidity (percent), annual				
8 a.m.	80	74	72	77
2 p.m.	68	58	56	66
Percent of possible sunshine, annual	41	67	71	59
Mean no.days (annual) with				
Clear	35.5	130.5	90.0	55.3
Partly cloudy	131.3	145.2	179.8	183.2
Cloudy	195.3	89.5	92.0	123.2
Wind speed (m.p.h.), annual				
Mean	6.8	13.1	10.4	13.5
Maximum 2-minute	37	48	40	48
Month and year of occurrence	Feb 2006	Jan 2004	Jan 2004	Dec 2007
Precipitation (inches)				
Normal, annual	126.27	18.80	18.29	39.57
Maximum monthly	50.82	14.46	20.79	36.13
Month and year of occurrence	Dec 1954	Jan 1980	Mar 1951	Mar 2006
Minimum monthly	0.13	-	(1/)	(1/)
Month and year of occurrence	Jan 1998	Jun 1957	Aug 1974	Feb 1983
Maximum in 24 hours	27.36	7.01	17.07	11.54
Month and year of occurrence	Nov 2000	Jan 1980	Mar 1958	Dec 1968

1/ Trace precipitation.

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center, *Local Climatological Data, Annual Summary with Comparative Data, 2010,* "Normals, Means, and Extremes", for Hilo, Kahului, Honolulu, and Lihue (annual).

Table 5.39-- MONTHLY AND ANNUAL CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT: 2010

[Normals are 30-year averages (1971 - 2000)]

Month	Normal temperature (°F)			Extreme temperature (°F)		Precipitation (inches)			
	Daily maximum	Daily minimum	Normal dry bulb 1/	Highest daily maximum	Lowest daily minimum	Normal	Maximum monthly	Minimum monthly	Maximum in 24 hours
January	80.4	65.7	73.0	88	53	2.73	14.74	0.18	6.72
February	80.7	65.4	73.0	88	53	2.35	13.68	0.06	6.88
March	81.7	66.9	74.3	88	55	1.89	20.79	0.01	17.07
April	83.1	68.2	75.6	91	57	1.11	8.92	0.01	4.21
May	84.9	69.6	77.2	93	60	0.78	7.23	0.03	3.44
June	86.9	72.1	79.5	92	65	0.43	2.46	(2/)	2.28
July	87.8	73.8	80.8	94	66	0.50	2.33	0.03	2.20
August	88.9	74.7	81.8	93	65	0.46	3.74	(2/)	3.03
September	88.9	74.2	81.5	95	66	0.74	2.74	0.05	1.40
October	87.2	73.2	80.2	94	61	2.18	11.15	0.07	7.57
November	84.3	71.1	77.7	93	57	2.27	18.79	0.03	9.15
December	81.7	67.8	74.8	89	54	2.85	17.29	0.04	8.25
Annual	84.7	70.2	77.5	95	53	18.29	20.79	(2/)	17.07

Continued on next page.

Table 5.39-- MONTHLY AND ANNUAL CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT: 2010 -- Con.

Month	Relative humidity (percent)		Wind (miles/hour)		Percent of possible sunshine	Number of days		
						Mean		Normal
	8 A.M.	2 P.M.	Mean speed	Maximum 2-minute speed		Clear	Cloudy	Precipitation .01 inch or more
January	81	61	3/ 8.7	40	65	9.5	8.5	8.8
February	79	59	3/ 9.2	37	68	8.1	7.6	7.9
March	73	57	3/ 10.4	3/ 33	72	7.4	9.3	9.0
April	70	55	11.2	35	70	5.9	9.6	8.6
May	67	54	3/ 10.7	29	72	6.7	8.7	7.3
June	66	52	12.0	30	74	6.5	6.2	5.8
July	68	52	12.1	30	76	7.4	5.1	7.2
August	68	52	3/ 11.8	31	77	8.0	5.7	5.4
September	70	53	10.3	30	77	7.9	5.7	6.9
October	71	56	3/ 9.8	31	71	7.5	8.1	7.3
November	75	59	9.7	35	64	7.2	8.8	9.1
December	79	60	3/ 9.3	39	63	7.9	8.7	9.7
Annual	72	56	10.4	40	71	90.0	92.0	93.0

1/ Temperature of the ambient air.

2/ Trace precipitation.

3/ Revised from previous *Data Book*.

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center, *Local Climatological Data, Annual Summary With Comparative Data, 2010,* "Normals, Means, and Extremes, Honolulu, HI" (annual).

Table 5.40-- AVERAGE TEMPERATURE, PERCENT OF POSSIBLE SUNSHINE, AND PRECIPITATION, FOR HONOLULU INTERNATIONAL AIRPORT: 1960 TO 2010

Year	Average temperature (°F)	Percent of possible sunshine	Precipitation (inches)	Year	Average temperature (°F)	Percent of possible sunshine	Precipitation (inches)
1960	76.7	70	12.07	1990 1/	77.6	69	19.84
1961	77.2	81	14.26	1991 1/	77.7	69	17.94
1962	76.5	71	13.58	1992 1/	77.8	69	19.00
1963	76.7	64	37.91	1993 1/	77.1	69	5.84
1964	77.0	63	20.12	1994 1/	78.8	70	15.59
1965 2/	76.1	74	42.78	1995 1/	79.3	70	13.60
1966 2/	77.6	68	23.18	1996 1/	78.6	70	33.12
1967 2/	77.6	58	34.34	1997 1/	77.8	71	19.99
1968 2/	77.9	63	37.26	1998 1/	77.1	71	4.52
1969 2/	77.4	68	22.50	1999 1/	76.9	71	11.99
1970 2/	78.2	72	15.49	2000 1/	77.6	71	7.10
1971 2/	76.1	70	26.64	2001 1/	78.2	71	9.14
1972	76.2	65	26.94	2002 1/	77.9	71	12.18
1973	77.2	63	14.24	2003 1/	78.5	71	12.69
1974	77.5	61	24.02	2004 1/	78.7	71	39.01
1975	76.2	62	24.39	2005 1/	78.4	71	15.60
1976	76.8	60	12.90	2006 1/	77.1	71	29.45
1977	78.2	68	12.36	2007 1/	78.0	71	11.99
1978	76.8	69	25.05	2008 1/	78.3	71	14.76
1979	77.0	68	16.93	2009 1/	(NA)	71	11.55
1980 1/	77.4	68	26.90	2010 1/	77.5	71	17.40
1981 1/	77.1	68	13.41				
1982 1/	76.9	67	34.92				
1983 1/	77.2	67	5.03				
1984 1/	78.1	67	17.08				
1985 1/	76.9	67	17.38				
1986 1/	78.3	68	13.93				
1987 1/	77.9	68	23.53				
1988 1/	78.5	68	16.47				
1989 1/	77.5	68	27.52				

NA Not available.

1/ From 1980 on, data taken from "Normals, Means, and Extremes, Honolulu, HI" table, and represents a historic average rather than annual data.

2/ Site conditions produced distorted temperature measurements from 1965 to 1971.

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center, *Local Climatological Data, Annual Summary With Comparative Data, 2010,* "Average Temperature (°F), Honolulu, HI", "Normals, Means, and Extremes, Honolulu, HI", "Precipitation (inches), Honolulu, HI" (annual).

Table 5.41-- AVERAGE DAILY TEMPERATURE AND DAYS WITH MAXIMUM OF 90° OR HIGHER, FOR HONOLULU INTERNATIONAL AIRPORT: 1971 TO 2010

Year	Average daily maximum (°F)	Days 90° or higher	Year	Average daily maximum (°F)	Days 90° or higher
1971	82.7	-	1991	84.9	35
1972	83.2	3	1992	85.2	28
1973	84.4	10	1993	84.5	23
1974	85.0	25	1994	85.5	85
1975	83.6	1	1995	86.8	116
1976	84.1	9	1996	85.8	69
1977	85.2	16	1997	85.1	50
1978	84.2	13	1998	83.7	-
1979	84.7	51	1999	83.2	-
1980	84.6	22	2000	84.0	4
1981	84.6	9	2001	84.5	19
1982	83.5	27	2002	84.1	9
1983	85.1	44	2003	84.8	35
1984	85.5	63	2004	84.9	53
1985	84.6	53	2005	84.7	55
1986	86.2	64	2006	83.1	1
1987	85.7	93	2007	84.2	11
1988	86.1	70	2008	84.5	12
1989	85.2	34	2009	(NA)	31
1990	84.0	47	2010	84.0	1

NA Not available

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center, *Local Climatological Data, Annual Summary With Comparative Data, 2010,* "Meteorological Data, Honolulu, HI " (annual).

Table 5.42-- CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT: 1997 TO 2010

Year	Average temperature (°F) 1/			Extreme temp. (°F)		Precipitation (inches)
	Annual	Coolest month	Warmest month	Lowest	Highest	
1997	77.8	72.3	82.7	57	94	19.99
1998	77.1	72.5	81.1	53	89	4.52
1999	76.9	73.3	80.8	60	89	11.99
2000	77.6	72.5	81.4	59	90	7.10
2001	78.2	74.1	82.2	59	92	9.14
2002	77.9	73.1	82.2	60	90	12.18
2003	78.5	72.5	83.2	57	92	12.69
2004	78.7	73.6	82.8	60	92	39.01
2005	78.4	72.7	83.6	58	93	15.60
2006	77.1	72.1	81.2	60	90	29.45
2007	78.0	73.4	82.1	57	91	11.99
2008	78.3	73.6	82.2	62	90	14.76
2009	(NA)	72.5	82.5	58	92	11.55
2010	77.5	73.1	80.7	61	90	17.40

Year	Relative humidity (percent)		Wind speed (miles/hour)		Percent of possible sunshine	Days with precipitation .01 inch or more
	8 a.m.	2 p.m.	Annual average	Peak gust		
1997	80	57	10.0	41	88	105
1998	72	56	11.0	(NA)	(NA)	74
1999	73	57	11.0	(NA)	(NA)	94
2000	75	60	10.9	(NA)	(NA)	67
2001	73	58	11.3	(NA)	(NA)	84
2002	72	58	10.2	(NA)	(NA)	64
2003	71	56	10.5	(NA)	(NA)	87
2004	75	61	9.7	(NA)	(NA)	122
2005	71	55	10.6	(NA)	(NA)	90
2006	66	58	9.9	(NA)	(NA)	97
2007	63	54	11.1	(NA)	(NA)	83
2008	62	53	10.0	(NA)	(NA)	92
2009	62	54	10.2	(NA)	(NA)	74
2010	63	53	10.1	(NA)	(NA)	88

NA Not available.

1/ Average dry bulb (temperature of the ambient air).

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center, *Local Climatological Data, Annual Summary With Comparative Data, 2010,* "Meteorological Data, Honolulu, HI" (annual).

Table 5.43-- CLIMATIC DATA FOR THE PERIOD OF RECORD

Subject	Date	Place	Magnitude
Long-term averages:			
Lowest monthly average minimum temp. (°F)	February	Mauna Kea summit	23.5
Lowest monthly average daily temp. (°F)	February	Mauna Kea summit	31.3
Highest monthly average maximum temp. (°F)	September	Kawaihae 1/	91.9
Highest monthly average daily temp. (°F)	September	Kawaihae 1/	80.8
Lowest average annual rainfall (inches)	…	Kawaihae	8.7
Highest average annual rainfall (inches)	…	Waialeale	444
Single events:			
Lowest temperature of record (°F)	Jan. 20, 1970	Mauna Kea summit 2/	1.4
Highest temperature of record (°F)	April 27, 1931	Pahala	100
Lowest annual rainfall of record (inches)	1953	Kawaihae	0.2
Highest annual rainfall of record (inches)	1982	Waialeale	666
Highest wind speed of record (m.p.h.)	Sept. 11, 1992	Makahuena Pt. 3/	143

1/ Puukohola Heiau National Historical Site, Kawaihae, Hawaii.

2/ Recorded by Dr. Alfred Woodcock 60 meters inside the Mauna Kea summit cone, at 6:50 a.m. The rim at that time had a temperature of 39°F.

3/ Makahuena Point Coast Guard Station, Poipu, Kauai.

Source: Hawaii State Department of Land and Natural Resources, Commission on Water Resource Management, data provided February 14, 1995.

Table 5.44--RAINFALL AT SPECIFIED LOCATIONS: ANNUALLY, 1998 TO 2010

[In inches]

Year	Hawaii				Maui		
	Hilo Airport	Lalamilo	Kona Village	Naalehu	Kahului Airport	Kihei	Lahaina
1998	76.12	8.86	1.37	17.62	6.36	4.47	1.86
1999	117.10	8.10	3.93	36.55	7.04	7.13	6.11
2000	119.45	6.85	6.31	36.03	9.66	3.26	6.01
2001	111.55	6.91	8.05	38.09	9.31	4.84	1.65
2002	132.36	18.01	9.70	59.15	15.01	13.33	(NA)
2003	91.38	12.40	5.66	28.71	13.83	12.03	(NA)
2004	137.49	23.40	19.97	46.95	26.17	26.38	(NA)
2005	123.32	15.58	14.90	31.48	42.13	10.88	(NA)
2006	122.02	10.61	9.68	76.33	18.65	16.49	(NA)
2007	106.75	16.39	4.76	42.46	13.06	14.61	(NA)
2008	127.04	7.43	7.74	7.24	9.56	5.84	(NA)
2009	132.35	9.65	6.99	12.22	14.07	7.33	(NA)
2010	63.29	7.31	5.55	17.27	9.44	4.68	(NA)

Year	Oahu				Kauai		
	Waikiki	University of Hawaii	Nuuanu Res. 4	Kane-ohe	Koloa	Lihue Airport	Princeville
1998	10.97	24.50	74.62	28.52	33.72	26.47	56.52
1999	19.09	26.55	88.06	30.76	40.25	33.18	72.98
2000	6.86	18.87	88.20	31.10	30.55	17.96	52.92
2001	15.73	22.69	82.73	32.22	27.00	27.75	72.05
2002	17.26	23.66	106.70	44.16	41.81	31.92	66.81
2003	27.23	24.96	111.33	50.75	36.36	35.78	74.82
2004	43.81	61.89	146.17	81.26	64.89	49.91	93.17
2005	19.26	36.45	83.73	58.24	40.51	27.41	79.95
2006	31.84	38.90	89.54	81.28	69.28	67.02	91.58
2007	18.69	36.22	97.26	45.19	43.52	24.37	72.09
2008	15.60	33.79	103.82	47.47	25.69	40.07	59.20
2009	11.56	24.22	66.41	52.53	37.21	26.63	55.30
2010	15.60	32.76	80.69	40.91	45.07	25.94	52.02

NA Not available.

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center, *Climatological Data, Annual Summary, Hawaii and Pacific* (annual); Hawaii State Department of Land and Natural Resources, Commission on Water Resource Management, records; University of Hawaii at Manoa, School of Ocean and Earth Science and Technology, Department of Meteorology, records.

Table 5.45-- MAJOR HURRICANES: 1950 TO 2010

Hurricane name	Date 1/	Islands most affected	Maximum recorded winds ashore (m.p.h.)		Deaths	Property damage (mil. dol.)
			Sustained	Peak gusts		
Hiki	Aug. 15-17, 1950	Kauai	68	(NA)	1	0.2
Della	Sept. 4, 1957	French Frigate Shoals	82	109	-	Minor
Nina	Dec. 1-2, 1957	Kauai	(NA)	92	1	0.1
Dot	Aug. 6, 1959	Kauai	81	103	-	5.5+
Fico	July 18-20, 1978	Hawaii	(NA)	58+	-	0.2
Iwa	Nov. 23, 1982	Kauai, Oahu	65	117	1	234.0
Estelle	July 22, 1986	Maui, Hawaii	(NA)	55	-	2.0
Iniki	Sept. 11, 1992	Kauai, Oahu	92	143	8	1,900

NA Not available.

1/ Period affecting the Hawaiian Islands.

Source: Samuel L. Shaw, *A History of Tropical Cyclones in the Central North Pacific and the Hawaiian Islands, 1832-1979* (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, September 1981); Hawaii State Department of Defense, Civil Defense Division, *Catalogue of Natural and Man-Caused Incidents and Disasters in the Hawaiian Islands* (December 1978); The Governor's Ad Hoc Committee on the Economic Impact of Hurricane Iwa, *Hurricane Iwa's Economic Impact on Hawaii* (January 1983); "The History of Hurricanes in Hawaii", *Honolulu Star-Bulletin,* July 18, 1983, p. A-5; "20-Foot Waves Hit Big Isle As Storm Brushes Coastline", *The Honolulu Advertiser,* July 23, 1986, pp. A1, A2; "Hawaii Hurricanes", *Honolulu Star-Bulletin,* August 4, 1988, p. A-8; Hawaii State Department of Land and Natural Resources, Commission on Water Resource Management, records; University of Hawaii at Manoa, School of Ocean and Earth Science and Technology, Department of Meteorology, records.

Table 5.46-- TRADE WINDS, HIGH SURF, AND TEMPERATURES IN HAWAIIAN WATERS, BY MONTH

Month	Trade wind frequency 1/ (percent)	Expected days of strong trade winds 2/	Highest surf 3/ (average number of days)		Water temperature 4/ (°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
Annual	73	92	71	110	78.6	74.8

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

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

3/ 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.

4/ 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), pp. 14, 22, 56, and 74; Hawaii State Department of Land and Natural Resources, Commission on Water Resource Management, data provided February 14, 1995.

Table 5.47-- SUNRISE, SUNSET, AND HOURS OF DAYLIGHT AT SELECTED LOCATIONS, AT BEGINNING OF EACH SEASON: 2011

[Based on Hawaii-Aleutian Standard Time which is 10 hours less than Universal Time Coordinated (UTC), the international standard for civil time]

Subject	Hilo	Kahului	Honolulu	Lihue
Sunrise (a.m.)				
March 20	6:25	6:30	6:35	6:42
June 21	5:43	5:46	5:50	5:55
Sept. 22	6:09	6:15	6:20	6:26
Dec. 21	6:50	6:58	7:04	7:12
Sunset (p.m.)				
March 20	6:31	6:37	6:42	6:49
June 21	7:02	7:10	7:16	7:24
Sept. 22	6:17	6:22	6:28	6:34
Dec. 21	5:47	5:50	5:55	5:59
Daylight (hours, minutes)				
March 20	12, 06	12, 07	12, 07	12, 07
June 21	13, 19	13, 24	13, 26	13, 29
Sept. 22	12, 08	12, 07	12, 08	12, 08
Dec. 21	10, 57	10, 52	10, 51	10, 47

Source: U.S. Naval Observatory, Astronomical Applications Department
<http://aa.usno.navy.mil/data/docs/EarthSeasons.php> and
<http://aa.usno.navy.mil/data/docs/RS_OneYear.php> accessed April 6, 2011;
calculations by the Hawaii State Department of Business, Economic Development & Tourism.

Table 5.48-- SUNRISE, SUNSET, AND HOURS OF DAYLIGHT AT SELECTED LOCATIONS, AT BEGINNING OF EACH SEASON: 2012

[Based on Hawaii-Aleutian Standard Time which is 10 hours less than Universal Time Coordinated (UTC), the international standard for civil time]

Subject	Hilo	Kahului	Honolulu	Lihue
Sunrise (a.m.)				
March 19	6:25	6:30	6:36	6:42
June 20	5:42	5:46	5:50	5:55
Sept. 22	6:09	6:15	6:20	6:26
Dec. 21	6:51	6:58	7:05	7:12
Sunset (p.m.)				
March 19	6:31	6:37	6:42	6:48
June 20	7:02	7:10	7:16	7:24
Sept. 22	6:16	6:21	6:27	6:33
Dec. 21	5:47	5:50	5:55	6:00
Daylight (hours, minutes)				
March 19	12, 06	12, 07	12, 06	12, 06
June 20	13, 20	13, 24	13, 26	13, 29
Sept. 22	12, 07	12, 06	12, 07	12, 07
Dec. 21	10, 56	10, 52	10, 50	10, 48

Source: U.S. Naval Observatory, Astronomical Applications Department
<http://aa.usno.navy.mil/data/docs/EarthSeasons.php> and
<http://aa.usno.navy.mil/data/docs/RS_OneYear.php> accessed April 6, 2011;
calculations by the Hawaii State Department of Business, Economic Development & Tourism.

Table 5.49-- HAWAII AUDUBON SOCIETY BIRD COUNTS OF MAJOR SPECIES IN THE HONOLULU AREA: 2005 TO 2009

[Counts are made in late December at various locations between Hawaii Kai and Aiea, and between Waimanalo and Kaneohe. Annual changes reflect differences in numbers of bird counters and counting time in the field, as well as changes in bird populations. Totals by species are also affected by the types of habitats studied]

Species	2005	2006	2007	2008	2009
Endemic species: 1/					
'Apapane	6	2	12	7	4
Hawaiian Moorhen 2/	22	9	19	17	22
Hawaiian Stilt 2/	134	168	174	181	189
Oahu 'Amakihi	40	28	7	-	3
Oahu 'Elepaio	6	4	10	-	8
Indigenous species: 3/					
Black-crowned Night Heron	39	51	40	-	49
Brown Booby	-	14	5	-	1
Great Frigatebird	115	39	14	-	2
Laysan Albatross	-	1	-	-	3
Red-footed Booby	829	4/ 267	432	347	333
White Tern	(5/)	6/ 28	11	5	5
Alien species: 7/					
Cattle Egret	102	106	98	165	167
Common Myna	703	861	767	725	772
Common Waxbill	428	672	297	215	705
House Finch	108	191	138	129	114
House Sparrow	140	173	109	99	122
Japanese White-eye	196	266	151	71	207
Java Sparrow	556	553	221	69	291
Northern Cardinal	26	28	22	19	36
Nutmeg Mannikin	9	70	8	7	94
Red-billed Leiothrix	97	68	128	17	45
Red-crested Cardinal	111	141	183	118	140
Red-vented Bulbul	338	401	330	35	491
Red-whiskered Bulbul	123	83	14	32	45
Rock Dove/Pigeon	198	206	66	125	711
Spotted Dove	313	536	237	302	347
White-rumped Shama	27	34	17	10	15
Yellow-fronted Canary	18	7	39	-	2
Zebra Dove	1,054	1,195	488	340	569
Visitor species: 8/					
Mallard	50	46	110	55	106
Pacific Golden-Plover	859	682	492	553	594
Ruddy Turnstone	199	214	205	180	411
Sanderling	4	7	4	12	5
Wandering Tattler	16	28	20	20	34

Continued on next page.

Table 5.49-- HAWAII AUDUBON SOCIETY BIRD COUNTS OF MAJOR SPECIES IN THE HONOLULU AREA: 2005 TO 2009 -- Con.

1/ Birds peculiar to Hawaii, and found nowhere else.
2/ Endangered species.
3/ Native to Hawaii, but also found elsewhere.
4/ Low count.
5/ Reported in the area during count week, but not reported during the count.
6/ High count.
7/ Formerly termed "introduced". Includes accidental escapes from captivity.
8/ Formerly termed "migratory". Includes stragglers and seasonal migrants.

Source: Hawaii Audubon Society, *'Elepaio,* Volume 66, Number 6, "Results of the 2005 - 2006 Christmas Bird Count", August/September 2006; Volume 67, Number 5, "Results of Audubon's 107th Annual Christmas Bird Count", June/July 2007; Volume 68, Number 5, "Results of Audubon's 108th Annual Christmas Bird Count", June/July 2008; Volume 69, Number 5, "Results of Audubon's 109th Annual Christmas Bird Count", June/July 2009; Volume 70, Number 5, "Results of Audubon's 110th Annual Christmas Bird Count", June/July 2010; <http://www.hawaiiaudubon.com/newsletter.html> accessed April 6, 2011.

Table 5.50-- HAWAII AUDUBON SOCIETY BIRD COUNTS IN THE HONOLULU AREA, BY TYPE OF SPECIES: 2003 TO 2010

[Counts are made in late December of various locations between Hawaii Kai and Aiea, and between Waimanalo and Kaneohe. Annual changes reflect differences in numbers of bird counters and counting time in the field, as well as changes in bird populations. Totals by species are also affected by the types of habitats studied]

Year	Type of species				
	All species	Endemic	Indigenous	Alien	Visitor
2003	52	5	10	28	9
2004	56	4	9	31	12
2005	52	5	8	28	11
2006	55	5	13	27	10
2007	47	5	7	26	9
2008	40	3	5	22	10
2009	51	5	11	28	7
2010	46	4	8	27	7
Year	Number of Individuals				
	All species	Endemic	Indigenous	Alien	Visitor
2003	8,105	183	778	6,069	1,075
2004	11,306	160	1,294	8,243	1,609
2005	7,007	106	1,143	4,673	1,085
2006	7,386	152	620	5,671	943
2007	5,021	149	695	3,445	732
2008	4,110	193	553	2,587	777
2009	6,963	149	656	5,102	1,056
2010	5,475	304	808	3,574	789

Source: Audubon, "Historical Results: Data for a Species"<http://audubon2.org/cbchist/table.html> accessed on April 6, 2011; Robert L. Pyle, *"Checklist of the Birds of Hawaii,"* <http://www.hawaiiaudubon.com/checklist/checklist2002.pdf> accessed on June 22, 2010; and calculations by the Department of Business, Economic Development & Tourism.

Table 5.51-- BIRD SPECIES OF HAWAII: 2002

Type of species	Number
All species	1/ 333
Resident native; normally does not leave the islands	78
Alien, introduced; resident, does not leave the islands	58
Breeding in Hawaii; most individuals leave Hawaii when not breeding	13
Visitor; breeds elsewhere, occurs in Hawaii when not breeding	184
Endangered (or threatened); on the Federal List of Endangered Species	32

1/ Includes double counts for mallard and eurasian skylark, that were classified as alien and visitor.

Source: Hawaii Audubon Society, 'Elepaio, Volume 65, Number 5, "Checklist of the Birds of Hawaii - 2002", updated to March 31, 2005 <http://www.hawaiiaudubon.com/newsletter.html> accessed October 24, 2005.

Table 5.52-- TREES ALONG STREETS OR IN PARKS UNDER THE JURISDICTION OF THE CITY AND COUNTY OF HONOLULU: 2005 to 2010

[As of June 30]

Location	2005	2006	2007	2008	2009	2010
Along City and County streets and highways 1/	141,999	141,480	140,765	139,650	138,800	139,200
In City and County parks	94,666	94,230	93,184	93,000	92,550	92,900

1/ Excludes Federal, State, and private thoroughfares.

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

Table 5.53-- ESTIMATED NUMBER OF SPECIES IN HAWAII: 2002 TO 2008

[Excludes viruses and bacteria]

Category	Species			
	2002	2005	2006	2008
Total in Hawaii and surrounding waters	25,615	27,573	26,608	26,608
Endemic to Hawaii	9,975	8,763	8,762	8,762
Nonindigenous protists, fungi, plants, and animals	5,175	5,281	5,311	5,311

Source: L. G. Eldredge and N. L. Evenhuis, "Numbers of Hawaiian Species For 2000", *Bishop Museum Occasional Papers* 68 (2002) 71-78; L. G. Eldredge and N. L. Evenhuis, "Hawaii's Biodiversity: A Detailed Assessment of the Numbers of Species in the Hawaiian Islands". *Bishop Museum Occasional Papers* 76 (2003): 1-28; L. G. Eldredge, *Bishop Museum Occasional Papers* 88 (2006): 62-78 and Bishop Museum, records.

Table 5.54-- THREATENED AND ENDANGERED SPECIES, FOR THE UNITED STATES AND HAWAII

[As of April 7, 2011]

Group	United States	Hawaii
Animal species	579	63
Amphibians	24	-
Arachnids	12	1
Birds	93	34
Clams	71	1
Corals	2	-
Crustaceans	22	1
Fishes	138	-
Insects	60	16
Mammals	84	3
Reptiles	37	5
Snails	36	2
Plant species	792	319
Conifers and cycads	3	-
Ferns and allies	29	15
Flowering plants	758	304
Lichens	2	-

Source: U.S. Fish & Wildlife Service, Threatened and Endangered Species System (TESS) <http://ecos.fws.gov/tess_public> accessed April 7, 2011.