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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: 2006*, 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 noon	+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	United States	Same	2:00 p.m.	+5
Santiago 1/	Chile	Same	4:00 p.m.	+7
Buenos Aires	Argentina	Same	4:00 p.m.	+7
Sao Paulo 1/	Brazil	Same	5:00 p.m.	+8
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	Singaporre	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 1/	Australia	Next	6:00 a.m.	+21
Auckland 1/	New Zealand	Next	8:00 a.m.	+23

1/ Daylight Saving Time.

Source: Paradise Media Group, L.L.C., *Oahu Telephone Directory 2004 - 2005,* p. 74; The Official Hawaiian Telcom White Pages O'ahu,October 2005 - September 2006, pp. 20-21; <http://www.timezoneconverter.com/cgi-bin/tzc.tzc> accessed October 31, 2005.

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 2/	
	Statute miles	Kilometers 3/	Statute miles	Kilometers 3/
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/ 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/ 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	1/ 2,157,985

1/ Revised from previous *Data Book* .

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: 2000

[See maps]

Measurement unit and type of area	State total	Hawaii	Maui	Kalawao	Honolulu	Kauai
Square miles	6,422.6	4,028.0	1,159.2	13.2	599.8	622.4
Square kilometers	16,634.5	10,432.5	3,002.3	34.2	1,553.4	1,612.1

Source: U.S. Census Bureau, Census 2000 Redistricting Data (P.L. 94-171) Summary File, and unpublished records.

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

Continued on next page.

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	...	620	400
	Akaka	442	...	...
	Waiilikahi	320	...	6
Maui	Honokohau	...	1,120	500
	Waihiumalu	...	400	150
Molokai	Kahiwa	...	1,750	1,000
	Papalaua	...	1,200	500
	Wailele	...	500	150
Oahu	Kaliuwaa (Sacred)	1/ 80	1,520	3,000
Kauai	Waipoo (2 falls)	...	800	600
	Awini	...	480	500
	Hinalele	280	...	...
	Wailua	200	...	...

1/ Refers to 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	(SL)	27	7
Maui:				
Kanaha Pond	Marsh	(SL)	41	3
Kealia Pond	Marsh	(SL)	500	(NA)
Waieleele	Pond	6,690	0.5	21
Molokai:				
Kauhako	Pool	(SL)	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	(SL)	198	(NA)
Kawainui Marsh	Marsh	(SL)	1,000	(NA)
Wahiawa Reservoir	Reservoir	842	302	85
Kauai:				
Nomilu Fishpond	Pond	(SL)	20	66
Waita Reservoir	Reservoir	241	424	23
Niihau:				
Halalii Lake	Playa	(SL)	841-865	(NA)
Halulu Lake	Playa	(SL)	182-371	(NA)
Laysan:				
Laysan Lagoon	Closed lagoon	(SL)	161	16

NA Not available.

SL Sea level.

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.

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	...	...	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

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 2005

[Four volcanoes have erupted in historical times: Haleakala, last active around 1790; Hualalai, last active in 1800-1801; Mauna Loa, last active in 1984; and 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 2/	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/	3.3	8,399	ER	900	4/ 117.0	4/ 2.7000

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/ In 1990, a series of 12 pauses lasting from 1-4 days interrupted the steady effusion of lava.

4/ Revised from previous *Data Book.* As of January 2005.

Source: Gordon A. Macdonald, Agatin T. Abbott, and Frank L. Peterson, *Volcanoes in the Sea,* 2nd ed. (1983), pp. 64-65 and 80-81; U.S. Geological Survey, Hawaiian Volcano Observatory <http://hvo.wr.usgs.gov> accessed March 24, 2006; records.

Table 5.18-- MAJOR EARTHQUAKES: 1838 TO 2005

[Includes all earthquakes with magnitudes of 6.0 or greater, 1838 to 1983, and 5.0 or greater, 1984 to 2005. 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 seamount 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 2005 -- Con.

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 <http://hvo.wr.usgs.gov/earthquakes/destruct> accessed March 28, 2006, <http://pubs.usgs.gov/gip/hazards/earthquakes.html> accessed March 28, 2006, records; Peter Boylan, "Earthquakes rattle Hawai'i twice", Honolulu Advertiser, July 18, 2005.

Table 5.19-- EARTHQUAKES WITH INTENSITIES ON OAHU OF V OR GREATER: 1859 TO 2005

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

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: 1819 TO 2005

Date	Place of observation	Maximum height in Hawaii		Deaths in Hawaii	Damage in Hawaii
		Meters	Feet		
1819: April 12 1/	W. Hawaii	2.0	7	-	Unknown
1837: Nov. 7	Hilo	6.0	20	16	200 houses
1841: May 17	Hilo	4.6	15	-	Unknown
1868: April 2	Ka'u	12.2	40	47	Great locally
Aug. 13 2/	Hilo	4.6	15	-	Severe
1869: Aug. 24	S.E. Puna	9.1	30	-	Some
1877: May 10	Hilo	4.9	16	5	Severe; $14,000
1878: Jan. 20	N. Oahu	3.0	10	-	Some houses
1896: June 15	Kona	2/ 5.5	2/ 18	-	Unknown
1903: Nov. 29 3/	N. Molokai	8.0	29	-	Some houses
1906: Aug. 16	Maalaea	3.6	12	-	Some
1919: Oct. 2 4/	Kona	4.3	14	-	None
1922: Nov. 11	Hilo	2/ 2.0	7	-	Minor
1923: Feb. 3 2/	Hilo	6.1	20	1	Severe; $1,500,000
1933: March 2	Kona	2/ 3.2	10	-	Some
1946: April 1	Molokai 2/	2/ 16.4	2/ 54	159	$26,000,000
1952: Nov. 4	Hawaii	2/ 9.1	2/ 30	-	$800,000-1,000,000
1957: March 9	Haena	16.0	52	1	$5,000,000
1960: May 22	Hilo	10.5	34	61	$23,000,000
1964: March 27	N. Oahu	2/ 4.9	16	-	$67,590
1975: Nov. 29	Ka'u	14.6	48	2	$1,500,000

1/ Earliest tsunami for which definite information exists. A tsunami observed at Ho'okena in 1813 or 1814 may have exceeded two meters.

2/ Revised from previous *Data Book.*

3/ New entry.

4/ Date and place of observation revised from previous *Data Book.*

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; U.S. Geological Survey, Hawaiian Volcano Observatory, records; Pacific Tsunami Warning Center, records.

Table 5.21-- MAJOR DAMS

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	1906	88	660	9,200	7,761
Kualapuu Reservoir	Kualapuu, Molokai	Irrigation, water supply	1969	54	7,100	5,082	3,685
Ho'omaluhia Dam	Kaneohe, Oahu	Flood control, recreation	1980	76	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	113	600	2,540	1,070
Koloko Reservoir	Waiakalua, Kauai	Irrigation	1890	44	1,800	1,400	1,255
Kitano Reservoir	Kekaha, Kauai	Irrigation	1928	26	720	1,120	110
Kapaia Reservoir	Hanamaulu, Kauai	Irrigation	1910	45	1,050	1,114	1,105

Source: Hawaii State Department of Land and Natural Resources, Engineering Division, Flood Control and Dam Safety, records.

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: 2003 TO 2005

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

Geographic area	Number of services			Consumption (million gallons)		
	2003	2004	2005	2003	2004	2005
State total	247,862	254,036	258,790	80,735	2/ 78,245	77,171
City and County of Honolulu	159,838	164,310	166,445	54,576	52,245	51,044
Honolulu District 1/	62,337	63,966	64,815	25,028	23,869	23,503
Rest of Oahu	97,501	100,344	101,630	29,548	28,376	27,541
Hawaii County	37,162	38,016	38,844	9,166	2/ 9,221	9,134
Kauai County	19,182	19,366	20,378	4,298	4,343	4,032
Maui County	31,680	32,344	33,123	12,695	12,436	12,961
Maui	30,102	30,751	31,510	12,357	12,105	12,644
Molokai	1,578	1,593	1,613	338	331	317

1/ Maunalua to Moanalua.

2/ Revised from previous *Data Book.*

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: 2006,* table 356.

Table 5.25-- TOP 25 WATER USERS ON OAHU: MAY 2004 TO APRIL 2005

[Estimated monthly average]

Rank	User	Gallons (1,000)
1	Marine Base in Kaneohe	51,528
2	Chevron USA Inc.	39,645
3	Hawaii State Department of Transportation, airport, Aolele St.	24,247
4	Hilton Hawaiian Village, 2005 Kalia Road	12,791
5	Hilton Hawaiian Village, 2003 Kalia Road	12,426
6	Sheraton Waikiki Hotel	12,134
7	Hawaii State Department of Transportation, airport, Paiea St.	11,019
8	Fort DeRussy Army Facility	10,917
9	University of Hawaii, 2444 Dole St.	10,109
10	Honolulu Zoo	9,994
11	Hawaii Kai Golf Course	9,392
12	University of Hawaii, 2566 Dole St.	9,215
13	Halawa Prison	9,157
14	United Laundry Service	8,454
15	Hyatt Regency Waikiki	8,222
16	Kapiolani Park	7,593
17	Hawaiian Electric Company, Kahe power plant	7,485
18	Magic Island Park	7,027
19	Ala Moana Hotel	6,699
20	Hawaiian Cement	6,610
21	Ala Wai Golf Course	5,461
22	City & County of Honolulu, Dept. of Environmental Services, Sand Island Road	5,454
23	Halekulani Hotel	5,379
24	American Linen	5,264
25	Wahiawa Community Garden	5,260

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/ 1/13/04
Naval Computer & Telecommunications Area 4/	Pearl Harbor	5/31/94	(X)
Pearl Harbor Naval Complex 5/	Pearl Harbor	10/14/92	(X)
Schofield Barracks (US Army) 6/	Wahiawa	8/30/90	8/10/00

X Not applicable.

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.

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 and soil 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/superfund/sites/npl/hi.htm> accessed April 6, 2006.

Table 5.27-- TOXIC CHEMICAL RELEASES IN 2003, HAZARDOUS WASTE SITES IN 2004, AND HAZARDOUS WASTE GENERATED, SHIPPED, AND RECEIVED IN 2001

Category	Unit
Toxic chemical releases in 2003 1/	3.1
On-site releases	2.7
Point source air emissions	1.9
Surface water discharges	0.4
Off-site releases, transfers to disposal	0.4
Hazardous waste sites in 2004 2/	3
Federal	2
Non-federal	1
Hazardous waste generated, shipped, and received in 2001 3/	
Generated	464.9
Shipped	0.8
Received	0.1

1/ In millions of pounds. Excludes delisted chemicals, chemicals added in 1990, 1994, and 1995, and aluminum oxide, ammonia, hydrochloric acid, PBT chemicals, sulfuric acid, vanadium, and vanadium compounds.

2/ 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 of 1980, and the Superfund Amendments and Reauthorization Act of 1986.

3/ In thousands of tons. Covers hazardous wastes regulated under the Resource Conservation and Recovery Act (RCRA) of 1976 as amended.

Source: U.S. Environmental Protection Agency, as cited in U.S. Census Bureau, *Statistical Abstract of the Unites States: 2006,* tables 368, 369 and 371.

Table 5.28-- WATER QUALITY AT PUBLIC BEACHES, BY ISLANDS: 2004 AND 2005

Island	Number of locations	Number of samples	Enterococci density 1/			
			Lowest 2/	Highest 3/	Number over 7	Mean 4/
2004						
State total	100	2,850	0.3	230.0	32	4.1
Hawaii	21	616	0.6	230.0	6	3.7
Hilo Shoreline	9	351	0.6	230.0	5	4.7
Kona Shoreline	12	265	1.2	7.3	1	2.7
Maui	17	559	1.2	18.2	2	2.9
Lanai	-	-	(X)	(X)	(X)	(X)
Molokai	-	-	(X)	(X)	(X)	(X)
Oahu	51	1,132	0.3	110.7	19	4.5
Kauai	11	543	1.0	227.0	5	5.4
2005						
State total	136	4,810	0.3	243.9	51	4.2
Hawaii	26	891	0.3	111.0	8	3.9
Hilo Shoreline	12	598	0.9	15.7	5	5.2
Kona Shoreline	14	293	0.3	111.0	3	2.2
Maui	19	666	0.5	27.0	1	2.1
Lanai	-	-	(X)	(X)	(X)	(X)
Molokai	-	-	(X)	(X)	(X)	(X)
Oahu	72	2,516	0.4	47.3	34	5.1
Kauai	19	737	0.3	243.9	8	4.7

X Not applicable.

1/ Geometric mean, number per 100 ml. The geometric mean standard for Enterococci density is 7 per 100 ml.

2/ The lowest average value in 2004 was reported at Camp Erdman on the island of Oahu. The lowest average value in 2005 was reported at Kailua Pier Station A on the island of Hawaii, and at Wailua Beach on the island of Kauai.

3/ The highest average value in 2004 was reported at Richardson Ocean Center, Hilo side, on the island of Hawaii. The highest average value in 2005 was reported at Wailua River on the island of Kauai.

4/ 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: 2004 AND 2005

Island and beach	Number of samples		Enterococci density 1/	
	2004	2005	2004	2005
Hawaii				
Hilo Shoreline				
Hilo Bay (Canoe Beach)	44	76	11.7	10.9
Honolii Cove (Ocean)	44	76	12.2	15.7
Kona Shoreline				
Anaehoomalu Bay	33	37	1.7	1.5
Kahaluu Beach Park	34	40	2.5	2.7
Spencer Beach Park	11	20	4.1	2.7
Maui				
Hukilau Hotel shoreline	50	58	4.4	2.5
Kamaole Beach #1	49	57	1.2	1.9
Kihei (south)	2/ 50	58	3.0	1.5
Spreckelsville Beach	2/ 50	58	2.1	1.8
Wailea Beach	43	55	2.1	3.8
Oahu				
Ala Moana Park (center)	10	35	16.0	5.5
Hanauma Bay	54	94	3.0	4.8
Kailua Beach Park	55	94	7.1	7.1
Kuhio Beach	55	97	12.0	13.4
Makaha Beach	53	96	1.9	3.5
Sunset Beach	13	96	3.4	3.2
Waimea Beach	49	95	4.4	5.0
Kauai				
Hanapepe Salt Pond	50	95	1.3	1.6
Kalapaki Beach (middle)	51	95	31.3	14.3
Kekaha (Oomano Point)	49	29	1.2	0.8
Lydgate Park (wading pool)	50	95	11.7	47.2
Poipu Beach Pavilion	50	97	3.0	3.1

1/ Geometric mean, number per 100 ml. The geometric mean standard for Enterococci density is 7 per 100 ml.

2/ Revised from previous *Data Book.*

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

Table 5.30-- REFUSE AND SEWAGE STATISTICS FOR OAHU: 1995 TO 2005

[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	
1995	1,017,709	325,381	692,328	43,175
1996	959,793	288,057	671,736	41,403
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

Year	Sewage pumped 2/ (millions of gallons)	Miles of sewers 2/	City and County pump stations	City and County treatment plants
1995	53,088	1,893	64	8
1996	52,114	1,910	65	8
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

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 2005

[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	1997	8	0.8
1989	-	1.8	1998	9	0.8
1990	-	1.5	1999	14	0.6
1991	-	1.7	2000	14	0.7
1992	-	1.6	2001	16	0.6
1993	13	1.8	2002	15	0.6
1994	14	0.8	2003	15	0.6
1995	14	0.8	2004	13	0.6
1996	14	0.8	2005 3/	14	0.6

1/ The State and Federal Ambient Air Standard for PM_{10} annual average is 50 $\mu g/m^3$.

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.

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

Table 5.32-- AIR QUALITY AT SPECIFIED LOCATIONS: 2005

[24-hour average, in micrograms per cubic meter]

Sampling station	PM 10 1/			Sulfur dioxide 2/		
	Annual range		Annual arithmetic average	Annual range		Annual arithmetic average
	Minimum	Maximum		Minimum	Maximum	
Oahu:						
Downtown Honolulu 3/	6	4/ 64	14	-	23	1
Liliha	7	4/ 94	15	(NA)	(NA)	(NA)
Pearl City	7	4/ 195	16	(NA)	(NA)	(NA)
Kapolei	7	4/ 53	14	-	21	2
Makaiwa	(NA)	(NA)	(NA)	-	19	4
West Beach 5/	6	33	12	-	11	2
Waimanalo 6/	4	21	13	(NA)	(NA)	(NA)
Waimanalo 7/	7	52	24	(NA)	(NA)	(NA)
Kauai:						
Lihue 6/	4	24	15	(NA)	(NA)	(NA)
Lihue 7/	2	30	14	(NA)	(NA)	(NA)

NA Not available.

1/ The State and Federal Ambient Air Standard for 24-hr PM_{10} is 150 $\mu g/m^3$.

2/ The State and Federal Ambient Air Standard for 24-hr SO is 365 $\mu g/m^3$.

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

4/ Probably due to New Year's fireworks.

5/ Manual PM_{10} samplers operated for 24 hours, once every 6 days in accordance with EPA guidelines.

6/ Manual PM_{10} samplers operated for 24 hours, once every 6 days in accordance with EPA guidelines. Operated for part of the year.

7/ Continuous beta-attenuation PM_{10} monitor. Operated for the other part of the year.

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

Table 5.33-- RELEASE OF TOXICS: 1999 TO 2004

[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 2/	3,688,240	2,495,256	454,684	228,634	2,241	507,425
2003	3,163,056	2,131,957	364,067	249,267	2,670	415,095
2004	3,161,123	2,356,380	296,414	227,719	6,601	274,009

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/region09/toxic/tri/report/04/HIstatefactsheet4-10.pdf> accessed April 17, 2006.

Table 5.34 -- RELEASE OF PERSISTENT, BIOACCUMULATIVE AND TOXIC (PBT) CHEMICALS: 2000 TO 2004

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

Year	Total on- and off-site release 1/						
	Lead	Lead com-pounds	PAC's 2/	Mercury com-pounds	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		1,780	187		3.48	5.391

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, *Hawaii Report: Toxics Release Inventory* (annual) <http://www.epa.gov/region09/toxic/tri/report/04/HIstatefactsheet4-10.pdf> accessed April 17, 2006.

Table 5.35-- ATMOSPHERIC CARBON DIOXIDE MEASUREMENTS AT MAUNA LOA: ANNUAL MEAN VALUES, 1958 TO 2005

[Parts per million]

Year	Annual average	Year	Annual average	Year	Annual average
1958	1/ 315.17	1974	1/ 329.72	1990	354.26
1959	315.83	1975	2/ 331.14	1991	355.45
1960	316.75	1976	332.04	1992	356.58
1961	317.49	1977	333.79	1993	357.01
1962	318.30	1978	335.35	1994	358.51
1963	318.83	1979	336.73	1995	360.62
1964	3/ 319.04	1980	338.72	1996	362.40
1965	319.87	1981	340.12	1997	363.54
1966	321.21	1982	341.21	1998	366.61
1967	322.02	1983	342.87	1999	368.33
1968	322.83	1984	344.48	2000	369.62
1969	323.93	1985	345.85	2001	371.20
1970	325.27	1986	347.21	2002	372.99
1971	326.17	1987	348.98	2003	375.82
1972	327.26	1988	351.34	2004	4/ 377.59
1973	329.45	1989	352.89	2005	5/ 379.92

1/ Based on data for 8 months.
2/ Based on data for 11 months.
3/ Based on data for 9 months.
4/ Preliminary. Revised from previous *Data Book*.
5/ Preliminary.

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, Earth System Research Laboratory, records.

Table 5.36-- TEMPERATURES AND PRECIPITATION FOR SELECTED PLACES

[Updated through June 2006]

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	2/ 38	66.3	2/ 82.3	53	94	2/ 126.39
Hawaii Volcanoes Nat. Park Hdq.	2/ 3,970	52.6	2/ 70.7	34	89	2/ 107.68
Naalehu	800	65.8	79.3	50	93	2/ 45.10
Kailua	2/ 700	64.1	77.0	50	88	2/ 125.48
Puako 3/	5	68.3	83.8	52	92	9.09
Waimea (Kamuela)	2,670	2/ 66.1	2/ 85.1	34	2/ 95	(4/)
Honokaa	1,080	67.6	75.5	(NA)	(NA)	105.94
Mauna Kea summit 5/	13,796	31.3	42.5	11	66	(NA)
Maui:						
Hana Airport	75	67.2	80.8	50	94	90.63
Haleakala summit 6/	10,025	38.9	54.6	14	73	36.52
Kihei 7/	85	70.9	78.4	49	98	2/ 15.20
Kahului Airport	2/ 51	67.4	83.7	48	97	22.49
Lahaina 8/	45	65.9	84.8	52	97	13.77
Molokai:						
Kaunakakai	12	(NA)	(NA)	(NA)	(NA)	2/ 24.23
Molokai Airport	450	67.4	80.9	46	96	(NA)
Lanai:						
Lanai City	1,620	61.5	75.1	47	89	2/ 48.15

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	70.1	2/ 84.7	52	96	2/ 22.13
Waikiki (Honolulu Zoo)	10	68.9	84.6	42	95	2/ 26.14
Manoa (Lyon Arboretum)	500	66.4	79.2	49	96	2/ 168.63
Kaneohe (State Hospital)	200	70.9	83.0	58	96	2/ 59.17
Kahuku 9/	15	68.9	80.8	51	99	40.86
Wheeler AFB 10/	820	68.2	75.5	52	89	38.46
Kauai:						
Kilauea (town)	320	65.6	78.8	50	90	76.60
Lihue Airport	103	69.7	2/ 82.2	50	90	2/ 36.18
Poipu (Makahuena Pt.) 6/	50	69.3	82.6	50	95	34.35
Kekaha 11/	9	64.5	84.8	44	95	20.66
Kokee (Kanalohuluhulu)	3,600	51.1	67.4	29	90	72.30
Northwestern Hawaiian Islands:						
Midway 12/	10	65.0	78.6	52	89	44.00

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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/ Data for December are missing.
5/ Based on incomplete and non-continuous data for 1966-1972.
6/ Data available through 1976.
7/ Temperature data available through 1953, refer to Puunene Airport.
8/ Data available through 2001.
9/ Data available through 1975.
10/ Data available through 1949.
11/ Data available through 2000.
12/ 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: 2000 TO 2004

Indicator	Unit	2000	2001	2002	2003	2004
Electric utility sales	Mil. kWh	9,691	9,777	1/ 9,959	1/ 10,206	2/ 10,509
Total energy used	Tril. BtU	325.2	1/ 304.6	1/ 306.3	320.4	(NA)
Estimated greenhouse gas emissions	Mil. Tons 3/	20.8	20.3	21.3	21.7	(NA)
Fossil fuel used	Tril. BtU	305.7	289.6	290.0	302.7	(NA)
Municipal water consumption 4/	Mil. gal	76,401	78,748	77,868	80,735	78,345
Wastewater reuse 5/	Percent	13.5	13.3	16.0	1/ 15.7	(NA)
Solid waste produced 5/	1,000 tons	1,794	1,971	1/ 2,115	1/ 2,141	(NA)
Hazardous waste generated 5/	Tons	(NA)	781	(NA)	(NA)	(NA)
Rare plant species	Number	588	588	(NA)	(NA)	(NA)
Beaches posted as unsafe due to pollution	Days	16	20	36	-	33
Oil and chemical spills 5/	Number	466	442	486	1/ 386	(NA)
Safe drinking water 6/	% population served	98.8	99.7	100.0	100.0	99.5
Environmental expenditures 4/	$ millions	69	51	64	66	150
Noise complaints	Number	536	523	455	363	432
Bikeways	Miles	181.1	206.8	208.0	1/ 208.0	214.2
Bus boardings (Oahu)	Millions	66.6	70.4	73.5	69.1	61.3

NA Not available.

1/ Revised from previous *Data Book.*

2/ Preliminary.

3/ Carbon dioxide equivalent.

4/ State fiscal year ended June 30.

5/ Federal fiscal year ended September 30.

6/ Federal fiscal year ended September 30. Below 1994 maximum microbiological and chemical contaminant levels.

Source: State of Hawai'i, Environmental Council, *Environmental Report Card* (annual); records.

Table 5.38-- CLIMATIC NORMALS, MEANS, AND EXTREMES FOR HILO, KAHULUI, HONOLULU, AND LIHUE AIRPORTS: 2005

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 1/				
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	77.4	75.7
Normal no. days with maximum 90°F and above	1.2	25.9	35.5	0.3
Normal relative humidity (percent), annual	79	2/ 73	69	75
Percent of possible sunshine, annual	40	67	71	58
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	7.4	13.9	11.4	12.8
Maximum 2-minute	35	48	40	46
Month and year of occurrence	Feb 2002	Jan 2004	Jan 2004	Jan 2004
Precipitation (inches)				
Normal, annual	126.27	18.80	18.29	39.57
Maximum monthly	50.82	14.46	20.79	22.91
Month and year of occurrence	Dec 1954	Jan 1980	Mar 1951	Dec 1968
Minimum monthly	0.13	-	(3/)	(3/)
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/ Temperature of the ambient air.

2/ 2002 data.

3/ Trace amount.

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center, *Local Climatological Data, Annual Summary with Comparative Data, 2005,* "Normals, Means, and Extremes", for Hilo, Kahului, Honolulu, and Lihue (annual).

Table 5.39-- MONTHLY AND ANNUAL CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT: 2005

Month	Normal temperature (°F)			Extreme temperature (°F)		Precipitation (inches)			
	Daily maximum	Daily minimum	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	67	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	77.4	95	53	18.29	20.79	(2/)	17.07

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Table 5.39-- MONTHLY AND ANNUAL CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT: 2005 -- 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	9.4	40	65	9.5	8.5	8.8
February	79	59	10.1	37	68	8.1	7.6	7.9
March	73	57	11.3	32	72	7.4	9.3	9.0
April	70	55	11.6	35	70	5.9	9.6	8.6
May	67	54	11.6	29	72	6.7	8.7	7.3
June	66	52	12.6	30	74	6.5	6.2	5.8
July	68	52	13.4	30	76	7.4	5.1	7.2
August	68	52	13.0	31	77	8.0	5.7	5.4
September	70	53	11.4	30	77	7.9	5.7	6.9
October	71	56	10.7	29	71	7.5	8.1	7.3
November	75	59	10.7	30	64	7.2	8.8	9.1
December	79	60	10.5	35	63	7.9	8.7	9.7
Annual	72	56	11.4	40	71	90.0	92.0	93.0

1/ Temperature of the ambient air.

2/ 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, 2005,* "Normals, Means, and Extremes, Honolulu, HI" (annual).

Table 5.40-- AVERAGE TEMPERATURE, PERCENT OF POSSIBLE SUNSHINE, AND PRECIPITATION, FOR HONOLULU INTERNATIONAL AIRPORT: 1950 TO 2005

Year	Average temperature (°F)	Percent of possible sunshine	Precipitation (inches)	Year	Average temperature (°F)	Percent of possible sunshine	Precipitation (inches)
1950	75.7	(NA)	31.68	1980	77.5	68	26.90
1951	76.3	(NA)	39.73	1981	77.1	68	13.41
1952	75.4	(NA)	10.65	1982	76.9	67	34.92
1953	75.9	71	9.97	1983	77.2	67	5.03
1954	75.8	68	27.30	1984	78.1	67	17.08
1955	74.5	62	37.86	1985	76.9	67	17.38
1956	75.9	69	21.23	1986	78.3	68	13.93
1957	76.0	72	24.22	1987	77.9	68	23.53
1958	75.3	70	35.02	1988	78.5	68	16.47
1959	76.7	70	14.14	1989	77.5	68	27.52
1960	76.7	70	12.07	1990	77.6	69	19.84
1961	77.2	81	14.26	1991	77.7	69	17.94
1962	76.5	71	13.58	1992	77.8	69	19.00
1963	76.7	64	37.91	1993	77.1	69	5.84
1964	77.0	63	20.12	1994	78.8	70	15.59
1965 1/	76.1	74	42.78	1995	79.3	70	13.60
1966 1/	77.6	68	23.18	1996	78.6	70	33.12
1967 1/	77.6	58	34.34	1997	77.8	71	19.99
1968 1/	77.9	63	37.26	1998	77.1	71	4.52
1969 1/	77.4	68	22.50	1999	76.9	71	11.99
1970 1/	78.2	72	15.49	2000	77.6	71	7.10
1971 1/	76.1	70	26.64	2001	78.2	71	9.14
1972	76.2	65	26.94	2002	77.9	71	12.18
1973	77.2	63	14.24	2003	78.5	71	12.69
1974	77.5	61	24.02	2004	78.7	71	39.01
1975	76.2	62	24.39	2005	78.4	71	15.60
1976	76.8	60	12.90				
1977	78.2	68	12.36				
1978	76.8	69	25.05				
1979	77.0	68	16.93				

1/ 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, 2005*, "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 2005

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

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center, *Local Climatological Data, Annual Summary With Comparative Data, 2005,* "Meteorological Data, Honolulu, HI " (annual).

Table 5.42-- CLIMATIC DATA FOR HONOLULU INTERNATIONAL AIRPORT: 1992 TO 2005

Year	Average temperature (°F) 1/			Extreme temp. (°F)		Precipitation (inches)
	Annual	Coolest month	Warmest month	Lowest	Highest	
1992	77.8	72.9	82.2	58	92	19.00
1993	77.1	70.9	81.3	54	93	5.84
1994	78.8	72.0	84.3	56	95	15.59
1995	79.3	73.4	83.4	56	94	13.60
1996	78.6	74.0	82.8	56	93	33.12
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

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		
1992	71	55	9.5	49	69	98
1993	70	53	10.9	46	69	76
1994	72	55	11.9	51	70	80
1995	74	57	10.7	41	70	81
1996	73	56	9.6	40	70	106
1997	80	57	10.0	41	71	105
1998	72	56	11.0	(NA)	71	74
1999	73	57	11.0	(NA)	71	94
2000	75	60	10.9	(NA)	71	67
2001	73	58	11.3	(NA)	71	84
2002	72	58	10.2	(NA)	71	64
2003	71	56	10.5	(NA)	71	87
2004	75	61	9.7	(NA)	71	122
2005	71	55	10.6	(NA)	71	90

NA Not available.

1/ Normal 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, 2005,* "Meteorological Data, Honolulu, HI", "Normals, Means, and Extremes, 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 15, 1995.

Table 5.44--RAINFALL AT SPECIFIED LOCATIONS: ANNUALLY, 1993 TO 2005

[In inches]

Year	Hawaii				Maui		
	Hilo Airport	Lalamilo	Kona Village	Naalehu	Kahului Airport	Kihei	Lahaina
1993	114.49	20.67	5.91	40.56	12.69	5.82	11.76
1994	182.81	11.87	4.62	63.34	13.93	5.61	8.02
1995	85.92	6.04	5.72	26.55	13.45	8.21	6.30
1996	120.21	25.35	24.70	59.07	31.00	22.32	22.81
1997	131.61	17.48	15.57	49.43	23.08	19.96	16.68
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)

Year	Oahu				Kauai		
	Waikiki	University of Hawaii	Nuuanu Res. 4	Kane-ohe	Koloa	Lihue Airport	Princeville
1993	16.92	24.14	81.62	34.55	52.98	22.27	48.02
1994	20.16	33.68	125.48	52.36	60.73	32.99	72.15
1995	12.25	20.98	99.26	42.25	56.76	46.57	86.94
1996	29.96	42.11	116.76	62.45	48.81	56.14	85.53
1997	25.30	40.62	116.22	62.28	42.02	48.02	81.57
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

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 2005

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 MONTHS

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: 2006

[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	6:24	6:30	6:35	6:41
June 21	5:43	5:46	5:50	5:55
Sept. 22 1/	6:09	6:15	6:20	6:26
Dec. 21 1/	6:50	6:58	7:04	7:12
Sunset (p.m.)				
March 20	6:31	6:37	6:43	6:49
June 21	7:02	7:10	7:16	7:24
Sept. 22 1/	6:16	6:22	6:27	6:34
Dec. 21 1/	5:47	5:50	5:55	6:00
Daylight (hours, minutes)				
March 20	12, 07	12, 07	12, 08	12, 08
June 21	13, 19	13, 24	13, 26	13, 29
Sept. 22 1/	12, 07	12, 07	12, 07	12, 08
Dec. 21 1/	10, 57	10, 52	10, 51	10, 48

1/ Revised from previous *Data Book.*

Source: U.S. Naval Observatory, Astrronomical Applications Department <http://aa.usno.navy.mil/data/docs/EarthSeasons.html> and <http://aa.usno.navy.mil/data/docs/RS_OneYear.html> accessed September 27, 2005; 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: 2007

[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	6:36	6:42
June 21	5:42	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	12:06	12:07
June 21	13, 20	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, Astrronomical Applications Department
<http://aa.usno.navy.mil/data/docs/EarthSeasons.html> and
<http://aa.usno.navy.mil/data/docs/RS_OneYear.html> accessed September 28, 2005;
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: 2000 TO 2004

[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	2000	2001	2002	2003	2004
Endemic species: 1/					
'Apapane	8	18	30	21	-
Hawaiian Moorhen 2/	16	19	6	29	3/ 24
Hawaiian Stilt 2/	148	139	146	159	175
Oahu 'Amakihi	16	55	71	96	4/ 21
Oahu 'Elepaio	16	14	15	15	3
Indigenous species: 5/					
Black-crowned Night Heron	49	70	61	35	66
Brown Booby	2	16	7	15	7
Great Frigatebird	24	34	212	17	17
Laysan Albatross	3	5	6	2	-
Red-footed Booby	850	1,085	1,138	517	996
White Tern	14	22	3	1	6
Alien species: 6/					
Cattle Egret	140	158	253	149	189
Common Myna	1,647	2,124	2,600	1,015	1,435
Common Waxbill	711	524	862	297	553
House Finch	265	425	874	117	323
House Sparrow	394	475	463	170	296
Japanese White-eye	430	713	938	298	284
Java Sparrow	2,133	2,012	1,121	506	909
Northern Cardinal	76	111	105	56	92
Nutmeg Mannikin	32	48	103	11	97
Red-billed Leiothrix	87	151	192	123	85
Red-crested Cardinal	199	299	218	180	225
Red-vented Bulbul	1,089	1,146	2,270	551	524
Red-whiskered Bulbul	139	298	226	178	122
Rock Dove	220	219	327	304	268
Spotted Dove	1,121	1,307	1,930	636	717
White-rumped Shama	101	102	116	72	41
Yellow-fronted Canary	94	23	37	10	18
Zebra Dove	3,381	3,474	3,894	1,176	1,902
Visitor species: 7/					
Mallard	50	139	99	156	74
Pacific Golden-Plover	922	1,075	1,585	788	978
Ruddy Turnstone	326	409	330	232	336
Sanderling	17	13	4	10	10
Wandering Tattler	14	17	27	38	30

Continued on next page.

Table 5.49-- HAWAII AUDUBON SOCIETY BIRD COUNTS OF MAJOR SPECIES IN THE HONOLULU AREA: 2000 TO 2004 -- Con.

1/ Birds peculiar to Hawaii, and found nowhere else.
2/ Endangered species.
3/ Revised from previous *Data Book.*
4/ Low count.
5/ Native to Hawaii, but also found elsewhere.
6/ Formerly termed "introduced". Includes accidental escapes from captivity.
7/ Formerly termed "migratory". Includes stragglers and seasonal migrants.

Source: Hawaii Audubon Society, *'Elepaio,* Volume 63, Number 5, "Christmas Bird Count No. 103: Hawai'i/Pacific Islands 2002 - 2003", June/July 2003; Volume 64, Number 9, "Results of 2003-2004 Christms Bird Count - Main Hawaiian Islands", December 2004/January 2005; Volume 65, Number 5, "Results of 2004-2005 Christmas Bird Count - Main Hawaiian Islands", June/July 2005; and records <http://www.hawaiiaudubon.com/newsletter.html> accessed October 24, 2005.

Table 5.50-- HAWAII AUDUBON SOCIETY BIRD COUNTS IN THE HONOLULU AREA, BY TYPE OF SPECIES: 1999 TO 2002

[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]

Type of species	Number of species				Number of individuals			
	1999	2000	2001	2002	1999	2000	2001	2002
All species	49	46	52	53	17,343	14,840	16,990	20,458
Endemic	6	7	8	7	259	217	367	279
Indigenous	8	7	6	8	1,108	943	1,232	1,453
Alien	30	27	27	30	14,754	12,351	13,733	16,678
Visitor	5	5	11	8	1,222	1,329	1,658	2,048

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

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: 2000 to 2005

[As of June 30]

Location	2000	2001	2002	2003	2004	2005
Along City and County streets and highways 1/	139,735	141,237	135,712	142,915	142,837	141,999
In City and County parks	105,175	106,179	102,380	95,276	95,224	94,666

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: 2000 TO 2005

[Excludes viruses and bacteria]

Category	Species			
	2000	2001	2002	2005
Total in Hawaii and surrounding waters	23,680	(NA)	25,615	27,573
Endemic to Hawaii	9,456	(NA)	9,975	8,763
Nonindigenous protists, fungi, plants, and animals	5,073	(NA)	5,175	5,281

NA Not available.

Source: L. G. Eldredge, "Numbers of Hawaiian Species: Supplement 4", *Bishop Museum Occasional Papers* 58 (1999): 72-78; 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. Bishop Museum, records.

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

[As of September, 2005]

Group	United States	Hawaii
Animal species	523	78
Mammals	79	3
Birds	90	35
Reptiles	36	4
Amphibians	21	-
Fishes	114	-
Clams	70	-
Snails	35	5
Insects	44	23
Arachnids	12	1
Crustaceans	22	7
Plant species	745	358
Flowering plants	714	343
Conifers and cycads	3	-
Ferns and allies	26	15
Lichens	2	-

Source: U.S. Fish & Wildlife Service, Threatened and Endangered Species System (TESS) <http://ecos.fws.gov/ecos/reports.do> accessed September 26, 2005