

## Section 20

# FORESTS, FISHERIES, AND MINING

This section presents data on forests and forest reserves, commercial fishing and fish populations, and mining and mineral products.

The most recent available statistics show 1.7 million acres of forest and 700,000 acres of timberland in the State, most of it on the Big Island. Over 46,000 acres had been planted in eucalyptus and other species of trees by mid-1992. Recent surveys of vegetation on three islands show ohia lehua to be the most common type of tree on Oahu and Kauai (with acreages of 38,000 and 109,000, respectively) and kiawe the leading type (at 33,000 acres) on Molokai. Forest and brushland fires burned 19 square miles in fiscal 1992.

The commercial fish catch in fiscal year 1993 amounted to 25 million pounds, with a value of \$60 million to primary producers. *Ahi* (yellowfin and bigeye tuna) and *aku* (skipjack) accounted for 45 percent of the total value. Other important species are swordfish, marlin, spiny lobster, *opakapaka*, *mahimahi*, *akule*, and *ono*. Commercial fishermen numbered 3,836. Among Marine Life Conservation Districts, those with the most fish per acre were Honolua Bay (6,775), Molokini Shoal (5,522), and Hanauma Bay (4,208).

The value of mineral production reached \$135 million in 1993, almost all of it in cement (\$45 million) and crushed stone (\$89 million).

Important sources of data on these subjects are the United States Census of Mineral Industries and reports and records of the U.S. Bureau of Mines and Hawaii State Department of Land and Natural Resources, Aquatic Resources Division and Forestry and Wildlife Division. *Historical Statistics of Hawaii*, Section 14, summarizes the data for earlier periods. Comparable Mainland statistics are reported in the *Statistical Abstract of the United States: 1993*, Sections 24 and 25.

**Table 20.1-- FOREST AND NATURAL AREA ACREAGE: JUNE 30, 1992**

Island	Conservation district forest land		Planted forest		Natural areas <sup>3/</sup>	
	Forest reserve land <sup>1/</sup>	Private forest land <sup>2/</sup>	Planted in preceding year	Total standing	Number of areas	Acres
State total .....	643,134	327,845	79	46,060	21	122,703
Hawaii .....	438,416	106,745	36	17,124	9	86,135
Maui .....	73,227	53,180	35	11,872	4	17,123
Kahoolawe .....	-	-	-	-	-	-
Lanai .....	-	6,150	-	512	-	-
Molokai .....	16,030	-	-	3,219	2	2,950
Oahu .....	32,462	87,920	1	7,098	3	1,770
Kauai .....	82,999	73,850	7	6,235	3	14,725
Niihau .....	-	-	-	-	-	-

<sup>1/</sup> State owned and privately owned lands under surrender agreement in forest reserve system.

<sup>2/</sup> Private forest land within conservation district. The majority of these lands were previously in the forest reserve system.

<sup>3/</sup> Includes Waimanu Research Reserve (3,600 acres) and Alakai Wilderness Preserve (9,939 acres).

Source: Hawaii State Department of Land and Natural Resources, Division of Forestry and Wildlife, records.

**Table 20.2-- WOODLAND ON FARMS, 1978 TO 1987, AND BY COUNTIES, 1987**

[Acres]

Use	1978	1982	1987				
			State total	Hawaii	Maui	Honolulu	Kauai
Total .....	145,802	117,270	99,135	75,331	14,024	7,085	2,695
Pastured .....	40,242	36,550	27,517	22,973	992	2,797	755
Not pastured .....	105,560	80,720	71,618	52,358	13,032	4,288	1,940

Source: U.S. Bureau of the Census, *1987 Census of Agriculture, Hawaii AC87-A-11* (August 1989), pp. 15 and 36.

**Table 20.3-- LAND AREA, BY VEGETATION TYPE AND FOREST RESERVE STATUS, FOR MOLOKAI, OAHU, AND KAUAI: 1986**

[In acres. Excludes land in forest plantations]

Vegetation type	Molokai		Oahu		Kauai	
	Total	Forest reserve	Total	Forest reserve	Total	Forest reserve
Total, all types...	163,214	44,288	370,002	34,931	347,088	88,127
Tree type:						
Ohia lehua.....	32,833	30,161	37,563	9,524	109,040	50,702
Koa.....	-	-	28,548	6,601	13,438	6,223
Kukui.....	4,773	4,009	2,775	617	7,634	2,029
Kiawe.....	33,215	-	17,354	241	10,358	116
Eucalyptus.....	1,527	954	1,131	411	3,157	1,288
Guava.....	5,918	4,200	10,287	1,421	12,143	3,099
Other trees.....	2,673	573	36,700	6,776	32,763	6,043
Shrub type.....	16,417	1,527	33,974	2,965	36,061	7,189
Forb type.....	191	-	11,338	2,718	4,120	2,043
Grassland.....	38,751	764	45,102	3,261	34,168	5,198
Cultivated land.....	18,325	-	55,770	-	64,741	387
No vegetation.....	3,819	-	822	-	6,709	3,810
Urban and other.....	4,772	2,100	88,638	396	12,756	-

Source: Hawaii State Department of Land and Natural Resources, Division of Forestry and Wildlife, multi-resource inventory reports.

**Table 20.4-- FOREST AND BRUSSLAND FIRES, 1990 TO 1992,  
AND BY COUNTIES, 1992**

[Years ended June 30]

Subject	1990	1991	1992, by counties				
			State total	Hawaii	Maui	Honolulu	Kauai
Number of fires .....	210	205	199	96	60	41	2
Acres burned .....	3,384	38,352	11,851	10,206	1,168	475	2

Source: Hawaii State Department of Land and Natural Resources, Division of Forestry and Wildlife, records.

**Table 20.5-- COMMERCIAL FISHING: 1988 TO 1993**

[Years ended June 30]

Year	Number of commercial fishermen	Commercial fish catch <sup>1/</sup>		
		Pounds landed	Pounds sold	Value to primary producers (dollars)
1988 .....	3,155	11,052,502	10,592,287	20,541,580
1989 .....	3,491	13,493,866	13,010,973	28,003,055
1990 .....	3,551	15,370,302	14,836,135	35,984,313
1991 .....	4,043	22,264,343	21,380,976	53,412,797
1992 .....	3,800	23,567,168	22,750,156	55,365,194
1993 .....	3,836	24,955,038	24,313,713	60,373,716

<sup>1/</sup> Represents the total catches of all licensed commercial fishers. Includes both sea and pond catches, but excludes coral harvests. Particularly for 1979-1988, data may be incomplete due to unreported aku (skipjack tuna) and longline boat catches.

Source: Hawaii State Department of Land and Natural Resources, Division of Aquatic Resources, *Commercial Fish Landings for Fiscal Year* (annual), as revised, and records.

**Table 20.6-- COMMERCIAL FISH CATCH, BY SPECIES: 1992**

[Year ended June 30, 1992]

Species	Pounds caught	Pounds sold	Value (dollars)
Total catch .....	23,567,168	22,750,156	55,365,194
Sea catch, all species.....	23,541,084	22,724,248	55,309,735
Tunas .....	9,198,135	8,922,952	21,593,601
Aku (Skipjack).....	2,467,690	2,344,694	3,175,332
Ahipalaha.....	700,812	692,886	830,579
Bigeye (ahi).....	2,764,162	2,741,154	10,576,677
Yellowfin (ahi) .....	3,239,558	3,124,138	6,973,412
Billfishes .....	9,792,356	9,545,734	24,284,777
Blue marlin.....	1,233,388	1,117,203	1,011,235
Striped marlin.....	1,027,735	1,004,837	1,319,064
Swordfish.....	7,320,460	7,224,162	21,739,160
Miscellaneous pelagic species.....	1,889,352	1,788,552	3,396,538
Mahimahi .....	1,060,425	995,262	1,762,286
Ono .....	428,871	396,907	1,054,915
Deep bottom fishes .....	768,134	728,151	2,582,442
Opakapaka .....	263,991	258,108	1,057,396
Uku .....	133,338	129,061	404,000
Ulaula.....	123,210	120,465	613,029
Akule/opelu .....	1,167,719	1,101,445	1,740,106
Akule .....	763,458	715,437	1,133,198
Opelu .....	404,261	386,008	606,908
Jacks.....	129,726	116,759	184,714
Inshore fishes.....	301,261	278,591	510,298
Sharks.....	145,483	108,188	100,970
Lobsters .....	39,318	38,617	547,228
Spiny lobster .....	33,196	32,518	487,536
Crabs.....	58,728	53,895	229,251
Shrimps.....	3,603	3,603	12,807
Coral.....	1,480	1,410	28,200
Seaweeds .....	8,083	6,899	22,768
Miscellaneous .....	5,452	5,259	7,039
Pond landings, all species.....	26,084	25,908	55,459

Source: Hawaii State Department of Land and Natural Resources, Division of Aquatic Resources, *Commercial Fish Landings, State of Hawaii--Fiscal Year 1991-1992*.

**Table 20.7-- COMMERCIAL FISH CATCH, BY SPECIES: 1993**

[Year ended June 30, 1993]

Species	Pounds caught	Pounds sold	Value (dollars)
Total catch .....	24,955,038	24,313,713	60,373,716
Sea catch, all species .....	24,930,632	24,289,689	60,322,021
Tunas .....	9,687,016	9,470,536	22,436,341
Aku (Skipjack) .....	1,756,759	1,663,497	2,477,258
Ahipalaha .....	878,427	869,583	989,345
Bigeye (ahi) .....	3,590,994	3,576,865	11,901,648
Yellowfin (ahi) .....	3,413,565	3,319,127	6,931,724
Billfishes .....	10,762,038	10,647,280	28,172,670
Blue marlin .....	708,343	650,512	631,367
Striped marlin .....	1,254,016	1,224,751	1,447,439
Swordfish .....	8,636,063	8,615,826	25,935,348
Miscellaneous pelagic species .....	1,925,601	1,818,016	3,099,205
Mahimahi .....	993,400	928,274	1,640,231
Ono .....	439,898	401,867	945,180
Deep bottom fishes .....	624,750	598,698	2,191,037
Opakapaka .....	230,468	225,294	973,729
Uku .....	113,140	109,471	354,516
Ulaula .....	72,904	71,650	401,663
Akule/opelu .....	1,128,278	1,053,643	1,618,111
Akule .....	803,018	736,841	1,124,481
Opelu .....	325,260	316,802	493,630
Jacks .....	123,627	112,599	195,311
Inshore fishes .....	286,784	259,635	503,457
Sharks .....	115,176	88,511	80,666
Lobsters .....	154,905	131,059	1,566,651
Spiny lobster .....	111,422	91,681	1,227,858
Slipper lobster .....	43,483	39,378	338,793
Crabs .....	45,976	42,114	180,632
Shrimps .....	35,631	35,631	169,726
Coral .....	1,013	918	18,360
Seaweeds .....	8,501	7,067	25,951
Miscellaneous .....	3,774	3,603	2,781
Pond landings, all species .....	24,406	24,024	51,695

Source: Hawaii State Department of Land and Natural Resources, Division of Aquatic Resources, *Commercial Fish Landings, State of Hawaii--Fiscal Year 1992-1993*.

**Table 20.8-- COMMERCIAL SEA LANDINGS, BY ISLANDS: 1992 AND 1993**

[Years ended June 30]

Island	Pounds landed	Pounds sold	Value (dollars)
1992			
State total .....	23,541,084	22,724,248	55,309,735
Hawaii.....	3,570,920	3,404,622	5,666,977
Maui.....	760,903	622,424	1,417,223
Lanai.....	34,789	27,524	67,010
Molokai.....	58,590	42,922	112,343
Oahu.....	18,295,734	17,948,603	46,398,528
Kauai and Niihau.....	820,148	678,153	1,647,654
1993			
State total .....	24,930,632	24,289,689	60,322,021
Hawaii.....	3,666,169	3,516,948	6,002,218
Maui.....	435,115	342,106	894,581
Lanai.....	26,825	23,399	56,630
Molokai.....	52,001	41,660	94,066
Oahu.....	20,232,589	19,926,382	52,272,031
Kauai and Niihau.....	517,933	439,194	1,002,495

Source: Hawaii State Department of Land and Natural Resources, Division of Aquatic Resources, *Commercial Fish Landings, State of Hawaii*-for fiscal years 1991-1992 and 1992-1993.

**Table 20.9-- COMMERCIAL SEA LANDINGS, BY FISHING METHOD: 1992 AND 1993**

[Years ended June 30]

Fishing method	Pounds landed	Pounds sold	Value (dollars)
1992			
All methods.....	23,541,084	22,724,248	55,309,735
Aku pole and line.....	2,017,976	2,008,644	2,683,529
Longline.....	14,114,193	13,951,021	38,981,571
Handline.....	3,244,064	3,097,496	6,772,650
Trolling.....	2,973,116	2,542,115	4,497,004
Net.....	983,699	941,506	1,440,719
Trap.....	81,684	80,184	642,017
All other methods.....	126,352	103,282	292,245
1993			
All methods.....	24,930,632	24,289,689	60,322,021
Aku pole and line.....	1,453,461	1,443,408	2,119,505
Longline.....	16,444,614	16,361,765	44,144,401
Handline.....	3,379,117	3,296,646	6,960,446
Trolling.....	2,314,538	1,967,293	3,665,847
Net.....	999,984	929,195	1,359,011
Trap.....	227,500	203,551	1,831,157
All other methods.....	111,418	87,831	241,654

Source: Hawaii State Department of Land and Natural Resources, Division of Aquatic Resources, *Commercial Fish Landings, State of Hawaii--Fiscal Year 1990-1991*.



**Table 20.10-- FISH POPULATIONS AROUND SELECTED SHORELINE  
AREAS: YEAR ENDED JUNE 30, 1993**

Location	Species	Fish per acre	Pounds per acre
Marine Life Conservation Districts:			
Hanauma Bay, Oahu:			
Outer bay .....	89	3,224	473
Inner bay .....	70	4,208	2,928
Pupukea, Oahu .....	77	1,484	148
Waikiki, Oahu .....	46	1,786	913
Molokini Shoal, Maui .....	100	5,522	528
Honolua Bay, Maui .....	64	6,775	1,852
Manele-Hulopoe Bays, Lanai .....	99	2,754	500
Lapakahi, Hawaii .....	44	2,124	515
Old Kona Airport, Hawaii .....	35	3,220	236
Artificial reefs:			
Maunalua Bay, Oahu (tire modules) .....	(NA)	(NA)	606
Waianae, Oahu (tire modules) .....	(NA)	(NA)	47
Keawakapu, Maui .....	(NA)	5,675	787
Fisheries Management Areas:			
Waikiki-Diamond Head, Oahu .....	63	1,913	235
Puako Bay and Reef, Hawaii .....	(NA)	2,898	401
Keahu O Lu .....	53	6,559	813

NA Not available.  
Source follows next table.

**Table 20.11-- MOST ABUNDANT AND HEAVIEST FISH SPECIES AT SPECIFIED LOCATIONS: YEAR ENDED JUNE 30, 1993**

[Three leading species at each location, based on both individuals per acre and pounds per acre]

Location and species	Individuals per acre		Pounds per acre	
	Rank	Number	Rank	Number
Hanauma Bay (inshore), Oahu:				
Manini ( <i>Acanthurus triostegus</i> ).....	1	955	6	94
Mamo ( <i>Abudefduf abdominalis</i> ) .....	2	540	(1/)	(NA)
Nenuue ( <i>Kyphosus</i> sp.).....	3	257	2	444
Awa awa ( <i>Elops hawaiiensis</i> ) .....	(1/)	(NA)	1	1,145
Pualu ( <i>Acanthurus xanthopterus</i> ).....	(1/)	(NA)	3	270
Waikiki MLCD, Oahu:				
Manini ( <i>Acanthurus triostegus</i> ).....	1	357	2	43
Saddle-back wrasse ( <i>Thalassoma duperrey</i> ).....	2	261	6	20
Kala ( <i>Naso unicornis</i> ) .....	3	177	1	622
Maiii ( <i>Acanthurus nigrofuscus</i> ) .....	5	157	3	41
Manele-Hulopoe MLCD, Lanai:				
Blackfin damsel ( <i>Chromis vanderbilti</i> ) .....	1	452	(1/)	(NA)
Maiii ( <i>Acanthurus nigrofuscus</i> ) .....	2	365	6	24
Kole ( <i>Ctenochaetus strigosus</i> ) .....	3	240	(1/)	(NA)
Clown tang ( <i>Naso lituratus</i> ) .....	9	109	1	117
Bullethead parrot ( <i>Scarus sordidus</i> ).....	10	89	2	48
Achilles tang ( <i>Acanthurus achilles</i> ).....	7	129	3	34
Old Kona Airport MLCD:				
Blackfin damsel ( <i>Chromis vanderbilti</i> ) .....	1	780	(1/)	(NA)
Chocolate dip damsel ( <i>Chromis hanui</i> ) .....	2	639	4	18
Kole ( <i>Ctenochaetus strigosus</i> ) .....	3	515	3	19
Nae Nae ( <i>Acanthurus olivaceus</i> ).....	10	65	1	111
Yellow tang ( <i>Zebrasoma flarescens</i> ).....	4	272	2	20

NA Not available.

MLCD Marine Life Conservation District.

1/ Not in first 10.

Source: Hawaii State Department of Land and Natural Resources, Division of Aquatic Resources, *Statewide Marine Research and Surveys, Survey of Fish and Habitat, July 1, 1992 to June 30, 1993.*

**Table 20.12 MINERAL INDUSTRIES: 1958 TO 1987**

[Excluding mines at manufactures]

Subject	1958	1963	1967	1972	1977	1982	1987
Number of establishments <sup>1/</sup> .....	20	44	12	15	7	12	9
With 20 employees or more.....	8	4	3	5	2	4	4
All employees:							
Number (1,000) .....	.4	.3	.2	.3	.1	.2	.2
Payroll (million dollars).....	1.7	1.7	1.6	2.4	1.9	3.8	7.4
Production, development, and ex- ploration workers:							
Number (1,000) .....	.4	.2	.2	.2	.1	.1	.2
Hours (millions).....	.7	.6	.4	.4	.2	.2	.4
Wages (million dollars) .....	1.4	1.5	1.3	1.8	1.5	2.6	5.7
Value added by mining (million dollars).....	4.6	4.9	5.0	9.0	8.1	9.7	23.5
Cost of supplies used, purchased machinery installed, etc. (million dollars).....	2.0	2.1	2.3	4.1	2.9	5.9	10.4
Value of shipments and receipts (million dollars).....	5.8	6.5	5.5	11.0	9.7	12.8	31.1
Capital expenditures (million dollars).....	.7	.5	1.8	2.0	1.3	2.7	2.8

<sup>1/</sup> After 1963, data for single-unit establishments without paid employees were excluded from the census of mineral industries. In 1987, seven of the nine establishments reported, including three of the four with 20 employees or more, were in SIC 142, crushed and broken stone, including riprap.

Source: U.S. Bureau of the Census, *1982 Census of Mineral Industries, Geographic Area Series, Pacific States*, MIC82-a-9 (April 1985), tables 1 and 2a, and *1987 Census of Mineral Industries, Geographic Area Series, Pacific States*, MIC87-A-9 (October 1990), Hawaii table 1.

**Table 20.13-- NONFUEL MINERAL PRODUCTION: 1991 TO 1993**

[Estimated production as measured by mine shipments, sales, or marketable production, including consumption by producers]

Minerals	1991	1992 <sup>1/</sup>	1993 <sup>2/</sup>
QUANTITY (1,000 SHORT TONS)			
Cement:			
Masonry .....	10	8	8
Portland .....	547	573	474
Gem stones .....	(NA)	(NA)	(NA)
Sand and gravel (construction) .....	400	(W)	-
Stone (crushed) <sup>3/</sup> .....	10,486	10,500	10,200
VALUE (\$1,000)			
Total <sup>3/</sup> .....	141,112	148,857	134,583
Cement:			
Masonry .....	600	1,421	664
Portland .....	47,589	53,936	44,619
Gem stones .....	60	(W)	(W)
Sand and gravel (construction) .....	2,300	(W)	-
Stone (crushed) <sup>3/</sup> .....	90,563	93,500	89,300

W Withheld to avoid disclosing company proprietary data.

NA Not available.

<sup>1/</sup> Revised.

<sup>2/</sup> Preliminary.

<sup>3/</sup> Excludes certain stores, to avoid disclosing data for individual firms.

Source: U.S. Bureau of Mines, "The Mineral Industry of Hawaii 1993," *Mineral Industry Surveys* (1994).