

KAKAHAI'A NATIONAL WILDLIFE REFUGE

Island of Molokai, Hawaii

ANNUAL NARRATIVE REPORT

Calendar Year 1991

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4-1-94
Date

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4/5/94
Date

[Signature]
Regional Office Approval

4/15/94
Date

INTRODUCTION

Little is known about the Hawaiian Islands before 1778 when Captain James Cook first sighted Oahu and Kauai. At the time of Cook's visit, the islands were divided into four kingdoms. Kamehameha, a chief, was rising to power on the island of Hawaii. By 1810, he had united all the islands into one kingdom.

Missionaries arrived from New England in 1820. They transcribed the spoken Hawaiian language into writing, translated hymns and parts of the Bible into Hawaiian, and taught the natives to read and write.

In 1835, the sugar industry was established at Koloa, Kauai. With increasing acreage and production, the need for additional labor increased. In 1852, Chinese immigrants arrived to work in the sugar fields. They were the first of a long list of immigrants, including Chinese, Japanese, Portuguese, Koreans, Germans, and Filipinos.

The pineapple industry was established near the turn of the century in Wahiawa, Oahu.

In 1900, Hawaii became a territory of the United States, and in 1959, it officially became the 50th State.

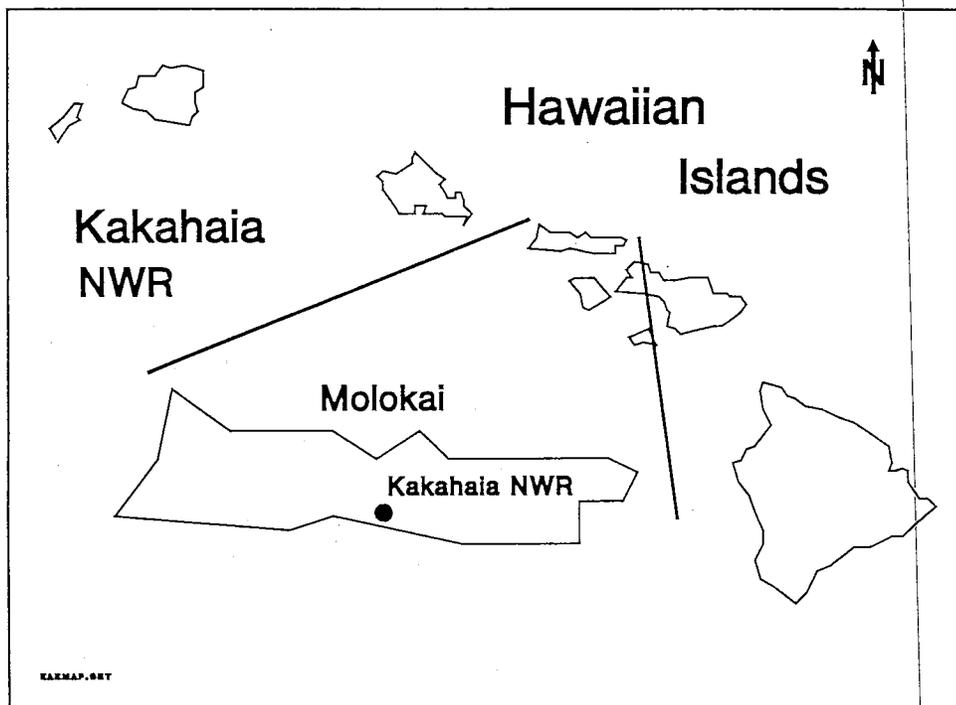
The Hawaiian islands form a chain that extends in a northwest-southwest direction. They are the summits of volcanic domes built up from the ocean floor through countless eruptions. In general, the volcanic activity moved from northwest to southeast.

The islands formed primarily in thin-bedded pahoehoe and Aa lava flows. The rocks are mostly basaltic; the basalt is about 50 percent silica. Andesitic rocks as well as volcanic ash and cinders occur in a few places. Adjacent to the ocean is a small amount of coral limestone and coral sand.

The relief of the islands varies. The once smooth volcanic domes have been weathered and eroded. The older islands are deeply dissected; their surface is one of ridges, valleys, and alluvial fans.

Kakahai'a National Wildlife Refuge is a coastal freshwater pond, originally formed and used as a man-made fish pond. This 44.6-acre refuge is situated along the south coast of the island of Moloka'i, Hawai'i, 5 miles east of the city of Kaunakakai. The refuge was established in 1976 to provide habitat for the endangered coot. In 1983, an impoundment was constructed on the refuge to provide additional shallow

water habitat for the endangered stilt. The refuge is surrounded by kiawe (Prosopis sp.), woodlands on the north, east and west. Hawai'i State Route 450 bisects the refuge in its southern half. The two acres seaward of the highway are under Special Use Permit to the County of Maui for use as a County Park.



Vicinity Map

INTRODUCTION

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Hawaiian Duck

A. HIGHLIGHTS

- The Oahu NWR Complex office moves to Haleiwa on the north shore.
(Section J.3)

B. CLIMATIC CONDITIONS

The climate of Hawaii is unusually pleasant for the tropics. Its outstanding features are the remarkable differences in rainfall over short distances, the mild temperatures, and the persistence of the northeasterly trade winds.

The major climatic influences in this region are the latitude, the State lies well within the geographic tropics; the surrounding ocean, which has a moderating influence on temperature; and the Pacific anticyclone, from which the trade winds flow. Between about October and April, storms that migrate eastward across the Pacific north of Hawaii, or the storms that form nearby, occasionally bring in spells of bad weather and wide-spread heavy rains.

The most important influence on all the weather elements is Hawaii's topography. Elevations range from sea level along the coastal plains to heights of about 5,170 feet on Kauai, 4,025 feet on Oahu, 10,025 feet on Maui, 4,970 feet on Molokai. More important than mere elevation, moreover, is the ruggedness of the terrain, in which each valley bottom, slope, and steep-sided ridge has its own local climate.

RAINFALL

Over the open sea in the Hawaiian area, rainfall averages between 25 and 30 inches a year. Yet the State itself receives more than 10 times this amount in some places, and less than half in others. Each of the major islands has regions in which the mean annual rainfall approaches or exceeds 300 inches. Mt. Waialeale, on the island of Kauai, which has 486 inches of rain a year and is known as the wettest spot on earth, is only 15 miles from Barking Sands, which receives less than 20 inches annually. The principal cause of this remarkable variability is the orographic, or mountain-caused, rain that forms within the moist air from trade winds as it ascends and traverses the steep and high terrain of the islands. The resulting rainfall

distribution, in the mean, closely resembles the topographic contours. The amount is greatest over windward slopes and crests and is least toward the leeward lowlands.

The lowlands obtain moisture chiefly from a few winter storms, and only negligibly from trade-wind showers. Thus, rainfall in the normally dry areas is strongly seasonal. Summers are arid. Seasonal differences are much smaller in the wetter areas, where rainfall is derived from both the winter storms and the year-round, trade-wind showers. For example, at Kaunakakai, a very dry station where the mean annual rainfall 12.5 inches, June and July together account on the average for less than 1 percent of the annual rainfall; but in Wahiawa where rainfall measures 50 inches a year, June and July account for 10 percent, and in Kahana where it measures 240 inches a year, they account for 17 percent.

The number of rainy days a year also varies widely from place to place; the number is greatest in areas where the mean annual rainfall is higher. Kaunakakai, for example, receives 0.1 inch or more of rainfall on an average of 15 days a year and 0.5 inch or more on only 6 days. In contrast, Wahiawa receives 0.1 inch or more on an average of 81 days a year and 0.5 inch or more on 25 days. Kahana receives 0.1 inch or more on an average of 200 days a year and 0.5 inch or more on 65 days.

Another source of rainfall is the deep cumulus clouds that build up over mountains and interiors on clear calm afternoons. Although such convective showers may be intense, they are usually too brief and localized to contribute significantly to the total water supply.

Hawaii's heaviest rains are brought by winter storms. Although the effects of terrain are not so obvious as in trade-wind showers, large differences in rainfall over small distances do occur, because of the topography and the path and structure of the rain clouds. Frequently, the most copious storm rains do not occur in localities that have the greatest average rainfall; nor is it uncommon during such storms for relatively dry areas to receive within a single day, or even a few hours, half or more of their mean annual rainfall. For example, downtown Honolulu has an average yearly rainfall of only 24 inches, but it has received more than 17 inches in a single day.

Intensities of 2 inches of rain an hour are not infrequent, and even the dry regions on Oahu have an average recurrence interval of only 5 years or less. In many of the farming areas, hourly intensities of 2.5 inches can be expected, and over the island as a whole, 3 inches an hour is by no means rare. Hawaii's heaviest rain was more than 40 inches recorded at Kilauea Plantation, Kauai, in a 24-hour period in January 1956. Of this, 6 inches fell in 30 minutes and more than 11 inches in a single hour. Flash flooding is a recurrent problem and results in frequent damage to fields, crops, and other property.

Another important, but often neglected, source of water is that directly extracted from passing clouds by vegetation and by the soil in areas where an elevation of 2,500 feet or more brings them into the cloud belt. For example, at Lanaihale, the contribution of what is locally called "fog drip" to soil moisture appears to be about equal to that of rainfall.

At the opposite extreme, neither is drought uncommon in Hawaii, although it rarely affects more than part of even a single island at one time. Drought occurs when either the winter storms or the trade winds fail. If the winter storms fail, the leeward areas, which receive little rain from trade winds, are hardest hit. A dry winter between two normally dry summers can have very serious mountain and upland regions, including many of the sources of irrigation water. The probability of serious drought somewhere in Hawaii during any given 10-year period exceeds 90 percent.

TEMPERATURE

Mean annual temperatures in Hawaii vary between about 72° and 75° F., near sea level, decrease by about 3° for each 1,000 feet of elevation, and tend to be higher in sunny dry areas. They are higher, for example, in the leeward lowlands, than in those areas that are cloudier, wetter, and more directly exposed to the trades. The average annual temperature at Mountain View, Hawaii (1,530 feet) is 67°; at Haleakala Branch Experiment Station (2,100 feet) 66°; at Kula Sanatorium (3,004 feet), 64°; at Hawaii National Park (3,971 feet) 61°; at Haleakala Ranger Station (7,030 feet) 54°; and at Mauna Loa Observatory (11,150 feet), 45°.

The average difference between daily high and low temperatures is between 10° and 20°; the higher readings occur in areas that are lower, drier, and less open to the wind. For example, on Oahu the daily range is 10° at Ewa Plantation, 13° at Kahuku, and only 8° at Makapuu Point.

August and September are the warmest months of the year, and January and February are the coolest. The seasonal range of temperature is only 6° to 8°, which is far below the daily range. Hence, throughout the State, the temperature varies more in the course of an average day than it does from season to season. In addition, the average nighttime temperature during most of the year is below the average temperature of the coolest months.

Almost everywhere at low elevations, the highest temperatures of the year are in the low 90's and the lowest temperatures near 50°. The warmest days are usually during Kona weather, when the trade winds, which come from cooler latitudes, fail and air stagnates over the heated islands.

As an example of the role of afternoon cloudiness in holding down the maximum temperatures, Maunaloa, at an elevation of 1,100 feet in dry West Molokai, has registered 90° or above in May through November, and 96° in September, while Lanai City only a few hundred feet higher, but shielded from the afternoon sun by an orographic cloud cap, has had no temperatures higher than 88°.

WIND

The prevailing wind throughout the year is the east-northeasterly trade. The trades vary greatly in frequency, they are virtually absent for long periods at some times and blow for weeks on end at others. On the average, however, the trade winds are more persistent in summer than in winter. At Honolulu they range from a minimum of about 45 percent in January to a maximum of more than 90 percent in July, for an annual frequency of about 70 percent.

In well-exposed areas, the trades average somewhat under 15 miles an hour. They are slightly stronger in summer than in winter. A speed of 31 miles an hour is exceeded only about 2 percent of the time by the trades and 3 percent by winds from other directions.

The strongest and most damaging winds are not ordinarily the trade winds but the winds that accompany winter storms and the infrequent hurricanes. High winds are more likely between November and March and blow from almost any direction. The strongest of recent years was a gust of 103 miles an hour at Kilauea Point, Kauai, in August 1959 during Hurricane DOT, but gusts exceeding 80 miles an hour have occurred twice at Honolulu Airport since 1951 and occasionally elsewhere.

The effect of topography on the local wind is varied and profound, ranging from a complete sheltering from winds from certain directions to deflections and accelerations, that is, through passes and narrow valleys and over crests, that can transform a moderate wind into a strong and gusty one. Thus, the Hoolehua plains, the windward side of west Molokai, and the north end of Lanai are subject to severe wind erosion and occasional crop damage by strong trades funnelling between the highlands of east and west Molokai or through the channel between Molokai and Lanai. At Molokai Airport, in the central saddle, winds exceed 15 miles an hour nearly 60 percent of the time during the entire year, and more than 75 percent of the time during the summer months.

In contrast, the Kona coast of Hawaii Island is so completely sheltered by the mountains to the east that the trades are never experienced near sea level, and local land and sea breezes constitute the prevailing winds.

TORNADOES

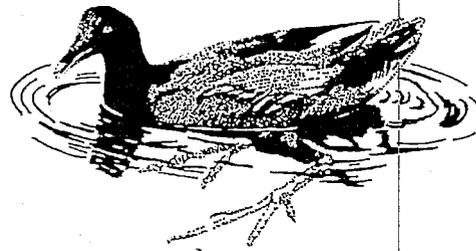
A number of funnel clouds occur over or near the State during an average year, but most either fail to reach the ground or remain at sea as waterspouts. Only rarely does a small tornado, usually much weaker than its mainland counterpart, cause even slight damage. By far the most destructive tornado of recent years was the one that roared through the small plantation town of Kaumakani, Kauai, in the early morning of December 17, 1967. The damage to houses, sugarcane, and other crops amounted to \$300,000.

HAIL

On the average, hail falls several times a year somewhere in the State, but it is only a quarter inch or less in diameter and thus does little damage. At times, however, leafy crops have been severely battered. Hail occurs most frequently between October and April, but it has been reported in every month but July. Falls usually cover only a square mile or less; only on occasion are they more widespread.

1991

The refuge is located on the leeward side of the island of Moloka'i. The refuge typically receives annual rainfall of 20-30 inches. Occasional storms will cause flooding in coastal areas near the refuge. Winds are generally light and variable.



E. ADMINISTRATION

1. Personnel

Oahu NWR is a complex within a refuge complex. The Oahu NWR is administered by the Hawaiian and Pacific Islands NWR Complex office located in Honolulu. The Oahu Complex manages James Campbell NWR and Pearl Harbor NWR on the island of Oahu, and Kakahaia on the island of Molokai. The refuge office is located on the north shore of Oahu in the small community of Haleiwa. The staff at Oahu consists of a refuge manager, wildlife biologist (co-operative education position), one permanent maintenance worker, and two temporary laborers.

Kakahai'a National Wildlife Refuge is an unmanned station. The refuge is typically visited twice a month to census birds, perform light maintenance and to check water conditions. Intermittent visits occur to work on various projects or meet individuals with refuge-related concerns or requests. Regular maintenance and bird counts are conducted during these visits if time allows.

The co-operative education position funded in 1987 to allow graduate research on endangered Hawaiian waterbirds was continued this year. Paul R. Chang continued in this position until June, then transferred to the Division of Law Enforcement.

Table 1: STAFFING - OAHU NWR COMPLEX
FY '87 - '91

	<u>Permanent</u>		<u>Temporary</u>
	<u>Full Time</u>	<u>Part Time</u>	
FY 87	3	0	2
FY 88	3	0	2
FY 89	3	0	2
FY 90	4	0	3
FY 91	3	0	2

OAHU NWR COMPLEX STAFF

1. Jim Glynn	- Refuge Complex Manager	GS-11
2. Paul Chang	- Wildlife Biologist	GS-9
	(Co-operative Education Position)	
	Transferred to Division of Law Enforcement	6-29-91
3. George Fisher	- Maintenance Worker	WG-7
4. Dean Takayama	- Laborer (TFT - NTE 1 yr.)	WG-3
	E.O.D. 8-12-91	
5. Robert Rawlins	- Laborer (TFT - NTE 1 yr.)	WG-3
	E.O.D. 12-02-91	

5. Funding

The Oahu National Wildlife Refuge Complex budget is allocated by the Hawaiian and Pacific Islands Refuge Complex project leader. The FY '91 budget for the Oahu NWR Complex was split between the 3 refuges on Oahu and Molokai.

6. Safety

No reported accidents occurred this year.

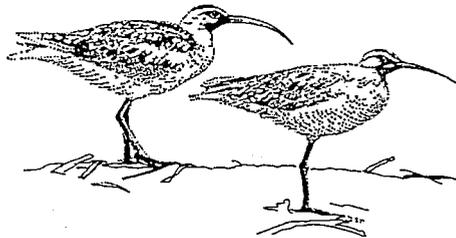
In November, maintenance worker Fisher and laborer Takayama traveled to Kilauea Point NWR for basic heavy equipment operator safety training on the 18-19th. The course was instructed by Dale Green of Klamath Falls NWR.

7. Technical Assistance

Refuge staff participated in semi-annual, state-wide waterbird surveys, and assisted other various agencies with resource-related concerns or problems. The Fish and Wildlife Enhancement, Honolulu Field Office frequently asked advice regarding review of Environmental Impact Statements and Environmental Assessments pertaining to wetlands, waterbirds or any wetland mitigation projects. Projects on Moloka'i that required refuge technical assistance included aquafarm requests for control of black-crowned night herons.

In February, manager Glynn and biologist Chang visited Kaloko - Honokohau National Park on Hawaii island at the request of the superintendent to assess and provide management recommendations for Kaloko and Aimakapa ponds.

Biologist Chang assisted the Department of Land and Natural Resources on forest bird counts from April 22 through 26 on the proposed Oahu Forest NWR area. An odd bird which might have been an endangered Oahu Creeper was sighted on the Kipapa trail.



Bristle-Thighed Curlew

F. HABITAT MANAGEMENT

1. General

This 44.6-acre refuge consists of a centrally located 15-acre, spring-fed wetland area that at one time was an ancient Hawaiian fish pond. Later it was used for rice and taro cultivation. A 5.5 acre moist soil impoundment borders this wetland to the west. This entire wetland area is bordered by a beach and two-lane highway on the south. Scrub forest surrounds the remaining sides. The refuge consists of the following:

- 20.5 acres of wetlands
- 22.1 acres of scrub forest
- 2.0 acres of beach



Kakahaia NWR

2. Wetlands

When this refuge was first established in 1976, the central fish pond contained a total of 15 acres of open water habitat. This wetland now consists of 4 acres of open water surrounded by 11 acres of dense bulrush. A thick algal mat covers 50-80% of the open water area. Waterbird use of this spring-fed wetland was restricted, for the most part, to the open water pond (average depth ca. 50-70 cm.) and the bulrush border surrounding the open pond.

During the summer of 1983, the 11-acre bulrush stand was partially opened by creating radiating channels from the central open water pond with a Menzi Muck backhoe. The channels were excavated to a depth of 4 feet and a width of 15 feet. A perimeter moat was also excavated around the entire wetland to the same dimensions. The moat serves as a barrier to the mongoose, which is the primary predator of nesting waterbirds.

During the last seven years, the sedimentation and subsequent rate at which bulrush has re-invaded the channels and moat created by the Menzi Muck has been extremely rapid. At present, only 10-20% of the formerly-open water habitat has resisted becoming choked with vegetation. In addition, the dredge spoil berms and islands created by the Menzi Muck have served as sites for the establishment of upland vegetation such as Pluchea indica which are now invading the wetland. Since the fish pond is a low-lying, spring-fed wetland, drawing down the water level would be difficult without massive pumping. However, we are currently investigating the feasibility of conducting prescribed burns of the fish pond as a means of setting the bulrush back.

The 5.5-Acre Moist-Soil Impoundment

Since the main bulrush wetland contains no mudflat habitat, the area is used only by coots and waterfowl. In order to create habitat for the endangered stilt and to diversify wetland habitat on the refuge, an additional wetland development project occurred during the summer of 1983. An open flat area along the west side of the refuge was cleared of trees and converted into a 5.5 acre shallow impoundment. Small nesting islands were constructed in the center of this impoundment which was designed to be managed at depths ranging from 0 inches to 1-1/2 feet.

Ideally, the refuge would like to maintain high water levels from October through March in the new impoundment. This would increase habitat for wintering waterfowl and coots. In April the pond would be drawn down to

provide stilt nesting habitat. Water levels would be manipulated through summer months to provide optimum mudflat and shallow water habitat for stilt broods. Dewatering would also allow germination and growth of moist-soil plant species for the upcoming fall and winter months. The entire month of September would be available for the slow build up of the pond to the desired high winter water level.

Since the original windmill water delivery system for the moist-soil impoundment does not adequately provide water to the pond, a supplementary system consisting of a 460-volt submersible pump was installed in 1987. The installation of this pump is critical in maintaining waterbird habitat, given the rapid succession occurring on other wetlands on the island and resulting losses in stilt and coot nesting areas.

Kakahai'a Bulrush Pond

The dredged channels in the old fish pond are being overtaken by exotic vegetation at a rapid rate. The spoil dikes are also getting more upland plant establishment on them; some kiawe trees are growing rapidly and need to be cut periodically. A culvert extends under the highway to the ocean beach for drainage of the main wetland. Typically, the county maintains this culvert by occasional removal of the sand plug in the culvert at the beach. High water levels exist in the old fish pond when the sand plug is in place. This inhibits further encroachment of bulrush into the pond, and high levels also assure a water source for the impoundment when needed. The old pond cannot be completely drained, but extended periods of low water levels permit more establishment of dry-site plant species into wetland vegetation. If a period of low water level could be maintained while a prescribed burn were attempted, it may be possible to improve habitat diversity in the fish pond. However, the pond is surrounded by dense, overhanging stands of kiawe, creating extremely hazardous burning conditions from possible spot fires.

3. Forests

Upland areas of the refuge are covered by dense stands of koa-haole (Leucaena leucocephala), kiawe (Prosopis pallida) and Pluchea spp.

9. Fire Management

No prescribed burning or wildfires occurred on Kakahaia refuge this year.

10. Pest Control

Vegetation control is a year-round maintenance task. Herbicide spraying is used to control exotic vegetation on the roads, dikes and fence lines. Roundup and Rodeo are used per manufacturers instructions.

G. WILDLIFE

1. Wildlife Diversity

Habitat manipulations conducted on the refuge are intended not only to provide optimal habitat for endangered waterbirds, but to maximize habitat diversity to the benefit of all native and migratory wildlife species that use Hawaiian wetlands.

2. Endangered and/or Threatened Species

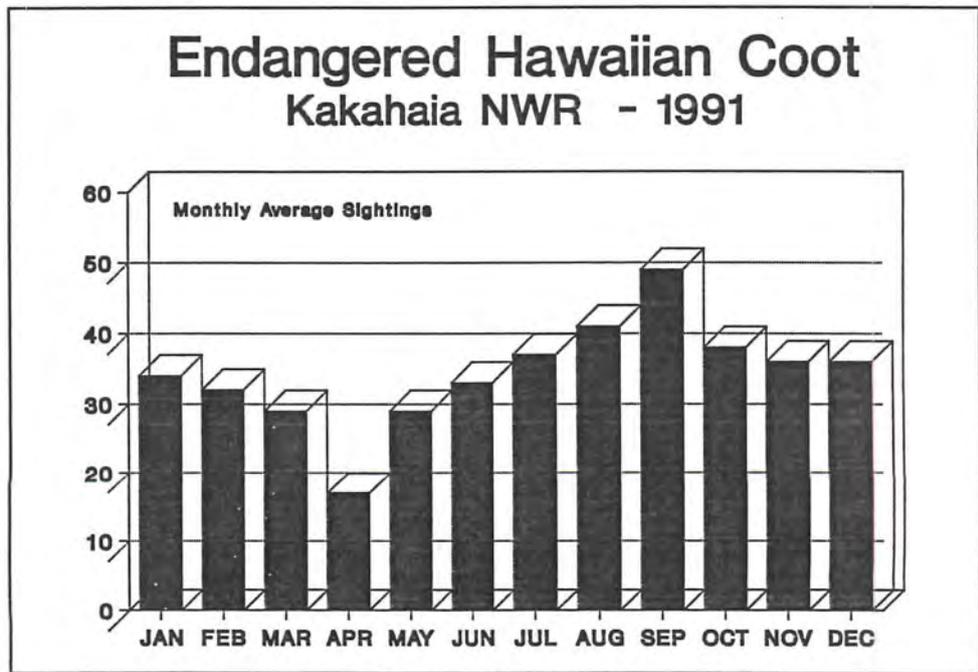
The Hawaiian coot and stilt are two endangered species normally encountered on the refuge. Management of wetland habitat on Kakahaia refuge is oriented toward these endangered species in addition to migrant shorebirds and waterfowl.

Hawaiian Coot ("Alae ke'oke'o")

Coot populations were variable, ranging from as few as 17 during the wet winter months to as many as 49 during the dry fall months. Apparently, coots move between different wetlands on Molokai, and to and from adjacent islands. Habitat availability varies seasonally, especially on this dry side of the island, and it is presumed that bird movements occur to take advantage of good wetland habitat as available. Coot nesting occurred throughout most of the year with 3 or 4 pairs consistently observed nesting, especially through the early summer months. It is not known if the same pairs are territorial and maintain these territories throughout the year. Apparently with higher coot densities there is a reduction in nesting, but the same resident breeders may persist until competition decreases allowing them to nest. Plans to open the large bulrush pond through spraying and burning should result in increasing the available nesting and brood rearing habitat for coots.



Hawaiian Coot or 'Alae ke'oke'o



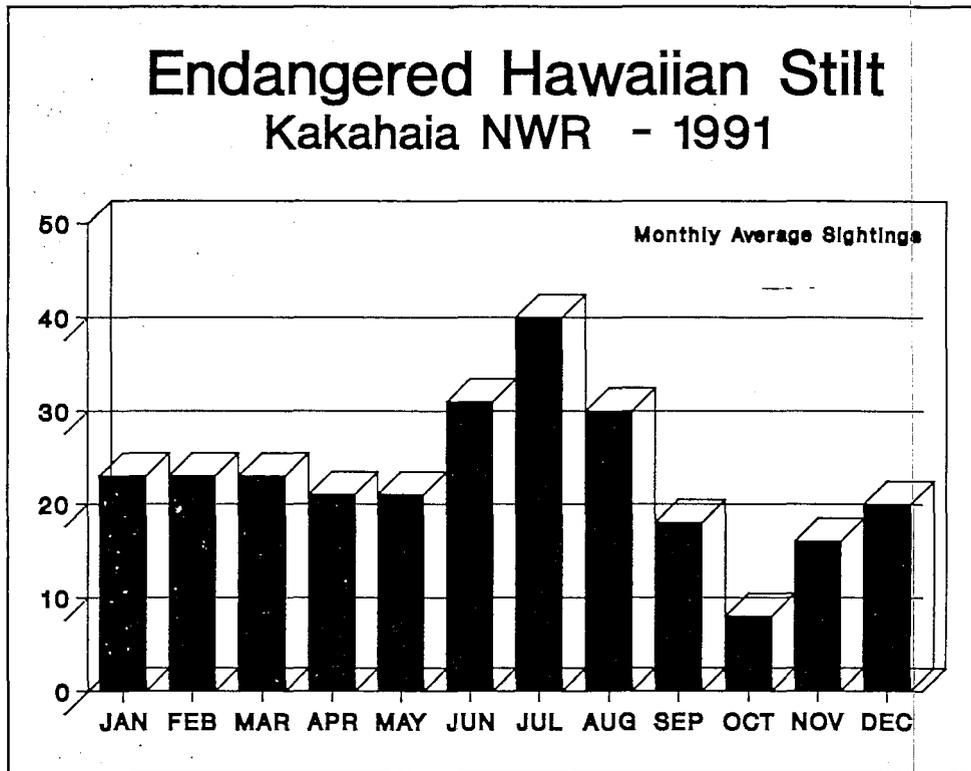
Sightings By Month

Hawaiian Stilt ("Ae'o")

Hawaiian stilt use occurs in the 5.5-acre impoundment which provides nesting islands and shallow feeding areas. Stilt counts were variable throughout the year, depending on our ability to control water levels in this impoundment. Typically 8 to 40 stilts are in the area and, presumably, production will increase with increased ability to control water levels and predator activity.



Hawaiian Stilt or Ae'o



Sightings By Month



Hawaiian Duck ("Koloa")

This species is very mobile and exhibits seasonal variation in use of Kakahaia wetlands. Populations build up in late fall and nesting usually begins in December. Reflooding of drained ponds is timed to coincide with the onset of koloa nesting.



Hawaiian Duck or Koloa

Hawaiian Moorhen ("Alae'ula")

The last reported sighting of a Hawaiian moorhen occurred in 1986. This bird was apparently a survivor of 6 birds that were transplanted to the refuge in 1983.

3. Waterfowl

Migrant waterfowl use of the refuge was noted during the winter months. Northern shoveler, pintail, and green-winged teal are commonly seen on the refuge from September through April.

4. Marsh and Waterbirds

Black-crowned night herons are regularly observed around the edge of the open water area or roosting in nearby trees. Numbers typically ranged from 1 - 9.



Black-Crowned Night Heron

Cattle egrets are common inhabitants at the Kakahaia refuge; typically 1 to 14 birds can be seen on the periphery of the wetlands.

5. Shorebirds, Gulls, Terns, and Allied Species

The 5.5-acre impoundment provides excellent shorebird habitat. These shorebirds are migrating and wintering birds that use the refuge during the fall, winter, and spring months. Common species include: lesser golden plover (2-4), ruddy turnstone (2-4), sanderling (1-2), and wandering tattler (1-2).

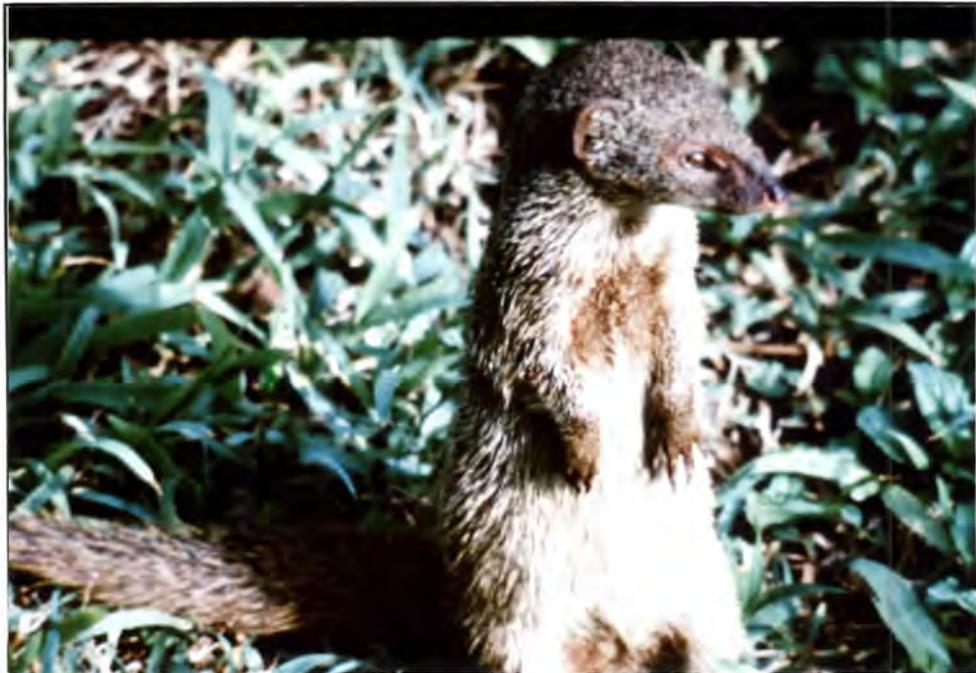
10. Other Resident Wildlife

Occasionally francolins (gray and black), an introduced game bird, can be heard calling as they use the upland areas of the refuge. Young gray francolins have been spotted near the 5.5-acre impoundment, and nesting may occur on the refuge. The island-wide populations of these birds have increased dramatically with the collapse of the island's pineapple growing industry as most of the former pineapple fields have reverted to grass and herbaceous cover.

Axis deer can be found in the thick kiawe forest on the refuge, and they drink water regularly at the bulrush pond and the 5.5-acre impoundment.

15. Animal Control

Live traps were set to catch mongooses, cats, rats and dogs. Mongooses are ubiquitous throughout the low-lying areas of Molokai.



Mongoose

17. Disease Prevention and Control

Manager Glynn and biologist Chang attended a disease workshop from the 12th - 14th on Hawaii island.

H. PUBLIC USE

9. Fishing

Moloka'i residents fish from the beach along the Maui County Park, which is under Special Use Permit from the refuge. Public use data are difficult to obtain due to night fishing and our infrequent visits to the refuge. Estimates derived with the assistance of the state fishery biologist for Maui County suggest that approximately 25 fishermen use the area an average of 2 hours per month each.

14. Picnicking

A day-use picnic area was constructed in 1978 on the ocean side of the highway intersecting the refuge and continues to be maintained by the County of Maui. The concrete tables, constructed by the YCC in 1978, and metal barbecue grills are used on a limited basis by local residents and tourists.

I. EQUIPMENT AND FACILITIES

1. New Construction

The northern boundary was surveyed and cleared by bulldozer in November in preparation for fence construction.

From 11/27 - 11/29, maintenance worker Fisher, biologist Chang and technician Roland constructed approximately 600 feet of new fence.

In December, approximately 260 ft. of fence was constructed and 8 refuge signs posted to complete the new fence.

2. Rehabilitation

Installation of a new pump rod on the refuge windmill, electric motor starter repair and installation of a running time meter to measure water usage on the electric pump occurred in November.

A broken windmill blade was replaced during a two day trip to the refuge in December.

4. Equipment Utilization and Replacement

A new Kubota slope mower tractor was delivered on June 5th. This tractor will improve the predator control program by reducing the thick California grass stands on dike slopes.

5. Communications Systems

A telephone system was installed in the newly acquired Haleiwa office on June 12th.

A fax line and fax machine was installed at the Haleiwa office in October.

J. OTHER ITEMS

1. Cooperative Programs

Refuge staff assisted the state with the annual Winter Water Bird Survey on January 10th.

On August 29th, Fisher and Takayama assisted the state with the Annual Summer Water Bird Survey.

3. Items of Interest

Jan - Refuge staff attended Aviation Flight Safety training.

Mar - Regional office contract specialist Tamara Swerdlik and refuge staff met with owners of the Xcel building in Haleiwa to discuss procurement of office space on the 6th.

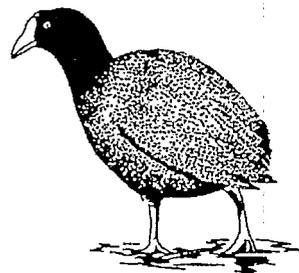
Apr - On the 18th, the Oahu NWR Complex relocated to the Xcel building in Haleiwa on the north shore. The office was previously at the federal building in downtown Honolulu.

Jun - Maintenance worker Fisher completed pesticide applicator certification training on the 28th.

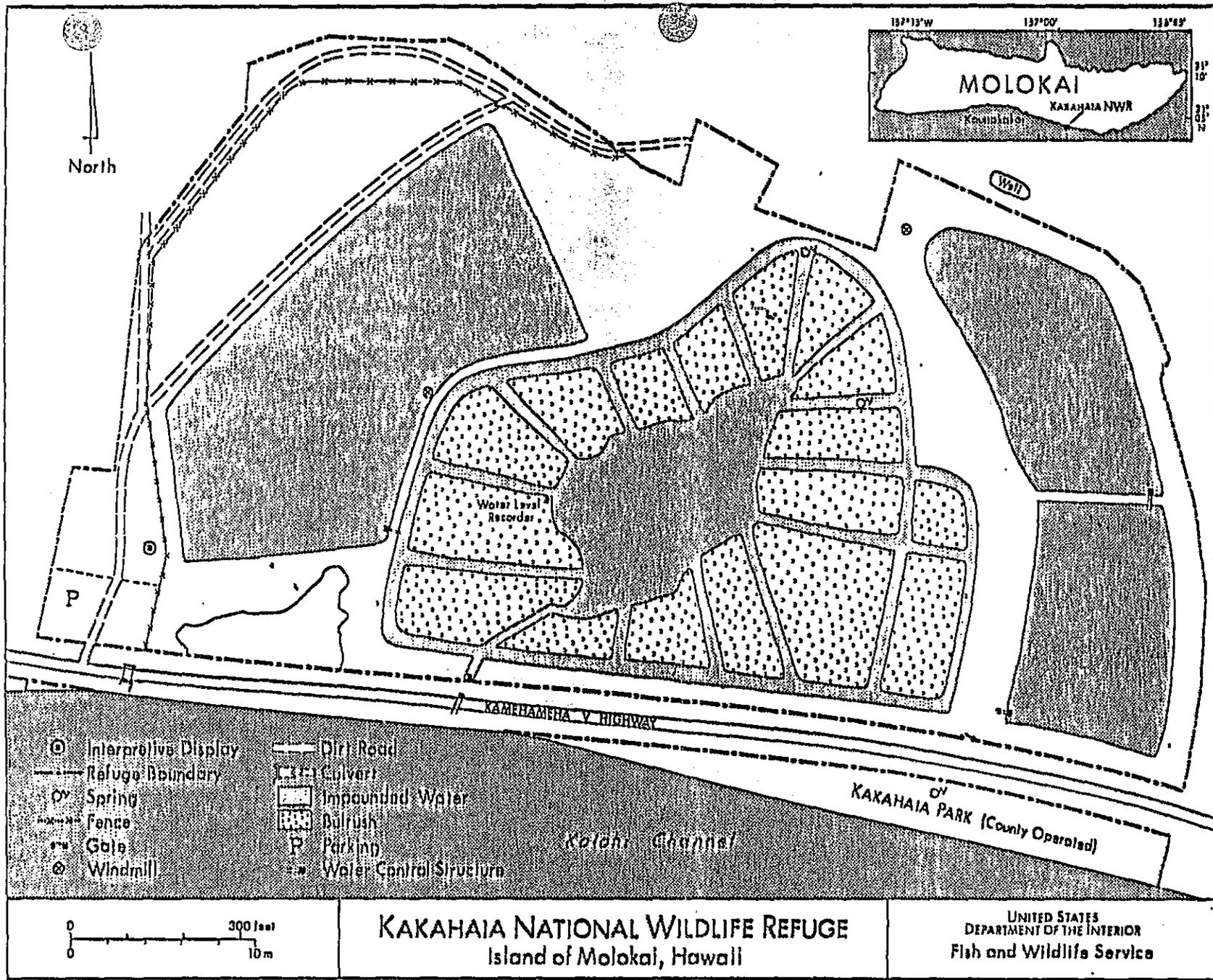
Jul - Maintenance worker Fisher attended Introduction to Wordperfect computer training, 10-11th.

4. Credits

This report was written and edited by Johnny Beall.



Hawaiian Coot

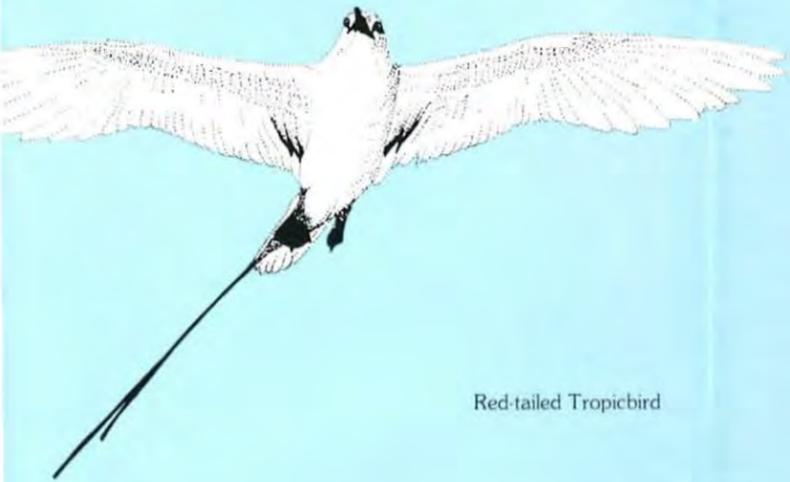


HAWAIIAN AND PACIFIC ISLAND NATIONAL WILDLIFE REFUGE



Masked Boobies

Red-tailed Tropicbird



For more information:

U.S. Fish and Wildlife Service
300 Ala Moana Blvd., Rm. 5302
P.O. Box 50167
Honolulu, Hawaii 96850
(808) 541-1201

Baker Island NWR—This island lies just north of the equator approximately 1,600 miles southwest of Honolulu. The 340-acre island is surrounded by 31,397 acres of submerged land included in the Refuge. Like the Hawaiian Islands NWR, Baker Island has a history of commercial guano harvest late in the 18th century and was occupied by American forces during World War II. The island supports four migratory seabird species.

Howland Island NWR—This island is located within 200 miles of Baker Island in the central Pacific. Both islands are vegetated by grasses, prostrate vines and low-growing shrubs. Howland contains 400 acres of emergent land and 32,150 acres of submerged land within the three mile limit of the Refuge. Guano harvest operations ceased in 1878. This island enjoyed some fame this century when an airstrip was built in 1937 for Amelia Earhart's ill-fated flight. Today Howland Island NWR supports eight species of migratory seabirds.

Rose Atoll NWR—The atoll is the easternmost emergent land in the Samoan Archipelago and is among the smallest of all atolls in the world. Two small islets, less than 20 acres in total size, are protected by a square reef, dominated by coralline algae. The largest of the two islets supports a dense forest of *Pisonia* and *Tournefortia* trees, and these trees provide cover and nest sites for 12 species of migratory seabirds. Threatened green sea turtles frequently nest on the two islets and feed in the central lagoon. Among the diverse marine fauna in the lagoon are numerous fish species and a population of giant clams. The Refuge, which includes the islets, the entire lagoon and surrounding reef, was established in 1974. It is managed cooperatively by the U.S. Fish and Wildlife Service and the American Samoa Government. At 14½ degrees south latitude it is the southernmost refuge in the National Wildlife System.



U.S. Department of the Interior
Fish and Wildlife Service



THE WETLAND REFUGES

Some Interesting Facts About Hawaiian Waterbirds and Wetlands

- The Hawaiian cormorant, Hawaiian noddie, Hawaiian booby and Hawaiian duck are found only on the main Hawaiian Islands—they don't migrate to the mainland.
- The native birds are joined from September to April by pintails, shovellers and other waterfowl that migrate thousands of miles from Canada, Alaska or Russia.
- Shorebirds like plover, tattler, turnstones and sandpeeps also make the same annual migration from the mainland that waterfowl do.



Ruddy Turnstones

Habitats are Acquired and Managed to Enhance Waterbird Use

All birds using the Hawaiian wetlands need appropriate foods and freedom from disturbance. The endangered waterbirds that only nest in Hawaii also need protection from predators. A dependable water supply is necessary to support the waterbirds. Controlling water levels in various ponds can create conditions favorable for certain plants, insects and other organisms which in turn are food for the birds. Creating artificial islands in refuge ponds separates bird nesting areas from dogs, cats and mongoose. Mammal-proof fences afford protection from feral dogs.

Habitat Loss and Predators Endanger the Waterbirds

Formerly more common and more widely distributed, these species have experienced population decline due to continuing loss of habitat, introduced predators and, to some extent, harvest by man. Although celebrated in legends of early Hawaiians, these species were collected for feathers and food, and more recently were hunted for sport until protected prior to World War II. Housing and resorts continue to expand into existing or potential marsh habitat in the Hawaiian Islands. The natural variety of habitats and quality of water and food supply was greater in the past before the wetlands were converted to other uses.

Mainland Migrants and Other Residents also Benefit from Hawaiian Wetlands.

More than two dozen species of ducks and geese occasionally migrate to Hawaiian wetlands for the fall to spring seasons. The most common species are pintails and northern shovellers that breed in North America.

Black-crowned night herons are common residents of the Hawaiian Islands. They feed on fish and invertebrates but may also take young waterbirds.

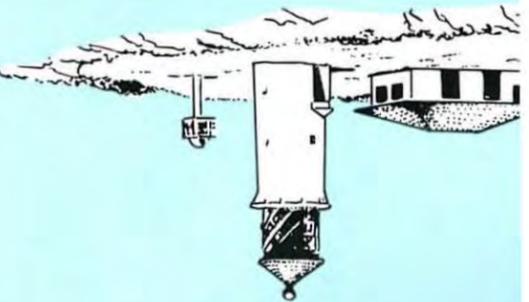
A diverse group of migratory shore birds also winters in Hawaii. They visit wetland refuges where suitable mudflats or shallow water habitats are available. Pacific golden plovers, sandpeeps, wandering tattlers and ruddy turnstones are most common.

Point National Wildlife Refuge



visitors come to Kilauea Point each year to view and marine mammals, to photograph and enjoy the scenery and the historic old lighthouse. The light built in 1913 and placed on the National Register of Historic Places in 1979. At Kilauea Point NWR describe some of the wildlife of the five wetlands refuges and the six remote island refuges and their significance are briefly described. Located 1 mile north on a paved road from Kilauea Point on the north coast of Kauai, Hawaii.

Point National Wildlife Refuge



es of wedge-tailed shearwaters and red-footed booby as the Laysan albatross, the great frigatebird, and other seabirds.

Point National Wildlife Refuge

NWR is open to the public Sunday through Friday. These hours will be expanded as staff and volunteers are available.

natural history books is offered at the lighthouse

THE REMOTE ISLAND REFUGES

Some Facts About Remote Pacific Islands and Wildlife

Over 5 million seabirds (18 species) nest on less than 2,000 acres on the northwestern Hawaiian Islands.

Many seabirds roam the Pacific Ocean for several years before returning to remote islands to nest.

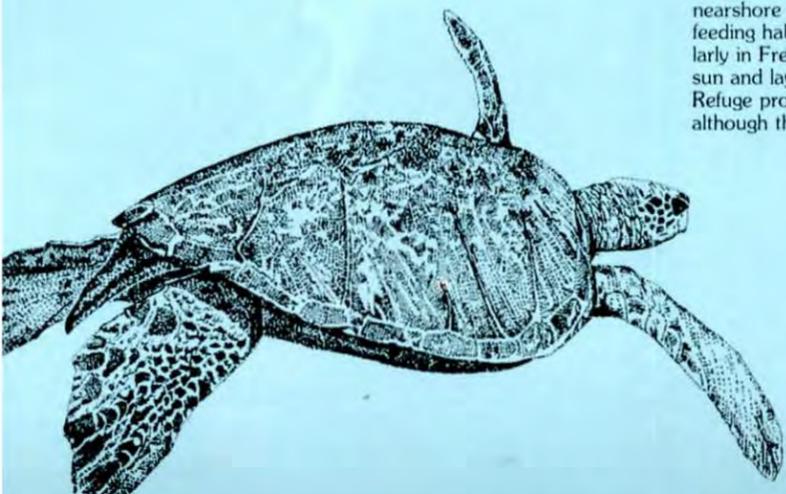
Frigatebirds fly continuously when at sea. Their feathers won't repel water like some other seabirds. To supplement the fish they catch, frigatebirds frighten boobies and shearwaters and take their food. Hawaiians called them Iwa, which means "thief".

Albatrosses don't nest until they are about seven years old. They will choose their mates and nest together each year for life. They may live over 30 years.

250,000 acres of submerged reefs surrounding 1,800 land acres of the remote Hawaiian Islands NWR provide habitat for fish and other life which in turn feed millions of seabirds.

Green Sea Turtles that nest on Pacific islands may roam several hundred miles in search of feeding areas.

As an experiment albatrosses were flown blindfolded to Alaska, San Francisco, Los Angeles, Australia and other points. Upon release they flew back to Midway Island (1,500 miles west of Honolulu) within 10 days.



Remote Island NWRs—Tiny Wildlife Oases in the Vast Pacific Ocean

Mere dots in the vast ocean, the remote mid-Pacific islands host breeding monk seals, turtles and millions of seabirds. They nest on rocky islands and islets among coral atolls.

The marine environment on the remote island refuges is largely undisturbed by commercial exploitation and consequently many species are unusually abundant. The relatively pristine nature of the nearshore waters and the importance of this habitat to seals, turtles and seabirds led to the inclusion of large bodies of protected lagoon and nearshore waters into the boundaries of various remote island refuges.

There are more than 14 million seabirds of 18 species on the Hawaiian Islands NWR alone. Sooty Terns are the most abundant nesters on the remote islands. Also common are albatrosses, shearwaters, petrels, tropicbirds, frigatebirds, boobies, and noddies.

The terrestrial habitat of the Hawaiian Islands National Wildlife Refuge is shared by endemic land birds on the small islands of Nihoa and Laysan. The Nihoa finch and Laysan finch are representatives of the unique Hawaiian honey creeper subfamily that includes several more species in the main Hawaiian Islands. The Nihoa millerbird is an endemic representative of an old world warbler family confined in distribution to this 168 acre island. A close relative formerly found on Laysan Island is now extinct, as is a flightless rail and honeycreeper that inhabited the same island. All three birds were indirect victims of a short but devastating period of human exploitation for guano and feathers which was stopped early in this century when this refuge was established. One additional species, the Laysan duck, barely survived this period and has made a significant comeback.

The Hawaiian monk seal is another endangered species confined in distribution to the Hawaiian Islands NWR. Beaches and rocky shelves on several islands provide space to haul out and rear their pups, while nearshore waters within and adjacent to the Refuge provide critical feeding habitat. These seals share the beaches of sandy islets, particularly in French Frigate Shoals, with green sea turtles that bask in the sun and lay their eggs in sand pits during the summer months. The Refuge provides the primary breeding habitat for the green sea turtles, although the species ranges widely into the main Hawaiian Islands.

Managing Remote Islands for Wildlife.

The remote island refuges are manipulated only where it is necessary to control predators, exotic plants or other factors adversely affecting the habitat or resident wildlife. Public access is severely restricted because of the history of abuse and slow recovery of these vulnerable areas when disturbed. Even research activities are closely scrutinized to minimize unnecessary disturbance and are confined largely to projects likely to yield important management data. A refuge field station is operated at Tern Island in the French Frigate Shoals, Hawaiian Islands NWR.

Remote Island Refuges

Hawaiian Islands NWR—This Refuge, the oldest and largest in the complex was designated in 1909 by President Theodore Roosevelt. The Hawaiian Islands NWR includes all the emergent rocky islands, sandy islets and major atoll lagoons between Nihoa Island and Pearl and Hermes Reef in the northwestern portion of the Hawaiian Archipelago. In total, nearly 1,800 acres of emergent land and over 250,000 acres of submerged land are included. Remnants of prehistoric occupation by early Polynesians are also protected on Nihoa and Necker Islands.

Johnston Atoll NWR—This Refuge is located 825 miles southwest of Honolulu. The Refuge is managed cooperatively with the Defense Nuclear Agency. Twelve species of seabirds breed on four islands within the atoll. The reef community in the lagoon supports diverse marine life including green sea turtles. The atoll was first protected as a federal bird refuge in 1926, although it has been used extensively as a military installation since 1939.

Jarvis Island NWR—Jarvis is part of the Line Islands Archipelago and is located just below the equator, 1,300 miles south of Honolulu. The island is about 1,100 acres in size. The Refuge also includes 36,419 acres of adjacent submerged lands. Like Baker and Howland the island is believed to have been discovered by European sailors early in the 18th century and was also exploited for its guano resources. Eight species of migratory seabirds are known to nest on Jarvis Island. Feral cats were at one time found on all three of the equatorial refuges where they preyed heavily on nesting seabirds. They were successfully eradicated from Baker in 1964 and Jarvis in 1983. All three islands were designated as National Wildlife Refuges in 19

Wetland Refuges



James Campbell NWR (Oahu)

—This Refuge was established in 1977 through the lease of 142 acres of land in two major parcels from the James Campbell Estate. The Refuge includes the spring-fed Punamano Pond and a series of remnant cane wash water settling basins known collectively as Kii Unit. Prior to the closing of the Kahuku Sugar Mill in 1971, these settling basins provided important habitat for stilts, coots, and gallinules. This habitat is being restored and enhanced through major modifications to the impoundments and water system to provide manageable nesting and feeding areas. The Refuge is open to the public on certain weekends and at other times by special permit.

Pearl Harbor NWR (Oahu)

—This 40-acre Refuge was established in 1977 on Navy lands in an effort to compensate for loss of still feeding habitat when a reef runway was added to the Honolulu International Airport. The Honolulu Unit was constructed at the site of remnant salt evaporation ponds through the excavation of new ponds with several nesting islets. Similar habitat was created for the Waiawa Unit at the northwest side of Waiawa Peninsula. These units were created primarily for Hawaiian Stilt, but other resident and migratory birds use them also. The Refuge is open by special permit only.

Public use of wetland refuges is limited because the areas are small and human visitors can disturb the endangered birds.

Public Uses are Limited by Size of Refuges

Maui NWR (Kauai)

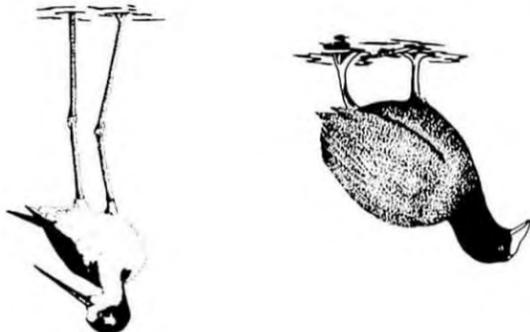
—In 1973 approximately 240 acres of riparian slopes and bottom lands along the Hulalea River were purchased to provide additional waterbird habitat. The Refuge includes ponds formerly in taro and rice that will be modified extensively to attract endemic waterbirds to new breeding and feeding areas. The Refuge lies adjacent to the famous Menehune Fish Pond, a registered national historic landmark. The Refuge is not open to the public. It can be seen from the Menehune overlook along the road.

Maui NWR (Molokai)

—This Refuge, established in 1976, includes a remnant inland freshwater fish pond along the south coast of Molokai. This pond was expanded in 1983 to enhance habitat for and coots. The county of Maui operates a small beach park on

American (Hawaiian) Coots

—are easily recognized by their white floating nests built from aquatic vegetation. Their Hawaiian name is 'Alae Ke'oke'o.



Common Moorhen (Hawaiian Gallinule)

—is related to the coot and is found in similar habitats. It is distinguished by its bright red



Hawaiian Duck or Koloa Maoli

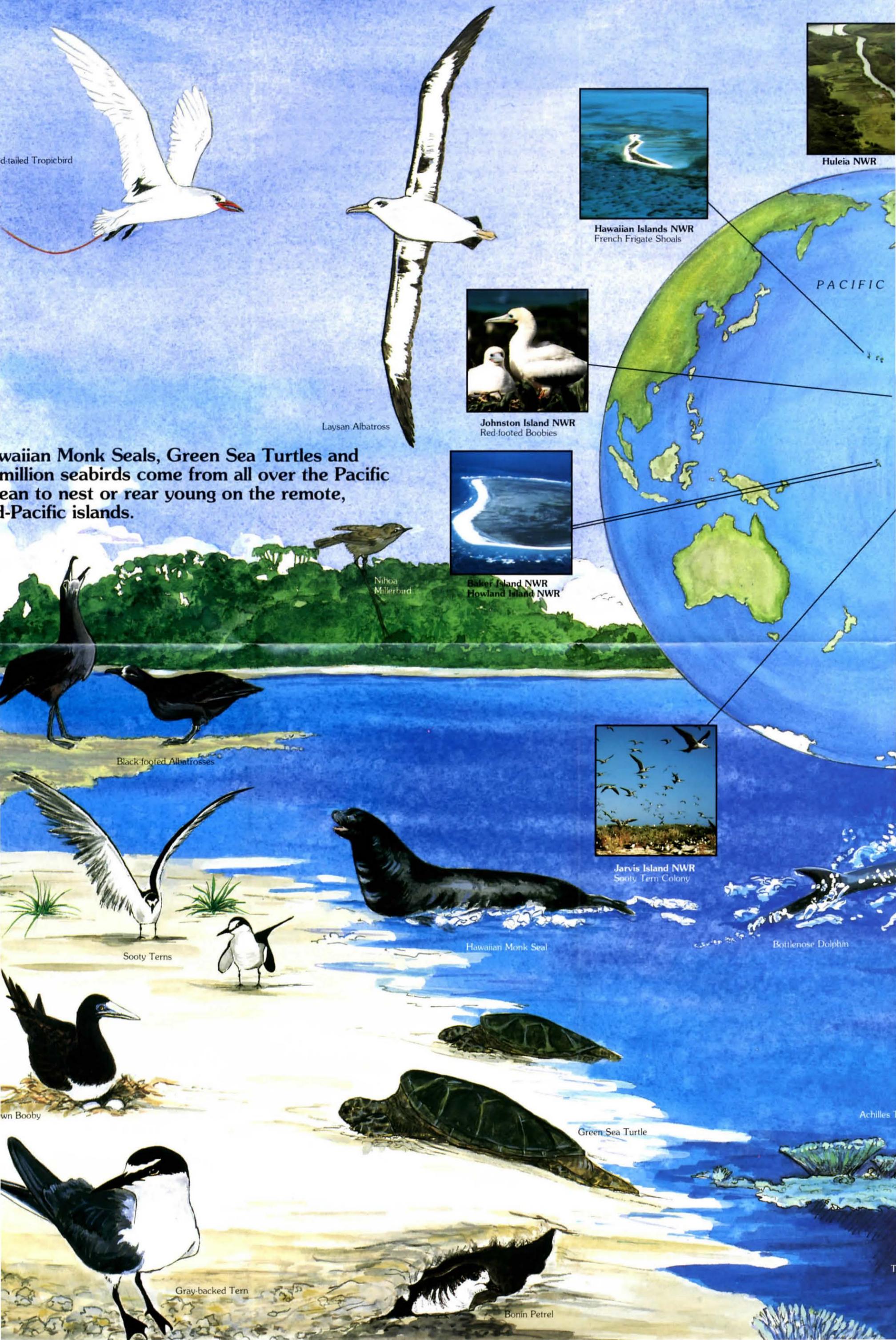
—is similar to though smaller than the common mallard. Koloa Maoli are most common on Kauai where they inhabit natural and artificial ponds, streams, ditches and marshes.



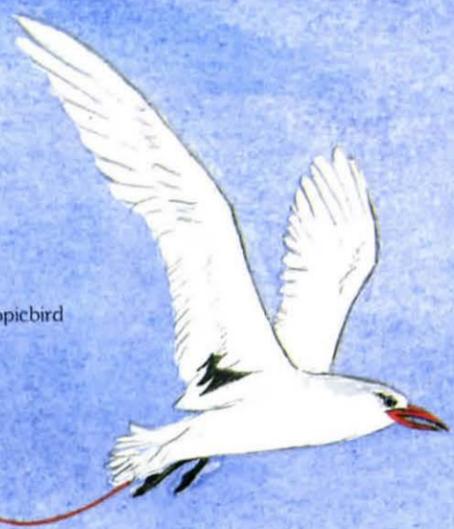
Wetland refuges on the main islands support four endangered water birds that are unique to Hawaii.

Four Endangered Waterbirds are Found on the Wetland Refuges

HAWAIIAN AND PACIFIC ISLAND



Red-tailed Tropicbird



Laysan Albatross



Hawaiian Islands NWR
French Frigate Shoals



Huleia NWR



Johnston Island NWR
Red-footed Boobies

Hawaiian Monk Seals, Green Sea Turtles and million seabirds come from all over the Pacific Ocean to nest or rear young on the remote, island-Pacific islands.



Baker Island NWR
Howland Island NWR



Nihoa Millerbird



Black-footed Albatrosses



Jarvis Island NWR
Sooty Tern Colony



Sooty Terns



Hawaiian Monk Seal



Bottlenose Dolphin



Brown Booby



Green Sea Turtle

Achilles T



Gray-backed Tern



Bonin Petrel

S NATIONAL WILDLIFE REFUGES



Hanalei NWR



Kilauea Point NWR



James Campbell and Pearl Harbor NWRs



Kakahaia NWR



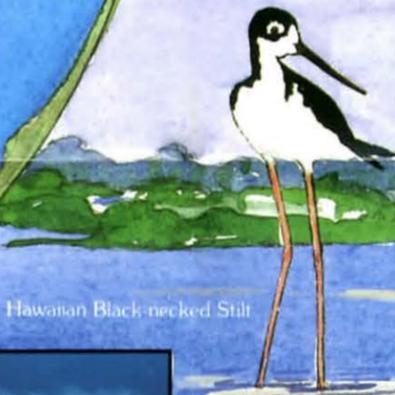
Great Frigatebird



Northern Pintails

Marshes and ponds on the main Hawaiian Islands support endangered resident waterbirds and migrating waterfowl and shorebirds from the North American mainland and other continents.

OCEAN



Hawaiian Black-necked Stilt



Rose Atoll NWR



Pacific Golden Plover



Sanderlings



Wandering Tattler



Common Moorhen (Hawaiian Gallinule)



Hawaiian Coots



Hawaiian Duck (Koloa Maoli)



Black-crowned Night Heron



Acropora Coral



C. HOLLEN