

Technical Report 103

**Distribution and Abundance of Alien and Native Plant
Species in Kaloko-Honokōhau National Historical Park**

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Birds of Kaloko-Honokōhau National Historical Park

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BIRDS OF KALOKO-HONOKŌHAU
NATIONAL HISTORICAL PARK

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ABSTRACT

Twenty-five bird species were detected at fifty-one count stations located along seven transects in Kaloko-Honokōhau National Historical Park. Each station was counted once during fall-winter (October and November 1992) and once again during spring-summer (April and May 1993). Significantly more species per station were detected during the spring counts, but there was no difference in the mean numbers of birds detected per station when the two count periods were compared. Nine of the bird species (36%) were indigenous waterbirds or shorebirds and the other 16 species (64%) were introduced, non-native species. Two of the three indigenous waterbirds are also endemic and endangered. As expected, the bird checklist for Kaloko-Honokōhau contains many more species than those detected during the two short-term censuses. The relatively high species diversity can be attributed to the large amount of wetland (primarily brackish water fishponds with associated marshy areas and anchialine pools) and sandy shoreline available within the park. Like other lowland sites, the high percent of non-native bird species is attributable to centuries of direct or indirect human impact.

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INTRODUCTION

This avifauna inventory was part of a project undertaken in 1992 to describe baseline plants, birds, insects, and mammals in the three coastal National Parks in West Hawai'i.

Descriptions of an avifauna are meaningful only in the context of past distributions, abundances, and species composition for any given area. Over time, changes in vegetation (whether natural or human induced) need to be known in order to understand changes in avian populations. The vegetation, as well as the fauna, at Kaloko-Honokōhau National Historical Park and most of West Hawai'i have been altered by humans for hundreds of years (Olson and James 1982, Cuddihy and Stone 1990), making it perhaps impossible to ascertain the original pristine flora and fauna.

It is probable that prior to the arrival of humans Kaloko-Honokōhau supported a dry, lowland shrubland/forest in areas not covered by new lava. Even today, a lowland remnant lama (*Diospyros sandwicensis*) and 'ohi'a lehua (*Metrosideros polymorpha*) forest with some hala pepe (*Pleomele hawaiiensis*) and naio (*Myoporum sandwicense*) can be found on a flow immediately above Kaloko-Honokōhau in an area targeted for further

development (the "light" industrial area). One or more of three species of extinct flightless rails, known historically and from fossils (Olson and James 1991), may have occupied the area. The extinct Lesser and Greater Koa-finches (*Rhodacanthis flaviceps* and *R. palmeri*), historically known only from the Kona and Ka'ū districts, may have lived nearby, as well as the Palila (*Loxioides bailleui*), which the fossil record documents originally occurred down to sea level on at least O'ahu (Olson and James 1982). The sluggish Kona Grosbeak (*Chloridops kona*), which was known from only a tiny area of Kona, fed on the hard seeds of native naio trees, which even today grow at sea level within the boundaries of Kaloko-Honokōhau. A large, flightless goose of unknown affinity was recently discovered in a lava tube 29 km (18 mi) from Kailua-Kona, along with fossils of a previously unknown flightless rail, a new species of crow, and a large 'Akialoa. Fossils of other birds such as the Palila, Hawaii 'O'o (*Moho nobilis*), and Kioea (*Chaetoptila angustipluma*), were also found (Giffin 1993). It is possible that some of these birds also frequented Kaloko-Honokōhau. Naturally occurring anchialine ponds and pools would have been populated with Hawaiian Stilts (*Himantopus mexicanus knudseni*), Hawaiian Coots (*Fulica alai*), Common Moorhen (*Gallinula chloropus sandvicensis*) and Hawaiian Ducks (*Anas wyvilliana*), as well as an assortment of migratory waterfowl and shorebirds.

The avifauna of Kaloko-Honokōhau has been severely altered by humans over the past centuries, only retaining two endemic and one indigenous non-migratory waterbird species from its original fauna. However, the park has a unique opportunity to utilize its past history of change to promote the preservation of the few remaining indigenous species and to educate the public about its rich past.

In 1992 and 1993, counts and other surveys were made by the author within Kaloko-Honokōhau in order to obtain a "snapshot" of the avifauna. Future changes can now be more easily documented, and hopefully this will encourage the slowing down or elimination of man-induced changes in species composition.

STUDY SITE

Kaloko-Honokōhau National Historical Park is located north of Kailua-Kona town and south of Keāhole Airport on the west coast of Hawaii Island. Kaloko-Honokōhau is bordered on its southern boundary by Honokōhau Harbor, and by Queen Ka'ahumanu Highway (Highway 19) and Kaloko Industrial Park on its eastern boundary. Although the Park's lava substrate is dated at 1,000 to 10,000 years old, the Park lies at the foot of Hualālai, a volcano which last erupted in 1801. The area under jurisdiction is approximately 255 ha, with approximately 202 additional hectares of State land, the latter being primarily offshore waters (U.S. Department of the Interior 1994).

Two ancient Hawaiian fishponds (Kaloko and 'Aimakapā) and a fishtrap ('Ai'ōpio) occur within the Park, as well as numerous anchialine pools which are

recognized as a rare and unique resource (Chai 1991). 'Aimakapā Fishpond contains primarily brackish water (Maciolek and Brock 1974), and Kaloko Fishpond historically had a "greater fresh water influx into the pond" (Chai 1991) than at the present time. Annual rainfall is low in the Kona coast lowlands; most of the freshwater outflow along the Park's coastline is recharged from rainfall on the slopes of Hualālai volcano (U.S. Department of the Interior 1994).

A wide variety of bird species are attracted to the Park due to its range of habitats including: sandy and rocky intertidal shoreline, brackish water wetlands with some mudflats (includes the fishponds and anchialine pools), coastal strand vegetation, open shrubland/grassland, areas of primarily bare lava, and small pockets of non-native forest.

METHODS

Fifty-one bird stations were marked along seven of the nine transects (Transects 1,2,3,4,5,6, and 7) flagged within Kaloko-Honokōhau National Historical Park. A unique position number was assigned to each bird station (Fig. 1). The transects coincided with those used for botanical and entomological surveys. Every 150 m was considered a bird station, beginning at 0 m on each transect, which usually was located on the Park's eastern boundary near Highway 19.

Eight minute counts were made twice at each station, once during fall-winter (October or November 1992) and once again during spring-summer (April or May 1993). The number of birds of each species, type of detection (audio, visual, or audio-visual), and detection distance were recorded. All counts were completed prior to 1030 hours and under low wind conditions without precipitation. Generally, only one transect was completed in a morning, primarily due to the difficulty of hiking on 'a'ā lava and the need to complete counts before the hottest hours of the day when bird activity dramatically decreases.

Each station was subsequently assigned to a vegetation type based on the predominant botanical and substrate descriptions obtained from the botanical crew. The four categories were: trees, mainly kiawe (*Prosopis pallida*) and/or milo (*Thespesia populnea*); shrubs, mostly koa haole (*Leucaena leucocephala*) or Christmasberry (*Schinus terebinthifolius*); grassland, mainly fountain grass (*Pennisetum setaceum*); and 'a'ā, comprised mostly of bare lava with some scattered vegetation.

Additional bird species were detected in Kaloko-Honokōhau by the author between March 1992 and July 1993 and also between January to December of 1994. These observations were generally made during waterbird censuses and nest surveys at Kaloko and 'Aimakapā Fishponds and along the tidal zone and anchialine pools. Although these data will not be presented in full detail here, the observations as well as records from Reginald David (pers. comm.) and other sources (Paton and Scott 1985) have been incorporated into this report's bird checklist.

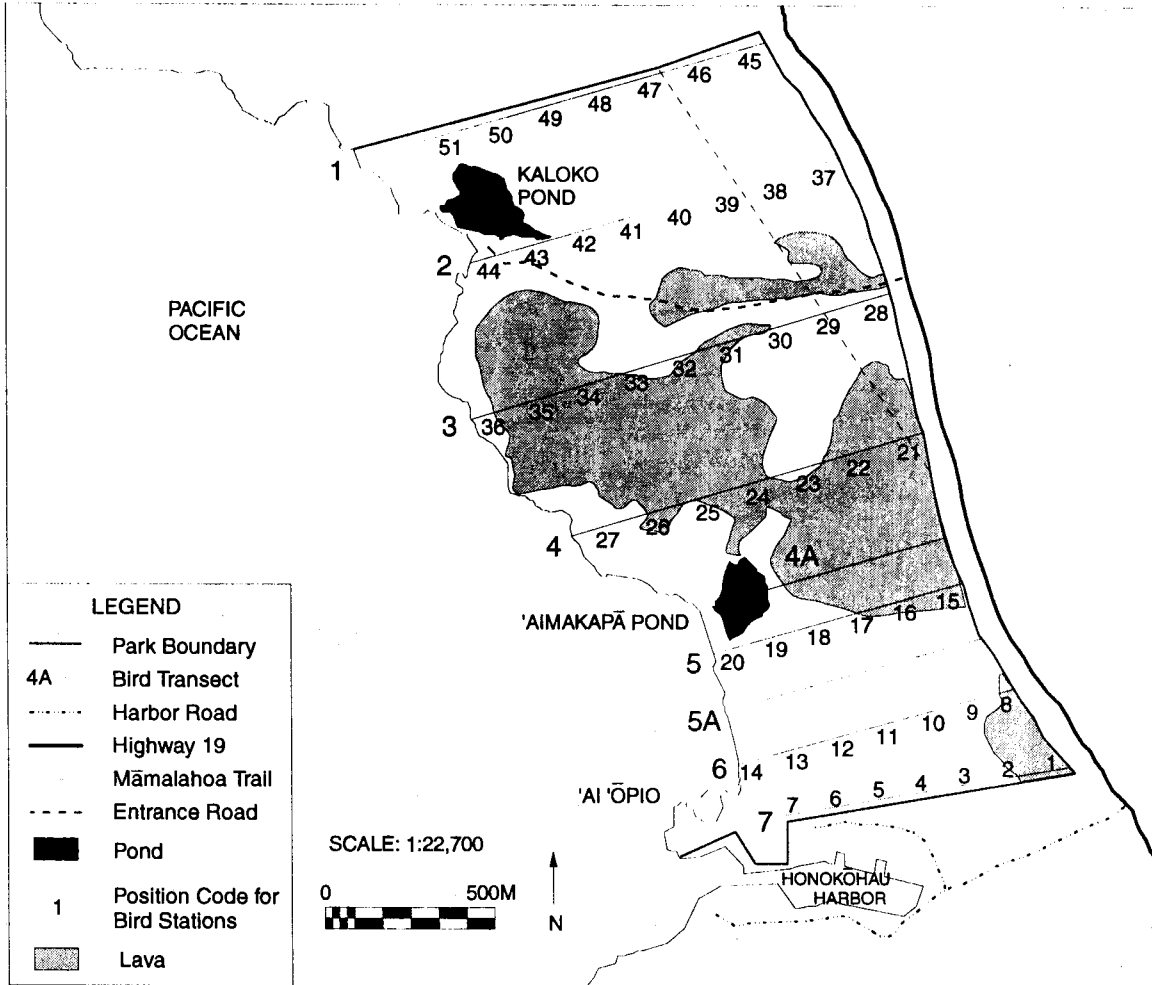


FIGURE 1. Map of Kaloko-Honokōhau National Historical Park, Kona, Hawai'i, showing the location of bird transects and stations. Numerous anchialine pools are not indicated due to uncertainty as to their number and locations.

RESULTS

Twenty-five bird species were detected during 102 station counts at Kaloko-Honokōhau (Table 1). The species most frequently detected during the counts was a common introduced passerine, the Japanese White-eye (*Zosterops japonicus*), and the least frequently detected was a water-dependent indigenous species, the Pied-billed Grebe (*Podilymbus podiceps*). Japanese White-eyes were detected at almost every station, whereas Sanderlings (*Calidris alba*) and Northern Shovelers (*Anas clypeata*) were each detected on only one station each.

Two of the bird species (8%) detected during station counts were endangered, another seven species (28%) were indigenous (includes migratory species), and another 16 species (64%) were introduced species.

Because data were paired and not normally distributed, these differences were analyzed using a nonparametric paired test, the Wilcoxon Signed Rank Test (Schlotzhauer and Littell 1987). The mean number of species detected per station was significantly higher during the spring-summer counts than during the fall-winter counts (4.5, S.D.=2.2, versus 3.8, S.D.=1.8; Wilcoxon Signed Rank Test, $P=0.006$).

The mean number of birds per station was not significantly different between spring-summer and fall-winter (9.9, S.D.=7.4, versus 10.8, S.D.=11.6; Wilcoxon Signed Rank Test, $P=0.36$). For eleven of the twelve most frequently detected species, spring-summer and fall-winter mean number of birds per station were compared. Rock Doves (*Columba livia*) were excluded from these comparisons because they were associated with permittee living quarters within the Park and should be considered semi-feral. Three species were detected significantly more often during the spring-summer, one species was detected significantly more often during fall-winter, and there was no significant difference for the other seven species (Table 2).

Eighteen stations were assigned the vegetation code "grassland", 15 stations occurred primarily on bare lava, 10 stations were described as predominantly shrub, and eight stations were assigned to the tree category (Table 3). Average counts of birds per station categorized by vegetation type and season are shown on Table 4. Friedman's Method for Randomized Blocks (Sokal and Rohlf 1981) indicated that the effect of vegetation was not significant in determining the total number of birds per station per season.

The average number of bird species per station are shown by vegetation category and season on Table 5. Friedman's Method for Randomized Blocks indicated that the effect of vegetation was not significant in determining the total number of species per station per season.

When bird detections were mapped by station, there were no obvious distributional patterns other than a tendency toward fewer species detected per station on open lava (Table 5) and an obvious tendency for waterbirds to be detected near water (the fishponds, anchialine pools, or shoreline). Surprisingly, although there was a tendency for fewer numbers of birds per station to be detected on lava (when compared to stations classified as predominantly tree or grass), there were fewest numbers of birds at those stations classified as shrub.

Table 6 is the bird checklist for Kaloko-Honokōhau, containing sightings from my station counts as well as other field work and sources described under METHODS. Nomenclature follows the current AOU checklist of North American birds (1983) and its subsequent supplements (AOU 1993).

DISCUSSION

General Comments

Although more species were detected during the spring-summer counts, there was no significant difference in the total numbers of birds detected per station. It would appear superficially that spring-summer is the best time to do bird surveys at Kaloko-Honokōhau; however, it is significantly hotter to hike on the lava flows during that time of year and the danger of heat stress is greater unless counts are confined to the very earliest morning hours (also see METHODS). A variety of migratory waterfowl and shorebirds are present during fall-winter but could otherwise be missed if counts were done too late in the spring. Probably the optimal survey period would be the months of February and March, when migrants are still present and resident passerines are more conspicuous due to courtship and breeding.

Because of the small size of Kaloko-Honokōhau and the closeness of the stations along the transects, the author suggests that no density estimates be made from this data, although using data from every other station could provide some density index. The stations' closeness means that bird detections are not necessarily independent, although this varied by species. Common Mynas (*Acridotheres tristis*), Northern Cardinals (*Cardinalis cardinalis*), and Black Francolin (*Francolinus francolinus*) are three species occurring at Kaloko-Honokōhau that have especially loud vocalizations, making them much easier to detect than most of the other birds. What were suspected to be the same birds could often be heard at several adjacent stations. The topography and vegetation of Kaloko-Honokōhau exacerbate the problem, because the park is quite level and the vegetation is generally low and sparse except in the wetter areas. Sounds were not well dampened as they would be in forested areas. The traffic noise generated by Highway 19 made it impossible to hear all birds within two stations' distance of the road. The highway is scheduled to be widened, which will make it even noisier and may remove one or two of the easternmost stations along some transects.

All of the species considered to be common (Table 6) in Kaloko-Honokōhau were detected by the bird counts along the transects (Table 1), except for the migrant Northern Pintails (*Anas acuta*). Although Pintails are certain to be seen in the proper habitat ('Aimakapā Fishpond) during the proper season (winter), there are not many of them present. Waterbird censuses at 'Aimakapā Fishpond itself more easily and consistently detect them. Obviously, waterbird and shorebird abundances are more accurate if concentrated effort is made in wetland and intertidal areas, rather than from sampling along a transect. However, great care must be taken to minimize count time if an entire pond is censused so that the same birds are not recounted.

In urban parks, some bird species are difficult to categorize as to whether they are wild or domestic. In addition to the feral duck discussed later, several geese and a flock of Rock Doves occurred in Kaloko-Honokōhau near 'Ai'ōpio Fishtrap during this survey period, in conjunction with the permittee residences. The geese were eventually penned, but the Rock Doves free-fly throughout the area and are functionally semi-feral. For this reason, the Rock Doves are included in the Park's species checklist (Table 6).

Wetlands and Waterbirds

The only indigenous resident birds remaining in Kaloko-Honokōhau are two endemic, endangered waterbird species, the Hawaiian Stilt (*Himantopus mexicanus knudseni*) and the Hawaiian Coot (*Fulica alai*), and the indigenous Black-crowned Night-heron (*Nycticorax nycticorax hoactli*). All three of these waterbird species bred in Kaloko-Honokōhau during 1992 and 1993, and were detected during the station counts (Table 1). However, station counts are obviously a poor method for censusing these wetland species, primarily because they occur in concentrated populations at wetland and tidal sites. Based on 104 censuses made during all of 1992 and through July of 1993, the mean count of Hawaiian Coots was 56 and the mean count of Hawaiian Stilts was 12 (Morin 1994). The Black-crowned Night-heron population consisted of a single family group and their associated progeny. In 1994, an avian botulism outbreak reduced the Coot numbers to less than five within the Park. The Stilt population was less seriously affected, numbering approximately 10 pairs before and after the botulism outbreak. These observations will be elsewhere discussed (Morin in prep. a, in prep. b).

Although both Hawaiian Coots and Hawaiian Stilts occur at 'Aimakapā Fishpond within Kaloko-Honokōhau, currently only the Stilts irregularly use Kaloko Fishpond. Since the mangrove (*Rhizophora mangle*) removal at Kaloko Fishpond in the early 1990's, Hawaiian Stilt use of that fishpond has increased (Morin unpubl. data). Migratory waterfowl visit 'Aimakapā but do not currently utilize Kaloko Fishpond. The Black-crowned Night-heron and migratory shorebirds, such as Wandering Tattlers (*Heteroscelus incanus*) and Pacific Golden-Plovers (*Pluvialis fulva*) do use the habitat at Kaloko Fishpond. The endangered Hawaiian Stilts, the Black-crowned Night-herons, and all of the shorebirds use the rocky intertidal beach areas for feeding, especially during low tides.

Some significant consideration should be given to this use when planning trails and human activities in these areas.

In addition to the native waterbirds, the introduced Cattle Egret (*Bubulcus ibis*) visits Kaloko-Honokōhau seasonally from other parts of the island. Although numbers are currently small (e.g. 5 to 12 birds at a time), this species should not be allowed to invade Kaloko-Honokōhau in larger numbers and especially should not be allowed to establish a breeding rookery in or near the park. Cattle Egrets are suspected to prey on native waterbird chicks and to compete with native waterbirds for resources. At Hawaiian airports statewide, Cattle Egret flocks have become significant safety hazards when they fly across runways while hunting for insects in nearby grassy areas; Kaloko-Honokōhau's proximity to the Keāhole Kona Airport makes this a consideration. Fortunately, Keāhole Airport is primarily surrounded by open lava and currently has few grassy areas

Another introduced resident in 'Aimakapā Fishpond is the single feral female Mallard (*Anas platyrhynchos*) which almost certainly represents an escapee from a domestic population, probably from a west Hawai'i resort north of Kaloko-Honokōhau. Any recent reports of the endangered Koloa (*Anas wyvilliana*) at 'Aimakapā Fishpond are without a doubt this single duck. Mallards have seldom been documented as natural migrants to the Hawaiian Islands (Pyle 1988). Although domestic waterfowl are supposed to be pinioned to prevent such accidental escapes, in reality there are many feral Mallards resident statewide. Feral Mallards have bred with the endemic Hawaiian Ducks or Koloa and created a management nightmare of hybrids that are swamping the Koloa genome out of existence (Browne et al. 1993; Engilis and Reid in prep.; Engilis and Pratt 1993). Although Koloa have not recently used the Kaloko-Honokōhau fishponds as habitat, it is not in the best interest of any of the endangered native waterbirds to have feral waterbird populations become established. They would compete for food and space (e.g., nesting, resting, breeding display, feeding sites) and can also be a reservoir of avian diseases.

A unique resident of 'Aimakapā is the Pied-billed Grebe, which has been seen infrequently on other Hawaiian islands but has apparently only nested at 'Aimakapā Fishpond. Other than the Hawaiian Stilt, Hawaiian Coot, and the Black-crowned Night-Heron, this is the only other waterbird species that currently breeds at Kaloko-Honokōhau. The Grebe is believed to have arrived on its own in the mid 1980's. It is not endangered in its normal natural range, which is North and South America (Harrison 1983). It is a secretive species, and difficult to census. There is usually at least one grebe nest on 'Aimakapā Fishpond at any given time, but eggs do not seem to hatch or are frequently abandoned. The author believes that this small population is declining, possibly due to decreased fertility from extreme inbreeding. If the Grebe population did continue to increase, managers (in consultation with State and Federal wildlife biologists) would need to decide at what level it should be stabilized in order to protect limited resources for the endangered, endemic waterbirds.

The Blue-winged Teal (*Anas discors*) that bred at 'Aimakapā Fishpond in 1982 and 1983 (Paton et al. 1984) were no longer breeding there during 1992, 1993, or 1994.

Many species of migratory waterfowl and shorebirds use Kaloko-Honokōhau during approximately half the year (Table 6). Except for Northern Shovelers, the numbers per species are generally not very high. However, due to the scarcity of wetlands in Hawai'i, and especially on Hawai'i Island, this use is extremely important for the maintenance of the migratory flyways, not only as a stopover site but also as a primary destination. Although many species are listed as not present every year or present in very small numbers, there are few trained bird observers in West Hawai'i and none that make daily observations within Kaloko-Honokōhau National Historical Park. Almost certainly other species occur in Kaloko-Honokōhau, and some species occur more frequently, and in greater numbers, than has been documented thus far.

Much work remains to be done in order to restore Kaloko-Honokōhau wetlands and associated areas for maximum waterbird breeding and maintenance. Where appropriate, specific areas should be managed as if they were wildlife refuges, with predator and people control, water quality management, vegetation management (e.g., nonnative plant species control or eradication), and other techniques such as artificial nesting islands and selective area closures. Leaving the wetlands in a status quo while otherwise developing the park for heavier human use dooms the waterbirds to inevitable decline and eventual eradication.

Seabirds and Passerines

Occasionally indigenous seabirds, which breed elsewhere, are sighted from shore, such as Great Frigatebirds (*Fregata minor palmerstoni*). Although no gulls breed in the Hawaiian Islands, a gull or two visits Kaloko-Honokōhau each year, generally arriving in the fall or winter months and departing in the spring like the regular migrants. Frequently gulls are in immature plumage, making them more difficult to identify to species. Unlike some of the other main Hawaiian Islands, there are no offshore protected islets along the Kona coast; this is partly why there are so few indigenous seabirds sighted from the Kona shoreline.

All of the passerines currently occurring in Kaloko-Honokoahu are introduced species, many of them originally brought to Hawai'i as cage birds. Although the general public enjoys seeing a variety of colorful birds, Kaloko-Honokōhau should prioritize the preservation of the rare endangered waterbirds and indigenous birds rather the preservation of non-native species which exist in adequate abundance elsewhere in the world.

MANAGEMENT RECOMMENDATIONS

Bird Counts and Staffing

Like the other two low elevation National Parks in West Hawai'i, Kaloko-Honokōhau National Historical Park is a likely place for regular ornithological surveys to reveal new introductions or distributional expansions of non-native species, especially because (unlike the other two parks) it is close to a harbor and an airport as well as a relatively large suburban area. Until a qualified biologist is on staff at Kaloko-Honokōhau, other experienced birders should be encouraged to make formal waterbird counts whenever possible, especially during the fall-winter when migrants are likely to be present. The annual Audubon Christmas Bird Count, and the State Semi-annual Waterbird Count are two examples of counts which currently take place, even though the abilities of the observers to identify species are not always constant.

Unlike the other two West Hawai'i parks, Kaloko-Honokōhau has a significant amount of wetland habitat, including numerous anchialine pools, two fish ponds, and tidal areas. These wetlands support the most important endangered waterbird habitat on Hawai'i Island (Engilis and Reid in prep.). 'Aimakapā and 'Ōpae'ula (Makalawena), along with Kaloko, have been identified as the key "unit of habitat for waterbirds on the island of Hawai'i" (Shallenberger 1977). A recent book cites 'Aimakapā Fishpond as "one of Hawai'i's most important and accessible birding localities" (Pratt 1993). For these reasons, the author recommends that the National Park Service should consider entering into a formal Cooperative Agreement or Memorandum of Understanding with the Refuges arm of the U.S. Fish and Wildlife Service for the management of wetlands and waterbirds within Kaloko-Honokōhau National Historical Park. At a minimum, Kaloko-Honokōhau should work toward having a wildlife biologist plus one or two biological technicians on its staff to manage the wetlands and waterbirds, as well as the other wildlife. The author is currently working on a waterbird/wetland management plan for Kaloko-Honokōhau, which will include this as a long-term recommendation. In the meantime, knowledgeable Park staff should continue to keep permanent records of bird sightings, documented whenever possible with photographs. Repetition of the transect censuses reported here should be made by an ornithologist at some regular interval such as every three to five years. Thorough waterbird censuses should be made by ornithologists much more frequently, but at an absolute minimum twice a year.

Access to Fishponds

Because it is the primary waterbird site within the Park, access to the area around 'Aimakapā Fishpond should not be enhanced. No trails should be built and no existing trails publicized (put on visitor brochures) within at least 45 m (150 ft) of the fishpond, unless the trail is up above on the lava flow mauka of the fishpond. Visitors should be encouraged to view the birds from a distance with spotting scopes or binoculars, ideally from some type of viewing tower. The endangered Hawaiian Coot breeds year-round at

'Aimakapā, and the endangered Hawaiian Stilt has an lengthy breeding season from February to August. Both of these species build nests which are often on the shore. The Stilt nests are especially difficult to see due to their cryptic coloration and lack of nesting material; for this reason, they are very vulnerable to being stepped on. Young Stilt chicks crouch in the grass and hide quietly when humans come very near, and also may be crushed underfoot without the visitor knowing the chick is there. Stilt adults and chicks feed on mudflats that line the fishponds. Repeated visitation by humans disturbs incubation at the nest and feeding in the mudflats; enough disturbance can cause nest abandonment and chick mortality. Adult Stilts become visibly distressed (engaging in wide flights, dive bombing, and alarm calling) even when humans are rather far from the nest and chicks. Other Stilts from nearby nests and territories often join in on these distress calls and flights. Frequently visitors and even staff are unaware that the Stilts' distress is caused by their presence.

Bird Control

Recommendations that were presented in the DISCUSSION section included: 1) Non-native Cattle egrets should be controlled if their use of Kaloko-Honokōhau becomes any greater, if they are observed predating waterbird young, or if they establish a rookery within or near the Park. 2) Any feral waterbirds such as domestic ducks or geese should be removed from the Park as soon as they are observed. 3) Pied-billed Grebes should be controlled if their numbers greatly expand and they begin to compete with the endangered species for breeding and food resources. 4) Kaloko-Honokōhau should make it a policy that indigenous and endangered species maintenance rather than non-native species maintenance will guide management priorities. Of course, the removal of any birds must be done by knowledgeable biologists with appropriate state and federal credentials and permits, in order to ensure that indigenous migratory or endangered endemic or other protected birds are not accidentally removed or injured.

Botulism and Disease Management

The recent 1994 botulism outbreak focused the author on other management needs for long-term maintenance of endangered waterbirds in the Park that are probably equally important but less obvious. At an absolute minimum, Kaloko-Honokōhau must maintain a technician whose primary job is to pick up dead animal carcasses and trap predators (Morin in prep.). The custodial agency for wetlands at Kaloko-Honokōhau needs to work actively with other government agencies and private landowners to develop contingency plans for future avian disease outbreaks. Waterbirds such as Stilts, Coots, and migratory ducks do not stay at one site, but use wetlands and shoreline up and down the coast. Management activities such as picking up dead carcasses to control disease spread, or simply monitoring coastwide waterbird populations to detect disease outbreaks and population changes is a multi-agency job. Disease management, even if no rehabilitation is done, is very labor intensive. No single agency in West Hawai'i is adequately staffed for the task.

Fishpond Management

Kaloko-Honokōhau should conduct a formal study for reopening the makahā (sluice gate) at 'Aimakapā. The Pond is currently almost fresh water, which is largely why the Hawaiian Coots and migratory waterfowl are relatively abundant there. The current salinities of the fishpond as well as the salt tolerances of the vegetation need to be known before a decision is made to alter the pond's salinity by re-opening the gate. The mudflats within the fishpond are partly the result of siltation and re-opening the sluice gate, if done improperly, could remove too much silt and seriously degrade the fishpond for Stilt feeding sites. Water depths of 13 cm or less seem to be optimal for Stilt foraging (Engilis and Pratt 1993). If the sluice gate is ever re-opened, it must be done with the utmost of care.

'Aimakapā Fishpond used to be much larger than it currently is; areas which previously were open water have silted in (Kikuchi and Belshe 1971). Some of this silted-in area should gradually be reopened through vegetation removal so that waterbird habitat is restored. Care must be taken to leave the reopened areas shallow (see above).

Kaloko-Honokōhau National Historical Park should conduct a formal study for the feasibility of rebuilding the seawall at Kaloko Fishpond. This would reduce the salinity of the fishpond, making it more attractive to a wider variety of waterbirds and shorebirds. Extensive removal of non-native plants, primarily the pickleweed *Batis maritima*, and restoration of indigenous wetland plants would also greatly enhance this fishpond's ability to support waterbirds and shorebirds.

Waterflow Monitoring

The final and urgent recommendation is that underground flows of freshwater into the Park from upslope need to be identified and quantified before waterflow is further decreased (e.g. via drilled wells, upslope deforestation and development). It is possible that the reduction of underground freshwater flows is impacting coastal wetlands (e.g. fishponds and anchialine pools) by reducing minimum flows during the dry months. It is already too late to identify original minimum quantities. Reductions of freshwater inflows could not only increase salinities but could also alter the movement of nutrients and sediment. These changes could have serious consequences for wetlands and endangered waterbird populations.

The juxtaposition of native endangered waterbirds and indigenous migratory species with introduced bird species, as well as native flora with non-native plants, provides Kaloko-Honokōhau National Historical Park with a prime opportunity to eloquently interpret the "story" of human alteration of native ecosystems.

LITERATURE CITED

- American Ornithologists' Union. 1983. Check-list of North American birds. 6th edition. Allen Press, Inc., Lawrence, Kansas. 877 pp.
- American Ornithologists' Union. 1993. Thirty-ninth supplement to the American Ornithologists' Union check-list of North American birds. *Auk* 110(3): 675-682.
- Browne, R.A., C.R. Griffin, P.R. Chang, M. Hubley, and A.E. Martin. 1993. Genetic divergence among populations of the Hawaiian Duck, Laysan Duck, and Mallard. *Auk* 110(1): 49-56.
- Chai, D.K. 1991. An inventory and assessment of Kaloko Pond, marsh, and anchialine pools at Kaloko-Honokōhau National Historical Park, North Kona, Hawaii. Univ. Hawaii Coop. Natl. Park Resourc. Studies Unit Tech. Rept. 76. Botany Dept., Univ. of Hawaii at Manoa, Honolulu, HI 96822. 16 pp.
- Cuddihy, L.W. and C.P. Stone. 1990. Alteration of native Hawaiian vegetation: effects of humans, their activities and introductions. Univ. of Hawaii Press, Honolulu, HI 96822. 138 pp.
- Engilis, A. and T.K. Pratt. 1993. Status and population trends of Hawaii's native waterbirds, 1977-1987. *Wilson Bull.* 105: 142-158.
- Engilis, A., and F.A. Reid. In prep. Hawaiian Waterbirds Recovery Plan. 3rd Revision, first Draft. U. S. Fish and Wildlife Service, Region 1. 142 pp. + 8 Figs.
- Giffin, J.G. 1993. New species of fossil birds found at Pu'u Wa'awa'a. *'Elepaio* 53(1): 1-3.
- Harrison, P. 1983. Seabirds, an identification guide. Houghton Mifflin Co., Boston, MA 02108. 448 pp.
- Kikuchi, W.K. and J. Belshe. 1971. Examination and evaluation of fishponds on the leeward coast of the island of Hawaii. Rept. prepared for Hawaii County Planning Comm., Hilo, HI.
- Maciolek, J.A. and R.E. Brock. 1974. Aquatic survey of the Kona coast ponds, Hawaii Island. Sea Grant Advisory Rep. UNIHI -SEAGRANT-AR-74-04. NOAA and U.S. Bureau of Sport Fisheries and Wildlife (USFWS), Honolulu, HI. 73 pp.
- Morin, M.P. 1994. Hawaiian fishponds and endangered waterbirds on the Kona Coast. *Trans. West. Sect. Wildl. Soc.* 30: 66-71.

- Morin, M.P. In prep. a. Endangered waterbird reproduction at Kaloko-Honokōhau National Historical Park, Hawaii Island. Univ. of Hawaii Coop. Natl. Park Resourc. Studies Unit Tech. Rept. Botany Dept., Univ. of Hawaii, Honolulu, HI 96822.
- Morin, M.P. In prep. b. Response of a remnant population of endangered waterbirds to avian bolulism. Trans. West. Sect. Wildl. Soc. Sparks, Nevada. Jan. 31-Feb. 3, 1996.
- Olson, S.L. and H.F. James. 1982. Prodrum of the fossil avifauna of the Hawaiian Islands. Smithsonian Contrib. Zool. 365. Smithsonian Institution Press.
- Olson, S.L. and H.F. James. 1991. Descriptions of thirty-two new species of birds from the Hawaiian Islands: Part I. Non-passeriformes. Ornithol. Monog. No. 45. 88 pp.
- Paton, P.W.C., A. Taylor, and P.R. Ashman. 1984. Blue-winged Teal nesting in Hawaii. Condor 86: 219.
- Paton, P.W.C. and J. Michael Scott. 1985. Water birds of Hawaii Island. 'Elepaio 45 (8): 69-76.
- Pratt, H.D. 1993. Enjoying birds in Hawaii. Mutual Publishing, Honolulu, HI 96816. 193 pp.
- Pyle, R.L. 1988. Checklist of the birds of Hawaii. 'Elepaio 44: 47-58.
- Shallenberger, R.J. 1977. An ornithological survey of Hawaiian wetlands. U.S. Army Corps of Engineers, Ahuimanu Productions, Honolulu, HI. Contract DACW 84-77-C-0036. 406 pp.
- Schlotzhauer, S.D. and R.C. Littell, Ph.D. 1987. SAS system for elementary statistical analysis. SAS Institute, Inc., Cary, NC 27512-8000. 416 pp.
- Sokal, R.R. and F.J. Rohlf. 1981. Biometry, 2nd ed. W.H. Freeman and Co., New York. 859 pp.
- U.S. Dept. of the Interior. National Park Service. 1994. General Management Plan / Environmental Impact Statement. Kaloko-Honokōhau National Historical Park, 73-4786 Kanalani St. #14, Kailua-Kona, Hawaii 96740. 347 pp.

TABLE 1. Cumulative numbers for species detected during eight minute counts during two seasons, and % of stations where each species was detected on the 51 stations at Kaloko-Honokōhau. Each station was counted once during each season.

	Count Frequencies			% of Stations	
	Fall- Winter	Spring- Summer	Total	Fall- Winter	Spring- Summer
Japanese White-eye	135	129	264	92%	90%
House Finch	65	72	137	69%	78%
Nutmeg Mannikin	87	10	97	29%	8%
Common Myna	30	63	93	29%	43%
Yellow-billed Cardinal	39	49	88	37%	43%
Rock Dove	46	20	66	4%	2%
Hawaiian Coot	37	12	49	6%	10%
Northern Cardinal	9	35	44	14%	45%
Warbling Silverbill	37	5	42	10%	4%
Zebra Dove	19	22	41	28%	18%
Spotted Dove	7	25	32	12%	26%
Yellow-fronted Canary	2	19	21	4%	26%
Black Francolin	4	14	18	6%	22%
Hawaiian Stilt	3	9	12	4%	10%
Pacific Golden Plover	7	1	8	12%	2%
Ruddy Turnstone	2	5	7	2%	2%
Cattle Egret	7	0	7	4%	0%
Wandering Tattler	1	5	6	2%	10%
Northern Shoveler	6	0	6	2%	0%
House Sparrow	1	4	5	2%	6%
Black-crowned Night Heron	1	4	5	2%	6%
Sanderling	3	0	3	2%	0%
Saffron Finch	0	3	3	0%	4%
Lavender Waxbill	3	0	3	4%	0%
Pied-billed Grebe	2	0	2	4%	0%
TOTALS	553	506	1059		

TABLE 2. Comparisons of average bird numbers detected per station for fall-winter (FW) and spring-summer (SS) counts for 11 of the 12 most common species at Kaloko-Honokōhau.

	FW Mean	S.D.	SS Mean	S.D.	P
Japanese White-Eye	2.65	1.8	2.53	1.5	0.967
House Finch	1.27	1.8	1.41	1.2	0.326
Nutmeg Mannikin*	1.71	4.6	0.20	0.9	0.004
Common Myna	0.59	1.3	1.24	3.8	0.066
Yellow-billed Cardinal	0.76	1.5	0.96	1.5	0.361
Hawaiian Coot	0.73	4.3	0.24	0.9	0.938
Northern Cardinal*	0.18	0.5	0.69	0.9	0.0006
Warbling Silverbill	0.73	3.2	0.10	0.5	0.281
Zebra Dove	0.37	0.8	0.43	1.1	0.878
Spotted Dove*	0.14	0.4	0.49	1.1	0.047
Yellow-fronted Canary*	0.04	0.2	0.37	0.8	0.0005

*Difference between seasonal counts is significantly different from zero.

TABLE 3. Vegetation categories of habitat surrounding bird stations at Kaloko-Honokōhau.

VEG. TYPE	STATION NUMBERS
GRASS	3, 4, 5, 6, 7, 10, 33, 34, 37, 38, 39, 40, 42, 44, 45, 46, 48, 49
LAVA	1, 2, 15, 16, 17, 21, 22, 23, 24, 25, 30, 31, 32, 35, 36
SHRUB	8, 9, 11, 12, 13, 28, 29, 41, 47, 50
TREE	14, 18, 19, 20, 26, 27, 43, 51

TABLE 4. Mean of total number of birds per station for each vegetation category during the FW (fall-winter) and SS (spring-summer) counts at Kaloko-Honokōhau. Vegetation was not a significant effect in determining the total number of birds per station (see text).

VEG. TYPE	FW	SS	# OF STATIONS
TREE	MEAN=18.0	MEAN=11.4	8
	S.D.=15.2	S.D.=5.9	
SHRUB	MEAN=9.9	MEAN=6.3	10
	S.D.=8.0	S.D.=2.9	
GRASS	MEAN=11.2	MEAN=11.3	18
	S.D.=14.0	S.D.=8.9	
LAVA	MEAN=7.9	MEAN=9.9	15
	S.D.=6.3	S.D.=7.8	

TABLE 5. Mean numbers of bird species per station for each vegetation category during the FW (fall-winter) and SS (spring-summer) counts at Kaloko-Honokōhau. Vegetation was not a significant effect in determining the number of species per station (see text).

VEG. TYPE	FW	SS	# OF STATIONS
TREE	MEAN=4.9 S.D.=2.5	MEAN=4.8 S.D.=1.9	8
SHRUB	MEAN=3.6 S.D.=1.2	MEAN=3.8 S.D.=1.5	10
GRASS	MEAN=3.6 S.D.=1.8	MEAN=4.9 S.D.=2.2	18
LAVA	MEAN=3.5 S.D.=1.6	MEAN=4.4 S.D.=2.8	

TABLE 6. Bird checklist for Kaloko-Honokōhau National Historical Park

	Status	Abundance	Occurrence	Breeding
FAMILY PODICIPEDIDAE				
Pied-billed Grebe (<i>Podilymbus podiceps</i>)	I	C	YR	BR
FAMILY PROCELLARIIDAE				
Wedge-tailed Shearwater, 'Ua'u kani (<i>Puffinus pacificus</i>)	I	R	YR	PH
FAMILY SULIDAE				
Brown Booby, 'Ā (<i>Sula leucogaster plotus</i>)	I	O	YR	PH
FAMILY FREGATIDAE				
Great Frigatebird, 'Iwa (<i>Fregata minor palmerstoni</i>)	I	O	YR	PH
FAMILY ARDEIDAE				
Great Blue Heron (<i>Ardea herodias</i>)	I	X	M	BE
Cattle Egret (<i>Bubulcus ibis</i>)	A	O	YR	UB
Black-crowned Night-Heron, 'Auku'u (<i>Nycticorax nycticorax hoactli</i>)	I	U	YR	BR
FAMILY THRESKIORNITHIDAE				
White-faced Ibis (<i>Plegadis chihi</i>)	I	X	M	BE
White-faced or Glossy Ibis (<i>Plegadis sp.</i>)	I	X	M	BE

TABLE 6. Bird checklist for Kaloko-Honokōhau National Historical Park (Continued)

	Status	Abundance	Occurrence	Breeding
FAMILY ANATIDAE				
Brant (<i>Branta bernicla</i>)	I	X	M	BE
Greater White-fronted Goose (<i>Anser albifrons</i>)	I	X	M	BE
Green-winged Teal (<i>Anas crecca</i>)	I	O	M	BE
Mallard (<i>Anas platyrhynchos</i>)	A	U	YR	UB
Northern Pintail, Koloa māpu (<i>Anas acuta</i>)	I	C	M	BE
Garganey (<i>Anas querquedula</i>)	I	X	M	BE
Blue-winged Teal (<i>Anas discors</i>)	I	O	M	BR
Cinnamon Teal (<i>Anas cyanoptera</i>)	I	X	M	BE
Northern Shoveler, Koloa mohā (<i>Anas clypeata</i>)	I	C	M	BE
Gadwall (<i>Anas strepera</i>)	I	X	M	BE
Eurasian Wigeon (<i>Anas penelope</i>)	I	X	M	BE
American Wigeon (<i>Anas americana</i>)	I	U	M	BE
Canvasback (<i>Aythya valisineria</i>)	I	X	M	BE

TABLE 6. Bird checklist for Kaloko-Honokōhau National Historical Park (Continued)

	Status	Abundance	Occurrence	Breeding
FAMILY ANATIDAE (Continued)				
Ring-necked Duck (<i>Aythya collaris</i>)	I	U	M	BE
Tufted Duck (<i>Aythya fuligula</i>)	I	X	M	BE
Greater Scaup (<i>Aythya marila</i>)	I	R	M	BE
Lesser Scaup (<i>Aythya affinis</i>)	I	O	M	BE
Hooded Merganser (<i>Lophodytes cucullatus</i>)	I	X	M	BE
FAMILY ACCIPITRIDAE				
Osprey (<i>Pandion haliaetus</i>)	I	X	M	BE
FAMILY PHASIANIDAE				
Black Francolin (<i>Francolinus francolinus</i>)	A	U	YR	BR
Gray Francolin (<i>Francolinus pondicerianus</i>)	A	U	YR	BR
FAMILY RALLIDAE				
Hawaiian Coot, 'Alae ke'oke'ō (<i>Fulica alai</i>)	E*	C	YR	BR
American Coot (<i>Fulica americana americana</i>)	I	R	M	BE

TABLE 6. Bird checklist for Kaloko-Honokōhau National Historical Park (Continued)

	Status	Abundance	Occurrence	Breeding
FAMILY CHARADRIIDAE				
Black-bellied Plover (<i>Pluvialis squatarola</i>)	I	X	M	BE
Pacific Golden-Plover, Kōlea (<i>Pluvialis fulva</i>)	I	C	M	BE
Semipalmated Plover (<i>Charadrius semipalmatus</i>)	I	O	M	BE
FAMILY RECURVIROSTRIDAE				
Hawaiian Stilt, Ae'ō (<i>Himantopus mexicanus knudseni</i>)	E*	C	YR	BR
FAMILY SCOLOPACIDAE				
Lesser Yellowlegs (<i>Tringa flavipes</i>)	I	R	M	BE
Wandering Tattler, 'Ūlili (<i>Heteroscelus incanus</i>)	I	C	M	BE
Grey-tailed Tattler (<i>Heteroscelus brevipes</i>)	I	X	M	BE
Spotted Sandpiper (<i>Actitis macularia</i>)	I	R	M	BE
Whimbrel (<i>Numenius phaeopus phaeopus</i>)	I	X	M	BE
Bristle-thighed Curlew, Kioea (<i>Numenius tahitiensis</i>)	I	X	M	BE
Bar-tailed Godwit (<i>Limosa lapponica</i>)	I	X	M	BE

TABLE 6. Bird checklist for Kaloko-Honokōhau National Historical Park (Continued)

	Status	Abundance	Occurrence	Breeding
FAMILY SCOLOPACIDAE (Continued)				
Ruddy Turnstone, 'Akekeke (<i>Arenaria interpres</i>)	I	C	M	BE
Sanderling, Hunakai (<i>Calidris alba</i>)	I	C	M	BE
Western Sandpiper (<i>Calidris mauri</i>)	I	R	M	BE
Rufous-necked Stint (<i>Calidris ruficollis</i>)	I	R	M	BE
Least Sandpiper (<i>Calidris minutilla</i>)	I	R	M	BE
Pectoral Sandpiper (<i>Calidris melanotos</i>)	I	R	M	BE
Sharp-tailed Sandpiper (<i>Calidris acuminata</i>)	I	R	M	BE
Dunlin (<i>Calidris alpina</i>)	I	R	M	BE
Ruff (<i>Philomachus pugnax</i>)	I	R	M	BE
Short-billed Dowitcher (<i>Limnodromus griseus</i>)	I	R	M	BE
Long-billed Dowitcher (<i>Limnodromus scolopaceus</i>)	I	O	M	BE
Wilson's Phalarope (<i>Phalaropus tricolor</i>)	I	X	M	BE
Red-necked Phalarope (<i>Phalaropus lobatus</i>)	I	X	M	BE

TABLE 6. Bird checklist for Kaloko-Honokōhau National Historical Park (Continued)

	Status	Abundance	Occurrence	Breeding
FAMILY LARIDAE				
Laughing Gull (<i>Larus atricilla</i>)	I	O	M	BE
Franklin's Gull (<i>Larus pipixcan</i>)	I	R	M	BE
Bonaparte's Gull (<i>Larus philadelphia</i>)	I	R	M	BE
Ring-billed Gull (<i>Larus delawarensis</i>)	I	R	M	BE
Herring Gull (<i>Larus argentatus</i>)	I	X	M	BE
Glaucous-winged Gull (<i>Larus glaucescens</i>)	I	X	M	BE
Caspian Tern (<i>Sterna caspia</i>)	I	X	M	BE
Little Tern (<i>Sterna albifrons</i>)	I	X	M	BE
Least Tern (<i>Sterna antillarum</i>)	I	X	M	BE
Black Tern (<i>Chlidonias niger</i>)	I	X	M	BE
Sooty Tern, 'Ewa'ewa (<i>Sterna fuscata oahuensis</i>)	I	R	YR	PH
FAMILY COLUMBIDAE				
Rock Dove (<i>Columba livia</i>)	A	C	YR	BR

TABLE 6. Bird checklist for Kaloko-Honokōhau National Historical Park
(Continued)

	Status	Abundance	Occurrence	Breeding
FAMILY COLUMBIDAE (Continued)				
Spotted Dove (<i>Streptopelia chinensis</i>)	A	C	YR	BR
Zebra Dove (<i>Geopelia striata</i>)	A	C	YR	BR
FAMILY PSITTACIDAE				
Rose-ringed Parakeet (<i>Psittacula krameri</i>)	A	R	YR	NB
FAMILY TYTONIDAE				
Barn Owl (<i>Tyto alba</i>)	A	U	YR	UB
FAMILY ALCEDINIDAE				
Belted Kingfisher (<i>Ceryle alcyon</i>)	I	X	M	BE
FAMILY MIMIDAE				
Northern Mockingbird (<i>Mimus polyglottos</i>)	A	U	YR	BR
FAMILY STURNIDAE				
Common Myna (<i>Acridotheres tristis</i>)	A	C	YR	BR

TABLE 6. Bird checklist for Kaloko-Honokōhau National Historical Park (Continued)

	Status	Abundance	Occurrence	Breeding
FAMILY ZOSTEROPIDAE				
Japanese White-eye (<i>Zosterops japonicus</i>)	A	C	YR	BR
FAMILY EMBERIZIDAE				
Northern Cardinal (<i>Cardinalis cardinalis</i>)	A	C	YR	BR
Yellow-billed Cardinal (<i>Paroaria capitata</i>)	A	C	YR	BR
Saffron Finch (<i>Sicalis flaveola</i>)	A	C	YR	BR
FAMILY FRINGILLIDAE				
House Finch (<i>Carpodacus mexicanus</i>)	A	C	YR	BR
Yellow-fronted Canary (<i>Serinus mozambicus</i>)	A	C	YR	BR
FAMILY PASSERIDAE				
House Sparrow (<i>Passer domesticus</i>)	A	U	YR	BR
FAMILY ESTRILDIDAE				
Lavender Waxbill (<i>Estrilda caerulescens</i>)	A	U	YR	BR
Warbling Silverbill (<i>Lonchura malabarica</i>)	A	U	YR	BR

TABLE 6. Bird checklist for Kaloko-Honokōhau National Historical Park (Continued)

	Status	Abundance	Occurrence	Breeding
FAMILY ESTRILDIDAE (Continued)				
Nutmeg Mannikin (<i>Lonchura punctulata</i>)	A	C	YR	BR
Java Sparrow (<i>Padda oryzivora</i>)	A	U	YR	UB

CHECKLIST KEY:

Status

- I - Indigenous: occurs naturally, not brought by humans (also called native).
- E - Endemic: found naturally only in Hawaii and nowhere else in the world. A special subset of native.
- A - Alien introduction by humans (also called non-native, introduced, or exotic).
- * - Endangered.

Abundance

- C - Common: certain to be seen in proper habitat or season.
- U - Uncommon: not easily seen even though present.
- O - Occasional: seen a few times a year at Kaloko-Honokōhau.
- R - Rare: seen every 2 to 5 years at Kaloko-Honokōhau.
- X - Accidental: has been seen only once or twice at Kaloko-Honokōhau.

Occurrence

- YR - Year round resident.
- M - Migrant or vagrant: generally present from September - May.

Breeding

- BR - Breeding: is known or is likely to have nested at Kaloko-Honokōhau at least once within the past two decades.
- UB - Unknown if breeding has occurred at or near Kaloko-Honokōhau National Historical Park within the past two decades.
- PH - Pelagic seabird seen nearshore: in the Hawaiian Archipelago breeds mainly on offshore islets or Northwestern Hawaiian Islands and also breeds outside Hawaiian Archipelago.
- BE - Breeds elsewhere outside of Hawaiian Archipelago
- NB - Breeding is extremely unlikely to have occurred at Kaloko-Honokōhau within the past two decades.