



**Pacific Island Ecosystems Research Center**

# **Site Reconnaissance for Koloa (Hawaiian Duck)**

## **Study, May 2006**

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# Site Reconnaissance for Koloa (Hawaiian Duck) Study, May 2006

By Kimberly Uyehara

## Purpose

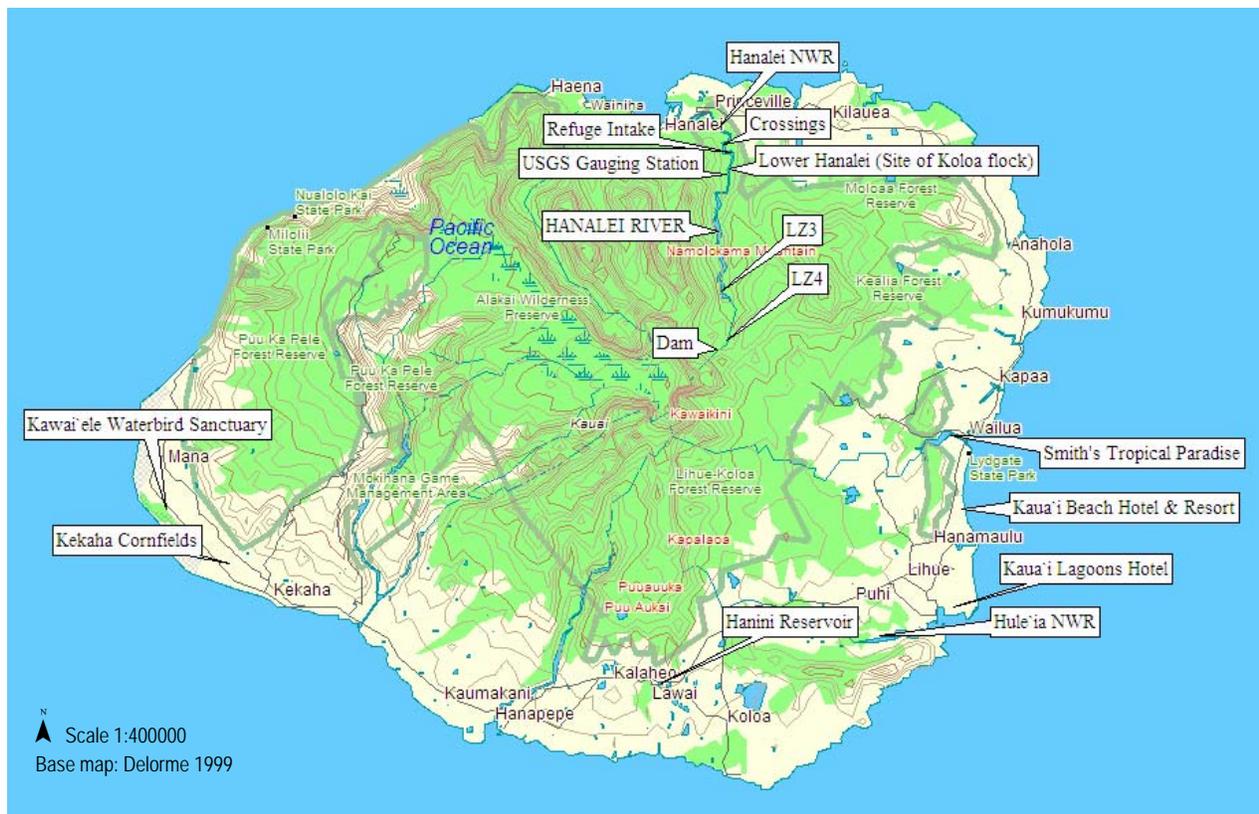
The purpose of the trip was to (1) collect background information, (2) evaluate potential study sites, and (3) assess trapping feasibility for future research on endangered Hawaiian Duck (Koloa maoli, *Anas wyvilliana*), feral Mallard (*A. platyrhynchos*), and their hybrids in collaboration with the University of California at Davis and the U.S. Fish and Wildlife Service. Hybridization with the feral Mallard is the primary threat to the persistence of Koloa (Engilis and others, 2002; USFWS, 2005).

## Pre-trip Preparations

Kimberly Uyehara reviewed the Koloa literature, Hanalei River maps and aerial photography, and Koloa, Mallard, and hybrid maps for Kauai (USFWS, 2005). Uyehara consulted with: Jan Surface (USDA-NRCS), Thomas Kaiakapu (DLNR-DOFAW), Marie Bruegmann and Brenda Zaun (USFWS), and Jennifer Crummer, Michelle Reynolds, and Jim Jacobi (USGS-BRD). Originally we planned to survey the Alakai Swamp; however, due to the logistics, this could not be accomplished within the time allotment. Therefore, Uyehara conducted assessments with Thomas Kaiakapu at sites with reported Mallards (1 day) and in the Hanalei River Valley (2 days). The field trip was conducted May 15-17, 2006.

State waterbird surveys from 1999-2003 show six sites with 1-2 feral Mallards: Wainiha River Taro Fields, Hanalei National Wildlife Refuge (NWR), Waiakalua Reservoir, Sloggett Reservoir, Smith's Tropical Paradise, and Hanini Reservoir (USFWS, 2005). A seventh site is the Hilton Kauai

Beach Hotel & Resort. Uyehara surveyed 4 of these 7 sites, the Kawai'ele Waterbird Sanctuary, and the upper and lower Hanalei River (Fig. 1). General criteria to be considered as a future sampling site were: (1) easily accessible to researchers, (2) limited public access or human activity that may interfere with duck trapping efforts, and (3) high probability of capturing Koloa and/or hybrids with minimal chance of harming birds. Photographs of these sites are found in the Appendix (Figs. A1-7).



**Figure 1.** Sites referenced in this report, island of Kauai

## **Kauai Trip**

**Monday, May 15, 2006**

Relevant notes from interview with Ernest Ventura, retired Division of Fish & Game (DFG)

Biologist

DOFAW Wildlife Manager Thomas Kaiakapu and Uyehara interviewed Ernest Ventura who, from 1966-1967, was the Assistant Biologist to DFG's Senior Biologist Gerald Swedberg. Ventura conducted bird surveys, at many of the wetlands and all of the waterways, for Swedberg's 5-year Koloa life history study on Kauai. Over the course of a year, 168 Koloa were observed on 122 stream miles (5.8 percent of Kauai's 2,092 stream miles) or 1.4 Koloa per mile (Swedberg, 1967). Stream surveys were conducted alone, by foot, with a map and compass. The terrain was difficult and surveys involved constant rock hopping, scanning from afar, and sneaking up on birds. Koloa, in small numbers, were usually observed in calm pools. Ventura did not observe any nests, but did observe ducklings regularly in sugarcane ditches (e.g., Polihale). During the 1960s, Koloa molted in the large reservoirs (e.g., Alexander Reservoir, Kalaheo). However, Ventura commented that there are few ducks in these areas now, probably because of increases in human disturbance (e.g., hunting, dogs, ATVs).

In the late 1960s and early 1970s, prior to the recognition of the Mallard × Koloa hybrid problem by the agencies, Ventura imported Mallard ducklings from a North American game farm to his Kalaheo farm on Kauai. He occasionally observed Koloa on the farm and suspected mating between Koloa drakes and domestic Mallard hens (supports findings in Rhymer [2001] and Fowler and others, [in prep.] where hybrids possess a Mallard mitochondrial haplotype; mtDNA is maternally inherited.). The ducklings of these hens were identical in appearance to Mallards, however, their behavior was that

of wild birds (e.g., would take cover and hide during feeding time). When flight was attained, the suspected hybrid offspring left the farm and did not return.

Regarding duck trapping, Kaiakapu suggested using drop-nets or throw-nets at Hanalei and Huleia NWRs. The State has a drop-net that could be used. The net is held up on poles by an electric charge. The net falls when the electric charge is turned off by a remote wireless device. It works best in open upland terrain, but could possibly work over shallow water or a loafing dike. The area is baited, e.g., cracked corn, for several days beforehand.

### Site Visit: Hilton Kauai Beach Hotel & Resort, Lihue

This hotel is located between Hanamaulu and Nukolii Beach Park on Kauai's eastern coast. There are 4 connected manmade lagoons totaling about 1.4 acres. The lagoons are surrounded by condos in close proximity (0-25 feet) and typical resort landscaping. There is an assortment of exotic waterfowl and, apparently abandoned, domestic Mallard breeds. We observed 41 introduced waterfowl, including dabbling ducks, whistling ducks, shelducks, swans, and muscovy, but no native waterbirds (table 1). Of these, 80 percent were domestic Mallard breeds, several came to beg for food when we approached the site (Fig. A1). Per Kaiakapu, the Ruddy Shelducks (*Tadorna ferruginea*) were imported by the Kauai Lagoons Hotel (3.5 miles to the south) in the mid 1980s and well cared for until Hurricane Iniki in 1992. Thus, the Ruddy Shelducks are free flying, readily moving between resorts, and successfully reproducing.

Since this survey, Kaiakapu and Jayme Patrick (USDA-APHIS-Wildlife Services) contacted hotel management and learned that the condo association pays a hotel maintenance worker to feed and care for the birds. Permission was not granted to remove ducks because they are considered pets, but permission was granted for non-lethal sampling to observe, photograph, trap, and collect blood and measurements. According to Patrick, Koloa have been observed on site and it is possible to work with

the management to keep wings of free-flying exotics clipped and get permission to remove higher risk ducks. This is not recommended as a sampling site because it does not meet criteria 2 or 3. However, there are opportunities at this site to study semi-feral domestic ducks and get a better understanding of the real versus perceived threats to native wildlife.

### Site Visit: Smith's Tropical Paradise, Wailua

Smith's is a 30-acre botanical-cultural garden located on the south bank of the lower Wailua River. It has 7 manmade lagoons totaling 4.7 acres (USFWS, 2005). The land is privately-leased from the State. In addition to domestic geese, swans, and muscovy and gallinaceous exotics, we observed 2 Hawaiian Moorhen (*Gallinula chloropus sandvicensis*), 2 Black-crowned Night-Heron (*Nycticorax nycticorax*), 2 domestic Mallards (tending toward wild type), 10 Koloa, and 1 Mallard × Koloa hybrid (table 1). Koloa have the reputation of being skittish. The presumed Koloa and hybrid appeared to have habituated to human activities onsite. They were wary, yet did not flush when approached. We were able to get within 10 to 20 feet of some Koloa. The introduced birds are fed; consequently, so are the Koloa. We observed a Koloa drake dominating feed and chasing other birds away. We noted that a couple of these birds have plumage and bill features that are unusual for Koloa (Fig. A2).

Smith's is recommended as a sampling site because, with constraints, it meets all 3 criteria. There are immediate opportunities to elucidate the status of the Koloa and hybrids. The atypical behavior of Koloa at this site could provide unique opportunities to capture ducks. Trapping operations could be conducted outside business hours, when gates are closed to the public. Since this survey, DOFAW biologists and Jayme have been working with the owners to capture and remove the Mallards. The maintenance staff has been helpful in providing information about the Mallards and may assist with future trapping efforts. With information on use patterns from the maintenance staff, researchers could target specific areas and increase trapping efficiency. With the permission of the owner, Koloa and hybrids could be baited and trapped using hand-nets, throw-nets, or swim-in traps.

### Site Visit: Hanini Reservoir, Lawai

Hanini is a 4.5 acre reservoir surrounded by a high density of residences and agricultural lots. The reservoir perimeter is mostly hau (*Hibiscus tiliaceous*), there is almost no emergent vegetation, and the water quality is poor. The Kaunualii Highway crosses the north end of the reservoir. The reservoir is visible from the highway. We did not observe any waterbirds at the site (table 1). Hanini has few records for Mallards and none for Koloa. This is not recommended as a sampling site because it does not meet criteria 2 or 3.

### Site Visit: Kawaiiele Waterbird Sanctuary and Mana Plain, Mana

The 35-acre sanctuary is a former sand mine with an exposed water table that was reshaped to provide habitat for Hawaiian waterbirds. East of the sanctuary is the Mana Ditch and pump system that drains the Mana Plain (historically 2,000 wetland acres). Two Koloa were observed at this site (table 1), however, Kawaiiele is not recommended as a sampling site because it does not meet criteria 3. On the nearby Kekaha cornfields, managed by Dow AgroSciences, Monsanto, Syngenta Seeds, and Pioneer Hi-Bred International, Kaiakapu mentioned that he observed a flock of about 60 Koloa in a recently-harvested cornfield. Access and bird surveys would be needed to determine if the cornfields meet the sampling criteria. Cannon nets would probably be needed to trap birds in fields; however, cannon nets can injure birds. Thus, trapping in cornfields would probably not meet criteria 3.

## **Tuesday, May 16, 2006**

### Site Visit: Hanalei River, Upper

The Hanalei River from the Alakai Swamp to Hanalei Bay is about 16 miles long. An aerial survey was conducted by helicopter in the upper watershed from just below the dam to the USGS

gaging station (1,200-ft to 85-ft elevation). Flight time was from 9:30-9:55 a.m. Flight altitude was approximately 100-200 ft. Weather was sunny with about 60 to 80 percent cloud cover and no wind or rain. The count was conducted with Carl Berg and Matt Rosener (Hanalei Watershed Hui). We observed 8 Koloa (2 pairs and 1 group of 4), 7 Cattle Egrets (*Bulbulcis ibis*), and 1 Black-crowned Night-Heron during the survey period (table 1). All birds counted were flushed. Jim Jacobi (USGS) and Larry Shinshiro (NRCS) flew in before us and their flight path included a portion of the survey route. They reported 6 Koloa (1 pair and 1 group of 4). Koloa are cryptic, thus it is possible that we overlooked Koloa that did not flush or birds were on the move prior to our survey. One pair flew downstream ahead of helicopter, but when the helicopter overtook the pair, the birds made a U-turn and headed back upstream. Thus, we counted 8 Koloa on approximately 6.3 miles or 1.3 Koloa per mile. This is contrasted with a survey on July 6, 2006 between 12:00-12:30 p.m. by Matt Rosener and Mike Mitchell (Assistant Refuge Manager for Hanalei NWR) when they flew over the Hanalei River above the Refuge. They counted 100 Koloa (90 in 3 large flocks and the rest in pairs or small groups) on approximately 7.5 miles of river or 13.3 Koloa per mile.

The aerial survey was followed by a ground survey. At about 10:00 a.m. we landed at Landing Zone (LZ) 4 at 1,052 ft elevation in the upper watershed about 0.5 mi below the dam. At this site, the river was narrow (20-50 ft wide), incised, and swift flowing (est. 40-50 cubic feet/second). The water was clear with few aquatic plants. California grass (*Urochloa mutica*), Job's tears (*Coix lachryma-jobi*), and guava (*Psidium guajava*) were common on lower banks, and neke (*Cyclosorus interruptus*) was common on upper banks. The upland plant community was dominated by the guava/ohia/lantana/clidemia (*Psidium/Metrosideros/Lantana/Clidemia*) complex (Jacobi, unpubl.). The canopy over the active channel was less than 10 percent (Fig. A3 a-b). Rosener and Uyehara did not observe Koloa; however, 50 yards downstream of LZ4 we observed fresh duck droppings and feathers on boulders below a large calm pool and small mudflat. The droppings were grayish green, probably

from foraging on the green algae common in river runs (Fig. A3 c-f). Koloa sign (e.g., droppings, feathers) was limited, however per Rosener, Hanalei received nearly 1 inch of rain in the previous 2 days which could raise water levels by 1 foot and wash duck sign away. This was assumed to be Koloa sign because no other ducks are known to use mountain riverine habitats in Hawaii.

From about 12:00–2:00 p.m. back at LZ4, the group observed 2 separate Koloa flying downstream at low altitude. When the Koloa saw us, one flew much higher but continued downstream, the other flew over the ridge toward Kalihiwai Valley (northeast). Rosener said the ducks were probably coming down from the Hanalei dam where water ponds.

At about 3:00 p.m. we were dropped off at LZ3 at 549-ft elevation. We explored 2 *Cyclosorus/Paspalum* bogs on the eastern bank (Fig. A4 a-b). At LZ3, the river widens and splits around a large boulder island. One branch was about 50 ft wide. The water was clear with few aquatic plants. Vegetation was similar to the previous LZ (Fig. A4 c-h). Although there were no signs of Koloa, these areas provide habitat. Koloa have been documented using fern/grass communities along the Hanalei River for nesting (Richardson and Bowles, 1964) as well as small pools of mountain forest bogs (Munro, 1944). Back at LZ3 we observed a Cattle Egret flying downriver and a Black-crowned Night-Heron at the mouth of a tributary. The upper watershed is not recommended as a sampling site because it does not meet criteria 1 or 3.

### **Wednesday, May 17, 2006**

Relevant notes from meeting with Mike Mitchell, Asst. Refuge Manager, and Chad Smith,  
Maintenance for Hanalei NWR

The Refuge has permits to collect migratory Mallards and capture, identify, and remove Mallard × Koloa hybrids. Suspected hybrids are occasionally seen on the Refuge; therefore, there should be opportunities to test plumage and morphometric keys on the Refuge. Baited swim-in traps are

recommended, but alternate baits (e.g., rice seed) should be explored because cracked corn is not always effective under water. The DOFAW drop-net could be setup on a dike or other loafing area. Mitchell recommends seeing if the Koloa project can use trapping supplies from the avian flu monitoring project where biologists will be trapping migratory ducks.

### Site Visit: Hanalei NWR

Hanalei NWR is 917 acres of wildlife impoundments, taro patches, and waterways including 2.6 miles of the lower Hanalei River (Fig. A5 a). Mitchell, Smith, and Uyehara surveyed the Refuge for potential hybrid ducks. We did not observe any obvious hybrid phenotypes. Smith recommended the “rice ponds” located west of the Haraguchi farm (Fig. A5 b) and the DU Pond for duck trapping, and Huleia NWR as well. The Koloa and suspected hybrids forage and loaf regularly at these sites. Koloa nests have been found in herbaceous cover on the banks of ditches and dikes (Fig. A5 c-f). Koloa hens might be captured by using nest traps, but this is not a preferred method due to the tendency of Koloa to abandon nests when disturbed. However, this strategy could be used for hybrid hens. There are an estimated 300 to 325 Koloa on the Refuge. Uyehara estimated about 200 Koloa on the Refuge from 9:30-11:30 a.m. This site is recommended as a sampling site because it meets all 3 criteria.

### Site Visit: Hanalei River, Lower

Zaun, Smith, and Uyehara surveyed the lower Hanalei River from 1:15-3:15 p.m. from the Refuge intake to about 0.75-mile upriver (37-81 foot elevation) in the State Halelea Forest Reserve. The weather was overcast with about 90-100 percent cloud cover, a light wind, and no rain. At this elevation the river widens to about 60-80 feet and rapids are common (est. 80 cubic feet/second). The water was clear with few aquatic plants and hau was the most common riparian tree. We observed 23 Koloa and 1 Black-crowned Night-Heron loafing on boulders on the western bank of the river. Although the ducks were at least 1,000 feet downstream, they were aware of our presence as indicated

by their alert posture. The ducks were located at a slight bend in the river where they had unobstructed view of their surroundings and were well camouflaged (Fig. A6 a-c). It is well known that depositional features in rivers such as point bars and islands influence plant communities and provide wildlife habitat. This area, possibly an active zone, appeared to be serving that same purpose, at a minimum, a place of refuge for Koloa. Emergent grasses and calm pools interspersed among boulders provide additional habitat (Fig. A6 d-i). The river banks are dense hau to the west and mixed grasses which extend to a large bog on the east side. The ducks in view were mostly drakes suggesting that this was a bachelor flock of post-breeders and nonbreeders. We carefully approached the site but the ducks flushed when they saw us moving.

We also surveyed the site where the road crosses the river known as “Crossings” (former cattle crossing) at the upper end of the Refuge. The reach is 100 to 200-ft wide, shallow, and calm with rocky islands which gives the river a braided appearance. The islands are partially vegetated with California grass, *Axonopus fissifolius*, and *Sphagneticola trilobata*. The southern banks are heavily vegetated with hau, and the northern banks are mostly California grass. There was a large pool above the island that supports cichlids, striped mullet (*Mugil cephalus*), and Tahitian prawn (*Macrobrachium lar*) (Fig. A7). At 1:00 p.m., 3 Koloa flushed from the upstream end of the island (table 1). In general, trapping ducks in rivers is not recommended due to challenging conditions (e.g., slippery rocks, flowing water). Crossings, however, could be considered as a secondary site because it meets criteria 1, 2, and possibly 3. Additional bird surveys would be needed to determine if this site could meet criteria 3. Crossings is a fish and water-quality monitoring site for the Hanalei Watershed Hui. Koloa are regularly sighted here, up to 20 birds, and some observations suggest this could be a molting site (J. Surface pers. comm.).

**Table 1.** Waterbird surveys, Kauai.

Site	Date	Time	MALL	HAWD	MALL × HAWD	Other domestic and exotic waterfowl	BCNH	CAEG	HAMO	HAST	WATA
Hilton Kauai Beach Hotel & Resort, Lihue	5/15/06	12:00-12:30p	33 <sup>a</sup>			8 <sup>b</sup>					
Smith's Tropical Garden, Wailua	5/15/06	1:00-2:30p	2 <sup>c</sup>	10	1	20 <sup>d</sup>	2		2		
Hanini Reservoir, Lawai	5/15/06	4:10-4:30p									
Kawaiele and Mana ditch, Mana	5/15/06	5:10-5:45p		2				4		4	2
Hanalei River, Upper Watershed	5/16/06	9:30-9:55a		8			1	7			
Hanalei River, Lower (Crossings)	5/17/06	1:00-1:15p		3							
Hanalei River, Lower (loafing bar)	5/17/06	1:30-3:15p		23			1				

<sup>a</sup>Does not include incidental observations described in text

<sup>a</sup>Mallard breeds (e.g., green-headed Mallard, Pekin, Cayuga, Rouen, various domestic hybrids)

<sup>b</sup>1 Plumed Whistling Duck (*Dendrocygna eytoni*), 2 White-faced Whistling Duck (*D. viduata*), 2 Black Swan (*Cygnus atratus*), 1 Ruddy Shelduck (*Tadorna ferruginea*), 2 Muscovy (*Cairina moschata*),

<sup>c</sup>Mallard breeds (green-headed Mallard)

<sup>d</sup>5 Domestic Geese (*Anser anser*), 1 Mute Swan (*Cygnus olor*), 14 Muscovy

MALL - Mallard (*Anas platyrhynchos*); HAWD - Hawaiian Duck (*Anas wyvilliana*); MALL × HAWD - Mallard × Hawaiian Duck hybrid phenotype; BCNH - Black-crowned Night-Heron (*Nycticorax nycticorax*); CAEG - Cattle Egret (*Bulbulcus ibis*); HAMO - Hawaiian Moorhen (*Gallinula chloropus sandvicensis*); HAST - Hawaiian Stilt (*Himantopus mexicanus knudseni*); WATA - Wandering Tattler (*Heteroscelus incanus*)

**Table 2.** Summary of site assessments, Kauai.

Site	Criteria 1 – Accessible	Criteria 2 – Minimal Disturbance	Criteria 3 – Good capture probability	Sampling site?
Kauai Beach	✓			No
Smith's <sup>a</sup>	✓	✓	✓	Yes
Hanini	✓			No
Kawaiele	✓	✓		No
Cornfields	?	?		No
Upper Hanalei		✓		No
Lower Hanalei <sup>a,b</sup>	✓	✓		More info needed
Hanalei NWR	✓	✓	✓	Yes
Huleia NWR	✓	✓	✓	Yes

<sup>a</sup>See text for special conditions;

<sup>b</sup>Refers to Crossings in Hanalei NWR

## **Recommendations**

In summary, Uyehara recommend Smith's Tropical Paradise, Hanalei NWR, and Huleia NWR as primary sampling sites. Lower Hanalei River (in Hanalei NWR) is a possible secondary sampling site; however, more investigation is needed to determine site suitability (table 2). The baited swim-in trap is preferred and alternate methods should be explored (e.g., drop nets) if swim-in traps are not effective. If feasible, share resources with the Avian Influenza Surveillance team, however, traps may need to be modified to prevent incidental take of Koloa and other listed birds. It is imperative that field staff take precautionary measures to prevent any harm to Koloa and other birds during trapping and handling activities. A couple of considerations: (1) there are many sites that could not be surveyed on a 3-day trip; other sites should be considered and (2) the information was collected when Kauai's year-to-date rainfall exceeded normal levels by about 176 percent (range 106 to 283 percent) (NOAA, June 2, 2006); use of habitats by Koloa is probably influenced by this weather pattern (see Engilis and Pratt, 1993). Incidentally, between February 17 and April 17, Hanalei Watershed Hui's rain gage located at about 1,000-ft elevation recorded 107 inches total (M. Rosener, pers. comm.).

## **Acknowledgments**

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## Agency Acronyms

DLNR-DOFAW	State of Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife
PACRC, UH Hilo	Pacific Aquaculture and Coastal Resources Center, University of Hawaii at Hilo
USDA-APHIS	USDA Animal and Plant Health Inspection Service
USDA-NRCS	USDA Natural Resources Conservation Service
USFWS	U.S. Fish and Wildlife Service
USGS-BRD-PIERC	U.S. Geological Survey, Biological Resources Discipline, Pacific Island Ecosystems Research Center

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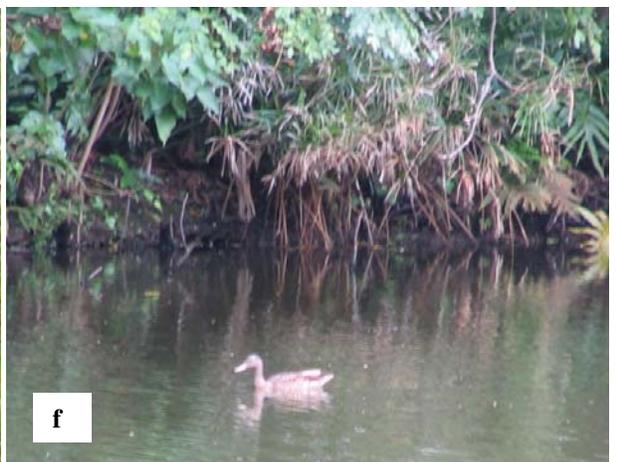
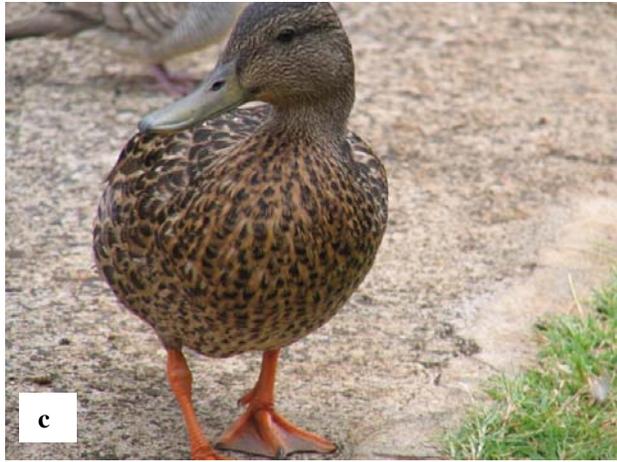
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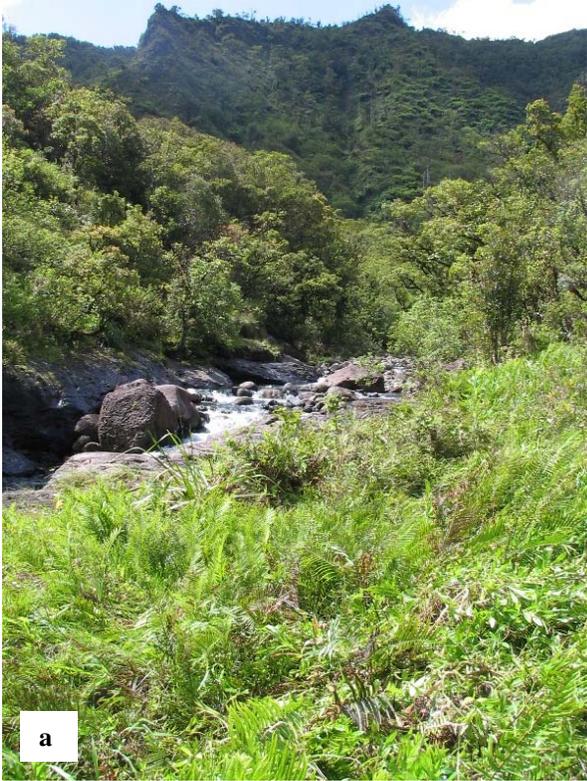
# Appendix: Photographs of sites visited

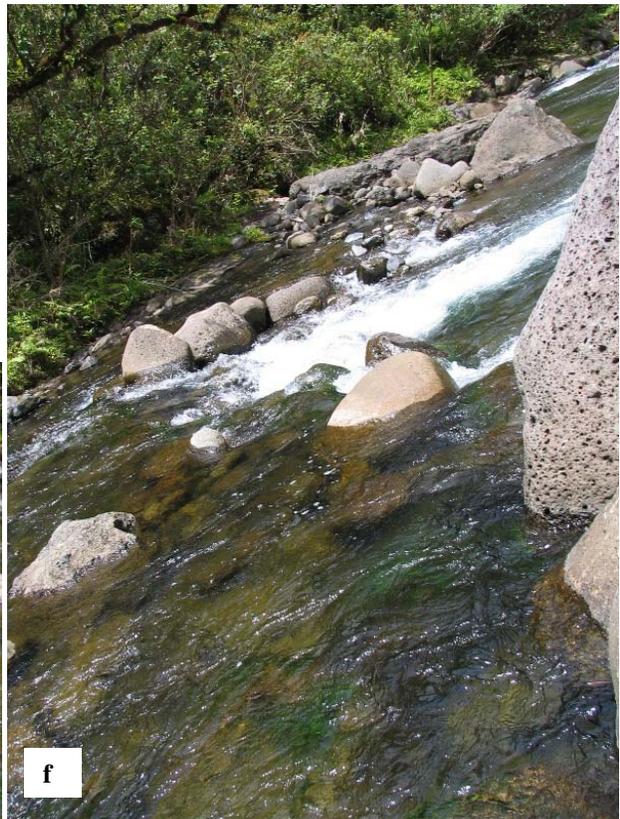


**Figure A1.** Kauai Beach Hotel and Resort. (a) Lagoons, (b) Domestic Mallard breeds, (c) Ruddy Shelduck and domestic Mallard breeds, (d) Ruddy Shelduck, (e) White-faced Whistling Duck and Plumed Whistling Duck, and (f) Domestic Mallard hybrids.



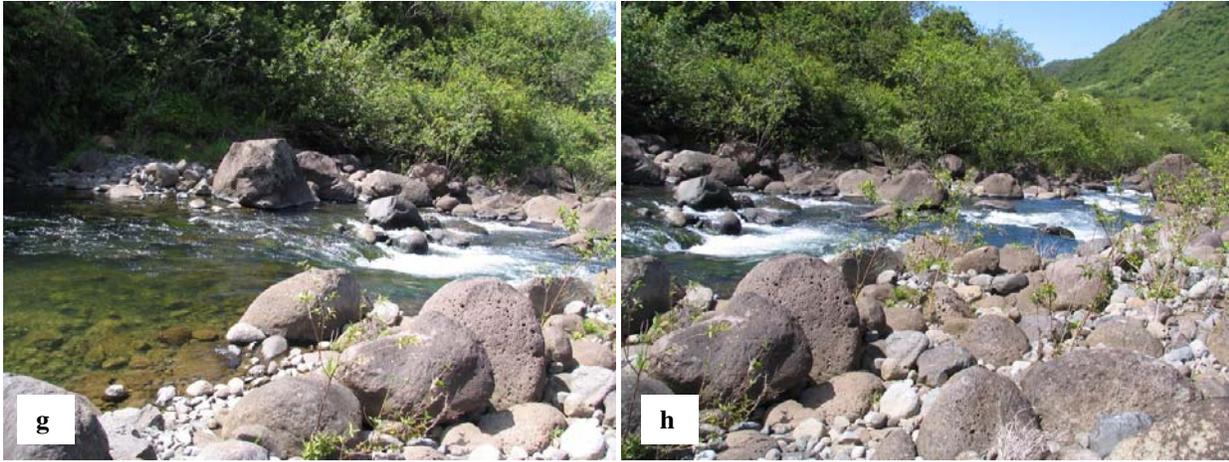
**Figure A2.** Smith's Tropical Paradise. (a) Wailua River lookout, (b) Koloa pair, (c) Koloa drake, (d) Koloa drake, (e) Koloa hen, possibly Mallard x Koloa hybrid, and (f) Mallard x Koloa hybrid. Note: The birds at Smith's are presumed to be Koloa or Mallard x Koloa hybrids. The presence of Mallards onsite for several years gives these determinations greater uncertainty.





**Figure A3.** Upper Hanalei River, near Landing Zone 4. (a) Landing Zone 4, facing upriver, (b) Landing Zone 4, facing downriver, (c) Koloa droppings and green algae, (d) Calm pool and mudflat near Koloa sign, facing upriver, (e) Site of Koloa sign, facing across river (west), and (f) Site of Koloa sign, facing downriver.





**Figure A4.** Upper Hanalei River, near Landing Zone 3. (a) *Cyclosorus/Paspalum* bog 1, (b) *Cyclosorus/Paspalum* bog 2; (c) Facing upriver, (d) Facing across river (west), (e) Facing across river, (f) Facing across river, (g) Facing downriver, and (h) Facing downriver.



**Figure A5.** Hanalei National Wildlife Refuge. (a) Wildlife impoundment, (b) “Rice ponds”, (c) Typical Koloa nesting site near ditch, (d) Site of Koloa nest on dike, presumably abandoned due to high rainfall and flooding, (e) Site of abandoned Koloa nest on dike, closer view, and (f) Abandoned Koloa nest.





**Figure A6.** Lower Hanalei River. (a) Koloa loafing site, view 1, (b) Koloa loafing site, view 2, (c) Koloa loafing site, view 3, (d) Loafing bar, view 1, (e) Loafing bar, view 2, (f) Loafing bar, view 3, (g) Loafing bar, view 4, (h) Loafing bar, view 5, and (i) Loafing bar, view 6.



**Figure A7.** Hanalei National Wildlife Refuge, Crossings. (a) Facing south, (b) Facing southeast, and (c) Facing east (downriver).