



Update on Nesting Activity and Habitat Utilization by Native Waterbirds at the Hamakua Marsh State Wildlife Sanctuary, Kailua, O'ahu

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Introduction

A review of the literature for Hawaiian Stilts (*Himantopus mexicanus knudseni*), Hawaiian Moorhen (*Gallinula chloropus sandvicensis*), and Hawaiian Coots (*Fulica alai*) reveals a great deal of information on general biology and life histories (Robinson et al. 1999; Banner and Kiviati, 2002; Alisaukas and Arnold, 1994). However, despite their endangered status, there is a limited amount of published information regarding these birds on managed wetland areas or their responses to management actions.

The Hamakua Marsh Ecosystem Restoration and Community Development Project recently completed its third year of work in the 22-acre (9 ha) wetland located in the heart of Kailua Town on O'ahu's windward side. The ongoing objectives of the project are twofold: 1) restore wetland habitat for native Hawaiian water birds and migratory shorebirds and; 2) involve local organizations, businesses, schools, and county, state, and federal agencies in the process in order to integrate the wildlife sanctuary into the fabric of the community. Many of the physical restoration goals of the project were realized in the first two years, the foremost of those goals being the removal of red mangrove (*Rhizophora mangle*) from the banks of the Hamakua Canal within the sanctuary. More recent management activities have focused on maintaining a "mangrove-free" stream bank and ensuring adequate habitat conditions for native waterbirds. Tilling of the wetland basins prior to the nesting season helps to control emergent vegetation, provides nesting materials and increases the amount of available nesting and foraging habitat. Consistent rains postponed plans for grading and debris removal operations, and were grounds for reconsideration of the need to install a well and water delivery system, as the area remained partially flooded for most of the year. As such, the physical characteristics of the wetland in 2004 were much the same as in the previous year.

These three species occur regularly at Hamakua Marsh State Wildlife Sanctuary, and have been closely monitored there over the last two nesting seasons. A summary of the 2003 season is available in Smith and Polhemus (2003). The following is a synopsis of the 2004 nesting season, with some comparison of findings from the previous season at Hamakua Marsh.

Methods

Hawaiian Stilts and Hawaiian Moorhen were surveyed at Hamakua during 31 site visits between 30 January and 1 October 2004. When present, Hawaiian Coots were also monitored opportunistically during this time period. Nest observations were recorded for all three species, including clutch size, nesting

materials and other notable occurrences. Robinson et al. (1999) reported that Black necked stilt (*Himantopus mexicanus*) nests visited early in the nesting cycle had moderate probability of failure in some areas. To minimize researcher-induced failure, stilt nests were not surveyed until two weeks after initial observation.

Hawaiian Stilt habitat use was recorded as described in Smith and Polhemus (2003). Nests, once located, were observed during subsequent site visits to determine status. Upon hatching, broods were monitored to document survival of known chicks. In 2002 and 2003, stilt chicks at Hamakua were banded with USFWS size 4 stainless steel leg bands only (i.e. not individually marked). All bands applied were placed on the right leg. We knew of no other program banding with only aluminum bands, and therefore assumed any resights were Hamakua birds. In 2004, chicks were marked with three plastic color bands and one size 4 aluminum band. To aid field identification and avoid overlap with other stilt banding efforts on O'ahu and other islands, a standardized combination of orange-over-aluminum was applied on one leg for all birds banded at Hamakua. Nest sites were recorded using a Trimble GeoXT Model GPS unit and plotted in ArcView.

Dispersal of Hawaiian Stilt has been investigated in several studies (Telfer 1972; Telfer and Burr, 1978, 1979; Reed et al 1994, 1998). Following the nesting season, surveys were conducted at off-site wetlands for banded birds, in an attempt to better understand the connectivity of stilt populations in Hamakua Marsh and other wetlands located on windward O'ahu. The primary goal of these surveys was to identify wetland sites utilized by birds fledged from Hamakua, and the relative distances traveled. No attempt was made to determine frequency of movement or number of birds involved in movements. As such, once a banded bird was observed at an off-site wetland, it was removed from future surveys.

Hawaiian Moorhen nesting territories were monitored for brood survival upon discovery of new broods. Little is known about the dispersal patterns and home ranges of Hawaiian Moorhen. Rough estimates for nesting territory size at Hamakua were reported in Smith and Polhemus (2003). Takano and Haig (2004) studied seasonal movement and home range patterns of the Mariana Moorhen using radio telemetry, and reported an increase in dispersal with the onset of the wet season. The absence of juveniles was observed in late 2003 at Hamakua Marsh, following heavy rains in November (Polhemus, pers. obs.) To provide more information about movement patterns

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April 18 Program Meeting: Pacific Golden Plovers by Wally Johnson

Wally Johnson, adjunct professor in ecology at Montana State University-Bozeman will present a talk on his research on Pacific Golden Plovers on Monday April 18th at UH Manoa, St. Johns Hall room 011 from 6:30 pm to 8:30 pm. Johnson has been following the Pacific Golden-Plover ever since noticing them in the Marshall Islands while researching the kidney function of birds that live around salt water. He conducts his research on O'ahu and in Nome, Alaska. Johnson and his crews band the birds in Hawai'i and attach small radio transmitters with the goal of learning where these birds nest in Alaska. The transmitters fall off in Alaska and cause the birds no harm.

He has studied the same individual birds for years, both on their wintering grounds and breeding grounds. This year he is starting a project to study the Pacific Golden Plover in Saipan. The National Geographic Society has funded much of Johnson's work, and television programs about it have aired on the Discovery Channel and "All Birds TV." Wally has also been the recipient of several research grants from Hawaii Audubon Society, and our Kolea Watch program has helped provide support for his research in Hawai'i and Alaska.

Program Meetings are held at the University of Hawai'i's St. John Lab (Botany Building Rm. 011) in the ground floor auditorium at 3190 Maile Way, where it intersects East-West Road. The main entrance to the building is at ground level, street side (*Hint: the Diamond head side stairs do not lead to the auditorium*). Program meetings take place from 6:30pm to 8:30pm, refreshments are served, and HAS products will be available for purchase.

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Got Binoculars?

by Ron Walker

Student birders need the extra pair of binoculars that may be sitting unused in your closet. The non-profit education organization, Moanalua Gardens Foundation (MGF), offers popular wetlands and waterbirds unit for students and teachers that culminates in a daylong adventure exploring Hawaiian wetlands. Since many children do not have access to binoculars to use for the field trip, MGF is attempting to build its own lending collection.

If you have a pair to donate, please call 839-5354. MGF and the young birders of Hawai'i send their sincere thanks!

Field Trips for 2005

Here are our planned Field Trips for the year ahead. Our Board Members have each volunteered to lead a Field Trip this year. As these trips are still in the process of being arranged and confirmed, some dates and times are not yet set.

Field Trip information and updates will also be available on the HAS office answering machine (528-1432) and on our website, www.hawaiiadubon.com.

April 16: Ka'ena Point to see Laysan Albatross chicks and parents, Wedge-tailed Shearwaters, humpback whales, Kolea, and coastal plants. Distance of hike is a total of about 5 miles. Bring food, water, sunscreen, etc. and be sure to wear appropriate hiking shoes. Limited to 15 hardy participants. Call the HAS office to register - 528-1432.

May 22: Honolulu Zoo: Wendy Johnson will lead another field trip not to be missed - Honolulu Zoo's Curator of Birds will give us a tour of some of the bird exhibits and of course the wonderful walk-through aviary (a fantastic close-up look at some very beautiful and unusual birds!). This trip is limited to 15 participants. Call the HAS office to register, 528-1432.

June (date TBA): Waikamoi Preserve on Maui
with Jennifer Crummer.

July 9 Kawai Nui Marsh: Wetlands bird walk with Ron Walker.

July (date TBA) Chevron Ponds with Sal Pagliaro. In 1992, the first Hawaiian Stilts on Chevron's property at Campbell Industrial Park were seen - standing fresh water attracts birds - so Chevron fixed up several ponds and began managing them. The US Fish & Wildlife Service has been monitoring them since 1993, and trapping cats & mongoose as well. Chevron and possible FWS personnel will give us a tour of this great place.

August (date TBA) Kuli'ou'ou:
'Elepaio search with Dr. Phil Bruner.

September (date TBA) James Campbell National Wildlife Refuge with Ron Walker

October (date TBA) 'Ihi'ihilauea on Maui
with Jennifer Crummer

November (date TBA) Sea Life Park seabird rehabilitation center with Arlene Buchholz

December (12/14 thru 1/5) 105th Christmas Bird Count.

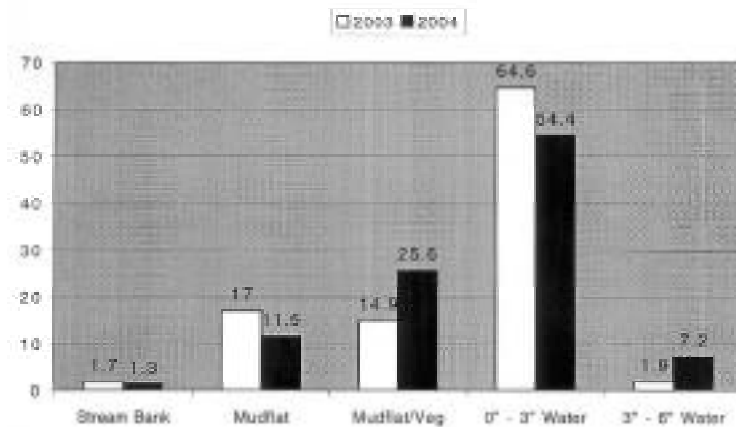
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and dispersal, we initiated banding of moorhens within the sanctuary. Moorhens were captured with modified pigeon traps baited with bread. One end of the trap was tied open with string and triggered manually when birds entered. Birds were marked with three plastic color bands and one size 6 aluminum band for individual identification. All birds were given a standardized red-over-aluminum on one leg to designate Hamakua Marsh, and birds from the same territory were given similar combinations (e.g. red-aluminum-green-white, red-aluminum-white-green). All birds were banded at >2 months after initial discovery.

Monitoring of Hawaiian Coots at Hamakua Marsh was conducted opportunistically. Byrd et al. (1985) reported low numbers of coot nesting at Hamakua in 1982. Following mangrove removal in 2002, coots have been observed regularly along the canal and, during heavily flooded stages, in the main portion of the marsh (Polhemus, pers. obs.).

Results and Discussion

Figure 1. Habitat use breakdown (expressed as the percentage of total observations) by Hawaiian Stilts of Hamakua Marsh from 2003 and 2004



Hawaiian Stilts

763 stilt habitat use observations were recorded during the 31 site visits in 2004. Mean total stilts per visit were 24.6, and ranged between 9-43 birds per visit. Similarly, in 2003, mean birds per visit were 25.4, with a range of 17-35. Between January and August 2004, the area received 145.9 cm of rain, more than twice the total for the same period in 2003 (64.5 cm, State Climate Office, University of Hawai'i data), resulting in an increase in the frequency and severity of flooding. Higher water levels caused changes in habitat use by stilts, showing increases in detections for the 3-6 inch and mudflat with vegetation habitat types, and decreases in detections for the 0-3 inch and open mudflat habitat types from the 2003 season (Figure 1). However, when grouped, detections in the 0-3 inch, open mudflat and mudflat with vegetation habitat types accounted for over 90% of all detections in both years (96.5% in 2003, 91.5 in 2004).

Table 1. Mean number of birds per site visit, percent of total wetland area and percent of total observations per site visit (by wetland basin) of Hawaiian Stilts at Hamakua Marsh State Wildlife Sanctuary, 2003 and 2004.

Table 1.

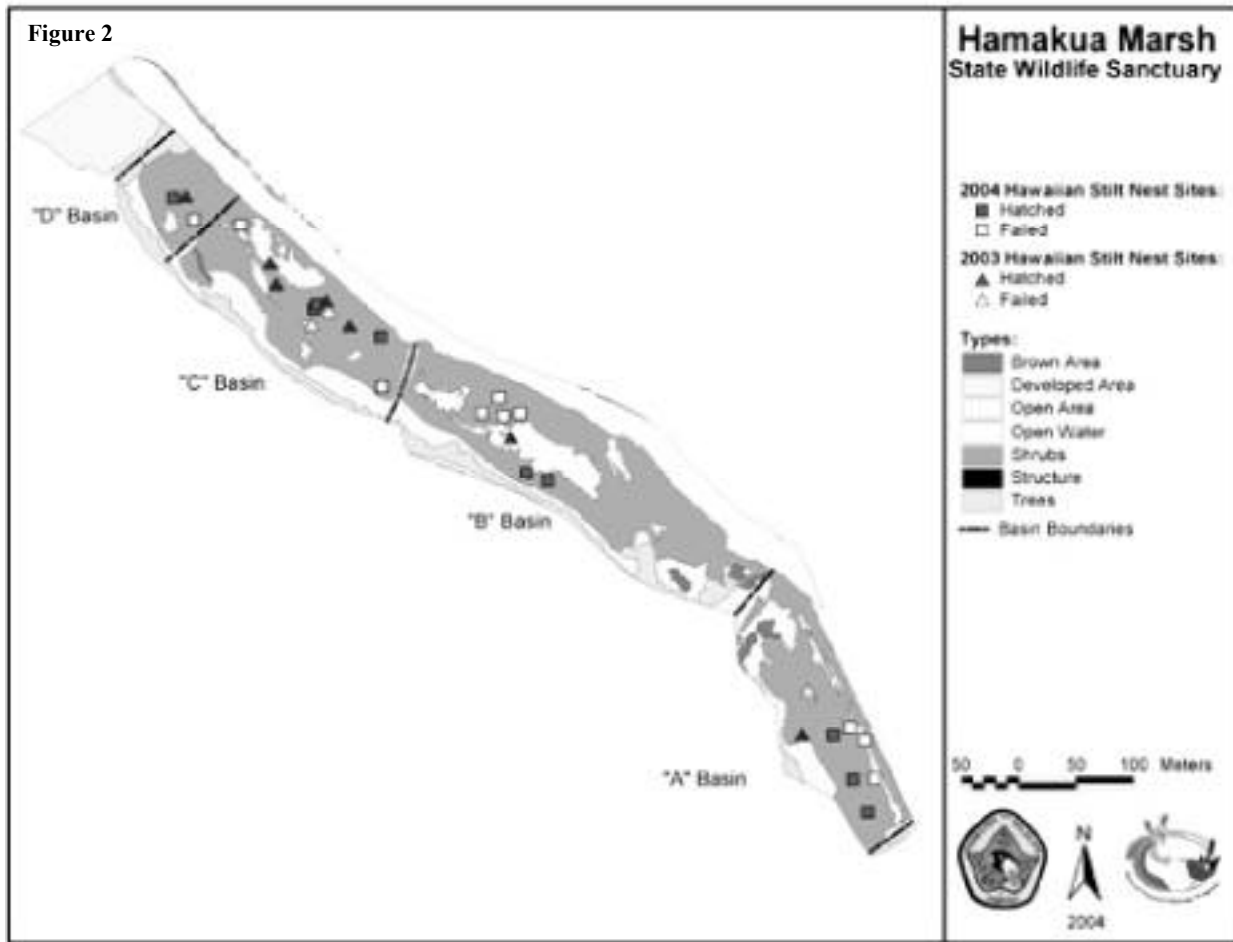
| | Basin A | Basin B | Basin C | Basin D |
|-------------------------------|---------------|---------------|---------------|-------------|
| Mean birds/visit (2003, n=19) | 3.47 | 9.47 | 10.0 | 2.47 |
| Mean birds/visit (2004, n=31) | 4.00 | 9.23 | 9.26 | 2.13 |
| % of total area (sq. m.) | 25.4 (16,426) | 38.0 (24,635) | 26.7 (17,283) | 9.9 (6,427) |
| % of total obs. (2003) | 13.7 | 37.3 | 39.9 | 9.7 |
| % of total obs. (2004) | 16.3 | 37.5 | 37.6 | 8.7 |

Analysis of use patterns and mean birds per site visit by basin (Table 1) show further similarity across the two seasons. Observations from the past two seasons suggest distribution of stilts within Hamakua Marsh may be spatially regulated. Territoriality has been documented for nesting stilts (Robinson et al, 1999), and territorial defense was observed during nesting and chick rearing at Hamakua in both years. In basins B and D, the proportion of overall stilt detections corresponds closely to the size (relative to the whole) of each basin for both years. Detections in basins A and C did not follow this pattern. Based on basin size, detections were higher than expected in C and lower than expected in A for both years. Parts of A basin were unusable to stilts due to the presence of large debris piles and vegetative growth, and may have skewed the distribution pattern observed in B and D basins.

Nests were active at Hamakua between 16 April and 14 June 2004, a total of 50 days, during which 19 nesting attempts were observed. A nesting season of 65 days was observed in 2003, and may have been a result of fewer and less severe flood events. Nest locations from both the 2003 and 2004 nesting seasons (Figure 2), can be used to infer preferred use for nesting by basin and may be useful in selecting areas for future restoration work (e.g. the areas where there has been no nesting activity). 18 of 19 nests were checked for clutch size (one nest was abandoned before it reached two weeks). All 18 nests contained 4 eggs at >2 weeks. 16 of 18 nests were built exclusively from *Batis* twigs, one clutch was found located on bare dirt and another was located on a mat of 'ae'ae (*Bacopa monnieri*).

Flooding played a large role in the success of nesting attempts during the 2004 season. Ten nesting attempts failed, of which eight were the direct result of flooding in early May. The other two nests failed or were abandoned for unknown reasons. Nesting sites later in the season, particularly in A basin, were located on higher ground than nests that had failed in the same basin earlier. Further, three successful nests from A basin were found to have been elevated as many as 5 cm above their original height on *Batis* twigs and dirt following rains in mid-June.

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total of 21 chicks were observed (2.2 per nest). Overall hatching success of known (observed) chicks was 29.1% for all nests (n=72 eggs from 18 clutches), and 58.3% for successful nests (n=36 eggs). These percentages are likely lower than the actual hatching success. Although no dead chicks were observed, some may have hatched and died prior to detection.

14 chicks were banded, five could not be captured and two chicks were unaccounted for. All banding occurred between 2-4 weeks after hatch. Results of off-site surveys for dispersing stilts revealed relatively short, local movements. Figure 3 shows observed movements of banded birds, which ranged from 0.4 km (ITT/Kihapai) – 2.0 km (Kawainui Marsh) from Hamakua Marsh. Surveys were conducted at sites as far as 17.2 km to the north (Kualoa Ranch Aquaculture Ponds) and 4.4 km to the south (Bellow's Training Area). Dispersal outside of the survey area is entirely possible, but was not observed within this monitoring period. The longest documented movement of Hawaiian Stilts was by two birds banded on O'ahu and resighted on the Big Island of Hawai'i, a distance of 295 km (Reed et al, 1998).

One banded adult was observed regularly as part of a nesting pair. The partial band combination was orange-over-aluminum on the left leg and an orange band on the right leg. According to banding records, this combination has only four possible matches,

location given) in 1992, or two birds banded at Enchanted Lake (presumably Kaelepulu) in 1994 by J. M. Reed (USFWS, unpubl. data).

Hawaiian Moorhen

As with stilts, flooding influenced moorhen nesting efforts this season. The number of nesting territories increased from the previous season, from 10 to 15, due in part to extended flooding of A basin, and shifting of territorial boundaries along the canal. Two nesting attempts were observed in A basin, and three additional territories were evident along the canal. Nesting activity was documented in all but one territory.

Nest inspections were conducted during three site visits in January, March and April 2004, during which a total of nine nests were discovered. Nests were found in emergent vegetation, either *Batis* or *Paspalum*, and never located more than 2m from the Hamakua Canal. Nests were constructed primarily of the vegetation type they were located in, and several had incorporated mangrove seedlings and other flotsam abundant in the canal. Average clutch size was 5.2 eggs per nest, and ranged between 3-7 eggs.

Moorhen chicks were first observed at Hamakua this season on 10 February 2004. Brood discoveries peaked in May and July and extended into August. Byrd and Zeilemaker (1981)

reported an incubation period of 22 days for moorhen at Hanalei NWR. Based on this, nest initiation likely began at Hamakua in mid January and extended through mid July. A total of 53 moorhen chicks were observed throughout the season. Brood sizes ranged from two to six chicks (3.3 chicks/brood, n=16) at initial discovery.

Four nesting pairs produced multiple broods during the 2004 season. Three pairs produced two broods each, and one pair produced three broods. Four distinct age classes (two adults, one bird from the first brood in subadult plumage, three with slate gray plumage and five downy chicks) were observed in the natal territory simultaneously on several occasions. In a summary of available literature, Greij (1994) reported multiple brood production is a common and important aspect of reproduction among moorhen throughout the world. Four broods have been reported from England, three broods from England and Germany, and two broods were common in England, Germany, Norway, Finland, the mainland US and in Hawai'i. While it is likely that a single nesting pair in Hawai'i has produced three (and possibly four) broods, there was no documentation of such an occurrence in any literature available to the authors, nor in the Bishop Museum SIGHTINGS database (R. L. Pyle, pers. comm.). At the close of monitoring (1 October), 36 chicks were observed for a survival rate of 68% for all known chicks. Eight chicks were banded from four territories. Banded birds were initially observed only within natal territories, until late September, when birds were located as many as three territories away from the natal territory.

Hawaiian Coot

Six coot nests were discovered during 2004 monitoring. Two nests were inspected, and clutches of two and five eggs were observed. Two chicks were seen, but it is not known whether either survived. Both were seen as downy chicks, one in May and the other in August, but no further observations were made. Coots were recorded on every site visit, ranging in number from 2-11 birds during the monitoring period. Movement of birds to Hamakua from Kaelepulu Pond (Enchanted Lake. 1.9 km) is highly probable. Other sites in the windward O'ahu area where coots have been recorded include Olomana Golf Course, Kawainui Marsh, MCBH Sewage Treatment Plant and Ho'omaluhia Botanical Gardens (DOFAW, unpubl. data).

Aggressive displays between coots and moorhen along the canal are possible cause for failed nesting attempts by both species, as they are each extremely territorial. Coot nesting territories along Hamakua Canal often encompassed more than one moorhen territory, and sometimes overlapped as many as three territories. Territorial defense may have been too great a distraction from nesting activity.

Conclusions

In a short period of time, Hamakua Marsh has been transformed from an overgrown cattle pasture to a highly productive breeding ground, relative to its size, for native waterbirds. Habitat enhancement projects, particularly the annual tilling of introduced vegetation, have optimized the area for most aspects of stilt and moorhen activity. An added benefit of vegetation removal and control has been the ability to monitor these species with limited disturbance. Ongoing vegetation removal and main-

tenance are expected to provide an additional 2-3 acres of wetland habitat over the next two years. Following two years of monitoring in an area with little physical manipulation, the transformation of previously unusable habitat should provide interesting information on response to management activities by native waterfowl, and may shed more light on spatial regulation of stilt distribution within the wetland. The ability to control water levels may be the most important aspect of wetland management, as was evidenced by the loss of over half of the season's stilt nests to flooding.

The dispersal studies initiated here should be continued and expanded to yield more meaningful data. Continued banding and off-site surveys for stilts from Hamakua will further the understanding of the connectivity and importance of each link in the local, island and statewide wetland complex. Trapping techniques for moorhen should be revisited. Many of the birds captured were used to being fed, and came readily to the trap. Application of this technique in other areas is not recommended. A greater effort to capture and band resident adults moorhens at Hamakua is also warranted, to investigate mate and/or territorial fidelity. Radio telemetry studies here may provide useful information on home range and dispersal for adults and juveniles. Further investigation of the interactions between coots and moorhen and their effects on nesting success in Hawaii should be undertaken. Competition between the two listed species may require a shift in management strategies for areas where both occur to achieve recovery goals.

The discovery of large-scale solutions is often found through small-scale investigation. Findings from Hamakua are expected to have meaningful application in the restoration and management of the 70-acre Pouhala Marsh and the 750-acre Kawainui Marsh. The State Division of Forestry and Wildlife and the Hawai'i Chapter of The Wildlife Society welcome all those interested in conducting research on the 23-acre Hamakua Marsh State Wildlife Sanctuary.

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REMINDER:

Deadline to Apply for UH Undergraduate Scholarship is May 1, 2004

Through a trust set up in memory of Rose Schuster Taylor, Hawaii Audubon Society offers a full tuition scholarship to an undergraduate student in the University of Hawai'i system each school year.

Applicants must be majoring in a field related to Hawaiian or Pacific natural history.

Applications are available by calling (528-1432) or emailing (hiausoc@pixi.com) the HAS office. The application should also be available shortly on our website, www.hawaiiudubon.com. Completed applications must be received by May 1, 2005.

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It can be a daunting task, but so rewarding when it comes time to release the healthy and grown precious little one. Now, what about 75, 100 or more birds a week all needing regular feeding and often times medical



care or treatment? No one person could take on such a task, but together the skilled rehabilitators of Wild Bird Rehab Haven here in Honolulu are doing just that—dedicating many hours every day of the year saving the lives of hundreds of birds. We provide supportive care to all birds received. Yes, it is daunting, but this is who we are and what we love to do.

Please help us do the job caring for our many avian friends in need here on O'ahu. We are a non-profit volunteer organization and need the help of our island community—your financial support will go a long way in helping save the lives of the many birds under our care. Donations go towards supplies, medications, baby bird formula, and bird food. Larger donations will benefit our new facility development.

We are also asking for caring members of our community to volunteer their time and take into their homes and hearts one or more of these precious little ones to care for and ultimately release back into the wild. To volunteer or for more information, please call 923-6034. We meet at Coffee Talk in Kaimuki on the second Sunday of each month - call for times.

Donations may be sent to: Wild Bird Rehab Haven, 2462 Kuhio Ave., Suite 411, Honolulu, HI 96815. All contributions are tax deductible.

ATTENTION PLOVER LOVERS!

Kolea Watch Update:

In spring '04, Dr. Wally Johnson (Montana State University) and his team of volunteers attached temporary radio transmitters to 20 Kolea on O'ahu. The birds migrated in late April, and 6 of them were found on breeding grounds in Alaska during May and June. All 6 Kolea were from a wintering ground on the windward side at Hawai'i State Veterans Cemetery in Kane'ohe. These recent findings are a valuable addition to our understanding of where O'ahu's Kolea are going in the summer to raise their keiki.

Johnson is planning another round of Kolea Watch radio-tagging in April '05. Can you help with a donation? Any amount will be most welcome. However, if you contribute \$150 or more you can "adopt" a Kolea and name your bird. You'll also be informed if/when/where "your" plover is found in Alaska! Donations (to pay for transmitters and/or other expenses associated with Kolea Watch research) can be sent to: Hawaii Audubon Society, 850 Richards Street, Suite 505, Honolulu, HI, 96813-4709. Checks should be made payable to the Hawaii Audubon Society and earmarked "Kolea Watch." Mahalo nui!



HAWAII AUDUBON SOCIETY
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Calendar of Events

Monday, May 16 Board Meeting

Open to all members, 6:30 to 8:30pm at the HAS office.
Education and Conservation Committees meet at 5:45pm
before Board meetings.

April 16 Field Trip

Kaena Point to see Laysan Albatrosses. *See page 18.*

April 18 Program Meeting

Kolea Research Update by Dr. Wally Johnson. *See page 18.*

May 22 Field Trip

Honolulu Zoo bird exhibits. *See page 18.*

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