



New Relocation Project Aims to Increase Habitat for Kiwikiu

Bringing a Native Forest & Its Native Songs Back to the Forest

This news release was first published by the State of Hawai'i Department of Land and Natural Resource (DLNR) on 4/10/19 (<https://dlnr.hawaii.gov/blog/2019/04/10/nr19-070/>)

(Nakula Natural Area Reserve, Maui) – Considered the most threatened among Maui's honeycreeper family, there are fewer than 300 Kiwikiu (Maui Parrotbill) left in the wild. With its entire population restricted to high elevation, wet rainforest on windward Maui, Kiwikiu are highly vulnerable to extinction, and establishment of a second population on leeward Haleakalā is considered by experts to be essential to Kiwikiu recovery. However, Kiwikiu need native forest habitat to survive, and the leeward forests of Haleakalā have been damaged by decades of grazing and browsing by feral ungulates (hooved animals).

To recover Kiwikiu, the Maui Forest Bird Recovery Project (MFBRP, a project of the Pacific Cooperative Studies Unit, UH Mānoa) and the DLNR Division of Forestry and Wildlife (DOFAW) have been working with government and landowner partners to restore the native forests to the leeward slopes and are now preparing to release up to 20 birds this fall to begin the re-establishment of a second population in the Nakula Natural Area Reserve (NAR). Kiwikiu had been once found throughout leeward Haleakalā.

Dr. Hanna Mounce is the Coordinator of the MFBRP and on a recent visit to the relocation site in the NAR, she eagerly shows off the tremendous amount of work underway to prepare this forest for the incoming Kiwikiu. Mounce explained, "The Kiwikiu population in the native forest on the windward side of Maui is being managed in every way possible. Fences are up to keep ungulates out, but introduced predators and avian diseases are still a threat, and as long as the entire population is restricted to one area, the species will

remain vulnerable to extinction. Without a second population, it is only a matter of time before we lose this critically endangered species."



Kiwikiu (Maui Parrotbill) at Maui Bird Conservation Center, photo credit: DLNR.

While work continues to develop landscape-level tools to control disease and predator threats, re-establishment of a second population holds the best hope for the survival of this species.

The forest restoration project on-going in the NAR began with fencing and removal of ungulates and has now planted more than 250,000 native trees like koa and ohia; 19 different species in all. It is a part of a larger effort with the Leeward Haleakalā Watershed Restoration Project. Dr. Fern Duvall, Native Ecosystems manager with Maui DOFAW said, "Once we removed the feral ungulates from the reserve and began planting native trees, it also became clear that there is a diverse and viable seed bank in the soil, and we are now seeing vigorous natural regeneration of native forest species". The reforestation has been remarkable. Mounce said, "It actually really blew us away. The survival rate of these out-plantings far surpassed any of our expectations." Teams of staff and volunteers spent months placing foot-high trees into the ground, developing new and better techniques along the way to ensure survival, which has resulted in healthy trees 20-30 feet tall now. Mounce added, "By enhancing natural regeneration with evolving planting and nurturing techniques, the forest is coming back a lot faster than we anticipated."

Some of the birds will be moved from their current forest homes in east Maui. Others were hatched and raised at the San Diego Zoo Global's Maui Bird Conservation Center. When they are moved, it will be their first time out in the wild, and teams are in high-gear preparing the birds and their new home for their arrival.



MFBRP Data Management Technician Chris Warren preparing for the releases, photo credit: Bryan Berkowitz.

Utilizing some of the best practices developed for other successful reintroductions, the Kiwikiu relocation teams have built a series of platforms to hold small release aviaries, where the birds will spend time adjusting to their new surroundings before they're released into the native forest. Once released, teams will carefully track and monitor their movements, feeding patterns, and behaviors to help inform and improve on possible future translocations.

The U.S. Fish and Wildlife Service (USFWS) 2006 Recovery Plan for Hawaiian Forest Birds (https://ecos.fws.gov/docs/recovery_plan/060922a.pdf) called for the creation of a second population of Kiwikiu. The recovery strategy centered on protection, restoration, and management of native high elevation forests on East Maui (Haleakalā), West Maui, and East Molokai. This includes ungulate monitoring and control, predator control, disease monitoring and control, captive propagation, and habitat restoration. According to the USFWS recovery plan, habitat restoration and re-establishment of a population on leeward East Maui is needed to promote natural demographic and evolutionary processes. This habitat is a mesic forest that appreciates lower annual rainfall forest than the habitat in the birds' current range. Michelle Bogardus, Maui Nui & Hawaii Island Team Manager, U.S. Fish and Wildlife Service, said, "This first reintroduction is an important step toward recovery for Kiwikiu. Collaborative conservation efforts like this are the key to success in protecting and

recovering Hawai'i's native species."

Scott Fretz, DOFAW Maui Branch Manager and one of the co-authors of the 2006 Recovery Plan said, "We are really excited to begin this phase of the work to recover, and I cannot emphasize enough the importance of the many partners that are working with us on this – communities, governments, landowners, non-profits, and volunteers. If we are successful, and that's still a big if, because new threats are always possible, it will be because these partners have worked tirelessly to save the ecosystems on which the Kiwikiu depend. The conservation translocation of the twenty Kiwikiu is expected to begin in October or early November.

–END–

Another critically endangered Hawai'i Forest Bird, the Palila, has been successfully bred by the Keauhou Bird Conservation Center (KBCC), which is located in Volcano, HI, and operated by the San Diego Zoo Institute for Conservation Research (<https://institute.sandiegozoo.org/species/hawaiian-forest-birds>). KBCC began the program in 2000 and released 28 of the finch-billed Hawaiian honeycreepers into the wild. Another small group was released in 2019:

Six Palila Released into Newly Restored Forest on Hawai'i Island

Sharp Decline in Palila Population Prompts Relocation

This news release was first published by the State of Hawai'i Department of Land and Natural Resource (DLNR) on 5/21/19 (<http://dlnr.hawaii.gov/blog/2019/05/21/nr19-101/>)

(Maunakea, Hawai'i) – On Sunday and Monday, a half-dozen Palila, hatched and raised at the San Diego Zoo Global's (SDZG) Keauhou Bird Conservation Center, flew in the open air for the first time in their lives. Palila, a distant relative of finches are the last surviving members of sixteen species of finch-billed, seed-eating birds in the main Hawaiian Islands. They were once found on Kauai and O'ahu, but are now found only high on the slopes of Mauna Kea.

The multi-year effort to try and boost their numbers and prevent their possible extinction involves a large number of collaborators, many of whom had representatives on hand to assist with today's release into the Pu'u Mali Restoration Area on towering Mauna Kea's northern flank.

Housed as pairs, in three separate release aviaries for the past several weeks, the Palila have been under nearly constant observation. They received daily food, and on May 17th were outfitted with radio transmitters attached to a backpack-style harness that will help researchers track them in the coming months. Feeding stations are placed within the release area to provide supplemental food to help the birds adjust to the wild.



Palila, photo credit: DLNR.

Lainie Berry, Hawai'i Forest Bird Recovery Coordinator at the DLNR Division of Forestry and Wildlife (DOFAW), explains, "Currently, Palila are found in one small isolated area on Mauna Kea. Having such a small population in one area, puts the species at a very high risk of extinction. This release is the beginning of our attempt to establish a second population on the mountain to broaden their current range and reduce the extinction threat."

Like most native Hawaiian forest bird species, Palila have been affected by habitat loss and degradation, as well as introduced predators such as cats and mongooses. Habitat degradation caused by ungulates such as sheep and goats has had a significant negative impact on m mane, a slow-growing native tree species. Palila are a specialist species that depend on m mane for approximately 90% of their diet (seeds, flowers, young leaves, and caterpillars) year-round. M mane seeds are poisonous to other birds, but Palila have no problem eating hundreds of seeds daily.

The Pacific Cooperative Study Unit's Mauna Kea Forest Restoration Project has conducted habitat management through predator control and extensive landscape scale restoration through outplanting of m mane and other dry-land forest species to restore this important ecosystem, of which Palila are a part. "Restoration work at Pu'u Mali has been ongoing since 2008 with thousands of m mane and other sub-alpine dry forest species planted between 5,000

and 8,000 feet in elevation to support the required elevational gradient of food Palila depend upon. The forest in and around the current release area has shown a significant response to the lower densities of sheep on the north slope and is a testament to the resiliency of Mauna Kea's unique ecosystem. It is very exciting to be a part of what we hope will be another step towards the recovery of this species." says Chauncey Asing, Maunakea Forest Restoration Coordinator. The American Bird Conservancy, one of the funders and collaborators on the Palila reintroduction project, has made the recovery of the six-inch bird a top priority for its Hawai i program. Chris Farmer, ABC's Hawai i Program Director, commented, "The Palila is a gorgeous bird, but tragically there are now only about 1,000 left in the world. It is urgent that we do everything to stop its population decline and prevent extinction. The restoration and recovery made possible by protecting the forest, removing the ungulates, and this release are excellent steps in that direction."

"This milestone shows how we can avert the tragedy of extinction, when we use years of research to guide conservation decisions." said Koa Matsuoka, SDZG's Hawai i Endangered Bird Conservation Program, Senior Research Coordinator. "Taking a 'One Plan Approach' to conservation, field work, and managed care, has allowed us to move forward with saving the Palila. Our reintroduction efforts with this species can be a model for other efforts to fight extinction in the future."

"This step toward the recovery of Palila would not have been possible without the collaborative efforts of the partner organizations over the last 30 years," said Michelle Bogardus, Maui Nui and Hawai i Island Team Manager, U.S. Fish and Wildlife Service. "Recovering endangered species is a complex process that takes time, but the long-term efforts to restore habitat on Mauna Kea and breed Palila in conservation breeding centers is allowing us to take this next step forward."

The rapid decline of the Palila population has led scientists and managers to take actions to restore the dry forest and evaluate the forest health over time and changes in environmental factors. Additional releases of Palila reared in conservation breeding centers are planned for later this summer, and translocations of wild Palila are planned in subsequent years. The Palila and m mane forest's decline occurred over decades, so recovering the Palila will likewise take many years, but today's release is an encouraging first step in this process. –END–

The historical relation between the critically endangered Palila and the Hawaii Audubon Society reaches back to the 1970s. The Hawaii Audubon Society, National Audubon Society, Sierra Club, and Alan Ziegler filed a lawsuit on behalf of the Palila against the Hawaii Department of Land and Natural Resources (DLNR). DLNR had maintained populations of feral sheep and goats within a State Game Management Area on the upper slopes of Mauna Kea for sport hunting. The area coincided with most of the Palila territory (for details, see 'Elepaio 73:3, pg. 6).

Since 2013, DLNR has been conducting animal control activities like trapping, staff hunting, and aerial shooting from helicopters to reduce feral populations of goats, sheep, as well as mouflon within the Palila critical habitat, most recently in February of this year (<http://dlnr.hawaii.gov/blog/2019/01/24/nr19-019/>).

Meet the HAS Board: Alice Roberts, Mermaid

After serving on the HAS Board from 2001 to 2003, Alice rejoined the Board in 2015. As the artistic director of "Mermaids Hawai'i" she teaches synchronized swimming and performs water shows. She has a B.S. in Biology (Gettysburg College) and a M.S. in Botany (UH Mānoa), as well as a Professional Diploma in Secondary Science Education (UH Mānoa). Alice taught Marine Science at Maryknoll High School for 18 years, driving a school bus and taking her students on 50 field trips a year. She is on the editing team for the 7th edition of the Society's Hawai'i's Birds book.



Alice (on right) with some volunteers at Freeman Seabird Preserve with 25 bags of weeds!

Alice designed a 'Plant Guide' for the Waikīkī Aquarium and also for our Freeman Seabird Preserve (FSP). As volunteer coordinator at FSP, Alice spends countless hours every winter restoring habitat for Wedge-tailed Shearwaters. She regularly leads walks through Paikī Lagoon Wildlife Sanctuary. During the latest walk in April, the group was able to observe Ae'o (Hawaiian Stilt) feeding, flying, and calling, as well as chasing away a gray striped cat. An adult Ae'o flew to a patch of pickleweed in the manmade pond, landed, and sat down in the greenery. Later, a DLNR-FWS wetlands coordinator confirmed that there were 4 eggs in a nest in the patch, which have now hatched!

**HAS Research
Grant Winner
Summer/Fall 2019
Sara Gabrielson
Congratulations!**



Project Title: "Determining Spotted Dove and Zebra Dove Diets on Oahu with Implications for Seed Dispersal"

Sara is a first year PhD student at Northern Arizona University in Flagstaff, AZ. She is interested in seed dispersal by birds on Oahu. The majority of native plants on Oahu are adapted for bird dispersal, yet no native frugivorous (fruit eating) birds remain. Introduced birds now serve as the major dispersers of fruiting plants, both native and non-native, although the effectiveness of these species as dispersers remains unclear. Spotted Dove (*Spilopelia chinensis*) and Zebra Dove (*Geopelia striata*) are non-native birds that have become naturalized on Oahu. They fly longer distances than smaller songbirds, the more typical disperser, and may be contributing to long distance seed dispersal. Despite their potential as important dispersers, no data have been published on the diet of these species. Sara plans to capture and release Spotted and Zebra Doves after taking fecal samples, and identify seeds in their diet. She will also determine if the seeds in fecal samples are viable and can germinate, or if the seeds are digested or broken such that they are no longer viable. This will illuminate the role of these doves as either seed dispersers or seed predators. The seed dispersal capabilities of the doves, or lack thereof, have implications for the maintenance of native plants across the island as well as the spread of non-native plants.

Seasonality and prevalence of pollen collected from Hawaiian nectarivorous birds: a summary

Authors: Kathryn N. van Dyk, Kristina L. Paxton, Patrick J. Hart, and Eben H. Paxton

This article is a research summary by the 2017 Winter/Spring Hawaii Audubon Research Grant Awardee Kathryn N. van Dyk. The subject of this published work differs slightly from that described in the grant proposal. The research team was able to examine nectar preference and seasonality trends from the birds at Hakalau. However, they did not include an analysis on forest fragmentation because they found extremely low levels of pollen on the birds from the k puka, the fragmented forest. They decided that more sampling was needed before definitive conclusions could be published and suggested the results obtained so far are important and meaningful. The following is a link to the early view of the full published work with *Pacific Science*: <https://pacificscience.files.wordpress.com/2018/12/pac-sci-early-view-73-2-1.pdf>

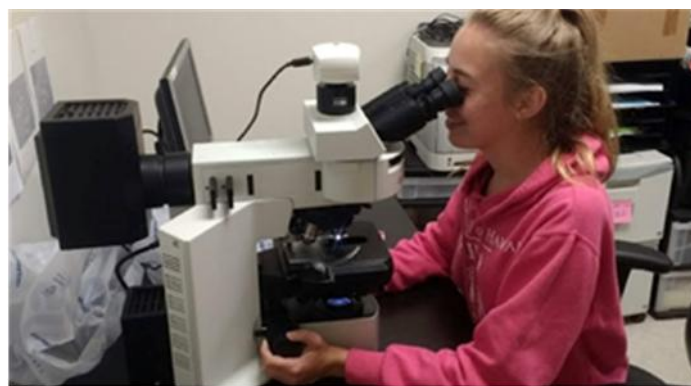
Hawaiian nectarivorous forest birds play a vital ecological role as pollinators in Hawaiian ecosystems, as many flowering plant and bird species have coevolved with one another (Sakai *et al.* 2002, Price and Wagner 2004). However, little is known of the nectar resources used by Hawai'i's nectarivorous birds, other than 'hi'a (*Metrosideros polymorpha*), how seasonality influences nectar availability, and how nectar preference differs by bird species (Richards and Block 1973, Warning *et al.* 1993). By addressing these questions, biologists may better understand and conserve Hawaiian ecosystems and biodiversity. To quantify which plant species are important to Hawai'i's nectarivorous birds, we studied pollen samples collected from birds at Hakalau National Wildlife Refuge on the windward side of Hawai'i Island.

We collected pollen from native bird species including 'i'iwi (*Drepanis coccinea*), 'apapane (*Himatione sanguinea*), and Hawai'i 'amakihi (*Chlorodrepanis virens*), and the non-native Japanese white-eye (*Zosterops japonicas*).



Field work: collecting pollen from 'amakihi and 'apapane, photo credit: Ann Tanimoto.

Pollen samples were obtained by gently pressing crystal clear scotch tape to the birds' foreheads, around the top of the bill, and to each side of the bill. The tape was then placed on a standard microscope slide and pollen species identified using an Olympus BX51 microscope with the 20X lens.



Lab work, photo credit: Ann Tanimoto.

We evaluated how the presence of pollen on birds varied as a function of bird species and season. Because the blooming phenology of plants varied across seasons and the period of time sampled, we predicted a strong seasonal pattern in the occurrence of pollen found on bird species. Moreover, bird species ranged from nectarivorous specialists to generalists, and we therefore expected to find a higher diversity of pollen species on the primarily nectarivorous species.

To analyze our data, we calculated the Shannon's diversity index for each bird species to compare the diversity of the pollen species among the birds. We also evaluated the similarity of total pollen species composition across bird species by calculating a Sorensen's coefficient for each pairwise comparison of bird species. A chi-square test with a Monte Carlo simulation of 10,000 replicates was also calculated to test for non-independent associations between pollen species and bird species and changes in pollen frequency by season.

Our results indicated that ‘hi‘a was the most prevalent pollen species, observed throughout the sampling period, while other species were more seasonal in occurrence. Consistent with the peak flowering phenology of the plant species, pollen from koa (*Acacia koa*), m mane (*Sophora chrysophylla*), and gorse (*Ulex europaeus*) plant species were more commonly sampled from birds in the winter months, while ‘helo (*Vaccinium reticulatum*), ‘kala (*Rubus hawaiiensis*), and blackberry (*Rubus argutus*) were more prevalent during the spring months.

We also found an association between bird species and pollen resources, with ‘i‘iwi and Hawai‘i ‘amakihi having a higher diversity of pollen than ‘apapane and Japanese white-eye, which primarily had just ‘hi‘a. These results demonstrate that ‘hi‘a is likely the most important nectar resource for Hawai‘i’s nectar-feeding birds, but seasonally abundant nectar may be important for some species.



Field work: banding, photo credit: Ann Tanimoto.

Although no nectarivore was completely dependent on ‘hi‘a, our study highlights the importance of ‘hi‘a nectar for Hawai‘i’s nectarivorous bird species throughout the study period. Therefore, Rapid ‘hi‘a Death, a fungal disease that had infected 75,000 acres of ‘hi‘a forest as of 2017 (Keith *et al.* 2015), has the potential to devastate the foraging resources of Hawai‘i’s nectar-feeding birds in areas where ‘hi‘a mortality is high. Concerns about potential large-scale habitat loss, as well as the dangers of avian diseases, demonstrate that the threats to Hawai‘i’s nectarivorous birds persist and should be addressed (Paxton *et al.* 2018).

The dependence of birds on forest habitats, and native forest communities on birds for pollination and seed dispersal, highlights the importance of identifying relationships across trophic levels in achieving an understanding of Hawaiian forest ecosystems.

This study provides a first look at likely sources of nectar for Hawai‘i’s forest birds. It contains insights on seasonality trends and feeding preferences of Hawaiian nectarivorous birds and demonstrates the importance of ‘hi‘a nectar as a food source. Understanding these aspects of Hawaiian bird pollination may help conservationists better understand and protect these birds and the ecosystems that depend on them from potential threats, including Rapid ‘hi‘a Death.

Acknowledgements

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