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Hawaiian Forest Bird Survey, Kona Team, May 1978. Left to right: Cam Kepler, Carter Atkinson, Rick Warshauer, Holly McEldowney, Rich MacArthur, Ted Bodner, Jack Jeffrey, Phil Ashman, Peter Pyle, Mike Scott, Tonnie Casey, Howard Hunt. © Tim Burr

Hawaiian Forest Bird Survey, 1976-1983: Purpose, Methods and Results

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Abstract

In this paper we report on the origin and findings of the 1976 to 1983 Hawaiian Forest Bird Survey, and how information from that survey was used by the Nature Conservancy of Hawai‘i, the U.S. Fish and Wildlife Service and other groups to establish the Hakalau Forest National Wildlife Refuge; identify and conserve areas of high conservation value to Hawai‘i’s native plants and animals; and to establish monitoring programs for endemic forest birds. Sadly, six native bird species observed during the survey are extinct in the wild. We also discuss management actions and tools needed to prevent additional losses of Hawaiian forest bird species at Hakalau Forest National Wildlife Refuge.

The Hawaiian Forest Bird Survey

In December of 1975 U.S. Fish and Wildlife researchers and managers concluded that available information on the forest birds of Hawai‘i was insufficient to make informed decisions about filling gaps in the existing protected areas system for endangered forest birds. What was needed to answer that question was a statewide survey of native forest birds and their habitats to determine their distribution, abundance, population size, habitat associations and conservation status. To fill this information gap, the Hawaiian Forest Bird Survey (HFBS) was initiated in the spring of 1976 (Scott et al., 1981, Scott et al., 1986). Observers carried packs as heavy as 40 pounds and stayed as many as eight nights in the forest.

During the seven-year HFBS survey (1976-1983), 1,401 km of transects were surveyed on the islands of Hawai‘i, Maui, Molokai, Lana‘i, and Kaua‘i. (Figures 1, 2, and 3). Along these transects, 20,789 eight-minute count periods were conducted to detect birds heard and/or seen, 9,940 points were sampled for other animals and plants (Scott et al., 1986), and new vegetation maps were prepared for each study area (Jacobi 1976, 1989). We observed 23 native forest bird and 6 non-native forest bird species and more than 120,000 native and 76,000 non-native birds were recorded during the survey (Figures 4, 5, and 6). The most abundant native forest bird was the ‘Apapane (*Himatione sanguinea*) with an estimated population size of 1.5 million birds, whereas the non-native Warbling white-eye (*Zosterops japonicus*) population was estimated to be 1.6 million individuals. Six of the native bird species reported during the survey are now considered extinct: Kaua‘i ‘Ō‘ō (*Moho braccatus*), ‘O‘u (*Psittirostra psittacea*), Kāma‘o (*Myadestes myadesinus*), Oloma‘o (*Myadestes lanaiensis*), Nukupu‘u (*Hemignathus lucidus*), and the Po‘ouli, (*Melamprosops phaeosoma*). One species, the ‘Alalā (*Corvus hawaiiensis*) went extinct in the wild but has recently been introduced to Maui; and another, the ‘Akikiki (*Oreomystis bairdi*), numbers fewer than six individuals and is considered functionally extinct in the wild (Gorresen et al., 2009). Lisa ‘Cali’ Crampton, Director of the Kaua‘i Forest Bird Recover Project, has stated that, “we

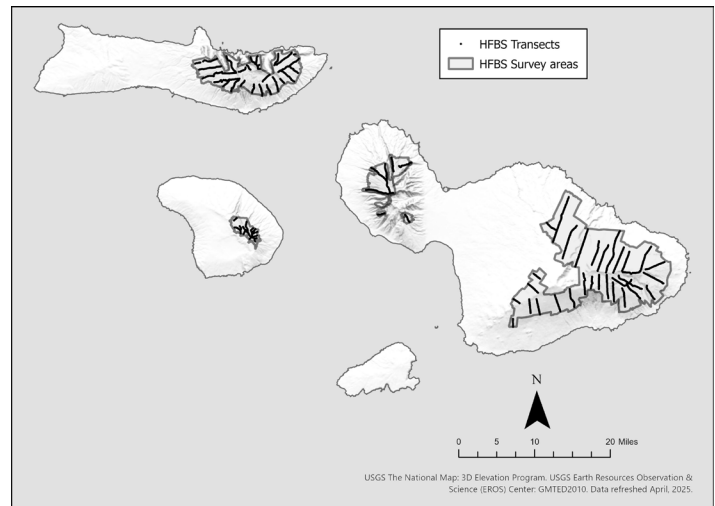


Figure 2. Hawaiian Forest Bird Survey Transects on Maui, Moloka‘i, and Lāna‘i.

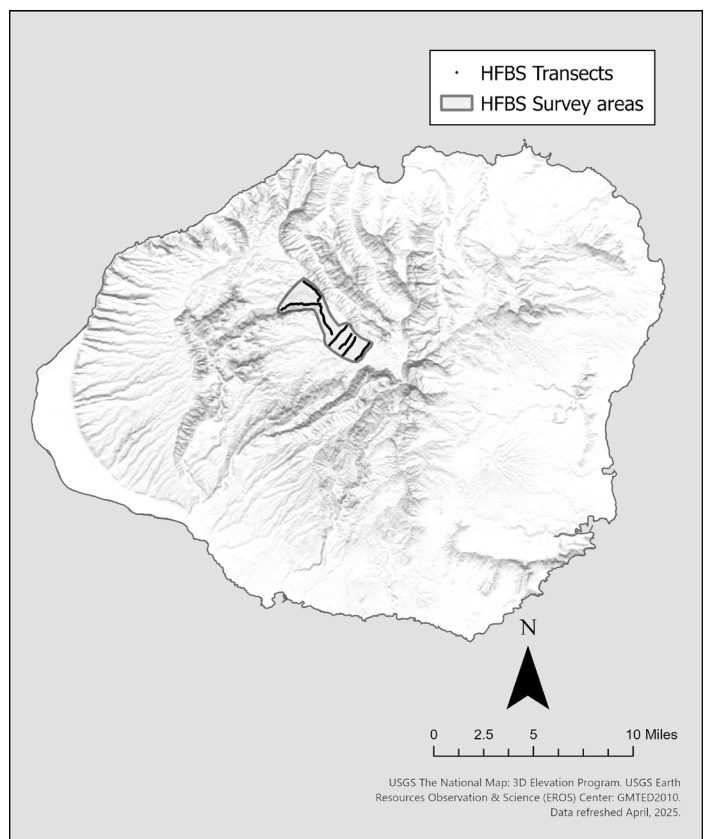


Figure 3. Hawaiian Forest Bird Survey Transects on Kaua‘i.

know of only two individuals in the wild, both at Mōhihi. There are doubtless a few other places we don’t survey, but not many.”

The botanical teams on the survey documented plant communities at 9940 survey points and recorded over 44,000 plants in 803 taxa of both native and introduced species along the transects. Over 3,600 plant specimens were collected and are being deposited in herbaria at the Bernice Pauahi

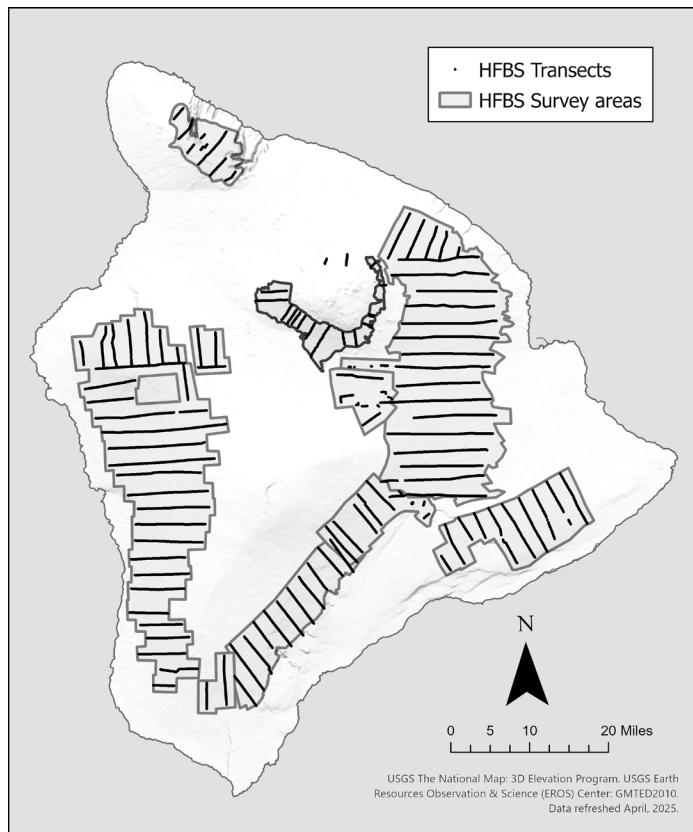


Figure 1. Hawaiian Forest Bird Survey Transects on Island of Hawai‘i.

Bishop Museum and Smithsonian Institution. Additionally, several new native plant taxa were discovered, and several new invasive plants were found for the first time in Hawai'i, including *Tibouchina herbacea*.



Figure 4. Hawaiian Forest Bird Survey, Hamakua Coast Bird Survey Team, June 1977. Left to right: Carter Atkinson, Larry Katahira, Tonnie Casey, Phillip Ashman, Tim Burr (background), Mark Collins, Peter Pyle, Avery Taylor, Mike Scott and Cam Kepler.

Management applications

Information on the distribution, abundance, habitat associations and conservation status of endemic forest birds and plants from the survey was shared with land management groups, agencies, and conservation groups so they could use it to help inform their decisions in identifying the best areas to conserve these species (Scott et al., 1986). In 1979, The Nature Conservancy in Hawai'i (TNCH) was seeking to develop a biological program in Hawai'i. They stated that, "It was largely from the findings of the U.S. Fish and Wildlife Service's Hawaiian Forest Bird Survey that the Conservancy launched the Endangered Hawaiian Forest Bird Project," which they then used to build a comprehensive program in Hawai'i, with the aim of preserving Hawai'i's beleaguered forest bird species (Little 1984). Information provided from the HFBS and other sources of information allowed TNCH to assess the status of forest bird habitats in the State and prioritize

their acquisition and management activities to protect the best remaining areas (Scott et al., 1987). High priority areas that were targeted for protection included what are now the Kamakou Reserve on Moloka'i, the Waikamoi Reserve on Maui, and the Hakalau Forest National Wildlife Refuge (HFNWR) on the island of Hawai'i (Scott et al., 1977, Scott and Sincok 1977, Scott and Kepler 1981, Little 1984, Scott et al., 1986, and Scott et al., 1987).



Figure 6. Hawaiian Forest Bird Survey, Kau Forest Team. Left to right: John Sincok, (Co-leader), Jim Jacobi, Mike Scott (Co-leader), Mark Collins, Pat Conant, Robert Eddinger, and Charles van Riper III. © Miles Nakahara.

Creation and management of the Hakalau Forest National Wildlife Refuge

Hakalau Forest, known as the "land of many perches" (Pukui et al., 1974), is located on the higher-elevation windward slopes of Mauna Kea above the Hāmākua coast. Multiple parcels were purchased by TNCH from 1976-1985 within the boundaries of the proposed HFNWR. These properties were then sold by TNCH to the U.S. Fish and Wildlife Service and became the foundational parcels to establish the HFNWR in 1985. HFNWR was the first national wildlife refuge established specifically to conserve endangered forest birds and their habitat in the United States.

Refuge acreage increased over the next 10 years when the USFWS and TNCH worked together to purchase other parcels from adjacent private landowners. Today, the Hakalau Forest Unit of the Refuge encompasses 32,733 acres and extends from 3,200 to 6,600 feet, elevation, almost half of which is above the current range of *Culex quinquefasciatus* mosquitoes that are the prime vector for avian Malaria in Hawai'i (LaPointe, et al., 2016; Fortini et al. 2020).

When HFNWR was established, over 5,000 acres at the upper reaches of the windward side of the refuge once covered in



Figure 5. Hawaiian Forest Bird Survey, birders in training on Keauhou Ranch, Hawai'i, May 1977. Left to right: Carter Atkinson, Avery Taylor, Mike Scott, Cam Kepler, Phillip Ashman, Peter Pyle. © Tim Burr

Koa (*Acacia koa*) and Koa-‘Ōhi’a (*Metrosideros polymorpha*) forest had been converted to mostly treeless non-native grass pasture after 125 years of grazing by domestic cattle, rooting by feral pigs (*Sus scrofa*), and other ungulates. Although the native understory in these pastures had been mostly replaced by non-native grasses, the Koa and ‘Ōhi’a forest below the pastures still contained an almost intact native tree canopy that provided habitat for the native forest birds.

The first refuge manager, Richard Wass, and first biologist for the refuge, Jack Jeffrey, shared a vision for the Refuge’s future that included revegetating the higher elevation pasture lands of the refuge to restore the native forest habitats needed by endangered forest birds to thrive. Fencing of the former pasture areas began in earnest in 1987 and by 1994 some 64 miles of fence had been constructed around 8 feral ungulate management units at the Refuge (USFWS 2010). Staff and public hunting for cattle and pigs, as well as snaring in some units, greatly reduced feral ungulate populations. The understory plants in the ungulate management areas rebounded after the feral animals were removed. However, because the native seed bank was very limited in the upper pasture area, nearly 600,000 native tree and shrubs were planted there between 1989 and 2020 to enhance forest recovery. Baron Horiuchi was hired as a horticulturist to construct a greenhouse, collect seeds, and raise and outplant native plants. A second greenhouse was completed in 2023, following Baron’s retirement in 2021. Eight endangered plant species, many with only a few individuals remaining in the wild, were grown in an on-site greenhouse facility and then out-planted under the rapidly growing, newly planted Koa and other native trees. Seedlings of the critically endangered plant, *Clermontia pyrularia*, in the Lobelia family, were mass planted in the upper Pua Akala Tract Koa restoration area in 2018. Many of these plants flowered for the first time in the spring of 2023 and even though the current populations of I‘iwi had never seen these plants flowering in this area before, these birds were observed feeding and pollinating the flowers of *Clermontia pyrularia*. In the fall of 2023, ‘Oma‘o were also seen feeding on the fruits of this endangered *Clermontia* dispersing the seeds of this almost extinct plant in their droppings (J. Jeffrey, personal communication).

In 2019, what was once open pasture had become forest with mature canopy trees and a recovering native shrub and fern understory (Figures 7 and 8). The populations of the endangered forest birds were found to be stable and/or increasing (Paxton et al 2016; Camp et al. 2015). Recent studies (Kendall et al. 2023), however, found that limited funding and

staffing had reduced the effectiveness of management actions to deter the threats from feral pigs and weeds, leading to variable trends in native bird species populations since 2012 across habitat types and elevation. Endangered forest birds appear to have generally benefitted from more than three decades of the reduction of pig and invasive plant impacts as well as reforestation of upper elevation pastures. As a consequence, HFNWR now provides important habitat for large proportions of the global populations of four listed forest bird species: Hawai‘i Creeper, also known as the Alawī (71%), Hawai‘i ‘Ākepa (44%), ‘Akiapōlā‘au (61%), and the T‘iwi (20%) (Kendall et al., 2023).



Figure 7. Hakalau Forest Ridge planting lands in 1989. Pre-reforestation in upper elevations of Hakalau Forest National Wildlife Refuge. © Jack J. Jeffrey



Figure 8. Reforested Hakalau Ridge Planting lands in 2010. © Jack J. Jeffrey

Managing the Hakalau Forest NWR into the future

Going forward, if the remaining endangered and even common forest birds of Hakalau Forest are to be saved we

need to be bolder in both our thinking and actions to mitigate threats to these species and their habitats. Consistent with that thinking, reforestation should be expanded at a landscape scale extending from approximately 4,500 ft elevation upslope to existing and future tree lines. Other management activities, including reducing the impacts of invasive animals and plants, must also be expanded at conservation relevant scales. This will necessitate collaborative management efforts by refuge staff and the owners and managers of lands adjacent to the refuge.

Similar to all National Wildlife Refuges, Hakalau Forest National Wildlife Refuge is understaffed and underfunded (<https://www.refugeassociation.org/the-refuge-staffing-crisis>). As a consequence, currently mitigation of threats is happening at time intervals that are often too long and over areas that are too small to achieve the landscape level conservation objectives and fully mitigate the threats. Threats to habitats and ecological processes, as well as the remoteness of the refuge, amplify the challenges faced by refuge staff. Threats to endangered species are such that, while they can be mitigated at a local scale, we currently do not have all the resources or knowledge needed to eliminate them at a landscape scale. The endangered species of Hakalau all face multiple threats, and refuge staff are having to make choices about which threat to address. They are practicing triage with some of the most endangered species on the planet.

Management actions taken at HFNWR and adjacent areas can increase the stability, diversity, and health of both HFNWR and the larger conservation landscape of the Hamakua Important Bird Area (Vanderwerf, 2008) and the Kanakaleonui Bird Corridor that provides a habitat link for the forest birds of HFNWR to the currently mosquito-free higher elevation forests of Palila Critical Habitat well above the upper elevation boundary of Hakalau Forest (Figure 9).

In late 2015 a group of individuals who understand the value of HFNWR to native plants and animals, and the consequences of insufficient management actions, established the Hakalau Forest Refuge Management Endowment to provide permanent funds capable of increasing management actions to the level needed to fully address threats to native species and their habitats and increase chances that HFNWR will remain the place that “harbors the largest and most stable populations of listed birds” in the Hawaiian Islands (Banko et al. 2022). The earnings and distribution of funds from the endowment will be used to help offset ongoing financial shortfalls of funds needed to conserve the endangered species and their

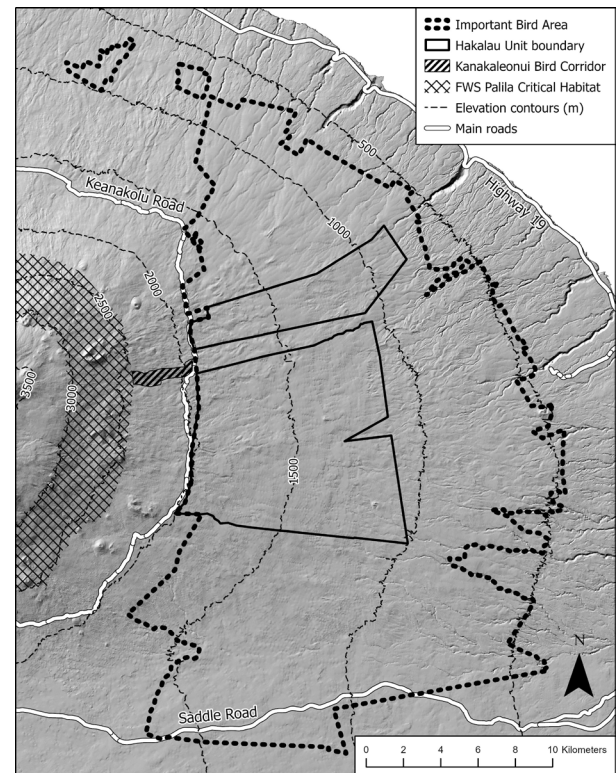


Figure 9. Hakalau Forest National Wildlife refuge in context of adjacent lands.

habitats of HFNWR and adjacent areas. To find out more about the Hakalau Forest Management Endowment visit: <https://friendsofhakalauforest.org/endowment/>.

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A temporary field station on Manawai used to process 'ekupu'u—each Laysan Finch (*Telespiza cantans*) was weighed, measured, banded, and recorded prior to transport to Kuaihelani. © Sheldon Plentovich, USFWS

A Song Returns to Kuaihelani: The Laysan Finch Translocation of 2025

By Laura Doucette

In July 2025, a sound long absent from Kuaihelani (Midway Atoll) returned—the melodic, trills, whistles, and warble-like song of the Laysan Finch ('ekupu'u; *Telespiza cantans*). For the first time in eight decades, their voices carried across the wind-shaped vegetation of Midway's Eastern Island. This moment marked the culmination of a complex and collaborative translocation effort designed to bolster the resilience of this endangered species, long absent from its ancestral home due to invasive species and habitat loss (Friends of Midway Atoll, 2025; U.S. Fish & Wildlife Service [USFWS], 2025).

Historically abundant on several Northwestern Hawaiian Islands, the Laysan Finch was once a common resident of Midway Atoll (Kuaihelani). Black rats (*Rattus rattus*) arrived at Midway, likely as stowaways on military supply ships in the mid-1940s. The invasive predators quickly devastated smaller ground-nesting and ground-feeding bird species, and the finches vanished from the atoll (USFWS, 2025). By then the birds survived only upon a single island; their English namesake: Laysan Atoll (Kamole). An insurance population was established in 1967 when U.S. Fish and Wildlife biologists

translocated 28 ‘ekupu‘u from Laysan Island to Pearl and Hermes Reef (Manawai), where they thrived. However, being low-lying and exposed to the hazards of climate change, Manawai became increasingly vulnerable to winter storms. These storms began to overwhelm the island, leaving the insurance population even more imperiled. Once again, the species was at greater risk of extinction. In 1996, the USFWS, U.S. Navy, and U.S. Department of Agriculture-Animal and Plant Health Inspection Service partnered to successfully remove rats from Midway, and with its higher elevation, Kuaihelani could once again serve as a home for ‘ekupu‘u and a bulwark against climate change, storms, invasive species and disease (U.S. Geological Survey [USGS], 2025).

The July 2025 mission involved the safe capture of 100 finches from Manawai, using fine mist nets. Each bird was examined with a health check, weighed, measured, and fitted with a unique combination of colored leg bands to allow individual identification in the wild. Some ‘ekupu‘u now also carry tiny radio transmitters that will help scientists follow their movements after release (Friends of Midway Atoll, 2025; Maui Now, 2025). To reduce stress during transport, the finches were housed individually in small ventilated containers—nicknamed ‘condos’—via zodiac (a small boat) to a larger research vessel, which carried them to Kuaihelani.

The voyage was just one piece of a much larger picture. This effort brought together multiple organizations and drew on the expertise of the U.S. Fish & Wildlife Service, NOAA, USGS, University of Hawai‘i’s Project VINE, Friends of Hawaiian Islands National Wildlife Refuge, Pacific Rim Conservation, Papahānaumokuākea Cultural Working Group, Pacific Bird Conservation, and the American Bird Conservancy. The Hawai‘i Audubon Society provided a small, yet critical amount of fundraising through the Hawai‘i Bird Crisis Fund, rallying community members and donors who understood the urgency of the birds’ safety.

Upon arrival at Eastern Island, the finches were released into native habitat restored and protected in preparation for their return. Monitoring began immediately. Field teams will track banded birds, record feeding behaviors, and search for signs of nesting. The newly arrived population faced an early test when a tsunami swept through the atoll only days later. But the birds endured—an encouraging sign of resilience (Hawaii Public Radio, 2025). By establishing insurance populations, wildlife managers help reduce the risk of total loss from localized threats. And Midway benefits from having these feathered ecosystem engineers restored into the atoll’s delicate balance.



Field crews depart Manawai by zodiac, transporting ‘ekupu‘u to a larger vessel bound for Eastern Island. Upon arrival, team members carefully carry the transport boxes ashore for the final leg of the journey — their release into restored habitat. © Dan Rapp, USFWS



Biologists release 'ekupu'u into restored habitat on Eastern Island during the July 2025 translocation. © Dan Rapp, USFWS

This reintroduction is part of a broader conservation strategy within the Papahānaumokuākea Marine National Monument, where restoring biodiversity and avian populations across the archipelago is key to safeguarding island ecosystems against future shocks (USFWS, 2025). This Laysan Finch relocation echoes the successful re-establishment of the Laysan Duck on Midway two decades ago. Further proof that with the right conditions, native species can reclaim lost ground.

For the Hawai'i Audubon Society, the project reflects a belief that conservation is both a science and a shared cultural responsibility. Every donor who contributed, every volunteer who spread the word, and every field biologist who endured the challenges of remote island work played a role in bringing the song of the 'ekupu'u back to Kuaihelani. Their efforts remind us that while extinction can happen quickly, restoration—though it takes patience—can succeed.

The return of the Laysan Finch to Kuaihelani represents more than a recovery milestone and a biological success, but

also a symbolic restoration of an ecological heritage lost for generations. The song of 'ekupu'u, once silenced, now echoes across Midway Atoll again, carrying with it a renewed hope for Hawai'i's native birds.



A newly translocated and released 'ekupu'u foraging in its new habitat. © Dan Rapp, USFWS

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The kōlea (Pacific Golden-Plover, *Pluvialis fulva*) are making their return back to Hawai'i for the winter.
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Events

September 6: Welcome Home Kōlea Festival (O'ahu)

September 13: Kalo & 'Awa Festival at Waimea Valley (O'ahu)

September 27: DLNR State Parks' Day at the Lake (O'ahu)

October 4: Hawai'i Island Festival of Birds (Hawai'i Island)

For more details and updates visit:
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Table of Contents

Hawaiian Forest Bird Survey, 1976-1983: Purpose, Methods and Results	43
A Song Returns to Kuaihelani: The Laysan Finch Translocation of 2025	48
Announcements and Events	51



A Laysan Duck (*Anas laysanensis*) lounging in a pond. © Nicole Carion