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'Alae 'ula chick forages. ©Hob Osterlund

Recovering the 'Alae 'Ula: The Path to Abundance

Helen Raine, Pacific Birds Habitat Joint Venture

Introduction

The 'alae 'ula or Hawaiian Common Gallinule (*Gallinula galeata sandvicensis*) is easy to find in wetlands, lo'i, rivers, streams and golf courses on the two islands where they persist (Kaua'i and O'ahu), such that many people assume it is common. In reality, it is one of the most endangered waterbirds in the world, having undergone a significant range contraction and population decline. Historically the species occurred on all the Main Hawaiian Islands except Lāna'i and Ni'ihau. 'Alae 'ula were extirpated from Hawai'i Island in the 1880s, from Maui Nui in the 1950s, and by the 1960s the statewide population had fallen to ~60 birds (USFWS, 2011). The most recent five-year average (2019–2023) estimates the population at 712 individuals, with ~485 on Kaua'i and ~230 on O'ahu (Gorresen et al. 2024). These small populations make the species highly vulnerable to a single storm, disease outbreak, or other stochastic event. Yet recovery is entirely achievable with adequate, well-targeted, and sustained resources. This review is framed by the concept of Resiliency, Redundancy, and Representation, three biological principles commonly used in recovery planning and summarized as "saving some of everything" and "saving enough to last" (Shaffer and Stein 2000). Here, we draw on research from the last decade, particularly on predator control and population viability, to chart a path that en-

sures this endemic species persists into the future.

Resiliency Through Predator Control

Resiliency describes a population's ability to withstand stochastic events such as storms, disease, and other short-term impacts (Shaffer and Stein 2000). For the ʻalae ʻula, resiliency is driven primarily by population size, adult survival, and reproductive output (nest success and fecundity; van Rees and Reed, 2018). The species is highly sensitive to changes in adult survival and juvenile recruitment but can respond quickly to high quality management. Due to a robust reproductive capacity, relatively modest improvements in survival or nest success can meaningfully raise the population growth rate. Modelling suggests that the Oʻahu population will persist at least 160 years or ~40 generations but with a high probability that individual subpopulations will be lost (van Rees and Reed, 2018). The mortality rates of juvenile and adult individuals significantly affect persistence, implying that reducing mortality through predator control would be key to lowering the extirpation risk (van Rees and Reed, 2018).


Cat stalking ʻalae ʻula. ©Hob Osterlund

Several studies identify mammalian and avian predator species that have significant impacts on ʻalae ʻula, which varies by location. The small Indian mongoose (*Urva auropunctata*) is the most prevalent nest predator of ʻalae ʻula (Botet, 2024, Works et al., 2024, Works et. al., 2026); Kauaʻi is free from this predator but Oʻahu is not (nēnē.org, 2026). ʻAlae ʻula are precocial so chicks leave the nest soon after hatching and remain vulnerable well beyond incubation. Mammal removal was the only management action found to benefit the species across the nesting and post-hatch phases in Oʻahu (Botet, 2024).

A study tracking marked adults and their broods at the U.S. Fish and Wildlife Hanalei National Wildlife Refuge (NWR) found that survival from hatch to 40 days was just 0.18 ± 0.08, the first direct estimate of chick survival for this species (Webber, 2024). Predation events included attacks by invasive Barn Owls (*Tyto alba*) on chicks and adults within the first week post-hatch, when broods were still roosting at the nest overnight, and one chick taken by an ʻaukuʻu or Black-crowned Night Heron (*Nycticorax nycticorax*). Night herons may be an underreported source of chick mortality. Water drawdowns in wetlands intended to improve habitat suitability may inadvertently attract foraging herons, increasing predation risk to ʻalae ʻula chicks (Webber 2024). Broods appear to roost overnight at the nest far longer than previously expected, suggesting that nest sites need continued protection well after hatching, not just during incubation (Webber 2024). Webber (2024) recommend a buffer of undisturbed habitat around nests found in harvested taro loʻi that continues beyond nest hatching. Ideally, nest success would be confirmed via remote camera before farmers resume plant removal (Webber, 2024).

Cats and barn owls are major predators at Hanalei NWR. From 2018 to 2020, feral cats accounted for ~ 70% of the 90 documented waterbird predation

Cat killing waterbird. ©Bryn Webber

cases and Barn Owls were responsible for the remaining 30% (Uyehara, pers. comm. 2020). In the prior four-year period (2014-2018), 251 endangered wetland birds were depredated by cats (predator identified postmortem based on method of kill) despite intensive efforts to reduce predation pressure (Mitchell pers. comm. 2020; Baker et al, 2019). Nearly 40% (N=100) of predated birds were ʻalae ʻula (Mitchell pers. comm. 2020; Baker et al, 2019). Observed carcasses represent only a proportion of actual depredation events as carcasses may be scavenged or go undetected.

American bullfrog (*Lithobates catesbeianus*) has recently been reported preying on ʻalae ʻula, with a tagged chick recovered in a bullfrog stomach (Nietmann, pers. Comm, 2023; Works, 2024). Likewise, the nonnative red-eared slider turtles (*Trachemys scripta elegans*) also predate chicks, pulling them underwater by the legs to drown and eat them (Works and Olson, 2018).

Taken together, these studies and observations underscore the importance of predator control efforts and indicate that current levels are not sufficient to recover ʻalae ʻula.

Predator proof fencing is a viable solution (Christensen et al. 2021, Raine et al., 2024, Young and VanderWerf, 2024) as it is effective against terrestrial predators and was identified by the ʻAlae ʻUla Working Group as the most important management action to recover ʻalae ʻula in Hawaiʻi (Raine and McFarlin, 2023). Yet, fencing can be expensive and challenging to place and manage in wetland habitats and does not deter avian predators. An increase in fencing where applicable, combined with high quality, expert-led predator control management, is critical to improving ʻalae ʻula resilience.

ʻAlae ʻula. ©Andre Raine

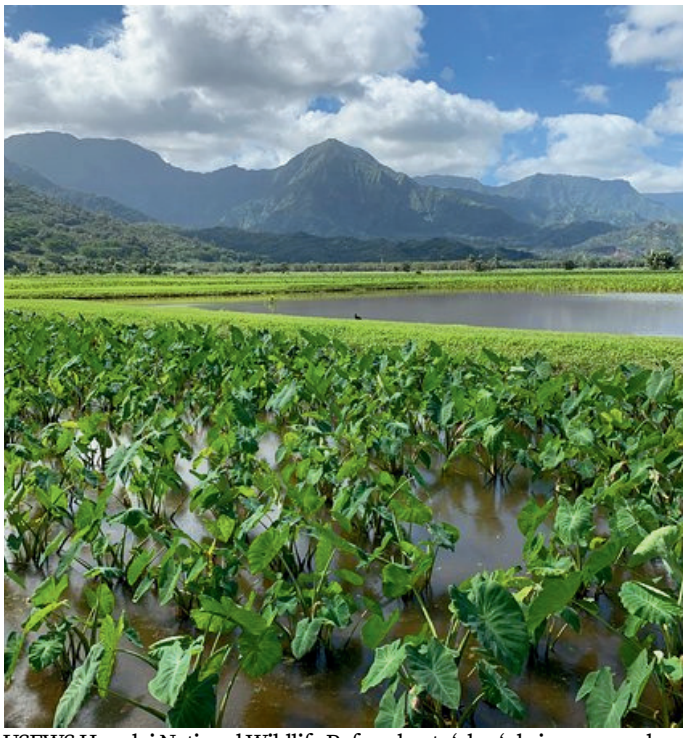
Increasing Redundancy: Reintroduction to a Third Island

Redundancy measures whether the species has enough independent populations, distributed widely enough, and with connectivity, to survive a catastrophic event that wipes one of them out (Shaffer and Stein, 2000). With the species restricted to Kauaʻi and Oʻahu, redundancy remains low; a single hurricane, avian disease outbreak, or other catastrophic event affecting either island would have devastating consequences.

To increase redundancy, between the 1950s to 1980s multiple efforts were made to translocate and establish the species to Molokai, Maui, and Hawaiʻi Island. Every effort failed (Dibben-Young, 2009, USFWS, 2011). Across four attempts, the challenges to success included inconsistent project delivery, particularly predator and habitat management (VanderWerf, 2024), potentially exacerbated by an absence of community engagement. However, reintroducing the species to a third island remains a vital part of a durable recovery strategy (USFWS, 2011), and a substantial body of recent work has laid the groundwork for future success.

Van Rees and Reed (2024) modeled population-level effects of translocating wild birds from Kauaʻi and Oʻahu to a third island. Modelled hatch-year juvenile survival had a large effect on the viability of any reintroduced population, yet the current estimated juvenile survival rate approaches the threshold for population failure. Therefore, predator control at any future release site is a necessary precondition for any reintroduction effort to succeed and would need to be in perpetuity (VanderWerf, 2024, van Rees and Reed, 2024). In addition, selecting birds for translocation from multiple, genetically distinct source subpopulations on both Kauaʻi and Oʻahu is recommended to preserve genetic variability, minimize the risk of inbreeding depression, and spread the impact of removal across multiple source populations (van Rees and Reed, 2024).

A reintroduction feasibility study evaluated sixteen potential release sites on Maui, Molokai, and Hawaiʻi Island (VanderWerf, 2024). Only ʻAimakapā Pond on Hawaiʻi Island was identified as having habitat suitable for immediate release, but long-term climate security, rising salinity and sea-level rise were major concerns given its location on the shoreline. Every other site requires substantial restoration first (VanderWerf, 2024). Two candidate sites, Waiheʻe (Maui) and Punalau Pond (Molokai) now have that work underway (Molokai Wetland Partnership, 2024). Three factors were identified as decisive for success: effective long-term habitat management, predator control or fencing at the release site, and community engagement (VanderWerf, 2024).



USFWS Hanalei National Wildlife Refuge hosts ʻalae ʻula in managed wetlands and loʻi kalo. ©Helen Raine

Redundancy will be affected by sea-level rise which is projected to significantly affect ʻalae ʻula habitat (van Rees and Reed, 2018; Harmon et al. 2021), making the acquisition, restoration or support of climate-resilient wetland habitat essential to any long-term recovery goal. Observed nesting and fledging of waterbirds within loʻi kalo (taro pond fields) at Heʻeia suggests that restoring Hawaiian indigenous agroecological wetland systems can support sustainable food production and provide waterbird habitat (Greer 2005, Harmon et al. 2021, Winter et al., 2020a and 2020b). Pairing Indigenous agroecosystem management with predator control offers a sustainable, landscape-level complement to formal state and federal refuge habitat provision and management, supporting redundancy despite the rising threat of sea-level rise, since loʻi can be located further inland on riverine corridors (Harmon et al. 2021).

Representation – Reversing a Narrowing Genetic Base

Representation measures a species' capacity to adapt to changing environmental conditions, gauged by the breadth of genetic, ecological, and behavioral diversity within and among its populations (Shaffer and Stein 2000). ʻAlae ʻula representation is under strain from two directions: a narrowing genetic base and a heavy dependence on a small number of managed sites. The high extirpation risk facing the smallest ʻalae ʻula subpopulations is a concern; on Oʻahu, some of the smallest subpopulations such as Keawāwa wetland or the Klipper golf course at the Marine Corps Base also hold some of the most genetically distinct individuals in the species (van Rees and Reed, 2024). Losing them would remove genetic variation that could not easily be recovered elsewhere, even though the numeric loss to the state-

wide population would be relatively low (van Rees and Reed, 2024). Large state and federal wetland sites have been the cornerstone of recovery for decades and remain essential to the survival of the species, but it is also important to preserve diversity in habitat type. Reducing species' reliance on any single wetland or management regime is needed to avoid events at one site having an outsized effect on the species. This concern is exemplified at Hanalei NWR where a reduction in actively managed wetland acreage corresponds with a reduced number of ʻalae ʻula statewide (Gorresen et al., 2024; Paxton et. al., 2021; DLNR-DOFAW, 2024, Pacific Birds Habitat Joint Venture, 2024).

The impacts of climate change are projected to exacerbate the challenges for ʻalae ʻula. Spatial modelling of a 1–2 m sea-level rise scenario suggests up to 29 % of current potential Hawaiian waterbird nesting habitat will be lost to inundation by the year 2100 (Harmon et al. 2021). On Oʻahu, the largest gallinule populations face a reduction of >40% in carrying capacity (van Rees and Reed, 2018).

Improving representation means expanding and improving predator control at existing and newly acquired or managed wetlands that regularly support ʻalae ʻula. Supporting diverse sites will preserve the behavioral and ecological flexibility the species needs to adapt to shifting hydrology, invasive species pressure, precipitation patterns, and sea-level rise, and increase connectivity between populations, supporting the dispersal and genetic exchange to keep adaptive capacity intact over time.

Community and Cultural Outreach

Recovery efforts grounded solely in biology are unlikely to succeed without sustained public support and active community stewardship. Hawaiians have a strong cultural connection to the ʻalae ʻula; it features in multiple moʻolelo and benefited from the habitat provided by the stewardship of once extensive loʻi kalo (Gomes 2024, Cody 2024).

Despite a deep cultural connection, local people are often unable to name the bird even where it is easy to see and the bird faces substantial risks from humans (e.g., vehicle and golf cart collisions, feeding birds, disturbance, development). Outreach

Outreach event on Kauaʻi. From left: Andre Raine, Keahi Renaud, Ryan Gallagher, Helen Raine. ©Mike McFarlin

is essential to raise the profile of the ʻalae ʻula and empower people to take action to protect them. In 2026, an outreach and education campaign was initiated by Pacific Birds Habitat Joint Venture, Hawaiʻi Audubon Society, and twenty additional partners. This campaign recognizes that returning this bird to abundance requires community-based solutions. The goal is to increase awareness of the ʻalae ʻula, its rarity, and importance in Hawaiian culture and ecology. Objectives include reintroducing people to the bird and communicating the need for high quality, predator free wetland and loʻi kalo management. The campaign is still running (bit.ly/alae-ula) but has reached thousands of people through TV, radio, press, social media, public events, art competitions, and school activities and lessons.

Conclusion

The ʻalae ʻula's recovery hinges on strengthening all three pillars of resiliency, redundancy, and representation. Beyond the basic requirement for high quality habitat, resiliency requires predator control tailored to each life stage of the ʻalae ʻula and predator behavior; additional predator proof fencing; statewide efforts to reduce the number of free roaming feral cats and Barn Owls; and continued vigilance against emerging threats. Redundancy re-

quires establishing a third, self-sustaining population supported by predator control and active habitat management sustained for the long term. Representation requires investing in restoring wetlands and indigenous agroecological spaces, to preserve the species' genetic and ecological diversity, in parallel with maintaining 'cornerstone' refuges and sanctuaries. Sustained community and cultural partnership will strengthen all aspects of recovery. The 'alae 'ula has responded well when resources are consistently applied. The challenge is sustaining that commitment and, in the face of new challenges, using new tools to secure the future of the 'alae 'ula and restore it to abundance across all islands it once called home.

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