

Phenomenon:
A Tale of Three Birds

Guiding Question:

What is **causing** the endemic birds of Kaua'i to go extinct?

What is happening?



Phenomenon
Observable events in
the real world

Kauai o'o'
EXTINCT



Akeke'e
725 remain



Akikiki
300 remain



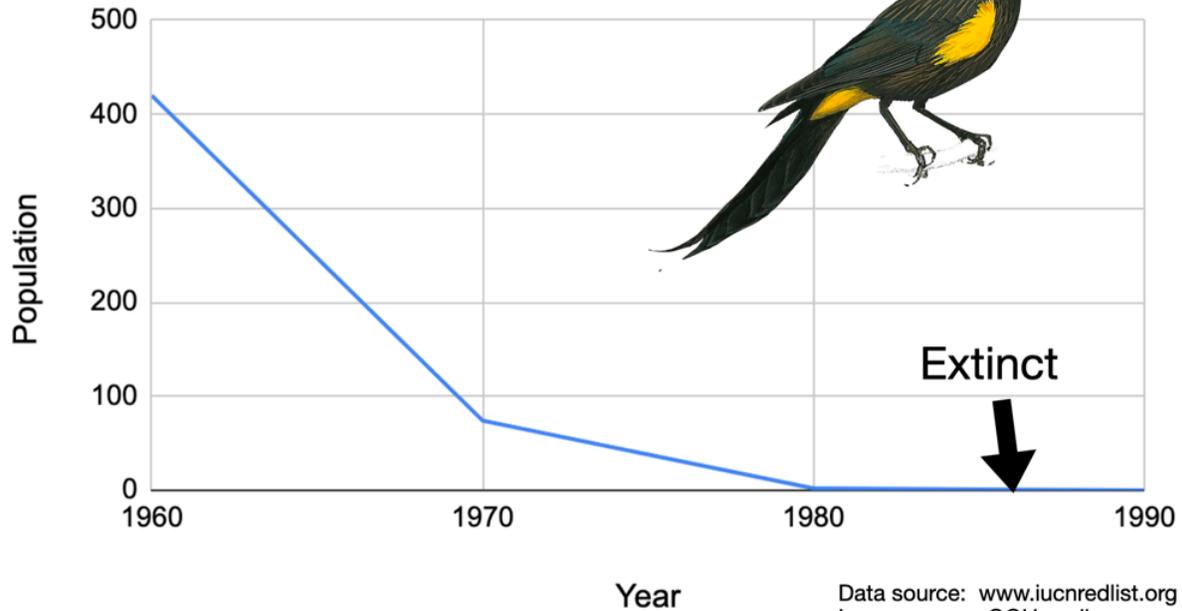
Evidence 1: Bird Descriptions	3
Evidence 2: Bird Populations	4
Evidence 3: Bird Range Maps	6
Evidence 4: The Island of Kauai	7
Evidence 4: Femmes Fatale	8
Evidence 5: Mosquito Breeding Zones	9
Evidence 6: Humans and the Hawaiian Islands	10
Evidence 6: Hurricanes	11
Evidence 7: Possible Solutions	12

Evidence 1: Bird Descriptions

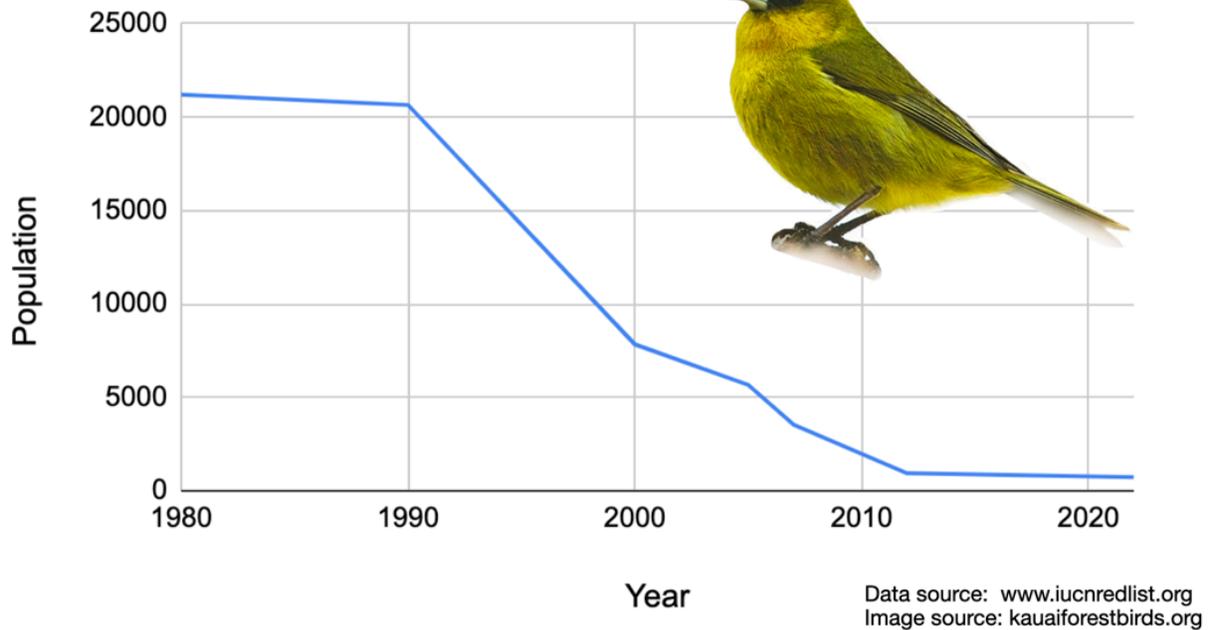
Name	Location	Image	Description
Kaua'i 'ō'ō'	Kaua'i, Hawaii		<p>The bird was only found on Kaua'i. It was common in the subtropical forests of the island until the early twentieth century, when its decline began. It was last seen in 1985, and last heard in 1987. The o'o had a slightly curved beak for sampling nectar. It also ate small invertebrates and fruit. The 'o'o was commonly found feeding in the Ōhi'a tree.</p>
'Akeke'e	Kaua'i, Hawaii		<p>This species has a specialized bill – with offset tips similar to those of mainland crossbill species – that allows it to pry open buds of Ōhi'a leaves and flowers to search for invertebrates. The 'Akeke'e is restricted to high-elevation forests that are in nearly pristine condition on the eastern edge of Koke'e State Park and the Alaka'i Wilderness Preserve.</p>
'Akikiki	Kaua'i, Hawaii		<p>The 'Akikiki' is only found on Kaua'i. 'Akikiki are usually seen traveling and foraging in pairs or in family groups in forests of the Alaka'i area at elevations above 1,140 meters. They eat invertebrates, which they find by pecking and pulling at the bark of snags and tree trunks of species such as 'ōhi'a and 'ōlapa. Once an 'Akikiki pair or family group is spotted, they can be watched for long periods of time as they move up and down along branches in the understory.</p>

Evidence 2: Bird Populations

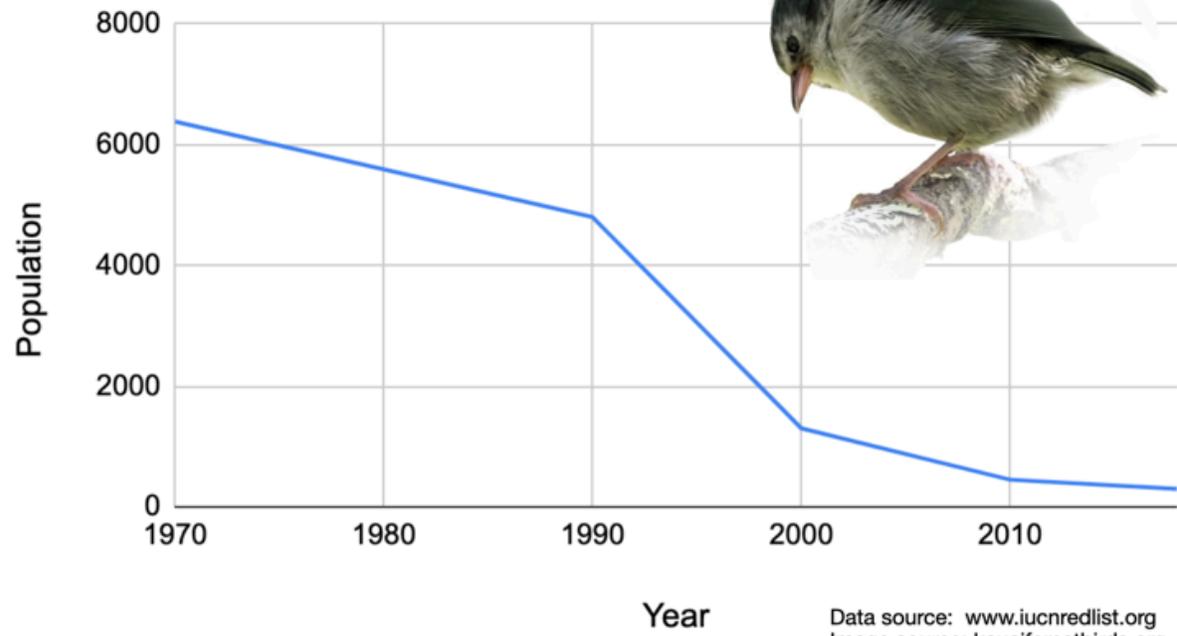
Kauai o'o' Population (1960-1990)



Akeke'e Population (1980-2022)

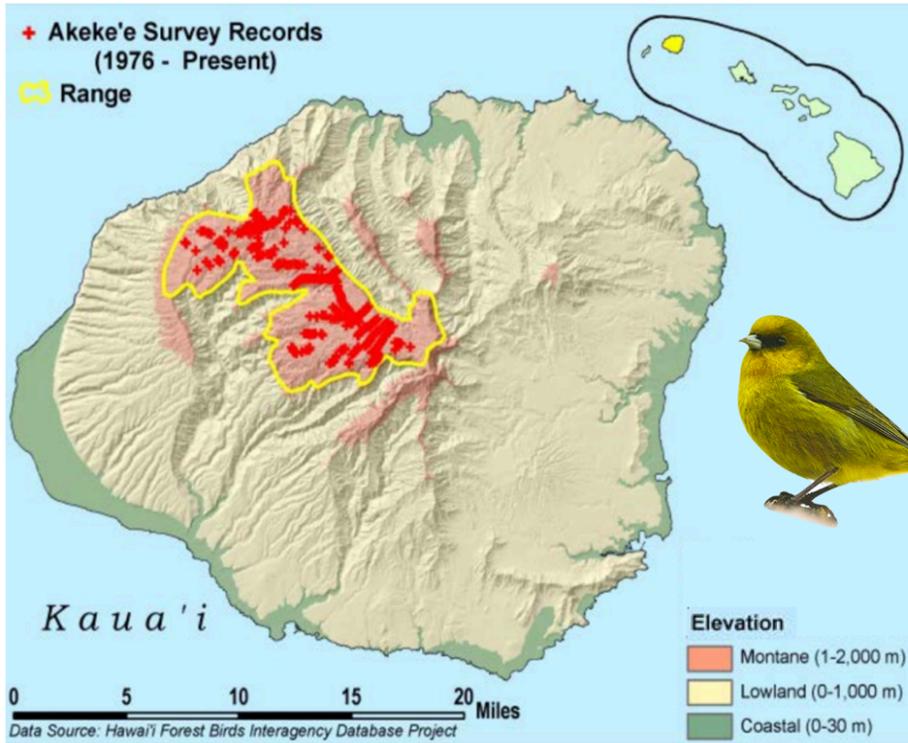


Akikiki Population (1970-2018)

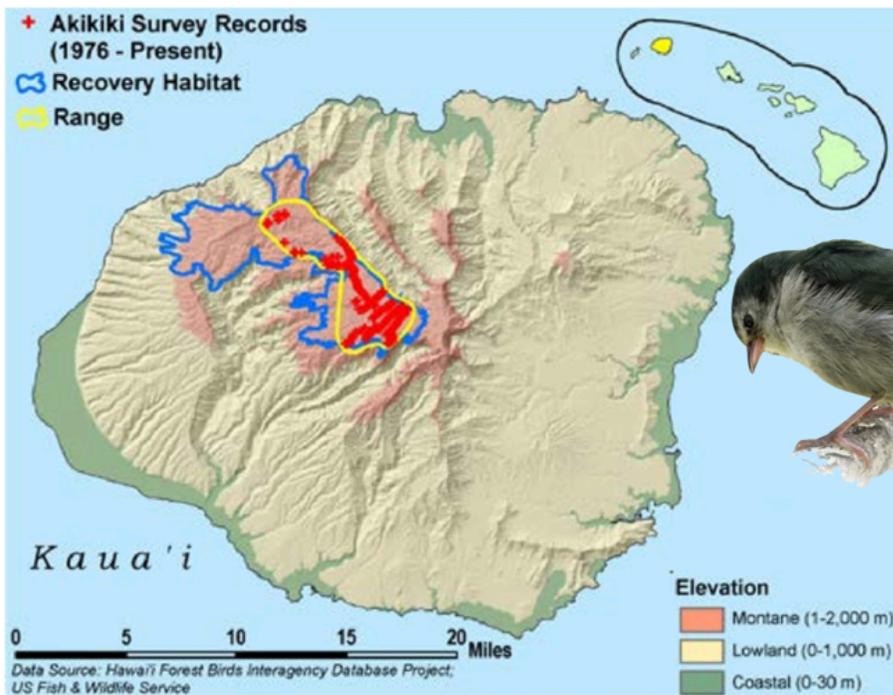


Evidence 3: Bird Range Maps

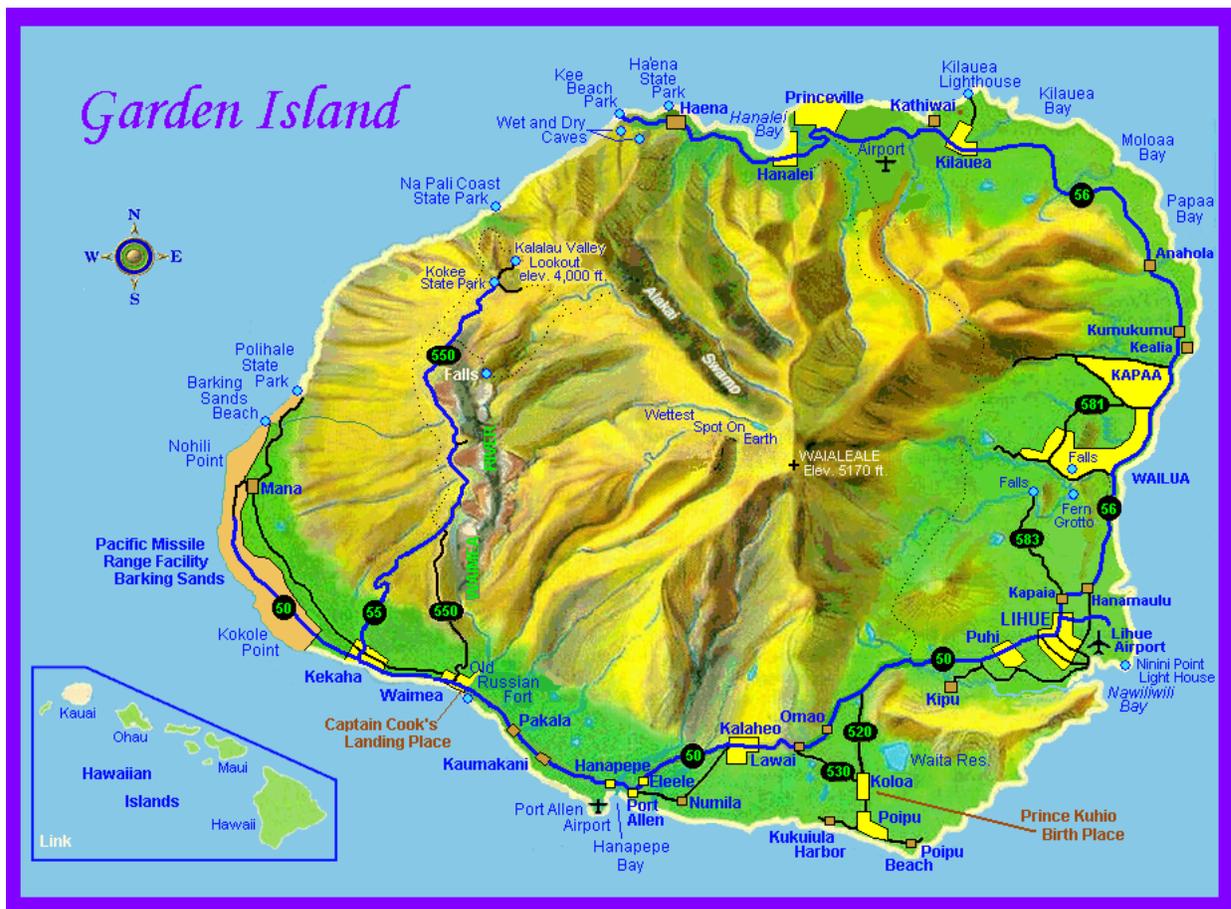
'Akeke'e Range on Kauai



'Akikiki Range on Kauai

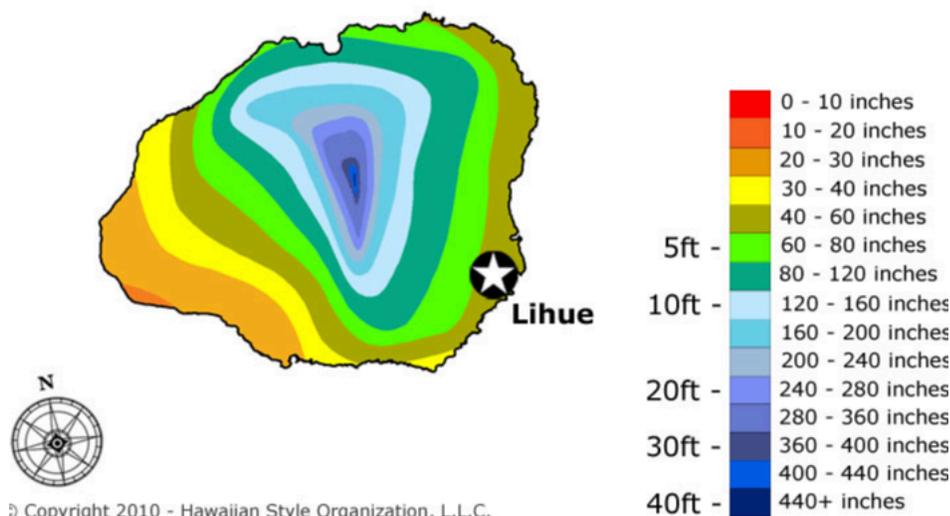


Evidence 4: The Island of Kauai



Kaua'i is the fourth largest island in the Hawaiian Islands and is sometimes called the "Garden Island". Kaua'i is the oldest and northernmost island as well. Kaua'i's highest peak is Kawaikini, at 5,243 ft (1,598 m). The second-highest is Mount Wai'ale'ale, near the center of the island, 5,148 ft (1,569 m) above sea level.

Kauai Annual Precipitation



Mount Wai'ale'ale receives nearly 500 inches of rain annually and is considered one of the wettest spots on Earth.

Evidence 5: Femmes Fatale

FEMMES FATALES

Rats are large, vile, and vicious killers of our beloved birds, but there is another killer out there that really sucks.

You are familiar with them,
they lurk around,
Ruin your backyard,
and even live in town.

They soar through the night
hardly making a sound,
Often only noticed
once they touch down.

Their bite can hurt,
maybe a slight sting.

To humans an annoyance,
but to forest birds death they bring.

Once bitten they may no longer sing,
Unless we are the ones
to take them under our wing.



Kauai Forest Recovery Project

Newsletter 2018

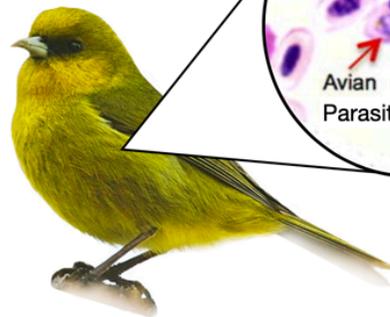
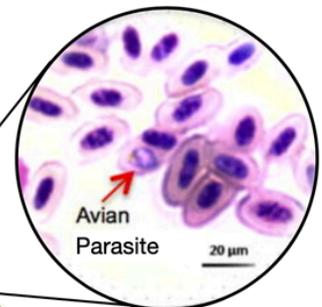
Mosquitos are threatening our forest birds. Only females transmit the disease, because females need a blood meal before mating and laying their eggs. Malaria is caused by a small protozoan that invades blood cells. The parasite will continue to attack, live, and accumulate in a native forest bird's body until the bird dies, often of malaria-related illness.

In comparison, non-native birds evolved resistance to malaria prior to being released in Hawai'i by developing antibodies that can fight and flush out the parasite. When we capture birds we rarely catch an 'Akikiki', or 'Akeke'e with malaria. At first you may think that is a good thing, but if these birds contract malaria, they will presumably die before we can catch them.

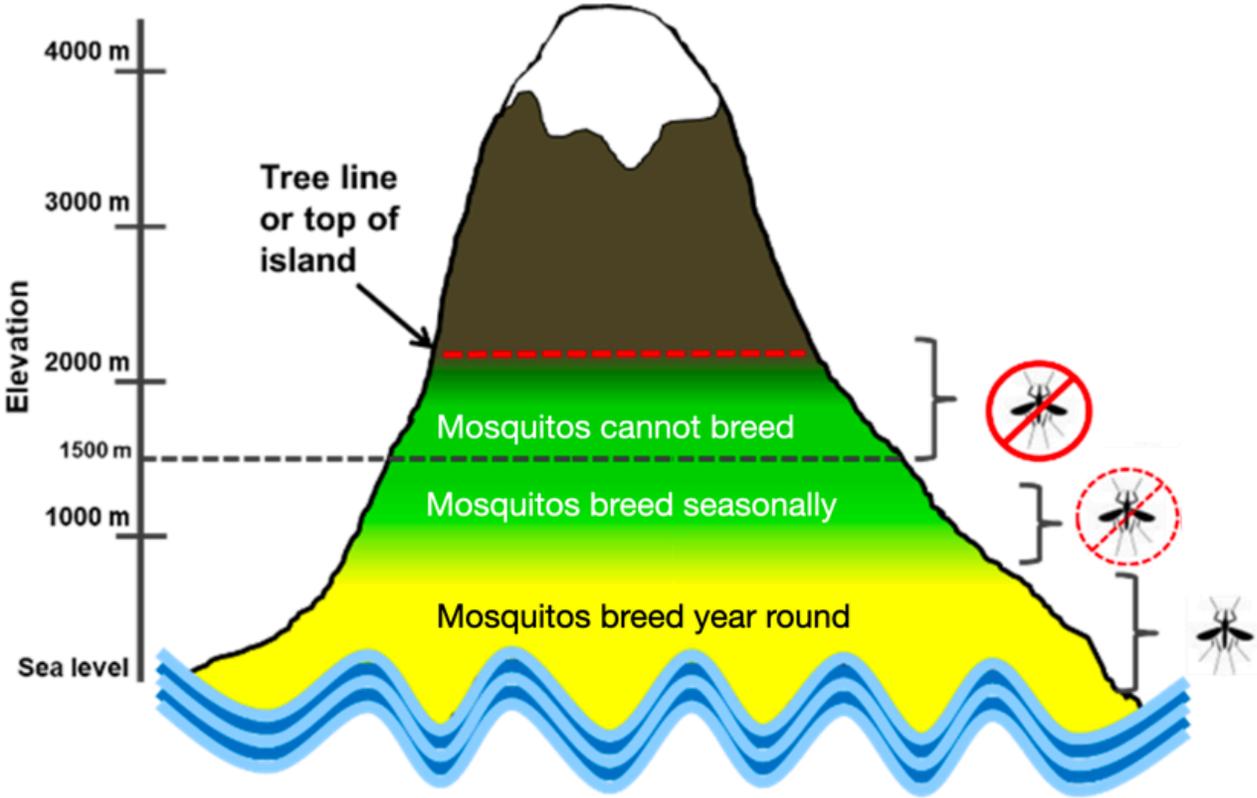
Mosquito



Bird Blood Cells



Evidence 6: Mosquito Breeding Zones



Evidence 7: Humans and the Hawaiian Islands

After the Polynesians arrived, large expanses of lowland forest were burned (or cleared) for agriculture. Elaborate feather cloaks called 'ahu'ula were created by early Hawaiians for the ali'i (royalty).



The 'i'iwi and 'apapane, which provided red feathers, were killed and skinned due to their abundance. Yellow feathers were obtained from the mostly black and rarer 'o'o using a catch and release philosophy to ensure future availability.

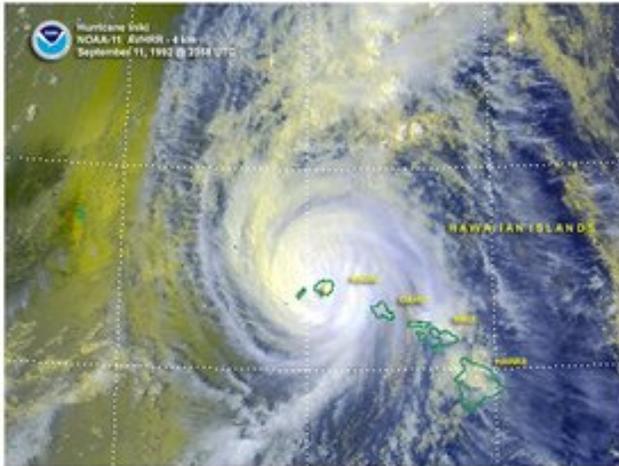


This initial loss of forest was exacerbated after the arrival of westerners in 1778. Europeans cleared additional forests for cattle ranching and development and over-harvested valuable timber species such as koa and sandalwood.

In addition, both Polynesians and Europeans introduced alien species to Hawai'i, which forever altered the native habitats and species. For example rats prey on nests, eating eggs, chicks, and incubating and brooding females. They also compete with native birds for food resources, such as fruit and invertebrates.



Evidence 8: Hurricanes



Major hurricanes struck Kaua'i in 1982 and 1992, destroying and degrading native forest bird habitat, by creating gaps into which alien plants could expand, spreading invasive plants, and felling large canopy trees that are the favored nest sites of some species, such as 'Akikiki.

Large numbers of dead trees killed by Hurricane Iniki in 1992 can still be seen in several areas where 'Akikiki have declined in abundance or disappeared.



Kaua'i's native birds are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a single population by random fluctuations in population size, and localized catastrophes such as hurricanes or fires.

Evidence 7: Possible Solutions

Alternative management actions identified for addressing declining populations of ‘akikiki and ‘akeke‘e on Kaua‘i. For each alternative, the probability of success was determined by a group of experts.

- Wildlife Society Bulletin (2014)

Management plan	% Success
1.1 – Initiate actions to control mosquitoes (and avian disease), including identifying source populations and treating larval breeding sites.	14%
1.2 – Initiate actions to reduce predation from non-native rodents including ground-based trapping around nest trees and in larger grids.	19%
1.3 – Initiate actions to improve habitat conditions, including fencing and ungulate control, invasive weed control, and supplementing food resources.	22%
1.4 – Initiate all actions of alternatives 1.2 and 1.3 (control weeds, rodents, and ungulates; supplement food resources).	32%
1.5 – Initiate actions of 1.1, 1.2, and 1.3 (identify and treat mosquito sources; control weeds, rodents, and ungulates; supplement food resources).	41%
2.1 – Initiate actions to slowly build-up captive populations by collecting eggs and nestlings.	40%
2.2 – Initiate actions to rapidly build captive populations, including capture and removal of adults, and egg and chick collection.	48%
3.1 – Establish a population above the disease line in suitable habitat on Maui or Hawai‘i Island slowly through removal of young of the year (eggs, nestlings, fledglings).	24%
5.1 – Initiate actions of alternatives 1.5 and 2.1/2.2 (start captive populations; identify and treat mosquito sources; control weeds, rodents, and ungulates; supplement food resources).	65%

