

Rat and kāhuli
tree snail,
East Hawai'i.

Photo by Jack Jeffrey

Endangered
kāhuli tree
snails, Wai'anae
Mountains,
O'ahu.

Photo courtesy
of O'ahu Army
Natural Resource
Program

KĀHEA – CALL TO ACTION

Protect Hawai'i's Native Plants, Wildlife, and Wild Places for Future Generations



'Apapane,
Hakalau Forest
National Wildlife
Refuge, Hawai'i.

Photo by Jack Jeffrey

Mongoose and
'apapane, East
Hawai'i.

Photo by Jack Jeffrey

The Threat. Since their introduction to the Hawaiian Islands, rats, mice, and mongooses have decimated populations of native plants and animals. Rats are opportunistic feeders – they eat the adults, chicks, and eggs of seabirds, waterbirds, and forest birds; sea turtle eggs and hatchlings; and kāhuli tree snails. Both rats and mice compete with native birds for plant seeds, fruits, and flowers, and harm native plants by stripping bark and eating stems. Invertebrates, such as native crickets and happyface spiders, make up a large proportion of the diet of rats and mice. Mongooses eat ground-nesting birds, reptiles, and invertebrates. Hawaiian species that are on the brink of extinction, such as the kāhuli tree snails, the honu 'ea (hawksbill sea turtle), and fragile lobeliad plants, are especially at risk. On a larger scale, rats can change the species composition of native forests and other natural areas, thereby altering entire ecosystems.

The Solution. We clearly need additional tools to reduce rodent and mongoose populations in areas where control is warranted. Therefore, in April 2012, the U.S. Fish and Wildlife Service (USFWS) and the Hawai'i Department of Land and Natural Resources (DLNR) entered into a Memorandum of Understanding on the development of a Programmatic Environmental Impact Statement (PEIS) for the control and eradication of invasive rodents and mongooses using an Integrated Pest Management approach.

Partnerships.

The collaboration between the federal and state entities represents an important commitment to combine resources for the benefit of Hawai'i's unique island environment. Both agencies recognize the urgency of the rodent and mongoose problem for Hawai'i's native species and have found this unique partnership imperative given the implications of inaction.

The PEIS will evaluate methods for using traps, and using rodenticide bait by applying it in bait stations, by hand, and by helicopter. It will include information on rodenticides that could be used, including diphacinone, chlorophacinone, and brodifacoum. Criteria will be identified in the PEIS to assist resource managers in determining the most appropriate tools for their particular conservation project. Future project proponents will be able to use this information as part of the assessment of impacts for a given project, in compliance with the requirements of the National Environmental Policy Act and Hawai'i Revised Statutes Chapter 343. All of the rodenticides and application methods covered by the PEIS are regulated by the U.S. Environmental Protection Agency and the State of Hawai'i Department of

Agriculture Pesticides Branch. In addition to the USFWS and DLNR, many other state, federal, and Native Hawaiian organizations will be participating in the PEIS process.

Your Kōkua.

The collaborating agencies are committed to working with the public on the PEIS process. The public is encouraged to participate in scoping, reviewing, and commenting on the PEIS. A Cultural Impact Assessment will also be conducted as part of the PEIS to ensure that rodent and mongoose control is culturally sensitive and effective in protecting our unique Hawaiian cultural resources. Project partners have been communicating with the public at small talk-story sessions and informal meetings, and they will be expanding the public involvement process through larger public meetings in 2012 and 2013. Public involvement and input will ensure that potential risks are identified, minimized, and mitigated, and methods are appropriate and effective.

Our Legacy.

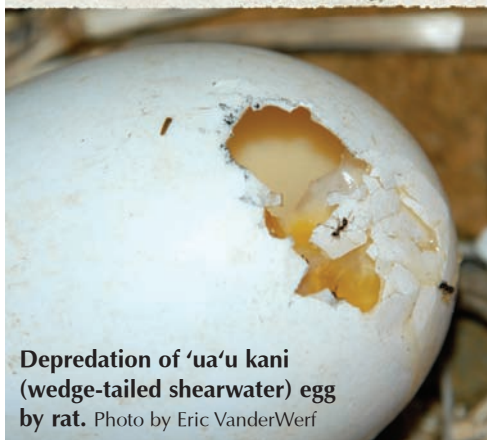
Protecting and preserving Hawaiian plants, animals, and the environment are our *kuleana* (responsibility). We need to do more to

For the keiki.

Photo by Alex Connelly



control non-native species, such as rodents and mongooses, to preserve native species for our children and generations to come. These species are intertwined with Hawaiian culture; our culture's existence is contingent on their ability to provide for Hawaiian material, intellectual, and spiritual activity. Without effective rodent and mongoose control on a landscape level, we cannot hope to protect and perpetuate many native species, and these valuable cultural and natural resources may not be available for future generations. The status quo is not an option. We must not lose our unique Hawaiian environment and culture to introduced pests.



Depredation of 'ua'u kani (wedge-tailed shearwater) egg by rat. Photo by Eric VanderWerf

“Kepler (1967) reported that Polynesian rats destroyed the eggs of smaller seabirds and actually ate into the backs of incubating Laysan albatrosses on Green Island in Kure Atoll. He observed more than twenty rats feeding on a single albatross one night; the bird was dead the following morning.”

ANDREW J. BERGER, *HAWAIIAN BIRDLIFE*, UNIVERSITY OF HAWAII PRESS 1972

Seabirds

“When you see koa'e kea (white-tailed tropicbirds) and 'iwa (great frigatebirds) soaring in the sky, 'a'o (Newell's shearwaters) skimming the surface of the ocean, 'ā (red-footed boobies) nesting in naupaka, or 'akē'akē (storm petrels) landing on the pali to feed their young ... that is to feel the pulse of Hawai'i. We must do all that we can to assure their survival.”

SABRA KAUKA, KUMU HULA, EDUCATOR, AND COMMUNITY ADVOCATE

The Northwestern Hawaiian Islands (Papahānaumokuākea Marine National Monument), main Hawaiian Islands, and offshore islets provide essential breeding habitat for millions of Hawaiian seabirds. Most seabirds nest on the ground, making them vulnerable to predation. Rats and mongooses eat eggs and chicks, and rats attack incubating birds. Although rats have been eradicated from the Northwestern Hawaiian Islands, they continue to threaten seabirds on the main Hawaiian Islands and offshore islets.



Mōli (Laysan albatross) trying to defend itself against rat attack. Photo by Mark Rauzon

Waterbirds



Endangered 'ālae 'ula (Hawaiian moorhen) chick, Keawāwa Wetland, O'ahu. Photo by Mardi LaPrade

“We use rat bait stations at the Nā Pōhaku O Hauwahine waterbird habitat to protect endangered 'ālae 'ula (Hawaiian moorhens) and at Ulupō Heiau to protect endangered ae'o (Hawaiian stilts) in lo'i kalo at Kawainui Marsh, O'ahu. Our volunteers faithfully set and monitor the stations to protect these birds. If we do not take more effective and comprehensive measures to control rodents, mongooses, and other predators, we will lose our native waterbirds forever.”

**DR. CHARLES PE'APE'A
MAKAWALU BURROWS, CO-PRESIDENT,
'AHAHUI MĀLAMA I KA LŌKAHI**

All of Hawai'i's endemic (unique) waterbirds are in danger of going extinct: ae'o (Hawaiian stilt), 'ālae 'ula (Hawaiian moorhen), 'ālae ke'oke'o (Hawaiian coot), koloa (Hawaiian duck), and Laysan duck. Ground-nesting birds are especially vulnerable during breeding season. Rats and mongooses eat eggs, chicks, and adults. Managing wetlands requires ongoing monitoring and predator control, and employment of the most appropriate methods for sensitive waterbird habitats.

Forest Birds

“At Hakalau Forest National Wildlife Refuge, we use traps to control rats, mongooses, and other predators on a regular basis to reduce depredation of nēnē nests. I have also seen the results of rats feeding on many rare and endangered plants, which prevents regeneration of these plants and reduces food sources for native birds. Information on additional tools and applications to more effectively reduce small mammalian predators within actively managed forest bird habitat will significantly benefit our unique Hawaiian forest birds.”

**JACK JEFFREY, WILDLIFE BIOLOGIST,
HAKALAU FOREST NATIONAL WILDLIFE
REFUGE (RETIRED)**

More forest birds are at risk of extinction in Hawai'i than anywhere else in the country, with one-third of the nation's threatened and endangered birds from the islands. Rats are known to eat endangered birds, such as the O'ahu 'elepaio, puaiohi (small Kaua'i thrush), 'ākohekohe, and palila, along with other Hawaiian forest birds. The ground-nesting endangered nēnē (Hawaiian goose) and the pueo (Hawaiian short-eared owl) are also vulnerable to mongoose predation.



Mongoose eating endangered nēnē (Hawaiian goose), Hawai'i Volcanoes National Park. Photo by Chris Johns, National Geographic Stock

Kāhuli Tree Snails

Rat predation is one of the most serious threats to Hawai'i's native kāhuli tree snails. These tiny jewels of the forest have been decimated by rats, non-native carnivorous snails, Jackson's chameleons, and the loss of native plant hosts. O'ahu is home to an entire genus (species group) of endangered kāhuli tree snails, *Achatinella*, with half of the 42 species already extinct. These celebrated singing tree snails of O'ahu are consumed by rodents, who crunch down on the shells, eat the animal within, and leave behind a pile of shell skeletons.



Endangered kāhuli tree snails eaten by rats. Photo courtesy of O'ahu Army Natural Resource Program

Endangered kāhuli tree snail, Honouliuli, O'ahu. Photo by Nathan Yuen



“We go to great lengths to protect kāhuli from rat predation. We constructed three predator fences using a design from New Zealand, which incorporates a curved hood made of smooth sheet metal to prevent rats from climbing in. When it is not feasible to construct one of these fences, we continue to employ extensive snap trap grids, which consist of a high-density array of snap traps arranged around our susceptible kāhuli populations. Our largest grid is over 550 snap traps in all.”

KAPUA KAWELO, BIOLOGIST, O'AHU ARMY NATURAL RESOURCE PROGRAM

*Kāhuli aku, kāhuli mai
Kāhuli lei 'ula lei 'ākōlea
Kōlea, kōlea
Ki'i ka wai
Wai 'ākōlea, wai 'ākōlea*

*Landshell turn away, landshell turn this way
Red landshell lei of 'ākōlea fern
Plover bird, plover bird
Fetch the dew
Dew from the 'ākōlea fern, dew from the 'ākōlea fern*

TRADITIONAL HAWAIIAN CHANT SET TO MUSIC BY AUNTY NONA BEAMER

Sea Turtles and Monk Seals

Rats and mongooses eat threatened and endangered sea turtle eggs and hatchlings. Hatchlings are extremely vulnerable and defenseless against predators as they crawl from their nests to the ocean. The loss of any sea turtle is significant. Only one in 1,000 baby sea turtles survives to adulthood. The endangered honu 'ea (hawksbill sea turtle) nests on beaches on the main Hawaiian Islands – some heavily used by humans. Food scraps and trash attract predators.

Rats, mongooses, and other non-native species also spread diseases, such as leptospirosis, threatening human health and native wildlife. A recent study suggests the prevalence of leptospirosis in rats and mongooses is as high as 23%. Leptospirosis has caused epidemic deaths in other seal species, and the endangered Hawaiian monk seal is at risk. In 2003 and 2005, two Hawaiian monk seals died on Hawai'i with leptospirosis the probable cause. People using Hawai'i's streams can also be infected with leptospirosis, the likely source being rats and mongooses.



Endangered 'Īlioholoikaua (Hawaiian monk seal), Kaua'i.
Photo by Kathleen Ho

“We attempt to control rat and mongoose depredation of endangered hawksbill sea turtle nests on Maui and the Big Island by trapping, but this is labor intensive and not completely effective. The addition of bait stations would provide added insurance against predation. Protecting hawksbill nests is essential to the recovery of this critically endangered species. The evidence is also clear that a high percentage of rats and mongooses carry leptospirosis. Leptospirosis infections can kill endangered monk seals and people who use Hawai'i's streams.”

**WILLIAM GILMARTIN, BIOLOGIST,
CO-FOUNDER, AND DIRECTOR
OF RESEARCH, HAWAII
WILDLIFE FUND**

Endangered honu 'ea (hawksbill sea turtle) hatchlings, Maui.
Photos by Anita Wintner



Rat-eaten hō'awa fruits, Hawai'i Volcanoes National Park.

Photo by Jack Jeffrey

Rat-eaten fruits of loulu palm.

Photo by Leland Miyano



Plants

Hawai'i has the unique reputation as the home to one-third of the nation's threatened and endangered plants. Many of these plants are damaged or destroyed by introduced rodents. Rats and mice eat the fruit, leaves and stems, which severely limits reproduction of these plants. Depredation of Hawaiian plants by rodents eliminates food sources for native birds and invertebrates. Hawaiian lobeliads, which include 'ōhā wai and hāhā, are very susceptible to rats. Their long, curved flowers are unique sources of nectar for native Hawaiian honeycreepers, such as the 'i'iwi and 'amakihi, which have curved bills. Hundreds of rare and endangered Hawaiian plant species would benefit from more effective and comprehensive rodent control.

“With permission, we have been trying to collect native loulu (Pritchardia palm) seeds in the Ko'olau Mountains for propagation and reintroduction into the lowlands, where it was once dominant. In almost every case – from the northern end to southern end of the Ko'olau range – every population we encountered showed signs of heavy depredation of fruits by rats. We hardly ever see young loulu, observing only 1% recruitment at best, even though each loulu palm has the potential to reproduce hundreds of keiki in the wild.”

**RICK BARBOZA, CO-OWNER, HUI KŪ MAOLI
OLA NATIVE PLANT NURSERY, AND DIRECTOR,
PAPAHANA KUAOLA**

Ecosystems

Rodents have the capacity to alter and eliminate entire native ecosystems by eating native plants and changing species composition. Depredation of seeds and shoots by rats resulted in the loss of the vast loulu palm forest that once thrived across the 'Ewa Plain of O'ahu around 1,000 AD – an extreme example of how rodents wreak havoc on the Hawaiian environment. Rats ate large quantities of loulu fruits and probably competed with the moa nalo – a large, flightless, goose-like duck now extinct and known only from the “fossil” record. The moa nalo subsisted on loulu fruits and other foods on the 'Ewa Plain. We can also learn from other Pacific Islands, such as Rapa Nui (Easter Island), where rats destroyed the ecosystem by eating the seeds and saplings of millions of palms and other plants.



Loulu (*Pritchardia lowreyana*), O'ahu.

Photo by Leland Miyano



Loulu fruit eaten by rats, O'ahu.

Photo by Leland Miyano

“I have been hiking in our native forests since the 1960s and have observed major changes to our native ecosystems by rodents, mongooses, and other non-native species. Once the native plants disappear, associated birds and invertebrates follow. Ultimately, the entire native ecosystem may be replaced by non-native weeds and other species. Unless the impacts of rats are better controlled, even common native species will decline. I have witnessed many extinctions in my lifetime, and I hope this alarming trend in Hawai'i will be reversed.”

**LELAND MIYANO,
NATURALIST**



*“We use rat bait stations and snap traps baited with peanut butter in areas with endangered Hawaiian plants to protect fruit during the peak season. The control efforts have reduced fruit depredation by rats, and we now have successful regeneration of keiki plants in these areas. Seedlings were seen for the first time in decades under loulu palms known only from 'Ōhikilolo Ridge, O'ahu, following rat control. In addition, new seedlings of the critically endangered hāhā (*Cyanea superba*) were first observed following the establishment of an extensive snap trap grid at Kahanahāiki Gulch, O'ahu.”*

**KAPUA KAWELO, BIOLOGIST,
O'AHU ARMY NATURAL RESOURCE PROGRAM**

'Iwi feeding on 'ōhā wai nectar, Hakalau Forest National Wildlife Refuge. Photo by Jack Jeffrey

Native Hawaiian Culture

Native plants and animals form the spiritual and material basis of the living Native Hawaiian culture. As watershed cover, native plants have provided life-giving *wai* (freshwater) to the Hawaiian people for thousands of years. Native plants are a source of food and used as medicines, in religious worship, and to make clothing, dyes, cordage, tools, digging sticks, weapons, and other essential items. Aquatic species are important sources of protein, and in traditional times, birds also nourished the people. Bird feathers were used in *lei* (garlands), *kāhili* (feathered standards), *'ahu 'ula* (feathered capes), and *mahiole* (helmets). These valuable cultural resources are critical to Native Hawaiians' ability to continue to exercise their traditional and cultural practices related to *lā'au lapa'au* (medicine), subsistence food sources, religion, and material culture.

“Our ancestors depended on endemic Hawaiian plants and animals for their survival. These plants and animals are in our DNA – they are part of who we are. Non-native species, such as rodents and mongooses, threaten the remaining native plants and animals that connect us to the land and sea. With each disappearance of a native species, we lose a part of our culture forever. Each loss precludes us from enjoying and using the resource. We must kū'ē and defend our culture against introduced pests and predators.”

JULIE LEIALOHA, COORDINATOR, WAO KELE O PUNA FOREST RESERVE



Minimizing Risks.

The goal of the collaborative federal and state PEIS is to protect Hawai'i's native plants, animals, and ecosystems from the devastating effects of introduced rodents and mongooses, with minimal impact to the environment, human health, and nontarget species. The PEIS will identify and evaluate methods for the control and eradication of rodents and mongooses within an Integrated Pest Management (IPM) framework. IPM utilizes knowledge of the behavior and biology of both target and nontarget species to select from a variety of biological, mechanical, and chemical tools to achieve clearly-defined goals. Careful monitoring before, during, and after control efforts is essential to measure efficacy of the method(s) and the negative and beneficial effects.

When rodenticides are selected for use within an IPM plan, mitigation measures, best management practices, and application by specially trained and experienced professionals minimizes risks to the environment and increases the likelihood of successfully meeting conservation goals. This is accomplished by using the rodenticide with the lowest toxicity to nontarget species that occur within the application area, carefully applying the rodenticide to minimize the amount used, preventing exposure to nontarget species as much as possible, and monitoring for the rodenticide by sampling for residues in the environment when hand or aerial applications are employed.

The PEIS will identify and evaluate methods that could be effectively utilized to protect native species in Hawai'i, and will identify criteria to assist resource managers in designing rodent and mongoose projects that are appropriate for their site-specific circumstances.



Manu O Kū chick.

Photo by Forest and Kim Starr

Photos from top: Hale o Lono Heiau, Waimea, O'ahu. Photo courtesy of Waimea Valley dba Hi'ipaka, LLC; Wili lei. Photo by Craig Elevitch; Rat in native forest bird nest, East Hawai'i. Photo by Jack Jeffrey; Pālolo, O'ahu. Photo by Ryder Onopa

The following organizations support the intent of the collaborative federal and state effort
to preserve and protect Hawai'i's native plants and animals from the
devastating effects of introduced rats and mice.

'Ahahui Mālama I Ka Lōkahi	Hawaiian Islands Land Trust	Maui Nui Botanical Garden
American Bird Conservancy	Hawaiian Malacological Society	Maui Nui Seabird Recovery Project
Amy B. H. Greenwell	Hawaiian Rare Plant Facilities	Maui Tomorrow
Ethnobotanical Garden	Hi'ipaka, LLC	Moloka'i Invasive Species Committee
'Ao'ao O Nā Loko I'a O Maui	Hui Kū Maoli Ola	National Tropical Botanical Garden
Association of Hawaiian Civic Clubs	Ka 'Ahahui 'O Ka Nāhelehele	National Wildlife Federation
Big Island Invasive Species Committee	KĀHEA: The Hawaiian-Environmental Alliance	Native Hawaiian Plant Society
Center for Conservation Research and Training	Kaho'olawe Island Reserve Commission	North Shore Community Land Trust
CGAPS (Coordinating Group on Alien Pest Species)	Kailua Hawaiian Civic Club	O'ahu Invasive Species Committee
Conservation Council for Hawai'i	Kaua'i Birding Tours, LLC	O'ahu Nature Tours
Earthjustice	Kaua'i County Historic Preservation Council	O'ahu Resource Conservation & Development
Earthtrust	Kaua'i Endangered Seabird Recovery Project	Office of Hawaiian Affairs
East Maui Watershed Partnership	Kaua'i Forest Bird Recovery Project	Offshore Islet Restoration Committee
East Moloka'i Watershed Partnership	Kaua'i Invasive Species Committee	Pacific American Foundation
Friends of Hakalau Forest National Wildlife Refuge	Kaua'i Native Plant Society	Papahana Kuaola
Friends of Haleakalā National Park	Kaua'i Seabird Habitat Conservation Program	Pono Pacific
Friends of Hawai'i Volcanoes National Park	Keauhou Bird Conservation Center	Sierra Club Hawai'i Chapter
Friends of Ka'ena	Kīpahulu Community Association	Surfrider Foundation Hilo Chapter
Friends of Midway Atoll National Wildlife Refuge	Kohala Watershed Partnership	Surfrider Foundation Kaua'i Chapter
Greenpeace Foundation	Konohiki Honua, LLC	The Nature Conservancy of Hawai'i
Hanalei Watershed Hui	Ko'olau Mountains Watershed Partnership	The Outdoor Circle
Harold L. Lyon Arboretum	Kupu	The Trust for Public Land Hawai'i Office
Hawai'i Association of Watershed Partnerships	Lāna'i Forest and Watershed Partnership	The Wildlife Society Hawai'i Chapter
Hawai'i Audubon Society	Leeward Haleakalā Watershed Restoration Partnership	Three Mountain Alliance
Hawai'i Biological Survey	Life of the Land	Turtle Island Restoration Network
Hawai'i Botanical Society	Makauwahi Cave Reserve	Wai'anae Mountains Watershed Partnership
Hawai'i Conservation Alliance	Mālama Hawai'i	Waikīkī Aquarium
Hawai'i Forest & Trail	Mālama Maunaloa	Waimānalo Hawaiian Civic Club
Hawai'i Watchable Wildlife Program	Maui Bird Conservation Center	West Maui Mountains Watershed Partnership
Hawai'i Wetland Joint Venture	Maui Cultural Resources Commission	
Hawai'i Wildlife Fund	Maui Forest Bird Recovery Project	
Hawai'i's Thousand Friends	Maui Invasive Species Committee	
Hawaiian Entomological Society		

KĀHEHA – CALL TO ACTION

Protect Hawai'i's Native Plants, Wildlife, and Wild Places for Future Generations



Brooding mōlī (Laysan albatross)
Photo by Rob Shallenberger



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July 2012

- ♦ **Learn** about the impacts of rodents and mongooses to our unique cultural and natural heritage
- ♦ **Attend** public meetings relating to the PEIS process
- ♦ **Review** the Draft PEIS and submit comments
- ♦ **Lead** your organization or agency in adopting a resolution in support of increased rodent and mongoose control in conservation areas
- ♦ **Explain** this issue to others and help generate support for our native Hawaiian plants and animals
- ♦ **Write** letters to the editor and opinion pieces expressing your support for increased rodent and mongoose control in conservation areas
- ♦ **Contact** your elected officials and urge them to support increased rodent and mongoose control in conservation areas

For More Information

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- ♦ Christy Martin, Public Information Officer, CGAPS (Coordinating Group on Alien Pest Species) 808 722-0995 (Honolulu), christym@rocketmail.com

Websites

- ♦ www.removeratsrestorehawaii.org/
- ♦ www.fws.gov/pacificislands/publications/Ratsfactsheet.pdf