

Farmers Can Help our Hawaiian Hoary Bats

Gregory A. Koob, Pacific Islands Area Biologist, USDA-NRCS

Hawaii has only one native land mammal, the Hawaiian hoary bat or 'ōpe'ape'a. It is a medium-sized bat and an endemic subspecies of the North American hoary bat, a solitary tree-roosting species. If everything you know about bats is what you learned on the Mainland or gleaned from the Discovery Channel, forget it. Our bats don't use caves, they won't use bat houses and they aren't in your attics or barns.

Description and Occurrences

'Ōpe'ape'a has frosted brown and gray fur which gives it a hoary (frosted) appearance. Fur color, frosted or reddish, may be related to location or age. The best time to observe them is at sunset when they come out to feed.

'Ōpe'ape'a is a major predator of night-flying insects such as moths, beetles, and termites. Insectivorous bats play an important role in regulating insect populations of natural and agricultural ecosystems.

Although the number of bats is unknown, resident populations occur on Kaua'i, Maui, and Hawai'i and possibly other main islands, with the largest numbers on Kaua'i and Hawai'i. They've even been seen recently in the Hawaii Kai area on O'ahu. Bats occur at all elevations, with the majority of sightings below 7,500 ft (2,286 m) on Hawai'i and in lowlands on Kaua'i. Local occurrence is influenced by insect prey abundance. 'Ōpe'ape'a is a Federal and State endangered subspecies.

'Ōpe'ape'a occur in nearly every habitat within their range including native, nonnative, agricultural, and developed landscapes. Habitat examples include:

- ▶ **Barren land** - Volcano craters and lava fields for foraging;
- ▶ **Cropland** - Macadamia nut farms with tall windbreaks and other orchards for foraging and roosting;
- ▶ **Developed land** - Golf courses, urban areas, suburban yards, rural roads, and farmsteads for foraging and roosting;
- ▶ **Forest land** - Eucalyptus plantations, albizia-dominant forest, 'ōhi'a-dominant forest, koa-dominant forest, and māmane-naio forest for foraging and roosting;
- ▶ **Other rural land** - Rural yards and windbreaks for foraging and roosting;
- ▶ **Pastureland** - Grazed lands with forest component for foraging;
- ▶ **Rangeland** - Fallow fields near forest for foraging; and
- ▶ **Water areas** - Reservoirs, wetlands, river corridors, and coastal waters for foraging.

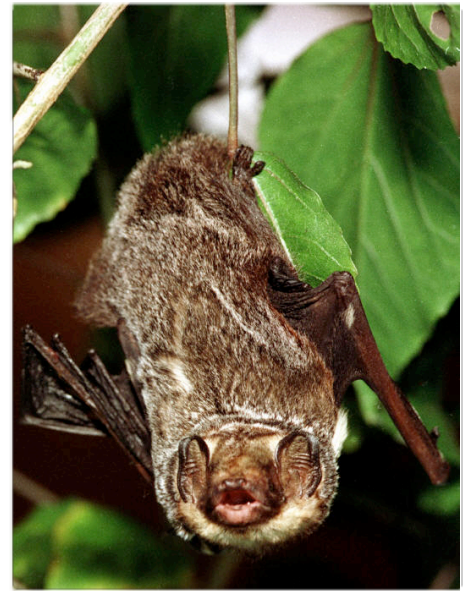


Photo: DOFAW stock

Feeding Preferences

'Ōpe'ape'a forage on moths, beetles, termites, leafhoppers, flies, bugs, and other night-flying insects. Prey is located using an advanced technique known as echolocation. Bats detect size, distance, and shape of prey by emitting and interpreting sound pulses that bounce off objects. In open habitats, medium-sized moths (0.6-0.8 inches [16-20 mm]) are preferred over large moths (>0.8 inches [20 mm]) and small moths and flies (<0.4 inches [10 mm]). In forested habitats, bats feed on a variety of small insects.

Habitat and Range

Vegetation cover and structure appear to be more important than tree species, as bats readily use both native and nonnative trees such as eucalyptus, mango, lychee, avocado, albizia, 'ōhi'a, and pandanus. On Hawai'i, roosts are located in dense canopy foliage (or sub canopy when canopy is sparse) with open access for launching into flight.

Foods presumably meet water requirements for these bats. 'Ōpe'ape'a are not known to drink from water bodies, but are regularly observed foraging over streams, reservoirs, wetlands, stream mouths, and out to about 330 ft (100 m) offshore. Bats may be attracted to insects of lush riparian vegetation or insects emerging from water, as many flying insects have aquatic larval stages.

Suitable foraging and roosting habitat near one another is preferable. Although the optimal mix of habitat types is unknown, varied habitat structure near riparian corridors or other insect-rich habitats appears beneficial.

'Ōpe'ape'a are capable of both high altitude and interisland flight. They require large areas that may encompass multiple landowners. For example, home range (area a bat normally uses for foraging and roosting) for males on a macadamia nut farm averages 124 ac (50 ha), but bats can also commute >7 miles (11 km) from roosts to foraging areas. Home range size varies with habitat type and territories may overlap.

Mortality

Roost disturbance is a common threat to bats worldwide. For 'ōpe'ape'a, this may include: (a) clearing trees that bats roost in, (b) loud unpredictable activities such as building a structure near a bat roosting site, or (c) other human activities that alter normal feeding and breeding patterns or cause direct mortality, all of which would be violations of Federal and State endangered species laws. Roost disturbance (felling or pruning trees) when juvenile hoary bats are fledging (Jul-Sep) has the highest potential for negative impacts. Hawaiian hoary bats don't seem to have high roost site fidelity (they may return to the same area but not necessarily the same tree), use roosts seasonally, and are adaptive to human-modified landscapes. Loss of native forests from agricultural conversions and other types of development historically contributed to 'ōpe'ape'a habitat loss.

Obstacles during flight are a major source of mortality for some continental species, particularly during mass migrations. Major sources of mortality include wind farms for migratory tree-roosting bats like the North American hoary bat and barbed wire fences for some migratory

bats in Australia. 'Ōpe'ape'a are not known to migrate in large aggregations. Nevertheless, a small number of individuals have been documented colliding with obstacles (e.g., structures, vehicles, windmills, barbed wire fences), presumably while foraging. Young 'ōpe'ape'a may be vulnerable to cats, rats, and other predators during rearing and fledging periods.

Insecticides can affect the abundance of insect prey available to 'ōpe'ape'a through reduction in insect populations or insect habitat, and may cause bats to fly further in search of food or feed in unfamiliar landscapes. Some insecticides can also affect bats through bioaccumulation of chemicals through the food chain. Herbicides can alter vegetation structure and community composition in foraging habitats, likely influencing the availability of insect prey.

What can Farmers and Ranchers do to Help our Native Bat?

Management treatments should address the habitat components and potential threats that appear to limit habitat potential for bats. Specific management options are lacking, thus general advice for 'ōpe'ape'a is given below that may increase the quality or availability of each habitat component. NRCS has conservation practices and various programs that may provide financial or technical assistance. Contact your local NRCS office for more information.



Photo: Norma Creps, DOFAW

General management options for increasing habitat quality or availability

- ▶ Minimize adverse effects of pesticides on non-target species (i.e., reduction in prey and prey habitat) by developing an integrated pest management plan; include role of bats and other native species in reducing pest outbreaks.
- ▶ In native forest, protect and enhance habitat, especially mature trees and understory; restore new forest patches.
- ▶ Restore forest community structure and function to benefit multiple species of native birds and bats.
- ▶ In orchards, increase horizontal and vertical vegetative structure by enhancing windbreaks; plant multi-species, tree-shrub windbreaks with varied leaf forms; use native species when feasible.
- ▶ In tree plantations, avoid extensive clear-cuts; integrate selective harvest techniques that leave young trees and snags; create gaps, bays, or irregular forest edges.
- ▶ Leave snags (dead or dying trees) and downed wood; old trees and decomposing woody debris provide good habitat for insects and other organisms eaten by bats.

- ▶ Exclude feral ungulates through fencing, or control feral ungulate populations through trapping or hunting.
- ▶ Protect roost sites and surrounding habitat by excluding areas from or minimizing activities related to resource extraction, grazing, or vehicular traffic
- ▶ Minimize chances of negatively impacting roosting bats by conducting activities such as vegetation clearing or timber harvesting when bats are not, or are not likely to be, present.
- ▶ Protect roost sites and surrounding habitat from potential predators.
- ▶ Keep cats and dogs restrained and away from bat roost sites, particularly during breeding.
- ▶ If riverbank management (e.g., dredging) is necessary, restrict management to small areas or one bank at a time; protect habitat by retaining natural meanders, shallow pools and riffles, and bank-side trees and shrubs.
- ▶ Establish riparian buffer zones through fencing, managing roads, runoff, feral ungulates, livestock, and vegetation For large properties, conduct a watershed analysis to identify and halt or control activities contributing to habitat degradation..
- ▶ Protect and enhance wetlands; including small temporary pool complexes with varied depths, aquatic vegetation, and high insect diversity.
- ▶ Avoid introducing nonnative fish to water bodies; fish can deplete aquatic insect communities and degrade water quality.
- ▶ Consider relationship of planning area to habitat components on property or neighboring lands. Landowners can manage for bats if one of more of the habitat components is present on their property and adjacent lands provide other habitat components.
- ▶ Options to prevent potential bat entanglement in barbed wire fences include:
 - Replace top 2 strands with smooth high-tensile wire.
 - Omit barbed wire atop hog-wire fences.
 - Install a 6-ft (1.8-m) high hog-wire fence without barbed wire on top.
 - Remove fence if old or no longer needed.

NRCS has a technical note that covers this information in more detail. The note can be found at ftp://ftp-fc.sc.egov.usda.gov/HI/pub/technotes/biology/Biology_20_Bats_Dec_2009/.

Article content is the sole responsibility of the author. For more information about this article, contact Dr. Gregory Koob, email: Gregory.Koob@hi.usda.gov.