



Photo: USFWS

Terrestrial Mammal

'Ōpe'ape'a or Hawaiian hoary bat

Lasiurus cinereus semotus

SPECIES STATUS:

Federally Listed as Endangered

State Listed as Endangered

State Recognized as Indigenous (at the Species Level
and Endemic at the Subspecies Level)

NatureServe Heritage Rank G5/T2 – Species Secure/Subspecies Imperiled

Recovery Plan for the Hawaiian Hoary Bat – USFWS 1998

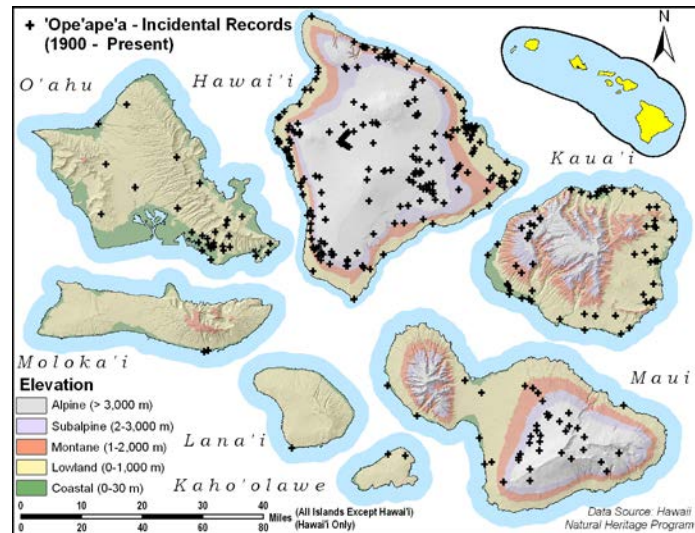
SPECIES INFORMATION: The 'ōpe'ape'a, or Hawaiian hoary bat (Family: Vespertilionidae), is Hawai'i's only native terrestrial mammal, although sub-fossil evidence indicates that at least one other bat species was native to the islands. Additionally, the hoary bat has dispersed to the Hawaiian Islands from the mainland at least twice, forming two different populations of Hawaiian hoary bats (Russell et al. 2015). The first emigrant arrived approximately ten thousand years ago, and the more recent emigrant arrived an estimated 600 years ago (Russell et al. 2015). Both sexes have a coat of brown and gray fur. Individual hairs of the coat are tipped or frosted with white; hence the name "hoary" which means frosted. The older population of hoary bats on the Hawaiian Islands is typically chestnut brown in color with less white "frosting" of the fur tips – it has largely lost the "frosted" appearance. The more recent population comprises individuals that are more hoary ("frosted"), similar to mainland hoary bats. Males and females have a wingspan of approximately one-third of a meter (1 foot), and females are typically larger than males. The Hawaiian name refers to a half taro leaf or canoe sail shape; these being somewhat similar to the shape of the bat.

Little research has been done on the 'ōpe'ape'a, and little is known about its habitat requirements or population status. Fewer than 30 accounts of roosting are known statewide, but these indicate that 'ōpe'ape'a roost in native and non-native vegetation from 1 to 9 meters (3 – 29 feet) above ground level; the species is rarely observed using lava tubes, cracks in rocks, or human-made structures for roosting. While roosting during the day, 'ōpe'ape'a are solitary, although mothers and pups roost together. They begin foraging either just before or after sunset depending on the time of year; altitude also may affect activity patterns. 'Ōpe'ape'a feed on a variety of native and non-native night-flying insects, including moths, beetles, crickets, mosquitoes, and termites; and similar to other insectivorous bats, prey is located using echolocation. Water courses and edges (e.g., coastlines and forest/pasture boundaries) appear to be important foraging areas; the species also is attracted to insects that congregate near lights. Breeding bats (e.g., lactating females) have been documented only on the islands of Hawai'i, Kaua'i, and O'ahu (Dave Johnston pers. obs.). Mating most likely occurs between September and December, and females usually give birth to twins during June. Mother bats likely stay

with their pups until they are six to seven weeks old. Little is known regarding dispersal or movements, but inter-island dispersal is possible.

DISTRIBUTION: The hoary bat is the most widely distributed bat in North America. In Hawai'i, 'ōpe'ape'a have been reported from all the Main Hawaiian Islands except for Ni'ihau, although specimen records exist only for Kaua'i, O'ahu, Maui, Moloka'i, and the island of Hawai'i. 'Ōpe'ape'a occur in a wide range of habitats across a wide elevation gradient. On the island of Hawai'i, bats are found primarily from sea level to 2,288 meters (7,500 feet) elevation, although they have been observed near the island's summits (above 3,963 meters or 13,000 feet). See "Location and Condition of Key Habitat," below, for distribution by seasons.

ABUNDANCE: Mostly unknown, although Pinzari et al. 2014 suggested that the population on the island of Hawai'i has been stable or is slightly increasing based on occupancy models from acoustic monitoring. Survey methods to count or estimate populations of solitary roosting bats have not been established. Although based on incomplete data, Kaua'i and the island of Hawai'i may support the largest populations.



LOCATION AND CONDITION OF KEY HABITAT: 'Ōpe'ape'a have been found roosting in 'ōhi'a (*Metrosideros polymorpha*), pu hala (*Pandanus tectorius*), coconut palms (*Cocos nucifera*), kukui (*Aleurites moluccana*), kiawe (*Proscopis pallida*), avocado (*Persea americana*), shower trees (*Cassia javanica*), pūkiawe (*Styphelia tameiameia*), fern clumps, eucalyptus (*Eucalyptus* spp.), cook pine (*Araucaria columnaris*), and Norfolk Island pine (*Araucaria heterophylla*) stands. Recent work on the island of Hawai'i found that bat activity varied with season and altitude, and the greatest level of activity occurred at low elevations (below 1,280 meters or 4,200 feet) from April to December (Bonaccorso et al. 2015). Because warm temperatures are strongly associated with reproductive success in this and other bat species, it has been suggested that key breeding habitat is likely to occur at sites where the average July minimum temperature is above 11°C (52°F). If true, key breeding habitat on the island of Hawai'i would occur below 1,280 meters (4,200 feet) elevation (Bonaccorso et al. 2015). Because bats use both native and non-native habitat for foraging and roosting, the importance of non-native timber stands, particularly those at low elevations, should be determined. Breeding sites are known for Mānuka Natural Area Reserve and scattered areas along the Hāmākua Coast.

THREATS: Bats are affected by habitat loss, pesticides, collisions with structures, and roost disturbance. A reduction in tree cover (e.g., roost sites) might be the primary reason for the species' decline in Hawai'i. Pesticides also may have reduced populations. Bats are known to interact and sometimes collide with wind turbines. Lastly, bats of many species are affected by predation, so this may also be a problem for 'ōpe'ape'a.

CONSERVATION ACTIONS: The goals of conservation actions are to not only protect current populations and key breeding habitats, but also to establish additional populations thereby reducing the risk of extinction (U.S. Fish and Wildlife Service 1998). In addition to common statewide and island conservation actions, specific management directed toward 'ōpe'ape'a should include the following:

- Conserve known occupied habitat.
- Develop and implement conservation plans and strategies that guide the management and use of forests to reduce negative effects on known bat populations.
- Support Hawaiian hoary bat research.

MONITORING: Continue surveys of population and distribution in known and likely habitats and identify key limiting factors affecting the recovery of the species.

RESEARCH PRIORITIES: Given that little is known about 'ōpe'ape'a any research would contribute to the understanding of and ability to conserve this species. Research priorities for the 'ōpe'ape'a include the following:

- Develop standard survey and monitoring methods and procedures that will allow the accurate estimation of populations and changes in activity and/or occupancy.
- Conduct occupancy surveys of all the Main Hawaiian Islands to examine distribution and population trends.
- Identify key breeding and wintering sites.
- Better describe roost site characteristics and preferences.
- Increase efforts to track and monitor movements and behaviors.
- Determine the extent to which Hawaiian hoary bats use torpor.
- Better describe threats and important factors limiting recovery such as whether depredation by introduced animals or availability of prey represent constraints for populations.
- Continue to support the development of avoidance and minimization measures that can be effectively implemented to reduce collisions with wind turbines.
- Direct research findings toward the development of conservation and management actions that address the needs and deficiencies of the species and refine these approaches using an adaptive management approach.

References:

Frank J. Bonaccorso, FJ, CM Todd, AC Miles, and PM Gorresen. 2015. Foraging range movements of the endangered Hawaiian hoary bat, *Lasiurus cinereus semotus* (Chiroptera: Vespertilionidae). *Journal of Mammalogy* 96(1):64-71. 2015

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<http://www.dofaw.net/fbrp/projects.php?id=39>. Hawai'i Natural Heritage Program [Hawai'i Biodiversity and Mapping Program]. 2004. Natural diversity database. University of Hawai'i, Center for Conservation Research and Training. Honolulu, HI. Pinzari, C. A., F. J. Bonaccorso, and K. Montoya-Aiona. 2014 Hawaiian Hoary bat occupancy at kaloko-honokohau National Historical Park Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Technical Report 51:1-19 Russell AL, CA Pinzari, MJ Vonhof, KJ Olival, FJ Bonaccorso. 2015. Two Tickets to Paradise: Multiple Dispersal Events in the Founding of Hoary Bat Populations in Hawai'i. *PLoS ONE* 10(6): e0127912.

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