5-YEAR REVIEW

Species Reviewed: ʻōpeʻapeʻa or Hawaiian hoary bat
(***Lasiurus cinereus semotus***)
Current Classification: Endangered

Federal Register Notice Announcing Initiation of this Review

[USFWS] U.S. Fish and Wildlife Service. 2023. Endangered and threatened wildlife and plants; Initiation of 5-year status reviews for 133 species in Oregon, Washington, Idaho, Montana, California, Nevada, Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands. Federal Register 88(56):17611–17614.

Lead Region/Field Office

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Methodology Used to Complete this 5-year Review

In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a 5-year review is to assess each species listed under the Act to determine whether its status has changed and it should be classified differently or removed from the lists of Threatened and Endangered Wildlife and Plants. Section 3(6) of the Act defines an endangered species as one that is "in danger of extinction throughout all or a significant portion of its range," and section 3(20) defines a threatened species as one that is "likely to become an endangered species within the foreseeable future."

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS) beginning in February 2025. The review is based on an assessment of current, available information since the last 5-year review for ʻōpeʻapeʻa (USFWS 2021). The evaluation by Diane Sether, Invertebrate and Wildlife Biologist, was reviewed by Chelsie Javar-Salas, Maui Nui and Hawaiʻi Team Manager, John Vetter, Animal Recovery Coordinator, and Megan Laut, Recovery Program Manager.

Background

Please refer to the Recovery Plan for the Hawaiian hoary bat (USFWS 1998) and the previous 5-year reviews for ʻōpeʻapeʻa signed September 30, 2011, and March 16, 2021, (USFWS 2011, 2021) for a complete review of the species' status, threats, management efforts, and references cited. These documents and other information on the species are available on USFWS's Environmental Conservation On-line System (ECOS) database at

https://ecos.fws.gov/ecp/species/770. The 2021 5-year review, in particular, provides detailed information about the distribution and spatial and temporal variation of ʻōpeʻapeʻa recorded in surveys using acoustic and other detection methods and mist-net captures on multiple islands in the Hawaiian Archipelago, genetic diversity in the species, foraging, diet, and general behavior (USFWS 2021, entire). In the 2021 5-year review, we recommended downlisting the ʻōpeʻapeʻa from endangered to threatened because significant new information gathered since listing regarding the species' distribution among islands, its generalist ecology, and its mobility among habitat within islands warrants this change in the Federal listing status. We maintain that recommendation here.

Introduction

The ʻōpeʻapeʻa (Hawaiian hoary bat, listed as *Lasiurus cinereus semotus*; Chiroptera: Vespertilionidae), was listed as endangered under the Endangered Species Act (ESA) in 1970. Resident populations of ʻōpeʻapeʻa are known to occur on Kauaʻi, Oʻahu, Molokaʻi, Maui, and Hawaiʻi. Bats have been acoustically detected once on Lānaʻi, and they may visit Kahoʻolawe seasonally. Genetic studies published between 2015 and 2020 improved our understanding of the taxonomic status and genetic variation of ʻōpeʻapeʻa within and between islands in Hawaiʻi (Russell et al. 2015, entire; Baird et al. 2015, entire; Baird et al. 2017, entire; Pinzari et al. 2020, entire). Key insights from these studies included the following: genetic evidence supports reclassifying the ʻōpeʻapeʻa as a full species endemic to Hawaiʻi; two genetic clades exist, both are widely distributed and, in some cases, occur on the same island; multiple unique haplotypes exist and seldom occur on more than one island; and some evidence exists of past mixing among island populations.

These solitary (non-colonial), insectivorous bats are distributed across a wide range of habitats from lowland to montane environments up to 3,562 meters (m; 11,682 feet [ft]) above sea level in the Hawaiian Archipelago. ʻŌpeʻapeʻa are aerial predators that forage at night and roost during the day. They are generalist feeders that consume a wide variety of native and non-native prey in at least seven orders of insects (Insecta); moths and beetles are generally the most frequently consumed taxa. ʻŌpeʻapeʻa roost alone or with dependent young (pups) in the foliage of native and non-native trees that are typically taller than 3–5 m (10–16 ft). Pupping typically occurs from June 1 to September 15.

Known threats to ʻōpeʻapeʻa include collision with wind turbines and entanglement with barbed wire fences. Other potential threats include loss and degradation of roosting and foraging habitat from timber harvest, forest biomass removal, and tree trimming above 5 m (16 ft) in height during the pupping season, foraging competition with non-native coqui frogs (*Eleutherodactylus coqui*), direct and indirect effects of climate change. The effects of pesticides, disease, and predation, all significant potential threats, remain unknown.

The technological challenges associated with surveying populations of ʻōpeʻapeʻa persist (USFWS 2021, pp. 4–5), along with consequent gaps in our knowledge of the species' abundance, population dynamics, and life history. The only trend analysis for the species remains a study of site occupancy on the island of Hawaiʻi between 2007 and 2011,

which suggested that occupancy was stable or slightly increasing over that 5-year period (Gorresen et al. 2013, entire). However, published results of recent genetic and ecological studies have added valuable information to our knowledge of this species. Below, we summarize new information about ʻōpeʻapeʻa and provide a qualitative analysis of the species' viability.

New Status Information

Taxonomy

Various authors have examined the colonization history and genetic diversity of hoary bat species and have recommended ʻōpeʻapeʻa be considered a full species (Baird et al. 2015, entire; Baird et al. 2017, entire; Pinzari 2019, entire; Pinzari et al. 2020, entire; USFWS 2021, pp. 2–4). Recent mitochondrial and microsatellite DNA analysis confirmed previous conclusions that a single founding population was located on Maui and that a single, full species occurs across the Hawaiian Archipelago (Pinzari et al. 2023, entire). Full species designation is recognized in the Handbook of the Mammals of the World (Wilson and Mittermeier 2019, entire), in the Integrated Taxonomic Information System (ITIS 2022, entire), by the American Society of Mammalogists (2022, entire), and in the Bats of the World database (Simmons and Cirranello 2025, entire). A future rule will reflect this change.[1] See the previous 5-year review for a full discussion on the colonization of the Hawaiian Islands by the ancestor of the ʻōpeʻapeʻa and interpretations of the species' taxonomic status across the archipelago (USFWS 2021, pp. 2–4).

Population Genetics

Results of molecular analyses published in 2023 provided new insights into genetic structure and diversity in ʻōpeʻapeʻa among islands (Pinzari et al. 2023, entire). Populations are genetically structured by island, dispersal among the main islands was rare in the past, and contemporary mixing is rare or nonexistent (Pinzari et al. 2023, p. 14–18, 24). Twenty-two unique haplotypes are now identified in the species' genome, with the island of Hawaiʻi harboring the greatest number and only three shared among islands (Pinzari et al. 2023, p. 11). The islands of Kauaʻi and Maui and the islands of Hawaiʻi and Maui showed the greatest sequence differences (>2.4%) (Pinzari et al. 2023, pp. 11–12). The two genetic clades in the species are distributed among the four islands in the study as follows: one is most abundant on the island of Hawaiʻi and also occurs on Kauaʻi, Oʻahu, Maui; the other is most abundant on Maui and is also present in low numbers on Oʻahu and Hawaiʻi (Pinzari et al. 2023, pp. 11–14). Further differentiated populations also occur on at least three islands: Maui, Hawaiʻi, and Oʻahu (Pinzari et al. 2023, pp. 11–18, 21–22).

[1] In 2023, the Service published a final rule proposing the ʻōpeʻapeʻa be moved from the genus *Lasiurus* to *Aeorestes* and reclassified as a full species (USFWS 2023, p. 7138). However, commenters on the rule noted *Lasiurus* continues to be used widely used and retained by multiple authorities including American Museum of Natural History (Bats of the World: A Taxonomic and Geographic Database), the Handbook of the Mammals of the World, and the International Union for Conservation of Nature (IUCN) Red List. In 2024, the Service restored the listing of the ʻōpeʻapeʻa to its original listed name, *Lasiurus cinerus semotus*, in a final rule correction (USFWS 2024, entire). A future rule correction will propose all bats in Hawaiʻi be considered a full species, *Lasiurus semotus*, following Pinzari et al. 2020 (entire) and Pinzari et al. 2023 (entire).

Pinzari et al. (2023, pp. 18–19) also provided the first estimates of long-term and contemporary effective population sizes (N_e and N_{eC}, respectively) for ʻōpeʻapeʻa on the four islands with sufficient genetic samples (Table 1). Effective population size is the idealized number of reproducing individuals in a population that would lead to the same amount of genetic drift or inbreeding as the census population. Estimates of N_{eC} were far smaller than estimates of N_e on each island and estimates of both N_e and N_{eC} were smaller for Oʻahu and Kauaʻi than for Maui and Hawaiʻi (Pinzari et al. 2023, pp. 18–20; Table 1). Census population size and demographic characteristics, data often used to estimate effective population size, are unknown for ʻōpeʻapeʻa on any island, and interpretation of these estimates, extrapolated with multiple caveats from genetic analysis, must be conservative (Pinzari et al. 2023, pp. 18–20, 25–26). That said, these estimates suggest Maui, Oʻahu, and Kauaʻi populations may be smaller than that of Hawaiʻi and that maintaining genetic diversity in the species may require several hundred to tens of thousands of ʻōpeʻapeʻa (Pinzari et al. 2023, pp. 18–20, 26).

Table 1. Estimates of long-term and contemporary effective population size (and confidence intervals) of ʻōpeʻapeʻa, adapted from Pinzari et al. 2023 (pp. 20–21). These estimates are based on mitochondrial and microsatellite DNA analysis; census population size and demography are unknown for any island.

Estimated Effective Population Size		
Island	Long Term (N_e)	Contemporary (N_{eC})
Hawaiʻi	491 (± 184) to 49,131 (± 18,290)	1,265 (CI: 314 to ∞)*
Maui	489 (±183) to 48,895 (±18,290)	106 (CI: 55 to 344)
Oʻahu	313 (±89) to 31,328 (±8,876)	21 (CI: 12 to 39)
Kauaʻi	310 (±87) to 30,966 (±8,705)	91 (CI: 17 to ∞)*

* Infinity estimates for the upper limit of confidence intervals for Hawaiʻi and Kauaʻi result from limitations of the data. This is not uncommon for the method used and indicates inconclusive results and the potential for larger effective population sizes on these islands. Additional samples would be needed to develop upper limits and refine estimates for Hawaiʻi and Kauaʻi (Pinzari et al. 2023, pp. 21, 26).

Activity Patterns and Habitat Use

Information is limited with respect to resource use and whether it differs by island, elevation, sex, and/or season. As generalists, ʻōpeʻapeʻa feed on a variety of insects and may move seasonally, daily, and/or among habitat types in search of these resources; they may have discrete core use areas within a larger foraging range, but these areas may shift seasonally or even nightly depending on climate, local weather, and or habitat and prey quality (USFWS 2021, pp 11–12). The greatest ʻōpeʻapeʻa activity has been broadly associated with forested locations, high insect biomass, and coastal lowlands during summer months (Jacobs 1994, p. 194–199; Menard 2001, pp. 71–96; Gorresen et al. 2013, pp 10–18).

More recently, male and female ʻōpeʻapeʻa have been captured below and above 1,000 m (3,281 ft) (Bonaccorso et al. 2016, entire; Hoeh et al. 2023a, pp. 9, 14), with peak capture rates occurring at approximately 930 m (3,051 ft) (Hoeh et al. 2023a, pp. 9, 14). Males were captured at a higher rate than females overall (Hoeh et al. 2023a, p. 10). Capture rates for females were highest during the reproductive season (June–September) and capture rates for males did not vary significantly with season (Hoeh et al. 2023a, pp. 10–11). Ōpeʻapeʻa were captured between 11 and 389 min (~6.5 hr) after sunset, but peak captures occurred 30–90 min after sunset (Hoeh et al. 2023a, pp. 7–8). Lowest and highest capture rates occurred seasonally at the end of June and the end of October, respectively (Hoeh et al. 2023a, p. 12). These recently documented variations in capture rates with elevation, season, sex, and time of day may help inform development of new survey strategies and assessment of the response to restoration or mitigation actions intended to benefit ʻōpeʻapeʻa.

Roosting

ʻŌpeʻapeʻa day roost in a wide variety of native and non-native tree species and have been documented in urban, semi-urban, and agricultural areas and in native and non-native forests (USFWS 2021, pp. 9–11). Recent, detailed tracking studies provided new information about roosting behavior (Montoya-Aiona et al. 2023a, entire). In general, ʻōpeʻapeʻa tend to select tall, large diameter trees of diverse species situated at forest edges with relatively open canopies (Montoya-Aiona et al. 2023a, pp. 8–11, 13, 18). Such trees and stands may ease roost access by providing an "edge-effect" favored by insectivorous bats (Jantzen and Fenton 2013, entire; Salganek et al. 2022, pp. 1106–1107; Montoya-Aiona et al. 2023a p. 18).

Individual male and female bats were sometimes observed to return to the same roost trees (and the same perches within them) and in some cases these trees were occupied by more than one bat concurrently (Montoya-Aiona et al. 2023a, p. 9). Females roost with their dependent pups typically in large trees with dense foliage; Montoya-Aiona and others (2023a, p. 16) found that the same trees often are used as maternity roosts over multiple breeding seasons, and some trees may harbor more than one female simultaneously. These results suggest potentially cross-generational site fidelity, particularly in female ʻōpeʻapeʻa, and the importance of identifying and protecting such legacy roost trees and the habitats where they occur (Montoya-Aiona et al. 2023a, p. 16, 20). The factors that influence the persistence of these roosts are not known, nor are the population-level impacts of removing these maternal roost trees (which can result in mortality of any non-volant pups present). Males, once they are independent, are territorial and are not known to roost together or forage simultaneously in the same area (Bonaccorso et al. 2015; Montoya-Aiona et al. 2023a, Montoya-Aiona et al 2023b).

Radio transmitter retention in studies of small bats has typically been short (Hoeh et al. 2023a, p. 13). The maximum retention time in this recent study, 25 days for males and 17

days for females (Hoeh et al., p. 9) points to a need for marking methods that permit longer term tracking of ʻōpeʻapeʻa.

Threats

Threats to the ʻōpeʻapeʻa are identified and discussed in the previous 5-year review (USFWS 2021, p. 15–19). In brief, the operation of land-based wind energy facilities from dusk to dawn, timber harvest, and removal of vegetation taller than 5 m (16 ft) during the pupping season remain known threats. Potential threats include competition for prey where the non-native coqui frogs occur at high density in ʻōpeʻapeʻa foraging habitat, and long-term changes in ambient temperature, rainfall, and the incidence and severity of storms related to climate change. Climate change effects on ʻōpeʻapeʻa may include expansion of habitat for invasive competitors or changes in resource availability or the quality and distribution of habitat. Increasing temperature may contribute to upslope expansion of the range of coqui frogs. Severe storms may cause direct mortality of individual bats and major changes to the distribution and quality of foraging habitat and roost trees may exact energetic and reproductive costs to ʻōpeʻapeʻa if they must travel greater distances or forage for longer periods to meet their needs.

Barbed wire-associated bat fatalities have been documented but, unlike wind energy turbines, most barbed wire fences are not monitored or, at best, are monitored infrequently. Threats toʻōpeʻapeʻa posed by predators such as rats (*Rattus* spp.), disease, and direct and indirect impacts of pesticides have not been evaluated. These threats presumably would affect ʻōpeʻapeʻa statewide.

Pesticide use may have an impact on the species by reducing or altering the prey population, or through biomagnification via prey base. Effects are mostly unknown. Trace amounts of rodenticide residues have been detected in carcass tissues from Hawaiian hoary bat carcasses examined (USFWS unpubl. data), but there is currently no data available in Hawaiʻi to evaluate the potential impact to Hawaiian hoary bats by island or statewide. Regulations limiting broad-spectrum aerial insecticide applications may have positively affected food resources available to ʻōpeʻapeʻa. In contrast, the demise of thousands of acres of pineapple cultivation across the islands and associated loss of souring beetles (Nitidulidae: *Urophorus humeralis*) likely resulted in a shift in foraging diet and increased time spent foraging.

Management to reduce known threats on each island may be ultimately important to preserve existing genetic diversity, especially given the limited or absent modern gene flow between islands. Projects to benefit ʻōpeʻapeʻa are underway on some islands (see below). Until efforts to address known threats are fully implemented and the response in ʻōpeʻapeʻa populations can be reliably measured, we consider the species to remain at risk.

Wind energy

Land-based wind energy facilities in the Hawaiian Archipelago that operate between dusk and dawn remain the greatest known source of anthropogenic mortality in ʻōpeʻapeʻa and the only one that is tracked and quantified. Currently, nine wind energy facilities operate on the islands of Oʻahu, Maui, and Hawaiʻi. Owing to the bat's protected status under the ESA and the known interaction of bats with wind turbines, these facilities are required to document and address take of ʻōpeʻapeʻa that occurs incidental to the lawful operation of the project. Seven of the facilities have habitat conservation plans (HCPs) and Incidental Take Permits (ITPs) under section 10(a)(1)(B) of the ESA, or federal Biological Opinions with Incidental Take Statements (ITSs) under section 7, that require systematic, rigorous monitoring of take associated with operation of the turbines and specify measures to avoid, minimize, and/or mitigate the facility's take. Two facilities, both on the island of Hawaiʻi, are operating although they have not yet completed similar regulatory compliance. At least four of the nine operating wind energy facilities are currently developing new HCPs or amendments to existing ones.

Incidental take of a cumulative total of 527 ʻōpeʻapeʻa is currently authorized for the seven wind energy facilities with permits spanning 2006 through 2038. The authorized take of 527 bats is divided among the seven permitted facilities for the life of the individual facilities' permits and is not an annual total. As of June 1, 2025, 167 observed ʻōpeʻapeʻa fatalities attributed to direct (adult carcasses) and indirect (dependent young) losses were reported by the seven wind energy facilities conducting systematic fatality monitoring (Auwahi Wind 2025a, entire; Auwahi Wind 2025b, entire; Kaheawa Wind Power I 2025, entire; Kaheawa Wind Power II 2025, entire; Kahuku Wind Power 2025, entire; Kawailoa Wind Power 2025, entire; Nā Pua Makani Wind Energy Project 2024, entire; Pakini Nui Wind Farm 2025, entire). Indirect fatalities, the loss of dependent young, are based on the time of year a female is killed; however, the lack of sex determination of ʻōpeʻapeʻa found during systematic searches since 2022 has hampered ability to appropriately assess indirect take associated with fatalities of females during the pupping season. As of June 1, 2025, adjusting the number of observed fatalities to account for imperfect detection (based on an 80% credibility standard) yields a modeled estimate of total fatalities attributed to these facilities not expected to exceed 302 (Auwahi Wind 2025a, entire; Auwahi Wind 2025b, entire; Kaheawa Wind Power I 2025, entire; Kaheawa Wind Power II 2025, entire; Kahuku Wind Power 2025, entire; Kawailoa Wind Power 2025, entire; Nā Pua Makani Wind Energy Project 2024, entire; Pakini Nui Wind Farm 2025, entire). This is based on USFWS calculations using the Evidence of Absence model (Dalthorp, et al. 2017, entire) and spans 2006 through June 2025. Facilities that do not have ITPs do not report systematic monitoring results to the Service.

Projects intended to provide compensatory mitigation for permitted take of ʻōpeʻapeʻa currently rely on adaptive management programs designed to ensure measures of success are met and fatalities are effectively offset using best available science. However, given the limited information on ʻōpeʻapeʻa numbers, life history, and resource needs, tying land-based mitigation projects to ʻōpeʻapeʻa populations on any island, or ascertaining that offsets are achieved before take occurs, is difficult, and uncertainty remains regarding the effectiveness of these mitigation projects. Additionally, habitat restoration

takes time to develop into ʻōpeʻapeʻa habitat, complicating evaluation of the outcomes—and adaptive management—of these mitigation projects.

Acoustic monitoring of ʻōpeʻapeʻa occurrence at wind energy facilities and mitigation sites is ongoing. Insect occurrence is also monitored at mitigation sites on Maui. Commercial bat deterrents have been installed and activated at several wind energy facilities on Oʻahu and Maui. To date, deterrents have had variable preliminary results with bat deterrents at a facility on Oʻahu showing an initial reduction in bat fatalities and a facility on Maui is experiencing an increase (Auwahi Wind 2025a, entire; Auwahi Wind 2025b, entire; Kawailoa Wind Power 2025, entire). Because fatalities are relatively rare, these preliminary data shed little light on the utility of these bat deterrents. Ongoing research continues locally and worldwide to develop and refine reliable detection tools, management and conservation actions, and bat deterrents to reduce the threats posed by wind energy turbines.

Timber harvest

Tree trimming and harvest of trees taller than 4.6 m (15 ft) continue to pose a threat to non-volant, dependent bat pups if they are present. Silviculture and biomass harvest operations occur primarily on the islands of Kauaʻi and Hawaiʻi. The Service recommends not trimming or cutting trees above 15 feet between June 1 and September 15 to avoid impacts to dependent (non-volant) bat pups present at these stands. The observation of a male ʻōpeʻapeʻa at a height of 2 m (6.5 ft) in a dense uluhe thicket indicates that roosting also occurs in low-stature vegetation (Montoya-Aiona et al. 2023a, p. 8). Because ʻōpeʻapeʻa roost in a wide variety of trees (native and non-native) and are broadly distributed across all islands, removal of trees outside of the pupping season is not currently anticipated to result in adverse effects to ʻōpeʻapeʻa populations. However, degradation or destruction of functioning habitat that has taken years to develop might be expected to have impacts on the activity, prey base, and territoriality of bats. Recent observations have indicated tree or site fidelity by some ʻōpeʻapeʻa females; protection of known roost trees used year after year may benefit the ʻōpeʻapeʻa. Forest decline from rapid ʻōhiʻa death and long-term drought are removing the tall ʻōhiʻa canopy trees used for roosting. Effects of this overstory loss to ʻōpeʻapeʻa are unknown.

Ungulates

Nonnative ungulates, including axis deer (*Axis axis*), black-tailed deer (*Odocoileus hemionus columbianus*), feral cattle (*Bos taurus*), goats (*Capra hircus*), mouflon (*Ovis gmelini musimon*), pigs (*Sus scrofa*), and sheep (*Ovis aries*) are highly destructive to forest vegetation in the habitats of the ʻōpeʻapeʻa and are an indirect threat. Feral ungulates damage vegetation by debarking and uprooting individual trees and creating game trails and wallows. Cumulatively, ungulates degrade forest habitat through destroying vegetation cover and destabilizing substrate, which leads to erosion, landslides, and rockfalls, and through facilitating invasion of nonnative plant species by dispersing seeds and vegetative parts and creating forest openings (Cuddihy and Stone 1990, pp. 63–64; Duenas et al. 2018, entire; Wehr et al. 2018, entire). These types of damage occur year-round, including the ʻōpeʻapeʻa pupping season. ʻŌpeʻapeʻa pups are especially vulnerable to events such as landslides given their limited mobility

during such as event. Fencing and removal of ungulates is the basis for restoring intact habitats for ʻōpeʻapeʻa roosting, breeding, and foraging.

Invasive plants
Invasive plant species alter soil-water regimes, modify nutrient cycling, and alter the fire regime in native plant communities, ultimately converting native-dominated plant communities to nonnative plant communities (Smith 1985, pp. 180–181; Cuddihy and Stone 1990, p. 74; D'Antonio and Vitousek 1992, p. 70, 73–74; Vitousek et al. 1997, p. 6; Tunison et al. 2002, p. 122). In addition, many non-native trees grow rapidly and are structurally brittle, rendering them vulnerable to storm winds. ʻŌpeʻapeʻa face increased risk of losing roosts if such trees are lost during storms.

Fire risk
The threat posed by fire is serious and increasing in dry habitats as well as lowland and montane mesic forests (Javar-Salas et al. 2020, p. 13; Lowe et al. 2020, pp. 8–9; Peʻa et al. 2020, p.10). The number and size of wildfires are increasing in the main Hawaiian Islands, and successive fires burn deeper into native vegetation, further reducing available habitat. Fire damages and destroys roosting and foraging locations. Additionally, non-volant ʻōpeʻapeʻa pups are unable to escape wildfire.

Rapid ʻōhiʻa death
Rapid ʻōhiʻa death (ROD) caused by *Ceratocystis* fungi has devastated ʻōhiʻa in the habitats of ʻōpeʻapeʻa (Barnes et al., 2018, entire; Heller et al. 2019, entire). This lethal fungal-caused disease of ʻōhiʻa currently exists in forest areas across Hawaiʻi supporting ʻōpeʻapeʻa (CTAHR 2025). Although ʻōpeʻapeʻa are known to use a wide range of native and non-native trees and plants for roosting (Bonaccorso et al. 2015, entire; Johnston et al. 2018, entire; Montoya-Aiona et al. 2023a, pp. 8–11) the loss of tall, large-diameter ʻōhiʻa trees may cause changes in roosting distribution and roost-site fidelity in the ʻōpeʻapeʻa.

New Conservation and Management Efforts
Although many conservation efforts occurring throughout the Hawaiian Archipelago may benefit the ʻōpeʻapeʻa, the actions described below specifically target benefits for this species. Conservation actions related to compensatory mitigation for take of ʻōpeʻapeʻa incidental to wind-power generation include reforesting and restoring native ecosystems, creating foraging opportunities, purchasing land, and protecting areas long-term from clearing and development. Management actions described in the 2021 5-Year Review, such as land acquisitions or conservation easements in perpetuity, are ongoing or completed, as described below:

- On Maui, restoration efforts at the Puʻu Makua mitigation site have been ongoing since 2012 (Auwahi Wind 2023, entire). Habitat restoration includes feral ungulate fence installation, ungulate removal, invasive plant species removal, and plantings of native trees and shrubs (Auwahi Wind 2023, entire). The ungulate fence, which was installed in 2013, is in good condition. The 2.4-meter-tall ungulate exclusion fence surrounding the parcel was repaired in FY 2023 after

storm damage was identified; the parcel remains ungulate-free. Other management activities in FY 2023 include targeted invasive plant species removal and outplanting of native species (Auwahi Wind 2023, entire).

- On Maui, a conservation easement for 1,792 acres of Ulupalakua Ranch lands in leeward Haleakalā to preserve the lands into perpetuity was recorded in December 2020 as part of compensatory mitigation for take of ʻōpeʻapeʻa at wind turbines (Auwahi Wind 2025a, entire; Auwahi Wind 2025b, entire). Two ponds were installed: one in 2020 and the other in 2021 (Auwahi Wind 2025b, entire). These ponds attract foraging ʻōpeʻapeʻa and provide a water source. In the last five years, five acres of hedgerows with native canopy trees and understory were planted to provide edge foraging resources for the ʻōpeʻapeʻa (Auwahi Wind 2025a, entire; 2025b, entire). Barbed wire was removed from 67 acres of mitigation lands (Auwahi Wind 2025a, entire). An additional 194 acres of hedgerow canopy and understory are undergoing installation. Acoustic and insect monitoring (malaise traps) are also ongoing at the ponds and hedgerows to measure increased foraging resources and use by ʻōpeʻapeʻa above initial baselines (Auwahi Wind 2025a, entire).

- On Maui, acoustic monitoring is ongoing for ʻōpeʻapeʻa on approximately 700 acres of former ranchland at elevations ranging from approximately 1,890 to 2,300 m (6,200 to 7,600 ft) on the west slopes of Haleakalā within the Kamehamenui Forest Reserve. Establishment of this forest reserve was partially funded by federal funds through the Habitat Conservation Plan Land Acquisition grant program with forest restoration for ʻōpeʻapeʻa as a key objective. The acoustic monitoring is to establish baseline occurrence before restoration for ʻōpeʻapeʻa mitigation (Auwahi Wind 2025a, entire; Thompson 2024, entire).

- On Hawaiʻi, extensive ʻōpeʻapeʻa roost selection research was conducted from 2018 to 2021 and the results were recently published (Hoeh et al. 2023a, entire; Hoeh et al. 2023b, entire; Montoya-Aiona et al. 2023a, entire; Montoya-Aiona 2023b, entire). This information is summarized above in the New Status Information section. This research was funded as part of state and federal approved ʻōpeʻapeʻa mitigation (Kaheawa Wind Power I 2025, entire; Kaheawa Wind Power II 2025, entire).

- On Oʻahu, the Waimea Native Forest acquisition was completed since the last 5-year review in 2021. The land will be in conservation for perpetuity (Kawailoa Wind Power 2025, p. 6). This acquisition was in part made through offset mitigation for ʻōpeʻapeʻa as well as other species.

- On Oʻahu, the Helemano Wilderness Area was acquired and placed into long-term protection for ʻōpeʻapeʻa as well as other species since the last 5-year review in 2021 (Kawailoa Wind Power 2025, p. 6). This acquisition was in part made through offset mitigation.

- On Oʻahu, a mitigation plan for ʻōpeʻapeʻa focusing on improving habitat for bats in the Helemano Section of the ʻEwa Forest Reserve was finalized and approved by the state and federal agencies and the Endangered Species Recovery Committee in April 2024 (Kahuku Wind Power 2025, p. 4). Plan implementation began in December 2024 with the clearing of non-native vegetation in preparation for planting species that will provide ʻōpeʻapeʻa habitat within the bat foraging corridors (Kahuku Wind Power 2025, p. 4). As of January 28, 2025, vegetation clearing of parcels 1 and 2 has been completed, and vegetation clearing within parcel 4 has begun (Kahuku Wind Power 2025, p. 4). Barbed wire fencing removal will commence upon approval by State Historic Preservation (SHPD) (Kahuku Wind Power 2025, p. 4).

- Since the last 5-year review (USFWS 2021, entire), several wind energy facilities on Maui and Oʻahu have deployed commercial bat deterrents on their wind turbine generators. The efficacy of such deployments in reducing ʻōpeʻapeʻa fatalities has been widely variable and the Service and State of Hawaiʻi Division of Forestry and Wildlife continue to evaluate the efficacy. Preliminary analysis of efficacy at one facility on Oʻahu shows a potential trend of decreased take based on observed fatalities, whereas results at a facility on Maui have been a general increase in observed fatalities. Because observed fatalities at either facility are rare in any case and annual variability is high, monitoring will continue for the life of these projects to evaluate the efficacy of these deterrents and inform take estimates and adaptive management.

Table 2. Threats to ʻōpeʻapeʻa (*Lasiurus cinereus semotus*) and ongoing conservation efforts.

Threat	**Listing factor**	**Current Status**	**Implementation of Conservation/ Management Efforts**
Ungulate degradation of habitat	A	Unknown	Partially addressed. Some areas known to be used by ʻōpeʻapeʻa for foraging and roosting have been fenced and ungulates removed. Monitoring is conducted to confirm zero ungulate presence at these sites. Fencing of additional areas statewide are planned.
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partially addressed. Protection of habitat and restoration projects specifically for the ʻōpeʻapeʻa are ongoing on the islands of Oʻahu, Maui, and Hawaiʻi.

Threat	Listing factor	Current Status	Implementation of Conservation/ Management Efforts
Fire	A		Partially addressed. Fire Management plans are in place for most publicly owned wilderness, refuges, reserves, parks, and other lands in the islands. Fire management plans for newly acquired lands such as Kamehamehanui and Makawao are expected in 2026.
Climate change	A, E	Increasing	Partially addressed. Water resources and restoration of forest is occurring in upper elevations of Maui and Hawai‘i, and lower elevations on O‘ahu.
Disease or Predation	C	Unknown	Not addressed. Little is known about the severity of threats from diseases, or from predation by introduced rats, barn owls (*Tyto furcata*), cats (*Felis catus*), native pueo (*Asio flammeus sandwichensis*).
Lack of adequate regulations	D	Ongoing	Not addressed. While Hawai‘i does have regulations in place to protect this species, the current biosecurity program is inadequate to prevent the introduction or spread of invasive species, such as coqui frog (Beard 2007; Beard 2009; Bernard and Mautz 2016), and others that may affect ‘ōpe‘ape‘a habitat and food resources.
Alien competitors	D, E	Ongoing	Not addressed. ‘Ōpe‘ape‘a face likely resource competition from nonnative coqui frogs (at low to mid elevations), which feed on insects also consumed by the bat. Existing regulations offer inadequate protection to the ‘ōpe‘ape‘a from the introduction of nonnative competitors and the loss of their food resources.
Collision with wind turbines	E	Ongoing	Partially addressed. HCPs are in place at seven of nine wind-power facilities operating in Hawai‘i with ITPs that require minimization and mitigation of take of bats. Bat deterrents have been installed at some facilities to reduce mortality, with inconclusive results. Compensatory mitigation in the form of land acquisition and habitat restoration is underway across the state, with so far inconclusive results. Two facilities still operate without ESA section 10 compliance.

Threat	Listing factor	Current Status	Implementation of Conservation/ Management Efforts
Human disturbance of roosts during pupping	E	Ongoing	Partially addressed. Education, guidance, and technical assistance are provided to parties that contact the Service about the removal of trees over 5 m (16 ft) in height from June 1 through September 15 when dependent young may be present in the vegetation. Additionally, forests protected through purchase or mitigation easements reduce this threat.
Environmental catastrophes	E	Ongoing	Not addressed. Risks posed by catastrophic events such as hurricanes, severe storms, and introduced or expansion of diseases and predators are ongoing. Management to prevent such events is generally not feasible, although some effects can be mitigated.

Recovery Criteria

Limited knowledge of the abundance, distribution, ecology, and life history of ōpeʻapeʻa permitted development of only interim criteria for downlisting and delisting in the 1998 recovery plan (USFWS 1998, pp. 18–20). Research addressing significant knowledge gaps must be undertaken prior to consideration of delisting; such research is ongoing. The interim downlisting criterion in the 1998 recovery plan (USFWS 1998, pp. 18–20) is:

> A widespread population of Hawaiian hoary bats must be naturally reproducing and stable or increasing in size on the island of Hawaiʻi for a minimum of 5 consecutive years before downlisting is considered.

While we consider recovery plans to be ‘roadmaps’ to guide recovery, they are not binding regulatory documents and achievement, or lack of achievement, of specific recovery criteria therein does not automatically confer regulatory status under section 4(a)(1) of the Act. Ultimately, our recommendation of listing status in this 5-year review is based on an evaluation of whether a species meets the definition of the threatened or endangered species under the Act. Therefore, below, we assessed the species’ viability to make our recommendation regarding the ‘ōpeʻapeʻa's listing status under the Act.

Improved information about ‘ōpeʻapeʻa presence and breeding, although still limited, indicates that the species is much more widely distributed than thought in 1998 (USFWS 2021, pp. 5–9). Resident populations are now known to occur on five of the seven Hawaiian Islands where the species has been observed (including well distributed populations on Hawaiʻi, Kauaʻi, and Maui), though population trends on any of the islands with known breeding populations of ‘ōpeʻapeʻa are unknown. Gorresen et al. (2013, p. 18) found that ‘ōpeʻapeʻa site occupancy on the island of Hawaiʻi was likely

stable or slightly increasing from 2007–2011. While encouraging, this does not equate to a stable or increasing population (per the interim downlisting criterion in the recovery plan), and no more recent or detailed trend analyses exist.

Table 3. Status and trends of ʻōpeʻapeʻa from listing through current 5-year review.

Date	**No. Wild Individuals**	**Interim Downlisting Criterion Met?**
1970 (listing)	No population given	N/A (No recovery plan developed)
1998 (recovery plan)	Population size is unknown for any island. Resident populations may occur on only Hawaiʻi, Kauaʻi, and Maui. No verified records for Molokaʻi, Lānaʻi, or Kahoʻolawe.	No
2011 (5-year review)	Population size is unknown for any island. ʻŌpeʻapeʻa are widely distributed on the island of Hawaiʻi and are naturally reproducing. However, whether the ʻōpeʻapeʻa population is stable or increasing in size is unknown. At this time, there is insufficient data from Maui or Kauaʻi on ʻōpeʻapeʻa distribution, breeding, or population trend.	No
2021 (5-year review)	Population size is unknown for any island. Breeding known on Kauaʻi, Oʻahu, Hawaiʻi, and likely Maui and Molokai; presence detected on Lānaʻi and Molokaʻi and known to at least visit Kahoʻolawe. Results of a 2007-2011 study on Hawaiʻi is suggestive of stable or slightly increasing site occupancy.	Partially; species is widespread and naturally reproducing, but population size and trends are unknown.

2025 (5-year review)	Population size is unknown for any island. Breeding known on Kauaʻi, Oʻahu, Maui, Hawaiʻi, and likely Molokai; presence detected on Lānaʻi and Molokaʻi and known to at least visit Kahoʻolawe. Results of a 2007-2011 study on Hawaiʻi is suggestive of stable or slightly increasing site occupancy.	Partially; species is widespread and naturally reproducing, but population size and trends are unknown.

Viability Assessment

Improved knowledge about the distribution, ecology, and genetics of ʻōpeʻapeʻa in recent decades suggest that the species' status likely is better than recognized at the time of its listing as endangered under the ESA in 1970 and the publication of the recovery plan for the species in 1998. To evaluate this objectively, we assessed the viability of ʻōpeʻapeʻa, that is, the species' potential to persist over time, based on three criteria: resiliency, redundancy, and representation (the 3 Rs; see Smith et al. 2018). Resiliency refers to the ability of a population to rebound from short-term or local stochastic changes in the environment (e.g., rainfall or habitat quality) and demography (e.g., reproductive success or mortality) within the natural range of variation. Redundancy, or risk-spreading, is the capacity of the species to withstand loss of one or more populations due to catastrophic events (e.g., hurricanes). Representation is the species' ability to adapt to trends of change in biological or environmental parameters, such as emerging diseases, invasive species, or long-term shifts in climate that affect the quality and distribution of habitat. In sum, with increasing resilience, redundancy, and representation, a species is more likely to persist (Smith et al. 2018, p. 306).

Our qualitative 3 Rs assessment used available information about the resource needs of ʻōpeʻapeʻa: their distribution, habitat use, foraging and roosting habits; results of genetic studies; and known or probable threats. This information is presented in detail in the 2021 5-year review and is summarized, along with new information since 2021, in earlier sections of this document. Information remains limited with respect to life history traits of ʻōpeʻapeʻa, the species' abundance on any island, and the impacts of threats and potential threats identified in the recovery plan.

Current condition

Resiliency

Although we lack information about the size or demographic characteristics of any population, several factors point to the resiliency of ʻōpeʻapeʻa: the species' geographic distribution and generalist diet and habitat use. When the recovery plan was published, ʻōpeʻapeʻa were regularly observed on only three islands (Hawaiʻi, Kauaʻi, and Maui; USFWS 1998, p. iii). Today, we know that they occur on six and possibly seven of the main Hawaiian Islands. Breeding populations are now known from five islands: Kauaʻi,

Oʻahu, Molokaʻi, Maui, and Hawaiʻi. The status of bats recorded on Lānaʻi and Kahoʻolawe is unknown; these observations may reflect temporary, possibly seasonal, movements from Maui rather than resident, breeding populations. The species consumes a wide variety of insect taxa, though larger prey, such as moths and beetles are preferred. The bats' diet shows some plasticity in the presence of coqui frogs. Within islands, ōpeʻapeʻa are highly mobile and use diverse foraging and roosting habitats, including along wide elevational gradients, and to some extent can traverse unsuitable areas in the fragmented landscapes typical of much of Hawaiʻi. This highly generalized, broad use of resources and habitat strongly suggests that populations are not habitat-limited and are resilient to localized (non-catastrophic) shifts in the composition of their prey base and the distribution of foraging habitats and roosting trees, even if some individual mortality results from such events.

Despite these beneficial traits, ōpeʻapeʻa remain subject to multiple threats across their range, some of which are poorly known or insufficiently addressed. The continued mortality of ōpeʻapeʻa caused by nighttime operation of turbines generating wind energy on three islands (Oʻahu, Maui, and Hawaiʻi) poses the single greatest known threat to individuals. Although the population-level impact of this anthropogenic source of mortality has not been quantified for ōpeʻapeʻa, wind turbines are significant sources of mortality for bats worldwide and have caused population declines for the closely-related hoary bat (*Lasiurus cinereus*) in North America (Friedenberg and Frick 2024, pp. 4–8). The population-level benefits of required minimization and mitigation measures for ōpeʻapeʻa (established through ESA compliance, see above) are also unknown, to date.

The loss of roosting trees and forest habitat from timber harvest and thinning, ROD, wildfire, and other disturbances also continue to threaten ōpeʻapeʻa with unknown long-term impacts to population viability. Female ʻōpeʻapeʻa show some fidelity to roost trees where they raise pups. Thus, identifying and protecting such heritage roost trees is an especially important consideration for conservation of bat populations. A key knowledge gap is how other potential threats, such as predation (especially by non-native species such as rats and barn owls, which may exacerbate effects of predation by the native pueo), disease, collision with barbed wire, and agricultural pesticides, may affect ʻōpeʻapeʻa populations. Additionally, little to no contemporary gene flow between islands indicates the isolation of each breeding population and underscores the need to address threats on an island scale to maintain existing genetic diversity (and the species' redundancy and representation; see below).

With respect to population size or changes in abundance on each island, the available information extends only to presence/absence and distribution of ōpeʻapeʻa. Recent molecular studies include estimates of contemporary genetic effective population size that are lower than long-term or historical estimates for the four islands with sufficient samples for analysis, but current population sizes cannot be inferred from this information. The lack of demographic data precludes estimates of current abundance or of impacts of any of the factors described above that may mitigate the resilience of populations.

New information gleaned since listing about the species' distribution of breeding populations on five main islands, its generalist diet, and its use of a variety of native and non-native habitats has changed our evaluation of the overall resiliency of ʻōpeʻapeʻa for the better. Although threats to the long-term viability of ōpeʻapeʻa remain, the species' resiliency is stronger than previously determined.

Redundancy

Of the 3 Rs, redundancy is likely the strongest indicator of the overall viability of ōpeʻapeʻa, especially with the change in taxonomic status to full species. With breeding populations on five islands distributed over roughly 395 km (245 mi), catastrophes such as hurricanes and wildfires are unlikely to affect the species across its entire range. Telemetry studies and molecular analysis suggest that contemporary dispersal between islands is rare or nonexistent. This isolation of island populations limits the likelihood that new, bat-specific pathogens would be spread by the bats themselves.

Genetic variation within the species is greatest between islands, reflecting rare or absent contemporary gene flow within the archipelago. Of 22 unique haplotypes, only three are shared among islands, pointing to a low incidence or likelihood of dispersal between islands. At a larger scale, ʻōpeʻapeʻa populations are represented by two clades with overlapping distributions on multiple islands, reflecting an evolutionary history that included some exchange among islands. Overall, this structure provides some redundancy in the distribution of the species' genetic differentiation.

Representation

ʻŌpeʻapeʻa are represented by breeding populations on five of the seven Hawaiian Islands where their presence has been recorded. Their generalist diet and high mobility among diverse foraging habitats in native and nonnative forests and fragmented landscapes are documented on each island where resident populations are known to occur, along with foraging along wide elevational gradients. Ōpeʻapeʻa demonstrate some plasticity when foraging at elevations where coqui frogs are abundant, with proportions of insect taxa taken reflecting their relative abundance in the environment. At elevations above 1,200 m (3,900 ft), where the frogs are still absent, ōpeʻapeʻa selectively take more moths and beetles than other insects. This aspect of representation indicates that the species has some adaptability in response to a threat that has increased over decades and is likely to worsen in the future. Taken together, these traits are suggestive of adaptive potential within islands that contributes to the strength of the species' representation in populations distributed across the archipelago. This ample geographic distribution, relatively broad niche, and evidence of behavioral plasticity implies some degree of adaptive capacity in the species.

Without census population sizes, we cannot determine whether ōpeʻapeʻa meets theoretical thresholds for population viability on each island: 100 individuals to avoid inbreeding depression and 1,000 individuals to maintain genetic diversity and putative adaptive capacity (e.g., Frankham, Bradshaw, and Brooke 2014, entire). Moreover, a conservative interpretation of the best available field and molecular data is that

contemporary movement of bats among islands is "incredibly rare" (Pinzari et al. 2023, p. 24). Using estimates of contemporary genetic effective population size (N_eC), as a very rough proxy, (Pinzari et al. 2023, pp. 20–21), suggest that the islands of Hawai'i, Maui, and Kaua'i may be most likely to meet the 100-individuals threshold; Hawai'i is most likely to meet the 1,000-individuals threshold, and Kaua'i and O'ahu may meet neither (Pinzari and others (2023) did not estimate N_eC for Moloka'i). However, the lack of sufficient samples from some occupied islands, extrapolating effective population estimates from molecular data alone, and uncertainty inherent in statistical models of N_e preclude using these estimates with confidence in place of census data. Moreover, direct relationships between N_eC or other aspects of genetic diversity and adaptive capacity in ōpe'ape'a are difficult to demonstrate. Nonetheless, these estimates do underscore, again, the importance of addressing threats such as mortalities caused by wind turbines and other threats on each island to protect the existing adaptive capacity of ōpe'ape'a into the future.

'Ōpe'ape'a are now known to breed on at least five of the main Hawaiian Islands (and may breed on two more). This breeding distribution, sustained over time, is much wider than was thought at the time of listing in 1970. In addition, research conducted since listing indicates that the bats are ecological generalists, adaptable to habitat and resource conditions that vary in space and time. They have a diverse diet and are highly mobile within islands, capable of using fragmented habitats in native and non-native forests. Based on these factors, which represent significant changes in our knowledge of the species since it was listed, we determine that the 'ōpe'ape'a is not currently in danger of extinction.

Future Condition

Technological advancements in monitoring and genetic analysis in the coming years will likely begin to fill critical data gaps and improve our knowledge of population characteristics and life history of 'ōpe'ape'a and the resources and conditions necessary for recovery. Although reliable quantitative projections of population viability are not currently possible with the available data, we can make some predictions about the future condition of the 'ōpe'ape'a that are subject to change as new information is gathered.

Intrinsic factors that contribute to 'ōpe'ape'a's current condition, such as the species' mobility and generalist ecology, are unlikely to change in the future. In addition, over the near term, we anticipate that extrinsic conditions supporting the current distribution of 'ōpe'ape'a among islands, such as the availability of foraging and roosting habitat, are unlikely to change significantly. However, given the significant knowledge gaps, the future viability of 'ōpe'ape'a on all occupied islands is uncertain and difficult to project. In addition, known threats are not well understood or definitively addressed, and numerous potential threats have yet to be investigated. The trajectory of any of these threats and their contribution to extinction risk remain unknown but could be significant in the future. Other specific uncertainties with respect to extinction risk include, but are not limited to the following:

- Population size on any island and vital rates such as longevity, fecundity, and recruitment are unknown.
- The status of bats recorded on Kahoʻolawe and Lānaʻi is unknown. Whether these bats are transient or resident carries important implications for interisland dispersal (at least within Maui Nui), which is currently thought to be extremely rare or nonexistent.
- Catastrophes, such as severe storms or disease outbreaks, are unpredictable and may lead to extirpation of ʻōpeʻapeʻa populations.
- The impacts of foraging competition between ʻōpeʻapeʻa and coqui frogs are not well understood, although existing information suggests that the bats generalist diet may allow them to adapt where the two species co-occur.
- Monitoring of compensatory mitigation projects (for mortality at wind turbines) in the form of land acquisition and habitat restoration has yet to confirm benefits for the species, such as consistent, improved use of these areas by foraging and/or roosting bats. This results from monitoring limitations and the time lag between restoration and habitat improvement for ʻōpeʻapeʻa.
- Two wind energy facilities have yet to complete habitat conservation plans as required under the ESA, and their incidental take of ʻōpeʻapeʻa currently is not permitted or accompanied by mitigation projects.
- The threat to ʻōpeʻapeʻa roosting habitat and known roost trees in the form of tree felling and trimming, especially during the breeding season, is not addressed by regulation.
- Existing biosecurity measures are inadequate to prevent the introduction of new organisms, including pathogens, to Hawaiʻi.

Synthesis

Since listing, resident populations of ʻōpeʻapeʻa have been documented on additional islands, and research has revealed that the species is more widely distributed within islands and is more generalist in its diet and habitat use than originally understood. This information, evaluated in the assessment above, indicates that the species' overall viability now and in the near term is likely better than assumed at the time of listing. However, ʻōpeʻapeʻa still face numerous, ongoing threats, many of which are poorly understood and not addressed. Therefore, we conclude that ʻōpeʻapeʻa meets the statutory definition of a threatened species and recommend downlisting the species from endangered to threatened status under the ESA.

Recommendations for Future Actions (not in order of priority)

Biological and Demographic Surveys

- Develop and implement a reliable and persistent marking technique such as passive integrated transponders (PIT) tags.

- Implement long-term mist net or other type of monitoring to determine ʻōpeʻapeʻa demographics and longevity.

- Continue field-based capture studies focusing on tagging of ʻōpeʻapeʻa, and identification of seasonal roosts, female roost fidelity, and swarming sites.

- Determine seasonal roosting patterns (lowland and upland) and landcover on each island hosting ʻōpeʻapeʻa.

- Conduct standardized surveys on Kauaʻi, Oʻahu, Lānaʻi, Molokaʻi, Maui, and Kahoʻolawe to determine the distribution of ʻōpeʻapeʻa and presence or absence of established breeding populations based on officially recognized taxonomic and genetic conclusions.

- Determine ʻōpeʻapeʻa patterns of interisland and intraisland movement and sex-specific dispersal patterns.

- Determine habitat and dietary needs and revise management actions to benefit ʻōpeʻapeʻa recovery.

- Deploy monitored acoustic detectors on, Molokaʻi, Lānaʻi, and Kahoʻolawe to capture presence, habitat use, distribution, and determine if ʻōpeʻapeʻa are resident or intermittent.

- Develop and refine detection technologies for the ʻōpeʻapeʻa.

- Quantify characteristics of ʻōpeʻapeʻa, such as pup and adult survival rates, longevity, breeding, fecundity, and heterothermy.

- Determine the trends of genetic-based ʻōpeʻapeʻa populations on each island.

Threats

- Determine the significance of barbed wire mortality to ʻōpeʻapeʻa populations and identify any risk factors that increase a fence's likelihood to snag bats (location, slope, surrounding habitat type, number of strands of barbed wire, distance from certain habitat features, etc.).

- Collect additional information on the threat from pesticides and/or rodenticides on the ʻōpeʻapeʻa, to help elucidate the threat that these may pose directly or indirectly (through prey reduction) to the bat populations in the islands.

- Collect information on other potential limiting factors for this species, such as predation by non-native mammals (i.e., cats or rats) or birds (i.e., barn owls) and competition from introduced amphibians (coqui frogs) or ants (little fire ants (*Wasmannia auropunctata*).

- Assess the impacts of climate change on ʻōpeʻapeʻa resource availability and thermal requirements.

- Develop alliances and expand partnerships throughout all islands of the State to avoid and minimize fatality risks and maximize benefit to the ʻōpeʻapeʻa.

- Implement and refine bat deterrent technology and deployment to minimize turbine fatalities.

Administrative

- Update the recovery plan and recovery implementation strategy for the ʻōpeʻapeʻa.

- Develop alliances and expand partnerships throughout all islands of the State to avoid and minimize fatality risks and maximize benefit to the ʻōpeʻapeʻa.

- Determine the sex and breeding condition of ʻōpeʻapeʻa carcasses to inform fatality modeling and mitigation.

- Preserve and manage existing and suitable future ʻōpeʻapeʻa habitat. This may need to include forests at all elevations, if altitudinal movements seen on some islands are relevant across the state. Low-elevation forests are under the most threat in Hawaiʻi due to development, agriculture, and high numbers of habitat-altering invasive plant and invertebrate species.

Genetic analyses

- Preserve genetic samples of all ʻōpeʻapeʻa to inform future genetic, biological, and ecological studies.

- Sequence the genome(s) of the ʻōpeʻapeʻa found throughout the State of Hawaiʻi.

- Determine the genetic structure and taxonomic status of ʻōpeʻapeʻa each island throughout the State of Hawaiʻi and describe new species, subspecies, or distinct populations, if warranted.

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U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of
Lasiurus cinereus semotus
(ʻōpeʻapeʻa or Hawaiian hoary bat**)**

Pre-1996 DPS listing still considered a listable entity? __N/A_____

Recommendation resulting from the 5-year review:

_____ Delisting
____X___ Reclassify from Endangered to Threatened status
_____ Reclassify from Threatened to Endangered status
_____ No Change in listing status

Name of Reviewer:

Diane Sether, Ph.D., Invertebrate and Wildlife Biologist, PIFWO
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Tara Easter, Recovery Biologist, Pacific Regional Office
Holly Freifeld, Contractor, Pacific Regional Office

Field Supervisor, Pacific Islands Fish and Wildlife Office Approval

EARL CAMPBELL Digitally signed by EARL CAMPBELL Date: 2026.05.04 08:30:38 -10'00'

Acting Assistant Regional Director – Ecological Services, Regional Office Approval

JESSE D'ELIA Digitally signed by JESSE D'ELIA Date: 2026.04.30 13:07:58 -07'00'