5-YEAR REVIEW
Short Form Summary
Species Reviewed: Hawai‘i ‘ākepa (*Loxops coccineus*)
Current Classification: Endangered

FR 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, Hawai‘i, Guam and the Commonwealth of the Northern Mariana Islands. Federal Register 88(56):17611–17614.

Lead Region/Field Office: Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

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Methodology used to complete this 5-year review: This review was conducted by staff of the PIFWO of the U.S. Fish and Wildlife Service (USFWS), beginning in March 2025. The review was based on a review of current, available information since the last 5-year review for the Hawai‘i ‘ākepa (*Loxops coccineus*) (USFWS 2020, entire). The evaluation by Jay Nelson, Fish and Wildlife Biologist, was reviewed by John Vetter, the Animal Recovery Coordinator, and Megan Laut, the Recovery Program Manager.

Background:
For information regarding the species' listing history and other facts, please refer to the USFWS Environmental Conservation Online System database for threatened and endangered species at *http://ecos.fws.gov/ecp/species/5714*)

Review Analysis:
Please refer to the Revised Hawaiian Forest Birds Recovery Plan (USFWS 2006, entire) and the previous 5-year reviews for the Hawai‘i ‘ākepa published on August 7, 2020; August 20, 2015; and August 27,2010 (available at https://ecos.fws.gov/ecp/species/5714) for a complete review of the species' status, threats, and management efforts. No new threats or no new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of the Hawai‘i ‘ākepa as endangered.

The Hawai‘i ‘ākepa is a Hawaiian honeycreeper that occurs only on the island of Hawai‘i. It is a small, sexually dichromatic Hawaiian honeycreeper. Adult males are bright orange, while females are greyish green with a yellow breast-band. The bill is conical and generally pale yellow in color with skewed tips for opening leaf buds for prey (USFWS 2006, p. 2-124). The species is an obligate cavity nester, primarily in old-

growth ʻōhiʻa (*Metrosideros polymorpha*) and koa (*Acacia koa*), and the distribution is thus closely associated with ʻōhiʻa forests (USFWS 2006, p. 2-125).

New status information:
The Hawaiʻi ʻākepa occurs as five disjunct populations in north and central Windward Hawaiʻi, Kaʻū, Kona, and Hualālai regions on the island of Hawaiʻi (Gorresen et al. 2009, p. 122).

- Scott et al. (1986) estimated the entire population of Hawaiʻi ʻākepa in 1977-1979 at 13,892 $\pm$ 1,825 birds (Camp et al. 2009, p. 62). In 2016, the total population was estimated 16,248 (95% CI 10,074 - 25,198) birds (Judge et al. 2018, p. 11). The most recent range-wide population estimate of Hawaiʻi ʻākepa is encouraging because it suggests that numbers have remained stable for approximately 40 years since global surveys for this species were first conducted in the late 1970s (Scott et al. 1986, entire). However, the overall range of the species is contracting and some populations are in imminent danger of extirpation.
- The Hakalau Forest National Wildlife Refuge Complex (HFNWRC), Hakalau Forest Unit (HFU) comprises the bulk of the habitat in the north Windward region and is comprised of three units (or forest stratum) based on elevation and forest type for analysis purposes. For the closed canopy forest stratum at 1,450-1,750 m (4,757-5,741 ft) elevation, Kendall et al. (2023a, p. 421) found Hawaiʻi ʻākepa went from having increasing population trends for the period from 1987 to 2012 (Camp et al. 2016, p. 235) to having downward population trends with the addition of count data through 2019. Compared to stable or inconclusive trends as found by Camp et al. 2016 (p. 235), Kendall et al. (2023a) found downward trends in the open canopy forest stratum at 1,400-1,920 m (4,593-6,299 ft) with the addition of data through 2019. Hawaiʻi ʻākepa use old-growth native forest and are not yet found in upper elevation reforested areas, which is the third unit (or forest stratum). Overall across the region, Hawaiʻi ʻākepa had a downward population trend in 2019 compared to previous surveys (Kendall et al. 2023a, p. 416). Total population of Hawaiʻi ʻākepa in the north Windward area is estimated to be 7,221 birds (95% CI = 4,164-11,173) (Kendall et al. 2023a, p. 425) compared to the 11,012 estimate (95% CI = 7,331-15,740) from Camp et al. 2016 used by Judge et al. (2018, p. 18) to calculate the global population.
- Population density (number of birds per unit area) for the central Windward population of Hawaiʻi ʻākepa on the east slope of Mauna Loa showed declining trends in intact native forest in the most recent analysis (Camp et al. 2010a, p. 8). Based on densities calculated by Gorresen et al. 2005 (p. 12) for surveys conducted in 2001-2003, Judge et al. 2018 (p. 18) reported 1,443 (95% CI = 951–1,935) Hawaiʻi ʻākepa in this region. More recent data on population trends and population size of Hawaiʻi ʻākepa for the central Windward region is unavailable.
- The population estimate of Hawaiʻi ʻākepa in Kaʻū was 3,761 (95% CI = 2,338 – 5,912) in 1976, and 4,169 (95% CI = 2,596 – 6,479) birds in 2019, which suggest the Kaʻū population has remained stable over the last 40 years (Judge et al. 2024, p. 19). However, the species' range in Kaʻū has contracted from 19,771 hectares (ha) in 1976, to 12,495 ha in 2019, or range contraction of 37%, with almost all detections in Kaʻū after 2002 above 1,500 m (4,921 ft) elevation (Judge et al.

2019, p. 77). This retreat upslope into highest elevation forest areas, beginning roughly around 2002, suggests avian disease, which is prevalent at lower elevations, is likely driving the species' range contraction (USFWS 2020, p. 2).

- Scott et al. (1986) estimated a combined Hualālai-Kona population of 661 ± 126 birds in 1978 during the Hawaiian Forest Bird Survey (HFBS) (Camp et al. 2009, p. 63). The population, however, was likely declining in the early 2000s in Hualālai and Kona regions (Gorresen et al. 2009, pp. 122 and 127). Recent analysis of forest birds survey information from 1987 to 2019 for HFNWRC, Kona Forest Unit (KFU) (Kendall et al. 2023a, entire) and 1990 to 2022 for the Pu‘u Wa‘awa‘a Forest Bird Sanctuary and Pu‘u Wa‘awa‘a Forest Reserve (Kendall et al. 2023b, entire) show Hawai‘i ‘ākepa continues to persist in both Kona and Hualālai regions, but in very low numbers. Only a single ‘ākepa was detected during the 1978 HFBS in central Kona (Camp et al. 2009, p. 63). Subsequent surveys in the HFNWRC/KFU at elevations above 1,500 m (4,921 ft) recorded very few birds from 1987 to 2019 (only 60 birds the entire survey period) and too few birds to estimate densities or population numbers (Kendall et al. 2023a, pp. 415 and 421). There were only four detections on two survey points for Hawai‘i ‘ākepa in 2022 at Pu‘u Wa‘awa Forest Bird Sanctuary compared to 22 in 1991. In the years after 1991, zero to five birds have been detected per year (Kendall et al. 2023b, p. 6), suggesting that, although a population of Hawai‘i ‘ākepa remains in Hualālai region, this is very small and vulnerable to extirpation.

New threats:

- Please see August 27, 2020, 5-year Status Review for discussion of habitat sustainability and threat from avian disease (USFWS 2020, pp. 2-3).
- Rapid ‘Ōhi‘a Death (ROD): ROD is a disease caused by the fungal pathogens, *Ceratocystis lukuohia* and *Ceratocystis huliohia*, that rapidly kills individual ‘ōhi‘a trees as well as groups of trees (Barnes et al. 2018, entire). Since its first detection on the island of Hawai‘i in the Puna District around 2010 (Keith et al. 2015, entire), ROD has spread across the island and killed an estimated over 1 million ‘ōhi‘a trees on the island of Hawai‘i (USDA 2024). ROD and ROD suspected trees currently overlap virtually all habitat occupied by Hawai‘i ‘ākepa (BIISC 2023, p. 2; Fig. 1). ROD therefore poses a substantial continuing and increasing threat to Hawai‘i ‘ākepa through widespread destruction of ‘ōhi‘a trees, which the species uses for nesting and foraging and which constitute the primary canopy tree of much of their habitat. ROD is a particularly pernicious threat to Hawai‘i ‘ākepa as the species is an obligate cavity nester with most nests found in large old-growth ‘ohi‘a and koa trees (USFWS 2006, p. 2-25).
- Avian malaria also poses an increasing threat to the remaining Hawai‘i ‘ākepa populations as the populations contract from the lower elevations of its former range (Judge et al. 2024, p. 77). This pattern is seen across Hawai‘i as forest bird populations are increasingly exposed to disease as temperatures warm and mosquitoes spread upslope (Fortini et al. 2015, entire; Paxton et al. 2018, entire; Paxton et al. 2022, entire; Neddermeyer et al. 2023, entire; Siedl 2023, pp. 11-45). For Hawai‘i ‘ākepa, these range contractions in Ka‘ū have been linked to an increase in disease at middle elevations. Gaudioso-Levita et al. (2015, p. 1) found

that avian disease prevalence decreased with increasing elevation and geographically from east to west in the Kaʻū region. Substantial prevalence of avian malaria in birds and mosquitoes at roughly 1,219 m (4,000 ft) elevation strongly suggests avian disease is the primary factor driving Hawaiʻi ʻākepa range contraction at lower elevations in Kaʻū. Although significant prevalence of avian disease was found in disease tolerant or resistant birds at high elevations, it is likely transfer of disease to Hawaiʻi ʻākepa is not occurring at higher elevations because no or very few mosquito vectors were detected at survey stations at the higher elevation study sites (Gaudioso-Levita et al. 2015, p. 23). Similarly, at HFNWRC/HFU, forest birds were sampled for blood parasites, adult mosquitoes trapped, and surveys conducted for larval mosquito habitat at three sites during 2012 and compared with similar data collected between 1998 and 1999 (LaPointe et al. 2016, entire). The study found long term changes in precipitation may have a more profound effect on local transmission of malaria than temperature as extended drought at HFU was associated with a decrease in feral pig activity and pig-associated larval mosquito habitat but increases in stream-associated larval mosquito habitat (LaPointe et al. 2016, p. 1).

New Management Actions:

- Threat Management –
  - Avian Disease. Continued public hunting and construction of ungulate fencing and removal of feral ungulates in the Kaʻū Forest Reserve and The Nature Conservancy (TNC) Preserves in Kaʻū will help diminish available larval habitat in forested areas. In central Kaʻū, the high prevalence of natural ground and rock pools, as well as feral pig created hapuʻu (*Cibotium glaucum*) tree fern cavities makes reduction of larval habitat more difficult than some other habitats. Grassy puddles along infrequently used ranch roads were found to be the main source of larval habitat in Kahuku (southwest Kaʻū region). Larval habitat along roads should be eliminated by grading abandoned roads to prevent standing water.
  - Rapid ʻŌhiʻa Death: It has been shown that feral ungulates are an effective vector in transferring ROD from infected trees to uninfected or only lightly ROD-infested forest areas (Hughes et al. 2023, entire). An experiment conducted from 2019-2022, comparing two equally sized areas across the fenced boundary of Hawaiʻi Volcanoes National Park, found virtually no incidence of ROD in the area without feral ungulates but widespread presence of ROD in the area with feral ungulates (UH News 2023, entire). This evidence suggests there is substantial benefit of fencing and removal of feral ungulates in preventing the spread of ROD.
- Habitat restoration – Reforestation of former pastureland has been ongoing at Hakalau Forest NWR/HFU since 1989 in areas from 1,600-2,000 m (5,249-6,562 ft] elevation. Examination of changes of tree cover from 1990 to 2024 from satellite images show a 49.1% increase in forest cover in planted areas (Nicoll et al. 2024, p. 12). Although it will be many years before ʻōhiʻa trees, which grow slowly, will be to a size to provide nest sites for Hawaiʻi ʻākepa, koa trees grow much more quickly and can become large trees in a matter of a few decades. [See below, Recommendations for Future Actions: Habitat and natural process management and restoration –

reforestation of high elevation grassland adjacent to protected forest areas for further discussion of the importance of restoration of native forest in high elevation areas.]

Table 1. Status and trends of Hawai‘i ‘ākepa from listing through current 5-year review.

Date	No. Adult Wild Individuals	Downlisting Criteria Identified in Recovery Plan	Downlisting Criteria Completed?
1970 (listing)	Rare	No recovery plan developed yet.	N/A
1977-1979 Hawaii Forest Bird Survey (first population estimate, Scott et al. 1986)	13,892 ± 1,825 (95% CI)	No recovery plan developed yet.	N/A
1983 (first recovery plan, USFWS 1983)	Approximately 14,000 birds	Improve habitat conditions; decrease threat of avian disease; monitor populations.	Partially
2006 (revised recovery plan, USFWS 2006)	Approximately 14,000 birds	Viable populations or metapopulations exist in Hāmākua, Kūlani/Kīlauea/Keauhou, Ka‘ū, south Kona, and Pu‘u Wa‘awa‘a/Hualālai.	Partially
		Viability of the populations is demonstrated through either a) quantitative surveys that show that the number of individuals in each isolated population or in the metapopulation has been stable or increasing for 15 consecutive years, or b) demographic monitoring that shows each population or the metapopulation has an average growth rate (lambda, λ) not less than 1.0 over a period of at least 15 consecutive years; and total population size is not expected to decline by more than 20 percent within the	No

		next 15 consecutive years for any reason.	
		Sufficient habitat in recovery areas is protected and managed to achieve Criteria 1 and 2 above.	No
		The threats that were responsible for the decline of the species have been identified and controlled.	No
2010 (5-year review)	Approximately 12,000 birds	Viable populations or metapopulations exist in Hāmākua, Kūlani/Kīlauea/Keauhou, Kaʻū, south Kona, and Puʻu Waʻawaʻa/Hualālai.	Partially
		Viability of the populations is demonstrated through either a) quantitative surveys that show that the number of individuals in each isolated population or in the metapopulation has been stable or increasing for 15 consecutive years, or b) demographic monitoring that shows each population or the metapopulation has an average growth rate (lambda, λ) not less than 1.0 over a period of at least 15 consecutive years; and total population size is not expected to decline by more than 20 percent within the next 15 consecutive years for any reason.	No
		Sufficient habitat in recovery areas is protected and managed to achieve Criteria 1 and 2 above.	No
		The threats that were responsible for the decline of the species have been identified and controlled.	No

2015 (5-yr review)	Approximately 12,000 birds	Viable populations or metapopulations exist in Hāmākua, Kūlani/Kīlauea/Keauhou, Kaʻū, south Kona, and Puʻu Waʻawaʻa/Hualālai.	Partially
		Viability of the populations is demonstrated through either a) quantitative surveys that show that the number of individuals in each isolated population or in the metapopulation has been stable or increasing for 15 consecutive years, or b) demographic monitoring that shows each population or the metapopulation has an average growth rate (lambda, λ) not less than 1.0 over a period of at least 15 consecutive years; and total population size is not expected to decline by more than 20 percent within the next 15 consecutive years for any reason.	No
		Sufficient habitat in recovery areas is protected and managed to achieve Criteria 1 and 2 above.	No
		The threats that were responsible for the decline of the species have been identified and controlled.	No
2020 (5-yr review)	16,248 (95% CI 10,074-25,198) (Judge et al. 2018, p. 11)	Viable populations or metapopulations exist in Hāmākua, Kūlani/Kīlauea/Keauhou, Kaʻū, south Kona, and Puʻu Waʻawaʻa/Hualālai.	Partially
		Viability of the populations is demonstrated through either a) quantitative surveys that	No

		show that the number of individuals in each isolated population or in the metapopulation has been stable or increasing for 15 consecutive years, or b) demographic monitoring that shows each population or the metapopulation has an average growth rate (lambda, λ) not less than 1.0 over a period of at least 15 consecutive years; and total population size is not expected to decline by more than 20 percent within the next 15 consecutive years for any reason.	
		Sufficient habitat in recovery areas is protected and managed to achieve Criteria 1 and 2 above.	No
		The threats that were responsible for the decline of the species have been identified and controlled.	No
2025 (5-year review)	16,248 (95% CI 10,074 - 25,198) birds (Judge et al. 2018, p. 11): north Windward region – population trend declining; central Windward region – population decreasing in intact native forest; Ka'ū region – range decreasing; Kona and Hualālai regions – populations very small and likely decreasing	Viable populations or metapopulations exist in Hāmākua (north Windward region), Kūlani/Kīlauea/Keauhou (central Windward region), Kaʻū (Kaʻū region), south Kona (Kona region), and Puʻu Waʻawaʻa/Hualālai (Hualālai region).	Partially
		Viability of the populations is demonstrated through either a) quantitative surveys that	No

		show that the number of individuals in each isolated population or in the metapopulation has been stable or increasing for 15 consecutive years, or b) demographic monitoring that shows each population or the metapopulation has an average growth rate (lambda, λ) not less than 1.0 over a period of at least 15 consecutive years; and total population size is not expected to decline by more than 20 percent within the next 15 consecutive years for any reason.	
		Sufficient habitat in recovery areas is protected and managed to achieve Criteria 1 and 2 above.	No
		The threats that were responsible for the decline of the species have been identified and controlled.	No

Table 2. Threats to the Hawai‘i ‘ākepa and ongoing conservation efforts.

Threat	Listing Factor	Current Status	Conservation/Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, E	Ongoing	Partial: Some habitat areas fenced.
Invasive introduced plants	A, E	Ongoing	Partial: Some habitat areas managed primarily fencing feral ungulates that spread seeds of invasive plants.
Rapid ‘Ōhi‘a Death	A	Increasing	Partial: Research has shown the importance to exclude feral ungulates from areas not yet infected or only lightly infected by ROD in slowing ROD spread.
Invasive predators	C	Ongoing	Partial: Some rodent control ongoing within portions of the species’ range.
Avian Disease	C	Increasing	Partial: Ungulate control reduces mosquito breeding sites. Applications

			of Incompatible Insect Technique mosquitoes and *Bacillus thuringiensis israelensis* (*Bti*) on other islands may provide an example for use on the Hawai‘i Island. Research has shown the importance of monitoring to document fine scale temporal and site-specific changes in presence of mosquitoes and prevalence of avian disease for developing most appropriate management responses to threat of avian disease.
Low numbers	E	Ongoing	Partial: Habitat management resulting in high elevation reforested areas at HFNWR/HFU that may be usable as nesting habitat in coming decades as trees mature; habitat management including fencing and removal of feral ungulates also possible resulting in population increase in Ka‘ū region high elevation areas.
Habitat degradation	A, E	Increasing	Partial: Forest protection at middle elevations and reforestation in some high elevation areas are beneficial in protecting the species from avian disease and expanding its range at higher elevations. Incidence of ROD however has increased dramatically throughout the species range and tens of thousands of ‘ōhi‘a trees affected.

Syntheses:

Surveys and population estimates indicate the Hawai‘i ‘ākepa population overall is robust (Judge et al. 2018, p. 11). However, the outlook in the two largest populations is mixed - at HFNWRC/HFU in the north Windward region, the population is declining (Kendall et al. 2023a, p. 421), and while the population appears to be stable in the Ka‘ū region, the species’ range is contracting (Judge et al. 2024, p. 77). Current trends and population estimate for the central Windward population are mostly unknown, but the most recent analysis based on surveys in 2001-2003 showed a decline in densities (Gorresen et al. 2005, p. 12). Populations in the Kona and Hualālai regions are very small and are likely declining and close to extirpation (Kendall et al. 2023b, p. 6) (Table 1). In addition, all threats are not being sufficiently managed throughout all of the species’ range and all populations (Table 2). Threat from avian disease has increased as indicated by downward population trends in closed- and open-forest areas in north Windward region and the disappearance of Hawai‘i ‘ākepa from lower elevation areas in the Ka‘ū region. Threat from ROD has also increased. In 2015, ROD was only present in the Puna District on

Kīlauea Volcano (Keith et al. 2015, entire), but by 2023, it had spread throughout all high-elevation ʻōhiʻa forest on Mauna Loa, Mauna Kea, and Hualālai volcanoes impacting all Hawaiʻi ʻākepa's habitat (BIISC 2023, p. 2; Fig. 1).

Downlisting and delisting objectives are provided in the recovery plan for Hawaiian Forest Birds (USFWS 2006, III Recovery Section, pp. 2-6). To be downlisted, viable populations or metapopulations of Hawaiʻi ʻākepa must exist in Hāmākua (north Windward region), Kūlani/Kīlauea/Keauhou (central Windward region), Kaʻū (Kaʻū region), south Kona (Kona region), and Puʻu Waʻawaʻa/Hualālai (Hualālai region), and viability of the populations is demonstrated through either a) quantitative surveys that show that the number of individuals in each isolated population or in the metapopulation has been stable or increasing for 15 consecutive years, or b) demographic monitoring that shows each population or the metapopulation has an average growth rate (lambda, λ) not less than 1.0 over a period of at least 15 consecutive years; total population size is not expected to decline by more than 20 percent within the next 15 consecutive years for any reason; there is sufficient habitat in recovery areas protected and managed representing the ecological, morphological, behavioral, and genetic diversity of the species; and the threats that were responsible for the decline of the species have been identified and controlled. For Hawaiʻi ʻākepa to be delisted due to recovery the above downlisting criteria need to be satisfied for at least 30 consecutive years. Given declining population trends in closed- and open-canopy forest in the north Windward region, range contraction in Kaʻū region, and very low numbers in the Kona and the Hualālai populations, Hawaiʻi ʻākepa continues to meet the definition of endangered as it remains in danger of extinction throughout its range. In addition, avian malaria and ROD are not being adequately controlled or managed. ROD has spread to all habitat areas occupied by Hawaiʻi ʻākepa and avian malaria is observed in Hawaiʻi ʻākepa forest habitat at highest elevations.

Recommendations for Future Actions:
The recovery strategy for Hawaiʻi ʻākepa centers on protection, restoration, and management of native high elevation forests in the four regions (north and central Windward, Kaʻū, Kona, and Hualālai) on the island of Hawaiʻi where Hawaiʻi ʻākepa are currently present.

- Surveys / inventories –
    - Continued monitoring of Hawaiʻi ʻākepa is important to determine the species' response to management actions, effects of habitat degradation, and population status.
    - Continued monitoring of site-specific changes in presence of mosquitoes and prevalence of avian disease is important to document fine scale temporal and spatial changes of avian disease and effects on Hawaiʻi ʻākepa.
    - Continue efforts to map changes in the distribution of ROD across the island of Hawaiʻi and changes in ROD presence in Hawaiʻi ʻākepa habitat.
- Habitat and natural process management and restoration –
    - We recommend continued habitat management in areas where the species currently exists (USFWS 2006, entire). Invasive plants such as Himalayan ginger (*Hedychium gardnerianum*) and strawberry guava (*Psidium cattleyanum*) and

non-native ungulates are degrading Hawai‘i ‘ākepa habitat. Continue control of introduced invasive plants and exclusion/removal of ungulates that spread seeds of invasive plants.
    - Hawaiian forest birds susceptible to avian disease may become extinct following a drastic reduction in disease-free habitat, but ultimately forest might expand into higher elevations maintaining disease-free refugia for some species. Acquisition and management of transmission-free high-elevation habitat is crucial to the preservation and restoration of native Hawaiian forest birds (Lapointe et al. 2009, entire). As a long-term contingency for ecosystem adaptation, we recommend securing deforested and pasture lands on Hawai‘i at high elevations adjacent to protected refugia and managing these areas for forest growth to provide suitable habitat for Hawai‘i ‘ākepa and other Hawaiian forest birds.
- Ungulate monitoring and control – Continue ungulate control. Hawai‘i ‘ākepa are currently restricted to the windward forests of Windward and Ka‘ū regions, and leeward forests of Kona and Huālalai regions. Ungulate removal is ongoing and new fence construction and repairs to existing fencing are planned throughout HFNWRC, Hawai‘i Volcanoes National Park, The Nature Conservancy Preserves in Kona and Ka‘ū, State of Hawai‘i Natural Area Reserves, Pu‘u Wa‘awa‘a Forest Bird Sanctuary, and some State Forest lands. However, it is important that fencing and ungulate control be conducted in all areas where populations of Hawai‘i ‘ākepa exist and in lower elevation areas where Hawai‘i ‘ākepa are disappearing to minimize damage caused by feral ungulates to forest and forest understory and prevent creation of wallows and other standing sources of water where mosquitoes can lay their eggs (LaPointe et al. 2009, entire).
- Predator monitoring and control – Research to determine impacts of rats (*Rattus* spp.) on Hawai‘i ‘ākepa is needed and control of small mammalian predators if necessary.
- Biosecurity – Implement a statewide interagency biosecurity plan to prevent spread of ROD on the island of Hawai‘i and to other Hawaiian Islands, and prevent the introduction of other threats that may affect Hawai‘i ‘ākepa and its forest habitat. An effective biosecurity plan requires a comprehensive approach that includes:
    - Pre-border policies and processes to prevent invasive species from making their way to the state of Hawai‘i.
    - Border policies and processes that support inspecting incoming items to ensure minimal risk of pest entry into the state.
    - Post-border policies and processes that support detecting and responding to new incursions of invasive species and controlling established invasive species wherever possible.
- Disease monitoring and control – Identification of resistance or tolerance to avian diseases within the population is an important recovery strategy. Disease control using traditional and new methods is critical.
    - Studies to examine potential genetic resistance by Hawai‘i ‘ākepa to avian disease have not been conducted but are important in order to identify any potential resistance or tolerance to avian disease.
    - Much of currently occupied Hawai‘i ‘ākepa habitat on the island of Hawai‘i is managed as native ecosystems mostly free of ungulates. However, some habitat areas at elevations below 1,350 m (4,429 ft) are not managed for feral ungulates,

where mosquitoes may be common. Removal of ungulates from lower elevation areas will help reduce mosquito densities in these areas and encroachment of mosquitoes from lower elevations into higher elevation areas.
    - Surveys of mosquitoes and disease prevalence is needed throughout the species' current range and lower elevation areas where species is disappearing.
    - Hawaiian honeycreepers are likely vulnerable to avian diseases such as West Nile virus, that have not been introduced to Hawai‘i but which have the potential to become established in the Hawaiian Islands (LaPointe et al. 2009). The U.S. Geological Survey, National Wildlife Health Center, Honolulu Field Station collaborates with the USFWS and State of Hawai‘i in surveillance and interdiction efforts to detect and prevent the establishment of new avian diseases into the state, including surveillance for West Nile virus (USGS 2025). Continued support for this program is critical to prevent West Nile virus and other avian diseases from entering the State of Hawai‘i.
    - Landscape-scale mosquito control — Over the last 5-years there has been substantial movement toward development and implementation of landscape-scale control of the introduced southern house mosquito (*Culex quinquefasciatus*) that transmits avian disease to Hawaiian forest birds. In 2022 an Environmental Assessment (EA) was published for broad-scale mosquito control in conservation areas on east Maui using the Incompatible Insect Technique (IIT) (HALE 2022, entire), and first use of IIT on east Maui using male *C. quinquefasciatus* mosquitoes treated with *Wolbachi*a is ongoing. Please see August 27, 2020, 5-year Status Review (USFWS 2000, p. 3) for a more detailed description of the IIT technique. A similar EA was finalized for Kaua‘i in 2023 (HDLNR/USFWS/SWCA 2023) and IIT applications began on that island in 2025 (HDLNR 2025a). Depending upon results of the IIT application on other islands, landscape-scale mosquito control using IIT may be an important tool to protect Hawai‘i ‘ākepa from avian disease, particularly with continued habitat degradation as mosquitoes move upslope into highest elevation areas on the island of Hawai‘i (USFWS 2020, p. 2).
    - Control of mosquitoes and their breeding sites is needed using traditional methods including application of *Bacillus thuringensis israelenis* (*Bti*), a bacterial larvicide, and has been used on a landscape-scale on other Hawaiian Islands (HDLNR 2025b). Ungulate exclusion and ungulate removal are essential to reduce mosquito breeding sites. Grade dirt roadways where puddles form causing mosquito breeding sites as applicable.
- Captive propagation and protocol development – Research on captive breeding for the Hawai‘i ‘ākepa was initiated in 1998, when eggs were removed to the Keauhou Bird Conservation Center on the island of Hawai‘i. Release of Hawai‘i ‘ākepa hatched from wild eggs to the wild in suitable high elevation habitat was conducted in 2007. Recovery of Hawai‘i ‘ākepa currently is achieved most effectively through *in situ* management techniques such as habitat management. Captive propagation technology, however, may need to be further developed for Hawai‘i ‘ākepa in case it is needed to help reestablish or augment wild populations in the future.

References:

See previous 5-year reviews for additional references.

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U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW on
Hawai‘i ‘ākepa (*Loxops coccineus*)

Pre-1996 DPS listing still considered a listable entity? ___N/A____

Recommendation resulting from the 5-year review:

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

Review Conducted By: Jay Nelson, Fish and Wildlife Biologist, PIFWO
John Vetter, Animal Recovery Coordinator, PIFWO
Megan Laut, Recovery Team Manager, PIFWO

for **Field Supervisor, Pacific Islands Fish and Wildlife Office**

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