ʻĀkohekohe (Crested Honeycreeper)
(*Palmeria dolei*)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

5-YEAR REVIEW
Species reviewed:
ʻĀkohekohe (Crested Honeycreeper)
(*Palmeria dolei*)

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5-YEAR REVIEW
ʻĀkohekohe (Crested Honeycreeper) / *(Palmeria dolei)*

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:
Region 1, Endangered Species Program, Division of Recovery, Jesse D'Elia, (503) 231-2071

Lead Field Office:
Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (808) 792-9400

Cooperating Field Office(s):
N/A

Cooperating Regional Office(s):
N/A

1.2 Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (USFWS) between March 2009 and March 2011. The Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006) and a recent summary and analysis of surveys of bird populations in Hawaiʻi (Gorresen *et al.* 2009) provided most of the updated information on the current status of *Palmeria dolei*. The draft five-year review was reviewed by the Recovery Program Leader and the acting Assistant Field Supervisor for Endangered Species before submittal to the Field Supervisor for approval.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2009. Endangered and Threatened Wildlife and Plants; Initiation of 5-year Reviews for 103 Species in Hawaii. Federal Register 74(49):11130-11133.

1.3.2 Listing history

Original Listing
FR notice: [USFWS] U.S. Fish and Wildlife Service. 1967. Office of the Secretary; Native Fish and Wildlife; Endangered Species. Federal Register 32(48):4001.
Date listed: March 11, 1967.
Entity listed: Species
Classification: Endangered

Revised Listing, if applicable
FR notice: N/A
Date listed: N/A
Entity listed: N/A
Classification: N/A

1.3.3 Associated rulemakings: None

1.3.4 Review History:
Species status review [FY 2010 Recovery Data Call]: Stable

Recovery achieved:
2 (26-50%) [FY 2010 Recovery Data Call]

1.3.5 Species' Recovery Priority Number at start of this 5-year review: 7

1.3.6 Current Recovery Plan or Outline
Name of plan or outline: Revised Recovery Plan for Hawaiian Forest Birds. Region 1, Portland, OR. 622 pp.

Date issued: September 22, 2006

Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?
__X_ ***Yes***
____***No***

2.1.2 Is the species under review listed as a DPS?

____ *Yes*
__X_ *No*

2.1.3 Was the DPS listed prior to 1996?
____ *Yes*
____ *No*

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?
____ *Yes*
____ *No*

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?
____ *Yes*
____ *No*

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?
____ *Yes*
__X_ *No*

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?
__X_ *Yes*
____ *No*

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?
_X_ *Yes*
____ *No*

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?
__X_ *Yes*
____ *No*

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

A taxon may be downlisted from endangered to threatened when all four of the following criteria have been met.

1. The species occurs in two or more viable populations or a viable metapopulation that represent the ecological, morphological, behavioral, and genetic diversity of the species, and viable populations exist on Haleakalā Volcano and either West Maui or Moloka‘i, and criteria 2 and 3 apply over a 15-year period.

   This criterion has not been met. There is only one viable population on Haleakalā.
2. Either a) quantitative surveys 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 shows that each population or the metapopulation exhibits an average growth rate (lambda) 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.

   This criterion has not been met. The Haleakalā population appears to be stable, however there is no second population on West Maui and/or Moloaka‘i.

3. Sufficient recovery area is protected and managed to achieve criteria 1 and 2 above.

   Sufficient recovery area is identified to have protection; however, habitat on the south and west slopes of Haleakalā is unmanaged or in early phases of habitat management/restoration.

4. The threats that were responsible for the decline of the species have been identified and controlled.

   Threats responsible for the decline of ‘ākohekohe have been identified, but have not been adequately controlled.

A taxon may be delisted when all four of the criteria above have been met for a 30-year period.

2.3 Updated Information and Current Species Status

The ʻākohekohe, or crested honeycreeper, is the largest (24 to 29 gram) (0.8 to 1.0 ounce) honeycreeper remaining on Maui Nui. Primarily a black-plumaged bird, the ʻākohekohe's lanceolate body feathers are strikingly tipped with orange-red, its throat and breast feathers are tipped with gray, silver, or white, and its wing and tail feathers are distinctly white-tipped. A distinctive brush of white feathers curling forward over the bill comprises the crest, giving the species its English name. Brilliant orange feathers surround the eyes and extend to and cover the nape, feathers on the thighs can be orange or yellowish-white, and the feathers of the epaulettes are white with orange tips. The somewhat curved bill, the feet, and the legs are black. Sexes are identical in plumage pattern and coloration, but males are larger and heavier and can be determined with accuracy by measurements (Simon *et al.* 1998, p. 657). Juvenile plumage is drab and cryptic yellow-brown or brown-gray, the body plumage lacks all orange-scarlet or orange and silver colors on the feathers or tips, and both the gray tail and wing feathers lack white tips. The crest of the juveniles is short and not as pronounced; its color is yellowish-white. Feet, legs, and bill are gray to black.

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

The ʻākohekohe is primarily nectarivorous, but also feeds on caterpillars (Lepidoptera), spiders, and dipterans (Berlin and VanGelder 1999, p. 4). Nectar is primarily sought from flowers of ʻōhiʻa (*Metrosideros polymorpha*) trees, but also from several subcanopy tree and shrub species (Berlin *et al.* 2001, pp. 2007-2008). Insects are taken mostly by gleaning ʻōhiʻa foliage, buds, and flower clusters (Berlin and VanGelder 1999, p. 4). ʻĀkohekohe defend relatively discrete feeding and nesting territories throughout the year by chasing and calling (Berlin and VanGelder 1999, p. 6; Pratt *et al.* 2001, p. 748). The species appears to be monogamous for more than one breeding season, with pair formation starting in October, nesting occurring mainly between November and May, and some pairs raising two to three successful broods in a season (VanGelder and Smith 2001, p. 196). ʻĀkohekohe nests were an average of 14 meters (46 feet) above ground (Berlin and VanGelder 1999, p. 8) in the terminal ends of branches below the canopy foliage of ʻōhiʻa

trees (Berlin and VanGelder 1999, p. 8; VanGelder and Smith 2001, p. 197). The open cup nest is built by the female, who lays one to two eggs. Incubation by the female lasts 17 days, and the chicks fledge after 3 to 4 weeks. Chicks can forage independently after 10 to 14 days or longer when the chicks are from the last brood of the season (Berlin and VanGelder 1999, p. 9). Independent juveniles flock in small groups and disperse to the edge of the species' range (Scott *et al.* 1986, p. 170).

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

The total population of 'ākohekohe was estimated at 3,753 ± SE 373 individuals in one population on the northeastern slope of Haleakalā Volcano on Maui based on the 1980 Hawai'i Forest Bird Survey (HFBS) (Scott *et al.* 1986, p. 68). The total population of 'ākohekohe in 2009 was approximately 3,800 birds in one population on the northeastern slope of Haleakalā Volcano based on analysis of variable circular plot point count data from the 1980s to the present (Gorresen *et al.* 2009, p. 123). The HFBS and subsequent surveys of the 'ākohekohe indicate the species' population is stable; however, range wide and core densities have both increased, and the current population may be larger than previously estimated (Gorresen *et al.* 2009, p. 124).

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

No new information.

2.3.1.4 Taxonomic classification or changes in nomenclature:

No new information.

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

ʻĀkohekohe currently are found only in 58 square kilometers (22 square miles) of wet and mesic montane forest dominated by ʻōhiʻa on the northeastern slope of Haleakalā Volcano in east Maui. Their elevational range has been reported to be 1,100 to 2,300 meters elevation (3,600 and 7,550 feet), but nearly all birds occur from 1,500 to 2,100 meters (5,000 to 6,600 feet), with some nonbreeding birds wandering further down slope (Scott *et al.* 1986, p. 170). ʻĀkohekohe occur from just west of the Waikamoi Drainage in the Koʻolau Forest Reserve east through the Koʻolau and Hāna Forest Reserves and around the eastern end of Maui to Haleakalā National Park lands in Kīpahulu Valley and southeast of Kuiki to Manawainui Valley. The current geographic range is much restricted compared to the known historical range that included native wet forests of the island of Molokaʻi (Perkens 1903, p. 407; Banko 1987, p. 228). On Molokaʻi, the bird was found at 1,200 meters (4,000 feet) on the high forested plateau between Wailau and Pelekunu valleys where the species was not known to have survived later than 1907 (Scott *et al.* 1986, p. 168; Banko 1987, p. 231). On Maui, the species was first collected in the late 1880s on the western slopes of Kula in mesic koa (*Acacia koa*)/ʻōhiʻa forest, but by 1920 it was already absent in this area due to deforestation caused by logging and cattle-ranching (Berger 1972, pp. 180-181). ʻĀkohekohe now inhabit only 5 percent of the estimated historical range of 1,015 square kilometers (385 square miles) on Maui and none of the 262 square kilometers (100 square miles) on Molokaʻi (USFWS 2006, p. 2-140). James and Olson (1991, p. 81) have reported subfossil evidence of the species from low, dry forest areas of southeastern and southwestern Maui, indicating the current and historical range of the species is much altered from its original pre-human distribution.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

At present, ʻākohekohe survive in mid- to upper-elevation montane wet forest dominated by ʻōhiʻa, and in a few more mesic areas dominated by ʻōhiʻa and koa, with an intact, dense, diverse native understory and subcanopy of ferns, sedges, epiphytes, shrubs and small to medium trees. The topography in these areas generally is steep and highly dissected by deep gulches and narrow ridges. The climate is montane year-round, with frequent clouds, mist, and rain. Annual precipitation may reach as much as 8,500 millimeters/year (335 inches).

‘Ākohekohe are sympatric with several other honeycreeper species, and their distribution is now limited to high elevation areas with relatively little alteration by feral ungulates (Mountainspring 1987, p. 37) or encroachment of non-native vegetation, and the absence of disease-carrying mosquitoes (Scott *et al.* 1986, p. 367).

2.3.1.7 Other:

N/A.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

Modification and loss of habitat and avian disease are the main factors that have contributed to the decline of ‘ākohekohe and other Hawaiian forest birds (Warner 1968, pp. 101-102). Clearing of forest by logging and ranching has been extensive, greatly reducing the amount of suitable habitat for ‘ākohekohe and other forest birds, and resulting in fragmentation of remaining forest habitat. Agricultural operations and forest fragmentation increase the abundance of mosquitoes and the distances mosquitoes disperse (Reitter and LaPointe 2007, p. 865; LaPointe 2008, p. 606). In addition, damage by feral pigs to understory vegetation provide mosquito breeding sites and may deplete nectar resources needed during times of year when ‘ōhi‘a bloom is less available (Lease *et al.* 1996, p. 1; Berlin *et al.* 2001, p. 212).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

Not considered a threat to this species.

2.3.2.3 Disease or predation:

Non-native disease likely limits the distribution of many native Hawaiian forest birds (van Riper *et al.* 1986, p. 341; Atkinson *et al.* 1995, p. S63; Atkinson and LaPointe 2009, p. 55) including the ‘ākohekohe, and global climate change threatens this species by increasing the elevation at which regular transmission of

avian malaria (a protozoan parasite, *Plasmodium relictum*) and avian pox virus (*Avipoxvirus* spp.) occurs (Benning *et al.* 2002, p. 14428). Avian malaria and avian pox are widely suspected to have had major impacts on historical populations of forest birds in Hawai‘i (van Riper *et al.* 1986, p. 341; Banko and Banko 2009, p. 52). ‘Ākohekohe are restricted to higher elevation forests due to the presence of mosquito-borne diseases at lower elevations and at upper elevations in some areas by destruction of forest habitat. ‘Ākohekohe juveniles may be particularly vulnerable to mosquito-borne diseases because they disperse to the periphery of the species’ range after breeding, and adults also may be at greater risk because of their post breeding dispersal (Scott *et al.* 1986, p. 170; Berlin *et al.* 2001, pp. 210-211), potentially increasing their exposure to mosquitoes at lower elevations. Avian malaria was isolated from an ‘ākohekohe in Hanawī Natural Area Reserve (Hanawī NAR) (Feldman *et al.* 1995, p. 670), and laboratory challenge experiments have shown that the ‘i‘iwi (*Vestiaria coccinea*), a non-listed and broadly distributed species at higher elevations which is closely related to the ‘ākohekohe, is extremely vulnerable to avian malaria, with 90 percent of experimental birds dying after being bitten by infected mosquitoes (Atkinson *et al.* 1995, p. S63).

West Nile virus and avian flu likely would pose a risk to ‘ākohekohe if these diseases were to reach Hawai‘i (LaDeau *et al.* 2007, p. 1; Causey and Edwards 2008, p. S31). Hawai‘i and Alaska are the only two States that have reported no occurrences of West Nile virus to date (State of Hawaii 2006, p. 1); however, it is estimated that from 7-70 infectious mosquito individuals arrive with West Nile virus in Hawaii per year (Kilpatrick *et al.* 2004, p. 207). Should this disease become established in Hawai‘i, native birds may be particularly susceptible as they are likely to be immunologically naïve to arboviruses such as West Nile virus because they evolved in the absence of biting insects (van Riper *et al.* 1986, p. 340); and there are a number of introduced birds (e.g., house sparrows and house finches) and mosquitoes (e.g., *Culex quinquefasciatus*) that could support West Nile virus amplification in Hawai‘i and transport it from low to middle and high elevations (Marra *et al.* 2004, p. 398).

Introduced predators are one of the most serious threats to Hawaiian forest birds, particularly during nesting (Atkinson 1977, p. 109; Scott *et al.* 1986, p. 363). Black (*Rattus rattus*)

and Polynesian (*R. exulans*) rats are predators on adults and nests of Hawaiian forest birds (Lindsey *et al.* 2009, p. 283) and are abundant in ʻākohekohe habitat (Sugihara 1997, p. 194; Malcom *et al.* 2008, p. 209). Simon *et al.* (2001, p. 741) found rat predation on an ʻākohekohe adult and egg as evidenced by rat droppings and bird remains in the nest. The remains of an ʻākohekohe were found in a Barn Owl pellet from Hanawī NAR, and feral cat scats contained remains of other native forest birds (Kowalsky *et al.* 2002, p. 131).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

Current regulatory mechanisms are adequate: The ʻākohekohe was federally listed as endangered March 11, 1967 (USFWS 1967), and thus receives regulatory protection under the Endangered Species Act. Species listed under the Endangered Species Act are automatically added to the State of Hawaiʻi list of endangered species, and thus are also protected by State regulations. The Service added 24 species in 2010 that belong to families covered by the Canadian and/or Mexican Conventions, but occur naturally in the United States only in Hawaiʻi, to the List of Migratory Birds. Accordingly, these species, including the ʻākohekohe, receive protection under the Migratory Bird Treaty Act (USFWS 2010, p. 9285).

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Single island endemics like the ʻākohekohe are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a single population by random demographic fluctuations and localized catastrophes such as fires, disease outbreaks, hurricanes (Wiley and Wunderle 1994, p. 319), and genetic issues (Keller and Waller 2002, p. 230; Brodie 2007, p. 288). The existing ʻākohekohe population is threatened with extinction because of its small size and restricted distribution making it vulnerable to a variety of natural processes, including reduced reproductive vigor caused by inbreeding depression, loss of genetic variability and evolutionary potential over time due to random genetic drift, stochastic fluctuations in population size and sex ratio, and natural disasters such as hurricanes and fires. Climate change likely poses a threat to the ʻākohekohe because of movements of disease carrying mosquitoes into higher elevations. A 2°C

temperature rise predicted by the end of this century would increase the area in the Hanawī NAR where malarial infection is virtually certain from 40 to 63 percent (Benning *et al.* 2002, p. 14247), seriously reducing the extent of the high elevation relatively disease-free refugia for this species.

2.4 Synthesis

Recent surveys confirm that the ʻākohekohe population is stable range wide, core densities may have increased, and the current population may be larger than previously estimated. Much of the species' habitat on East Maui is protected from feral ungulates; however, ʻākohekohe remain in danger particularly because of the threat of avian disease. Although the species is stable, because of its small population size and restricted distribution it remains vulnerable to a variety of natural processes, including reduced reproductive vigor caused by inbreeding depression, loss of genetic variability and evolutionary potential over time due to random genetic drift, stochastic fluctuations in population size and sex ratio, and natural disasters such as hurricanes and fires, thus the ʻākohekohe still meets the definition of endangered.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
  ____ ***Extinction***
  ____ ***Recovery***
  ____ ***Original data for classification in error***
__X__ No change is needed

3.2 New Recovery Priority Number: N/A

Brief Rationale:

3.3 Listing and Reclassification Priority Number: N/A

Reclassification (from Threatened to Endangered) Priority Number: ____
Reclassification (from Endangered to Threatened) Priority Number: ____

Delisting (regardless of current classification) Priority Number: ____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

The recovery strategy for the ʻākohekohe centers on protection, restoration, and management of native high elevation forests on East Maui (Haleakalā), West Maui, and East Molokaʻi, and research to optimize efforts at mitigating threats from disease and predation. Reestablishment of ʻākohekohe on West Maui or East Molokaʻi is needed to provide a minimum of two viable populations, or to allow for a single viable metapopulation, in order to reduce the risk of extinction due to catastrophes such as hurricanes and epizootics of disease. Reestablishment in southern or western areas of Haleakalā is needed to promote natural demographic and evolutionary processes.

Habitat protection and restoration: ʻĀkohekohe are currently restricted to the windward forests of East Maui from Waikamoi to Manawainui Valley. State and Federal interagency efforts and the East Maui Watershed Partnership have had landmark success in protection of this habitat for the ʻākohekohe. However, extensive work is still needed to fence and protect the lower elevation areas from Hanawī NAR to Waikamoi, which provide habitat within the current range of the ʻākohekohe, and potential habitat on the fringes of the current range. Additional fencing and ungulate eradication in this area will allow an intact and diverse native subcanopy vegetation to develop, thereby increasing food availability, and may also help to reduce levels of mosquito vectors. On southern and western exposures of East Maui (Haleakalā), a continuous band of suitable forest should be reconnected around the mountain, especially at upper elevations where mosquitoes are rare. Although the current population is restricted to the wet ʻōhiʻa forests of windward East Maui, this represents a contraction of range following widespread habitat loss and degradation (Berlin and VanGelder 1999, p. 3), and habitat restoration and reestablishment of a population on the leeward or western exposures of East Maui is needed to promote natural demographic and evolutionary processes.

Predator control and avian disease: Control of small mammalian predators is needed throughout the species' range. Currently, intensive control of rats is underway in a portion of Hanawī NAR. An important component of ʻākohekohe recovery is evaluation of the effect of rodent control on the species' reproduction and survival, and an expansion of the scale of this work if warranted. Broad scale aerial application of rodenticides is likely needed to

protect ʻākohekohe from rodent predation and reduce habitat damage caused by rats.

Identification of resistance or tolerance to avian diseases within the population is also an important recovery strategy. Resistance or tolerance to avian malaria appears to be evolving in populations of some honeycreeper species (Woodworth *et al.* 2005, p. 1535; Foster *et al.* 2007, p. 4743) and may exist for ʻākohekohe as well. Rodent control at middle elevation areas, by promoting survival of possible disease resistant individuals, may facilitate the evolution of resistance to malaria in some species of Hawaiian birds (Kilpatrick 2006, p. 483). Control of mosquitoes or their breeding sites may also be needed to render existing forest on West Maui and Molokaʻi suitable for endangered birds like ʻākohekohe and reduce incidence of mosquitoes within the lower reaches of the ʻākohekohe's current range.

Much of the potential ʻākohekohe habitat on West Maui and East Molokaʻi is managed as native ecosystems mostly free of ungulates. However, the suitability of these areas with respect to the presence of introduced mosquito-borne diseases is not clear. Much of the potential habitat lies at elevations below 1,350 meters (4,500 feet), where mosquitoes may be common. Ongoing habitat management and removal of ungulates may reduce mosquito densities, but surveys of mosquitoes and disease prevalence are needed prior to the reintroduction of endangered forest birds in these areas. This work should be integrated into an evaluation of the amount of suitable habitat available, estimates of the size of the population that could be supported, and a population viability analysis of the hypothetical population that would aid plans to reestablish populations in those areas. In addition, control of mammalian predators is needed at a large enough geographic scale to protect new populations.

To help prevent West Nile virus and other avian diseases from spreading to Hawaiʻi, the State's Department of Agriculture has established a pre-arrival isolation requirement and a Poultry and Bird Import Permit issued through the Livestock Disease Control Branch for all birds entering the State. The Hawaiʻi State Department of Health has an ongoing, multi-agency West Nile virus surveillance program in place on all of the main Hawaiian Islands, which involves surveillance for infected mosquitoes and dead birds, as well as live-bird surveillance at major ports of entry, equine surveillance, and human surveillance (State of Hawaii 2006, pp. 3-4). To date, no cases of West Nile virus have been reported in Hawaiʻi; however, there is currently no certainty that we can prevent the disease from arriving and spreading. Budget cuts to the West Nile virus surveillance program have resulted in the State Laboratory Division stopping, beginning December 31, 2009, the testing of live and dead bird samples, and placing on hold the writing of a West Nile virus response

plan (Gabela 2009). As a result of these budget cuts the U.S. Geological Survey, National Wildlife Health Center (USGS/NWHC), Honolulu, Hawaii, will no longer take blood samples from birds at the Honolulu airport. The USGS/NWHC will continue to look at dead native birds and unusual mortality events (10 or more birds) using other funding but will not be accepting non-native birds that otherwise would have been submitted to the State Laboratory Division for testing. These developments raise the concern that should West Nile virus arrive in Hawai‘i, it may not be detected early enough to be able to take measures to prevent its establishment.

Captive propagation and reintroduction: Research on captive breeding for the ‘ākohekohe was initiated in 1997, when eggs were removed to the Maui Forest Bird Conservation Center and the Keauhou Bird Conservation Center following the recommendations of Ellis *et al.* (1992, p. 23). Six individuals hatched in captivity from late-stage wild eggs. Three individuals died before 1 year of age. There are no birds currently surviving in captivity. No success at captive production of ‘ākohekohe has been attained due to the aggressive nature of this species and incompatibility of the paired birds. Establishment of a second `ākohekohe population in historically occupied habitat on leeward East Maui, West Maui, or Moloka‘i is an important component of the recovery strategy in order to reduce the threat from catastrophes such as hurricanes and epizootics of disease that could eliminate a single population.

Research: Translocation of wild-caught adult birds may be the preferred method of establishing a second ‘ākohekohe population, because the aggressive nature of this species (Carothers 1986, p. 567) makes it difficult and expensive to propagate in captivity. However, establishment and maintenance of an effective captive-breeding program for future releases into disease-free recovery areas should remain an option if translocations of wild birds do not succeed in establishing a second population. Suitability of West Maui and Moloka‘i as release sites for translocated birds currently is questionable due to the presumed presence of avian diseases in these lower elevation areas. Research to better understand threats and optimize management methods, particularly regarding rat predation and disease, remain important.

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Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of ʻĀkohekohe
(*Palmeria dolei*)

Current Classification: _____E_____

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_X_ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable:_____

Review Conducted By:
Jay T. Nelson, Fish and Wildlife Biologist
Jess Newton, Recovery Program Leader
Assistant Field Supervisor for Endangered Species

Approved _____ Date _____
Field Supervisor, Pacific Islands Fish and Wildlife Office