

**Hawai`i `Ākepa**  
**(*Loxops coccineus coccineus*)**

**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: Hawai'i 'Ākepa (*Loxops coccineus coccineus*)

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**5-YEAR REVIEW**  
***Loxops coccineus coccineus* (Hawai`i `Ākepa)**

**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) in 2008. The Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006) and recent surveys of populations on the Island of Hawai`i (Gorresen *et al.* 2009) provided most of the updated information on the current status of *Loxops coccineus coccineus*. The document was then reviewed by the Vertebrate Recovery Coordinator, Assistant Field Supervisor for Endangered Species, and Acting Deputy Field Supervisor before submittal to the Field Supervisor for approval.

**1.3 Background:**

**1.3.1 Federal Register (FR) Notice citation announcing initiation of this review:**

USFWS. 2008. Endangered and Threatened Wildlife and Plants; Initiation of 5-year Status Reviews for 70 Species in Idaho, Montana, Oregon, Washington, and the Pacific Islands. Federal Register 73(83):23264-23266.

### 1.3.2 Listing history

#### Original Listing

**FR notice:** USFWS. 1970. Conservation of Endangered Species and Other Fish and Wildlife; Appendix D – Unites States List of Endangered native Fish and Wildlife. 35 FR 16047.

**Date listed:** October 13, 1970

**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:

N/A

### 1.3.4 Review History:

Species status review [FY 2009 Recovery Data Call (September 2009)]:  
Stable

### Recovery achieved:

2 (26-50%) (FY 2007 Recovery Data Call – most recent year reported)

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

2

### 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?

Yes

*No*

**2.1.2 Is the species under review listed as a DPS?**

*Yes*  
 *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*  
 *No*

## **2.2 Recovery Criteria**

**2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?**

*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?**

*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 in Hāmākua, Kūlani/Kīlauea/Keauhou, Ka`ū, south Kona, and and Pu`u Wa`awa`a/Hualālai.

*This criterion has not been met. Some populations are declining and others are not viable.*

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. Some populations are declining and others are not viable.*

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

*Sufficient recovery area is identified to have protection; however, some areas are not adequately managed.*

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

*Threats responsible for the decline of Hawai`i `ākepa 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 Hawai`i `ākepa is a small, sexually dichromatic Hawaiian honeycreeper endemic to Hawai`i island. Its total length is approximately 10 centimeters (3.9 inches) and its weight varies from 10 to 12 grams (0.34 to 0.41 ounces). Adult males are bright orange, while females are grayish green with a yellow breast-band. The male adult plumage is not obtained until the molt preceding the fourth year. Males have a female-like subadult plumage (without breast-band) during their second year and a male-like subadult plumage during their third year (Lepson and Freed 1995).

The bird was originally described as *Fringilla coccinea* from specimens collected by the James Cook expedition of 1779 (Medway 1981). It was occasionally placed in the genus *Hypoloxias* (Wilson and Evans 1890 to 1899). Its current nomenclature is based on Rothschild (1893 to 1900). The Hawai`i `ākepa shares subspecific status with the Maui `ākepa (*Loxops c. ochraceus*) and the O`ahu `ākepa (*Loxops c. rufus*). The O`ahu subspecies is extinct and the Maui subspecies was last observed in 1995 (Reynolds and Snetsinger 2001).

### **2.3.1 Biology and Habitat**

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

No new information.

#### **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 Hawai`i `ākepa in 2009 based on analysis of variable circular plot point count data from the 1980s to the present was approximately 12,000 birds distributed in four wild populations (Gorresen *et al.* 2009, p. 136). Density is possibly increasing in Hakalau Forest National Wildlife Refuge, possibly stable in upper Ka`ū, likely decreasing in central

windward Hawai'i island, and the species has been nearly extirpated from Hualālai and central Kona (Gorresen *et al.* 2009, p. 136).

Results of demographic research from 1987 to 2006 on a local population of Hawai'i `ākepa at Hakalau Forest National Wildlife Refuge were published in 2008 (Freed *et al.* 2008a). Freed *et al.* (2008a) hypothesized the incipient extinction of the Hāmākua population of Hawai'i `ākepa caused by increases in certain ectoparasites (Freed *et al.* 2008b) and competition with the Japanese white-eye (*Zosterops japonicas*), an introduced bird species to Hawai'i. The analytic methods used by Freed *et al.* (2008a) are problematic in that the authors based their conclusions on extremely small samples sizes in some cases, they batched their data inappropriately, and they extrapolated results from their local study area to the entire Hāmākua population of Hawai'i `ākepa. Given the problems with the work by Freed *et al.* (2008a), and the proven strength of the variable circular plot point count census method for estimating avian populations, we have used population and trends information from Gorresen *et al.* (2009) for this review.

**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.):**

The historical range of the Hawai'i `ākepa once included much of the island of Hawai'i, presumably wherever there were large trees that provided nest cavities (Freed 1999). The major change in distribution historically has been the complete loss of birds from lower elevations, below 1,300 meters (4,300 feet) above

sea level (asl). However, the range also has contracted at upper elevations (Freed 1999, Scott *et al.* 1986).

Hawai`i `ākepa are currently found in four disjunct populations in `ōhi`a/koa forests in Hāmākua, Kūlani/Keauhou, Ka`ū, and southern Kona/Hualālai. The highest densities occur in the southwestern portion of the Ka`ū Forest Reserve and in the Pua `Ākala Tract of Hakalau Forest National Wildlife Refuge (Scott *et al.* 1986). Hawai`i `Ākepa occur in a gradient of population density, with a small core area of highest density in the Pua `Ākala area and rapid decreases in density away from the core (Scott *et al.* 1986, Hart 2001). This pattern is more pronounced for `ākepa than for other endangered forest birds (Scott *et al.* 1986).

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

See 2.3 above.

**2.3.1.7 Other:**

See 2.3 above.

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

Modification and loss of habitat and avian disease are the main factors that have contributed to the decline of Hawai`i `ākepa. Predation by introduced mammals also may have played a role. Clearing of forest by logging and ranching has been extensive, greatly reducing the amount of suitable habitat for Hawai`i `ākepa and other forest birds, and resulting in fragmentation of remaining forest habitat. Hawai`i `ākepa are especially sensitive to the loss of old growth forest due to their dependence on large trees with cavities for nesting (Freed 2001).

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

Hawai`i `ākepa are birds of old-growth `ōhi`a or `ōhi`a/koa forest (Freed 2001). Their density depends in part on the density of large trees because only large trees provide the cavities required for nesting (Hart 2000, 2001; Freed 2001). The average size of trees used for nesting is 1 meter (3 feet) in

diameter at breast height (Freed 2001). `Ōhi`a appear to be more important to `ākepa than koa, because the highest density of Hawai`i `ākepa on Mauna Loa, in the Ka`ū Forest Reserve, is in an area without koa (Jacobi 1978, Scott *et al.* 1986). Large `ōhi`a trees provide cavities for nest-sites and the preferred foraging substrate, whereas large koa trees provide mainly cavities (Freed 2001) and not preferred foraging substrate. The highest `ākepa density at Hakalau Forest National Wildlife Refuge on Mauna Kea exists in an area with large trees but heavily disturbed understory. The breeding density in this location appears to be limited by the availability of nest sites (Hart 2000).

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

Not known to be a limiting factor at this time.

**2.3.2.3 Disease or predation:**

Hawai`i `ākepa are not found below 1,300 meters (4,300 feet) asl, presumably because of the distribution of the introduced mosquito (*Culex quinquefasciatus*) that transmits avian malaria (*Plasmodium relictum*) and avian pox (*Poxvirus avium*) (van Riper *et al.* 1986). Both the mosquito and malaria parasite are limited in elevation by temperature (LaPointe 2000). Greater exposure of remaining `ākepa populations to vectors and pathogens is likely to occur with global warming (Benning *et al.* 2002).

**2.3.2.4 Inadequacy of existing regulatory mechanisms:**

Current regulatory mechanisms are adequate: The Hawai`i `ākepa was federally listed as endangered October 13, 1970 (USFWS 1970), and thus receives regulatory protection under the Endangered Species Act. Species listed under the Endangered Species Act are automatically added to the State of Hawai`i list of endangered species, and are thus also protected by State regulations. The Service recently added 24 species that belong to families covered by the Canadian and/or Mexican Conventions, but occur naturally in the United States only in Hawai`i, to the List of Migratory Birds. Accordingly, these species, including the Hawai`i `ākepa, receive protection under the Migratory Bird Treaty Act (USFWS 2010).

**2.3.2.5 Other natural or manmade factors affecting its continued existence:**

The existing Hawai'i `ākepa populations are threatened with extinction because of their small size and restricted distribution making them 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 may also pose a threat to the Hawai'i `ākepa. However, current climate change models do not allow us to predict specifically what those effects, and their extent, would be for this species.

## 2.4 Synthesis

Recent surveys confirm that the Hawai'i `ākepa population is stable overall and is increasing in Hakalau Forest National Wildlife Refuge. However, Hawai'i `ākepa is likely decreasing in central windward Hawai'i Island and is nearly extirpated from Hualālai and central Kona. Although the species is stable overall, its range is contracting, thus the Hawai'i `ākepa 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*
- No change is needed**

### 3.2 New Recovery Priority Number:

**Brief Rationale:**

### 3.3 Listing and Reclassification Priority Number:

**Reclassification (from Threatened to Endangered) Priority Number:** \_\_\_\_\_

**Reclassification (from Endangered to Threatened) Priority Number:** \_\_\_\_\_

**Delisting (regardless of current classification) Priority Number:**

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**Brief Rationale:**

**4.0 RECOMMENDATIONS FOR FUTURE ACTIONS**

Recovery of the Hawai'i `ākepa will require protection, management, and restoration of native forests above 4,000 feet (1,300 meters) asl, as well as lower elevation forest areas, and management of threats such as predation and disease. Conservation efforts for the Hawai'i `ākepa have focused primarily on protection and management of high-elevation native forests. The Hakalau Forest National Wildlife Refuge was established in 1985 primarily to protect and manage habitat for native birds, including the Hawai'i `ākepa. Much of the refuge has been fenced and efforts are underway to remove feral pigs from the refuge. Planting of koa and other native plants began in the early 1990s, and over 350,000 koa seedlings have been planted thus far. Plans to remove ungulates from the State Kīpāhoehoe Natural Area Reserve and from lands at Honomalino, owned by The Nature Conservancy of Hawai'i, would protect recovery area that could serve as sites for reintroducing Hawai'i `ākepa. The recent purchase of the former Kahuku Ranch by the National Park Service will help protect and restore forest habitat adjacent to the area of highest `ākepa density in Ka`u.

**Research.** Research comparing forest structure and `ākepa demography in areas of low and high population density has highlighted the importance of large trees with cavities to this bird (Hart 2000, 2001). Additional research with artificial cavities has shown that the birds will use artificial cavities attached to the outside of trees and successfully nest in them (Freed 2001). Artificial cavities are a promising conservation tool that can be used to increase nest site availability until a time when growth and recruitment of large `ōhi`a trees provide sufficient natural nest sites. To complement these efforts, research needs to address factors that affect the growth form of regenerating `ōhi`a. Management of growth form, including removal of ungulates that destroy the apical meristem (growing tip) of seedlings, and possibly providing wind shields or shading, may be useful for long-term regeneration of monopodial `ōhi`a trees that are most likely to develop natural cavities and provide suitable nest sites for `ākepa (Freed 2001).

Hawai'i `ākepa are one of the few species of Hawaiian forest birds for which the significance of food availability has been quantitatively investigated. This work confirmed the strong reliance of `ākepa on terminal `ōhi`a foliage for food (Fretz 2000) and suggests food availability is associated with habitat structure, including subtle aspects of canopy foliage density. This type of

variation in canopy structure may be common at regional scales and therefore has the potential to influence `ākepa densities (Fretz 2002). In addition, food availability is seasonal and the well-defined timing of breeding seen in `ākepa may be an adaptation to exploit this seasonality so that food is maximally available at the time of independence of the young (Fretz 2000).

**Habitat protection and restoration.** The most important component of the recovery strategy for the Hawai`i `ākepa is protection, management, and restoration of koa/`ōhi`a forests above 1,300 meters (4,000 feet) asl. High elevation forest is of primary importance because it provides the greatest refuge from mosquito-borne diseases, but forests at lower elevation also could be valuable if a means of controlling mosquitoes can be found. Protection of old-growth forest ecosystems is essential to the long-term recovery of this species, as Hawai`i `ākepa nest in cavities of large diameter trees. The use of artificial cavities have potential to increase the density of nesting pairs within an area or to establish new populations in forests that have suitable foraging substrate but lack large trees with cavities.

**Predator control and avian disease.** Control of alien predators, especially rats, has been shown to be an effective method of increasing reproduction and survival in other Hawaiian forest birds (VanderWerf and Smith 2002). The degree of threat from alien rodents may vary among species and locations, and rodent control programs initially should be conducted in an experimental way to document the population-level effect on the Hawai`i `ākepa. Ground-based methods of rodent control using snap traps and diphacinone bait stations have been effective on a small scale, but are labor intensive; effective large-scale rodent control likely will require aerial broadcast methods. Eradication of mosquitoes is not practical with methods currently available, and management for avian disease should focus on reduction of breeding habitat for mosquitoes through drainage of stock ponds, public education/container removal in residential areas, and removal of feral pigs.

**Captive propagation and reintroduction.** Recovery of the Hawai`i `ākepa may be achieved most effectively through *in situ* management techniques such as habitat management because the current population is relatively large; captive propagation is not considered essential for recovery at this time. However, captive propagation technology is being developed for the Hawai`i `ākepa in case it is needed to help reestablish wild populations. Techniques developed for Hawai`i `ākepa include protocols for collection of wild eggs, artificial incubation of eggs, hand-rearing of chicks, and maintenance of adults in captivity. Progeny from captive propagation efforts would provide birds for reintroduction in order to establish and enhance wild populations.

## 5.0 REFERENCES

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**Signature Page**  
**U.S. FISH AND WILDLIFE SERVICE**  
**5-YEAR REVIEW of Hawai'i `Ākepa (*Loxops coccineus coccineus*)**

**Current Classification:** \_\_\_\_\_ E \_\_\_\_\_

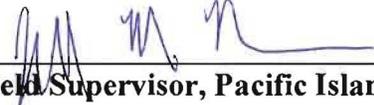
**Recommendation resulting from the 5-Year Review:**

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

**Appropriate Listing/Reclassification Priority Number, if applicable:** \_\_\_\_\_

**Review Conducted By:**

Jay T. Nelson, Fish and Wildlife Biologist  
Holly Freifeld, Vertebrate Recovery Coordinator  
Marilet A. Zablan, Assistant Field Supervisor for Endangered Species  
Jeff Newman, Acting Deputy Field Supervisor

Approved  Date **AUG 27 2010**  
 **Field Supervisor, Pacific Islands Fish and Wildlife Office**