

AKEKE'E FIVE-YEAR RECOVERY WORK PLAN 2010-2015
Kauai Forest Bird Working Group

PURPOSE. The 'Akeke'e was listed as endangered in 2010 and there are currently no long-term recovery goals, delisting criteria, recovery strategy, or a comprehensive list of recovery tasks, however, they will likely be similar to those developed for 'Akikiki (USFWS 2006). The purpose of this work plan is to identify recovery objectives for the 'Akeke'e that can be realized within five years, and to succinctly describe the actions needed to reach these objectives. Identification of interim recovery objectives and actions will facilitate the efficient use of limited recovery resources and provide milestones that can be used to evaluate progress.

SPECIES SUMMARY. The 'Akeke'e, or Kaua'i 'Ākepa (*Loxops caeruleirostris*), is a small (10-12 g) insectivorous Hawaiian honeycreeper endemic to Kaua'i. Males are bright yellow below, greenish above, with a yellow forehead and rump (Pratt *et al.* 1987, Lepson and Pratt 1997, Pratt 2005). Females are similar, but less brightly yellow and slightly smaller. Both sexes have a dark mask that extends from the base of the bill to the eye. The bill is pale bluish, short, and pointed, and the tips of the mandibles are slightly crossed; a characteristic shared with the Hawai'i 'Ākepa (*L. coccineus*). The tail is notched and somewhat longer than in other Hawaiian honeycreepers. The song is a wavering trill that changes in pitch and speed; call notes given by males and females include a soft "sweet" (Pratt *et al.* 1987, Lepson and Pratt 1997). 'Akeke'e are most often observed in pairs or family groups.

'Akeke'e are found in mesic and wet native montane forests dominated by 'ōhi'a (*Metrosideros polymorpha*), koa (*Acacia koa*), 'ōlapa (*Cheirodendron trigynum*), lalalapa (*C. platyphyllum*), 'ōhia h'a (*Syzygium sandwicensis*), kāwa'u (*Ilex anomala*), and kōlea (*Myrsine lessertiana*), with a diverse understory of native plants including 'ōhelo (*Vaccinium calycinum*), and kanawao (*Broussaisia arguta*). The 'Akeke'e forages for insects, insect larvae, and spiders on the outer branches and leaves of 'ōhi'a trees, and occasionally in other trees and understory shrubs (Lepson and Pratt 1997). Prey is taken primarily by gleaning, and the asymmetrical crossed mandibles are used to pry open leaf buds and flower buds, similar to the behavior used by crossbills (*Loxia* spp.). The species' methodical probing of leaf buds is distinctive and can be used to identify the species.

Only six nests of the 'Akeke'e have been found and there is limited information about its breeding biology, but the nesting season is thought to extend from March-June (Lepson and Pratt 1997, E. VanderWerf unpubl. data). Nests occur 9-12 m above ground in the crown of 'ōhi'a trees and are constructed of moss and lichen lined with fine grasses and soft bark strips (Eddinger 1972, Berger 1981, Lepson and Pratt 1997). There is no information about nest success, reproductive rates, survival of adults or juveniles, or movements (Foster *et al.* 2000, USFWS 2006), but their reproductive biology is likely similar to that of the closely related, and well-studied, Hawai'i Creeper (*O. mana*) (VanderWerf 1998). Both sexes help build the nest, but the female alone probably incubates the eggs, and both sexes probably feed the nestlings (Eddinger 1972, Lepson and Pratt 1997). There is no information about nest success, reproductive rates, survival of adults or juveniles, or movements.

POPULATION STATUS. The 'Akeke'e was described as "quite plentiful" (Bryan and Seale 1901) and common "over a large part of the high plateau" in the late 1800s (Perkins 1903), and probably occurred throughout upper elevation forested regions of the island (Munro 1944). Richardson and Bowles (1964) reported that it was fairly common in higher elevation forests. The first quantitative information on population size and distribution was based on extensive surveys conducted from 1968-1973, which yielded an island-wide population estimate of $5,066 \pm 840$ birds (USFWS 1983). Most individuals were found in the Alaka'i Plateau area and the Kōke'e area west of the Alaka'i at elevations from 800-1,370 m. Fewer individuals also were found at approximately 800 m elevation on Makaleha Mountain and down to 600 m elevation near Hinalele Falls in Wainiha Valley (USFWS 1983). In 1981, the number of 'Akeke'e

estimated to occur in a 25 km² area of the southeastern Alakai was 1,700 ± 300, with higher densities in the higher, more remote regions of the eastern Alaka'i Plateau and lower densities toward the west in the Kōke'e region (Scott *et al.* 1986). In 1968-1973, the 'Akeke'e population in this same area was estimated to be 600 ± 200 birds (USFWS 1983), though it is not clear whether these estimates are from exactly the same areas.

The current population of the 'Akeke'e is estimated to be 3,111 ± 591 (SE) birds, based on surveys conducted in April and May 2008 (Hawaii Division of Forestry and Wildlife and USGS, unpubl. data). The estimated population has declined from 7839 ± 704 birds in 2000 and 5669 ± 1003 birds in 2005 (Hawaii Division of Forestry and Wildlife and USGS, unpubl. data). The geographic range occupied by the 'Akeke'e was approximately 88 km² in 1970 (USFWS 1983, Scott *et al.* 1986), and this was reported not to have changed in 2000 (Foster *et al.* 2004), but surveys in 2008 failed to find the species in many areas where it was previously observed, and its range is now estimated to be 50 km² (Fig.1).

MANAGEMENT/PROTECTION TO DATE. A petition to list the 'Akeke'e was submitted in October 2007, and the species was listed as endangered under the Endangered Species Act in March 2010. The species has not been the focus of any long-term study or management actions; most life history data is based on anecdotal observations. The first focused studies of this species will begin in 2011. Weed control is being conducted by The Nature Conservancy and Kōke'e Resource Conservation Program. The Kaua'i Watershed Alliance is currently (2010) constructing a fence to protect the southeastern Alaka'i Wilderness Preserve from ungulates and fencing in the Hono O Nā Pali Natural Area Reserve (NAR) is currently being planned. Extensive pre and post fence construction forest bird surveys and vegetation data collection will document the benefits of the southeastern Alaka'i fence. Captive propagation of the 'Akeke'e has not been attempted, although the closely related Hawai'i 'Ākepa has been successfully bred in captivity by the Zoological Society of San Diego (ZSSD).

PRIMARY THREATS. Non-native disease appears to limit the distribution of many native Hawaiian forest birds, including the 'Akeke'e (van Riper *et al.* 1986, Atkinson *et al.* 1995, Atkinson and LaPointe 2009), and global climate change may exacerbate this threat by allowing an increase in the elevation at which regular transmission of avian malaria and avian pox virus occurs (Reiter 1998, Benning *et al.* 2002, Harvell *et al.* 2002, Hay *et al.* 2002). Currently, there are no forested areas on Kaua'i where the mean ambient temperature prevents the seasonal incursion of malaria, meaning mosquitoes and malaria can survive across all parts of the island, at least periodically (Benning *et al.* 2002). Benning *et al.* (2002) used GIS simulation to show that an increase in temperature of 2° C, which is a conservative figure based on recent data (IPCC 2007), would result in an 85 % decrease in the land area on Kaua'i where malaria transmission currently is only periodic. Without translocation to higher islands or the development of disease resistance, the loss of such a large proportion of suitable habitat would likely result in extinction of the 'Akeke'e (Pounds *et al.* 1999, Still *et al.* 1999). Temperature data on Kaua'i have not been examined, but disease prevalence on Kaua'i has increased over the last 10 years. Although based on a small sample, the prevalence of malaria in 'Akeke'e decreased from 4.5% 1994-1997 to 0 between 2007-2009 (Atkinson and Utzurrum 2010).

The habitat of the 'Akeke'e has been, and continues to be, negatively affected by invasive alien plant species that displace native plant species used for foraging and nesting, and by feral ungulates, particularly feral pigs (*Sus scrofa*) and goats (*Capra hircus*) (Lepson and Pratt 1997, Foster *et al.* 2004). 'Akeke'e depend on areas of intact native forest for foraging and nesting. Feral ungulates negatively affect native forest by browsing, causing soil erosion, disrupting regeneration, spreading of invasive alien plant seeds, facilitating the invasion of alien plants, and creating breeding habitat for mosquitoes (Cabin *et al.* 2000, Scott *et al.* 2001, USFWS 2006), and degradation of forest habitat has likely played an important role in the range contraction of the 'Akeke'e. Most declines have occurred at the edge of the species' range (Foster *et al.* 2004), where disturbance and the effects of ungulates and invasive alien

plants are most severe. Habitat degradation by non-native plants and feral ungulates is likely to continue damaging forest structure and integrity.

Introduced predators are one of the most serious threats to Hawaiian forest birds, particularly during nesting (Atkinson 1977; Scott *et al.* 1986; VanderWerf and Smith 2002). The nesting biology of the 'Akeke'e has been little studied, but black rats (*Rattus rattus*), Polynesian rats (*R. exulans*), Norway rats (*R. norvegicus*), and feral cats (*Felis catus*) are present on the Alaka'i Plateau and are potential predators on roosting or incubating adults, nests, and young. Predation, probably by black rats, was the greatest cause of nest failure in the Puaiohi or Small Kauai Thrush (*Myadestes palmeri*), another endangered bird species that inhabits the same areas as the 'Akeke'e, occurring at 38% of nests (Tweed *et al.* 2006). Two species of owls, the native Pueo (*Asio flammeus sandwichensis*) and the introduced Barn Owl (*Tyto alba*) also occur on Kaua'i and are known to prey on forest birds (Snetsinger *et al.* 1994). Feral cats also are present on the Alaka'i Plateau.

Major hurricanes struck Kaua'i in 1983 and 1992 and significantly affected native habitats by destroying native habitat, creating gaps into which alien plants could expand, and spreading invasive plants. Large numbers of dead trees killed by hurricane Iniki in 1992 are still visible on the ground in several areas where 'Akeke'e have declined in abundance or disappeared. Habitat damage by the hurricane was more severe at higher elevations near Ke'ākū Cave on the western slope of Wai'ale'ale (E. VanderWerf pers. obs.), and 'Akeke'e have not been found in this area recently.

A number of other factors are likely contributing to the decline of this species. The effects of non-native arthropod predators and competitors are completely unknown. Threats or stressors may interact with each other and increase their negative impact on 'Akeke'e. For example, birds experiencing malarial symptoms may be more susceptible to predation. Finally, species like the 'Akeke'e that are endemic to single small islands or areas 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 hurricanes, fires, and disease outbreaks (Wiley and Wunderle 1994), and potentially genetic issues (Keller and Waller 2002, although see Brodie 2007). As populations and ranges of island birds decline due to other threats, the extinction risk from catastrophic events also increases.

RECOVERY STRATEGY. Given the lack of data on this species, initiating studies to collect basic life history is critical. In addition to this, several tools can potentially be used to manage 'Akeke'e populations, including captive propagation and release, which may include the breeding of disease resistant individuals, controlling predators, which may facilitate the evolution of disease resistance (Kilpatrick 2006); controlling alien plants; fencing and ungulate eradication; and translocating the species to other islands. All of these tools are likely to be important components of the long-term recovery strategy for 'Akeke'e, but knowing which tool is most effective will allow more efficient short-term use of limited conservation resources. Collecting life history and assessing threats will contribute to making these determinations.

Interim Recovery Objectives 2010-2015. In order to meet the long-term recovery goals for the 'Akeke'e, the following interim goals were developed:

- Collect demographic data necessary to conduct PVAs.
- Conduct a threat assessment to determine what factors most strongly influence abundance and distribution.
- Continue monitoring population status and trends.
 - Develop new monitoring methods as needed.
- Determine habitat preferences.

- Investigate management tools for stabilizing/increasing the ‘Akeke‘e population (e.g., predator control, habitat restoration).
- Develop a captive breeding work-plan that outlines different methods (i.e., rear-and-release) and how these methods would dovetail with other recovery actions.
- Investigate feasibility of translocating birds to protected areas on higher Hawaiian Islands (e.g., Maui, Hawai‘i Island).

If these objectives are met within five years, then new recovery objectives will be identified to continue to guide progress toward recovery. If these objectives are not met within five years, then the causes for failure should be identified and rectified if possible. If it is not possible to correct the causes for failure and the current strategy is deemed ineffective, then a new strategy will be developed.

Five-year Recovery Actions (2010-2015). In order to realize the recovery objectives described above, the following actions are necessary:

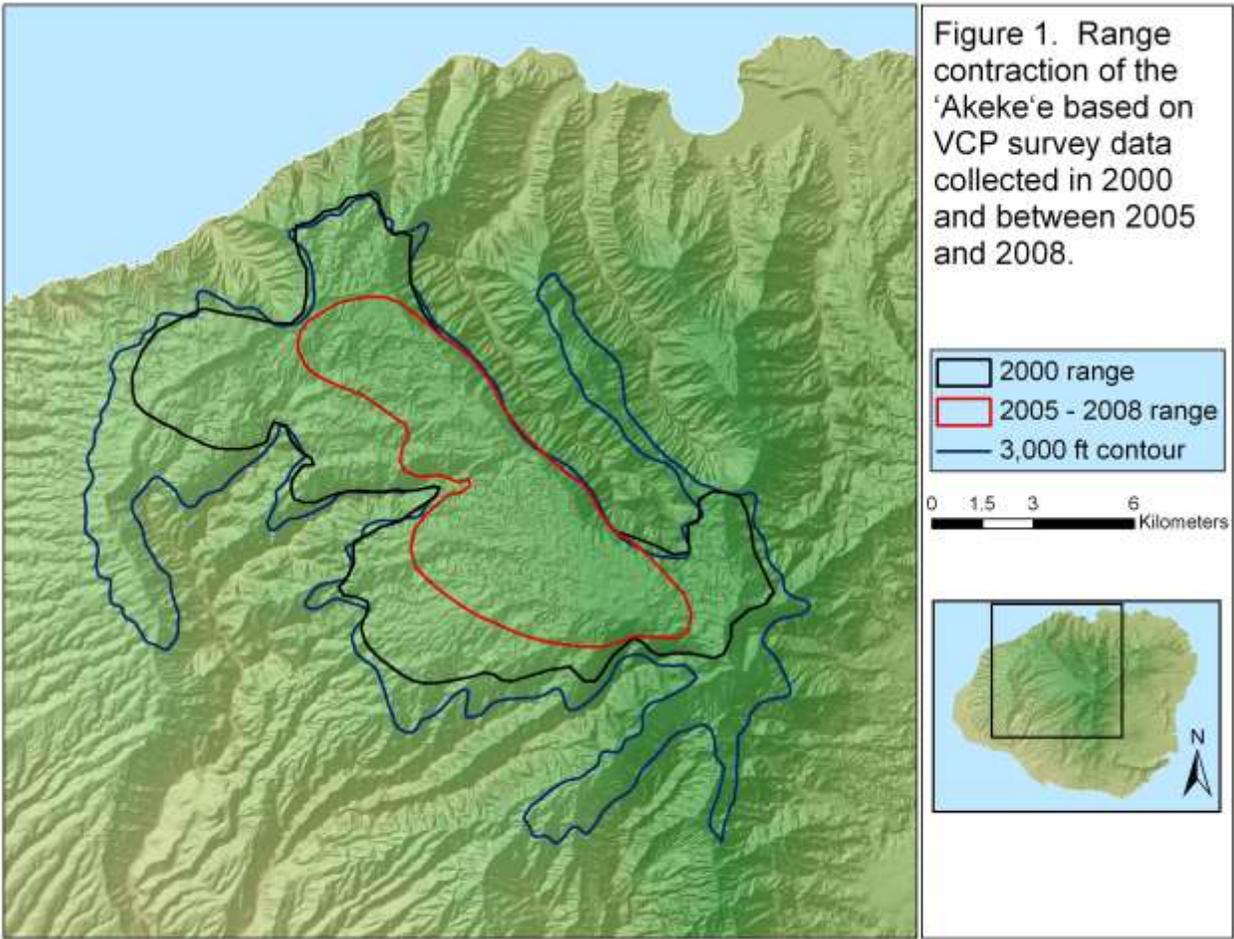
- Complete surveys in areas not surveyed or under-surveyed areas (DOFAW, KFBRP).
 - Hono O Nā Pali NAR
 - Northeastern Alaka‘i
- Develop captive propagation and translocation thresholds, time tables, budgets, and plans. Plans should identify thresholds for initiating different phases of a captive breeding program (e.g., developing protocols, developing a captive flock) (ZSSD).
- Determine food availability and preferences (KFBRP, CSU).
- Determine productivity and nest site selection by following nests (KFBRP, CSU).
 - Experiment with protecting nests using flashing or collars.
- Determine survival and dispersal of adults and juveniles, by mist-netting, banding, and resighting (KFBRP, CSU).
 - Collect and screen blood samples for disease.
 - Monitor survival and reproduction of individuals with and without malaria.
- Use habitat imagery and biological data to model ‘Akeke‘e habitat (KFBRP).
- Assess any response in density attributable to habitat recovery related to the East Alaka‘i fence (KFBRP).
- Model ‘Akeke‘e population trends using density, occupancy, or demography (as funding allows) under various management scenarios (KFBRP, CSU).
- Develop a translocation document (KFBRP, ZSSD).

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