

# Maui Forest Bird Recovery Project (MFBRP): Work Plan 2010



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[www.mauiforestbirds.org](http://www.mauiforestbirds.org)

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## INTRODUCTION

This 2010 Maui Forest Bird Recovery Project (MFBRP) work plan is intended for:

- a) MFBRP staff as background on our organization and its activities, and for planning
- b) MFBRP collaborators such as Zoological Society of San Diego, TNC, NPS, & watershed partnerships to inform them of our activities.
- c) MFBRP advisors including DOFAW, USFWS, and collaborating scientists to gain feedback.
- d) Supporters of MFBRP and organizations concerned with endangered birds and their recovery.

We provide an overview of current project activities and outline several future projects for which we seek funding and collaboration. For more information about the Maui Forest Bird Recovery Project, please visit our website at [www.mauiforestbirds.org](http://www.mauiforestbirds.org).



### ***MFBRP Mission***

The Maui Forest Bird Recovery Project develops and implements techniques to sustain native forest birds through research and applied conservation. The USFWS recovery plan covering Maui Parrotbill (MAPA), `Akohekohe or Crested Honeycreeper (CRHO), and other endangered forest birds, and Hawaii's Comprehensive Wildlife Conservation Strategy (HCWCS) help guide our conservation work.

### **MFBRP Long-term goals:**

- 1) Sustain and increase current populations of Maui's endangered forest birds
- 2) Monitor with appropriate methods a) population status, b) response to management and c) threats to Maui's forest birds
- 3) Contribute to reestablishment of a second Maui Parrotbill population on leeward Haleakala
- 4) Contribute to reestablishment of an `Akohekohe population on Molokai'i and west Maui
- 5) Promote collaboration and policy supportive of Maui's forest birds including reforestation with native tree species and share information on forest birds in outreach efforts

For further reading, please refer to:

- US FWS (2006) Revised Recovery Plan for Hawaiian Forest Birds
- DLNR (2005) Hawaiian Comprehensive Wildlife Conservation Strategy

**Current MFBRP Staff**

<b>Name</b>	<b>Role</b>	<b>Status</b>
Dr. Dusti Becker	Project Coordinator	Full-time Core Staff
Hanna Mounce	Conservation Research Facilitator	Full-time Core Staff
Kelly Iknayan	Ornithological Research/GIS	Full-time Core Staff
Wayne Li	Americorp Intern	January-November 09
Laura Berthold	Americorp Intern	January-October 10
TBA X 6	Field Technicians	Feb-June 10

**FY 2010 Schedule (July 1-June 30, 2010)**

<b>Months</b>	<b>Staffing</b>	<b>Activities</b>
July-Aug	3-5: Core & Interns	Rare bird searches, rodent control, MAPA productivity monitoring, HCC, museum study.*
Sept-Oct	3-5: Core & Interns	MAPA re-sights, productivity monitoring, banding, leeward MAPA translocation site visits, rare bird search in Waikamoi, lab work, museum study*, outreach.
Nov-Dec	3-5: Core & Interns	Pre-breeding season banding, rodent control, spring tech hires, citizen science and outreach.
Jan-Feb	3-5: Core & Interns	Pre-breeding season banding, crew training.
Feb-June	11: Core, interns, techs	MAPA breeding season monitoring, rodent control, MACR densities and VCP transects.

**\* Measurement and DNA collection for study of historical genetic diversity and morphological variation in MAPA, see page 12 for more details.**

## FOCAL SPECIES: MAUI PARROTBILL (MAPA)



Figure 1. Adult male Maui Parrotbill

**Status:** The Maui Parrotbill (*Pseudonestor xanthophrys*; Fig. 1) is listed as endangered under the U.S. Endangered Species Act, the state of Hawai'i, and the IUCN. Population estimate is about 500 individuals. Although the population has been reported as stable for a number of years, there is evidence that the parrotbill's range is contracting.

**Geographic Area:** Restricted to a single population of about 50 km<sup>2</sup>, between 1,200 – 2,350 m in east Maui (Fig. 2). The species was formerly more widespread and occurred on west Maui and Moloka'i. Fossils have been found from drier, low elevation koa (*Acacia koa*) forests, and historic observations suggest that parrotbill may have preferred to forage on koa; now they are restricted to wet `ōhi`a - dominated forests.

**Primary Threats:** Similar to other Hawaiian honeycreepers, parrotbill have suffered from habitat destruction, predation by non-native mammals, and disease, but their extremely low reproductive rate and limited distribution makes them very vulnerable to extinction. Parrotbill lay a one-egg clutch and produce a maximum of one fledgling per year. Their current range is most likely an artifact of habitat destruction and disease and is likely suboptimal habitat, where frequent storms result in the loss of a high percentage of nests. Climate change is predicted to permit avian malaria at higher elevations. This would further reduce suitable habitat for Maui parrotbill unless they develop resistance.

**Conservation Planning and Action:** Maintaining and monitoring productivity and abundance of Maui parrotbill within their current range is a top priority. Establishing a second Maui parrotbill population on the southern (leeward side) of East Maui is considered an important response to threats. The climate is less metabolically challenging and malaria carrying mosquitoes do not thrive in the drier conditions, a potential positive factor given that climate change is predicted to permit upslope movements of mosquitoes and malaria. Restoring leeward mesic and koa forest in time establish a self-sustaining population of Maui parrotbill will require substantial time and expenditures. New sites must be fenced, ungulates removed, and predation by rodents must be controlled along with restoration of forest features required by the birds (food, cover, connectivity, etc.)

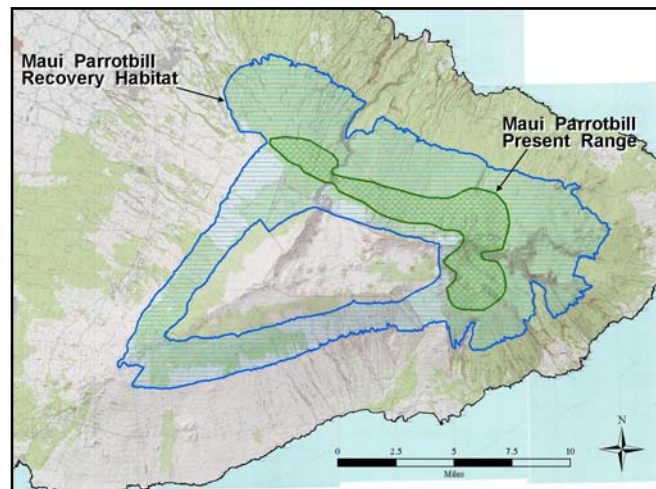


Figure 2. Range of Maui Parrotbill

## FOCAL SPECIES: `ĀKOHEKOHE OR CRESTED HONEYCREEPER (CRHO)



**Status:** The `Ākohekohe or Crested Honeycreeper (*Palmeria dolei*; Fig. 3) is listed as endangered under the U.S. Endangered Species Act, the state of Hawai`i, and the IUCN. Population estimate is 3800 ±700 individuals. Although the population has been reported as stable for a number of years, there is concern that `Ākohekohe range will contract in response to climate change.

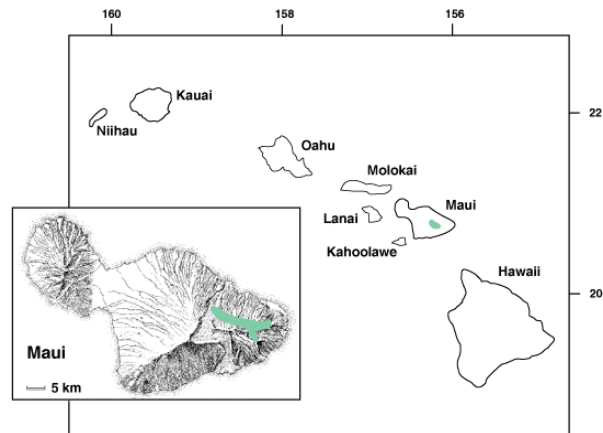
**Figure 3.** Adult `Ākohekohe

**Geographic Area:** Restricted to a single population in 58 km<sup>2</sup>, between 1,200 – 2,350 m on east Maui that overlaps with MAPA (Fig. 2), CHRO were formerly more widespread and occurred on west Maui and Moloka`i. Fossils have been found from drier, low elevation mesic koa (*Acacia koa*)/`ōhi`a forests, and historic observations suggest that `Ākohekohe may have preferred mesic forests over wet `ōhi`a-dominated forests.

**Primary Threats:** Similar to other Hawaiian honeycreepers, `Ākohekohe have suffered from habitat destruction, predation by non-native mammals, and disease. Fortunately, `Ākohekohe have a moderate reproductive rate, but altitudinal migration in response to `ōhi`a flowering phenology may bring them in contact with mosquitoes, thereby increasing mortality from avian malaria. Their limited distribution makes them vulnerable to extinction. Their current range is most likely an artifact of habitat destruction and disease and may be sub-optimal.

### Conservation Planning and Actions:

Conservation planning and delisting criteria for `Ākohekohe are described in detail in the USFWS Recovery Plan for Hawaiian Forest Birds (2006). To secure `Ākohekohe, another population must be established. Currently, they are restricted to a single, small population that occupies sub-optimal habitat. Restoration of mesic koa/`ōhi`a forest at all locations possible above 4500 ft and establishment of a second population in a disease-free recovery area is considered essential for recovery. Translocation, rather than captive breeding, is preferred for `Ākohekohe because they are aggressive and do not adapt well to captive conditions.



**Figure 4.** Range of Crested Honeycreeper

## FOCAL SPECIES: MAUI 'ALAUAHIO OR CREEPER (MACR)



Figure 5. Adult Creeper

**Status:** The Maui 'Alauahio or Creeper (*Paroreomyza montana*, Fig. 5) is not listed at endangered or threatened under the U.S. Endangered Species Act, the state of Hawai'i, or the IUCN. Population estimate is 35,000  $\pm$  5,000 individuals. Although the 'alauahio is considered stable, their population could decline with climate change and associated factors.

**Geographic Area:** MACR occur in three separate populations above 900 meters elevation on the slopes of Haleakalā in east Maui. The species was formerly more widespread and occurred on west Maui and Lāna'i. Fossil evidence suggests that 'alauahio were common across the south side of the island and their range included lowland forests.

**Primary Threats:** Similar to other Hawaiian honeycreepers, 'alauahio have suffered from habitat destruction, predation by non-native mammals, and disease. Although 'alauahio only successfully raise one brood a season, this is not considered a factor in lowering their population. Their nests, though, are the most heavily affected out of all the honeycreepers by depredation by introduced mammals. Their current range is most likely an artifact of habitat destruction and disease and may be sub-optimal. Climate change is predicted to permit avian malaria at higher elevations. This would further reduce suitable habitat for 'alauahio unless they develop resistance.

### Conservation Planning and Actions:

Although there are no specific conservation plans for MACR, plans and projects for rarer birds like the Maui Parrotbill may benefit MACR as well. These projects include ungulate fencing for better habitat, predator control to reduce non-native predators, and restoration of mesic koa/ōhi'a forest on the leeward side of Haleakalā. Continued forest bird surveys and habitat monitoring will be needed to assess the efficacy of these habitat management efforts.

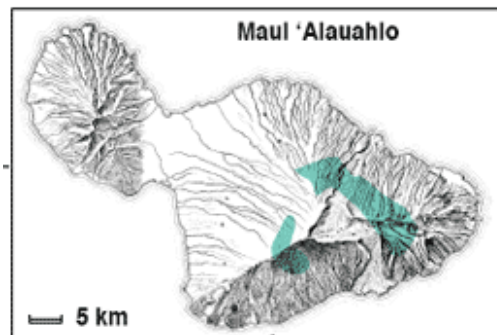


Figure 6. Range of Maui 'alauahio

## **MAUI PARROTBILL POPULATION DYNAMICS & VIABILITY**

Several on-going projects interrelate and focus on understanding MAPA survival, productivity, and population viability.

### **MAUI PARROTBILL (MAPA) NEST SUCCESS**

- Goals:** Input for PVA, determine appropriate management  
**Status:** On-going since 2005 to be continued through 2010  
**Tasks:** Determine nest success and identify causes of nest failure

#### **2010 Key Tasks and Deliverables:**

1. Feedback to USFWS on nest success.
2. Evaluate data on parental investment at nests.
3. Maintain predator control around nest sites.
4. Compile data on nest location, positioning & success.
5. Provide technical advice to MBCC, FWS, DOFAW related to recovery plan goals for MAPA.

**Locations:** Hanawi Natural Area Reserve

**Collaborators:** DOFAW, USFWS, MBCC, University of Kent

**2010 MFBRP Staffing requirements:** 6-8 staff per field trip. Rotation of core staff.

#### **Details:**

1. Hanawi NAR is highest priority for MFBRP work because it is the core area for breeding Maui parrotbill, has a good historical data set, and is protected via NARS fencing and MFBRP rodent reduction (HR3 only). Fence repair and predator control are on-going by NARS and MFBRP.
2. Nest success update to USGS June, 2010.
3. Hanna Mounce will include nest success data in her Ph.D.
4. Will continue collecting nest success data but with a transition to more emphasis on reproductive success: proportion of pairs with a viable offspring at end of field season.

#### **Publications & Presentations as a Result of this Work:**

1. C. D. Becker, H. L. Mounce, R. L. Hammond, T. A. Rassmussen, A. Rauch-Sasseen, K.J. Swinnerton, & D. L. Leonard Jr.(2009). Parental Investment at the Nest in Wild Maui Parrotbill (*Pseudonestor xanthophrys*): Implications for Captive Propagation and Recovery Efforts. Endangered Species Research: submitted 4-16-09.
2. Oral presentation with above title by Hanna Mounce at Hawaiian Conservation Conference July, 2009.
3. H. Mounce (2008). What threat do native avian predators pose to Hawaiian honeycreepers? Two cases of predation by pueo (*Asio flammeus sandwichensis*). 'Elepaio 68(3).



### ***ESTIMATING PRODUCTIVITY (HATCH-YEAR/PAIR) IN MAUI PARROTBILL (MAPA)***

- Goal:** Improved PVA, information for future translocation work  
**Status:** Ongoing since 2006, refining methodology since 2008  
**Aims:** Estimate productivity and reproductive success in MAPA

#### **2010 Key Tasks and Deliverables:**

1. Determine pair densities and production of young/pair in Hanawi 100 ha study area.
2. Use probability of producing an offspring in population viability models.
3. Assess biases in productivity estimate as compared with nest success.
4. Provide technical advice to DOFAW & USFWS in regard to productivity of MAPA population in the core area of Hanawi.

**Locations:** Hanawi NAR – HR3 & Frisbee Meadows Study Areas

**Collaborators:** DOFAW, USFWS, University of Washington, University of Kent

**Staffing requirements:** 4 staff per field trip (6-8 trips, Mar-June ). CDB for non-fieldwork.

KJI for GIS. HLM for target mist-netting. 2-6 interns summer/fall re-sights & to assist with target banding

**Field Season:** Year round with peak fieldwork March-June, Aug-Nov. Evaluation periods in July and December, and training session in February.

#### **Details:**

1. MAPA pairs may have up to two nest failures during the breeding season, but this does not preclude production of a single offspring (the maximum per pair). Proportion of pairs producing an offspring provides a robust measure of productivity, but verification of offspring presence/absence is challenging as pairs with no offspring are less vocal than pairs with an offspring.
2. Pair densities can be estimated by re-sighting of color-banded individuals.
3. Hanawi has the highest densities of MAPA recorded on Maui and well-maintained trails and a grid system for monitoring birds.
4. Results will be used for H. Mounce's Ph.D. and team-produced journal articles.

## **HATCH-YEAR & SECOND YEAR SURVIVAL & DISPERSAL IN MAPA**

**Goal:** Information needed to determine best method (translocation or captive release) to establish second population.

**Status:** Ongoing since 1997 using resights; radio-tracking in 2010

**Aims:** Determine recruitment potential of young MAPA and dispersal behavior

### **Key Tasks 2010 and beyond:**

1. Expand mark-resight effort. Fine tune survival estimates for HY & SY birds.
2. Radio-track several SY MAPA at Hanawi.
3. Finish making shapefiles for birds banded as HY and SY birds for use with GIS software
4. Use ArcMap9.3 to evaluate the movement of these birds throughout their life history from their first or second year.
5. Investigate dispersal patterns of MAPA based on sex and band location (study area)
6. Continue banding of SY and HY birds
7. Explore the role of conspecific vocalizations in movements of young MAPA (attraction?)

### **Deliverables:**

1. Technical advice to DOFAW & USFWS in regard to feasibility of approach.
2. Journal article or HCC presentation

**Locations:** Hanawi NAR – HR3 & Frisbee Meadows Study Areas; desktop

**Collaborators:** DOFAW, USFWS, MFBRP

**Staffing requirements:** GIS specialist, bander, 6 seasonal field biologist for resighting MAPA & radio-tracking

**Field Season:** Year-round monitoring to obtain appropriate data

### **Details:**

1. Survival data are quite good for MAPA adults due to extensive re-sights and modeling in program MARK. We need more HY & SY birds marked so that they can be re-sighted.
2. Re-sights can be obtained in all months.
3. Age ratios may be evaluated as indices of recruitment and population growth.
4. Some experimentation with attraction to conspecific vocalizations may be monitored using radio-tagged birds.

### ***MODELING POPULATION VIABILITY IN MAUI PARROTBILL (MAPA)***

- Goal:** Estimate population viability of MAPA  
**Status:** Ongoing since 2004  
**Aims:** Estimate population viability of MAPA and compare models for doing so.

#### **2010 Key Tasks and Deliverables:**

1. Develop PVA models for Hanawi
2. Assess MAPA population viability and model variation and sources of variation.
3. Provide PVA estimates to partners

**Locations:** Hanawi NAR – HR3 & Frisbee Meadows Study Areas; desktop

**Collaborators:** DOFAW, USFWS, University of Washington, University of Kent

**Staffing requirements:** 4 staff per field trip (6-8 trips, Mar-June ). CDB for non-fieldwork.

HLM for models and collaboration on models. 2-6 interns summer/fall re-sights of offspring.

**Field Season:** Year round with peak fieldwork March-June, Aug-Nov. Evaluation periods in July and December, and training session in February.

#### **Details:**

1. For any model the quality of output depends on that of input. High quality survival data for Maui Parrotbill have been developed from years of mark-resight data collected by MFBRP and USGS and modeled in program MARK. Productivity data, however, are problematic. Mayfield estimates underestimate nest success when small numbers of unsuccessful pairs re-nest (successfully) but their nests are not found. Because begging fledglings are easier to locate than nests, using the proportion of pairs with fledglings may provide a better estimate of productivity than carefully monitoring fate of a few individual nests.
2. Vortex and other population viability models will be used to model parrotbill population dynamics under various scenarios related to genetic, demographic, and environmental stochasticity.
3. Expected to be part of Mounce Ph.D. and other team produced articles/presentations.

### ***Maui Parrotbill Genetic Diversity***

**Goals:** Determine genetic diversity of current population, inform the establishment of a second

**Status:** Samples have been collected since 2006

**Aims:** Use mtDNA and microsatellites to quantify historic and current genetic diversity

#### **Key Deliverables:**

Genetic data will be used to guide the future establishment of a second Maui Parrotbill population. Specifically, these data will guide the selection of birds for captive propagation or translocation such that the second population will be genetically representative of the donor population.

#### **Key Tasks:**

1. Contemporary samples will continue to be collected in the field (Hanawi NAR, Waikamoi and possibly Kipahulu)
2. Historical samples will be collected from 34 museum specimens
3. Microsatellite work to be done in the lab of Jim Groombridge at the University of Kent
4. Data analysis and write-up

**Locations:** Hanawi NAR, Waikamoi, Kipahulu, University of Kent

**Collaborators:** DOFAW, USFWS, PCSU, University of Kent, MBCC, KBCC

**2010 MFBRP Staffing requirements:** HLM ½ time; assistance from technicians and interns throughout their normal field schedule

#### **Details:**

1. Samples to be collected from museum specimens in Oahu, California and Washington, D.C. 2010
2. Samples to be collected from all captive stock in 2010.
3. Currently, an archive of genetic samples already exists at DICE and further routine sampling is ongoing.
4. A suite of avian microsatellite markers that amplify successfully in Maui Parrotbill have already been identified and will be used alongside mtDNA control region sequence data.
5. Hanna Mounce using data for PhD.

## ***MAUI PARROTBILL (MAPA) SIGHTINGS DATABASE***

**Goal:** Increase density/distribution data.

**Status:** Implemented Spring 2009

**Aim:** Create geospatial database of MAPA sightings on east Maui including reliable historical sightings obtained by others. Rank credibility.

### **Key Deliverables:**

1. Standard protocol for MAPA sightings and GIS data management, including standardized summary statistics and spatial information
2. Integrate Access database with GIS to retain information on:
  - i. Survey effort, dates, and personnel
  - ii. Key results including MAPA locations and detections/effort
  - iii. Historical records of MAPA on Maui
3. Summary publication

### **Key Tasks:**

1. Create database compiling all historical MAPA detections on Maui.
2. Collect and collate previous information of MAPA detections with collaborators such as TNC and Haleakala (HALE) National Park.
3. Create standard protocol for storing MAPA spatial information, and linking associate data with locations and GIS file
4. Create GIS layers covering a) survey effort, b) MAPA locations and c) yearly layers

**Locations:** Desktop, Olinda Rd. Office

**Collaborators:** MFBRP, TNC, USGS, DOFAW, Haleakala NP

### **Staffing requirements:**

- GIS Database management by KJI with input from Sam Aruch, CDB & HLM.

## ***ANALYSIS OF MAPA AND MACR HOMERANGE SIZE AND VARIABILITY***

**Goal:** Estimate area use and need to inform establishment of additional populations

**Status:** Ongoing since 1997

**Aim:** Map resights of MAPA and MACR to investigate individual variation in home range size and fluctuation between years and study sites. Create metadata file that can relate home range with habitat, age, and sex.

### **Key Deliverables:**

1. Visual understanding of home range for two species of concern within core habitat.
2. Will aid in identifying trends in homerange size and yearly fluctuation as they relate to factors such as pair reproductivity, habitat density and make up, density of heterospecifics occupying similar niches, age class, and sex class.
3. Publication or HCC presentation - KJI

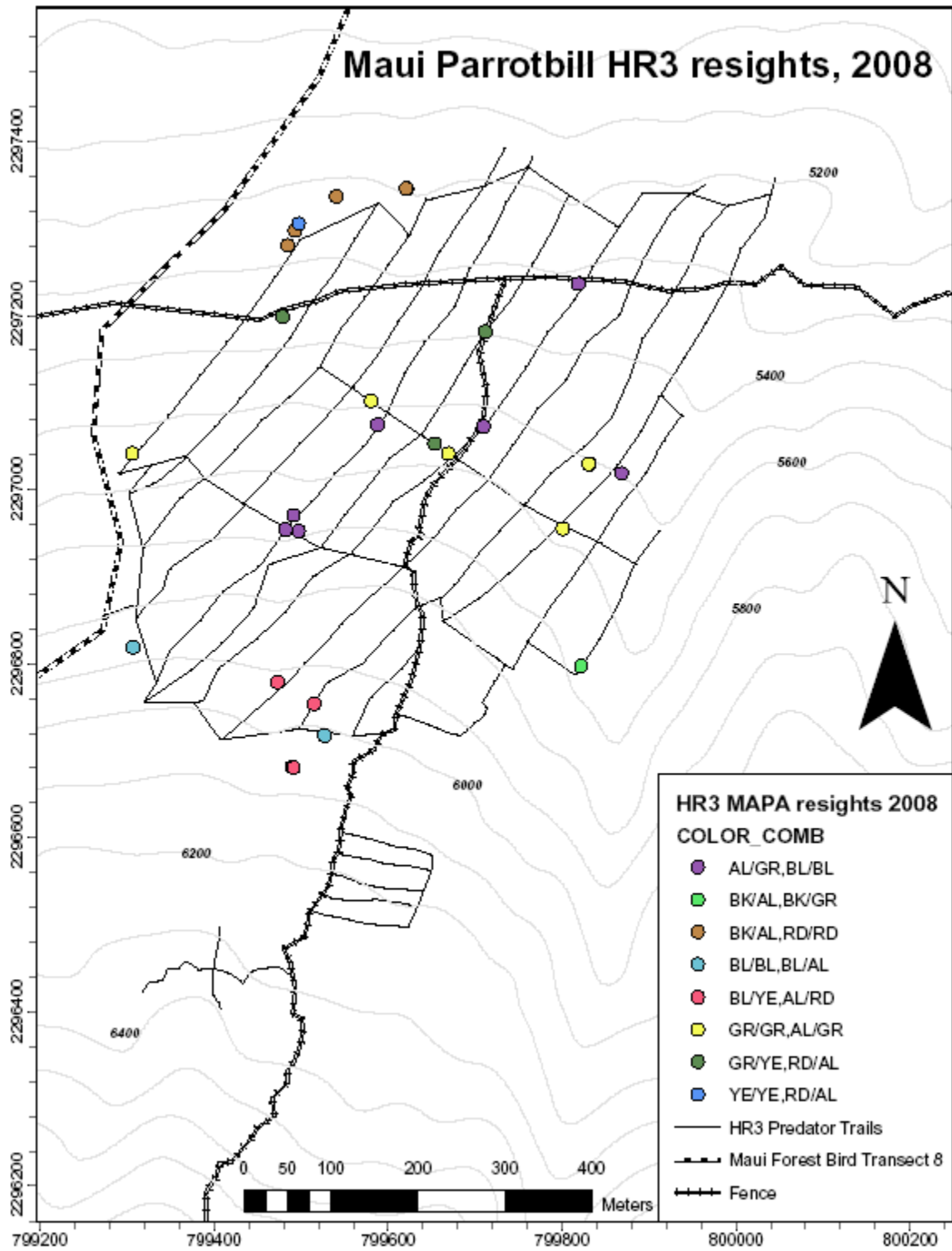
### **Key Tasks:**

1. Finish creating homerange polygons for MACR and MAPA in HR3 and Frisbee study areas using only birds with a sufficient number of well-distributed resights.
2. Finish creating metadata files including total homerange area and approximate fluctuation of persistently resighted birds in between years.
3. Use JMP 8 to interpret trends.
4. Continue resight effort in HR3 and FSB

**Locations:** Hanawi NAR; possibility to add other study sites later

**Collaborators:** Natural Resource Data Solutions (Sam Aruch)

**MFBRP staffing requirements:** 1 GIS specialist, 1 staff, 6 seasonal field biologists



Example of 2008 analysis of MAPA resights in HR3

## **ASSESSING POTENTIAL CLIMATE CHANGE IMPACTS ON NUMBERS OF MAUI PARROTBILL**

**Goal:** Inform agencies and NGOs involved in habitat restoration efforts

**Status:** Initiated March 2009

**Aim:** Use GIS techniques to model effects of climate change on MAPA numbers

### **Key Deliverables:**

1. Geospatial model of climate change effects on the future of MAPA habitat
2. Predictions of the MAPA's population size due to habitat loss
3. HCC poster – completed July 2009 (R. L. Hammond)
4. Pacific Conservation Biology paper - in progress

### **Key Tasks:**

1. Spatial analysis of current MAPA range
2. Spatial analysis of current MAPA homerange size
3. Construct model using ArcMap 9.2 to portray change in quantity of suitable (malaria-free) forest habitat as a result of global warming.
4. Incorporate other characteristics of MAPA biology that may be effected by use of this model

**Locations:** Current MAPA range

**Collaborators:** TNC, NARS

**MFBRP staff requirements:** GIS specialist, Project Coordinator

### **Details:**

1. Ruby Hammond completed a poster for HCC July 2009 based on this framework.



## ESTABLISHING A SECOND POPULATION OF MAUI PARROTBILL (MAPA) -

### BACKGROUND

Conservation planning and delisting criteria for Maui Parrotbill are described in detail in the USFWS Recovery Plan for Hawaiian Forest Birds (2006). To secure Maui Parrotbill, another population must be established. Currently, MAPA are restricted to a single, small population that occupies sub-optimal habitat. Restoration of koa forest on leeward east Maui and establishing a second parrotbill population are essential recovery actions

A portion of their current range (Hanawi Natural Area – 2,950 ha) is fenced, ungulate free, and rat controlled, despite this, reproductive output is still low and is likely a function of extreme weather. According to the USFWS Recovery Plan for Hawaiian Forest Birds, habitat restoration and re-establishment of a population of parrotbill on the leeward side of east Maui is needed to reduce extinction risk. The restoration of native koa forest to this region is key to the establishment of a second population. This area holds great promise for parrotbill and other honeycreepers as mosquitoes are rare even at low elevations because of the porous nature of the substrate.

Unfortunately, most of the koa forest has been severely degraded by ungulates. Fencing is the first step to restoring this area, and the Hawai'i Division of Forestry and Wildlife, the Leeward Haleakala Watershed Restoration Partnership, and Living Indigenous Forest Ecosystems, a native Hawaiian group, are currently building or planning to build fences in this area. All existing or planned fences tie into the fence enclosing Haleakala National Park (Fig. 3). To date 4.9 km of fence has been built. Completing the next two segments of fencing (13 km) will secure 2,360 ha and cost between \$850,000 and \$1.06 million (yrs 1 - 2). Eradication of ungulates from this exclosure will cost between \$120 and \$150 per ha (\$283,200 to \$354,000; yrs 3 - 4). Planting of koa and other parrotbill food plants will follow the methods developed by the Leeward Haleakala Watershed Restoration Partnership and cost between \$125 and \$750 per ha (yrs 2 – 5). Once restored, this area could double the current population. Restoration costs vary by such a wide margin because some areas will require extensive efforts, while others will require minimum restoration.

Although forest in much of the area is badly degraded and will require long-term restoration efforts, the area is characterized by large gulches with protected pockets of native vegetation (Fig. 4). These refuges provide enough habitat to serve as experimental release sites for Maui Parrotbill. Toward this goal, increasing the size of the captive Maui Parrotbill flock managed by the Zoological Society of San Diego will be necessary to ensure that

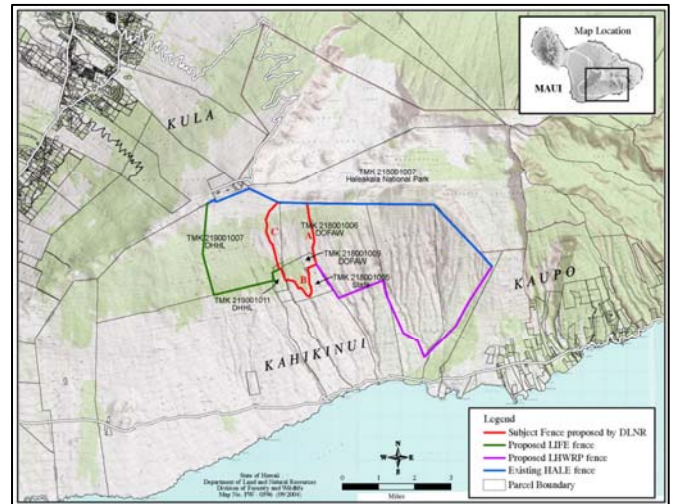


Figure 3. Proposed and actual fence lines on leeward east



Figure 4. Looking toward the ocean from the top of Kahikinui. Note mature forest in gulch.

enough birds are available for release. Currently there are 12 birds in captivity but successful breeding has been poor. Additional birds, infrastructure, and staff are needed to increase production. Bringing additional eggs or birds into captivity and having dedicated staff will require \$50,000 per annum over the next five years (yrs 1 - 5). Finally, \$100,000 per annum over 8 years (yrs 3 - 10) would be needed to support the development of release protocols, pre-release reconnaissance trips, release efforts, and monitoring efforts.

**Table 1.** Specific conservation actions for the Maui Parrotbill.

Task	Years	Minimum Total Cost	Maximum Total Cost
Fencing	1 - 2	\$850,000	\$1,060,000
Ungulate Removal	3 - 4	\$283,200	\$354,000
Habitat Restoration	2 - 5	\$295,000	\$1,770,000
Captive Flock Management	1 - 5	\$250,000	\$250,000
Release Efforts	3 - 10	\$800,000	\$800,000
TOTAL		\$2,478,200	\$4,234,000

The restoration of Maui Parrotbill to leeward east Maui will take at least a decade. However, the Maui Parrotbill is one of two endangered birds with a USFWS priority rank of 1. This rank reflects the species' uniqueness (i.e., monotypic genus) and the fact that it is highly threatened with extinction but has a high potential for recovery. Unfortunately, funds allocated to this species to date have been relatively small. Between 1996 and 2004 the mean annual spending on the Maui Parrotbill was less than \$100,000 per year, far less than what is needed to re-establish a second population. For perspective, this area is only accessible by helicopter and per hour helicopter costs have increase by \$250 per hour over the last 2 years and now are \$1,000 per hour.

**Planning/Research Needs:** Research to fine-tune koa restoration methods and planning to ensure sufficient capacity for long-term restoration and monitoring are needed to maximize success of this project. Restoration planning will ensure efforts can proceed in conjunction with ungulate removal. Techniques for building the captive flock and release protocols will have to be developed.

**Potential Partners:** U.S. Fish and Wildlife Service, Living Indigenous Forest Ecosystems, Leeward Haleakala Watershed Restoration Partnership, the National Park Service, and the Zoological Society of San Diego would be important partners in this effort.

**Ancillary Species:** Fencing, ungulate eradication, and restoration of forest on leeward east Maui would benefit numerous native plants and invertebrates, and all native birds that currently occupy the area including `Apapane (*Himatione sanguinea*) and Amakihi (*Hemignathus virens*). It is unknown whether `iwi (*Vestiaria coccinea*) still persist on leeward east Maui, but restoration efforts would increase chances for natural recolonization by this highly-mobile species. Other species that that could be re-introduced to restored koa forest include the federally endangered `Akohekohe (*Plameria dolei*) and the Maui Creeper (*Paroreomyza montana*).

## DEVELOP PROTOCOL FOR TRANSLOCATION AND REINTRODUCTION OF MAPA TO KAHIKINUI

- Goal:** Assure well-planned and feasible establishment of second population
- Status:** Implemented - April 2009
- Aims:** Assist with design and testing of protocol for establishing a new Maui Parrotbill population on leeward Haleakala

### 2010 Key Tasks and Deliverables:

1. Visit and prioritize release sites at Kahikinui Forest Reserve (Figure 1, following page)
2. Select an experimental release site
3. Add MAPA to captive flock to improve breeding potential to provide birds for reintroduction
4. Assist with protocol & infrastructure for translocation and reintroduction
5. Potential poster or oral at a conference focusing on endangered species translocation

**Locations:** Hanawi NAR, Kahikinui Forest Reserve, MBCC

**Collaborators:** SDZS (San Diego Zoo)/DOFAW/USFWS/MFBRP

**Staffing requirements:** 2-3 staff per field trip (6 trips during FY10).

**Field Season:** Variable in response to fencing of experimental release site

### Details:

1. Kahikinui (see map on following page)
2. Site visit/fly-over resulted in selection of K1-5 as optimal release area.
3. Exclosure fence is to be made by connecting external fence
4. Access from farm roads below release needs to be explored and developed
5. Release caging needs to be built and positioned
6. Temporary camp site needs to be developed
7. Coordination with MBCC required to determine sex of MAPA needed in captive flock
8. Planning protocol during MAPA working group meeting June 17,2009

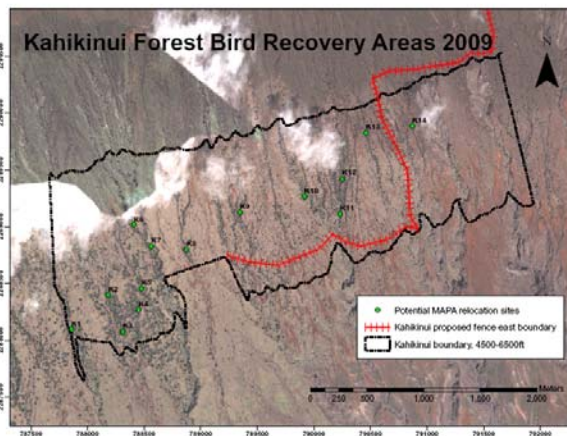


Figure 1. Air photo and GIS overlays showing Kahikinui recovery area proposed for MAPA reintroduction and translocations on leeward Haleakala volcano, east Maui. K2-5 are likely experimental sites.



## **IIWI TRANSLOCATION SUMMARY**

**Goal:** Publish data gathered from IIWI translocation efforts in 2001 and relate to future translocation effort for CHRO and MAPA.

**Status:** Fieldwork completed 2001. Data analysis and journal article in progress as of summer 2008.

**Aim:** Write a summary of previous fieldwork to inform future efforts in translocation

### **Key Deliverables:**

1. Journal article and/or white paper for DOFAW/USFWS

### **Key Tasks:**

1. Continue analysis of spatial data gathered on individual IIWI released post-translocation to West Maui.
2. Continue to investigate possible variables in movement patterns and survival of individual birds.
3. Determine pros and cons for hard release vs. soft

**Locations:** Data analysis at MFBRP.

**Collaborators:** Trent Malcom, Jamie Bruch, Christopher Brosius, Jim Groombridge, Gregory Massey

**MFBRP staff requirements:** GIS specialist, Project Coordinator

**Details:** According to the USFWS Revised Forest Bird Recovery Plan (2006) – “The suitability of West Maui and Molokai as release sites for translocated birds is questionable due to the presumed presence of avian diseases in these lower elevation areas”. Climate change will likely result in less disease free habitat on all Hawaiian islands.

## PREDATOR MANAGEMENT

### RODENT REDUCTION & PREDATOR CONTROL AT HANAWI

**Goal:** Reduce predation on native birds

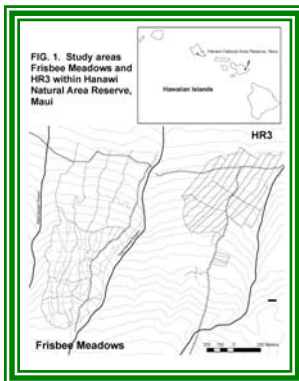
**Status:** Ongoing since August 2001

**Aims:** Maintain and possibly expand predator control grid at Hanawi

**Key Tasks & Deliverables:**

1. Maintain diphacinone bait stations and traps to reduce mammalian predators.
2. Produce bait reports to meet pesticide use regulations.
3. Maintain trap success records.
4. Maintain grid transects and bait sites, refresh tags, flagging, and other markers.
5. Outcome: probable reduction of nest predation for ESA forest bird species.
6. Peer-reviewed paper describing community level effects of rodent control (2010).
7. Maintain treatment for research and population management purposes.

**Location:** Hanawi – HR3 grid – 28 hectares



**Collaborators:** MFBRP/DOFAW/USFWS

**Staffing requirements:** 2-3 staff for 4 days every two-three months

**Details:**

1. Black rat (*Rattus rattus*) populations were effectively reduced by 99% using snap traps and diphacinone bait stations (Malcolm et al. 2008).
2. MFBRP are comparing densities and group sizes of Maui creeper (MACR) on the predator control with a control site with no rodent removal (potential poster or paper for HCC or island mgt. conference).

**Publication**

Malcolm TR, Swinnerton KJ, Groombridge JJ, Sparklin BD, Brosius CN, Vetter JP, Foster JT (2008) Ground-based rodent control in a remote Hawaiian rainforest on Maui Pacific Conservation Biology 14:206-214.

## **MAUI PARROTBILL/ ALAUAHIO FEEDER EXPERIMENTS**

**Goal:** Improve nest success during inclement weather and improve survival of translocated or released birds.

**Status:** To implement winter/spring 2010

**Aims:** Investigate whether Maui Parrotbill will use feeding stations.

### **Key Deliverables:**

1. Determining whether or not we can assist birds in getting through the tough weather times with food supplementation
2. Identify a feeding station design that will be appealing for supplementing birds moved or released to new areas

### **Key Tasks:**

1. Locate Maui Parrotbill nests through the regular breeding season
2. Sort out what we can feed MAPA that they will recognize as a prey item and yet will not become invasive in the environment
3. Install a variety of feeding stations in trees surrounding nest sites and monitor for any bird use/visits

**Locations:** Hanawi NAR

**Collaborators:** DOFAW, USFWS, MBCC, KBCC

**2010 MFBRP Staffing requirements:** normal field season staffing

**Details:**

## **DISEASE MONITORING IN NATIVE FOREST BIRDS**

Climate change models for the Hawaiian Islands suggest that average ambient temperature will rise by 2° C during the 21<sup>st</sup> century. Mosquitoes now relegated to relatively warm elevations below 5000 ft will presumably move to higher ground and bring avian malaria and pox with them. This could prove devastating for native bird species that have not evolved resistance to the disease. Rates of malaria and pox infection and evidence of resistance in bird populations are important baseline variables to measure. Resistance is predicted to evolve at mid-elevations.

### **MALARIA INFECTION RATES IN MAUI'S FOREST BIRDS**

**Goal:** Monitor malaria infection rates in forest bird populations in order to detect increasing or decreasing trends or differences in levels at similar elevations across east Maui

**Status:** Techniques to be piloted spring 2009 and fully implemented in 2010

**Key Deliverables:** Data on malaria infection rates.

#### **Key Tasks:**

1. Collect blood smears during all banding operations
2. Learn to process smears and read them.
3. Establish database and link it to previous data on malaria

**Locations:** Hanawi NAR, Waikamoi Preserve (possibly Kipahulu and PoliPoli State Park)

**Collaborators:** DOFAW/MFBRP/PCSU/USGS BRD (Carter Atkinson)

**2010 MFBRP Staffing requirements:** HLM to complete smear collections; 1-2 technicians during the summer (3-4 weeks) to look at samples; assistance from other staff and technicians in the field as needed

#### **Details:**

1. Staff to get training in smear prep and reading from Carter Atkinson
2. In comparison with other techniques (PCR, plasma) smears offer the lowest level of detection probability. Still such screening may provide impetus for more in depth monitoring and reveal elevational shifts in malaria.

## **COMMUNITY ECOLOGY: DIET OVERLAP ANALYSIS IN FOREST BIRDS & INSECT AVAILABILITY**

**Goal:** Document degree of diet overlap in insectivorous forest birds in Hanawi

**Status:** Sample collection ongoing since 2007; lab work ongoing since 2008

**Aims:** To identify key prey items for Maui Parrotbill and 'Alauahio through fecal sample analysis and to describe overlap in prey items between MAPA and MACR and Japanese Bush Warblers & White-eyes. To quantify types and amounts of insects available across forest types on Maui.

### **Key Deliverables:**

1. Description of Maui Parrotbill and Maui 'Alauahio diet overlap in wet and mesic forests
2. Description of dietary overlap with alien bird species
3. Correlate prey preferences with availability in the environment and bird densities
4. Identification of plant hosts for prey to direct priorities for leeward restoration efforts
5. Conference poster presentation (2010)
6. Peer reviewed manuscript (2011)

### **Key Tasks:**

1. Collection of fecal samples during all banding efforts for MAPA, MACR and JABW (additional species may be collected as well for future use as convenient)
2. Sorting fecal samples and pulling out all invertebrate parts to be sent for identification and training of technicians and interns to complete
3. Invert part ID to be done by Bob Peck's USGS lab in Volcano
4. Collection of invertebrates opportunistically in the field for invertebrate reference collection
5. Collection of invertebrates using a standardized method at Hanawi, Kahikinui, and Waikamoi
5. Data Entry, Data analysis and Write-up

**Locations:** Hanawi NAR, Waikamoi Preserve (possibly Kipahulu and PoliPoli State Park)

**Collaborators:** DOFAW/MFBRP/PCSU/USGS BRD/MCC – Bob Peck & Paul Banko

**2010 MFBRP Staffing requirements:** HLM supervising, techs complete fecal sample collections; 1-2 technicians during the summer (3-4 weeks) sort samples; assistance from other staff and technicians in the field as needed.

### **Details:**

1. MFBRP needs to set-up lab at Olinda office to pre-sort samples. Samples may be sorted at the Maui Community College until we have all the materials we need.
2. Samples collected before 2009 have already been sorted and are awaiting identification by the USGS lab
3. Also to be used in analysis are samples collected by Thane Pratt et al. from Hanawi NAR before 2000.



## **COMMUNITY ECOLOGY: RESPONSE OF MAUI `ALAUAHIO (MACR) TO RODENT REDUCTION**

**Goal:** To inform decision makers of the importance of rodent control for conservation of endangered forest birds.

**Status:** Implemented February 2009

**Aims:** Use MACR numbers as a proxy for benefit to MAPA

1. Determine if rodent reduction enhances numbers of MACR
2. Use density, encounter rates, and group size frequencies as response variables to three treatments: predator removal grid (edges, center) and control area (FSB study area).
3. Reevaluate site specific survival for MACR (HR3 vs. FSB)

### **Key Tasks and Deliverables:**

1. Conference presentation (2010)
2. Peer reviewed manuscript (2011)
3. Mgt. Information for DOFAW/USFWS ESA recovery planning for Maui's ESA forest birds.

**Locations:** Hanawi – HR3 & FSB

**Collaborators:** DOFAW/MFBRP/PCSU

**Staffing requirements:** Normal spring breeding season team – 6-8 techs & core staff visits

### **MFBRP Major Tasks:**

1. Training for new staff (Feb/Mar 2010)
2. Maintenance of predator control grid in HR3 (bi-monthly or tri-monthly as needed)
3. Transects – 50 edge of grid, 50 central grid, 50 control
4. Data entry
5. Data analysis
6. Write-up

### **Details:**

1. Biological data collected will help assess benefits to an insectivorous bird (MACR), a proxy for Maui parrotbill (which are too scarce to sample adequately for statistical purposes). These data are useful for making management decisions on rodent control efforts for conservation of endangered forest birds.
2. Data are collected during spring monitoring of breeding success of Maui parrotbill.
3. These data can be collected in other parts of the year, as well.

## **COMMUNITY ECOLOGY: VARIABLE CIRCULAR PLOT (VCP) COUNTS OF FOREST BIRDS AT HANAWI**

- Goal:** Improve information on relative abundance and density of ESA forest birds.
- Status:** Fieldwork implemented March 2009
- Aims:**
1. Compare and describe bird communities, especially densities of ESA forest birds on a predator removal grid and a control area in Hanawi NAR
  2. Compare VCP counts between FSB control site to 1995-97 study (Simon et al. 2002) to monitor change over time.

**Key Deliverables:** Peer reviewed manuscript (2011-12) & management evaluation

### **Key Tasks:**

1. Fieldwork: Complete 40 VCP counts in triplicate each field season
2. Maintain transects and stations
3. Input and evaluate data

**Locations:** Hanawi NAR

**Collaborators:** MFBRP/DOFAW/USGS

**MFBRP staffing requirements:** 4 techs during Hanawi spring monitoring season, 2 mornings/month/site (HR3 & FSB)

### **MFBRP Major Tasks:**

1. Training of field crews in VCP count techniques (March 2010)
2. Clearing transects and marking stations
3. Triplicate data collection (Feb-May)
4. Data entry and analysis
5. Data sharing with USGS
6. Evaluation of impacts of predator control on avian community structure and densities

### **Literature Cited:**

Simon, J.C., T. K. Pratt, K. E. Berlin, J. R. Kowalsky, S. G. Fancy, & J. S. Hatfield. 2002. Temporal variation in bird counts within a Hawaiian rainforest. *The Condor* 104:469-481.

## **OUTREACH, ENVIRONMENTAL EDUCATION, & OTHER MFBRP ACTIVITIES**

### ***Rare Bird Searches (Citizen Science)***

**Goal:** Enhance awareness of Maui's native forest birds with a volunteer program

**Status:** Proposed for Fall 2009 and onwards

**Aim:** Determine presence-absence patterns for Maui Parrotbill and Akohekohe and relate to forest characteristics (% koa, ohia, distance to edge, understory, snags, etc. )

#### **Key deliverables:**

1. Enhanced local awareness about Maui's ESA native forest birds
2. Assessment of distribution and relative abundance of ESA forest birds on east Maui
3. Sufficient monitoring effort to detect evidence of breeding.
4. Interactive portal on website.
5. Poster at HCC (2011)

#### **Key tasks:**

1. Develop field protocol that are easy to do with volunteers
2. Train intern leader and citizen volunteer leader
3. Train and accommodate citizen scientists
4. Create database and link it with GIS records
5. General public outreach (press release)
6. Scientific community outreach (conference poster, paper?)

**Locations:** Waikamoi Preserve

**Collaborators:** TNC, Haleakala NP, MFBRP, DOFAW

**MFBRP Staffing requirements:** 2 interns & 2 staff part-time(CDB, KJI) – Fall 2009/10

**MFBRP Major Tasks:** Staff allocation and scheduling

#### **Details:**

- Distribution and abundance of MAPA and CRHO is poorly monitored outside of Hanawi NAR. There are no standardized survey efforts for ESA forest birds beyond the Hawaiian Forest Bird Survey which is done infrequently (every 5 years).
- Waikamoi is ideal for citizen science as it is accessible by vehicle and has numerous trails suitable for surveying habitat features and bird occurrences.

### ***Other MFBRP FY 2010 Events and Activities***

During FY 2010 we hope to assist other HI conservation programs and gain new insight and experience in other techniques and protocols. These include:

1. **Shearwater banding:** Assist Jay Penniman and Fern Duvall with adult and chick banding in April and October
2. **Forest restoration on leeward east Maui:** assist LHWRP in planting activities whenever possible - volunteering
3. **Hawaiian Forest Birds Survey on Maui:** Assist with VCP counts and preparation of transects
4. **Palila Surveys:** Assist with annual population surveys on the Big Island as needed
5. **Kauai:** assist with bird related conservation as needed
6. **DOFAW:** Assist with bird-related projects as needed

We will also focus on:

7. **Training:** undertake training where appropriate, including first aid, toxin applicators course, GIS, and firearm training.
8. **Conferences:** attend Hawaii Conservation Conference (July) and other appropriate meetings.
9. **Fundraising**– Flatbread, Earthday booth, Library Exhibit, and establish annual It's for the Birds pre-Christmas fund-raiser. Search for additional grants.
10. **Outreach** – Citizen Science, Waikamoi bird watches, Resort talks (Maui county funding)
11. **Working Group Meetings** – contribute to MAPA Working Group meetings
12. **Internships** – provide internships when possible
13. **Administration:**
  - a. Manage budgets, hiring and purchasing through PCSU / RCUH
  - b. Maintain non-profit relationship via Tri-Isle RC & DC, Inc.
  - c. Host interns via Americorps and UH-Hilo
  - d. Develop volunteer options

### **Acknowledgements**

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*Putting away Extinct birds at Bishop Museum.*