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March 31, 1999

Mr. Gary Gill, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawai`i 96813

Dear ~~Mr. Gill~~: Gary

Subject: Finding of No Significant Impact (FONSI) for the joint Federal and State Environmental Assessment for the "Possible Management Actions to Save the Po`ouli", TMK 1-2-04-05 and TMK 1-2-04-07, Ko`olau Forest Reserve, Maui, Hawai`i.

The Hawai`i Department of Land and Natural Resources has reviewed the comments received during the 30-day public comment period which began on September 8, 1998. The agency has determined that this project will not have significant environmental effects and has issued a FONSI. Please publish this notice in the April 23, 1999 OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form and four copies of the final EA. Please call me at 587-0166 if you have any questions.

Sincerely yours,

Michael G. Buck
Administrator

cc: Robert Smith, USFWS
Paul Conry, DOFAW HNL
Wes Wong, DOFAW Maui

1999-04-23-MA-FEA-Poouli Management Action Plan

Environmental Assessment

for

Proposed Management Actions to Save the Po`ouli

Maui County, Hawaii

P. Baker – USGS-BRD

State of Hawaii

Department of Land and Natural Resources

United States Department of the Interior

Fish and Wildlife Service

April 1999

PROPOSED MANAGEMENT ACTIONS TO SAVE THE PO`OULI

Melamprosops phaeosoma

ENVIRONMENTAL ASSESSMENT

ENVIRONMENTAL ASSESSMENT

Proposed Management Actions to
Save the Po`ouli
Melamprosops phaeosoma

Prepared by:

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Pacific Islands Ecoregion
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Hawai`i Department of Land and
Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Rm. 325
Honolulu, Hawaii 96813

Authorities for Action:
NATIONAL ENVIRONMENTAL POLICY ACT OF 1969
U.S. ENDANGERED SPECIES ACT OF 1973, as amended
HAWAI`I ENVIRONMENTAL IMPACT STATEMENT LAW (HRS Chapter 343)
HAWAI`I ENDANGERED SPECIES LAW (HRS 195D)

April 1999

Summary Information

Proposed Action:	Po'ouli (*Melamprosops phaeosoma*) Recovery Actions
Applicant:	Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) 1151 Punchbowl Street, Room 325 Honolulu, Hawai'i 96813 United States Department of the Interior (USDI) U.S. Fish and Wildlife Service (USFWS) Pacific Islands Fish and Wildlife Office 300 Ala Moana Blvd., Room 3-122 Honolulu, Hawai'i 96850
Location:	Hanawī Natural Area Reserve Hāna District, Maui, Hawai'i (TMKs 1-2-04, 05 and 07)
Land Owner:	State of Hawai'i, Dept. Land and Natural Resources
Land Use Classification:	State Conservation District, Protective Subzone
Special Designation:	Natural Area Reserve
Determination:	Finding Of No Significant Impact
Approving Agencies:	Department of Land & Natural Resources and USDI, U.S. Fish & Wildlife Service
Permits Required:	Federal Endangered Species Permit DLNR Natural Area Reserve Special Use Permit (pending)

Executive Summary

In an effort to prevent the extinction of the Po'ouli (*Melamprosops phaeosoma*), an endangered Hawaiian forest bird, the U.S. Fish and Wildlife Service (USFWS) and State of Hawai'i Department of Land and Natural Resources (DLNR) are proposing to implement intensive habitat management and to conduct a translocation(s) with one or more individuals of this species. This endemic bird occurs in a restricted area of rain forest on the island of Maui. Since its recent discovery in 1973, its numbers have declined and the total population may presently be no more than three individuals. The USFWS and DLNR prepared and circulated a Draft Environmental Assessment (DEA) for review and comment by interested parties. This Final Environmental Assessment (EA) presents a historical review of the Po'ouli, conservation efforts that have been implemented to protect the species, a range of management alternatives that were outlined in the DEA, and the reasoning for the selection of the proposed action (preferred alternatives).

The proposed action will be conducted in the Hanawī Natural Area Reserve (NAR) and possibly portions of Haleakalā National Park and adjacent State forest reserves. The 3,035 hectare (500 acres) Hanawī NAR lies within the Ko'olau Forest Reserve in the Hāna District of Maui. All action areas discussed in this EA are zoned conservation.

Six alternatives were presented in the DEA and interested parties were provided copies on which they could provide comments and suggestions. Based on comments by these reviewers and in-house review by the DLNR and USFWS, a hybrid alternative based on Alternatives 1 (No Action) and Alternative 2 was selected. This action proposes that the agencies continue conducting and intensify habitat management to reduce or eliminate threats to the birds that occur in the action area and, if necessary and feasible, conduct "hard release" translocations in an attempt to establish a breeding pair. This preferred alternative (the proposed Action) was primarily selected based on the following factors:

- Intensified and expanded habitat management will provide protection for known birds surviving in the wild and aid any other Po'ouli that may occur or move through the area. The intensified habitat management will include expansion of ungulate control efforts, expansion of ground based predator control, potential control of harmful alien birds, expanded searches for additional Po'ouli, and continued monitoring of wild birds for nesting activity. If nesting is detected, eggs will be brought in for artificial incubation and rearing. This expanded habitat management, combined with the possible use of translocation, is believed by these agencies to be most likely to result in recovery of the Po'ouli in the wild.

- Intensified habitat management would provide the most good for the most species. Given that the Po'ouli shares its habitat with no less than two other endangered forest birds and numerous rare and endangered plants, all of which suffer from many of the same threats, habitat management would promote the protection and recovery of numerous species.

- If, after further surveys and monitoring, it is concluded that pairing of birds under current, natural conditions is unlikely, translocation and "introduction" should be conducted in an attempt to form a breeding pair. Prior to a translocation, additional efforts may be made to confirm the sexes of the birds to be translocated. In addition, translocation techniques will be tested with surrogate species prior to their use with Po`ouli.

- Bringing adult birds into captivity from the wild for attempted propagation stands a large chance of failure and death to the birds due to handling and associated stress and difficulties in caring for insectivorous birds in captivity. This was deemed to be unacceptable as there are only three known individuals of this species and the loss of one or two of them would result in their extinction.

- The location and capture of multiple Po`ouli would be time consuming and unpredictable. This factor alone would make capture of the birds, necessary for the captive breeding alternatives, undependable, postponing the captive breeding alternatives indefinitely.

- The construction and maintenance of a temporary field aviary(ies), along with the necessary staff, would be expensive and difficult to maintain at the remote, primitive location.

Agency Determination

The Department of Land and Natural Resources, Division of Forestry and Wildlife and the U.S. Department of the Interior, Fish and Wildlife Service, have reviewed the proposed actions and have assessed impacts to the physical, social, economic, and biological environments. No long term significant negative impacts are anticipated from the proposed project. The proposed actions to protect the known Po`ouli and to protect and manage habitat for the recovery of the Po`ouli and other native birds will result in benefits to the entire native biotic community over the long term. The proposed project has the potential to create new permanent and temporary trails and establish or spread weeds. Mitigative actions included in the proposed project will include monitoring for and elimination of incipient populations of weeds. Capture and translocation of Po`ouli has the potential to harm this species and other endangered birds inadvertently captured in the mist nets. Biologists involved in these activities will be properly trained and use established banding protocols. Surrogate species will be used to test translocation techniques prior to translocation attempts with Po`ouli. Known or newly discovered endangered plants will be flagged and avoided during mist netting and other habitat management field work. The proposed project is not expected to cause significant negative impacts to the environment, pursuant to the significance criteria established by the Environmental Council (Hawai`i Administrative Rules, Section 11-200-12); therefore, the determination of the Department of Land and Natural Resources, Division of Forestry and Wildlife and the U.S. Department of the Interior, Fish and Wildlife Service is to issue a Finding of No Significant Impact.

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1 Chapter 1. Need for and Purpose of the Action

1.1 The Proposed Action

The State Division of Forestry and Wildlife (DOFAW) and the U.S. Fish and Wildlife Service (USFWS) are proposing that ongoing conservation efforts to prevent the extinction and reverse the decline of the endangered Po`ouli (*Melamprosops phaeosoma*) be directed toward intensified habitat management. Additional conservation efforts will be directed at establishing a breeding pair of birds in the wild by translocation of one or more, wild adult(s) to the home range of a conspecific, likely a single female to the home range of a male. The latter action will be conducted only after more information is gathered regarding the feasibility of success of such a translocation using a surrogate species and only if the wild birds fail to form breeding pairs on their own. This Environmental Assessment (EA) analyzes a number of alternatives that were considered in a preceding draft Environmental Assessment (DEA) and provides justification for the selection of the proposed action and the rejection of the alternative actions.

1.2 Need for the Proposed Action

Only three Po`ouli are known to currently exist in a very narrow stretch of native forest on the windward slope of Haleakalā Volcano. within Hanawī Natural Area Reserve and Haleakalā National Park. Since the species' discovery in 1973, the Po`ouli's population has declined drastically. The best data available indicates that the home ranges of the remaining birds do not overlap and the individuals have not been observed interacting with one another. Although there remains a chance that other Po`ouli exist, the USFWS and DOFAW need to undertake actions as soon as possible to prevent further loss of the three known individual Po`ouli and promote successful reproduction of the species.

1.3 Purpose of the Proposed Action

The purpose of the action is to prevent the continued decline of the Po`ouli population in the wild. This will be done by removing or reducing non-natural sources of mortality in areas where Po`ouli are known or suspected to be present and assisting in the formation of at least one reproductive pair if pairing does not occur naturally. It is hoped that implementation of these actions will prevent the imminent extinction of this species and reverse the population decline.

1.4 Description of the Proposed Action

DOFAW and the USFWS are proposing to intensify habitat management within the Hanawī Natural Area Reserve (NAR) and adjacent areas where Po`ouli are known or suspected to occur. DOFAW and USFWS further propose that translocation of Po`ouli be attempted if further investigation determines that the birds are not pairing on their own and that this action has a low probability of resulting in the death of any Po`ouli.

Intensified habitat management will include those actions that have successfully been used in the past to protect or restore native forest habitats in Hawai`i. These actions include: expansion of ungulate control efforts through continued and increased fencing of habitat areas that are known or suspected to be appropriate habitat for the Po`ouli and removal of feral ungulates (e.g., pigs) from those fenced units; an expanded, on the ground, predator control program that focuses on the removal of alien predators (e.g., rodents, mongooses, cats); and monitoring and removal of invasive alien plants. In addition to habitat management actions, a number of research projects will be conducted that will address the biology of the Po`ouli and other endangered birds as well as investigate the impacts of selected alien taxa on the native biota in the area. These projects *include, but are not limited to:* studies on the impacts of alien passerines to native birds; behavioral and telemetry studies with other native forest birds within the action area; avian disease monitoring; and research to promote the broad-scale use of rodenticides, which may include aerial broadcast methods (not currently registered for use in forested areas in Hawai`i and would require regulatory agency approvals).

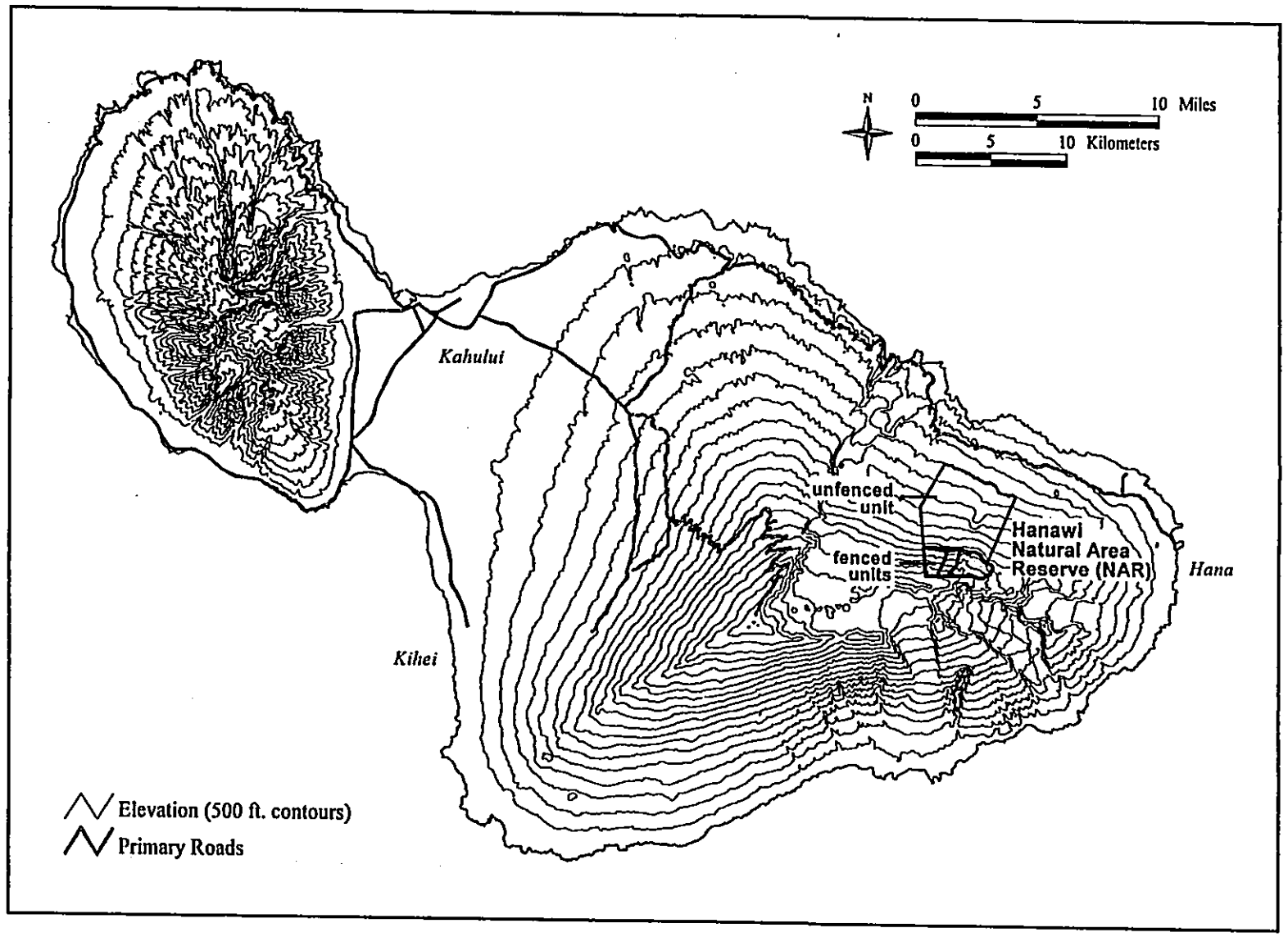
Translocation of a Po`ouli from its home range to the home range of a conspecific of opposite sex will be investigated and carried out if this option is deemed necessary and feasible. Feasibility should include factors such as: capture and transport that will minimize the possibility of death or injury to Po`ouli, and relatively high assurance that birds of opposite sex can be "introduced" within the home range of one of the two birds.

1.5 The Project Area

The proposed action will take place in the Hanawī NAR, but may also include portions of Haleakalā National Park, Ko`olau Forest Reserve, and Hāna Forest Reserve. The 3,035-hectare (ha) (7,500-acre (ac)) Hanawī NAR lies within the Ko`olau Forest Reserve in the Hāna District of Maui (Figure 1). Elevation within Hanawī NAR ranges from 610 meters (m) (2,000 feet (ft)) above Nāhiku to 2,287 m (7,500 ft) on the slopes of Haleakalā. The Po`ouli currently exists in a 121 ha (299 ac) area between 2,037 m (6,680 ft) and 1,585 m (5,200 ft) elevation.

Hanawī NAR provides habitat for the largest number and highest density of endangered forest birds in the State, and provides a habitat link between the Haleakalā National Park (HALE NP) on its southern border and the Ko`olau Forest Reserve on its eastern and western borders (DLNR 1988).

Figure 1
Hanawi Natural Area Reserve (NAR)
Fenced and Unfenced Units



1.6 Related Agency Actions

1.6.1 U.S. Fish and Wildlife Service Activities in the Hanawī NAR and Environs

From 1980 to 1986 the USFWS Research Division (now the Biological Resource Division of the U.S. Geological Survey, BRD) periodically conducted research in the Hanawī area, which resulted in life history information concerning the Maui Parrotbill (*Psuedonestor xanthophrys*) (Mountainspring 1987) and Po`ouli (Mountainspring *et al.* 1990; Kepler *et al.* 1996).

From 1985 to 1994, the USFWS provided $370,000 in Federal funds to the State of Hawai`i and National Park Service to cover a portion of the costs for fencing units within Hanawī NAR and removing pigs from within the units. In 1993, the USFWS entered into a cooperative recovery project with DLNR, the National Biological Survey (NBS) (now BRD), and The Nature Conservancy of Hawai`i (TNCH) to conduct field studies of endangered forest birds on Maui. The three species targeted for this four-year project were `Ākohekohe (*Palmeria dolei*), Maui Parrotbill, and the Po`ouli. From 1994 to 1997, the USFWS provided $277,000 to BRD to conduct these field studies in Hanawī. With the confirmation of the continued existence of the Po`ouli in 1994, a second field effort was initiated by the USFWS, DLNR, BRD, and TNCH. From 1995 to the present, the USFWS and DLNR have provided $602,200 ($542,200 USFWS and $60,000 DLNR) to BRD and DOFAW for the field effort to locate and monitor all remaining Po`ouli, conduct predator control, and continue weed and ungulate removal activities in Hanawī NAR.

The USFWS also provides Federal funds to the State of Hawai`i for the protection and recovery of endangered and threatened species under the provisions of Section 6 of the Endangered Species Act (ESA). In addition, the USFWS administers the appropriation of Federal funds from the Pittman-Robertson Federal Aid to Wildlife Restoration program. These funds, derived from a Federal excise tax on the manufacture of arms and ammunition, are apportioned to the State Department of Land and Natural Resources for use in game management and other wildlife programs. The Pittman-Robertson funds have been used for annual forest bird surveys in the State of Hawai`i, including the 1980 and 1992 Maui Forest Bird Surveys and part of the additional surveys conducted between July 1997 and August 1998.

1.6.2 Research activities in the Hanawī NAR and Environs

From 1994 to 1997 BRD conducted field studies in Hanawī NAR to ascertain the status of the Po`ouli, `Ākohekohe, and Maui Parrotbill; identify limiting factors, and collect basic information on these species' breeding biology, foraging ecology, and movements. In 1995 BRD initiated a second project in Hanawī NAR specifically aimed at the Po`ouli, Maui Nukupu`u (*Hemignathus lucidus affinus*), and Maui `Ākepa (*Loxops coccineus ochraceus*). The objective of this project was to continue monitoring the individual Po`ouli that had been relocated, search all likely habitat to locate additional Po`ouli and individuals of the Nukupu`u and Maui `Ākepa, identify limiting factors, and

conduct predator control. This project was later transferred to the direction of DOFAW and remains under the direction of this agency. Other research activities in the NAR include ongoing plant and invertebrate studies conducted by a variety of researchers. The NARS Commission within DLNR approves entrance into the NAR for research activities, including scientific collection.

1.6.3 Natural Resource Management in Hanawī NAR

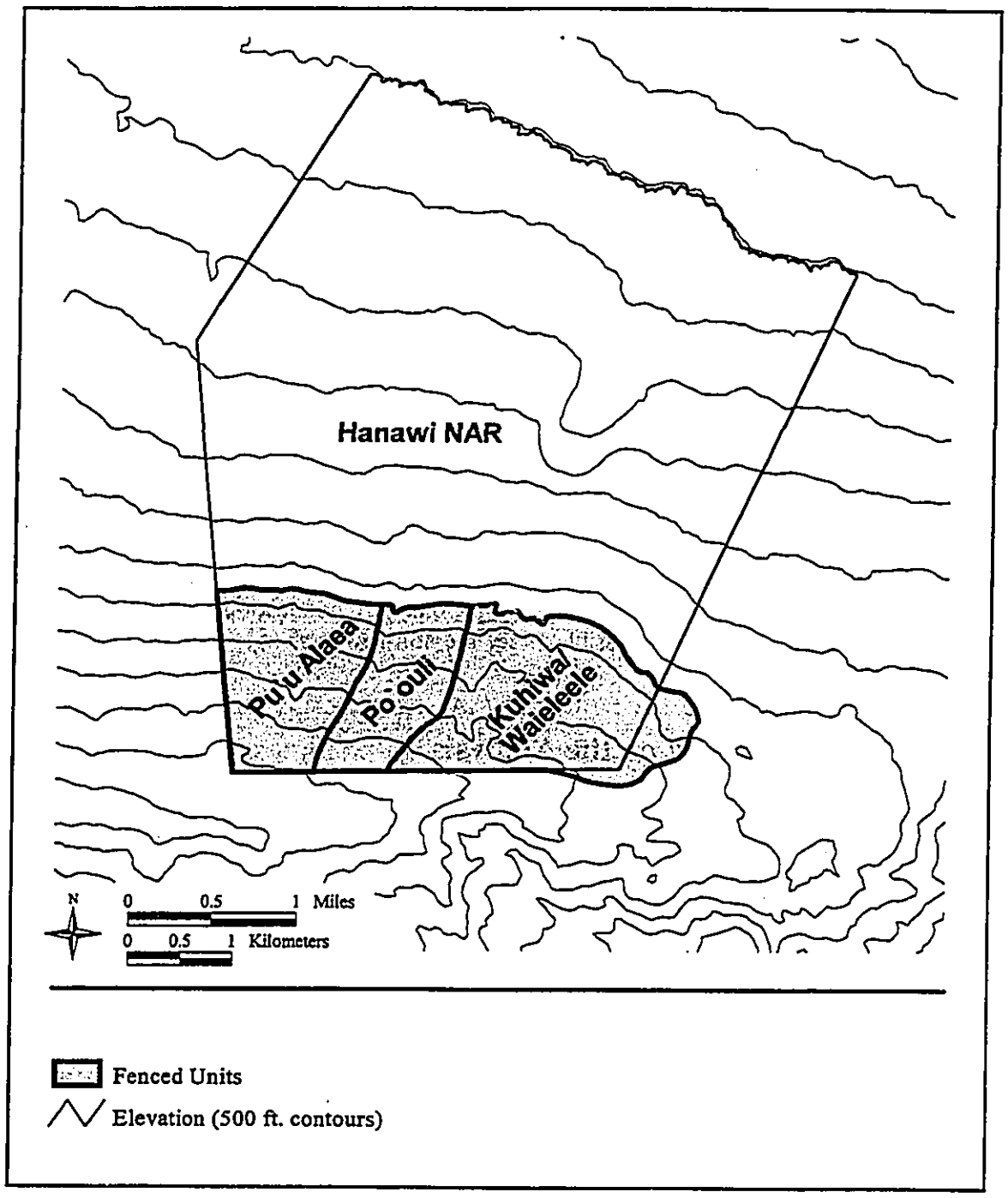
Hanawī NAR, established in 1986 by Executive Order 3351, is part of the State of Hawai`i's Natural Area Reserve System (NARS). The NARS was created "to preserve in perpetuity specific land and water areas which support communities, as relatively unmodified as possible, of the natural flora and fauna, as well as geological sites, of Hawai`i" (HRS 195-1). Hanawī NAR is an important component of the East Maui watershed, harbors nine native vegetation communities, and contains nearly all of the native forest and upland birds found on the island of Maui (DLNR 1988). Three of the five endangered forest birds that occur in Hanawī NAR are critically endangered: the Po`ouli, Nukupu`u, and Maui `Ākepa. Of these, only the Po`ouli has been seen with regularity in recent years.

The current management program for Hanawī NAR is two-fold. The first priority is to control and ultimately eradicate ungulates within the reserve (DLNR 1988) in order to protect and restore the forests of East Maui as a watershed. Ungulate control (mainly pigs) has been carried out via the construction and maintenance of three fenced units - the 202-ha (500-ac) Pu`u `Alaea Unit, the 405-ha (1,000-ac) Kūhiwa/Wai`ele`ele Unit, and the 202-ha (500-ac) Po`ouli Unit (Figure 2) - and the systematic removal of ungulates from within the enclosures. Efforts to eradicate pigs from within Hanawī NAR are ongoing (B. Evanson, DOFAW, personal communication 1998). The second priority is to limit the spread and, where possible, eradicate non-native plant species within the NAR (DLNR 1988).

1.7 Decision Made Based on the Analysis

Based on the analysis documented in this EA, the Regional Director of the U.S. Fish and Wildlife Service, Pacific Region, and the Chairman of the Department of Land and Natural Resources have determined the appropriate action to take, which is believed to be most likely to prevent the imminent extinction and promote recovery of the Po`ouli.

FIGURE 2
Hanawi NAR, showing the three fenced ungulate removal units: Pu`u Alaea, Po`ouli and Kuhiwa/Waieleele



1.8 Public Involvement and Identification of Issues

The USFWS and DOFAW have worked closely and coordinated with TNCH, the National Park Service (NPS), BRD, TPF, East Maui Watershed Partnership, Kamehameha Schools/B.P. Bishop Estate (KSBE), the Hawai'i Forest Bird Recovery Team, the Captive Propagation Recovery Working Group, Avian Disease Recovery Working Group, and former members of the Pacific Avifauna Recovery Coordinating Committee to identify the issues, weigh the pros and cons of each of the alternatives, and aid in the selection of a preferred alternative.

A DEA was prepared to share the Po'ouli's plight with as wide an audience as possible and seek input from interested and affected parties on the best possible management actions that should be carried out to prevent its extinction. A press release dated September 15, 1998, as well as an announcement in *The Environmental Notice* (OEQC), were used to notify the public of the availability of this DEA and to solicit public comments.

Three public meetings were held to present the proposed alternatives to interested organizations and individuals, and to allow them to provide comments and information. Public meetings were held in Hāna and Kahului (Maui) on September 22 and 23, and in Honolulu (Oahu) on September 24, 1998. Attendees were encouraged to provide written or oral (via a provided tape recorder) comment for the agencies' consideration.

A total of 54 letters were received that contained comments on various topics presented in the DEA. The majority of the respondents (30) were professional biologists with strong ecological backgrounds with Hawaiian birds or with extensive backgrounds in captive propagation or habitat management focusing on bird conservation. An additional 17 commenters were biologists with knowledge and/or background in Hawaiian biology and the remainder were from government agencies, land managers, or land owners. Of the comments received, 35 stressed the need for intensified habitat management with increased predator control, fencing, and ungulate removal; sixteen argued that some effort at translocation of birds to the home ranges of conspecifics of opposite sex should possibly be attempted; twelve urged some degree of captive propagation; while 19 were decisively opposed to any attempt at captively manipulating these birds, with the possible exception of a translocation.

With the exception of Alternative 3 (one supporter) and Alternative 4 (no supporters), proponents of each of the alternatives argued strongly for the implementation of their selected alternative(s). Given the extreme opposite management options presented by these alternatives, not all of the comments received could be incorporated into this EA. Based on comments of the respondents, consideration of a probability analysis of the alternatives (letter of comment from Freed *et al.*), and in-house review by DOFAW and USFWS biologists, the DOFAW and USFWS developed the proposed action which is outlined in this EA. A summary of the comments that were received is provided in Appendix A.

1.9 Regulatory Authorities

1.9.1 Authorities

This action is consistent with the USFWS mandate for promoting long term conservation and recovery of the nation's endangered and threatened species (the U.S. Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544, 87 Stat. 884) and DLNR's mandate to promote long term conservation and recovery of Hawai'i's endangered and threatened species (Hawai'i's Endangered Species Law (HRS 195D)).

1.9.2 Compliance

The proposed action will be completed in compliance with Federal and State policies and the following laws and regulations: National Environmental Policy Act (NEPA) of 1969, as amended; Executive Order 12372 (Intergovernmental Review of Federal Programs); Endangered Species Act of 1973, as amended; Hawai'i's Endangered Species Law (HRS 195D); and Hawai'i's Environmental Impact Statement Law (HRS 343).

1.10 Scope of the Environmental Assessment

This EA evaluates the current status of the Po'ouli, identifies alternative management actions that were considered as options in the DEA, provides suggestions on pertinent management actions that were not fully considered in the DEA, and provides the basis on which the preferred alternative(s) were selected. This EA outlines increased habitat management activities to be conducted in the Hanawī NAR that will help protect the remaining Po'ouli within that area and increase the likelihood of establishing a breeding pair in the wild. In addition, this EA makes recommendations for management activities and research that may be important for the conservation of the Po'ouli and other native species found within the Hanawī area. This EA further outlines recommended prerequisites that should be considered prior to the translocation of Po'ouli from their home range to that of a conspecific.

2 Chapter 2. Overview and History of Species and Project

2.1 Introduction

The USFWS and DOFAW are considering emergency measures to prevent the extinction of the Po'ouli (*Melamprosops phaeosoma*), a native Hawaiian forest bird from the island of Maui, whose population may total only three (3) birds. This Environmental Assessment (EA) was prepared by DOFAW and USFWS. It presents a historical review of the conservation efforts to protect the Po'ouli, examines a range of alternative management measures, analyzes the possible environmental

effects of the alternatives, and provides the agencies' decision on which alternative to implement. This EA is a product of a previous draft environmental assessment, which was made available to involved and interested parties in September 1998. A preferred alternative was selected based on public opinion as well as the opinions and recommendations of professional biologists. The justification for the selection of the preferred alternative is outlined in this EA.

2.2 Background Information

The Po`ouli was first discovered by University of Hawai`i students during the Hāna Rain Forest Project in 1973 in the upper elevation rainforest of East Maui at 1,980 m (6,494 ft) elevation. This species was so unique that it was placed in a new, monotypic genus, *Melamprosops*. It was given the common name of Po`ouli, which means "black-faced" in Hawaiian, by Mrs. Mary Kawena Pukui, a leading authority on the Hawaiian language (Casey and Jacobi 1974).

2.2.1 Po`ouli Population Range, Distribution, and Size

In recent years the Po`ouli's range has been restricted to the northeast slope of Haleakalā Volcano, east of the west branch of Hanawī Stream to the headwaters of Heleleike`oha Stream, in an area of about 600 ha (1,483 ac); however, subfossil records indicate that the Po`ouli once had a much wider distribution and inhabited the southwest slope of Haleakalā Volcano at 300-1,500 m (1,000-4,800 ft) elevation in much drier habitat (Pratt *et al.* 1997). All historic detections of Po`ouli have been within the Hanawī NAR, Hāna Forest Reserve, and Haleakalā National Park (HALE NP) (Pratt *et al.* 1997).

The Po`ouli population was initially estimated to be fewer than 200 birds (Casey and Jacobi 1974) and has experienced a precipitous decline since its discovery (Mountainspring *et al.* 1990, Reynolds and Snetsinger, in prep.). In 1975, the population density in the Hanawī NAR was estimated to be 76 birds per square kilometer (km^2); in 1981, the density was estimated at 15 birds/km^2; and, in 1985, was only 8 birds/km^2, representing a 90% decline in density from 1975 to 1985 (Mountainspring *et al.* 1990). Mountainspring *et al.* (1990) hypothesized a direct correlation between Po`ouli decline and increase in pig (*Sus scrofa*) activity in the study area. From 1975 to 1985, when the Po`ouli population density within the Hanawī NAR declined by 90%, there was a concurrent 473% increase in pig activity, as indexed by ground cover disturbance (Mountainspring *et al.* 1990).

During the 1980s, the Po`ouli disappeared from the westernmost portion of its range, between the west and east branches of the Hanawī Stream, an area of about 50 ha (124 ac) (Pratt *et al.* 1997). It is now known only from the area east of the east branch of Hanawī Stream, to and including Lake Wai`ele`ele, in an area of about 121 ha (299 ac), between 1,418-2,037 m (4,650-6,680 ft) elevation.

2.2.2 Habitat Management and Restoration: A Historical Review

In 1986, the State of Hawai`i established the 3,035 ha (7,500 ac) Hanawī NAR in the Hāna District of Maui (Figure 1) to protect the watershed of East Maui, preserve nine native plant communities, provide habitat for the highest number and density of endangered forest birds in the State, and create a habitat link between Haleakalā National Park on its south border and the Ko`olau Forest Reserve on its east and west borders (DLNR 1989). Following the establishment of Hanawī NAR, DOFAW began to take steps to protect the forest from impacts of feral goats and pigs by fencing three large tracts within the reserve (Kūhiwa/Wai`ele`ele (Kūhiwa), Po`uli, and Pu`u `Alaea Units) and removing feral ungulates from within these units (Figure 2).

In addition, the East Maui Watershed Partnership, a historic partnership established in 1991 between the State of Hawai`i, NPS, Maui County, TNCH and other private landowners, initiated management efforts to fence selected upper watershed areas in East Maui and control ungulates in critical areas. The complete fencing plan is detailed in the *Final Environmental Assessment For A Fence Project To Protect the East Maui Watershed* (1996).

Since fencing of Hanawī NAR began in February 1990, pigs have been steadily removed from within the three management units. Vegetation has begun to recover in the areas of pig removal, but not to density levels measured in 1973 (Casey, personal communication 1996). Fencing of the last of the three management units in the upper elevations of Hanawī NAR was completed by DOFAW in June 1996, and pig removal from these units was believed to be completed in late 1997. An estimated 200 pigs have been removed from these units since ungulate control began in 1990 (B. Evanson, personal communication 1998). While there has been some pig intrusion into the Pu`u Alaea and Kūhiwa units (J. Turner and T. Haurez, DOFAW-NARS, personal communications 1998), all three of these units are believed to be completely pig-free at the present time (B. Gagné and B. Evanson, DOFAW, personal communications 1999).

While fencing and ungulate removal actions have been underway, the Po`ouli and other native forest birds have continued to decline. In the last ten years, five species of endangered forest birds are known to have existed in Hanawī NAR, Haleakalā National Park, and surrounding forest. These included Maui Parrotbill, Maui `Ākepa, Maui Nukupu`u, `Ākohekohe or Crested Honeycreeper, and Po`ouli. Despite the progress made in removing feral ungulates from the high elevation forests of East Maui, a preliminary analysis of bird surveys conducted in 1980 and 1992 in the Hanawī area indicates that populations of endangered birds declined over this time period (Paul Conry, DOFAW, personal communication 1997). The reasons for this decline are not thoroughly understood but are believed to be continued predation by introduced mammalian predators (i.e., 3 species of rats, mongooses and cats); avian disease; habitat degradation as a result of feral pig activity in the forest; competition with introduced birds; and possible lack of adequate food resources.

2.2.3 Po`ouli Breeding and Nesting Behavior

Only two Po`ouli nests have been documented and studied. In 1985-1986, USFWS biologist Cameron Kepler (BRD) and DOFAW biologist Andrew Engilis (now with Ducks Unlimited) conducted studies on endangered Maui birds, including the Po`ouli. In 1986, they discovered and monitored two active nests of a single pair of Po`ouli, located in a tributary ravine of the East Hanawī Stream at 1,800 m (5,900 ft) elevation (Kepler *et al.* 1996). Two chicks were hatched in the first nest in April, but they subsequently died during extremely heavy rains during April 8-14. Following the failure of the first nest, the Po`ouli pair nested again within 30 m (98 ft) of their first nest. This second nest fledged one chick at the end of May 1986 (Kepler *et al.* 1996).

The last known breeding of Po`ouli occurred in 1994 and 1995, inferred by the sightings of a fledgling in August 1994 (BRD 1994a) and an immature bird in October 1996 (BRD 1996b).

2.2.4 Maui Forest Bird Project: Bird Monitoring Activities

During the Maui Forest Bird Survey of 1992, no Po`ouli were sighted. This prompted an additional search to confirm the status of this species. In September 1993, Dr. Thane Pratt of the National Biological Survey (now BRD), Betsy Gagné of DOFAW-NARS, and Tonnie Casey (KSBE), traveled to Hanawī NAR to search for Po`ouli. On September 12, 1993, while standing on the ridge at 1,799 m (5,900 ft) elevation where the Po`ouli nests were located in 1986, the group of searchers observed a single Po`ouli with a flock of Maui `Alauahio or Maui Creeper (*Paroreomyza montana*). The following day, Gagné observed a lone Po`ouli about 200-300 m (658-986 ft) from the 1986 nest site. It is unknown whether these sightings were of the same individual or of two different birds (Pratt, unpublished data 1993).

In May 1994, the USFWS entered into a cooperative recovery project with DOFAW, NBS (now BRD), and TNCH to conduct field studies of endangered forest birds on Maui. The three species targeted for this project were the Po`ouli, `Ākohekohe and Maui Parrotbill. The purpose of this field project was to locate and monitor individuals and nests, identify limiting factors, and collect information necessary to understand the species' life histories. Individuals and nests of `Ākohekohe and Maui Parrotbill were located and studied from May 1994 through June 1997. BRD is currently working on the final reports for this project.

Field efforts to locate, band, and monitor the Po`ouli, `Ākohekohe, and Maui Parrotbill actually began in April 1994. The field crew was led by BRD biologist John Simon. During the first three months of the project (April-June 1994), three days were devoted to searching for Po`ouli in the area in which the two 1993 sightings were made; however, no Po`ouli were seen (BRD 1994b).

In August 1994, an expedition was launched to search for four species of critically endangered Maui forest birds, Po`ouli, Nukupu`u, Maui `Ākepa, and Bishop's `Ō`ō (*Moho bishopi*). Two biologists

with BRD, Tom Snetsinger and Michelle Reynolds, searched ridges, gullies, certain forest bird transects (8, 9, and 10 from the 1992 forest bird surveys), fence lines within the Pu`u `Alaea, Po`ouli, and Kūhiwa Units of Hanawī NAR, and the western edge of Haleakalā National Park. On August 30, 1994, they located a family group of Po`ouli, made up of one juvenile and two adults, on transect 9 in the Kūhiwa Unit at 1,915 m (6,280 ft) elevation. Follow up visits to this site resulted in the observation of a single Po`ouli by Simon and two possible auditory detections approximately 100 m (328 ft) off of the transect in an adjoining gulch by Snetsinger and Reynolds (BRD 1994a).

A second rare bird search expedition was conducted from October 19 to October 27, 1994. Snetsinger and Reynolds, along with USFWS biologists Jack Jeffrey and Rick Warshauer, Doug Pratt of the Louisiana State University Museum of Natural History, and Greg Homel searched the area again, with particular emphasis on the eastern boundaries of the Po`ouli Unit and western boundary of the Kūhiwa Unit. On October 20, Jeffrey and Reynolds observed an adult male Nukupu`u in a gulch west of the east Po`ouli fence line at approximately 1,900 m (6,250 ft) elevation. A single adult Po`ouli was seen by Homel on October 21 in the Po`ouli Unit, and on that same day, a Po`ouli was seen by Jeffrey in the Kūhiwa Unit.

A third rare bird search expedition was conducted from February 17 to February 24, 1995, in the same areas searched in October 1994. On February 18, 1995, Snetsinger heard a Po`ouli at 1,845 m (6,060 ft) elevation. The bird was not visually confirmed. On February 22, 1995, an adult Po`ouli was seen by Snetsinger, Reynolds, and Anne Carter of TNCH, near the lower fence line of the Kūhiwa Unit east of Kūhiwa Stream.

With the confirmation of the continued existence of the Po`ouli and Nukupu`u and upon the recommendation of the Hawai`i Forest Bird Recovery Team, another field effort was co-funded by the USFWS and DLNR and carried out by BRD, beginning in July 1995. Dr. Paul Baker, BRD biologist, led the field efforts, which were dedicated to locating and monitoring all remaining Po`ouli, Nukupu`u, and Maui `Ākepa; identifying those factors that have caused the decline of these East Maui forest birds; developing an effective predator control program for the removal of mammalian predators; monitoring the invasion of non-native plants into the NAR; and locating and monitoring nests of all species to potentially remove eggs, chicks, or adults for captive propagation purposes.

The BRD field crew immediately began intensive searches for Po`ouli in the areas in which the rare bird search team observed Po`ouli. During the period of October-December 1995, two sightings of Po`ouli were made in the western side of the Kūhiwa Unit, one at 1,615 m (5,300 ft) elevation on the western edge of the unit, and one at 1520 m (5000 ft) elevation near the lower fence (BRD 1995). From December 1995 to March 1997 the field crew had confirmed three locations in which Po`ouli were seen on a regular basis. These areas where identified as home range 1 (HR-1), HR-2 and HR-3 (Figure 3).

In 1996 and the early part of 1997, only four Po`ouli could be found with any regularity and another three birds were detected infrequently (BRD 1997). One adult and an immature bird were seen many

times in 1996 in the area of HR-1 in the Kūhiwa Unit. Another adult was also frequently observed in 1996 in HR-2, also in the Kūhiwa Unit. The bird was seen twice in 1996 with a second bird. A third bird was infrequently encountered from December 1995 to February 1997 in HR-3 along the northwestern boundary of the Kūhiwa Unit and the northeastern boundary of the Po`ouli Unit. In February 1997 this bird was possibly accompanied by a second bird which was heard giving an alarm call; the second bird was not seen. In a fourth area (previously called HR-4), a Po`ouli was heard singing on one occasion in 1996 but this audible detection was never confirmed (Figure 3).

The existence of possibly only six birds in 1996 prompted the USFWS and DOFAW to bring together a large working group, made up of members of the USFWS,DOFAW, BRD, TPF, NPS, TNCH, and KSBE, to draft a plan for management of the Po`ouli and the other endangered forest birds in Hanawī NAR and its environs. The result was the completion of a plan entitled "Initiating Recovery of the Po`ouli and other Endangered Forest Birds in East Maui" in May 1997, and the hiring of Mark Collins as the Maui Forest Bird Project Coordinator and a full-time field crew for implementation of the plan.

2.2.5 Capture, Banding, and Sex Determination of Known Po`ouli Population

In October 1996, P. Baker reported that the total known population of Po`ouli in the Hanawī NAR was six individuals made up of one pair, one adult male with one immature, one unknown sex adult, and one adult male (BRD1996b). On January 15, 1997, the field crew captured a Po`ouli in HR-2, banded it with USFWS and colored bands, and fortuitously collected shed body feathers. Based on plumage coloration, the field crew identified this bird as a male. From January-March 1997, the banded bird was seen several times in HR-2. At one point, this banded individual was observed feeding one or more Maui Parrotbill fledglings, which led the field crew to believe that this individual Po`ouli had no mate. From January through July 1997, there were only two sightings of a Po`ouli in HR-1. Although elusive, another individual was seen on the border of the Po`ouli and Kūhiwa Units (HR-3) on several occasions in 1997. Thus, the Po`ouli
field crew could confirm the existence of only three individual Po`ouli, although hope was still high that there were at least six individuals in the area (BRD 1997).

In July 1997 the Endangered Maui Forest Bird Project changed administration from BRD to DOFAW and a new crew took over the field responsibilities. The field crew spent their first two
weeks of field work in August 1997 searching HR-1, HR-2, and HR-4 for Po`ouli. While they had several sightings of the banded individual in HR-2, no Po`ouli were seen in HR-1 or HR-4. The focus of the project at this time was to capture and band the remaining Po`ouli. Due to the degree of endangerment of this species, it was decided by the USFWS and DOFAW that body feathers would be collected instead of blood to assist the agencies in determining the sexes of the known individual Po`ouli. On January 28, 1998, the field crew finally captured the elusive HR-1 Po`ouli. In early March 1998, the HR-3 individual was also captured. Both birds were banded and body feathers were collected. These feathers, along with feathers collected from the HR-2 bird captured in January 1997, were sent to the University Diagnostics Limited (UDL) laboratory in London and the Smithsonian

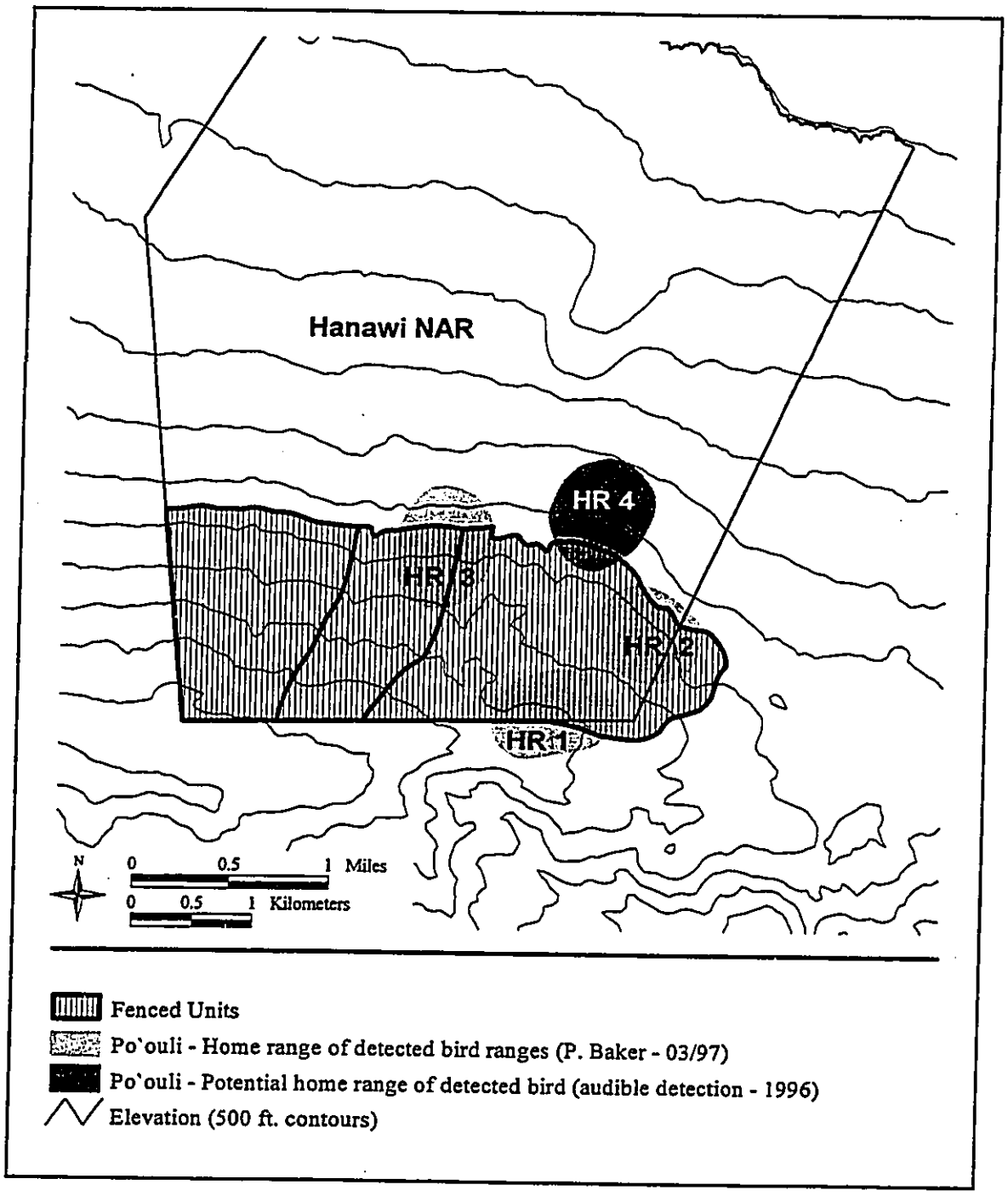
Institution in Washington, D.C., for DNA sexing analysis. Up to this time sexes of the Po'ouli were based on external morphological characteristics and on the birds' behaviors. The UDL results identified the sexes as 1 male (HR-3) and 2 females (HR-1 and HR-2). A summary of the sexing results is attached as Appendix B.

2.2.6 Predator Control in Hanawī NAR

The Indian mongoose (*Herpestes auropunctatus*), domestic cat (*Felis catus*), and three species of rodents – black rat (*Rattus rattus*), Polynesian rat (*Rattus exulans*), and house mouse (*Mus musculus*) – are known to live in the upper elevation forests of East Maui. The adverse effects of these introduced mammals on native birds, plants and invertebrates have been documented by Perkins (1903), Berger (1972), Atkinson (1977), Stone (1985), Scott *et al.* (1986), and Sugihara (1997).

In mid-November 1994, KSBE biologist T. Casey and Maui Critically Endangered Project research assistant Sally Atkins initiated predator control in the Kūhiwa Unit of Hanawī NAR where the Po'ouli family unit had been observed by Snetsinger and Reynolds. They spent a week in the area, placing rat tracking tunnels and laying a grid of 87 bait stations, serviced with the rodenticide diphacinone in the form of JT Eaton® bait blocks (BRD 1994c). This grid was serviced only briefly (1-2 times). By May 1996, the Po'ouli field crew had confirmed two locations in which Po'ouli were seen on a regular basis: HR-1 at 1,920 m (6,300 ft) elevation near New Greensword Bog in the Kūhiwa Unit and HR-2 located at 1,700 m (5,600 ft) elevation in the Kūhiwa Unit. The field crew initiated a systematic study of the efficacy of controlling introduced predators in Hanawī. They began by assessing the native snail population in the two areas where birds were found on a regular basis and by July 1996 had placed 56 diphacinone bait stations, five mongoose (Fenn®) traps, and 20 tracking boards in the HR-1 area (BRD 1996a). In August 1996, the field crew increased the number of bait stations in HR-1 to 117, established a grid covering approximately 52 ha (128 ac), and set up a second grid in HR-2, which included 119 diphacinone bait stations in a 46 ha (114 ac) area. The bait stations were serviced by the field crew during each field session of the project. Between December 1996 and the end of June 1997, 124 rats and 1 mongoose were caught in snap traps, 5 rats and 9 mongooses were caught in Fenn® traps. No cats were captured. The diphacinone bait stations continued to be serviced throughout this time period (DOFAW 1997a). In July 1997 the new DOFAW Maui Forest Bird Recovery Project field crew continued the work that was begun by BRD: searching for the birds, conducting predator control in HR-1 and HR-2, and sampling snails in the treated and control plots. Between August 1997 and March 1998, two grids were maintained with 118 diphacinone bait stations, 102 snap traps, and 54 Fenn® traps in HR-1 and 125 diphacinone bait stations, 112 snap traps and 65 Fenn® in HR-2. In early September a pilot snap trapping experiment using 20 traps placed ten meters apart on a 40 x 50 m grid was conducted in HR-1 to determine the effectiveness of the bait grid and to determine the densities of rats and the minimum number of snap traps required within the treatment and control areas to sample rat abundance. The results indicated that approximately four times as many traps would be needed. The Po'ouli field crew continued to assess the effectiveness of their predator control activities in HR-2 by placing snap traps both inside and outside the treated areas in an attempt to gain a better understanding of the predator densities

FIGURE 3
Po`ouli home ranges (HR) and fenced areas within the Hanawi NAR



within the diphacinone bait station grids. A summary of the effectiveness of the ground-based predator control in the Hanawī Natural Area Reserve was prepared by Collins (Evaluation of Ground-based Predator Control in the Hanawī Natural Area Reserve, unpublished report 1998).

Results of the snap trapping experiment were used to determine the relative densities of the three species of rodents and to determine the effectiveness of the ground based predator control. The results of these studies indicated that the diphacinone bait station grids were effective in reducing the number of black rats (Control Area 19.75, Treatment Area 2.97) and house mice (Control Area 36.2, Treatment Area 5.94) in the area; however, they were not effective in reducing the number of Polynesian rats (Control Area 88.89, Treatment Area 92.09). Furthermore, Polynesian rats were found in much higher numbers than black rats in both the Control and Treatment plots. These results suggested that Polynesian rats were not being controlled as well as the black rat. (DOFAW 1997b, Collins 1998).

With the confirmation and banding of the HR-3 Po'ouli in March 1998, an assessment of the predator numbers in HR-3 was made using snap traps and cat traps. Subsequently a *diphacinone-baited* predator control grid was placed in HR-3 at the beginning of May 1998. (A summary of recent predator control work was presented as a poster at the 1998 Hawai'i Conservation Conference and a written report is being prepared by DOFAW). Between July 1997 and June 1998, approximately 1,440 man-hours were spent servicing the 3 predator control grids. In early 1998 the State received approval to use a new fish-flavored diphacinone bait to complement the peanut-buttered flavored bait to control rodents and mongooses. The new flavor is now available and has been used in HR-2. Preliminary results indicate that this bait is not taken at a higher rate than the previously used bait type (M. Collins, personal communication 1998).

2.2.7 Avian Disease Surveillance in Hanawī NAR

Avian disease is known to have caused the decline of native Hawaiian forest bird populations and possibly contributed to the extinction of many lower elevation forest bird species (Perkins 1903, Warner 1968, van Riper *et al.* 1982). To better understand the role of avian disease as a limiting factor in the Hanawī NAR, disease monitoring activities have been an ongoing part of the Maui Forest Bird project. In November and December 1993, Dr. Carter Atkinson of the National Wildlife Health Laboratory conducted disease screenings at Hanawī NAR and TNCH's Waikamoi Preserve. The purpose of these screenings was to determine if avian pox and malaria were acting as limiting factors in the high elevation forests of Maui. Samples were taken from 147 native and non-native birds. There were no signs of pox lesions and all of the blood smears were negative for malaria (Atkinson, unpublished data 1994).

These preliminary findings are encouraging, but the impact of avian disease on upper elevation forest bird populations is still a major concern. Working in collaboration with Dr. Atkinson and Dr. Rebecca Cann (University of Hawai'i-Mānoa), the Maui Forest Bird field crew has continued collecting blood for this disease survey work in order to monitor the increasing prevalence of pox and malaria in native

and non-native forest birds in Hanawī and the surrounding forests, in particular the lower elevation forests.

2.2.8 Additional Field Surveys

In addition to searching the known Po'ouli home ranges on a regular basis, the Maui Forest Bird field crew has conducted three searches in Kīpahulu Valley within Haleakalā National Park since October 1997. No Po'ouli were located on any of these surveys.

In February 1998, efforts were stepped up using volunteers from other agencies and partners to search additional areas outside of the three known home ranges for Po'ouli. In March 1998, two search crews went into Hanawī NAR. The first crew, consisting of five individuals (Sharon Reilly and Fern Duvall (DOFAW), Joy Tamayose (HALE NP), Anne Carter (formerly of TNCH) and Jamie Bruch (CPSU Maui Forest Bird Project), searched in the HR-4 area below the lower elevation fence where an audible detection of Po'ouli occurred in 1997. The second crew, consisting of four individuals (J. Jeffrey (USFWS), B. Gagné (DOFAW), T. Casey (KSBE) and Valerie Stein (CPSU Maui Forest Bird Project)), searched in the area west of Frisbee Meadow and areas around Transect 8, close to where the first Po'ouli nest was discovered. No Po'ouli were sighted by either team. In mid-June 1998, two Maui Forest Bird field crew members spent 6 days searching the western boundary fence of the Hanawī NAR and the west Hanawī River. At the end of June, four people (S. Reilly (DOFAW), Jennifer Turner (DOFAW-NARS) Russell Thorstrom (TPF), and Peter Dunlevy (CPSU Maui Forest Bird Project)) searched the Pu'u 'Alaea Unit and the area west of the Hanawī boundary fence. Unfortunately, no Po'ouli were located. Between August 6-13, 1998, an additional team of four (J. Jeffrey and Guy Hughes (USFWS), A. Carter, and Tracy Powers (TPF)) searched the vicinity of Smith Camp. No Po'ouli were detected.

Throughout the remaining 1998 field season, there were 2 reported sightings of the HR1 bird, one sighting of the HR2 bird, and four sightings of a bird in the HR3 area, three of which were confirmed as the resident Po'ouli from color bands. On two of the confirmed HR3 sightings, this bird was observed below the fence line, within 100 m of the Po'ouli Cabin. To date, during the 1999 season, the HR2 bird has been observed once and the HR3 bird twice (J. Kowalsky, personal communications 1998).

2.2.9 Summary

The plight of the Po'ouli reflects the many problems faced by all of Hawai'i's native species. The reasons for its decline - habitat degradation, avian disease, predation by introduced mammals, possible competition with introduced bird species, and possible lack of adequate food resources - are believed to be the same factors that have led to the decline and extinction of several of Hawai'i's forest birds. While little has been done to assess the impacts of introduced birds on native Hawaiian forest birds, there is considerable evidence of the devastating effects of ungulates in Hawai'i's forests, avian disease (malaria and pox), and introduced mammalian predators (rats, mongooses, and cats).

Ungulate control in the three managed units can be achieved through fencing and the ongoing removal of pigs. Predator control in Hanawī and surrounding areas has been less effective. Efforts to develop the best possible methods for controlling introduced mammalian predators in Hawai'i's forests have been underway for several years. The Toxicant Working Group, made up of members of several governmental agencies, private conservation organizations, and private landowners in Hawai'i, gained approval in 1994 for the use of diphacinone bait blocks in bait stations in Hawai'i's forests. While the use of bait blocks in bait stations has proven very effective in many areas of Hawai'i, there is an urgent need for the development of better methods for toxicant dispersal over larger areas, particularly in rugged, remote areas like Hanawī NAR. The Working Group continues to identify and promote studies that will be used to support an application in the near future for broad-scale methods of delivery of rodenticide in Hawai'i, such as aerial broadcast, to control introduced mammalian predators.

Avian disease research in Hawai'i, such as that currently underway by Dr. Carter Atkinson and Dennis LaPointe of BRD and Dr. Rebecca Cann of the University of Hawai'i at Mānoa, is aimed at developing methods to control the mosquito vector of avian malaria and methods to safely ascertain whether birds are infected. Other researchers are attempting to develop methods to treat infected birds and methods to promote immunity to the diseases, but more needs to be done.

During the past year, the Maui Forest Bird Field Crew has managed to confirm only three Po'ouli within three distinct and disjunct home ranges, HR-1, HR-2, and HR-3 (Fig. 3). All known birds have been captured and preliminarily sexed as one male (HR-3) and two females (HR-1, HR-2). Predator control in all three home ranges and intensive searches for additional birds continue. The best data available indicates that the home ranges of the remaining birds do not overlap and the individuals have not been observed interacting with one another. Based on BRD's estimate that the home range size of the Po'ouli is 11.2 ha (28 ac)(unpublished reports), and given the suspected sedentary nature of this bird and the distances between each home range, the remaining Po'ouli may not interact. Given this, it is believed that some form of human intervention may be necessary for the known Po'ouli to form a pair and reproduce in the wild. The extinction of this species is believed imminent unless actions are undertaken rapidly to protect remaining individuals, prevent further losses, and promote successful reproduction of the species.

2.3 Overview of the Project Area

The island of Maui is the second largest island in the Hawaiian Archipelago (Figure 4). The island has an area of approximately 1,887.6 km^2 (188,760 ha or 466,426 ac) and is approximately 73 km (45 miles) long and 40 km (25 miles) wide. The major city on the island is Kahului, located on the north of the isthmus between 20^0, 52' and 20^0, 54' north latitude, and from 156^0, 27' to 156^0, 31' west longitude. Mountainous forested areas where the Po'ouli is known or suspected to have occurred lie due east, approximately 30 km (18.6 miles), of this population center.

These mountainous areas are directly exposed to the prevailing trade winds, which deliver an average of 880 cm (350 in) of rain annually, and are technically classified as rain forest. Forests at lower elevations are dominated by alien plants, with native forests being restricted to elevations above 900 m (3,000 ft). The north slope of Haleakalā reaches an altitude of 2,713 m (8,900 ft), where night time winter temperatures frequently drop below freezing.

Although the original range of the Po'ouli is not known, fossil evidence indicates that these birds were once found in dry to mesic habitats of the southwestern portion of east Maui (Pratt *et al.* 1997). Since its discovery in 1973, the Po'ouli has only been recorded to occur in the wet, montane forests of the upper Hanawī area (Figure 3) between the elevations of 1,418 and 2,037 m (4,650-6,680 ft). The three known Po'ouli are restricted to a total area of approximately 121 ha (299 ac).

2.4 Physical Environment

2.4.1 Volcanology, Topography, Soils, and Climate

The Hawaiian Islands were formed by multiple, relatively small eruptions of thin-bedded flows, which were seldom thicker than 3 m (9.8 ft). The fluid nature of Hawaiian lava resulted in the formation of gently sloping shield volcanoes (Stearns 1985), as illustrated by Mauna Loa on the youngest island of Hawai'i. As one moves west along the island chain, the gradual sloping nature of the shield volcanoes becomes less and less evident due to erosional effects over time. Due to the regular and heavy rain fall brought on by the trade winds to the northeast slopes of Haleakalā, the north-facing slopes are bisected by stream and river drainages. The broad and narrow ridges are separated by steep, vegetated slopes with intermittent rock exposures. Streams descend rapidly, dropping from elevations of greater than 2,700 m (8,850 ft) to sea level in only 12 km (7.5 mi). Cataracts and waterfalls are common features on all streams of the area. Unlike continental volcanoes, the Hawaiian Islands were/are formed by heavier, basaltic, and some andesitic lavas. Therefore, the soils that result from the breakdown of these volcanic rocks are low in silicates while being high in iron and aluminum (Street 1989). Except for some coastal areas, the soils are free of sand. Well formed, deep humic latosols occur in wetter Hawaiian climates such as Hanawī. These soils are highly permeable and their clay-like texture make them relatively resistant to erosion. Soils of wetter habitats, like those of the Hanawī rainforest, contain 8-10 percent organic matter and are acidic in nature (Street 1989).

The prevailing trade winds as well as winter storm systems typically approach the Hawaiian Islands from the north (northeast and northwest, respectively). Due to the great elevational height of Haleakalā (3,048 m (10,000 ft)), much of the moisture carried in these accompanying clouds and weather systems is dropped along the large elevational gradient of the volcano slope. As a result, the Hanawī area receives an average of 880 cm (350 in) of rain annually.

2.4.2 Hydrology and Water Resources

The Hanawī rainforest lies within the east Maui watershed. Water from most of the streams that drain down slope to the north is tapped by a series of flumes, the Ko`olau and Wailoa Ditch System. This water source, as well as that from west Maui, provides for the agricultural and urban needs of Maui residents and visitors.

2.5 Social and Economic Environment

2.5.1 Land Ownership

There will be no change in land ownership as a result of the proposed action. All management considerations within this EA are on lands owned by the State of Hawai`i and are set aside as conservation lands under the management of the Natural Area Reserve System (NARS). Adjacent lands are managed by DLNR (State forest reserves) or the Federal government (National Park Service).

2.5.2 Land Use

All lands within the Hanawī NAR are zoned as Conservation lands. The area is remote and the few trails that exist are not well maintained. There are no roads within the Hanawī NAR, and access is by foot or helicopter. This area serves as part of the east Maui watershed, but no resource extraction is allowed.

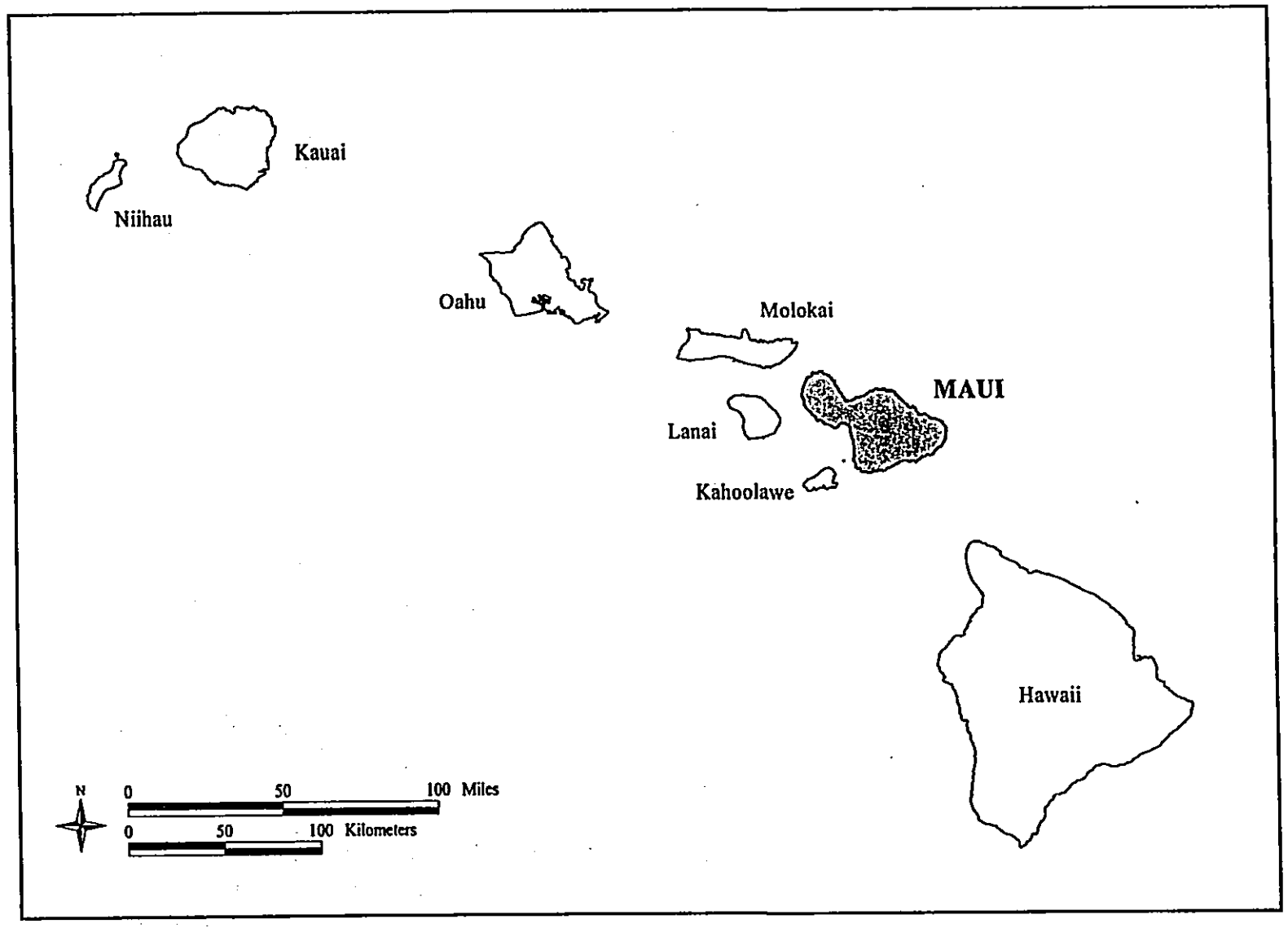
2.5.3 Public Use

Lands zoned as Conservation are separated into five different subzones. Hanawī NAR is classified as Protective subzone, receiving the most stringent protection of any State conservation lands. While some NAR lands are used in a limited recreational fashion by the public, the Hanawī NAR is not. Use of this area is by permit only and typically restricted to uses such as research and land management.

2.5.4 Archaeological and Historical Resources

While archaeological resources have been located within more open areas of Haleakalā National Park (which lies adjacent to the Hanawī NAR), little in the way of such resources have been found in high elevation wet forests. None are known to occur within the Hanawī NAR.

Figure 4
Hawaiian Islands



2.6 Biological Environment

2.6.1 Native Biological Resources

The upper elevation wet forests of northeast Maui support a high diversity of native plants and insects. Although the lower elevations are largely invaded or dominated by numerous alien plant species, the upper elevation wet forests support large expanses of native forest, typically with only scattered or incipient pockets of alien plants. Dominant forest trees, which make up a large portion of the habitat, include: `ōhi`a-lehua (*Metrosideros polymorpha*), `ōlapa (*Chirodendorn trigynum*), alani (*Melicope* spp.), kōlea (*Myrsine* spp.), and kāwa`u (*Ilex anomala*). Common understory plants include: pūkiawe (*Styphelia tameiameaie*), pilo (*Coprosma montana*), `ākala (*Rubus hawaiensis)*, and `ūhule (*Dicranopteris linearis*). A number of the woody trees are often found as understory plants and some of the plants noted here as understory periodically become components of the canopy. Numerous other common species are found in the understory or canopy, as ground cover or as epiphytes.

Insect diversity, while felt to be fairly high, has been little studied. However, given the large portion of intact, native forest, with numerous endemic plants, the number of endemic insects can be assumed to be quite high. Endemic snails, while not as diverse as those of west Maui, can be locally common at lower and mid-elevations and include the genera *Succinea*, *Auriculella*, and *Elasmias*.

There is also a relatively healthy diversity of native birds in this area. Commonly encountered honeycreepers include: `Apapane, `Amakihi, Maui Creeper, and `I`iwi. All of these species are most common at higher elevations (above 1,390 m (4,500 ft)), where it is felt that malaria-bearing mosquitos do not reproduce or occur with great frequency. However, even though the `Apapane, `Amakihi, Maui Creeper. and `I`iwi do occur at lower elevations than the rarer forest birds, they become increasingly rare at elevations below about 1,500 m (4,920 ft) (Scott *et al.* 1986).

2.6.2 Rare, Endangered, and Threatened Species

There are no fewer than 18 rare plants known from the windward forests of east Maui, eight of them listed as endangered (E) under the U.S. Endangered Species Act of 1973, as amended (ESA), or proposed (P) for listing as endangered. Endangered and proposed plant species include: *Clermontia oblongifolia* ssp. *mauiensis* (E), *Clermontia samuellii* (P), *Cyanea mceldowneyi* (E), *Geranium arboreum* (E), *Geranium multiflorum* (E), *Melicope balloui* (E), *Melicope ovalis* (E), and *Platanthera holochila* (E). Within the Hanawī NAR two endangered and one proposed plant species have been documented: *Clermontia samuelli* (P), *Geranium multiflorum* (E), and *Plantanthera holochila* (E) and three which are considered to be species of concern: *Calamagrostis expansa*, *Cyanea horrida*, and *Schiedea diffusa*.

Besides the Po`ouli, this area is known to support at least two other species of endangered forest bird, the `Ākohekohe and the Maui Parrotbill. Both of these species are Maui endemics, being restricted to upper elevation, rain forests of east Maui. Historic observations of the `Ākohekohe on Moloka`i indicate that it was once found in other areas of the Maui Nui island complex (includes Maui, Moloka`i, Lāna`i, and Kaho`olawe) as well as Maui (Perkins 1903; Bryan 1908). While the `Ākohekohe is locally common at elevations from 1,700-2,160 m (5,500-7,000 ft), the Maui Parrotbill is much more sparsely distributed and is found in lower abundance throughout its range (Perkins 1903; Scott *et al.* 1986). The Maui Parrotbill, like the`Ākohekohe, was formerly more widespread throughout the Maui Nui group, in drier, lowland habitats (Olson and James 1982). Recent population estimates for these species are approximately 3,800 for the `Ākohekohe and 500 for the Parrotbill (USFWS 1984).

Three other endangered birds may still reside in this area, the Maui `Ākepa, the Maui Nukupu`u, and the Maui `O`o. While the `Ākepa is still locally present on the Big Island of Hawai`i, Maui birds have been seldom encountered. Although they were reported as locally common in the 1890s, they have rarely been sighted in this century. If extant, the `Ākepa is likely restricted to low numbers at upper elevation, remote locations. The most recent reports of sightings of this bird in the Hanawī area were in 1988. The Maui Nukupu`u was observed as recently as 1994, but, like the Maui `Ākepa, the infrequent, and sometimes questionable, observations are cause for concern. The enigmatic bird of this area is the Maui `Ō`ō.

Both the Nēnē (*Branta sandvicensis*) and the `Ua`u or Hawaiian Dark-rumped Petrel (*Pterodroma phaeopygia sandwichensis*) are resident in the mountainous areas of Haleakalā. While both of these birds may pass over the Hanawī area, there are no reports that either species uses the area for foraging or breeding. Although little reported, the Hawaiian hoary bat (*Lasiurus cinereus semotus*) is a likely resident of the Hanawī NAR. An occasional resident is the Hawaiian short-eared owl or Pueo (*Asio flammeus sandwichensis*), considered to be a species of concern by the USFWS.

2.6.3 Harmful, Non-native Species

A large number of harmful, non-native species are present within the known range of the Po`ouli. A number of these non-native organisms are likely responsible, to some degree, for the decline of the Po`ouli and other native forest birds, and the control of the more serious of these threats is essential for the successful recovery of the Po`ouli.

It has long been determined that wild pigs have a major negative impact on Hawai`i's forest birds and to the Po`ouli in particular The rooting of pigs destroys native vegetation and habitats and provides breeding habitat for introduced mosquitos, which carry avian malaria (*Plasmodium relictum*). Earlier accounts proposed an inverse relationship of Po`ouli numbers with the degree of pig activity in an area (Mountainspring *et al.* 1990). Although pig damage is not the only factor in the Po`ouli's

decline, habitat destruction by pigs is recognized as a significant negative factor to native habitat and Hawaiian forest birds.

Numerous non-native mammalian predators are well established in the Hanawī area. Among these are feral house cats, rats, and the small Indian mongoose. While all of these are suspected to prey on forest birds opportunistically, it is predation by rats that is likely the most significant threat to the Po'ouli and other forest birds in these areas.

Mongooses have been known to take eggs, chicks, and adult birds when possible but are not present in Hanawī at the same density as rats. As evidenced by recent observations by BRD researchers (P. Banko, BRD personal communication 1998), cats can be significant predators of birds nests. However, they are not believed to be abundant in the forests of upper Hanawī (Maui Forest Bird Project Quarterly Reports and Field Summaries, 1995-1998). Both cats and mongooses are persistent, if only modest, predators of native forest birds, particularly those birds that commonly utilize understory habitats, such as the Po'ouli (Stone 1985; Scott *et al.* 1986).

Two species of rats, black or roof rats and Polynesian rats, are known residents of Hawaiian forests. While Polynesian rats are believed to have arrived early in the colonization of the islands (Tomich 1986), they are less common than black rats above 1,500 m (5,000 ft). Both species have been trapped in Hanawī NAR at and above that elevation. Black rats are largely nocturnal and arboreal and are believed to be active raiders of birds nests. They not only take eggs, but will also prey opportunistically on sleeping and brooding passerines, as evidenced by the recent predation of an adult brooding female small Kauai Thrush, or Puaiohi, (*Myadestes palmeri*) on the island of Kauai (T. Snetsinger, USGS/BRD, personal communication 1998). Its generalized foraging behavior, arboreal habit, and ubiquitous nature make the black rat an important target for control.

In addition to directly preying on forest birds, rats may also compete with the Po'ouli and other native forest birds for food (Van Riper 1976; Ralph 1978; Conant 1976, 1981; Stone 1985). Although observed in the upper canopy, the Po'ouli is typically associated with dense understory vegetation where it forages for insects and snails. Rats are known to feed opportunistically on arthropods and/or snails, and in some cases arthropods may make up a majority of the diet (Baldwin *et al.* 1952; Tomich 1986; Stone 1985). The black rat has been documented to be a serious threat to Hawaiian tree snails in some instances (Hadfield 1986).

A number of alien bird species are widespread at lower elevations and have become more abundant at higher elevations where native birds are resident. Among these are Japanese White-eyes (*Zosterops japonicus*), Red-billed Leothrix (*Leiothrix lutea*), Japanese Bush-warblers (*Cettia diphone*), Melodious Laughing-thrush (*Garrulax canorus*) and Northern Cardinal (*Cardinalis cardinalis*). The Japanese White-eye, Bush-warbler and Red-billed Leiothrix are highly insectivorous and thus can directly compete with the Po'ouli and other native birds for food (Ralph 1978; Stone 1985). In addition, all of these non-native species carry diseases such as avian pox virus (*Poxvirus avium*) and avian malaria. While the malaria parasite requires an intermediate mosquito host, avian

pox virus can be transmitted through physical contact. Lastly, birds such as the white-eye and leothrix are felt to serve important roles in the dispersal of certain non-native plants, such as passion fruit (*Passiflora* spp.), helping some alien plants to spread and become established in areas where they do not presently occur (Stone 1985).

Mosquitos (*Culex*) are vectors of avian diseases such as avian pox and malaria. Avian malaria is believed to have been one of the most destructive factors to affect the Hawaiian avifauna (Warner 1968; van Riper *et al.* 1982). The upper elevation limit of the malarial parasite, or of the mosquito vector, likely limits the Po'ouli and other forest birds to their current high elevation distributions.

3 Chapter 3. Alternatives Including the Proposed Action

3.1 Po'ouli Management Alternatives

Six management alternatives were presented in the DEA. The alternatives were different in the degree to which capture, translocation and/or captive propagation of Po'ouli was a component of each. Based on public feed-back and careful consideration by the primary agencies involved (DOFAW and USFWS), a hybrid alternative drawing from Alternative 1 and Alternative 2 was selected. In essence, the selected alternative eliminates captive propagation options outlined in alternatives 3-6 as well as the soft release option described in Alternative 2 that were presented in the DEA.

As outlined in the DEA, a program of intensified habitat management was a factor common to all six of the alternatives presented. This included increased fencing and removal of feral pigs in known and suspected home ranges of Po'ouli, as well as adjacent areas that are considered to be appropriate habitat for Po'ouli and other rare forest birds; and for the current predator control grids, present in three of the home ranges, to be expanded to include areas between known home ranges and possibly other areas suspected of containing Po'ouli. Another feature common to all of the alternatives was the continued effort to locate additional, unbanded Po'ouli as well as their nest(s) and to collect eggs for artificial incubation.

3.1.1 The Proposed Action; Alternatives 1-2 Hybrid (Hybrid-alternative)

The preferred alternative combines elements of Alternative 1 (No action) and Alternative 2 (translocation of adult bird(s) to the home range of a conspecific of the opposite sex). This approach relies largely on intensified habitat management to aid the Po'ouli by protecting individuals in the wild and improving habitat. Management actions will include removal of threats such as ungulates and predators, and research to identify other perceived threats, such as potential competitive interactions with alien birds. These management actions will be beneficial to other endangered species that share habitats with the Po'ouli, as well.

If continued observation of wild birds indicates that pair formation and nesting in the wild is unlikely under the current conditions, this Hybrid-alternative allows for the option of a translocation(s) of birds utilizing a "hard release" in order to encourage the formation of a breeding pair within one of the home ranges. Prior to such a translocation attempt, additional efforts will be made to determine the sexes of those birds to be moved. Translocations would be timed to take advantage of the reproductive readiness of the target birds. Techniques for translocation will be tested on surrogate species prior to undertaking such actions with Po`ouli. Depending on results of field monitoring, further consideration or analysis of sex determination, success with surrogate-species holding and translocation, and field conditions, a translocation may or may not be attempted during the next breeding season.

Under this Hybrid-alternative, searches for additional, unbanded Po`ouli would continue. In addition, if located during on-going surveys and monitoring, wild eggs will be collected for captive propagation.

The Hybrid-alternative was selected over the other alternatives for the following reasons:
1) Increased habitat management will reduce or eliminate threats to the three known birds occurring in the managed areas and benefit any other Po`ouli that may occur or move through the area(s). 2) Removing two or more of the known wild birds would prevent interactions with other, undetected, wild birds that might still exist. 3) It was deemed that the holding of Po`ouli in captivity, either for captive propagation or for a soft-release translocation, stood too great a chance of resulting in the death or injury of a bird(s). Given the small number of known birds (3 known individuals) with which conservation efforts could be conducted, this was viewed as too great a risk. 4) Increased habitat management would provide the most benefit to the most species.

This alternative allows for conducting research that will address questions regarding threats to the Po`ouli and possible management tools for their conservation and recovery. Possible research projects include, but are not limited to, effects of alien passerines on the Po`ouli and other native forest birds; continuing work on avian disease and its control; and research on broadcast application of rodenticides.

3.1.2 Alternative 1. Current Management Actions -- no manipulation of known birds.

Under this alternative, the agencies would simply continue the current management actions being undertaken on behalf of the Po`ouli in the Hanawī area. Current management actions consist of fencing to remove ungulates in the Hanawī area, ground-based predator control activities, weed monitoring and removal, monitoring of the three known Po`ouli, searches for additional Po`ouli, and preparations to collect eggs of the Po`ouli for captive propagation should a nest be located. Under this alternative, every attempt would be made to accelerate and expand these ongoing management actions and there would be no manipulation of the wild adult birds other than occasional mist-netting for health checks, band replacements, possible attachment of radio transmitters, etc.

3.1.3 Alternative 2. Translocate bird(s) of opposite sex to the home range of another individual and either release the bird(s) immediately (hard release) or after a short acclimatization period in a holding cage (soft release).

Under this alternative, attempts would have been made to either capture the male or one or both of the females and move them to the home range of a conspecific of opposite sex. Under the hard release option, the translocated bird(s) would be released immediately upon arrival to the conspecific's home range area. Under the soft release option, the translocated bird would be held in a small field aviary for a minimum of 48 hours and closely monitored throughout the holding period.

The first option, hard release, of this alternative is included in the proposed action, i.e., the Hybrid-alternative, and is addressed under the Proposed action section above. This option was selected because it was felt that some degree of manipulation may be needed in order to encourage the formation of a breeding pair, but that prolonged holding presented an unacceptably high risk to the bird(s). The potential need for translocation is based on the best available information, that the three known Po'ouli are site specific within their home range and that there is no known interaction between these birds. Translocation options will be further considered with the acquisition of additional information, which may include, but is not limited to, considerations such as clarification of data on gender determination of the Po'ouli, successful tests of translocation techniques with surrogates, no evidence of pairing in the wild, and optimizing the chances of encounter between the translocated and resident bird.

3.1.4 Alternative 3. Capture and hold one, two, or all of the remaining three individuals in holding cages and/or aviary(ies) in Hanawī NAR until a pair bond is formed, then release the pair back into the wild.

This option relied on the construction and maintenance of at least one, and possibly two, field aviaries and/or holding cages within Hanawī NAR. Under this alternative birds would have been held in field aviaries until pair formation had occurred, at which time the pair would be released into the surrounding habitat. One or both of these birds would have been fitted with a radio transmitter prior to release, and would have been tracked and monitored. Had nesting occurred, eggs would have been removed, if possible, for rearing in a captive breeding facility. The option for collecting the second clutch would have remained open.

Alternative 3 received relatively little support and was rejected for a number of reasons. 1) This alternative required holding Po'ouli in captivity for a prolonged period of time, increasing associated health risks to them with an increased likelihood of mortality before a successful breeding could be achieved. 2) The establishment and maintenance of the proposed field aviary with appropriate field staff, avian veterinarian, and adequate supplies throughout the duration of this alternative would be expensive and would result in greater damage to the environment. 3) Unpredictable and sometimes severe weather conditions would have greatly complicated the field operation, potentially at a critical

time during the project. 4) Given that observation and netting of Po'ouli have been problematic and unpredictable, capture of these birds would require much additional time and costs, and would have the potential to result in additional stress to the captive bird(s).

3.1.5 Alternative 4. Capture and hold two or all of the remaining three individuals in holding cages and an aviary(ies) in Hanawī NAR for attempted captive propagation and subsequent release of the adults and/or young back into the wild.

This alternative combined aspects of Alternatives 3 and 5 (the latter described below). As proposed, it would have involved the capture of two birds and translocation of at least one or possibly two birds. It would have required the construction and maintenance of at least one field aviary in the Hanawī NAR, and a full-time staff to care for the birds while being held in captivity in the field. The birds would be placed into a holding cage and/or field aviary within Hanawī NAR in one of the home ranges for pair bond formation and attempted captive propagation. If nesting was successful, all first clutch eggs would be removed and transported to a captive propagation facility for incubation and rearing. Second clutch eggs would have been considered for similar propagation. Both young and adults of a successful captive rearing effort would potentially be released into the surrounding habitat.

None of the respondents to the DEA were in support of this alternative. It was withdrawn from consideration for the same reasons that Alternative 3 (above) was dropped. In addition, this alternative proposed holding the birds for a longer period than Alternative 3, thus increasing the likelihood of death or injury due to captive holding and extending the difficulties of maintaining the field aviary along with the needed staff and supplies. As with alternative 3, this option would have resulted in more delays and additional stress to the birds since encounter and capture rates are infrequent.

3.1.6 Alternative 5. Capture and hold one, two, or all of the remaining three individuals in a field aviary(ies) in Hanawī NAR until a pair bond is formed and/or the birds are acclimated to captivity, then transfer the birds to an approved facility for attempted captive propagation.

Under this option, rather than immediately transporting captured Po'ouli to an approved facility for captive propagation purposes (as described in Alternative 6 below), the birds would be held in field aviary(ies) within Hanawī NAR, in accordance with the procedures described under alternative 4 (above), until such time that a pair bond is formed. After pair formation, or at least acclimation to captive holding, the birds would be transported to a captive breeding facility where clutch manipulation would, in theory, allow for maximum production of offspring while reducing the time and risks associated with the field aviary.

There was some degree of support for this alternative (see section 1.8), which stressed captive propagation utilizing gradual acclimation from a field aviary to a captive rearing facility. However, a greater number of reviewers were decisively opposed to an attempt at captive breeding of wild

adults. Reviewers cited concerns about the uncertainty of acclimatization of wild adult insect-eating birds to captivity. The uncertainties associated with sex determination and dietary needs of the birds further heightened these risks. Given the accumulating probabilities that a bird(s) might be lost in such an attempt, it was felt that the risks were too high and would likely result in the loss of one or more of these individuals before captive breeding could be achieved. As well as utilizing a captive breeding facility, this option bore the associated costs of building and maintaining a field aviary with accommodations and costs of the needed staff and veterinarian. As with Alternatives 3 and 4, this alternative also exposed the birds being kept in the aviary(ies) to the vagaries of weather and the uncertainties of adequate supply that might result from such factors. Common to the two previous alternatives, Alternative 5 would require extensive increases in time, effort, and staff to capture the birds for this effort. In addition, TPF has indicated they will not be able to participate in captive management of adult Po'ouli collected from the wild because the necessary biological information for this species is unavailable and the mortality risks for insectivorous passerines in captivity are very high. Although this would not prevent proceeding with this alternative, it would possibly require that other aviculturists be hired and appropriate facilities prepared to receive birds. This would increase costs and require additional time for implementation.

3.1.7 Alternative 6. Capture two or all of the remaining three individuals and take them immediately into an approved facility for attempted captive propagation.

Under this alternative it was proposed that a pair of Po'ouli of opposite sex, or possibly all three known birds, be captured and rapidly transported to a captive breeding facility. Birds would be initially kept separate but would be provided opportunities to meet, with the hopeful outcome of forming a reproductive pair.

While this alternative would cause less disturbance to native habitats than those which rely on field aviaries (Alternatives 3-5), it was ultimately rejected based on the high risk factor associated with bringing adult birds into captivity from the wild, as discussed above under Alternative 5. As with the previous alternative, additional netting time and staff would be required without guarantees of capturing sufficient birds. The inability of TPF to participate in captive breeding alternatives would require the hiring of other aviculturists and preparation of facilities, which would potentially result in more costs and delays. In addition, the biological information necessary for maintaining wild-caught adult insectivores like th Po'ouli in captivity is minimal, making the risks of mortality for captive birds unacceptably high.

3.2 Summary of Factors Leading to the Selection of the Proposed Action (Preferred Alternative)

Ultimately, all of the alternatives that called for attempted captive propagation utilizing adult birds from the wild, or for a translocation that relied on holding birds for a prolonged period, were dropped from consideration. This decision was based on a number of factors, which taken alone or together,

increased the chances of mortality to an unacceptably high level. With only three Po`ouli known to exist, the loss of even a single bird would greatly jeopardize the continued existence, or result in the extinction of the species. The vast majority of captive propagation efforts utilizing wild-caught adult birds suffer high degrees of mortality until appropriate methods for handling are developed for the taxa involved (Muller 1976). It was argued that lack of knowledge of the Po`ouli's diet and natural history, as well as the lack of hands-on experience in rearing this and other Hawaiian insectivorous species, greatly increased the likelihood of mortality if this species were brought into captivity. (See the Hawai`i Forest Bird Surrogate Project Summary, Appendix C, for details on survivorship of captured Hawaiian forest birds.) The lack of Po`ouli in the wild to serve as surrogates or models to captively reared birds could possibly hamper attempts at reintroduction of the captively reared birds.

Large amounts of time and effort with additional staff would have been required to implement Alternatives 3-6 since Po`ouli are so infrequently encountered and even less frequently captured. Additionally, the inability of TPF to participate in captive breeding alternatives with wild-caught birds would have required increased costs and delays while alternative captive propagation options were developed.

Some commenters felt that removal of Po`ouli from the wild could possibly result in reduced funding and reduced public attention to the conservation of native ecosystems, i.e., public attention would be drawn to successes or failures of a captive breeding program. The emphasis on captive propagation could potentially divert funds from habitat conservation in the Hanawī area. This would potentially reduced funding and efforts that might otherwise focus on the conservation of the habitat essential to the Po`ouli and other threatened and endangered Hawaiian species. It was also felt that the captive propagation and soft release translocation scenarios had more potential negative outcomes than positive outcomes.

The Hybrid-alternative was selected for a number of positive factors. Large-scale predator control efforts have been successfully used in conservation efforts in New Zealand (Campbell 1979; Daugherty *et al.* 1990), some of which have resulted in drastic rebounds for native bird species. Alien predators are known to have negative impacts on Hawaiian forest birds (see review in section 2.6.3) and at least one preliminary study has shown rodent removal to increase nest success and to increase the number of fledglings per adult pair of Elepaio (*Chasiempis sandwichensis*) (VanderWerf 1997, 1998a, b). Rodents are also known to consume fruits and seeds of native plants and can be important limiting factors in the recruitment or health of a number of such species (Baker and Allen 1976; Russell 1980; Stone 1985; see review in Cuddihy and Stone 1990; Male and Loeffler 1997). Hence, rodent and predator control may have positive influences that go beyond conservation of the Po`ouli, benefiting other native birds and other components of the biotic community.

A summary of the pros and cons associated with the various alternatives is provided in Table 3-1.

Table. 3-1 Pros and Cons of the Alternatives. See section 3.1 for more details.

ALTERNATIVES	ALTERNATIVE #1 CURRENT MANAGEMENT-NO MANIPULATIONS OF KNOWN BIRDS	ALTERNATIVE #2 TRANSLOCATION AND RELEASE	ALTERNATIVE #3 HOLD IN FIELD AVIARY FOR PAIR FORMATION	ALTERNATIVE #4 HOLD LONG-TERM IN FIELD AVIARY	ALTERNATIVE #5 HOLD IN FIELD AVIARY/TRANSFER TO CAPTIVITY	ALTERNATIVE #6 CAPTIVE PROPAGATION
PROS	Provides increased habitat management.	Provides increased habitat management.	Provides increased habitat management.	Provides increased habitat management.	Provides increased habitat management.	Provides increased habitat management.
	Minimal handling of adult Po'ouli; therefore, low risk of death or injury attributable to hands-on management activities.	Birds held in cages or aviary for minimal amount of time (soft release)				
	Keeps birds in natural habitat.	Keeps birds in natural habitat.	Keeps birds in somewhat natural surroundings.	Keeps bird in somewhat natural surroundings.	Allows birds to acclimate to captivity and form pair bond in somewhat natural surroundings.	
		Allows for prompt release of birds if necessary.	Allows for prompt release of birds if necessary.	Allows for prompt release of birds if necessary.	Allows for prompt release of birds if necessary.	
				If nesting occurs, eggs can be easily located and collected for incubation and rearing at captive breeding facility.	If nesting occurs, eggs can be easily located and collected for incubation and rearing.	If nesting occurs, eggs can be easily located and collected for incubation and rearing.
			Birds kept in an environment that is relatively secure from threats until pair is formed.	Birds kept in an environment that is relatively secure from threats.	Birds kept in an environment that is relatively secure from threats.	Birds kept in an environment that is relatively secure from threats.

Table. 3-1 Pros and Cons of the Alternatives. See section 3.1 for more details.

ALTERNATIVES	ALTERNATIVE #1 CURRENT MANAGEMENT-NO MANIPULATIONS OF KNOWN BIRDS	ALTERNATIVE #2 TRANSLOCATION AND RELEASE	ALTERNATIVE #3 HOLD IN FIELD AVIARY FOR PAIR FORMATION	ALTERNATIVE #4 HOLD LONG-TERM IN FIELD AVIARY	ALTERNATIVE #5 HOLD IN FIELD AVIARY/TRANSFER TO CAPTIVITY	ALTERNATIVE #6 CAPTIVE PROPAGATION
PROS	Low cost relative to other alternatives, which may allow for a more accelerated approach to habitat management, predator control, and expanded searches.	Low cost relative to other alternatives, which may allow for a more accelerated approach to habitat management, predator control, and expanded searches.				Since captive propagation facilities are already built and operating, cost may be reduced, which could allow for a more accelerated approach to habitat management, predator control, and expanded searches relative to alternatives requiring field aviaries.
CONS	High probability that known birds will die before reproducing.	High probability that known birds will die before reproducing.	High probability that known birds will die before reproducing.	High probability that known birds will die before reproducing.	High probability that known birds will die before reproducing.	High probability that known birds will die before reproducing.
	Remaining wild Po'ouli may not pair and reproduce.	Limited opportunity for birds to form a pair bond.				
			Birds may not adapt to captivity and may die before reproducing.	Birds may not adapt to captivity and may die before reproducing.	Birds may not adapt to captivity and may die before reproducing.	Birds may not adapt to captivity and may die before reproducing.
	Birds still exposed to uncontrolled/unknown agents of mortality.	Birds still exposed to uncontrolled/unknown agents of mortality.	Inclement weather could damage aviary and/or birds and allow the entrance of predators. Unknown sources of mortality?	Inclement weather could damage aviary and/or birds and allow the entrance of predators. Unknown sources of mortality?	Inclement weather could damage aviary and/or birds and allow the entrance of predators. Unknown sources of mortality?	Birds could not be immediately released to the wild. Unknown sources of mortality (aspergillosis, other)?

Table. 3-1 Pros and Cons of the Alternatives. See section 3.1 for more details.

ALTERNATIVES	ALTERNATIVE #1 CURRENT MANAGEMENT-NO MANIPULATIONS OF KNOWN BIRDS	ALTERNATIVE #2 TRANSLOCATION AND RELEASE	ALTERNATIVE #3 HOLD IN FIELD AVIARY FOR PAIR FORMATION	ALTERNATIVE #4 HOLD LONG-TERM IN FIELD AVIARY	ALTERNATIVE #5 HOLD IN FIELD AVIARY/TRANSFER TO CAPTIVITY	ALTERNATIVE #6 CAPTIVE PROPAGATION
CONS		Birds could be injured or die from handling and transport.	Increased chance that birds could be injured or die from handling and transport.	Increased chance that birds could be injured or die from handling and transport.	Increased chance that birds could be injured or die from handling and transport.	Increased chance that birds could be injured or die from handling and transport.
			Construction and maintenance of field aviary and staff facilities are logistically difficult and costly.	Construction and maintenance of field aviary and staff facilities are logistically difficult and costly.	Construction and maintenance of field aviary and staff facilities are logistically difficult and costly.	
			Impacts to the environment would be high due to aviary construction and ongoing bird care and monitoring activities.	Impacts to the environment would be high due to aviary construction and ongoing bird care and monitoring activities.	Impacts to the environment would be high due to aviary construction and ongoing bird care and monitoring activities.	
	Difficulties in locating future nests would not allow for maximum nest protection and reproductive output through double-clutching, etc.	Difficulties in locating future nests would not allow for maximum nest protection and reproductive output through double-clutching, etc.			Would require agreement/ contracts with aviculturists or other conservation organization.	Would require agreement/ contract with aviculturists or other conservation organization.
		Translocated bird likely to leave area.				

4 Chapter 4. Environmental Consequences And Mitigation Measures

4.1 Effects on the Physical Environment

4.1.1 Topography, Soils, and Climate

There will be no significant effects to the topography, soils, or the climate of the area as a result of the proposed project. One of the proposed research items that may be conducted as part of the proposed action is the aerial or broadcast use of rodenticide. This activity could have impacts to soils and water in the area. This is addressed in section 4.1.2 below.

4.1.2 Hydrology and Water Resources

The continuing activities of resource managers and researchers will not have significant effects on the hydrology or water resources of the area. However, as stated in 4.1.1 above, it is possible that aerial or other broad-scale application of rodenticides may be used in the future. It is possible that use of rodenticides in this fashion could have negative effects on soils and water resources of the east Maui area. Prior to initiating such broad-scale use, the appropriate environmental assessment and/or environmental impact statement will be prepared to disclose use and present an analysis of the potential impacts.

4.2 Effects on the Social and Economic Environment

Aside from its importance as a watershed area, the Hanawī NAR and surrounding areas are not used for resource extraction. All of these upper elevation lands are zoned as protected conservation land and are not heavily used for recreation. There is no cultural Hawaiian use of the Hanawī or surrounding areas, and, except for management purposes, these areas are closed to hunting or only rarely accessed for this purpose. The proposed actions are not anticipated to have any negative impacts to the social or economic environment of the area.

4.2.1 Population and Local Community

No local communities occur in the project area. The proposed activities will not adversely affect the communities that are located within 300 m (1000 ft) elevation of the coast. The proposed activities will not occur in areas currently open to public use.

4.2.2 Employment and Local Economy

None of the proposed activities would result in changes to agriculture, farming, the visitor industry or any other jobs currently contributing to the local economy.

4.2.3 Land Use

No changes in land use will occur under any of the proposed activities.

4.2.4 Archaeological and Historic Resources

None of the proposed activities will result in negative impacts to archaeological or historical resources.

4.3 Effects on the Biological Environment

4.3.1 Native Vegetation Communities

Under the proposed actions, the natural communities where Po`ouli will be captured and/or released will remain under the management of the NARS and DLNR. Project activities will increase the likelihood of non-native weeds being introduced into these areas. High-use areas such as transects, camps, predator-control grids, and mist net lanes, will receive greater disturbance and will increase the chance of weed spread along such "corridors." However, management activities to be conducted as part of the proposed action include monitoring for and elimination of incipient populations of such weeds and ungulate removal. Removing pigs from these areas will greatly reduce disturbance to and destruction of the native plant community and have positive effects that will more than compensate for possible weed introductions/spread by managers and researchers working in the area. Given that monitoring and removal of alien weeds will be an on-going effort during the project, native vegetation communities should remain relatively intact and recover fully. The additional fencing proposed as part of the on-going habitat management may also result in weed introductions and/or spread. However, this will be more than compensated for by additional weed monitoring that will be conducted periodically along these fence lines and the ungulate removal that will occur in any additonal fenced units.

A small portion of one or two of the three Po`ouli home ranges would be temporarily altered should the translocation option be found to be feasible. Under this scenario, small holding cages would be constructed to temporarily hold Po`ouli while awaiting translocation to the home range of a conspecific. Minor clearing of vegetation might be necessary in order to safely air-lift (via helicopter or attached cable) a captured bird. As stated above, on-going monitoring for incipient populations of weeds will greatly reduce or eliminate the chance of weed establishment in these areas.

4.3.2 Endangered and Threatened Species

Under the preferred alternative, Po'ouli may be captured for translocation to the home range of conspecifics of opposite sex if such a translocation is deemed feasible. Capture of Po'ouli will entail the use of mist nets. Mist nets are unselective in the species of bird captured. Given the relatively high density of other endangered passerines present in the project area (see section 2.6.2 above), there is a possibility that other endangered species will be captured in the mist nets. Should other endangered species be captured, the birds will be banded, measured, and promptly released, in accordance with the banding protocols specified in Appendix D. All biologists involved in mist netting, handling, and banding of the endangered birds will possess all necessary State and Federal permits for the handling of these endangered species and be trained in proper and safe bird banding protocols. Surrogate species will be used to train personnel on handling and banding protocols and any invasive sample collection.

Precautions would be taken such that none of the bird netting or other management activities would have detrimental effects on endangered plants found in the area. Known or newly discovered endangered plants will be flagged and avoided.

Capture, holding, and transportation for the purpose of translocation, have the potential to result in death or injury of the endangered Po'ouli. Field personnel will conduct capture, holding, and translocation techniques using surrogate species such as the Maui Creeper prior to attempting such manipulation with Po'ouli. At least two successful translocations with surrogates will be completed before a translocation is attempted with Po'ouli.

4.3.3 Perpetuation of Native Biological Diversity

The proposed action is specifically designed to perpetuate the native bird diversity of the east Maui rainforest, with Po'ouli being the species of focus. The proposed actions seek to arrest the current decline of the Po'ouli and begin to increase its numbers.

4.4 Other Effects

4.4.1 Cumulative Effects

If adequate land management techniques are pursued that will eliminate or greatly reduce factors that negatively impact the Po'ouli (*e.g.*, predation, disease, competition with non-natives), then other native species, including other endangered species, would benefit from these activities. Although human disturbance has the potential to establish and/or spread alien weeds, this threat should be more than off-set by the continued weed monitoring conducted by biologists currently employed on this project. In addition, the continued management currently being employed, fencing and removal of

pigs, as well as fencing of additional areas, will greatly decrease disturbance to native habitats, and remove one of the most prolific vectors of alien seeds in remote areas. Proper habitat management activities should benefit the entire native biotic community and will protect it as an important watershed. Hence all cumulative effects that may result from the proposed actions will be positive effects only.

Should the broad-scale application of rodenticide be adopted as a management action, all Federal NEPA and State environmental requirements (i.e., preparation of environmental assessment or environmental impact statement) will be met before initiation of broad-scale management actions. Assessing potential long-term and cumulative effects of such actions will be included in those assessments.

4.5 Summary

A summary of the Effects of the Alternatives on the Physical, Social, Economic and Biological Environment is presented in Table 4-1.

Table 4-1. Summary of the Effects of the Alternatives

AFFECTED RESOURCES	ALTERNATIVE 1 CURRENT MANAGEMENT	ALTERNATIVE 2 TRANSLOCATE AND RELEASE	ALTERNATIVE 3 HOLD IN FIELD AVIARY FOR PAIR FORMATION	ALTERNATIVE 4 HOLD LONG-TERM IN FIELD AVIARY FOR PROPAGATION	ALTERNATIVE 5 HOLD IN FIELD AVIARY/ TRANSFER TO CAPTIVITY	ALTERNATIVE 6 CAPTIVE PROPAGATION
PHYSICAL ENVIRONMENT						
Climate and Soils	None/Status Quo*	None/Status Quo*	None/Status Quo*	None/Status Quo*	None/Status Quo*	None/Status Quo*
Hydrology and Water Resources	None/Status Quo*	None/Status Quo*	None/Status Quo*	None/Status Quo*	None/Status Quo*	None/Status Quo*
SOCIAL/ECONOMIC ENVIRONMENT						
Population and Local Community	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo
	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo
	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo
	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo	None/Status Quo

Table 4-1. Summary of the Effects of the Alternatives

BIOLOGICAL ENVIRONMENT						
Native Vegetation Communities	Increased disturbance due to predator-control grids and additional fencing.	Increased disturbance due to predator-control grids. Additional disturbance from mist-net lanes and additional fencing.	Increased disturbance due to predator-control grids. Additional disturbance from mist-net lanes and additional fencing. Increased disturbance from field aviaries.	Increased disturbance due to predator-control grids. Additional disturbance from mist-net lanes and additional fencing. Increased disturbance from field aviaries.	Increased disturbance due to predator-control grids. Additional disturbance from mist-net lanes and additional fencing. Increased disturbance from field aviaries.	Increased disturbance due to predator-control grids. Additional disturbance from mist-net lanes and additional fencing.
Endangered and Threatened (E/T) Species	All native species should benefit from predator control and expanded ungulate removal. Possible mortality of Po`ouli without reproduction if birds do not pair, or from predators and/or other causes.	All native species should benefit from predator control and expanded ungulate removal. Possible negative effect through death/injury of Po`ouli and other native E/T forest birds during mist netting, etc. Possible mortality of Po`ouli without reproduction due to captive holding. Possible mortality of Po`ouli without reproduction if birds do not pair, or from predators and/or other causes.	All native species should benefit from predator control and expanded ungulate removal. Possible negative effect through death/injury of Po`ouli and other native E/T forest birds during mist netting, etc. Possible mortality of Po`ouli without reproduction due to captive holding. Possible mortality of Po`ouli without reproduction if birds do not pair, or from predators and/or other causes.	All native species should benefit from predator control and expanded ungulate removal. Possible negative effect through death/injury of Po`ouli and other native E/T forest birds during mist netting, etc. Possible mortality of Po`ouli without reproduction due to captive holding. Possible mortality of Po`ouli without reproduction if birds do not pair, or from predators and/or other causes.	All native species should benefit from predator control and expanded ungulate removal. Possible negative effect through death/injury of Po`ouli and other native E/T forest birds during mist netting, etc. Possible mortality of Po`ouli without reproduction due to captive holding. Greater control over mortality sources in wild. Possible predation while birds in field aviary.	All native species should benefit from predator control and expanded ungulate removal. Possible negative effect through death/injury of Po`ouli and other native E/T forest birds during mist netting, etc. Possible mortality of Po`ouli without reproduction due to captive holding. Greater control over mortality sources in wild.

Table 4-1. Summary of the Effects of the Alternatives

Native Biological Diversity	All native species should benefit from predator-control and expanded ungulate removal. Potential introduction of alien weeds along new fence lines or predator-control grids. Possible loss of Po'ouli due to insufficient action.	All native species should benefit from predator-control and expanded ungulate removal. Potential introduction of alien weeds along new fence lines or predator-control grids and mist-net lanes. Possible loss of birds from capture. Possible loss of Po'ouli due to insufficient action.	All native species should benefit from predator-control and expanded ungulate removal. Potential introduction of alien weeds along new fence lines or predator-control grids and mist-net lanes. Possible loss of birds from capture and prolonged holding.	All native species should benefit from predator-control and expanded ungulate removal. Potential introduction of alien weeds along new fence lines or predator-control grids and mist-net lanes. Possible loss of birds from capture and prolonged holding.	All native species should benefit from predator-control and expanded ungulate removal. Potential introduction of alien weeds along new fence lines or predator-control grids and mist-net lanes. Possible loss of birds from capture and prolonged holding.	All native species should benefit from predator-control and expanded ungulate removal. Potential introduction of alien weeds along new fence lines or predator-control grids and mist-net lanes. Possible loss of birds from capture and prolonged holding.
Harmful Nonnative Species	Threat of alien weed introduction or spread along predator-control grids and fence lines. Reduction in ungulate and predator activity.	Threat of alien weed introduction or spread along predator-control grids, mist net lanes, and fence lines. Reduction in ungulate and predator activity.	Threat of alien weed introduction or spread along predator-control grids, mist net lanes, and fence lines. Reduction in ungulate and predator activity.	Threat of alien weed introduction or spread along predator-control grids, mist net lanes, and fence lines. Reduction in ungulate and predator activity.	Threat of alien weed introduction or spread along predator-control grids, mist net lanes, and fence lines. Reduction in ungulate and predator activity.	Threat of alien weed introduction or spread along predator-control grids, mist net lanes, and fence lines. Reduction in ungulate and predator activity.

*: See text, sections 1.4, 4.1.1, 4.1.2, 4.4.1, for actions pertaining to broad-scale rodenticide use.

5 Chapter 5. Summary of Significance Criteria

The proposed project is not expected to cause significant impacts to the environment, pursuant to the significance criteria established by the State of Hawai'i Environmental Council (Hawai'i Administrative Rules, Section 11-200-12) and discussed below; therefore, the determination is to issue a Finding of No Significant Impact.

The proposed actions do not involve an irrevocable commitment to loss or destruction of any natural or cultural resource. The actions proposed in this Final Environmental Assessment (FEA) are anticipated to prevent the extinction of the Po'ouli (*Melamprosops phaeosoma*).

The proposed actions will not curtail the range of beneficial uses of the environment. All affected areas are in the Hanawī Natural Area Reserve and Haleakalā National Park, which are zoned Conservation, and the activities proposed are intended to enhance the site for endangered forest birds, native plants, and other wildlife.

The proposed actions will not conflict with the State's long-term environmental policies. The proposed actions will not conflict with the environmental policies set forth in the State Plan and Chapter 344, HRS, in that the proposed management actions will restore and enhance habitat for endangered and native species, protect the endangered Po'ouli, and will not result in damage to sensitive natural resources nor emit excessive noise or contaminants.

The proposed actions will not substantially adversely affect the economic and social welfare of the community. The proposed activities utilize the most cost-effective conservation strategies for the recovery of a critically endangered species and benefit the entire native biotic community.

The proposed actions will not substantially adversely affect the public health of the community. The proposed actions will not emit excessive noise or contaminants and will not have substantial adverse affects on public health.

The proposed actions will not involve substantial secondary impacts, such as population changes or effects on public facilities. The proposed actions will not affect any existing public recreational facilities and will not induce population growth in the area.

The proposed actions will not involve a substantial degradation of environmental quality. Best management practices will be used to minimize impacts to the environment during implementation of these proposed actions and the overall, long term affects of actions will be to protect and recover endangered species and restore and enhance native wet forest community in Hawai'i.

The proposed actions will not have cumulative impacts or involve a commitment for larger actions. The proposed actions will not have negative cumulative impacts or involve significant commitment for larger actions than those described.

The proposed actions will not adversely affect a rare, threatened, or endangered species, or its habitat. Actions described will be implemented in a manner to avoid harm to any endangered plants or other rare, threatened, or endangered species. The proposed activities will benefit endangered species and their habitat.

The proposed actions will not substantially affect air or water quality or ambient noise levels. Because of the scale of the project, it will not substantially affect air or water quality or ambient noise levels. The habitat management actions proposed will, in fact, improve the quality of the watershed.

The proposed project is not located in an environmentally sensitive area (e.g., flood plain, tsunami zone, and coastal zone). Although the site is located in a Conservation District, the proposed actions are in accordance with the zoning of the area as preservation lands and implement management actions to restore and enhance native habitats.

The proposed actions will not substantially affect scenic vistas and view planes identified in county or State plans or studies. The project will not affect any of the listed sites or vistas for Maui.

The proposed project will not require substantial energy consumption. The affected area is not on a local power grid, and, with sources being battery or generator power, energy consumption will be minimal.

6 Chapter 6. List of Preparers and Reviewers

Preparers

Sharon Reilly, Department of Land and Natural Resources, Division of Forestry and Wildlife, Honolulu, Hawai'i

Karen Rosa, Assistant Field Supervisor for Endangered Species, U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai'i

Dave Hopper, Biologist, U.S. Fish and Wildlife Service, Ecological Services, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai'i

Reviewers

This EA incorporates the special expertise of refuge managers, planners, local conservation scientists, recovery biologists, natural resource managers, landowners, government agencies representatives, botanists, and educators. We also received input from members of the general public during the public comment period.

7 Chapter 7. List of Agencies, Organizations, and Persons Consulted

The Draft EA was distributed to the following agencies, organizations, and interested individuals:

7.1 Federal Agencies

U.S. Department of Agriculture

Animal Damage Control, Honolulu
Earl Campbell, Denver Wildlife Research Unit, Hilo, Hawai`i
Natural Resources Conservation Service, Honolulu (Kenneth Kaneshiro, acting State Conservationist)
U.S. Forest Service, Pacific Southwest Research Station, Institute of Pacific Islands Forestry, Honolulu
National Resources Conservation Service, Hanā Soil and Water Conservation District

U.S. Department of the Interior

Secretary of the Interior, Washington, D.C.
Fish and Wildlife Service
- Director, Washington, D.C.
- Regional Director, Portland, Oregon
- Associate Manager, Endangered Species, Portland, Oregon
- Assistant Regional Director-Ecological Services, Portland, Oregon
- Assistant Regional Director-North Pacific Coast and Pacific Islands Ecoregions, Portland, Oregon
- Pacific Islands Manager, Pacific Islands Ecoregion, Honolulu
- Field Supervisor, Division of Ecological Services, Honolulu
- Special Agent In Charge, Division of Law Enforcement, Honolulu

Geological Survey, Pacific Island Ecosystem Research Center, Honolulu
- Hawai`i Research Station, Volcano, Hawai`i
- Haleakalā Research Station, Haleakalā National Park
- Cameron Kepler, BRD, University of Georgia-Athens
- Michelle Reynolds, BRD, Volcano
- Tom Snetsinger, BRD, Kaua`i

National Park Service, Pacific Area, Honolulu
- Superintendent, Haleakalā National Park, Maui
- Resource Management Division, Haleakalā National Park, Maui
- Resource Management Specialist, Hawai`i Volcanoes National Park

Congressional Delegation

Senator Daniel K. Akaka
Senator Daniel K. Inouye
Representative Patsy T. Mink
Representative Neil Abercrombie

7.2 State Agencies

Governor Benjamin Cayetano
Office of State Planning, Hawai'i Coastal Zone Management Program (Rick Egged, Director)
Office of Environmental Quality Control (Gary Gill, Director)
Office of Hawaiian Affairs (Linda Colburn, Administrator; Martha Ross, Deputy Administrator)
Department of Agriculture (James Nakatani, Chairperson)
Department of Land and Natural Resources (Michael Wilson, Chairman)
- State Historic Preservation Office, Honolulu (Don Hibbard, Director)
- Division of Forestry and Wildlife (Michael Buck, Administrator)
- Division of Forestry and Wildlife, Maui District Manager (Wes Wong)
- NARS Commission

Department of Education
- Public Library System - Hāna and Kahului, Maui and the State Library
- University of Hawai'i, Environmental Center and Hamilton Library
- Secretariat for Conservation Biology (Nancy Glover)

State Legislative Representatives

David Morihar, East Maui District

7.3 County Agencies

Mayor Linda Lingle
J. Kalani English, Hana District Representative, Maui County Council
Maui County Council
Maui County Board of Water Supply (David Craddick, Ellen Kraftsow)

7.4 Hawaiian Community Leaders

Hanna Springer
Michael Minn, Hāna, Maui
Dana Naone-Hall, Wailuku, Maui
Living Indigenous Forest Ecosystems, Wailuku, Maui (Mahealani Kaiaokamalie)

7.5 Private Conservation Organizations

Local Organizations

The B.P. Bishop Museum (Donald Duckworth, Director and Carla Kishinami)
Friends of Haleakalā National Park
Hawai'i Audubon Society
The Nature Conservancy of Hawai'i (Alan Holt, Kim Harris, Eric Nishibiyashi, Alenka Remec, Mark White)
The Peregrine Fund (Bill Burnham, Jeff Cilek, Al Lieberman, Cyndi Kuehler)
Sierra Club, Hawai'i Chapter
The Wildlife Society - Hawai'i Chapter

National and International Organizations

American Bird Conservancy
American Ornithologists Union
American Museum of Natural History
BirdLife (formerly known as the International Council for Bird Preservation)
International Union for the Conservation of Nature
National Audubon Society
RARE Center for Tropical Conservation
Smithsonian Institution
Society for Conservation Biology

7.6 Private Landowners and Other Interested Parties

Peter Baldwin, Haleakalā Ranch
Maki Dee Boersma, University of Washington
Tom Cade, Professor Emeritus of Cornell University
Anne Carter, Maui Forest Bird Project Volunteer
William Conway, Wildlife Conservation Society
Garrett Hew, East Maui Irrigation Company
Susie Ellis, Captive Breeding Specialist Group, IUCN
John Fitzpatrick, Cornell Lab of Ornithology
Kamehameha Schools/B.P. Bishop Estate

Randy Bartlett, Maui Land and Pine
Ian McFadden, Dept. of Conservation, New Zealand
Patrick Morris, DVM, San Diego Zoo
Simon Mowbray, Dept. of Conservation, New Zealand
Ian Newton, Institute of Terrestrial Ecology, UK
Bruce Rideout, DVM, San Diego Zoo
Alan Saunders, Dept. of Conservation, New Zealand
Ullie Seal, Captive Breeding Specialist Group, IUCN
Noel Snyder, Wildlife Preservation Trust International
Martin Vince, North Carolina Zoo
Jim Wiley, Grambling State University
Gerald Winegard, American Bird Conservancy
Dave Woodruff, UC San Diego

7.7 Recovery Teams and Working Groups

Avian Disease Recovery Working Group

Carter Atkinson, BRD
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Keven Flammer, NC State University
Renate Gassman-Duvall, DVM, Maui
Lee Goff, UH Mānoa
Don Jansen, DVM, San Diego Zoo
Cyndi Kuehler, TPF, Hawai`i
Greg Massey, DVM, DOFAW
Bob Nakamora, USDA
Glenn Olsen, BRD
Charles van Riper, BRD
Thierry Work, BRD

Captive Propagation Recovery Working Group

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Peter Luscomb, Honolulu Zoo
Greg Massey, DVM, DOFAW
Thane Pratt, BRD
Chelle Plasse, Disney's Wild Animal Park
Peter Shannon, WCS

Hawai'i Forest Bird Recovery Team

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Paul Conry, DOFAW
Fern Duvall, DOFAW
Steve Fancy, NPS
Lenny Freed, UH Mānoa
Jon Giffin, DOFAW
Jack Jeffrey, USFWS
Al Lieberman, TPF
Thane Pratt, BRD
Tom Smith, San Francisco State University

Hawai'i Surrogate Forest Bird Working Group

Don Bruning, WCS
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John Finch, Philadelphia Zoo
John Groves, North Carolina Zoo
Peter Luscomb, Honolulu Zoo
Greg Massey, DVM, DOFAW
Patty McGill, Brookfield Zoo
Chelle Plasse, Disney's Wild Animal Park
Lee Schoen, Houston Zoo
Peter Shannon, WCS

Pacific Avifauna Recovery Coordinating Committee

Don Bruning, WCS
Sheila Conant, UH Mānoa
Scott Derrickson, National Zoo
John Engbring, USFWS
Andrew Engilis, Ducks Unlimited
Rob Fleischer, National Zoo
Jim Jacobi, BRD
Lloyd Kiff, TPF
Stuart Pimm, University of Tennessee
Michael Scott, BRD

Genetic Sexing Advisory Committee

George Amato, Wildlife Conservation Society
Oliver Ryder,
David Woodruff
Curt Benirske,
Robert Fleisher, National Zoo
Barrie Mellars, UDL
Ed de Kloet, Avian Biotech

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APPENDIX A

Letters of Comment and Responses

Summary of Comment Letters Received

The following is a synopsis of the letters received during the public comment period (September 15-October 16, 1998) and the Division of Forestry and Wildlife (DOFAW) and the U.S. Fish and Wildlife Services (USFWS) responses to those letters.

1. **Dr. Kurt Benirschke** (University of California San Diego, Medical Center; 09/27/98) was a member of the genetics advisory group and was asked to review the sexing results received from the various labs. Dr. Benirschke felt that the recovery effort should not hinge on successfully sexing all three birds. He recommended that translocation be attempted, starting with one male and female (HR-3 and HR-2) as determined by UDL. He also stressed the problematic nature of captive rearing and recommended not bringing Po'ouli into captivity.

Since there were conflicting results on the sexes of the three Po'ouli, the DOFAW and the USFWS have requested additional guidance from the genetics advisory group on this issue. As recommended by Dr. Benirschke, translocation was selected as a management tool to accelerate breeding of this species in the wild. However, the agencies will not proceed with translocation of Po'ouli until the sexes of the birds have been verified to the highest degree of confidence and the successful translocation of surrogate species has been accomplished.

2. **Tonnie Casey** (Biologist/Land Manager, B.P. Bishop Estate; 10/08/98) felt that the DEA was overly biased and needed to be completely rewritten. Her recommendation was to have an unaffiliated, non-governmental agency such as National Research Council or the Department of Conservation in New Zealand prepare the document. Her recommendation was to rewrite the document to include three broad alternatives (no action, increased habitat management, captive propagation). Ms. Casey stressed that habitat management should not be a sub-option since it is an alternative that needs to be pursued aggressively. In her comments on management actions, she emphasized expanded habitat management and was opposed to all other alternatives involving manipulations of any of the three remaining birds.

The DOFAW and USFWS recognize that Ms. Casey had based her comments and recommendations on many years of experience working in Hanawī and throughout Hawai'i. To address her concerns about the Draft Environmental Assessment as it was written, the DOFAW and USFWS prepared this document to include as much information as possible for all readers to understand the scope of the issue. In addition the DOFAW and USFWS included all possible management actions, without a preferred alternative. Many of the activities outlined in Ms. Casey's definition of "accelerated habitat management" will be pursued, such as expanded ground-based predator control between the home ranges of Po'ouli, accelerating the fence project for East Maui, increasing research into understanding the effect of alien bird species on native forest birds, and continuing the monitoring and control of alien weeds in the Hanawī NAR. However since the Hanawī NAR is in a State conservation zone, conducting experimental studies within the NAR on aerial or hand broadcast rodenticides and mosquito control substances, such as Bascillus thurengensis israeliensis, would need approval by the Natural Area Reserves Commission and additional environmental impact statement. Research necessary to evaluate and obtain a registration for an aerially broadcast

rodenticide has been initiated in other areas. The DOFAW and the USFWS agree that the development of a more effective predator control technique would have tremendous benefits to all of Hawai`i's native plants and wildlife, not only the Po`ouli.

3. **Mark S. Collins** (Maui Forest Bird Recovery Project, Coordinator; 10/08/98) was a proponent of increasing Po`ouli numbers as quickly as possible through the use of a "gradual" captive program (an approach most like Alternatives #4 and #5). Mr. Collins also presented a novel approach to the management and manipulation of wild birds using supplemental feeding stations.

The DOFAW and USFWS recognize that Mr. Collins based his recommendations on his experience as the project leader for the past year and half, and on his many years of previous field experience here in Hawai`i and elsewhere. The alternatives of maintaining birds in a field aviary or acclimating birds to captivity (Alternatives #4 and #5) as proposed by Mr. Collins were deemed to be too risky to the individual birds. In addition, activities identified in these alternatives would have a tremendous impact on the environment and would be more costly based on the available resources. The agencies agree with Mr. Collins' assessment that the recovery efforts for Po`ouli are to promote reproduction. However, the DOFAW and USFWS concluded that expanded habitat management would benefit all extant Po`ouli as well as other native species and that this approach offers the best chance for promoting reproduction of this species. By minimizing the risks within the environment, reproduction was determined to be more likely in the wild than in captivity. In addition the agencies recognize that a translocation of one Po`ouli into the home range of another may be necessary to promote reproduction of this species in the wild. Even though there are inherent risks involved in translocation this management action was determined to be less likely to result in mortality than capturing and holding a pair of birds in a field aviary for an extended period of time. Other methods of intervention will be used to help recover this species such as the collection of eggs for rearing in captivity. This approach has proven to be the best method for rapidly building populations of endangered Hawaiian honeycreepers without negatively impacting the breeding population.

4. **Dr. Sheila Conant** (Department Zoology, University of Hawai`i, Mānoa; 10/02/98) stressed the need to minimize disturbance to the forest habitat. She supported Alternative #1 but proposed more intensified habitat management. She also supported Alternative #6, with the assumption that this would be a lower-cost option than maintaining birds in field aviaries. She also felt that conservation programs within the State have been taxonomically centered around birds but unfortunately these programs have been "too little too late."

In response to Dr. Conant's plea for more ecosystem based conservation, the DOFAW and the USFWS have selected expanded habitat management along with a potential translocation. Dr. Conant also expressed support for captive propagation but the DOFAW and USFWS decided that the risks associated with captive propagation were too high and that resources would be better directed toward expanded habitat management which would benefit more native species.

5. **Dr. Scott R. Derrickson** (Director of Ornithology and Conservation, National Zoology Park, Smithsonian Inst.; 10/09/98) stressed the need to implement Alternative #6 because natural mortality

could not be determined without a larger population; the steep population declines in the wild will likely continue; constructing field aviaries would impact the environment in Hanawī and would unnecessarily reproduce the existing captive breeding centers; and the need to produce a breeding pair is immediate. While acknowledging the high risks of captive propagation, Dr. Derrickson felt that anything less will result in the absolute loss of the remaining birds.

Dr. Derrickson's recommendation to bring all three Po'ouli in a captivity was not selected for the following reasons. The DOFAW and the USFWS elected to dedicate resources to expanded habitat management efforts. These efforts are intended to control those limiting factors in the environment that are considered to be adversely affecting Po'ouli and other native species. These include accelerating the East Maui fencing project, controlling feral ungulates to begin restoration of more lower elevation forest habitat, on-going and expanded ground-based predator control and controlling the negative impacts of alien bird species. In addition, the agencies do not support captive propagation because the biological and husbandry information necessary for successfully managing this species in captivity is lacking. The agencies recognize that translocation of one Po'ouli into the home range of another individual may be necessary to accelerate breeding of this species in the wild. While there are inherent risks involved in translocation, these risks are less likely to result in mortality and possible extinction than bringing all three birds into captivity. In addition to habitat management and a potential translocation, other management activities that will be pursued to increase the reproductive potential of these three birds include monitoring the three known Po'ouli, searching for additional birds and Po'ouli nests, and pulling eggs for captive rearing.

6. **Dr. Fern. Duvall** (Maui, DOFAW; 09/22/98) stressed the need to confirm the sexes of Po'ouli utilizing blood for genetic testing, and to bring birds of confirmed sexes (male and female) together as outlined in Alternative #6 for captive propagation. Once large numbers of birds had been produced in captivity, a release program back into the Hanawī NAR should be undertaken.

The DOFAW and the USFWS agree with Dr. Duvall's concern about the ambiguous sexing results but disagree with his recommendation to address this question after the birds were brought into captivity. Since the necessary biological and husbandry information about the species is lacking and the risk of injury or death is substantial, establishing a captive population of Po'ouli was considered too risky. The uncertainty of the sexes of all three Po'ouli, further highlights the risks of bringing these individual birds into a captive environment for propagation purposes without clear evidence that there was a reproductive unit. Instead resources, that would have potentially been used on captive propagation will be focused on expanded habitat management, attempting a translocation to accelerate breeding in the wild, monitoring the known birds, searching for additional Po'ouli and for Po'ouli nests, and the collection of eggs for captive rearing.

7. **Kevin Evans** (Convener, Australian Passerine Taxon Advisory Group; date 10/06/98) provided information on issues for consideration as well as information on captive programs within Australia. Based on his limited knowledge, Mr. Evans felt that there was a lack of sound life history information on the species and that this argued against a captive propagation option at this time. He further stressed the need to control the threats in the habitat.

The DOFAW and the USFWS selected, as recommended by Mr. Evans, a modified version of Alternative #1 which would focus efforts on control limiting factors in the environment. In addition to habitat management efforts, monitoring the known Po`ouli and searching for nests will continue. If active nests are located, eggs will be collected for artificial incubation and hand rearing which would encourage the pair to renest as suggested by Mr. Evans. Given the lack of vital husbandry information, the agencies did not select captive propagation but are pursuing translocation as a potential management tool to accelerate breeding of the species in the wild. Given our finite resources and reluctance by The Peregrine Fund to work with wild adult birds, the amount of surrogate work that can be pursued, as proposed by Mr. Evans, is limited.

8. **Dr. Steve G. Fancy** (Research Biologist, BRD, Hawai`i Volcanoes; 10/02/98) was a proponent of intensified habitat management and for leaving the Po`ouli in the field. Due to lack of experience working with Hawaiian honeycreeper, Dr. Fancy recommended against captive propagation and a soft release translocation.

As suggested by Dr. Fancy, the DOFAW and the USFWS have selected expanded habitat management efforts, including expanded ground-based predator control, controlling the negative impacts of alien bird species, and accelerating the East Maui fencing project to begin restoration of the lower elevation forests of Hanawī.

9. **Dr. Lenny A. Freed** *et al.* (Department Zoology, University Hawai`i, Mānoa; 10/09/98) and Mr. Eric Van derWerf provided a quantitative probability analysis of the six alternatives. Based on their analysis, Alternative #2 or translocation was the only option that they felt could be supported scientifically. Their analysis suggested that Alternative #1 would result in extinction, and Alternatives #3-6 would result in immediate loss without producing offspring.

The DOFAW and the USFWS support Dr. Freed's analysis and are considering a possible translocation of one Po`ouli into the home range of another once confirmation of the sexes can be established. Moreover, the agencies have selected an expanded version of Alternative #1 that would focus resources on more aggressive habitat management which would include expanded ground-based predator control, expanded fencing and removal of ungulates, and the control of alien birds that are considered to be unnatural competitors and potential agents of disease. These efforts would provide security for the three known Po`ouli, other undetected Po`ouli and protect habitat for other endangered native forest birds, such as the Maui Parrotbill and `Akohekohe.

10. **Betsy Harrison Gagné** (Acting Program Manager Natural Area Reserve Program, Hawai`i Division of Forestry and Wildlife; 10/11/98) advocated for more habitat management as a preventative measure to keep other species from "slipping from our grasp". She would support educated attempts at captive propagation only if it did not divert funds from habitat management.

The DOFAW and the USFWS recognize the Mrs. Gagné's comments were based on many years of field experience in Hawai`i and a very close attachment to the Po`ouli as the first person to have seen this species. The agencies have selected a combination of Alternative #1 and #2 in an effort

to save the Po'ouli from extinction. As recommended by Mrs. Gagné, habitat management efforts will be increased to include expanded ground-based predator control, accelerating the completion of the East Maui Fencing Project and the continued removal of feral ungulates, controlling invasive weeds and minimizing the negative impacts of non-native birds. In addition to these habitat management activities, the agencies have also selected Alternative #2 or translocation as a potential management tool to accelerate breeding of the species in the wild.

11. **Aaron Gallager** (formerly with Maui Forest Bird Recovery Project; 10/09/98) felt that Alternative #3 was a "middle-ground" approach that provided the opportunity to propagate the species while allowing for rapid release and study.

The DOFAW and USFWS did not select Alternative #3 as proposed by Mr. Gallager because this alternative was considered to be inherently risky to the remaining Po'ouli population, too costly based on the available resources and would have too great an impact on the environment.

12. **G.S. Holaday** (Plantation General Manager, Hawaiian Commercial & Sugar Co. (HC&S), a division of Alexander & Baldwin; 10/09/98) expressed concern over the suggested use of an aerially dispersed rodenticide as a method of predator control in the Hanawī Natural Area Reserve. Mr. Holaday pointed out that water collected from this area is used by HC&S for agricultural irrigation and by the Maui Department of Water Supply for domestic use.

The Hawai'i Commercial and Sugar Company's concerns about water quality as expressed by Mr. Holaday are also major concerns of the DOFAW and the USFWS. As stated in the Draft Environmental Assessment, the DOFAW and the USFWS are working with other government and conservation agencies to develop more effective methods to control rodents and other predators in order to better protect all of Hawai'i's native species. One of these methods is an aerially dispersed rodenticide. This technique has been used in New Zealand to restore many of their native birds. The agencies recognize that additional research is needed for EPA approval prior to use of this technique here in Hawai'i. In addition, before an aerially dispersal rodenticide can be used on a wide scale basis, State Department of Agriculture and EPA approvals, additional Federal NEPA disclosures and State environmental impact statements will be needed. The alternative selected specifically to enhance habitat for Po'ouli and other native forest birds includes an expansion of the ground-based predator control until an aerial broadcast rodenticide becomes available, accelerating the East Maui Fencing Project, controlling feral ungulates and controlling the spread of non-native weeds. These activities are intended to preserve the East Maui Forest as a watershed and to better protect Hawai'i's resident native species..

13. **Nelson Ho** (Hawai'i Sierra Club; 10/07/98) spoke on behalf of the Hawai'i Chapter of the Sierra Club. He stressed that too much federal funding has already been directed toward captive propagation and they objected to Alternatives 3-6. They stressed the need to expand habitat management.

The DOFAW and the USFWS selected expanded habitat management, or Alternative #1 as recommended by the Sierra Club, Hawai'i Chapter. The agencies agree with the Sierra Club that

this alternative would protect the remaining Po'ouli in the wild and at the same time benefit other native species. In addition translocation of Po'ouli to establish a breeding pair will be attempted and any future eggs of Po'ouli will be collected for captive propagation. The DOFAW and the USFWS still considers the collection of eggs for captive rearing a viable recovery option for Po'ouli and other rare native forest bird species.

14. **Paul Jansen's** (Manager, Department Conservation, National Kakapo Team, New Zealand; 10/08/98) comments were primarily directed at the decision making process. He provided advice on how to best achieve the "best" alternative using a decision tree.

The preparation and review of the Draft Environmental Assessment involves weighing the risks and benefits of each alternative. This process is similar to the decision making process identified by Mr. Jansen. Through the process of analyzing each alternative and reviewing public comments, the agencies have selected habitat management as one of the "common goals" because it offers the best chance for the Po'ouli and it will benefit multiple species. This strategy is also strongly supported by the scientific and local communities. In addition to habitat management, the agencies will pursue, if necessary, a translocation of Po'ouli to accelerate breeding of this species in the wild. The decision tree concept, as proposed by Mr. Jansen, would be valuable in developing new management strategies to achieve these common goals.

15. **Dr. Donald L. Janssen** (Veterinarian, Zoology Society of San Diego; 10/09/98) stressed the need for sex confirmation and a better method to estimate the risks involved in the acclimatization of wild-caught birds. In addition, Dr. Janssen recommended intensive habitat management with broad-reaching effects over the narrow-reaching captive propagation approach.

The DOFAW and USFWS have convened, as recommended by Dr. Janssen, a panel of experts to review the genetic sexing results to provide the agencies with recommendations on the best course of action for future management activities. In addition the agencies concurred with Dr. Janssen's assessment that captive propagation of Po'ouli was not appropriate given the lack of information about the species' general biology. The agencies have instead selected expanded habitat management as the best approach to protecting the three known Po'ouli as well as other native species. In addition the agencies recognize that translocation may be necessary to accelerate reproduction of this species in the wild. Future recovery efforts will continue to focus on monitoring the known Po'ouli, searching for additional birds, searching for nests, and the collection of eggs for captive rearing.

16. **Dr. Kenneth M. Kaneshiro** (State Conservationist, USDA; 09/30/98), no comments were offered. *No response.*

17. **James R. Kowalsky** (Maui Forest Bird Recovery Project; 10/09/98) feels that current management without hands-on manipulation will not result in a reproductive pair, which would ultimately result in imminent extinction. Mr. Kowalsky felt that the greatest gain for the effort would come from Alternative #6; however, he does stress the fact that no alternative guarantees success.

The DOFAW and the USFWS recognize that Mr. Kowalsky's comments and recommendations were based on many years of field experience, working in the study site as a field technician and as the field project leader. The agencies concur with Mr. Kowalsky's assessment that given all of the options presented to save the Po'ouli, none are guaranteed to succeed. Therefore the agencies decided to dedicate limited resources to managing the habitat in the Hanawī Natural Area Reserve in order to improve the habitat for the remaining three Po'ouli as well as for many other native species. Translocation of one Po'ouli into the home range of another has been selected as a potential management tool to accelerate breeding of this specie in the wild. As Mr. Kowalsky pointed out in his comments, the risks involved in translocation could result in the birds returning to their original home ranges. This risk was considered minimal compared to the high risk of mortality that could result in bringing birds into captivity. In addition, translocation would only risk one individual and not a potential breeding pair, as would bringing two or three birds into a captive situation. The agencies' decision to focus future efforts on habitat management are intended to accomplish what Mr. Kowalsky stated in his final recommendations, which include developing better predator control methods, long term monitoring of the native ecosystem, and increasing the amount of fenced habitat to control feral ungulates.

18. **Senator Andrew Levin** (Third District; 10/01/98) felt that the most effective use of conservation dollars would be to develop a program of increased habitat management.

The continuation and expansion of habitat management, as recommended by Senator Levin, was one of the management actions selected by the DOFAW and the USFWS. The agencies also concur with Senator Levin that this approach would provide "more bang for the buck" and would restore habitat not only for the Po'ouli but for other native Hawaiian species as well. In addition to habitat management, the agencies are considering a translocation of Po'ouli if necessary to increase the breeding potential for this species in the wild.

19. **Al Lieberman & Cyndi Kuehler** (The Peregrine Fund, TPF, Hawai'i; 10/10/98) provided an in-depth and detailed letter that promoted the need for expanded habitat management. In order for a captive propagation program to succeed it must be complemented with an effective habitat management program. They emphasized in particular the need for increased predator control. They also recommended that ongoing field work include continued, expanded searches for more Po'ouli. They pointed out in great detail that the vital information on the life history and aviculture of the Po'ouli was inadequate or nonexistent. Given the difficulties of rearing insectivorous passerines and the lack of information on the species, it was their professional opinion that any captive breeding scenario involving adult, wild Po'ouli would result in their mortality. Under the current situation, given that the total known birds is extremely low, with only 3 individuals, and that the gender of the birds were still in question, such a program had an unacceptably high likelihood of failure. With regard to captive propagation, TPF is still committed to the removal of eggs and nestlings from wild nests and will work with the involved parties in this capacity. TPF stated that the DEA lacked adequate information on all of the alternatives, information which should be included if reviewers were expected to make an educated and balanced decision. TPF included a number of references to support their recommendations on increased habitat management and on the risks of hands-on manipulation of wild birds. TPF would support, if thoroughly researched and appropriately carried

out, a translocation attempt with a hard release.

The DOFAW and USFWS recognize that the recommendations and comments provided by Mr. Liebermann and Ms. Kuehler are based on their experience managing the State and FWS's captive propagation facilities and on many years of experience at the San Diego Zoo. To address Mr. Liebermann's and Ms. Kuehler's concerns about the Draft Environmental Assessment as it was written, the DOFAW and USFWS prepared this document to include as much information as possible for all readers to understand the scope of the issue. In addition the DOFAW and USFWS included all possible management actions, without a preferred alternative. The agencies agree with Mr. Liebermann and Ms. Kuehler and have chosen to direct resources to habitat management which would include expanding ground-based predator control, accelerating the East Maui Fence project and controlling feral ungulates to restore more lower elevation forest, and conducting more research into the impacts of alien birds on native forest bird populations. Translocation, similar to that conditionally supported by Mr. Liebermann and Ms. Kuehler, has also been selected as a potential option to increase the reproductive potential of this species in the wild. In addition to these activities the three known Po'ouli will be monitored for nesting activity. Should an active nest be located, eggs and/ or nestlings will be collected for captive rearing. The collection of eggs is a management strategy that conforms with TPF's work plan which is to establish captive breeding stock for endangered Hawaiian birds "by building breeding stock from eggs or nestlings whenever possible and avoiding removal of behaviorally independent birds".

20. **Peter Luscomb** (General Curator, Honolulu Zoo; 10/12/98) comments that the only way that the species can be saved is to minimize mortality and maximize reproductive potential. To do this, Mr. Luscomb argues, will require bringing the birds into captivity. Mr. Luscomb also notes the high risk involved in bringing insectivorous passerines into captivity, but notes that an increasing number of aviculturists are showing more success in this field. He identified that appropriate techniques need to be established if a successful captive breeding program is to be achieved. These included bringing in wild adults as well as through the collection of eggs. Many of the techniques are already available and the ones lacking, he proposed, could be developed using surrogate species in a relatively short period of time. To benefit Po'ouli, the agencies would need to begin an aggressive surrogate program as soon as possible. Mr. Luscomb further pointed out that these techniques developed with surrogates could ultimately be used on other endangered Hawaiian passerines.

The DOFAW and USFWS recognize that Mr. Luscomb's comments were based on many years of experience working in Hawai'i. The agencies have selected Alternative #1 which will direct future resources on habitat management to protect the existing Po'ouli as well as numerous other native species. In addition a translocation was also selected as possible management action in order to accelerate reproduction of this species in the wild. Since the expertise necessary for maintaining insectivorous Hawaiian honeycreepers in captivity has not yet been developed and bringing adult wild birds into captivity was deemed too risky. However should Po'ouli eggs be found, they will be collected, for artificial incubation and hand rearing. The offspring of which will be released back to the wild or maintained in captivity to establish a breeding flock. This strategy was selected based on what Mr. Luscomb had recommended and that was "to minimize mortality while at the same time

maximize reproduction".

21. **Ian McFadden** (Department Conservation, New Zealand; 10/12/98) stressed that an aggressive program in predator control is the most tenable option to protect the three remaining Po'ouli. Mr. McFadden reiterated the stance of TPF regarding the high risks inherent to Alternatives #3-6, all being different captive propagation scenarios. He supported a translocation once the predator situation in Hanawī was "stabilized."

The DOFAW and USFWS have selected an expanded version of Alternative #1 as recommended by Mr. McFadden which includes expanded ground-based predator control. Translocation was also selected as a potential management tool to accelerate breeding of this species in the wild.

22. **James Mejeur** (Curator of Birds, Honolulu Zoo; 10/14/98) stressed the need, if possible, to get all three birds into a breeding situation where threats can be controlled and reproductive out-put maximized. To do this Mejeur recommended Alternative #5 as a means to acclimate the birds in more familiar surroundings before transporting them into a captive propagation facility. He also supports aggressive habitat management and predator control, but feels that without the attempt to maximize reproduction, with genetic material from all remaining individuals, the species will be lost.

Alternative #5, as recommended by Mr. Mejeur, was considered to have too many inherent risks to Po'ouli as well as to the environment in the Hanawī NARS. In addition Alternative #5 was considered to be too costly in terms of financial resources needed to maintain a second field crew to care for the birds while being held in the aviary and to construct the field aviary. In addition this construction and added human activity would have had a negative impact on the environment. The DOFAW and the USFWS have selected an expanded version of Alternative #1 as recommended by Mr. Mejeur. Habitat management efforts will continue and would include expanded ground-based predator control, expanded fencing and removal of ungulate from lower elevation forests, and the control of alien birds that are considered to be unnatural competitors and potential agents of disease In addition, translocation was selected as a management option to accelerate pair formation of this species in the wild. Other activities include continued monitoring of the three known Po'ouli, searching for additional birds and Po'ouli nests. Mr. Mejeur also expressed concern over nest accessibility for the collection of eggs in the wild. To date extracting eggs from the nests of forest birds has not proved to be a problem. The Peregrine Fund and the various field crews have been able to extract eggs from all target species' nests that have been located. This strategy of collecting eggs for artificial incubation and hand rearing will also be pursued. The offspring of which will be released back to the wild or maintained in captivity to establish a breeding flock.

23. **Jeffrey M. Melrose** (Land Planner, Kamehameha Schools Bishop Estate; 10/12/98) stated that the Po'ouli conservation actions should not isolate this species as the main target, but rather the birds should be viewed in a holistic fashion, one that addresses other species within the habitat. Melrose recommends that an intensive habitat management alternative be included in documents that will follow the DEA. He supports TPF with their concerns on attempted captive propagation of this species as outlined in alternatives 3-6, and supports an expanded habitat management approach.

The DOFAW and the USFWS have selected a combination of Alternative #1 and #2 in an effort to save the Po'ouli from extinction. Habitat management efforts as recommended by Mr. Melrose will be increased to include expanded ground-based predator control, additional fencing to include more lower elevation forests, controlling feral ungulates over a larger area and subsequently reducing the spread of non-native weeds. In addition to these habitat management activities, the agencies have also selected Alternative #2 or translocation as a potential management tool to accelerate breeding of the species in the wild. Should reproduction occur in the wild, eggs will be collected for captive rearing by The Peregrine Fund or a future partner. The chicks reared will be released back to the wild or will be maintained in captivity to establish a breeding flock to produce offspring for reintroduction.

24. **Theresa Menard** (Department Zoology University Hawai'i, Mānoa; 10/09/98) emphasized the need for an ecosystem approach that would benefit all native species within the Hanawī area. Ms. Menard presented a detailed review of the perceived costs and risks associated with all of the captive propagation alternatives.

The agencies support Ms. Menard's recommendation on focusing resources on ecosystem based habitat management. This approach has and will continue to be the long term goals of the DOFAW and the USFWS. Establishment of the Hanawī Natural Area Reserve, the East Maui Watershed Partnership, and the East Maui Fencing project are all cooperative projects between the DOFAW, TNCH, and HALE NP, and EMI company that manifest this commitment to preserving and protecting the forest ecosystem of east Maui. The purpose and function of the Draft Environmental Assessment was to consider other alternatives that could potentially save the Po'ouli from extinction. Since the agencies are committed to ecosystem management, but also have a legal mandate to preserve biodiversity, Alternatives #1 and #2 were selected to address both of these objectives. As recommended by Ms. Menard, an alternative was selected to protect the Hanawī NARS through expanded predator and weed control, restoration of additional lower elevation habitat by accelerating the completion of the East Maui Fencing Project and the subsequent removal of feral ungulates, and controlling the negative impacts of alien bird species. In addition to these habitat management activities, the translocation of one Po'ouli into the home range of another has been selected as a potential management tool to accelerate breeding of this species in the wild. The monitoring of Po'ouli in the wild will continue to determine nesting activity and to potentially collect eggs for artificial incubation and hand rearing. The offspring will be reared for potential release back to the wild or to be maintained in captivity for captive propagation and reintroduction of future offspring. Ms. Menard expressed concern that the cost of additional captive propagation activities directed specifically at Po'ouli, including the captive rearing of eggs collected from the wild, would increase the total amount of funds allocated to captive propagation which would further reduce funding for habitat management. Funding for captive propagation is stable from year to year but the agencies do recognize that funding for expanded and accelerated habitat management will need to be aggressively pursued. The agencies will continue to support captive propagation as a potential tool for the recovery of Hawai'i's critically endangered birds.

25. **Dr. Patrick J. Morris** (Zoological Society of San Diego; 10/02/98) stressed the need for increased habitat management and the inclusion of such an option in the DEA. He also recommended

increased census activities and scientific review of census results. In addition he recommended confirmation of sexes of the known birds and an outside analysis of these results. Mr. Morris did not support any of the captive breeding alternatives and recommended that surrogate studies using passerines be conducted.

The DOFAW and USFWS have elected, as Dr. Morris recommended, to direct future resources to more expanded habitat management program. In addition to the habitat management activities, surveys for Po'ouli will continue throughout the species known historical range and into other areas of suitable habitat as proposed by Dr. Morris.

26. **Bradley J. Mossman** (State Office of Planning; 10/01/98) expressed hope that there was still time to act on one or more of the alternatives and noted that the acquisition of genetic material from the remaining birds should be preserved for future work.

The DOFAW and USFWS have selected translocation as a management action to assist in establishing a breeding pair of Po'ouli if needed. Habitat management will continue in order to preserve habitat for Po'ouli and other native forest birds, plants and invertebrates. In addition, as Mr. Mossman recommended, collection of genetic material will be considered for future research.

27. **Dr. James J. Nakatanai** (Chair, State Board of Agriculture; 10/02/98) spoke out against Alternative #4, since it was felt that this option was the most damaging to the area. He was a proponent of activities that protected the watershed (i.e., ungulate control and weed removal).

Expanded habitat management was selected, as Dr. Nakatani, recommended to prevent the spread of alien weeds by limiting human impacts to the environment, and by monitoring and controlling ungulate and rodent populations within the Hanawī Natural Area Reserve. Assessing the possible negative impacts on the environment from the various management actions was a consideration in this decision making process.

28. **Dr. Ian Newton** (Institute of Terrestrial Ecology, Cambridgeshire, U.K.; 10/12/98) spoke of habitat management (including predator control) being a "bare minimum" and that intensified management in this arena should be considered. He stressed the high risk of bringing adult birds into captivity and reiterated the need to better assess gender of birds and if they are paired, before attempting a translocation.

The DOFAW and the USFWS have selected, as recommended by Dr. Newton, a combination of Alternatives #1 and #2 in an effort to save the Po'ouli from extinction. Habitat management efforts will be increased to include expanded ground-based predator control, accelerating the completion of the East Maui Fencing Project to include more lower elevation forests, controlling feral ungulates and invasive weeds and minimizing the negative impacts of non-native bird. In addition to these habitat management activities, the agencies have also selected Alternative #2 or translocation as a potential management tool to accelerate breeding of the species in the wild. The agencies concur with Dr. Newton's recommendation on confirmation of sexes before translocation is attempted. The genetics advisory group has been asked to provide the agencies with additional guidance on this

issue. Based on the guidance received from the genetics advisory group, the agencies will consider the best translocation scenario, whether it would be a female Po`ouli moved into the home range of a male or vice versa. The current presumed sex ratio of one male and two females statistically and biologically supports Dr. Newton's recommendation of moving a female into the home-range of the male.

29. **Robert L. Pyle** (Assistant Curator, Bishop Museum; 09/25/98) regarded increased habitat management as the most beneficial action for the Po`ouli and all other species within the Hanawī Natural Area Reserve (NAR). He stressed the need for more research into the birds' behavior and life history before translocation.

Expanded habitat management and translocation of Po`ouli were selected as the best management strategies. To address the concerns that Mr. Pyle and others presented, the DOFAW and the USFWS will not proceed with a translocation of Po`ouli until sexes of the birds are verified to the highest degree of confidence and until the successful translocation of a surrogate species has been accomplished.

30. **Donald W. Reeser** (Superintendent, Haleakala Ntl. Pk.; 10/06/98) felt that a hard release translocation attempt was the most acceptable option but was not supportive of the use of radio transmitters. He also expressed support for expanded habitat management.

Expanded habitat management and translocation were selected as the preferred alternatives, as recommended by Mr. Donald W. Reeser. At this time, the agencies have no intention of conducting radio-telemetry studies with Po`ouli. However, future research and management activities will include the use of surrogate species to explore the effectiveness of such techniques which could then be used on other endangered species, possibly including the Po`ouli, if the developed methods are felt to be safe.

31. **Dr. Bruce Rideout** (Chief Veterinarian, Zoology Society San Diego; 10/09/98) discussed the need to better evaluate all of the alternatives, providing more information on the problems complicating captive propagation options. Dr. Rideout feels that the benefits of focusing all attention on habitat management are more likely to help Po`ouli as well as other native species in the area.

The DOFAW and USFWS concurred with Dr. Rideout's assessment that captive propagation of Po`ouli was not appropriate given the lack of information about the species' general biology. The agencies have decided to allocate resources toward habitat management as recommended by Dr. Rideout. These efforts would include expanding the ground-based predator control and accelerating the completion of the East Maui Fencing Project. In addition searches for additional Po`ouli will continue in areas that have not been adequately surveyed.

32. **Art C. Risser** (Zoology Society of San Diego; 10/08/98) felt that as a first step, all potential quality habitat needed to be fenced and aggressive habitat management put in place within that area. He notes the successes in species recovery that have been achieved in New Zealand through "comprehensive habitat management" as well as successes on other oceanic islands and mainland

areas. He notes that maintenance of a self-sustaining population of insectivorous passerines in a captive setting has not yet been achieved and is a highly risky venture. Without more extensive knowledge of the Po`ouli's life history and some record of captive holding, Risser holds that success for captive holding of those species is very remote. He also stresses that without a better assessment of gender of the remaining birds, any attempt at manipulation (e.g., translocation) is "moot." Under the current situation, Risser is a proponent of fixing the limiting problems within the habitat.

In response to Mr. Risser's concerns about captive propagation of a small insectivorous passerine, the DOFAW and USFWS have chosen to direct limited resources to a more expanded habitat management program. The East Maui fencing plan addresses the need for additional fencing to protect and restore habitat for many species including the Po`ouli. In addition to the habitat management activities, surveys for Po`ouli will continue throughout the species known historical range and into other areas of suitable habitat as recommended by Mr. Risser. Efforts will continue to clarify the sexing data prior to a translocation.

33. **Dr. Ollie A. Ryder** (Geneticist, Zoology Society San Diego; 10/09/98) was asked by the DOFAW and USFWS to serve on the Genetics Advisory Panel to review the results of the genetic sexing tests. Dr. Ryder recommended that the amplification of a presumptive W-chromosome fragment in two Po`ouli by UDL should be given priority for management considerations over the cleavage result obtained at NZP until known female Po`ouli DNA can be used for controlled studies.

The agencies accepted Dr. Ryder's review of the genetic testing results. The equivocal nature of these results from the National Zoological Park Lab and UDL require further investigation. The DOFAW and the USFWS have requested guidance on this issue from the genetics advisory group, of which Dr. Ryder is a member.

34. **Stuart A. Sandin** (Department Ecology and Evolutionary Biology, Princeton University; 10/12/98) supported the two extreme alternatives, 1 and 6. Alternative #1 should be accompanied by research or other activities that could bring a pair of birds together. Sandin's selection of Alternative 6 was based on the successes in honeycreeper breeding by the state (at Olinda) and by the TPF, as well as from successes achieved in New Zealand (Old Blue). He notes that there has been no use of the large field aviaries such as those proposed in Alternatives 3-5, and thus does not feel that they should be used under these circumstances. Based on Palila translocations, he does not feel that Alternative #2 would be successful at this time.

The DOFAW and the USFWS have selected a combination of Alternative #1 and #2 in an effort to save the Po`ouli from extinction. Habitat management efforts and searching for Po`oui nests and eggs will continue as recommended by Mr. Sandin. However the agencies also selected translocation as a potential management tool to accelerate breeding of the species in the wild. The agencies concluded that translocation of one Po`ouli into the home range of another individual would be less likely to result in mortality and had a greater potential for reproduction than bringing all three Po`ouli into captivity.

35. **Dr. Thomas B. Smith** (Department Biology, San Francisco State University; 10/07/98) stressed that, due to increased risk and small number of birds, no Po`ouli should be radio-tagged. Smith felt that a gradual introduction into captivity, Alternative #5, should be attempted.

Alternative #5, as recommended by Dr. Smith, was considered to have too many inherent risks to Po`ouli as well as to the environment in Hanawī With only three individuals, the chance of successfully establishing a captive breeding population of Po`ouli for potential production and release of offspring back to the wild, was not considered to be feasible. Alternative #5 was also considered to be too costly in terms of financial resources needed to maintain a second field crew to care for the birds while being held in the aviary and to construct the field aviary. In addition this construction and added human activity would have a negative impact on the environment. The DOFAW and the USFWS have selected Alternative #1, with some modification and Alternative #2, translocation, as the best options to save the Po`ouli from extinction. Alternative #1, with expanded habitat management which would include expanded ground-based predator control, expanded fencing and concomitant removal of ungulates, and the control of alien birds that are considered to be unnatural competitors and potential agents of disease, would provide security for the three known Po`ouli, other undetected Po`ouli and protect habitat for other endangered native forest birds, such as the Maui Parrotbill and `Akohekohe. Translocation was selected as a management option to accelerate pair formation of this species in the wild. At this time, the agencies have no intention of conducting radio-telemetry studies with Po`ouli. However, future research and management activities will include the use of surrogate species to explore the effectiveness of such techniques which could then be used on other endangered species, possibly including the Po`ouli, if the developed methods are felt to be safe.

36. **Tom Snetsinger and Christina Herrmann** (Research Biologists, BRD; 09/30/98) stated that the DEA lacked balanced perspective on alternatives and that an alternative specifically focused on habitat management should be added. They stressed the need for intensified habitat management, continued searching, and the need to review the sexing results; felt that there was little chance of success in utilizing a captive propagation approach.

The DOFAW and the USFWS have selected expanded habitat management as recommended by Mr. Snetsinger and Ms. Herrmann, and a translocation of Po`ouli as management actions. Management of the forest habitat within the Hanawī Natural Area Reserve will continue with more focus on addressing the immediate threats to Po`ouli and other native forest birds that Mr. Snetsinger and Ms. Herrmann have identified in their letter, which include: continued rat control and other predator control, completion of the East Maui Fencing Project, additional ungulate removal with expansion of fenced areas in lower elevations, and control of and research into the role of introduced birds as competitors.

37. **Dr. Noel Snyder** (Wildlife Preservation Trust; 09/021/98) stressed the need to immediately adopt Alternative #6 because the known wild population of 3 birds could suffer additional losses of greater than 50% within one year. His recommendation was based on reasonable successes of rearing Hawaiian birds at the National Zoo and on the fact that the elements of mortality in the wild are not yet known.

The State of Hawai`i and USFWS did not select Dr. Snyder's recommendation to immediately capture and bring all three Po`ouli into captivity because of the high risks. Instead the agencies elected to allocate resources toward expanded habitat management. In addition, with only three individual birds remaining, the sexes of which are still in question, successfully establishing a captive population of Po`ouli was not considered to be a feasible alternative given limited time and resources. As Dr. Snyder pointed out in his letter, there is a high probability of death under all circumstances and it would take only the death of one individual to result in a functionally extinct species. Under the current circumstances the risk of death for an individual Po`ouli before it could potentially breed was considered much higher in captivity than in the wild, due to the level of difficulty anticipated in maintaining a wild-captured insectivore in captivity. Given the four possible sex ratios (1 male and 2 females, 2 males and 1 female, 3 males, or 3 females), two scenarios do not support captive propagation and the remaining two possible scenarios leave no room for error, since as Dr. Snyder pointed out the death of one bird would result in a functionally extinct species. The possibility of collecting DNA and other tissues for future scientific research, as suggested by Dr. Snyder, will be considered and potentially pursued if and when a translocation occurs.

38. **Valerie Stein & Jamie Bruch** (Maui Forest Bird Recovery Project; 10/07/98) were proponents of increased habitat management with the option of conducting a translocation without transmitters. However, they note that the netting effort in any of the manipulation options will have environmental impacts and that the potential pay-back needs to be evaluated carefully. They noted that true success will only be accomplished when there is a breeding population of Po`ouli in the wild.

The DOFAW and the USFWS recognized that Ms. Stein's and Mr. Bruch's comments are based on a long standing association with this project and first hand field experiences. A hard release translocation was selected as a potential management action to promote breeding of this species in the wild. This management option was considered the least risky as noted by Ms. Stein and Mr. Bruch. As Ms. Stein and Mr. Bruch suggested in their comments, more research is needed to determine the cause of Po`ouli decline in the wild. In addition to translocation, habitat management will be expanded to include more predator, ungulate and weed control, as well as research into the effects of alien birds.

39. **Tom Telfer** (DOFAW Wildlife manager; 10/05/98) spoke out against Alternatives #2 through #6, feeling that they presented too high of a risk. He felt that Alternative #1 was the most justifiable.

In response to Mr. Telfer's recommendation in favor of Alternative #1, recovery efforts for the Po`ouli will focus on expanded habitat management. Translocation as described in Alternative #2 was also selected as a potential recovery activity to promote breeding of this species in the wild.

40. **Keith F. Unger** (McCandless Ranch; 09/29/98) stressed the need to develop partnerships between government agencies, conservation organizations and private land owners, as well as the need to develop research programs to control existing threats and to determine additional threats. Mr. Unger was opposed to bringing birds into captivity but supported translocation of two Po`ouli

into the same territory.

The DOFAW and the USFWS agree with Mr. Unger's position on the Po'ouli as well as his long term management strategy for partnership building. The Maui Forest Bird Recovery Program was developed as a partnership between the State of Hawai'i Division of Forestry and Wildlife, U.S. Fish and Wildlife Service, The Nature Conservancy of Hawai'i, The National Park Service, the U.S. Department of Agriculture, The Peregrine Fund and Kamehameha Schools/Bishop Estate. In addition, the East Maui Watershed Partnership, a joint project of TNCH, DOFAW, and East Maui Irrigation/A&B, has been formed to protect the forest habitat of East Maui as a watershed and in turn protect resident native species. Mr. Unger also pointed out the need for more focused research to identify what the true limiting factors are within these ecosystems. Focusing future resources on habitat management will begin to address these questions; the answers to which would have greater benefits to all native species.

41. **Eric VanderWerf** (Graduate Student, University Hawai'i, Mānoa; 10/04/98) presented qualitative reasons for leaving the birds in the wild. In addition, Mr. VanderWerf coauthored a quantified probability analysis of bringing birds into captivity. His analysis of the data presented in the DEA showed that the mortality rate for Hawaiian honeycreepers within the first year was 50%. He considered this potential loss unacceptable.

Mr. VanderWerf analysis of the data on the surrogate forest bird work that was presented in the DEA was taken into consideration and the DOFAW and the USFWS came to the same conclusion regarding captive propagation. Recovery efforts for the Po'ouli will focus on expanded habitat management and a potential translocation in order to promote breeding of this species in the wild.

42. **Ellen VanGelder** (Research Biologist, BRD; 10/07/98) felt that a translocation attempt was needed as the best option for achieving a breeding pair. She was opposed to use of radio transmitters but was undecided regarding which translocation release measure, hard or soft, was more favorable. Ms. VanGelder noted that habitat management should be implemented to protect the other native forest birds, most notably the Maui Parrotbill.

The DOFAW and USFWS have concurred with Ms. VanGelder's recommendations and have selected translocation as a potential option to initiate pair formation and a modification of Alternative #1 to direct limited resources to expanded habitat management which includes additional ground-based predator control, acceleration of the East Maui Fence project to begin restoration of more lower alleviation forest, and more research into the impacts of alien birds on native forest bird populations. These steps would protect the three known Po'ouli as well as other forest birds such as the Maui Parrotbill. The use of radio transmitters on Po'ouli or any other endangered forest bird would be considered only after surrogate work is completed.

43. **Dick Veitch** (Associate, Department of Conservation, New Zealand; 10/08/98) stressed the need to review current management efforts to assure they are working. He asserted that ground-based predator control efforts should be causing a significant change in the ecosystem if implemented properly. He also supported the translocation of one bird.

The DOFAW and USFWS agree with Mr. Veitch's recommendation of continuing with habitat management. As he pointed out, there is an on-going need to review management efforts to assure that they are achieving the desired goals. The DOFAW and the USFWS continue to review the effectiveness of these efforts but the data presented in the DEA clearly indicate that under the field conditions in Hanawī, ground-based predator control is not effective on an ecosystem-wide level. There is an urgent need to develop additional predator control methods, such as aerial broadcast to achieve the agencies desired goals. The ground-based predator control has been and will continue to be implemented, and expanded where possible to protect more habitat for the three known Po'ouli. In addition to habitat management, the DOFAW and USFWS are considering a possible translocation, as recommended by Mr. Veitch.

44. **Mark L. White** (The Nature Conservancy of Hawai'i, Maui; 10/07/98) emphasized the need to allocate limited funds to increased habitat management which would help meet the need of many other native species. He also supported translocation. Mr. White presented three steps to reversing the extinction trend on East Maui: the development and implementation of more effective predator control methods; protection of important lower elevation forest habitat through fencing and ungulate removal; and the on-going development of captive propagation techniques for other endangered and common forest birds.

The DOFAW and USFWS agree with Mr. White's assessment of the immediate need for the three known Po'ouli and have chosen translocation to initiate breeding of this species in the wild. A modified version of Alternative #1 was also adopted, as recommended by Mr. White, because this alternative was considered to be a wiser use of funds and would not only benefit Po'ouli but many other native species. Expanded habitat management efforts would include accelerating the East Maui Fencing Project and continuing removal of feral ungulates to restore lower elevation forests, expanding the ground-based predator control, and developing techniques to control alien birds that are considered to be unnatural competitors and potential agents of disease.

45. **Dr. James W. Wiley** (BRD, Grambling State University, LA; 10/06/98) endorsed Alternative #2 as the option with the highest probability of success and the lowest risk of mortality. He was strongly opposed to captive breeding alternatives and stressed the need for intensified habitat management and continued searches for additional birds.

The DOFAW and USFWS concur with Dr. Wiley's recommendation of a translocation and expanded habitat management and have selected a modified version of Alternative #1 and Alternative #2.

46. **Julia Williams** (Keakealani Outdoor Education Center; 10/09/98) was a proponent of leaving birds in the wild while increasing habitat management and searching for nests to allow for egg removal and rearing.

As Ms. Williams recommended, the DOFAW and the USFWS have selected expanded habitat management as one of the two alternatives to potentially save the Po'ouli from extinction. The other

management tool being considered to accelerate reproduction of this species is a translocation of one Po'ouli into the home range of another individual. The focus of these future efforts will be promote reproduction of the species in the wild. In order to increase the reproduction potential, eggs will be collected to be reared in captivity for potential release back to the wild or to establish a captive breeding flock to produce offspring for future reintroduction.

47. **Michael Wilson** (Chairperson, State Board of Land and Natural Resources; 09/29/98). This letter stressed need to avoid impacts to native Hawaiian archaeological sites.

As Mr. Wilson directed in his letter, the field staff will notify the State Historic Preservation Division of any sites of historical significance that are discovered during implementation of this program.

48. **Dr. David S. Woodruff** (Department Biology, University of California. San Diego; 10/12/98) felt that the technical difficulties and risks associated with alternatives 3-6 (captive propagation) were not well enough addressed in the DEA. Dr. Woodruff supported an intensive program in habitat management, including pig and predator control with a doubling of effort in research on the Po'ouli. Due to the uncertainty of the sexing results, he could not support translocation at this time, but might do so if sexes of the birds could be better supported.

The agencies accepted Dr. Woodruff's review of the genetic testing results. The equivocal nature of these results require further investigation. The DOFAW and the USFWS have requested further guidance on this issue from the genetics advisory group, of which Dr. Woodruff is a member. In addition, as recommended by Dr. Woodruff, the agencies have selected an expanded version of Alternative #1, which includes expanded ground-based predator control, controlling the negative impacts of alien bird species, controlling the spread and introduction of non-native weeds and accelerating the East Maui fencing project to begin restoration of the lower elevation forests of Hanawī. To address the concerns that Dr. Woodruff and others presented, the DOFAW and the USFWS will not proceed with a translocation of Po'ouli until sexes of the birds can be verified or established to higher degree of confidence; and until the successful translocation of a surrogate species has been accomplished. This management activity is being pursued as a possible method to accelerate breeding of this species in the wild.

The following is a synopsis of the letters received after October 15, 1998.

49. **Tim A. Burr** (former DOFAW biologist currently a wildlife biologist with the Department of the Navy; 12/11/98) pointed out the lack of life history information on the Po'ouli that would improve the success of a captive propagation program. Burr also discusses the lack of confirmation of gender, provides information against the use of a telemetry study this early on in the study, and emphasizes the importance of an expanded habitat management approach.

In response to Mr. Burr's comments in favor of Alternative #1, recovery efforts for the Po'ouli will focus on expanded habitat management, which includes expanded ground-based predator control,

accelerating the completion of the East Maui Fencing Project and the continued removal of feral ungulates, controlling invasive weeds and minimizing the negative impacts of non-native birds. In addition to these habitat management activities, the agencies have also selected Alternative #2 or translocation as a potential management tool to accelerate breeding of the species in the wild. The agencies concur with Mr. Burr's recommendation on confirming the sexes of Po'ouli before management steps can be taken. The genetics advisory group has been asked to provide the agencies with additional guidance on this issue.

50. **Dr. Robert Fleischer** (Head Geneticist, Molecular Genetics Laboratory, National Zoological Park, Smithsonian Institute.; 10/17/98) considered the best option for saving the Po'ouli was captive propagation. In support of this view, he cited the continuing decline of Hawaiian forest birds in the wild along with the successes achieved in captive propagation by groups such as TPF. He also noted that the control of threats would be easier achieved in a captive setting. Dr. Fleischer also noted that conservation may be achieved through acquisition of appropriate genetic material for future cloning when technologies improve, and that preservation of the birds for future research could be achieved if the birds were brought into captivity. In addition to his comments to the Draft Environmental Assessment, Dr. Fleischer also participated in the sexing analysis and in reviewing the results of these genetic tests. He reiterated the concerns of others on the advisory group, stating that there is no way to be absolutely sure of any results without known-sex controls. He concluded from these results that the best estimation of the sexes were HR-1= female, and HR-3 =male and that HR-2= unknown.

The DOFAW and the USFWS greatly appreciated Dr. Fleischer's assistance in addressing the Po'ouli sexing issue. The uncertainty of the results is still a concern to the agencies and additional guidance from the genetics advisory group of which Dr. Fleischer is a member has been requested. The agencies did not select Dr. Fleischer's recommendation to immediately capture and bring into captivity a pair of Po'ouli because of the risks involved but instead decided to allocate resources toward expanded habitat management. Restoring lower elevation forests through accelerated fencing and ungulate control and controlling predators and the negative impacts of alien bird species would benefit the remaining Po'ouli as well as other native forest birds, plants and other wildlife. In addition, with the sexes of the three Po'ouli still in question and the lack of vital biological and husbandry information on this species, successfully establishing a captive population of Po'ouli was not considered to be feasible. Under these current circumstances the risk of death for an individual Po'ouli before it could potentially breed was considered much higher in captivity than in the wild. Therefore translocation was determined to be the management strategy less likely to result in mortality and would be used to accelerate reproduction of the species in the wild. Nest searches will continue and eggs that are located will be collected for captive rearing. The offspring produced will be released back to the wild or maintained in captivity for future breeding.

51. **Jack Jeffrey** (Wildlife Biologist, Hakalau Wildlife Refuge, U.S. Fish and Wildlife Service; 11/05/98) advocated an ecosystem-based approach to ungulate, predator and disease vector control. He felt that the best hope for Po'ouli and other endangered forest birds was expanded habitat management. He noted that most conservation dollars in Hawai'i are directed toward single species approaches, such as captive propagation, releases and translocations and that these efforts cannot succeed without habitat management being in place first. In addition to expanded habitat

management, Mr. Jeffrey considered Alternative #2, translocation, to be the least objectionable but not without risk. He supported this management action because it was a low risk opportunity to bring two widely separated birds together for potential breeding, but with the caveat that this action be coordinated with a comprehensive habitat management plan.

The DOFAW and the USFWS agree with Mr. Jeffrey and have selected a modification of Alternative #1 to direct limited resources to expanded habitat management which would include additional ground-based predator control, acceleration of the East Maui Fence project to begin restoration of more lower elevation forest, and conducting more research into the impacts of alien birds on native forest bird populations. Translocation has also been selected as a potential option to increase the reproductive potential of this species in the wild.

52. **Dr. Thane Pratt** (Avian Ecologist, BRD, Hawai'i Volcanoes National Park; 11/24/98) feels that due to the high risk associated with capturing the birds, options to manipulate the birds in this way should be abandoned. He suggests an increased effort in habitat management (e.g., pig removal and predator control) along with monitoring of the known individuals. Pratt stresses the need to support managers to achieve these ends.

The DOFAW and the USFWS concur with Dr. Pratt and have selected habitat management as the primary focus of future efforts. Translocation of one Po'ouli into the home range of another was also selected as a potential method to accelerate reproduction of this species in the wild. Even though there is a risk of injury in the process and an inherent that the translocated bird will return to its original home range, these risks are minimal compared to other more aggressive management activities and less likely to result in mortality.

53. **Sharon Reilly** (Wildlife Biologist, Hawai'i Division of Forestry and Wildlife; 11/02/98) recommended that management actions should not have long-term negative impacts to the environment; recovery activities for the Po'ouli should also benefit other forest bird species; and future decision making process should be flexible to allow for adaptive management. Ms. Reilly presented recommendations that would assist in the recovery of the Po'ouli, as well as the Maui Parrotbill, while at same time achieving a greater degree of habitat management. She felt that translocation was the least risky option for the Po'ouli at this time but she also recommended accelerated work with surrogate species that would benefit both Po'ouli and Parrotbill.

The DOFAW and the USFWS concur with Ms. Reilly's recommendation to pursue expanded fencing and ungulate removal to begin restoration of additional lower elevation forests. The agencies also agree with the recommendation on translocation. Pursuing additional surrogate work that could benefit both the Po'ouli and the Maui Parrotbill is being considered.

54. **Clive Roots** (Wildlife consultant and author (formerly of Winged World, U.K.), B.C. Canada; 11/8/98) stresses, that with the few birds that are known to exist, the chance of success is very slim. However, he feels that Alternative #5 is the most balanced approach as it allows for acclimation with the option of release (a likely outcome). It could, if birds acclimate, produce a large number of birds over a short period of time.

Alterative #5 was considered too risky plus the construction of a field aviary and housing for avicultural staff would have too great an impact on the environment in the Hanawī NARS. In addition, holding birds in captivity without adequate information on the biology and the husbandry of the species had a greater risk of death than leaving the birds in the wild. The agencies prefer to direct limited resources to habitat management which would include expanded ground-based predator control, expanded fencing and removal of feral ungulates, and control of alien birds. These efforts would provide greater protection to known Po'ouli and would be beneficial to many other native species. The three known Po'ouli will continue to be monitored for nesting activity and to collect eggs for captive rearing. If a pair does not form, the agencies will be conducting a translocation of Po'ouli to increase the breeding potential for this species in the wild.

55. **Dr. Thierry M. Work** (Wildlife Disease Specialist, BRD; 11/9/98) stressed the high risk in bringing these birds into captivity as well as the likely failure of a translocation attempt. Dr. Work suggested intensifying the investigation in order to determine why these birds are in decline in their present habitat and ultimately to target (manage for) the reason(s) of the decline.

Monitoring the three known birds and expanding habitat management efforts will continue as recommended by Dr. Work. These efforts will assist in determining and controlling factors causing the decline of this species and will be beneficial to other native forest birds and other native species. Translocation of one Po'ouli into the home range of another was also selected as a potential method to accelerate reproduction of this species in the wild. The agencies recognize that there are inherent risks to conducting a translocation, but these were minimal compared to bringing the birds into captivity and were less likely to result in mortality.

APPENDIX B

Summary of Po`ouli Sexing Results

Summary of Po`ouli Sexing Results

Prepared by Sharon Reilly

In October 1997 Mark Collins, the Maui Forest Bird Project Coordinator and the DOFAW staff, Sharon Reilly and Dr. Fern Duvall, began exploring methods for determining the sexes of the three known Po`ouli. At the beginning of the FY'98 field season, the priority was to capture, band and gather bio-materials for sexing the known birds. Since there was concern about the effect of collecting blood on such a critically endangered species, the partnership had recommended using the non-invasive technique with feathers. The University Diagnostics Limited Laboratories was contacted upon the recommendation from Martin Vince the Associate Curator of Birds at the North Carolina Zoo, Dr. Christine Sheppard, Curator of Ornithology at the Wildlife Conservation Society and Dr. George Amato, Geneticist at the Wildlife Conservation Society.

The original intention was to test UDL's technique using feathers from a known sex museum specimen. The holotype at the Bishop Museum was dissected and sexed by Andy Engilis (Wilson Bulletin 108:4 pg. 607-619), but the Museum records still showed that the sex was indeterminate. Plans were being made to send feathers from holotype to confirm Andy's results and to determine if UDL's test was appropriate. The decision to send feathers to UDL was accelerated when, in January, one Po`o-uli was captured in the field. Feathers collected from this bird and HR2 bird (captured April 1997 by Dr. Paul Baker) were shipped to UDL for testing. Their results indicated these birds were both females. (The technique developed and patented by UDL which was used to determine the sexes of these and the third Po`ouli is described in Attachment I.)

At the urging of other partners to confirm UDL's results, the National Zoo's Genetics laboratory and Dr. Rebecca Cann's, University of Hawaii were surveyed on their ability to perform this task. Dr. Cann was in the developmental stages and was in need of funding whereas Dr. Fleischer had more experience with other Hawaiian honeycreepers and had an equipped lab with experienced technicians. In addition, the Smithsonian Lab was the designated depository of genetic material of Hawaiian Birds, including DNA extracted from the holotype. (The Bishop Museum was reluctant to send out feathers from the Holotype, if genetic material was already available). Since Dr. Cann was still interested in this particular project, she was selected to work on the genetics of avian disease comparing different techniques to assess exposure to the plasmodium parasite.

The National Zoo Genetics Lab conducted several tests using primers described in the available literature, and were unable to get any results using these primers. During this initial period of confirming UDL's results, the third Po`ouli (HR3) was captured and banded and had feathers collected. UDL tested these feathers; their results indicated that the HR3 bird was a male. Upon request UDL conducted a second test of all three birds and these results were again 1 male and 2 females. The National Zoo lab continued to use several different primers, including primers sent to them from UDL. The only results produced by the National Zoo Lab were for 2 of the 3 birds (HR1 Male, HR3 Male). The primers successfully used are unknown but they were not the ones provided by UDL. Unfortunately they were not able to extract enough genetic material from HR2 bird; no results were produced. Beth Slikas, a Postdoctoral

Fellow in the NZP Molecular Genetics conducted these tests due to her experience at extracting and multiplying (using PCR) ancient DNA. Beth expressed her concerns about these results because of contamination found in the control samples. Not knowing if the contamination effected these results, the sexing test was to be conducted again (on the 2 Po`ouli in which she was able to extract enough DNA) and additional tests on known sexed Honeycreepers (from DNA banked in the lab). As of this writing those results are not available.

Since the National Zoo was unable to confirm UDL's results, a third commercial lab, Avian Biotech International, that specialized in DNA sexing using feather was contacted. Their technique compares sequence differences between the Z and W (sex) chromosomes. This technique is dependent upon identifying the sequence differences of known sexed birds (of the same or closely related species). Therefore they were asked to sex known-sexed Apapane and to use those results to determine sexes of the Po`ouli. Once establishing this baseline data on Apapane, they used that difference for Po`ouli. Their results suggested that HR1 and HR3 were both males. However, as Mr. de Kloet stated in his letter (Attachment III), there were enough differences between Apapane and Po`ouli, that the species were not closely enough related to use this technique. According Avian Biotech, inaccuracy in this test would produce a natural default toward MALE.

Since neither the National Zoo Genetics Lab nor Avian Biotech were able to confidently produce results on Po`ouli, UDL was sent additional feathers of known sexed honeycreepers. They were able to accurately sex one apapane (Female) but were unable to complete their test of the other birds. Like Avian Biotech, UDL observed notable differences between Po`ouli and the other honeycreepers. In one the last communications with UDL, they said they were going to attempt another test of the known sexed honeycreepers however, there are no results as of this writing.

As a reminder to those who have concerns about the accuracy of UDL's results and who are reviewing this summary, the only lab that has been able to accurately, in their own estimation sex Po`ouli, has been UDL. The other labs have conceded that they have not been able to successfully accomplish this task. Since these researchers are professionals who have no vested interest in what the sexes of the Po`ouli are, we should be willing to trust their own professional opinion of their own work. A further reminder, each of these facilities have provided these services free of charge and have vested an enormous amount of personal time and energy in answering this vital question. It should be a professional courtesy to them that these inconsistencies between the labs should not be considered failures and in no way should they reflect negatively on any of the facilities that have assisted us in this manner. Recognizing that the sexes of the Po`ouli is a critical piece of information, we must use the best information we have at hand. Hopefully we will be able to resolve this issue as soon as these other results are made available.

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DNA AVIAN SEXING – THE LATEST DEVELOPMENTS

BY BARRIE J. MELLARS

Sexing of avian species not differentiated by plumage or specific sexual characteristics has long been a problem for aviculturists and zoos alike. A number of systems from cultured cell karyotyping to endoscopy of anaesthetised birds have been tried with varying degrees of success and at varying costs from the plain expensive to the highly exorbitant!

University Diagnostics Ltd (UDL) has now developed a highly sensitive and accurate system based on DNA extracted from either feathers or blood. The technique was discovered by Richard Griffiths at Oxford University in response to a request to provide a captive-bred mate for the last Spix's macaw living in the wild. The scientists concerned wanted to release a companion of the opposite sex to ensure that skills of survival in the wild were not lost, but did not want the stress or danger of the capture that would be required for conventional sexing. Richard, therefore, devised the genetic test, and using moulted feathers the bird tested as male. A female has now been released, but in the interim the cock had paired with a hen Illiger's macaw, which subsequently laid eggs. The latest initiative is to replace these eggs with those of a captive Spix hen – how successful this will be remains to be seen.

The test uses the Polymerase Chain Reaction (PCR) methodology and patented primers to prepare millions of copies of the minute amount of sex-linked DNA present in feathers. This method provides sufficient DNA from a specific part of the avian sex chromosomes for sex analysis. The system employs a W-linked gene (CHD-W) first described in the great tit (*Parus major*). This gene is highly conserved and W-linked across the Avian class. At the same time a non-W-linked gene termed CHD-NW (found on the Z chromosome) is identified in the test, and together they give the gender assignment of either male (termed ZZ, with the absence of the female W gene) or female (WZ). Demonstration of the DNA product is by Southern blot analysis. This test is not to be confused with the culture system based on blood feathers, which is no longer considered reliable.

The test does not need feathers from the wings or tail, only breast or head feathers. These should preferably be freshly-plucked, in order to reliably provide DNA for analysis; Richard's trials and tribulations with moulted feathers were more than enough to dissuade us from their use. The use of breast and head feathers is much less invasive than either blood or surgical sexing, and far less traumatic. The potential harm or death associated with surgical sexing and anaesthesia is entirely eliminated.

Birds such as penguins, however, are not well disposed to giving their feathers, so a blood system has been developed which works just as well.

Thanks to the PCR method employed, only a spot of blood is required, and this can be collected by claw clipping or foot pricking. The blood spots are simply collected on filter paper strips and dispatched in the same way as the feathers.

Neither the feathers nor the blood samples require any form of special storage conditions, so they may be batched and then posted by ordinary surface mail. Once they have been collected and stored in the sterile sealable bags provided, temperature and humidity have no adverse affect on the samples. This makes the test especially useful for field work, when conditions often border on the primitive.

Currently, bird species that have been fully validated include the following:

Penguins – King, Humboldt, Gentoo, Rockhopper, Macaroni and Magellanic;
Parrots – African Grey, Amazons, Caiques, Cockatiels, Cockatoos, Galahs, Conures, Lovebirds, Lories, Lorikeets, Macaws, Parakeets, Pionus, Poicephalus, Rosellas;
Birds of Prey – Buzzards, Caracaras, Eagles, Falcons, Goshawks, Harriers, Kestrels, Kites, Vultures;
Wading Birds – Bitterns, Cranes, Egrets, Flamingos, Ibis, Lapwings, Spoonbills, Storks;
Gamebirds – Guans, Grouse, Partridges, Pheasants, Snowcocks;
Owls – many species;
Others – Aracaris, Bee-eaters, Blackbirds, Corvines, Cuckoos, Doves, Hornbills, Kingfishers, Kookaburras, Mynahs, Nutcrackers, Pelicans, Pigeons, Roadrunners, Seriemas, Starlings, Swans, Terns, Toucans, Turacos, Warblers.

UDL offers the test for non-UK professional animal establishments and workers at £21.00 per bird, with results available in five working days from sample receipt. Discounts are available for large numbers of samples.

For further details and free collection kits contact:
Client Services Department,
University Diagnostics Ltd,
South Bank Technopark,
90 London Road,
London SE1 6LN, U.K.
Phone 0171 401 9898; *Fax* 0171 928 9297; *E-mail* udl@genelab.demon.co.uk

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Primate Keeper Position Vacant

at Monkey World – Ape Rescue Centre. A keeper is needed who has experience working with primates, who is prepared to give talks to the public, and who can help with handyman jobs.

Experience with chimpanzees, orang-utans, siamang gibbons, woolly monkeys, lemurs, as well as other monkey species would be an advantage.

Please send a CV to Monkey World, Longthorns, Wareham, Dorset BH20 6HH, U.K., or phone 01929–462537.

Attachment I

Excerpted from UDL's webpage, http://www.genelab.demon.co.uk/animal.htm) and also published in *International Zoo News* Vol. 44. No. 5 (1997). DNA AVIAN SEXING.

DNA Avian Sexing - the Latest Developments

Sexing of avian species not differentiated by plumage or specific sexual characteristics has long been a problem for aviculturists and zoos alike. A number of systems from cultured cell karyotyping to endoscopy of anaesthetised birds have been tried with varying degrees of success. University Diagnostics LTD (UDL) has developed a highly sensitive and accurate system based on DNA extracted from either feathers or blood. The technique was discovered by Richard Griffiths at Oxford University in response to a request to provide a captive-bred mate for the last Spix's Macaw living in the wild. The scientists concerned wanted to release a companion of the opposite sex to ensure that skills of survival in the wild were not lost but did not want the stress or danger of the capture that would be required for conventional sexing. The test uses the Polymerase Chain Reaction (PCR) methodology and patented primers to prepare millions of copies of the minute amount of sex-linked DNA present in feathers. This method provides sufficient DNA from a specific part of the avian sex chromosomes (W & Z) for sex analysis. This system analyses a highly conserved W-linked gene. At the same time a Z-linked gene is identified in the test and together they give the gender assignment of either male (termed ZZ with the absence of the female W gene) or female (WZ). The test only needs chest or head feathers not blood or wing/tail feathers. This test is not to be confused with the blood feather-based culture system, which is no longer considered reliable. Feathers should preferably be freshly plucked feathers as these reliably provide suitable DNA for analysis. The use of chest and head feathers is much less invasive than either blood or surgical sexing and far less traumatic. The potential harm or death associated with surgical sexing and anaesthesia is entirely eliminated. Birds such as penguins, however, are not well disposed to giving their feathers so a blood system has been developed which works just as well. Just a spot of blood is required because of the PCR method employed and this can be collected by claw clipping or foot pricking. The blood spots are simply collected on filter paper strips and dispatched in the same way as the feathers. Neither the feathers nor the blood samples require any form of special storage conditions and may be batched then posted by ordinary surface mail. Once collected and stored in the sterile sealable bags provided, temperature and humidity have no adverse affect on the samples. This makes the test especially useful for fieldwork when conditions often border on the primitive.

Attachment II
List of Bird Species sexed by UDL's technique.

African Grey Parrot
Amazon all spp
Aracari
Barbet
Bee-eater
Bird of Paradise
Bittern
Blackbird
Fairy Bluebird
Buzzard
Cacatua
Caique
Caracara
Catbird
Cockatiel
Cockatoo
Conure all spp
Corvines
Crakes
Cranes (Common, Japanese white-naped, Black-necked, Sarus, Demoiselle, Blue, Black-crowned, Grey crowned)
Cuckoo
Curassows
Curlew
Dove (Rock, Quail, Fruit)
Eagle (Golden, Tawny, Sea, Booted)
Egret
Flamingo (Greater, Chilean, Falcon)
Galah
Goshawk
Guan
Grouse
Harrier
Hawks (Harris, Red-tailed)
Heron
Honeyeater
Hornbill
Ibis (Sacred, Black-faced, Hermit, Scarlet, Glossy)
Jay
Kea
Kagu
Kestrel (Common, American)
Kingfisher
Kookaburra
Kite (Black, Red, Brahminy)
Lapwing
Lovebird
Lory
Lorikeet
Macaws all types
Magpies
Moorhen
Mousebird
Motmot
Mynah
Nestor
Nutcracker
Owls all types
Oystercatcher
Parrot all types
Parakeet
Partridge
Pelican
Pigeon (Pink, Bleeding Heart, Magnificent Ground, Blue-Crowned, Green Imperial)
Pionus
Pheasant
Plovers
Penguins (King, Humboldt, Gentoo, Rockhopper, Macaroni, Magellanic ,Blackfoot, Chinstrap)
Poicephalus
Rails
Roadrunner
Rosella
Seriemas
Shrike
Snowcock
Spoonbill (White, African,Roseate)
Starling
Stork (Marabou, Less Adjutant, White, Black, Milky Stork)
Swan
Tern
Thrushes
Tinamou
Tragopan
Trumpeter
Turaco
Toucan
Vulture (King, Turkey, Black, Griffon, Egyptian)
Warblers

July 17, 1998

4500 Shannon Lakes Plaza
Unit 1, Suite 138
Tallahassee, Fl 32308
Phone (800)514-9672
Fax (850)386-1145

Avian Biotech International

Post-it® Fax Note 7671	Date 6.15.98	# of pages ▶ 3
To Sharon Reilly	From Mark Collins	
Co./Dept.	Co.	
Phone #	Phone #	
Fax #	Fax #	

June 8, 1998

Olinda Field Station
534 Olinda Road
Makawao, HI 96768

Mark Collins:

Our sexing method requires some sequence knowledge of the bird's DNA. More specifically, we need to know if there is a sequential difference in the sex specific segment of DNA we analyze between male and female DNA. A female has both a Z and W chromosome and a male has only the Z chromosomes. Since there are DNA sequence differences between the Z and W chromosomes, the female can have differences in the DNA that arise from the presence of this W chromosome. If there are no sequence differences in the segment of DNA between the Z and W chromosome, the results for sexing will default to male. We normally need control male and female DNA for every new species we attempt to sex to find these differences in DNA. In some cases, when a species of bird is very closely related to another species we can already sex, the segment of DNA we analyze has the same differences between male and female (or conserved between the two species).

We have been able to find differences between male and female for the Apapane by analyzing the same segment of DNA as we would analyze when sexing Finches. When we attempted to sex the Po'o-uli's with that segment, we did not find differences between the two samples of DNA on our first attempt. Since there must be a DNA sequence difference to be a female, both samples were thus sexed as males. If these samples were from finches or the Apapane, we could conclude that they were males.

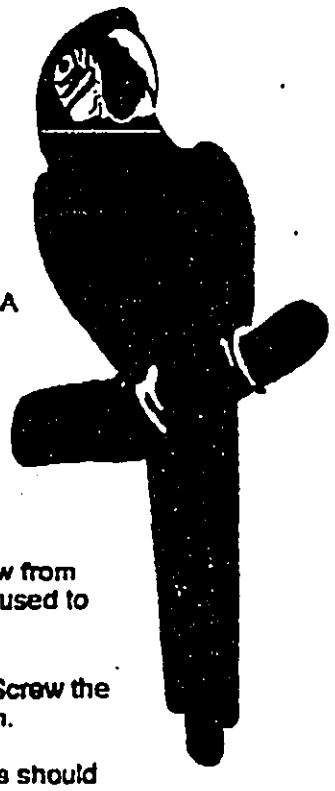
Since there was some question as to the relatedness of the Po'o-uli and honeycreepers, we analyzed another sex specific segment of DNA (in Finches) for both the Apapane and Po'o-uli. Here we noticed some sequence difference in the segment of DNA we analyzed between these two species. This would lead us to conclude that the two species may not be closely enough related for us to extrapolate a sexing method from one to the other. Another method would have to be used to sex the Po'o-uli's confidently. This would require both male and female control samples and additional DNA sample to find the segment that has some male/female differences.

I hope this explains exactly what we have done to this point and the lack of confidence we have in the results of male for both Po'o-uli.

Sincerely,

Ed de Kloet

DNA SEXING



Results:
Test results are usually available within 2-3 days after we receive your sample. You may request that your results be PHONED or FAXED to you at no charge as soon as they are completed. A certificate stating the sex of each sample will be sent upon completion of each test.

Sample Preparation

Avian blood samples:
Blood samples are generally collected from the end of a toenail. Once you have gained control of your bird, clip the toenail approximately two-thirds of the distance from where the nail protrudes out of the toe. Then hold a glass capillary tip next to the nail allowing the blood to flow from the nail into the tip. Bleeding should stop in a few minutes, however a blood coagulate may be used to speed up the coagulation process.

B. Once the tip is full, place the entire tip containing the blood sample into the collection tube. Screw the cap back on the tube and shake gently to allow the blood in the tip to mix with the buffer solution.

C. Each sample should be appropriately labeled using the barcode labels provided. All samples should be labeled, listed and identified on either a single or a bulk order form.

Feather Sample: New
Samples can be collected by plucking four or five fresh feathers (no molted feathers please) from the chest, wing, back or tail of your bird. ABI isolates the DNA necessary to sex your bird from a small amount of tissue located at the end of each feather shaft. Samples may be submitted in a small zip lock bag. These feathers do **not** have to be blood-feathers!!

Mail all samples in a **padded envelope or box** with the white copy of the order form (yellow copy is for your records) to **4500 Shannon Lakes Plaza, Unit 1, Suite 138, Tallahassee, FL 32308-2285.** Blood sample results are generally available within 2-3 days from the time we receive the samples. Feather samples may take an extra day or two.

New Species List:

This list is a partial list of species that we currently are able to sex. Many other birds are continuously being added to this list. If your bird is not on the list please call.

- African Greys
- Alexandrine Parakeet
- Amazons
- Australian Parakeets
- Budgies
- Bourke's Parakeets
- Caiques
- Cranes
- Cockatiels
- Cockatoos
- Conures
- Doves
- Emu
- Fig Parrot
- Flamingos
- Great Billed Parrot
- Hanging Parrots
- Kakarikis
- Kookaburras
- Lories
- Lorikeets
- Lovebirds
- Macaws
- Meyer's Parrot
- Moustached Parakeet
- Mynahs
- Ostrich
- Owls
- Pesquet's Parrot
- Pigeons
- Plonus
- Quaker Parakeets
- Ringneck Parakeets
- Rock Pebbler
- Rosellas
- Starlings
- Storks
- Senegals
- Toucans
- Turacos

Avian Biotech International 4500 Shannon Lakes Plaza, Unit 1, Suite 138, Tallahassee FL 32308
Outside the U.S. **850.386.1145** In the U.S. **800.514.9672** Fax # **850.386.1146**
Website address http:// WWW.Nettally.com/agt

APPENDIX C

Hawai`i Forest Bird Surrogate Project Summary

COOPERATIVE HAWAIIAN FOREST BIRD PROPAGATION PROJECT SUMMARY

1988:

Total captured: 52 Amakihi
No. of escapes during processing: 5
No. released after processing: 8
No. released w/in 24 hours: 9
No. transferred to mainland zoos: 30 (6 CZS, 8 Bronx, 10 PZG, 6 NZP)
Mortalities:
- During capture/processing: 0
- During field acclimation: 0
- During transfer to mainland: 0
- 1 month post-transfer: 12 [6 CZS, 6 Bronx]
- 6 months post-transfer: 3 [2 Bronx, 1 PZG]
- 6 months – 1 year post-transfer: 0
- >1 year post-transfer: 13 [9 PZG, 4 NZP; note: female transferred from NZP to PZG 04MAY89 died 17 May 1995]

No. Surviving: 2 Amakihi [current locations: 1 PZG; 1 NZP]

1991:

Total captured: 48 Amakihi, 86 Iiwi, 6 Omao
No. of escapes during processing: 2 (both Iiwi)
No. released after processing: 7 Amakihi, 46 Iiwi, 0 Omao
No. released w/in 24 hours: 3 Amakihi, 1 Iiwi, 0 Omao
No. released >48 hours: 14 Amakihi, 15 Iiwi, 0 Omao
No. transferred to mainland zoos: 24 Amakihi [8 CZS, 8 HZG, 4 PZG, 4 NZP]; 22 Iiwi [8 CZS, 6 NZP, 4 HZG, 4 PZG]; 6 Omao [4 HZG, 2 PZG]
Mortalities:
- During capture/processing: 0
- During field acclimation: 0
- During transfer to mainland: 0
- 1 month post-transfer: 3 Amakihi (CZS), 1 Iiwi (CZS)
- 6 months post-transfer: 1 Amakihi (PZG), 1 Iiwi (PZG), 2 Omao (PZG and HZG)
- 6 months – 1 year post-transfer: 1 Iiwi (HZG)
- > 1 year post-transfer: 10 Amakihi (2 PZG, 3 CZS, 4 HZG), 13 Iiwi (3 PZG, 5 CZS, 3 HZG, 2 NZP) 2 Omao (HZG)

No. Surviving:
- 10 Amakihi [current locations: 1 PZG, 1 CZS, 4 HZG, 4 NZP]
- 7 Iiwi [current locations: 4 CZS, 3 NZP]
- 2 Omao [current locations: 1 PZG, 1 NZP]

Summary of 05 JUNE 98 - Derrickson

1992:

Total captured: 108 Amakihi, 66 Iiwi, 27 Apapane, 11 Omao
No. of escapes during processing: 3 (2 Amakihi, 1 Iiwi)
No. released after processing: 77 Amakihi, 46 Iiwi, 17 Apapane, 8 Omao
No. released within 24 hours: 11
No. released >48 hours: 21
No. transferred to zoos: 11 Amakihi (3 PZG, 4 NZP, 4 HNL); 9 Iiwi (3 PZG, 1 HZG, 4 NZP, 1 HNL); 5 Apapane (4 CZS, 1 HNL); 3 Omao (1 PZG, 2 HNL)

Mortalities:
During capture/processing: 1 Amakihi and 1 Iiwi killed by Io while in nets; 1 Amakihi euthanized due to injury in net.
During field acclimation: 1 Amakihi (stress related)
During transfer to zoos: 0
1 month post-transfer: 2 Amakihi (1 PZG, 1 NZP) 1 Iiwi (NZP)
6 months post-transfer: 1 Amakihi (PZG)
6 months- 1 year post-transfer: 2 Amakihi (1 PZG, 1 HNL)
>1 year post-transfer: 2 Iiwi (1 HZG, 1 PZG), 1 Omao (HZG)

No. Surviving:
7 Amakihi (1 PZG, 3 HNL, 3 NZP)
6 Iiwi (2 PZG, 1 HNL, 3 NZP)
5 Apapane (4 CZS, 1 HNL)
2 Omao (1 HZG, 1 PZG)

FIELD COLLECTION SUMMARY:

Amakihi:
1988 - 30 collected (2 survive)
1991 - 24 collected (10 survive)
1992 - 11 collected (7 survive)

Total surviving: 19

Current Distribution:

	1988	1991	1992
NZP-CRC	1	2	3
NZP-WASH	-	2	-
HZG	-	3	-
CZS	-	1	-
PZG	1	2	1
HNL	-	-	3
TOTALS	2	10	7

Summary of 05 JUNE 98 - Derrickson

Iiwi:

1988 - none collected
1991 - 22 collected (7 survive)
1992 - 9 collected (6 survive)

Total Surviving: 13

Current Distribution:

	1991	1992
NZP-CRC	1	3
NZP-WASH	2	-
HZG	-	-
CZG	4	-
PZG	-	2
HNL	-	1
TOTALS	7	6

Apapane:

1988 - none collected
1991 - none collected
1992 - 5 collected

Total surviving: 5

Current Distribution:

	1992
CZS	4
HNL	1
TOTAL	5

Omao:

1988 - none collected
1991 - 6 collected (2 survive)
1992 - 3 collected (2 survive)

Total surviving: 4

Current Distributions:

	1991	1992
HZG	0	1
PZG	1	1
NZP	1	0
TOTALS	2	2

Summary of 05 JUNE 98 - Derrickson

CURRENT 1998 INVENTORY (as of 5 June):

Amakihi:

HZG	2.1.0 (wild-caught)
PZG	3.0.1 (wild-caught)
CZS	1.0.0 (wild caught)
NZP-CRC	5.4.2 (6 wild-caught, 5 captive-bred)
NZP-WASH	1.1.0 (wild caught)
HNL	2.1.0 (wild-caught)
TOTAL:	**14.7.3**

Iiwi:

HZG	0.0.0
PZG	1.1.0 (wild-caught)
CZS	2.2.0 (all wild-caught)
NZP-CRC	2.2.0 (all wild caught)
NZP-WASH	3.0.0 (all wild-caught, 2 from NBS)
HNL	0.1.0 (wild-caught)
TOTAL:	**8.6.0**

Apapane:

CZS	2.2.0 (wild-caught)
HNL	3.2.0 (wild-caught, 3.1 collected by HNL elsewhere)
Total:	**5.4.0**

Omao:

HZG	3.1.1 (2.0 wild-caught (1 by HNL elsewhere); 1.1.1 captive-bred)
PZG	1.1.0 (wild-caught)
NZP	1.0.0 (wild-caught)
TOTAL:	**5.2.1**

BREEDING SUMMARY:

Amakihi: Thus far 5 females have built nests and have been observed copulating; 4 have laid eggs (1 PZG, 1 NZP-WASH, 2 NZP-CRC); 14 young have been hatched at NZP-CRC from 2 females; 6 fledged successfully and 5 still survive.

Iiwi: Thus far 3 females have built nests and have been observed copulating (1 CZS, 2 NZP-CRC). Two females have laid eggs (both NZP-CRC); 2 chick have been hatched, and 1 successfully raised in 1995 (died 31 DEC 1997 of spinal tumor).

Apapane: Nesting activities have been observed at CZS, but to my knowledge no eggs have been laid. HNL has hatched 5 chicks from 2 different pairs in 1996 and 1997;, all were raised to fledging, but none have survived to adulthood.

Summary of 05 JUNE 98 - Derrickson

Omao: HZG has hatched 16 chicks from 2 different pairs since 1995, 5 have been successfully raised (3 hand-reared, 2 parent-reared).

APPENDIX D

Mist Netting and Banding Protocols

INSTRUCTIONS FOR HANDLING BIRDS DURING
MIST-NETTING AND BANDING

BEFORE HANDLING ANY BIRDS AT MIST NETS, GET INSTRUCTIONS FROM AN EXPERIENCED BANDER. BIRDS CAN BE SEVERELY INJURED BECAUSE OF IMPROPER HANDLING. IT IS POSSIBLE TO SQUEEZE A BIRD TOO HARD OR TO BREAK A LEG OR WING. When holding a bird by its legs, always make sure the hold is on the bird's femur, not on the tarso-metatarsus.

OPERATING THE MIST NETS:

Nets are opened each morning and closed each evening. For closing nets, wrap and tie at 1 meter intervals with colored flagging. Nets will remain attached to the poles overnight during banding operations. Nets will be removed from the poles when banding crews leave the study area overnight (i.e., not remaining at the Base Camp) or for the weekend.

Nets are checked every 30 minutes for birds during the day. However, it may be necessary to check them more during hot, misty, or windy periods. The nets will be closed during the day if (1) it is raining or there is a damp mist where moisture begins to bead on the net, (2) the wind increased to greater than 20 miles per hour, (3) there is extremely hot weather and banding personnel cannot remove birds soon enough to prevent captured birds from becoming hear stressed, or (4) any other situation where captured birds may be at risk. All nets will be closed at least one hour before sunset.

If birds become overheated or stressed when captured in nets, they can be given water to help relieve the stress. One obvious sign of stress is panting.

DANGERS TO WATCH OUT FOR WHEN REMOVING BIRDS FROM A NET:

When removing birds from a net, be aware of the bird's tongue. Some species (i.e., honeycreepers) have a "barb" near the back of the tongue which can get hooked on the mist net. If the net is caught in the bird's tongue or mouth, it may be necessary to cut the net. Scissors should be kept in the banding kit for this purpose.

If, for any reason the net is cut to remove a bird, check for any pieces of net that may still be on the bird. This is best done by blowing to lift the feathers in any areas when bits of nets may be present. IMPORTANT - CUTTING A NET TO REMOVE A BIRD IS A LAST RESORT EFFORT.

It is important to examine all birds captured for lesions before removing them from the net. Toward the end of summer, birds can shown pox lesions. Lesions will appear primarily on the legs or around the eye of an infected bird. If possible, wear rubber gloves to take the "pox" bird out of the net. It is very important to mark the net where the bird was captured (use color flagging) and close the net until the area is disinfected. A spray bottle of Environs should be kept with each banding kit for this purpose. Spray the area where the bird was captured and keep the net closed until the sprayed area is dry.

If lesions on an infected bird are discovered at the banding table, it is important to disinfect any instruments that came in contact with the bird and to clean your hands. Use alcohol for this purpose. Make sure the holding bags infected birds were carried in are not used again until they are cleaned.

BANDING THE BIRDS

While birds are held in bags waiting to be banded, tie the bag and bird on a bag-line at the banding station. Do not lay or set the bag with a bird down anywhere.

WASHING THE NETS

All nets brought in from the field should be washed and cleaned before reusing.

1. Fill the sink with ENVIRONS solution (1 tablespoon ENVIRONS to 1 gallon of water). Use enough solution to wash 3-4 nets per wash.
2. Soak the nets in the ENVIRONS solution for 10 minutes, then rinse then thoroughly with clean water an the adjacent sink.
3. using the same ENVIRONS solution, again soak the nets for an additional 10 minutes.
4. Rinse nets in clean water a second time, then hang outside to dry.
5. Discard the used ENVIRONS solution.
6. Prepare a new batch of ENVIRONS solution and repeat the process until all nets have been washed.

WASHING BIRD HOLDING BAGS

All holding bags used to transport or hold birds in the field should be washed before reusing. Holding bags are routinely washed once per week. turn the bags inside out (seams will be on the inside) and wash with chlorox and detergent in a washing machine.

NOTE: The above information was extracted from protocol conglomerated by the U.S. Fish and Wildlife Service, National Biological Survey, 1849 C Street, N.W., ARLSQ 725, Washington, D.C. 20240 (202/208-6394).

Environmental Assessment
for
Proposed Management Actions
to Save the Po`ouli

APPENDIX A - continued

Copies of Letters of Comment

Kurt Benirschke, M.D.
Professor Emeritus of Pathology & Reproductive Medicine
University of California San Diego, University Medical Center
200 West Arbor Drive
San Diego, CA 92103-8321
619-543-2618 (5719 secretary)
FAX 619-543-7711
E-Mail: kbearsc@ucsd.edu

September 27, 1998

Sharon E. Reilly
Wildlife Biologist
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Re: Po'ouli sexing

Dear Ms. Reilly:

I have read all of the material that you sent and weighed the conflicting results. I was surprised to be on this committee, as I do not myself do molecular sexing of avian species. Nevertheless, the verdict seems to be fairly straight, in the absence of any reference material it is impossible to guarantee the sex of all three birds. It **may** be that there are 2.1, but more likely, 1.1 are assured and the third is in dispute. Absent reference material from this genus (let alone this species), even the new methodology employed by Griffiths et al. (A DNA test to sex most birds. Molecular Ecology 7:1071-1075, 1998) may not be capable of adequately sexing the birds. Besides, there may now be too little DNA left to start all over.

Having digested all of that and the other information on the sad state of this bird it would seem to me best if the birds were brought together into the same region, at least the 1.1. I suppose that it is possible that, if the third bird were a male and also brought into the same region, that fighting might occur. So, why not start at least with the 1.1 relocation; I personally would favor bringing all three birds together but not caged. Hand raising seems too problematic, moreover, who would willingly accept that responsibility.

Since I favor bringing the birds into one region, the important decision would

need to follow, which area. That is difficult for me to judge; the area in which there is greatest chance of success and, therefore, least prevalence of predators. I hope that this would work. At that time, and perhaps during capture and relocating the birds one can secure some additional feathers for DNA acquisition and later sexing by the variety of techniques discussed in the protocol and this letter.

It seems to me that the laboratories that have so far done the sexing of feather material have done an outstanding job with all too little material and no information to help them. They should be congratulated but I do not think that the potential recovery effort should **hinge** on successful sexing of **all** birds. The time is too late for that and the alternative should be promoted vigorously and rapidly.

This will be the only report I will send and I hope that you will be sharing this with the other parties who have an interest cr concern with the topic. I am leaving for a conservation effort to Paraguay tomorrow and will be away for three weeks.

Yours Sincerely,

Kurt Benirschke, M.D.

Cc: Cindy Kuehler

11 October 1998

Mr. Michael G. Buck
Administrator
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawai'i 96813

Dear Mr. Buck;

I was born and raised in Hawaii and have been a practicing wildlife biologist since 1974 when I began as a non-game wildlife biologist in Honolulu with the then Division of Fish and Game. While working for your Division, I worked on a number of projects, including the review and assessment of the State's captive propagation facility, then at Pohakuloa on the Big Island, resulting in its ultimate move to Olinda on Maui . Since 1989, I have worked as a wildlife biologist for the Department of the Navy in San Diego. Between 1990 and early 1997, I was involved in a Navy project to recover the endangered San Clemente Loggerhead Shrike (shrike). Like the efforts proposed in the document entitled *Draft Environmental Assessment for Possible Management Actions to Save the Po'ouli*(EA), the programs that developed over my 7 year involvement to better the conditions for the shrike were both complex and controversial, and involved a captive propagation program at both an urban as well as a remote island setting.

I have reviewed the above mentioned document have the following comments.

General

1. Inasmuch as the proposed actions deal with a federally listed species, a "take" permit will be needed to compete whatever action (other than the no action alternative) is selected. In order for the U.S. Fish and Wildlife Service to issue a "take" permit, a Biological Opinion must be issued by the Service. No Biological Assessment, prepared by the lead agency, was included in this EA, and must be prepared prior to the issuance of a Biological Opinion. When will the Biological Assessment be completed?

2. The Agency Determination states that "none of the alternatives being proposed are expected to cause significant, irreversible impacts to the environment pursuant to.....; therefore the anticipated determination is a Finding of No Significant Impact"(FONSI). This position appears to based on the Agency determination that "all actions proposed in this draft EA are anticipated to prevent the extinction of the Po'ouli." Although I read the draft EA, much of the analysis, discussions and conclusions presented in the document and, ultimately for use by the

decision makers, were based on general summaries of referenced information lacking substantial quantitative data on critical areas of Po'ouli knowledge, including, but not limited to essential habitat parameters, courtship and pair formation, food habits (what are preferred items and availability of these items in the habitat), and the sex of remaining individuals in the wild, as well as the ability of aviculturalists to successfully maintain individuals in captivity. If this is the information that will be used to base a decision on, this decision has the potential to be seriously flawed in that keystone programs, such as captive propagation, have no supportive information/data analysis to substantiate document assumptions of success. Since the basis for the FONSI is prevention of the extinction of the Po'ouli, substantial and supportive information must be provided to the decision makers that an action, when selected, will, indeed, help keep this critically endangered bird from going extinct. I did not find that this had been done.

Specific Areas

1. Captive Propagation. The proposal for some form of captive propagation is first found in Alternative 3 and culminates in complexity with Alternative 6, and appears to be the hope for success to save this species. Yet, there is no in-depth, detailed discussion of what makes a captive propagation program successful, what causes it to fail, where the "pitfalls" are, what similar (to the Po'ouli) species have succeeded or failed and why, and an independent evaluation of the proposed Po'ouli captive program.

Yes, examples of "successes" with captive Apapane, Amakihi, Omao and Iiwi are given, but, to date 19/65 (29.9%) of the Amakihi, 13/31 (41.9%) of the Iiwi 4/9 (44.9%) of the Omao and 5/5 (100%) of the Apapane are alive. This might look to be a good record at first glance, but none of these birds have the dietary focus (native land snails) of the Po'ouli. One is left to assume the needs of Po'ouli pairs for nesting, incubation temperature parameters, and chick rearing techniques are so similar to these other endemics that most major hurdles will be quickly overcome. With only three Po'ouli remaining, insufficient supportive data was presented to show that even the success of the Amakihi was achievable, let alone the Apapane.

Additionally, statements such as "Capture and hold one, two or all of the remaining three individuals.....then transfer the birds to MBCC or another approved facility...; Capture two or all of the remaining three individuals and take them immediately into captivity at MBCC or another approved facility...."; "Total elapsed time from capture of the birds to arrival at the propagation facility will not exceed 3 hours", and such matter-of-fact, simplistic statements on the capture, uneventful acclimation to captivity, ease of transport, paring and nesting give little confidence that the proposed actions presented in the EA have been thoroughly researched, thought out and evaluated. Why would you capture only one bird? It seems to me there are only two facilities, Olinda and Keauhou, capable of attempting captive propagation. Which one will it be? Which will be the primary destination? It seems unlikely that even a coordinated mist netting effort, combined with a waiting helicopter can get the birds successfully to Keauhou and into an isolation cage in less than three hours. And little in the captive propagation world ever goes so matter-of-factly.

2. Sexing of Remaining Birds. A summary of the results of DNA sexing, presented as Appendix A, was helpful in trying to tease out exactly who said what about what samples, although a tabular presentation might have been clearer. Although it appears the document favors the conclusions of the UDL laboratories, I think in this situation where the success of most of the proposed alternatives depend on the accurate sexing of the remaining birds, it is almost unthinkable to proceed without more solid evidence. I can't comment on the technical aspects of the sexing procedures presented, but having worked with Dr. David Woodruff at the University of San Diego on developing accurate sexing of shrikes from feather samples, the need for good "primers" for micro-satellite analysis is essential and took over two years and more than $150,000.00 to complete. If you want accurate sexing, you are probably going to have to pay for it; it's the time that poses the problem.

3. Transmitters. This management tool is only mentioned in passing with no discussion on any previous work with surrogate species, the intended weight of transmitters, preferred methods of attachment, or that permits would be obtained. Not only the Po'ouli's status but its extremis position mandates that this tool, if used, be thoroughly evaluated on surrogate species in the Po'ouli habitat to ensure that once a transmitter is successfully attached, the signal can be successfully received up to the signal limits. For the shrike, this involved more than two years of hardware research and evaluation and evaluating attachment methods on captive birds before attaching transmitters to birds prior to release.

4. A plan entitled *Initiating Recovery of the Po'ouli and other endangered Forest Birds in East Maui*, May 1997. This plan is mentioned in passing at the top of page 9 with no further reference to it in the EA. How was the recovery of the Po'ouli addressed in the May 1997 plan ? How do the proposed actions in this EA parallel or not parallel actions proposed in this document? What role did the plan propose for captive rearing (of the Po'ouli)? What were the identified captive rearing "prerequisites" and time frames? Anyone evaluating alternatives presented in this EA to base their decision on would clearly be interested in this.

5. Habitat Management/Harmful Non-native Species. Section 2.2 clearly states that "effective habitat management of the known threats will always be critical to the survival of the Po'ouli..." and, at some level, management actions of predator management, fencing and monitoring will continue. I concur with this except that I would strongly urge the responsible agencies not only to maintain these efforts at their current level, but increase them. This is one aspect of the information presented on threats to the Po'ouli that clearly can be effective. Keeping pigs out has already proved to be overwhelmingly beneficial to the native flora and fauna. Also, in the face of evidence of rat depredation on AND competition for food with the Po'ouli, development of more effective control methods, such as aerial dispersal of bait, can only benefit the species on both fronts. With your success achieved in this arena to date, together with an declared intent to continue these efforts, I would recommend that the "None/Status Quo" in the Alternative 1 column for the "Harmful Nonnative Species" category be changed to "Positive effect through continued management".

In summary, although strongly I support your intent to keep the Po'ouli off the extinct list, significantly more thoughtful discussion and evaluation of the alternatives proposed must be presented in this document to validate conclusions presented. There are many experienced and dedicated conservationists in Hawai'i and elsewhere that only want the best for its native flora and fauna. However, unless more Po'ouli are found in the wild, this may be one of the species that just has too much going against it to be able to successfully survive, and the best that we can do is to manage its habitat and minimize predation.

I thank you for giving me the opportunity to comment on this most important Hawai'ian conservation issue.

Sincerely,

Timothy A. Burr

17063 Tam O'Shanter Drive
Poway, CA 92064
(619) 532-3745 day
(619) 485-6904 eve

KAMEHAMEHA SCHOOLS BERNICE PAUAHI BISHOP ESTATE

October 8, 1998

Mr. Robert Smith
Fish and Wildlife Service
300 Ala Moana Blvd.
Honolulu, HI 96813

Dear Mr. Smith:

Draft Environmental Assessment for Po'ouli

Thank you for allowing me to review the Draft Environmental Assessment (EA) for possible Management Actions to Save the Po'ouli.

I can tell that alot of hard work has gone into the preparation of the document, but it is basically faulty regarding possible choices or actions. Five of the six proposed choices for the management will be underlying all actions.

Habitat management is not a suboption. It is a huge task, requiring interest and real on-the-ground management. Captive propagation is one choice of at least three, with various ways of doing it.

The EA needs to be rewritten. I suggested by some other party than either State or Federal governments. It should go to the National Research Council and the Department of Conservation in New Zealand.

If an independent organization writes the document, readers/reviewers will know that all information from every source is included. It is definitely not in the present form.

The writers of the EA rely on captive propagation only because the Peregrine Fund is here and has accomplished so many miracles. Cyndi Kuehler, Alan Lieberman, Joop and Marla Kuhn, Barbara McIlraith, and John Turner have done things we never thought possible: get endangered Hawaiian birds collected as eggs to breed subsequent populations. Because of this success, it is somehow expected that they can bring in adults, which they do not want to do for many sound scientific reasons. Further, to expect that Po'ouli adults will survive handling with the less skilled present field crew is not realistic. None of them have enough experience to warrant any translocation of birds. They have not had enough success with even common species, to include Maui Creeper.

101 AUPUNI STREET, SUITE 227 HILO, HAWAI'I 96720 TELEPHONE (808) 969-1768 FAX (808) 961-6862

Our Business is Education

Habitat management is a set of many actions. Captive propagation should be the smallest part of habitat management, and the last resort. If there are reasons that the bird is declining are not addressed, or addressed as a secondary or underlying theme, then these factors (problems) which lead to the decline are not solved. And they have been written about *ad nauseam*, and still the field crew does not understand we need solutions to real problems. We have ways to solve: predator control, mosquito control, removal of alien birds and plants, fencing landscapes to exclude ungulates.

I would make this set of choices:

1. **No action**;

2. **Accelerate habitat management**; and

3. **Captive propagation**.

Under these choices:

1. NO ACTION.

    A. Continue to monitor home range areas.
    B. Continue to look for nests, first clutch taken.
    C. Continue predator grids.
    D. Continue insect studies.
    E. Continue to expand search areas, when time permits.

All these actions require scheduling: people, money and time.

2. ACCELERATE HABITAT MANAGEMENT.

    A. Predator control.
        1. Bait stations increased in areas between and around "home ranges".
        2. Increase traps (kinds and numbers) for mice, rats, cats and mongooses.
        3. Research into "problems" in aerial dispersal techniques.
            a. Base data.
                1. Polynesian, Black rat numbers.
                2. Mongoose numbers.
                3. Cat numbers.
                4. Insect numbers.
                5. Alien bird numbers.
                6. Plant species data.
            b. Data needed.

1. New designs for bait stations.
2. New baits and their registrations.
3. Hand broadcast as a strategy.
   A. Water and soil samples from hand broadcast areas.
   B. Any microbes that eat bait.
   C. Insects that eat bait.
4. Breeding cycles of all alien species, particularly rats.
5. Incidence of leptospirosis in rat populations.
6. Stomach samples and analysis for all alien species.
7. Cage birds testing on pellets; all flavors.

B. Alien bird control.
   1. Stomach samples determine:
      a. weed species spread; and
      b. native insect, snails eaten.
   2. Disease survey.

C. Disease control.
   1. Mosquito surveys at lower elevations.
   2. Dunk (Bti)*[Bascillus thurengensis israeliensis]* trials on endemic insects.

D. Weed control.
   1. Continue hand pulling.
   2. Try other strategies such as sanitizing clothes, leaving clothes.
   3. Helicopter landing zones, sanitized before coming into area.

E. Ungulate control.
   1. Fencing expands.
   2. Monitoring continues.
   3. Increase controls: snares, traps.

These are equally important actions requiring set time tables. If they are lumped, as they have been in this draft, the work takes second seat to captive propagation, and the definition of the work that it physically entails is not defined, nor properly budgeted for time, manpower and money.

3. CAPTIVE PROPAGATION

A basic **con** to the captive propagation scenarios is the uncertainty of the sexing procedures. Two out of three labs could not adequately sex these individuals. You **must** know what the sexes are, if any human-involved movement of birds takes place.

Absolute certainty that none of the birds has a mate, is also of great importance. If, for instance, there is another bird in Home Range 3 that has never been seen with the other, because of being on a nest, (or whatever), the best, absolute best, thing we can do is expand the predator control to

include areas below the fence near "Po'ouli camp". The fact that Paul Baker's crew took weeks to get there and even look for the second bird that Tom Snetsinger, Christine Hermann, and I heard, shows the level of interest in finding a nest of the last crew. This crew was very slow in getting predator control in HR 3, where the bird might possibly be the only male. If Paul Baker's crew had gone to look for a nest, and put out predator control we might have protected a whole family. And we might have more now.

The Peregrine Fund has produced a comprehensive document regarding all the proposed actions in the Draft EA. I agree with all of their decisions. I especially think the tables are much more accurate than those in the Draft EA.

Some correction to the EA document:

Page 10: second paragraph. I went into the Transect 9 area with Sally Atkins and put out 87 bait stations. I left eight cases (320 pounds) of bait with John Simon who agreed to rebait these stations. They may have been rebaited once. I only volunteered my Thanksgiving vacation to do this, and it was not serviced by myself, and there is no truth in the last sentence at all.

Table 2-1 gives no basis for any decisions. Whoever made these charts needs to learn what a decision matrix is, and how to weigh each alternative. Then some judgment can be made. All the tables need to be worked on.

HABITAT MANAGEMENT is alot of individual actions. Predator control is hard work. I think anyone who goes to Hanawi must WANT to do habitat management of some sort: predator control or alien bird control.

Sincerely,

Tonnie Casey
Wildlife Biologist
Hawai'i Island Region

TC:kaf

DATE: Sep.22, 1998

TO: Interested parties

FROM: Tonnie Casey, Wildlife Biologist, KSBE, phone: work (808) 934-5326, home: 985-8819, mobile: 936-6539, email: tocasey@ksbe.edu Address: 101 Aupuni St., Suite 227, Hilo, HI 96720.

SUBJECT: Aerial Rodenticides

Just imagine a nest full of squeaking nestlings, and a male and female bird rushing around, looking for insects to feed the hungry mouths. Think about how the rats can hear the helpless nestlings, and what a delicate morsel a nestling is for the rat. Mother birds are easy prey too, when they are sitting on the eggs, patiently waiting for them to hatch.

One solution to the imminent crash and ultimate extinction of the Hawaiian birds is to control predators. These include rats, mongooses and feral cats. Rats are nocturnal, usually out at night, and we don't see the destruction. They are fantastic climbers and can jump 50 feet. They eat anything- eggs, nestlings, nesting female birds, insects, snails, larva, plant parts, seeds, and fruit.

New Zealand, our kin to the South, is successfully controlling pests that carry many diseases into their watersheds. Tuberculosis was spread from infected possums to cattle, endangering the people of the area. They waged war on the possums, an exotic species imported from Australia for furriers in the 1800s. They decreased possums with an aerial dispersal of 1080. They continue to use aerial dispersal of rodenticides to reduce disease, and have also discovered how well it works for the conservation of rare and endangered species. Many rodenticide drops on offshore islands and in mainland forests have reduced pest species, and helped native ones.

In Kaharoa Forest, after six years of both aerial drops and bait stations of rodenticides, managers reported that the endangered Kokako's, (Blue wattled crow) population grew from three active nests to 17 in just three years. And in the sixth year, they discovered that they had a population of fernbirds. These birds are so quiet and stealthy that no one saw or heard them until there numbers expanded due to the predator control.

In Hawaii, we have been using diphacinone baits successfully. This bait dissolves in four inches of rain. Diphacinone is not water soluble and only permeates two inches into the soil. Insects or snails may find a pellet but the chances of a bird eating that insect before the insect has excreted the diphacinone are very slight. The birds themselves will probably not be interested in the pellets. Birds have a size range of things they eat, and the pellets are too big. Also, the pellets are green and birds rarely eat green things. They also are deterred by fish and peanut butter flavoring. A rat only needs to eat one pellet to die, where a bird will be less effected.

The system of aerial drops works. New Zealanders enjoy seeing their wildlife, drinking pure water and swimming in their streams, without fear of diseases such as leptospirosis and giardia.

Aerial dispersal of rodenticides cuts down on the necessity for trails in forests, which also cuts down on weed dispersal. The man hour cost for bait stations, trail cutting, and labor has been determined to be about $34/ acre. This process is very lengthy, bait stations must be constantly maintained prior to and throughout the birds and rats breeding season. This is a very effective means, none the less, and is best in areas when ground birds live, such as the nene. Aerial dispersals are done twice in a year, with two weeks between drops.

COSTS

At 10 pounds of 8 gram fish and peanut-butter (molasses) flavored .005 % diphacinone pellets per acre, area 1, 1880 acres equals= 18,800 pounds of bait.

At $1.70/pound (including shipping) the cost for bait is $32,000.

At 1000 pounds (100 acres) per load, approximately 20 loads.

20 loads at 15 minutes per load equals 5 hours @ 1800/hr = $9000 helicopter cost.

Two drops at 10- 14 days apart= $ 41,000 + $41,000 = $82,000

To do the whole area, (tree line to 5,000 ft. elevation) 7.2 square miles @ $29,000/square mile = $208,800.

DETAILS ON THE TOXICITY OF THE BAIT.

Imagine yourself in a 25 foot square room. There would be only one pellet in that whole room.

Each 8 gram bait @ .005%diphacinone = .04g diphacinone /pellet.

So in 10 pounds = 4500grams = 562.5 pellets per acre.

Of these 562.5 pellets @ .005% diphacinone = 22.5 grams of diphacinone =Total diphacinone in pellets equals 3 pellets of diphacinone per 562.5 pellets .

1 acre = 208.7 ft square, 10 pounds per acre or 562.5 pellets/14520 square feet = 1 pellet per 26 feet.

Rec'd
10/9/98
@ FWS
office.

Maui Forest Bird Recovery Project

Olinda Field Station
2465 Olinda Road
Makawao, HI 96768
(808) 573-0280 phone
(808) 573-0519 fax

TO:
Michael G. Buck
Administrator
DLNR-DOFAW
1151 Punchbowl Street, Room 325
Honolulu, Hawaii. 96813

October 8, 1998

FROM:
Mark S. Collins
Research Project Coordinator

RE: Recovery Efforts For the Po'ouli

As research project coordinator for the Maui Forest Bird Recovery Project, I would like to submit comments on the "Draft Environmental Assessment for Possible Management Efforts to Save the Po'ouli".

Note: The opinions expressed here are my own and do not necessarily reflect the position of the Division of Forestry and Wildlife.

HIGHLIGHTS OF RECOMMENDED RECOVERY EFFORTS FOR THE PO'OULI

1) Our ultimate goal should be clear from the outset: To effect full recovery of the species by building the numbers of Po'ouli as rapidly as possible to an effective population size of 500+ birds.

2) To rapidly build large numbers of Po'ouli will require intense interventionary techniques such as: bringing in from the wild the remaining three birds to form a breeding pair in captivity, providing a spacious captive environment with natural elements to encourage early onset of breeding, manipulating the male bird to service both females in the same breeding season, taking of first clutch eggs for artificial incubation, optimizing nutrition to maximize reproductive yield, sperm collection/artificial insemination and systematic pairing of off-spring to minimize genetic defects in the population.

3) The captive-breeding effort involves risks to the three known individuals that would otherwise die in the wild without producing offspring, leading to extinction of the species. The need to save the species supersedes the risks to the individuals.

4) We must choose the difficult course that gives us the greatest potential to optimize reproductive productivity. We should attempt to form a breeding pair in captivity, by first catching and habituating a Po'ouli to captivity in a holding cage at the capture site. The bird would then be moved and housed in an aviary near the home range of a Po'ouli of opposite sex. This second free-flying bird would then be captured and an appropriate method would be used to introduce the birds to effect pair bonding. The third individual would similarly be brought into captivity for use as a breeder, once the first two birds are habituated to the captive condition.

5) Hard or soft-release translocation for breeding in the wild is <u>not</u> recommended because: it represents an option that is "too little to late". The output of 1-2 offspring per year that can be expected of a wild pair of Po'ouli, (given the slim odds that a pairing would occur) will not likely be great enough to build a sustainable population, based on genetic and demographic models. Furthermore, use of transmitters to track released birds is strongly <u>not</u> advised because of potential problems with attachment methods that could lead to mortality, or at the least, diminished sexual activity. Released birds may not remain at the release site, and without transmitters could become lost to the field researchers.

6) There are aviculturalists in the USA who possess the knowledge, skills, and confidence, and are available, to supervise bringing wild insectivores into captivity.

7) Qualified aviculturalists should accompany the field crew in their initial efforts to capture individual Po'ouli to provide expertise holding birds in captivity. An aviculturalist should be retained to supervise holding Po'ouli in captivity.

8) We should remain flexible in our capture/holding techniques, dictated by decision trees keyed to the behavior and physical condition of the captive individuals.

9) The recapture of any one of the three known Po'ouli may take weeks or months given the vagaries of the weather, and the illusiveness of the individuals, as evidenced from search effort and net hour data.

10) Given the possible delays in recapturing Po'ouli, the field crew should receive on-site training in the holding of wild surrogate insectivores, simultaneous to the mist netting effort, in anticipation that an aviculturalist may not always be available if the mist netting effort takes many weeks.

11) The supplemental food proposal submitted to the Po'ouli recovery partners in July 1997, should be implemented simultaneous to the mist netting effort to improve the chances of recapturing Po'ouli. This document will soon be re-released with updated information and citations.

RECOVERY STRATEGIES FOR THE PO'OULI IN DETAIL

The Po'ouli is on the verge of eminent extinction. Despite nearly three years of searching by field crews, no new areas with Po'ouli have been discovered, and the 5-6 birds reported in 1996 has dwindled to just three singleton birds with disjunct home ranges. It is imperative that we act soon to implement section 62 of the "final plan" which calls for moving birds of opposite sex to form new breeding pairs. Even if more Po'ouli individuals are located in areas to be searched, we still are faced with what to do with these singleton birds.

Population Genetics Considerations

The ultimate goal of the recovery/translocation efforts should be clear from the outset: To effect full recovery of the species by building the numbers of Po'ouli as rapidly as possible to an effective population size of 500+ birds.

Population geneticists have shown that to bring a species back from the brink, the fecundity of the founding pair must be great in order to avoid the loss of genetic variation in the following generations. The output of 1-2 offspring per year that can be expected of a wild pair of Po'ouli, will not likely be great enough to build a sustainable population (This is a primary reason why breeding in the wild is not recommended). To rapidly build large numbers of Po'ouli will require intense interventionary techniques such as: bringing in from the wild the remaining three birds to form a breeding pair in captivity, providing a spacious captive environment with natural elements to encourage early onset of breeding, manipulating the male bird to service both females in the same breeding season, taking of first clutch eggs for artificial incubation, optimizing nutrition to maximize reproductive yield, sperm collection/artificial insemination and systematic pairing of off-spring to minimize genetic defects in the population. The bottom line is that the initial pair(s) must be encouraged to produce as many eggs as feasiblely possible.

Risk Assessment

There is understandably great concern over the risks to the three remaining birds if they are translocated and/or held in captivity. Wild birds brought into captivity are at risk of mortality due to stress. Even if the most advanced techniques to hold a wild bird are employed, the individual could die from complications that arise from a pre-existing health condition.

It must be kept in mind that the captive-breeding effort proposed here involves risks to birds that would otherwise die in the wild without producing offspring. There is no indication that the three individuals will ever make contact with one another, based on nearly three years of observations on their movement patterns. The risks involved with capture and captive-breeding can be justified as it is the only option left to save the species. Simply stated: the need to save the species supersedes the risks to the individuals.

Bringing Insectivores Into Captivity

There is a perception by some in Hawaii that bringing an insectivorous forest bird into captivity is destined to failure because of difficulties in providing the proper care. I have made contact with several aviculturalists in Hawaii and the mainland who possess the knowledge, skills, confidence, and are available to bring wild insectivores into captivity. The field crew has received training

from an avian veterinarian, Greg Massey and an aviculturalist, Peter Luscomb with the Honolulu Zoo who has extensive experience bringing into captivity wild Hawaiian Honeycreepers and Birds of Paradise in New Guinea. The field crew is presently building on this training, by bringing into captivity (up to 72 hours before release) the insectivores; Japanese Bush-warbler (*Cettia diphone*), and Alauahio, (*Paroreomyza montana*), and the high strung frugivore, Red-billed Lieothrix (*Lieothrix, lutea*). One caveat that we adhere to is that birds that do not feed within the first few hours of captivity must be released back to the wild; leaving open the option of trying again after an assessment.

Forming A Breeding Pair in Captivity

We should remain flexible in our translocation techniques, dictated by decision trees keyed to the behavior and physical condition of the captive individuals. This stated, the goal should be to attempt to form a breeding pair in captivity, by first catching and habituating a Po'ouli to captivity in a holding cage at the capture site. [Provided that the sex ratio (HR1 female, HR2 female, HR3 male,) determined by the UDL lab in London is the best information we have, the first bird to be captured would be the HR2 bird.] The HR2 bird would then be moved and housed in an aviary near the home range of a Po'ouli (HR3) of opposite sex. The second free flying bird (HR3) would then be captured and an appropriate method would be used to introduce the two birds to effect pair bonding.

Initially the pair would be held in a forest aviary in Hanawi Natural Area Reserve. Holding birds in the forest allows the birds to remain acclimated to the conditions of their natal forest. If it is found that the effort to hold the birds in Hanawi is untenable due to logistics and/or expense, the pair would be moved to an off-site captive propagation facility after first being habituated to captivity in the field aviary.

The third individual (HR1) would remain in the wild as a back-up for further use as a breeder, and would be captured once the HR2 and HR3 birds are secure and well habituated to captivity.

Aviculturalists/Mist Netting Considerations

Qualified aviculturalists should accompany the field crew in the initial efforts to recapture individual Po'ouli, to provide expertise in holding birds in captivity. However, it must be recognized that the recapture of any one of the three known Po'ouli may take weeks or months given the vagaries of the weather, and the illusiveness of the individuals as evidenced from search effort and net hour data.

> *For example: It took 1,649 net hours or 18 banding days over a span of 7 weeks to capture the HR3 bird. We spent 6 days and 504 net hours in an unsuccessful attempt to capture the HR2 bird. For the HR1 bird, we spent up to 137 man days to get a re-sighting and 305 net hours and six days to capture the bird.*
>
> *The success in capturing the HR1 and HR3 individuals was in large part a factor of El Nino, the drought allowed us to run our nets day after day. (note: you cannot mist net in the rain or high winds)*

Given that many weeks may be required to recapture a Po'ouli, it is anticipated that an aviculturalist will not always be available on-site, therefore, the field crew should receive further on-site training by the aviculturalist in the holding of wild surrogate insectivores, simultaneous to the mist netting effort. The field crew would become proficient in avicultural techniques and an aviculturalist would be retained to supervise holding Po'ouli in captivity.

Forest Aviary Considerations

I have proposed in the section "Forming A Breeding Pair In Captivity" that an aviary would be established in the home range of the HR3 bird. This aviary should be of a design that would incorporate elements of the existing forest (trees, bushes, mesh openings large enough for the passage of insects etc.) that may be beneficial in stimulating nesting behavior. We should attempt to get support from the local community for construction material and pre-fabrication construction assistance at Olinda or the DLNR Baseyard. The call for help can go out via the Maui News, attached to a news story about the project, and/or the carpenter's union.

The aviary should be designed for a life span of approximately five years, which approximates the reproductive potential of the founding pair. The construction of the structural components should be done with power driven screws and duplex nails to allow for easy disassembly. Funds would be held in reserve to remove the structure, once it is no longer needed. The structure could also function as a hacking structure for captive-reared birds to be released back into the wilds of Hanawi.

Field Crew Considerations

The existing field crew should be retained at full strength through fiscal year '98-99. They will be needed in the effort to recapture birds for translocation and captive-breeding, as well as their existing duties as defined in the final plan. There are great advantages to having the field crew become proficient at staffing the forest aviary. The field crew could work both jobs, manning the aviary and continuing the forest research. The HR3 home range has a relatively high density of Maui parrotbill (*Psuedonester, xanthrophrys*), and studies on this species (example: survival and recruitment of juveniles) could be conducted on site. By having a field crew with expertise in both field studies and aviculture of captured wild birds, the Maui Forest Bird Recovery Project could move on to proposed recovery projects i.e., building a captive population of parrotbill, and akohekohe *(Palmeria dolei)* translocations to West Maui and/or Molokai.

Supplemental Food Proposal

The supplemental food proposal that I submitted to the Po'ouli recovery partners in July of 1997 should be approved for application in Hanawi. The methodology involves supplemental feeding stations designed to attract Po'ouli moving in mixed foraging flocks of alauahio that have been habituated to the feeders. The successful application of this methodology will lessen the amount of time required to net Po'ouli and will make the capture more predictable. The bird holding component of the proposal will be simultaneous to the mist netting effort. The methods provide important avicultural experience for the field crew, and will be a long overdue first step in developing supplemental food as a management tool for Hawaiian forest birds. This document will soon be re-released with updated information and citations.

University of Hawai'i at Mānoa

Department of Zoology
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2 October 1998

To: Michael G. Buck
Administrator
DLNR-DOFAW
1151 Punchbowl St.
Honolulu, HI 96813

Robert P. Smith
Pacific Islands Manager
U.S. Fish and Wildlife Service
P.O. Box 50088
Honolulu, HI 96850

From: Sheila Conant, Ph. D.
Professor

Sheila Conant

Re: Draft EA for Possible Management Actions to Save the Po`ouli

First, I commend your agencies on producing a clear and readable Draft EA. Unfortunately, these attributes have not made it any easier for me to offer my comments and recommendations on this difficult issue.

Of the alternatives offered, I would choose none, but would instead suggest that a modification of Alternative #1 be pursued. The modification I suggest is that your agencies undertake greatly increased efforts to control predators, particularly rats, and other alien species in the habitat of the Po`ouli.

The only other alternative I would find acceptable is Alternative #6, bringing the birds into captivity immediately. As stated in the EA, this alternative involves high risk to the birds, but would cause minimum damage to the habitat, unlike Alternatives # 3, 4, and 5. It would be lest costly than those alternatives, though more costly than Alternative #2, which I think has little chance of success because of the tendency of adult birds to return to their home ranges. The low cost of Alternative #6 is what appeals to me.

I am considering a number of factors in making my recommendations. Of highest priority in my own thinking is the importance of managing resources for the good of the entire plant and animal community, as opposed to managing for just one species. Also of concern to me is the cost of the different alternatives and the philosophical mindset they represent. Although it might be possible to get funding for dramatic and bold attempts to save this species that would be unavailable for the more mundane activities such as rat and pig control, all the alternatives except the first would involve spending large amounts of money on a single species effort. I can no longer, as I have in the past, condone a species specific approach to the conservation of our endemic biota, no matter how charismatic the species may be, nor how dire its predicament is.

Since I became interested in the biology and conservation of Hawaiian birds 35 years ago, I have watched one bird species after another decline and go extinct. I have simultaneously watched idealistic but underfunded government agencies launch program after program to save species on the brink. In my humble opinion, these programs have been, without exception, too little too late.

At the very least we must stop pretending that hatching the eggs of a handful of endangered birds and hacking the young back into dying forests will save those species from extinction, no matter how well we do it. At minimum we should redirect our avian conservation program resources towards habitat management to control predators, disease vectors and other destructive alien species.

Today the cost of avian captive propagation dwarfs the resources we invest in all programs directed at non-avian Hawaiian species by comparison. Let us turn our attention and more than a few tens of thousands of dollars to the more than 300 listed endangered plants and the hundreds and hundreds of biologically, though not yet legally listed, endangered species of invertebrates and plants that have received so little attention and support.

I remember when there were over 100 `Alala, I remember visiting the Alaka`i when every dead snag in the bog had a Kama`o or `O`u perched atop it, and the last pair of `O`o`a`a awakened us each morning with their beautiful and haunting duets. These last three are gone now. I am greatly saddened and more than discouraged by the losses we have experienced, as well as by our inability to learn from our failures at conservation. As biologists and managers we have not acted soon enough, nor in great enough measure, nor in the right direction. It is time to stop our futile attempts to plug the holes in a crumbling dike. It's time to put our efforts, our dollars, our minds and our hearts into conserving ecosystems.

Cc: Dave Hopper, Karen Rosa, Carol Terry, Paul Conry, Sharon Reilly, Dave Smith

Smithsonian
National Zoological Park

October 9, 1998

Michael G. Buck
Administrator
DLNR-DOFAW
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

RE: Draft Environmental Assessment (EA) for Possible Management Actions to Save the Po'ouli

Dear Mike:

I have reviewed the management alternatives outlined within the Draft EA carefully, but still believe Alternative 6 to be the best option. My reasons for preferring Alternative 6 are fourfold. First, the factors limiting the population are unknown, and will remain so until numbers are dramatically increased to facilitate field study. Second, the population now consists of only one male and two females. The population has been in a steep decline (15+% per year) for the past two decades, and there is no reason to believe that this trend will change until limiting factors can be identified and ameliorated. Third, there is the matter of resources and conservation priorities. Hawaii already has two facilities, with trained and dedicated staff, devoted to the *ex situ* propagation of endangered species and their restoration in the wild. Clearly, constructing and staffing a field facility for *in situ* propagation and management would duplicate these programs unnecessarily. I worry that such an effort might divert already scarce resources from ongoing efforts to manage known factors in this habitat that are adversely affecting many other native plants and animals. I also worry about unforeseen and inadvertent habitat impacts that might be associated with constructing and staffing a facility in this fragile area. Fourth, there is the matter of time. The Po'ouli is only one mortality (the male) away from extinction. I rarely promote captive propagation and reintroduction as a recovery tool, but this strategy is clearly warranted in cases such as this one. While there are clearly risks associated with capturing, acclimating, and breeding Po'ouli in captivity, I believe these to be less than those associated with sustaining and breeding the birds in the field. In summary, I favor Alternative 6, and recommend that all three birds be captured and brought into captivity as soon as practicable.

I thank you for providing me with the opportunity to comment on the Draft EA. And, regardless of the final decision, I will do everything I can to support the recovery efforts for this magnificent species.

Sincerely,

Scott R. Derrickson

Scott R. Derrickson, Ph.D.
Curator of Ornithology and Deputy Associate
Director for Conservation

SMITHSONIAN INSTITUTION
National Zoological Park
Conservation & Research Center
1500 Remount Road
Front Royal VA 22630-5972

Author: Fern Duvall II <mawildl@aloha.net> at ~internet
Date: 9/22/98 10:48 AM
Priority: Normal
TO: Karen Rosa at 1PO-PIE
CC: <wildlife@pixi.com> at ~INTERNET
Subject: Comments on Poouli Recovery

Hawaii Forest Bird Recovery Team

22 September 1998

MEMORANDUM

TO: Karen W. Rosa, Executive Secretary HFBRT
and Mr. Robert Smith, Pacific Islands Administrator

FROM: Dr. Fern Duvall II, HFBRT Team Member

SUBJECT: Reply to Po'ouli Draft Environmental Assessment

Please find my comments in this e-mail, it is a reiteration of my earlier communication sent to you for the Recovery Team deliberation. I re-submit them now, with some changes for clarification of my position, since the EA process calls for comments to be submitted for consideration.

This is a response to the Poouli project as a whole, and to the issue of recovery based upon three remaining Poouli in 1998. I am intimately aware of the recent field aspects of this particular project, as the current supervisor for the field project, and having participated in the last stint of intensive
searching for the "HR4 poouli" and other poouli. I use all of this, as well as my professional role in captive propagation of endangered Hawaiian birds 1984 -
1996, in my following recommendations.

Primary Background to Recommendations:
.. Only three Poouli seem to exist (i.e. are locatable even with considerable manpower, search design, under good weather, and expense).
· Only one reproductive unit is present (one male that could be pair partner of one female).
· No reproduction is occurring in wild, and it seems uncertain if the birds are aware of the other's presence or not.
· Territories are hard to delineate, and characterize, it is unknown how degraded they are in terms of poouli usage, therefore they will be very difficult to manipulate or manage specifically for poouli restoration.
· It is unknown if territories could support a breeding unit and active reproduction (since birds have declined to one bird unit per territory in all known territories, perhaps two adult birds cannot survive in a single territory).
· It is unknown if the birds are related (blood-line relations, and perhaps sibling-sibling birds, or mother-daughter/son, or father-daughter/sons, etc.) and therefore the observed inhabiting of separate territories is due to actual (and normal) bird to bird avoidance.
· It is unknown how old the birds are (sexually immature, or reproductively senescent), or if they are/were reproductively abnormal due to past/present disease, or metabolic conditions.
· A single breeding unit will not recover the species without drastic intervention. The probability is very great that three individual birds, even

if unrelated genetically, will NOT successfully be able to generate RECOVERY OF THE SPECIES.

- Field-site remoteness, and the specific Poouli homerange characteristics make manipulations of the birds in in-situ aviary setups unacceptably risky, even if proper avicultural and veterinary staff were available full-time on-site.
- Since it seems clear that Maui Akepa, Maui Nukupuu are also now functionally "more gone" than even the Poouli, by having applied the NO ACTION alternative of management for them, it is imperative that some action be taken for the Poouli.
- The Service has contracted with the Peregrine Fund for long-term expert captive breeding resources, facilities, and personnel, which is capable of handling any species needing captive breeding management.

Recommendation in order and by priority:

1. Determine sexes. BUT... now since it is obvious that feather testing did not give unequivocal answers to birds' sexes, it is clear that this testing should be redone using more accurate blood or feather pulp testing, after the birds are removed to the captive situation.

2. If at least one male and one female exist, prepare for removal (post-breeding season) of all individuals to Maui Bird Conservation Center, without field-aviary holding phase, for ex-situ attempts at pair-formation, intensive breeding and all necessary captive breeding manipulations to rapidly build-up species population.

3. Move some progeny from the three wild caught birds to Hanawi NAR and Keauhou Bird Conservation Center on Hawaii [equal priority for stocking the second captive site, and the wild with progeny].

Background

The Australian Passerine TAG has come a long way in recent years with respect to improving the management and husbandry of native insectivorous and nectivorous species. Historically, an ad hoc approach had been taken to selecting and collecting species from the wild and the manner in which they were collected was also unplanned and largely ineffective.

Current position

These days the TAG process ensures that a rigorous feasibility study is conducted prior to the selection and collection of any passerine species from the wild. The primary objectives of this study are to reach consensus from all key stakeholders on long term strategic planning, determining and allocating needed resources, that is financial, equipment and personnel. Frequently, as it would seem in your case, the local community needs to be reassured that *the captive option is necessary and this requires time and energy. This is* however, an essential component of any recovery programme. Vocal community descent can make or break a recovery programme, especially if there is doubt that key stakeholders are not committed as full sponsors of the programme. The resulting blame and recrimination if things do not go to plan are destructive and place further limitations for future work in this area. It is therefore incumbent of any programme team to develop effective communication processes to encourage a synergy between all stakeholders.

Planning and contingencies

It is essential that all strategic planning incorporate contingencies at each of the critical steps, for example testing field equipment, conducting exercises to monitor staff responses under a range of stressful scenarios. The results can indicate where further training is required and can assist in fine tuning the strategic plans for the programme. Importantly these issues have helped reduce resistance to some of our programmes from the local and Scientific communities and from key stakeholders who were not fully supportive of the process or even the initial programme.

Measuring performance

There are a range of other benefits which thorough documentation and planning can contribute to programmes of this nature such as benchmark criteria. This is a new area for us and we are looking at establishing a set of measurable criteria for reviewing the performance of a programme across a range of categories. The categories such as resource allocation, cost benefit, survivorship of wild founders, collation of reproductive, behavioural and physiological parameters for the species, production of breeding action plans, studbooks and species management plans, determining reproductive outcomes and species tolerance as a result of husbandry intervention, cross fostering etc.

This type of information should provide effective models for future programmes and it can allow programme managers to use the data to adjust the objectives or strategic goals of their programmes. I will keep you informed of our progress in respect of this.

Further comment

I appreciate the dilemma you and the team are facing with respect to an intervention with a fatally endangered species. I would not like to be in your shoes. There are some significant risks with whichever decision is ultimately made. If 3 specimens is the true population estimate the species has a poor likelihood of survivability in the wild or in captivity. I would expect losses with acclimatising mature obligate insectivores of unknown age, which this population could not sustain. Without having all the relevant information excuse the obvious suggestions I offer here. Passerines are characterised by their ability to multi-clutch in a single breeding season, in captivity at Taronga Zoo a pair of Blue-faced Honeyeaters *Entomyzon cyanotis* have been recorded as having 9 clutches in the one season. Are there any appropriate analogues on the mainland, which could be brought in to captivity and intensively, managed? If an analogue could be identified and a programme initiated immediately cross fostering could be a successful technique, which has been widely used with Honeyeaters in Australia. This obviously assumes that the species is reproductively active! Other techniques used successfully here include the removal of nestlings in the early stages of development, a technique with far less risks than encountered with the invasive trapping of adults. With this later technique reproductive maturity in some passerines would seem to be reached earlier with artificially reared birds.

Are there resources available to determine the home range of the remaining pair? If so consider some form of corral or semi captive 'enclosure' to eliminate the factors causing their decline. If this 'enclosed area could be intensively baited and trapped to removed terrestrial vertebrate pests you may improve reproductive opportunities with the pair of Po'ouli. This option would allow you to remove several clutches of eggs for fostering or a lessor number of nestlings for artificial rearing.

The bottom line!!
A cost benefit analysis of you present situation in terms of investment verses likely outcome would not seem to support an intervention involving removal from the wild to captivity. The husbandry gaps with this species are significant and no appropriate analogue is available (is this correct?). How much time do we have? What is the longevity of this species? What is the likely post-reproductive age for this species? Are there any Islands with suitable habitat (without the limiting factors), which could be considered for a translocation of the 3 birds? I am sure you have looked at these issues, but I am not aware of the background.

I would consider the threat of failure from taking the birds into captivity to have the potential to threaten other less critical but equally important programmes locally so the long term implications and risks must affect your judgement.

I would like to also suggest that whatever intervention is initiated that the people charged with undertaking the task document every aspect. Each observation not recorded is an observation lost.

Summary of how many species have been kept and by how many institutions?

Collaborative collecting from the wild is somewhat new for Australia the complexity of our State Laws previously made this a beaurocratic nightmare. Recent regional collection planning initiatives have largely eliminated these barriers and several species have been collected cooperatively including the following 2 examples:

1. Variegated Fairy-wren *Malurus lamberti*

Participating Institution	Collected 1995/96	1996/97	1997/98	Medium-Target	Long term target
Taronga Zoo	3.3.0	2.3.0	3.3.13	4.4.4	5.5.4
Adelaide Zoo			1.1.0	3.3.3	4.4.4
Currumbin Sanctuary	2.2.0	2.2.1	3.3.0	4.4.4	5.5.4
Featherdale Wildlife Park	2.2.0	5.2.0	6.3.0	4.4.4	5.5.4
Western Plains Zoo				2.2.2	3.3.4
Additional spaces sought					3.3.4
TOTAL	7.7.0	9.7.1	13.11.13	17.17.17	25.25.24

As you can see from the chart, initially the population remained stable. The founders collected in mist nets were adult or at least independent immature birds and this contributed to the slow reproductive success in the first breeding season as they adjusted to their captive environment. No losses occurred during the collecting process, in transport or during quarantine/acclimatisation. One founder loss was recorded at Taronga Zoo within one year. We can see that by the second breeding season the birds had settled into captivity with a corresponding increase in reproductive output recorded. Breeding control measures were introduced at Taronga Zoo in the second breeding season. This was by recommendation from the studbook keeper to ensure founder genetic representation was balanced across all institutions to meet medium population targets and long term viability of the species (there are far fewer captive spaces available in this region). Greater husbandry emphasis was placed on these unrepresented birds to encourage breeding. Supplementary wild collection will be essential for the captive population however and has not been included in the above forecast. Wrens are terrestrial insectivores and therefore introducing wild caught adults to captive feeding regimes is relatively simple. We have nocturnal insect traps, which collect a diverse range of flying insects. These are offered throughout the day in addition to inanimate insectivorous diets, which they also consume.

2. Regent Honeyeater *Xanthomyza phrygia*

Participating Institution	Collected 1995	1996/97	1997/98	Target-1999-2000	Target - 2000-2001
Taronga Zoo	5.4.0	5.6.7	11.8.4	7.7.0	7.7.0.
Adelaide Zoo			1.1.2	2.2.0	2.2.0
Currumbin Sanctuary				2.2.0	3.3.0
Melbourne Zoo				2.2.0	3.3.0
Healesville Sanctuary				2.2.0	3.3.0
Western Plains Zoo				2.2.0	3.3.0
TOTAL	5.4.0	5.6.7	12.9.6	17.17.0	21.21.0

This species is not an obligate insectivore however research indicates that *invertebrate consumption is significant. This species has an* ARAZPA conservation category of one, defined as a wild population of less than 1,000 individuals (EST). The initial founders were all collected from the nest and ranged in age from approximately 4-6 days old. One chick had a compromised health status and died after 2 days however, 9 birds were artificially raised successfully. This was a critical period in the National Recovery programme as the captive component was being observed intensively. The recovery team determined that it was not good enough to aim for just a successful rearing process but to use the opportunity for non-invasive research purposes. Everyone supported this decision, for at this stage the primary aim for the captive component was not for wild release to. There was not even basic behavioural data recorded for this species and due to their taxonomic uniqueness no appropriate analogue species was available for assumptions to me made.

Of the 9 original wild founders 8 have reproduced successfully the 9th bird a male was the sibling of the weak bird which died. This resulted in a hopelessly imprinted specimen and we have little hope that it will breed successfully. It would seem critical that at least in some passerine species, nestlings should be reared with some attention to strategies for avoiding human imprinting such as raising 2 or more chicks together, introduction of no talking zones, a 'hands off' policy between essential contact etc. A further collection of 3 adult females was undertaken the following year. We needed to determine our effectiveness with this method of collecting and to establish the suitability of wild caught adults in a captive-breeding programme. The same rigorous planning process was followed as for the nestling collection. The adults were measured and weighed and introduced to the captive diet by placing their bills into artificial nectar. The birds were then released into a small transport cage for the road transport back to the zoo (6hours). The birds settled in well and all 3 birds on arrival were placed into a larger environmentally controlled (light, heat, ventilation etc) The birds were monitored by camera. See attached cage plans. They quickly adapted to feeding from the nectar source and the 3-week quarantine period was uneventful. As predicted the adults were highly-strung and nervous of humans. After 2 breeding seasons no reproductive results have been

recorded although greater emphasis has been placed on these birds for the coming breeding season.

Reproductive record for Regent Honeyeater
for the 1996/97 captive breeding season

Nest construction	All females
Laying season	July – January
Incubation period	14 days
Brooding period	13-15 days
Earliest reproductive age	303 days
Age of female when laid first egg	343
Average age (n=4females)	343 days (range:303-373)
Total number of clutches	8
Total number of eggs	18
Average clutch size	2.25 (range:2-3)
Max. numbers of successful consecutive clutches this season	2
% number of females laying multiple clutches	50% (2 of 4 females)
Inter clutch interval	64 and 97 days
% of fertile eggs	44.44% (8 0f 18 eggs)
% hatchability	87% (7 of 8 eggs)
% fledging success	100%
Hatch sex ratio	5:2
Number of fledglings per egg laid	0.39 (7 of 18)
Number of fledglings per viable female	1.75 (7 of 4)

Brice, (1996)

Good luck. If we can be of any further assistance with this programme please feel free to contact me. We have a public holiday this coming Monday however I can be contacted at home on 02 9550 3228.

Kevin Evans
Manager Birds Taronga Zoo
Australian Passerines TAG Convenor

October 2, 1998

Michael G. Buck
DLNR-DOFAW
1151 Punchbowl St., Rm. 325
Honolulu, HI 96813

Dear Mike:

As a member of the Hawaiian Forest Bird Recovery Team and researcher on Hawaiian forest birds, I have reviewed the "Draft Environmental Assessment for Possible Management Actions to Save the Poouli" and offer the following comments.

1. Alternatives for management action are presented based on the assumption that only three Poouli exist in the wild, but this assumption is not supported by existing information on the Poouli and its habitat. Even under the best of circumstances, it is rarely possible to find all individual birds in a given area during a search. The Poouli is a cryptic, quiet species, making its detection extremely difficult in the dense rainforest in which it lives. After Poouli were banded, it required many hundreds of hours of search effort by biologists familiar with the species and the Hanawi study area to relocate each of the banded birds, even though these searches were within the suspected home ranges of the banded birds. Large tracts of forest within the potential range of the Poouli have not been adequately searched in recent years, and based on the low detectability of the species and the large amount of area remaining to be searched, it is highly probable that total population size is greater than three. I also question whether all of the sightings within each home range are of the same individual, since most of the sightings were made before the birds were banded. In most cases, sightings were considered to be the same bird if they were close to previous locations, but without unique identifying marks, this assumption cannot be defended. Tom Snetsinger, perhaps the most skilled observer ever to study Hawaiian forest birds, believes that he detected two Poouli in one of the home ranges. In short, the conclusion that only three Poouli exist in the wild is not based on strong evidence.
2. Sexing of the three banded birds has been problematic. The sexes identified by University Diagnostics Limited have not been independently verified, and they have not been able to adequately sex the "blind control" feathers of other honeycreepers that were sent to

them. Paul Baker and his crew originally identified the bird in HR-2 as a male based on plumage characteristics when the bird was captured, but UDL has sexed this bird as a female. Based on the inability of other labs to independently confirm UDL's results, the failure of UDL to correctly sex other honeycreepers, and the apparent anomalies of the Poouli compared to other honeycreepers, it is entirely inappropriate to assume that the sexes of the three birds are known. We are engaged in an exercise of risk control, and the level of risk involved in bringing two birds together in an attempt to form a breeding pair, when we cannot be certain of their sexes, is entirely unacceptable.

3. The EA correctly points out that the process of bringing two birds together, either in the field or in a captive breeding facility, involves high risk to the birds. My experience with bringing Palila and Omao into field aviaries is that the fate of individual birds is largely unpredictable. In several cases, birds that were closely watched during the day and seemed to be in fine condition at dusk, were dead the next morning. Of even greater concern to me is the poor track record of bringing Hawaiian honeycreepers into captivity and getting them to breed. Based on Appendix C, of the 101 adult honeycreepers transferred to zoo breeding facilities, only 12 fledglings have been produced. The USFWS and DOFAW have contracted with one of the top experts in the world for raising passerine birds, and she believes based on experiences of zoos throughout the world in raising insectivorous passerines, that the likelihood of bringing two wild Poouli together and getting them to produce young is extremely low.
4. The EA presents six alternatives: the first involves a continuation of current management actions, whereas the other five involve capturing and moving one or more Poouli. I believe that an additional alternative should be added, namely to greatly increase efforts to control potential threats to the Poouli and other species. Because we do not know why populations of the Poouli and other forest bird species have declined, it is necessary to take a conservative approach and use all available tools to reduce potential threats such as introduced predators and feral pigs. Such efforts may benefit not only the Poouli, but also the endangered Nukupuu, the Maui Akepa if it is still extant, the endangered Maui Parrottbill and Akohekohe, and numerous endangered plants in the study area. The current level of effort is greatly constrained by inadequate funding. While the source of additional funding may not be identifiable, from a biological perspective it is clear that field efforts

need to be intensified, and the EA should at least include intensified habitat management as an alternative.

5. I recommend that you delete Appendix D, "Mist netting and banding protocols". The instructions shown were developed by what is now the Kilauea Field Station of USGS/BRD, and did not come from a "protocol conglomerated by the U.S. Fish and Wildlife Service, National Biological Survey..." as indicated. A more detailed protocol is available from BRD, but I do not think this information is important enough to include in the EA.

If indeed only three Poouli exist, the likelihood of extinction is extremely high. However, based on the uncertainty involved in determining the sexes of these birds, the high risk involved in bringing the birds into captivity, and the low probability of the birds producing offspring even if a male and female are brought together and survive in a captive situation, the risks involved in Alternatives 2-5 are unacceptably high. I also believe that a continuation of current management activities, Alternative #1, is unacceptable. We can do more for the Poouli and the other rare elements of the Hanawi ecosystem. I believe that our best hope of saving the Poouli involves intensifying field efforts, and an additional alternative to this effect should be added to the EA.

Sincerely,

Steven G. Fancy, Ph.D.
National Park Service
Natural Resource Information Division
1201 Oak Ridge Dr., Suite 350
Fort Collins, CO 80525

Date: Sat, 17 Oct 1998 02:29:52 +0000
From: Robert Fleischer <Robert.Fleischer@durham.ac.uk>
Reply-To: robert.fleischer@durham.ac.uk
X-Mailer: Mozilla 3.04 (Macintosh; I; PPC)
To: wildlife@pixi.com
Subject: Re: Poouli Sexing Report for Draft EA

[Sharon, please pass this memo on to Mr. Smith and Mr. Buck. Thank you]

To: Robert Smith, Pacific Islands Manager, USFWS
Michael Buck, Administrator, DLNR-DOFAW

From: Rob Fleischer, Head, Molecular Genetics Laboratory, National Zoological Park, Smithsonian Institution.

Concerning: Decision on Po'o-uli.

I feel that the best option for salvaging the Po'o-uli at present is to bring a pair in for an attempt at captive breeding. I have come to this conclusion over the years of my involvement with Hawaiian birds not because I like seeing birds in cages, but because I think this is the only way to keep some of the critically endangered forest bird species from becoming extinct. Some of these species are on the brink of extinction. They are unique and cannot be replaced. Drastic situations call for drastic and sometimes risky measures. Here are some of the reasons why I have come to this conclusion:

1. We have opted for the "study more and maintain in situ" approach for forest birds for most of the past 20 years. Where has that gotten us? Species keep declining and keep going extinct, no matter what our intentions and concerns. The Peregrine Fund facility offers some hope to try ex-situ methods as an alternative, and these seem to be working for some species (e.g., Puahiohi).

2. If there really are only three Po'o-uli left (which may be true based on the intensity of the recent searches), and they are on territories out of the normal "wandering" range of each other, then we obviously need to do something to get them together. A cage will keep them together. As was true for some of the Palila translocations, there is no guarantee that an individual will not head back to his or her original territory immediately following removal to another territory.

3. We probably would have no nene today if we had not begun a captive propagation program 50 years ago. Evidence suggests that they went extinct in the wild about the time of the captive releases in the 60's. The alala is also here largely because of the captive propagation program: contingencies and problems in the field have whittled away at the natural population, in spite of our intensive efforts to manage them.

4. We can control contingencies better (not completely of course, but better) in captive situations. As I am sure you both are aware, it is very difficult to control problems in the field, especially in a rainforest high upon a steep, wet volcano. With perhaps only three birds left the loss of any one could devastate the chances for success.

5. I have heard the argument that a population of three cannot be recovered. The truth is that the smaller the population the greater the likelihood of extinction; but it is not an absolute. Note that a number of successful introduced species to Hawaii and elsewhere were founded by extremely small inoculi (e.g., nine house sparrows, two to four red-whiskered bulbuls, etc.).

6. With the birds in captivity and under control we can achieve, at the very least, two things: (1) we can take appropriate tissues for cell culture (which potentially could be used in the future to clone the species back into existence) and (2) we will be able to turn the indivdiuals into extremely valuable museum specimens should they die.

The latter may seem mercenary, but there are only two specimens in collections, both juveniles, and the new specimens would be extremely valuable for evolutionary research. If these three birds die in the field it is very unlikely that their bodies could be recovered for either use.

I hope my comments and opinions will be of use to you in making this exceedingly difficult decision. If you would like additional feedback please do not hesitate to contact me.

Date: Sat, 17 Oct 1998 01:32:59 +0000
From: Robert Fleischer <Robert.Fleischer@durham.ac.uk>
Reply-To: robert.fleischer@durham.ac.uk
X-Mailer: Mozilla 3.04 (Macintosh; I; PPC)
To: wildlife@pixi.com
CC: bslikas@nzp.si.edu
Subject: Re: Poouli Sexing Report for Draft EA

Hello Sharon, Here are my comments on the sexing:

I have reviewed the materials sent concerning the sexing of Melamprosops phaesoma. First, it needs to be pointed out again that there is no way to be absolutely sure that any results are correct without having control individuals of known sex. We only had the two study skins to use for controls, which had been tentatively identified as male by Andy Engilis. One of these worked for the sexing primers and gave the pattern expected for a male, but this is not satisfying because of the uncertainty about the early sex identification. The second point to make is that the problem with having no good control individuals is one that is problematic for any lab that does the sexing. This was stated most strongly by Ed de Kloet of Avian Biotech International in his letter of 8 June 1998, and this could mislead people into thinking that his method is less reliable than either ours (NZP) or UDL's.

Likewise, in his careful discussion of the problem de Kloet states that perhaps Melamprosops is not closely related to Apapane, for which his test apparently "worked." de Kloet suggests perhaps the apapane is more closely related to "finches" [i.e., estrildids] than is Melamprosops? This is not true however - our DNA and morphological data indicate that Melamprosops is a honeycreeper (and, if not, nothing less related than a cardueline) and thus it and apapane are closer to each other and of roughly equal relationship to estrildids. So if the test works for apapane as it does for estrildids, then there is no reason to believe it will not work for Melamprosops. When we talked with de Kloet it was revealed that the "sequence difference" they found was detected using only one additional restriction enzyme, i.e., it is likely only a single base difference.

Thus Avian Biotech and the MGL-NZP got the same results (null, male, male) while UDL got (female, female, male). I am willing to guess that UDL got the correct sex for the first bird as a female. We all matched on the third bird = male. Thus it is very likely that there is at least one male and one female. This is what is required for the next step, which is to try to get the birds to reproduce somehow. So it is now time to act on this, before one or all of these apparently last three individuals belonging to a monotypic genus get hit by a malaria-carrying mosquito, a mongoose or a cat!

On the modelling of extinction or recovery of the Poouli: how to choose among alternative actions

An analysis and statement by Leonard Freed, Eric VanderWerf, Rebecca Cann, and Sara Burgess

Each of the 6 alternative actions is loaded with demographic assumptions beyond the simple pros and cons listed in the EA. Here we attempt to identify the relevant parameters and to provide estimates based on field studies of endangered Hawaiian birds and on 3 years of attempting to bring iiwi, apapane, and amakihi into captivity.

Critical parameters:

Annual adult survival in the wild
Annual adult survival once established in a facility

Survival of translocation in the wild
Survival of transport to a facility
Survival during establishment in a facility

Probability of breeding in the wild during year following translocation
Probability of breeding in the facility during year following establishment

Probability of breeding in the wild during second year
Probability of breeding in the facility during second year

Basic assumptions of values for critical parameters:

Annual adult survival in the wild: 0.7

This value is conservative relative to values .8-.9 estimated for endangered birds such as Hawaii akepa and Hawaii creeper in upper elevation forests with the same threats as Hanawi.

Annual adult survival once established in a facility: 0.89

This value is based on the average annual survival of iiwi, apapane, and amakihi ONCE ESTABLISHED in captivity. The calculations are shown on the last page. It is important to consider that while the net effects of storms, predators, etc can be eliminated

in the facility, there is the possibility of disease developing within a captive breeding facility, as has recently occurred in Hawaii..

Survival of translocation in the wild: 1.0

We assume that simply capturing a Po-ouli and releasing it within a few hours will not harm it. Also, it does not have to run a gauntlet through the home ranges of other indviduals. The bird will be introduced into a section of habitat that is known to support another Poouli. The assumption of perfect survival at this stage is supported by the perfect record of capture and acclimation for iiwi, apapane, and amakihi for captivity.

We also assume that the Po-ouli will be released in the presence of the other sex, and that by proper conditioning through playbacks before release, the two will be curious about each other. If they are not curious about each other in nature, it is difficult to imagine them being curious about each other in captivity

Survival of transport to a facility: 1.0

This assumption is based on the perfect survival of birds at this stage that were taken to zoos for captivity. Based on testimony of aviculturalists, there is some mortality expected with taking birds out of nature and into a captive facility, so our assumption, while based on data, is optimistic.

Survival during initial establishment in a facility: 0.73

As shown in the attached sheet of calculations, birds within their first year of captivity survived at a lower rate than did the survivors during their second year of captivity (average .73 vs .89). The mortality during establishment was higher in 1988 than in 1991 or 1992. While this could be interpreted as practice makes perfect, there is no margin of error for practice with Po-ouli, where loss of the singleton sex equals extinction.

Breeding successfully in nature during the first year after translocation: 0.3

This probability is intentionally pessimistic and reflects both that the pair attempts to breed and then breeds successfully. The probability of breeding successfully is consistent with data reported on endangered forest birds during poor years. However, there is also the possibility that if a nest is found, eggs could be taken from the first clutch.

Probability of breeding in captivity during the first year after establishment: 0.0

Based on testimony given for other insectivorous birds, and our limited understanding of the biology of Po-ouli, there is no expectation that pairs that are

established in captivity will attempt to breed the first year. There is also no expectation of getting eggs.

Probability of breeding in nature during the second year after translocation: 0.4

This assumes that a pair with experience is more likely to breed and breed successfully the second time around. It is still low because nests can fail due to weather or a predator or disease, but eggs could still be taken.

Probability of breeding in captivity during the second year after establishment: 0.0

Based on testimony given for other insectivorous birds, we would not expect attempts at breeding for 3-4 years after establishment. Again, eggs could not be taken.

What can happen in nature for one year (compreshensive set of outcomes):

Case	Probability of case
All three birds survive:	.7 x.7 x..7 = .343
Female 1 + male survive:	.7 x .7 x .3 = .147
Female 2 + male survive:	.7 x .7 x .3 = .147
Female 1 + Female 2 survive:	.7 x .7 x .3 = .147
Female 1 survives:	.7 x .3 x .3 = .063
Female 2 survives:	.7 x .3 x .3 = .063
Male survives:	.7 x .3 x .3 = .063
No bird survives:	.3 x .3 x .3 = .027

Under this set of assumptions, the first three cases do not result in extinction. There is still the potential for a mature male and female to mate. The probability of no extinction during the first year is .637, the total probability of the first three cases. In addition, with the assumptions surrounding translocation, there is a 1 in 3 expectation that a successful breeding attempt will occur during this first year.

Now, consider what can happen in captivity for the first year. To do this, we need to consider the net survival resulting from transport, establishment, and survival in captivity for a year. The net survival is 1.0 x .73 x .89= .65 (survival from transport times survival during establishment times survival in captivity.

Note that .65 for captivity is less than .7 for survival in nature. This makes the two alternatives about equal for the adults. But also note that while there is expectation of reproduction in nature during the first year, there is no expectation that there will be reproduction in captivity during the first year. In fact, we would not even expect reproduction in captivity during the second year, whereas we would increase our expectation of reproduction in nature during the second year.

For captivity models, we would have to assume that the single male will survive the transport and establishment and continue to survive for at least three years. The probability of this happening is .51 (.65 x .89 x 89). For the nature model, we would have to assume that the single male has to survive at least one year which is .7 or perhaps two years (.49 = .7 x .7). A difference between .51 (captivity) and .7 (nature) before expectation of breeding would favor leaving the birds in nature. A difference between .51 for one attempt of breeding and .49 for two attempts of breeding would again favor leaving the birds in nature, since the future of the Po-ouli depends on successful reproduction.

It is also pertinent to consider the age of the 3 remaining Po-ouli. They are adults of unknown age and it is possible that they are near the end of their reproductive lifespan. Having to wait 2,3, or 4 years before reproduction is attempted in captivity might be too long.

We have set up simple models so that parameters can be changed if justified. Before changing any of these parameters, a scientific basis must be presented, such as additional data from previous captive breeding attempts. We note here that alternative 2, getting the sexes together in the same home range, while intensively managing for predators, competitors (e.g Leiothrix and Japanese Bush Warblers), and mosquitos, has the best chance of promoting reproduction over the short term years before a captive breeding attempt. We also imagine there being a survival cost of establishment in a field aviary since we know nothing of the daily movements of the Po-ouli or how it samples its environment.

ALTERNATIVE 2 is the only alternative that can be supported scientifically. Alternative 1 is guaranteed to fail because the remaining birds are not aware of the other's existence, and the results of the previous 3 years provide no basis that this situation will change. Alternatives 3-6 run into problems of mortality from establishment in captivity and huge delays in breeding.

Calculation of probabilities of survival of birds taken into captivity using data provided in the Environmental Assessment

METHODS

The estimates below are based on data from all species and years combined to increase the sample sizes. Values for some parameters have increased with each attempt, possibly because techniques have been improved by knowledge gained from past experience, but since this would be the first attempt with Po'ouli, the values from the earlier attempts might be more realistic.

There were a few inconsistencies in the data, the numbers don't always add up, e.g., number of surviving Iiwi in 1991 possibly should be 6, not 7, based on number transferred and mortality. These would make only small changes in the overall estimates of survival.

Survival estimates for 1 month, 6 month, and 1 year post-transfer are cumulative, i.e., the mortality 1 year after transfer includes mortality after 6 months and after only 1 month.

Annual survival for each cohort after establishment in captivity was found by taking the *n*th root of survival over *n* years. For example, in the 10 years since 1988, 13 of 15 birds taken into captivity have died, resulting in a cumulative survival rate of 2/15 = 0.13, and the 10th root of 0.13 = 0.82. Annual survival was calculated by simply taking the average of the 3 cohorts.

Probability of mortality during:	1988	1991	1992	total
capture	0/52 = 0	0/140 = 0	3/212=0.014	3/404=0.007
acclimation	0/30=0	0/52=0	1/61=0.016	1/143=0.007
transfer	0/30=0	0/52=0	0/28=0	0/110=0
within 1 month post transfer	12/30=0.40	4/52=0.08	3/28=0.11	19/110=0.17
within 6 months post transfer	15/30=0.50	8/52=0.15	4/28=0.14	27/110=0.25
mortality in first year of captivity	15/30=0.50	9/52=0.17	6/28=0.21	30/110=0.27
survival during first year	15/30=0.50	43/52=0.83	22/28=0.79	80/110=0.73
mortality after 1 year-present	13/15=0.87	25/43=0.58	3/22=0.14	N.A.
survival after 1 year-present	2/15=0.13	18/43=0.42	19/22=0.86	N.A.
annual survival to present	0.82	0.88	0.97	mean = 0.89

CONCLUSIONS

1. There was very little mortality during capture and acclimation, suggesting catching and holding birds for a short time in the field would incur little risk.

2. There was no mortality during transfer to zoos based on the data provided. Aviculturalists at the meeting seemed to think there often is some mortality, so this value might change if data from other attempts were included.

3. Most mortality occurred in the first year after birds were transferred to captivity. During the first attempt in 1988, 50% of birds died in the first year. Similar losses during a first attempt with Po'ouli probably should be considered unacceptable.

4. Annual survival in captivity after 1 year is quite high (89%), but this value applies only to birds that survive the first year, which apparently can be a relatively small proportion of those that start.

October 11, 1998

Robert Smith
Pacific Islands Manager
USFWS-Pacific Islands Ecoregion
P.O. Box 50088
Honolulu, HI 96850

Subject: Po`ouli Management Actions

Dear Robert,

This comes from my heart and from years of association with the Northeast slopes of Haleakala. Whatever you chose to do for the three known remaining Po`ouli, please do not lose sight of or funding for habitat management and a thorough exploration of limiting factors on the bird and other species slipping from our grasp. The present crew needs increased support to elevate the habitat management that they have been doing.

The thought of the loss of such a unique entity as the Po`ouli is magnified by the list of other critters, both feathered and otherwise, lining up behind it. Is it the sum of one or the sum of many? I have always believed that there were never anywhere near the numbers of Po`ouli even in 1973 when we saw the first individuals. The "precipitous decline" which belatedly triggered all this action in reality happened long before the discovery.

If there is an organization that can work with adult insectivores and it does not drain funding away from habitat management, if that is the chosen avenue, so be it. But I will always advocate, first and foremost, HABITAT MANAGEMENT, not to mention the message of not letting this happen to any of the remaining species.

As I said in Hana, past decision-makers were loath to make a move, perhaps believing that the area was remote and seemingly protected by this remoteness. Kipahulu proved that way of thinking to be less than a service to the ecosystem, we have repeated the same mistake.

I trust you to do the right thing. It must be very difficult for you. I hope you can convey the anguish of this decision and its many ramifications to the decision makers at the regional and national levels. I hope that the present field crew is allowed to voice their individual opinions and their own professional views on what should happen. I hope that the Natural Area Reserve Program can take a more active role in whatever actions will ensue. I hope that some day the people who have the field knowledge/reality may be heard early enough to avoid such exercises in the future. Then we will actually have a chance to do recovery, not just write plans and not have to prepare ourselves to say good bye. Sharon Reilly has a great attitude that we should prepare ourselves to succeed not to fail. Her support and involvement, along with the rest of the Maui Forest Bird team does give me hope.

Twenty five years ago, on July 22, 1973 at 4 in the afternoon, I saw three little brown birds with dark faces sitting on one branch together. The Endangered Species Act came into being the same year. Twenty five years later, there are three known, widely spaced individuals difficult to see even in their known ranges and at the times most likely seen. That makes extra searches an even more dicey prospect, but one which cannot entirely be ignored.

I hope I am not writing a letter of condolence or not attending a wake. I choose to look to the health of the habitat, its functions and the symbol that this little bird has become to many.

Thank you for your concern, support, and your presence in Hana. I wish you and Mike well in your decision-making. I guess I have a nested, rather than vested interest in all of this.

Aloha nui,

Betsy Harrison Gagné
Naturalist at Large
47-682 Hui Kelu Street No. 8
Kaneohe, HI 96822

Date October 7, 1998
RE: Environmental Assesment / Po'ouli
TO: Michell G. Buck
From: Aaron Gallaser

1 of 2

Sharon

Dear Michell G. Buck I am writing to you regarding the Po'ouli and the Environmental Assesment to save the species. I believe that Alternative 3 should be used. I belive that this should be done because if nothing is attempted Common sense says that this species will go Extinct. With all the work that has gone into finding other Po'ouli (Compared to other projects) it seems likely that there aren't any secret pockets were a Po'ouli is flourishing. With each alternative reflecting greater degrees of intervention I belive Alternative 3 is the middle ground. The birds can be re-released quickly if they stop eating then tracked. Alternative 6 is to risky, and alternative 1,2 seems likely the birds will Not establish a breeding pair due to the birds natural history ie cryptic, huge home ranges, quiet - although as

far as I know these major positive factors. I belive each situation is unique and it seems that the Peregrine Fund is not adressing the issue directly but rather stating there mission and methods.

Although I can see that the political aspects of this issue is important to consider. Is it good to intervene only to see the last species? And does that give the right to other people in the future to act with good intentions but in an irresponsible manner? That is why I belive in alternative 3. Something can be done and at the same time the birds can be re-released if they stop eating and then tracked.

Thank you for reading my letter

Aaron Zellaphy
Former Volunteer on the
Paouli Project. Apr. 98-Feb. 98

SIERRA CLUB, HAWAI'I CHAPTER

P.O. Box 2577,
Honolulu, Hawai'i 96803
(808) 538-6616

Robert Smith, Pacific Islands Manager
U.S. Fish & Wildlife Service
P.O. Box 50088
Honolulu, HI 96850

Michael Buck, Administrator
DLNR-DOFAW
1151 Punchbowl St. #325
Honolulu, HI 96813

October 7, 1998

COMMENTS ON DRAFT EA MANAGEMENT ACTIONS TO SAVE THE PO'OULI

Dear Sirs,

The Sierra Club, Hawai'i Chapter would like to go on record in support of active preservation of the Po'ouli in its native habitat and applaud certain statements made recently. It was reported in the Sept. 28, 1998 Honolulu Advertiser's Jan TenBruggencate column that Mr. Buck feels, " The public is really coming together for protecting the (Po'ouli's) ecosystem." We heartily agree and in this instance support only those particular alternatives in the draft environmental assessment.

1) Sierra Club believes that far too much state and federal money have gone to captive breeding efforts. These moneys have been spent at the expense of other programs that protect and manage habitat. The reality is that every dollar spent on captive breeding is a dollar that cannot be spent on habitat preservation.

We concur with Alan Liberman and Cyndi Kuehler of the Peregrine Fund in their statement (also in the TenBruggencate column) saying, "The best chance for the po'ouli survival is in its native habitat." Liberman and Kuehler further recommended aggressively managing the habitat and expanding it.

This bird was discovered in the 1970's - What was its numbers then and why this proposed captive breeding action at such a late stage? We need to shift the focus of government expenditures from last ditch efforts to save single species to habitat restoration and management. By protecting habitat, a variety of species can be protected -- many before they become endangered.

2) We specifically object to captive breeding for the Po`ouli (alternatives 3-6). To ensure that no more birds in Hawai'i become extinct, we advocate spending more resources on aggressive habitat management. Captive breeding's track record is a mixed bag -- hardly an unqualified success. With so few po`ouli remaining (perhaps as few as three), it is unlikely that there is sufficient genetic diversity to guarantee success.

We support a continued vigorous effort to reduce the threat posed by alien species including predators. Thank you for the opportunity to comment.

Sincerely,

Nelson Ho

Nelson Ho
Conservation Chair, Hawai'i Chapter

Sham
cafdy

HC&S

G. Stephen Holaday
Plantation General Manager, HC&S
Sr. Vice President, A&B Hawaii, Inc.

October 9, 1998

RECEIVED
'98 OCT 13 P2:39
DIVISION OF FORESTRY & WILDLIFE
STATE OF HAWAII

Mr. Michael G. Buck
Administrator
DLNR – DOFAW
1151 Punchbowl St., Rm. 325
Honolulu, HI 96813

RE: *Draft Environmental Assessment (EA) for Possible Management Actions to Save the Po'ouli*

Dear Mr. Buck:

East Maui Irrigation, Co. (EMI) would like to express its concern regarding one of the several alternatives developed to help protect the Po'ouli.

We are concerned with the use of an aerial dispersal of diphacinone pellets as a rodenticide to control the predators (rats, mongoose, cats, etc.) of the Po'ouli in the Hanawi Natural Area Reserve.

Our concern is the potential adverse impact the dispersal of the 20,000 pounds of rodenticide may have on the water collected in the 2,000-acre section of the Hanawi Natural Area Reserve. EMI's Koolau ditch is located makai of the proposed 2,000-acre parcel in Nahiku. The water collected in this area is used by HC&S, as agricultural irrigation water, is used by the Maui Department of Water Supply, as water for domestic use from the Kamaole Weir, and is used by residents in Nahiku who divert stream water for their domestic use.

We have reviewed available information, and are not convinced that the use of rodenticide will not have an adverse affect on this drinking water source. As such, we would like to see the USFW and DLNR-DOWFAW do additional research relating to our concern over water safety.

HAWAIIAN COMMERCIAL & SUGAR COMPANY A DIVISION OF A&B HAWAII, INC.
P.O. BOX 266 PUUNENE, MAUI, HAWAII 96784 TEL 808-877-0081 FAX 808-871-2149

Thank you for this opportunity to express our concern, and we will anxiously await your response to this matter.

Sincerely,

G. S. Holaday
Plantation General Manager

cc: G. Hew
J. Hoxie
M. J. Ching

FYI

8 October 1998

Michael Buck
Division of Forestry & Wildlife
Dept. of Land and Natural Resources
1115 Punchbowl Street
Honolulu
HAWAII
96813

Dear Michael

I am writing to you in the hope that I may be able to assist you with the vexing problem of what should be done to recover the po'ouli from the brink of extinction. This is not a letter about adding options to those already contained within the draft EA or a letter about which option of those under consideration is best. Instead I hope to present to you an aid to the decision making process which I have found useful in my native country, New Zealand. I have been made aware of the plight of the po'ouli from a number of sources and had been asked to comment on an earlier draft of the EA which appeared in New Zealand some months ago.

Firstly I should establish my credentials so you can make up your own mind on whether I am "yet another impassioned crank" or some one who has been in the same position of "knife edge" decision making for endangered species. My current position is within the Department of Conservation as the Manager of the National Kakapo Team. The Department is the Government agency responsible, among many conservation activities, for endangered species management. The kakapo is one of the highest profile NZ endangered species not only because of its low number (56) but for it's unique attributes not found in any other parrot species. The kakapo is a large (4kg), flightless, nocturnal, lek breeding parrot that only reproduces every 3-5 years and, up until very recently, has continued to decline despite "best conservation efforts". This poor performance on recovery can, in part, be blamed on a lack of common focus of the people involved. Often issues under discussion have become emotive and parties would leave meetings with issues unresolved or, even worse, taking only what they wanted from the recovery group meeting and ignoring what did not suit. As a consequence the species suffered and the programme members became despondent and frustrated by the lack of progress. Three years ago a structural change to the Department saw the formation of a task force who's sole responsibility was kakapo recovery and I was appointed the manager . Unfortunately restructuring did not solve the problem of consistent decision making amongst "emotionally charged" people and complex conservation issues.

My main concern, as a manager in a decision making role, was to have clear, consistent decisions which could withstand audit. In reviewing the literature, and looking at field programmes, it was evident that formal decision making processes are not well understood by conservation managers and scientists, and have been used on very few occasions.

The process which I have adopted is common place within business, taught in the first year of our university business school curriculum. The tool is called a "decision tree" and assigns values to specified outcomes and probabilities to events happening. It is kind of like a PVA in it's operation but with the bonus of highlighting the best option out of the many that you have.

As stated above I began this search looking for a process for audit reasons but I have rapidly learnt that the decision tree process has many other useful side effects which help people like us with, not only making good decisions, but getting the various stake holders to accept it as the best decision. This overcomes many of the problems associated with getting a decision enacted particularly when factions have already formed or there is a diverse range of opinion. To gain maximum benefit from the decision tree process it is imperative that the stake holders (and any others which are likely to influence the enactment of the decision) be included in the tree drawing exercise. After all the probabilities of events happening will come from the empirical data and anecdotal resources these people supply. It has been said that the exercise of producing the tree is just as valuable as the decision reached as it draws the participants together to the common goal. Producing the tree is a relatively straight forward exercise to undertake once you get your head around the concept. I have found that people from diverse backgrounds quickly grasp the idea and participte well. It converts empirical data and anecdotal information into probabilities/odds/chances of things happening and comfortably accommodates best guess information because it is declared as such and these probabilities can be adjusted to see how wrong a "best guess" has to be before it becomes critical. It accommodates the scientists need of "numbers to crunch" yet is easily understood by the field guy who bets on the odd ball game or horse race.

I would like to offer you three things which you are welcome to accept or decline as you wish.

1. An explanation of the decision tree process by some documented "kakapo" examples.

2. A chat on the phone to clarify the examples and expand your understanding of the process.

3. Assistance with facilitating the decision tree process for po'ouli.

What ever you decide to do, in regard to my offer of assistance, I wish you luck in your unenviable role as decision maker for this species.

Best wishes and kind regards

Paul

Paul Jansen
fellow endangered species decision maker

cc. Robert Smith
US Fish and Wildlife Service
PO Box 50088
Honolulu
HAWAII
96850

Anne Badgley
US Fish and Wildlife Service
911 11th Avenue, NE
PORTLAND OR
97232-4181

More on Decision Trees

Paul Jansen

Response To Po'ouli Quandary

general observations

The recovery plan for po'ouli etc. contains a comprehensive list of options which will meet, to the best of the authors current knowledge and experience, any possible contingency. I suggest that your current problem is deciding among all these options which is "the best" given the current set of circumstances confronting you. This problem is further exacerbated by a relatively large group from diverse political, ideological, and professional experiences which compound/confound the decision making process. These varying backgounds lead to a tug of war between group members, each devout in the conclusions they have drawn from their experience. I believe one thing is agreed on by all ... quick action is required to save the po'ouli.

suggested solution

From previous experience from within the Kakapo Recovery Programme (a high public profile recovery effort to save the NZ endemic flightless night parrot) I have found the following solution to work well where some or all of the following apply:

1. Intense pressure from external scrutiny
2. Highly emotive issue
3. Lack of statistical certainty for any course of action
4. Lack of a common focus
5. Disparity of knowledge between group members
6. Friction between Managers (doers) and Researchers (thinkers)
7. Political or ideological differences between group members.

decision trees

The decision tree methodology is not new. It was developed during the second world war to place ordinance at the most likely point of assault by the enemy from what was quite often very small amounts of intelligence gathered hastily. It's a decision making formula which uses probabilities of events occurring in series and compares these to other possibilities. The elegance of this method comes from your ability to do sensitivity analysis on the individual probabilities and figure out how wrong your estimate of an event occurring has to be before it would change the decision.

This type of approach is a standard tool in business management all over the world but has only been used in conservation management occasionally. I have only seen one paper published which used a decision tree to solve a species conservation problem (some Javan or white lipped rhino thing).

It is generally acknowledged that the decision making process(other than coming up with the appropriate decision) is a tool for people to declare what they think and feel included. The process of running the tree is as important as the decision!

The tree also solves the enumerated points above by collating good scientific evidence with "best guess" type info, where solid stuff is lacking, within a robust frame work which can be reviewed and openly debated. I strongly suggest you undertake this exercise which should be able to be completed by the group within a day. It is imperative that the group are all at the same location to undertake this. Doing it by remote control dilutes the human aspect of the process which I believe to be the most important.

I've include a simple example of one of the kakapo decision trees for your information.

Flossie Decision: A template for decision-making about kakapo

We recently assessed four options for Flossie's future management: (Flossie is a female kakapo)

1. Doing nothing.
2. Attempting to move Flossie on Little Barrier Island.
3. Moving her to Maud.
4. Moving her to Codfish.

Moving her to Codfish was not a serious possibility because all birds will have to be moved off Codfish in the next couple of years to enable the rat eradication to go ahead.

The following is a decision tree assessemnt of this decision

For each possible management option for Flossie we estimated the probability of all important possible alternative events and the value to the kakapo recovery programme of each possible outcome.

All though we identified 16 possible chains of events (see the three appended decision trees) that might arise from our managment of Flossie, there are only 4 significant different outcomes:

1. Flossie dies.

2. Flossie does not die but does not breed or breeds unsuccessfully and is unavailable experimental management.

3. Flossie does not die but does not breed or breeds unsuccessfully and is available for experimental management.

4. Flossie breeds successfully.

For the purposes of this analysis each of these outcomes has to have a utility value attached to it. I decided on a utility value which is essentially a proportion of a successfully breeding bird. On this scale a breeding bird is worth 1, a dead bird or one that does not breed successfully and is unavailable for experimental management is worth nothing (a utility value

of 0). I arbitrarily decided that a bird that does not breed but can be experimentally manipulated is worth a tenth of a successfully breeding bird (0.1).

The probabilities used in the decision tree were estimated as follows:

Survival
Kakapo survival is at present about 98% per annum. I assumed the probability of Flossie surviving if she was not moved or manipulated would be 98%. I assumed that moving Flossie once would lower her probability of survival to 92.5%, and that moving her twice would further lower her probability of survival to 90%. I also assumed that the arrival of stoats (a predator) on Maud Island would lower her probability of survival to 90%.

Probability of breeding
Flossie has been on Little Barrier for 14 years without breeding. Our best (and minimum) estimate of the probability of her breeding is 0. It is also possible that the probability of her breeding is higher than 0 though it is probably less than 1 in 14. Erring on the optimistic side I have used a probability of breeding of half way between 0 and 1 in 14 *i.e.*, 3%.

I have arbitrarily assumed that on Little Barrier or Maud Island in the presence of supplementary food that Flossie's probability of breeding will rise to 15%.

Probability of breeding successfully
I have assumed that on Maud Island or on Little Barrier after she has been successfully moved Flossie has a 50:50 chance of successfully breeding if she attempts to do so. This assumes that her nests can be totally protected from kiore on Little Barrier.

I have assumed that in her present situation on Little Barrier the probability of her breeding successfully is 0. She cannot be supplementary fed in her present home range, and it will be very difficult to protect her nest from kiore.

I have assumed that the presence of stoats on Maud will lower her probability of breeding successfully to 25%.

Staying where she's put on Little Barrier
I have assumed that there is a 90% probability that Flossie will return to her old home range if we attempt to move her on Little Barrier.

Staying on Maud
I have assumed that there is a 50:50 chance that females will be allowed to stay on Maud Island.

Use as an experimental animal
I have assumed that Flossie will not be able to be used as an experimental animal if she stays where she is or if she has to be returned from Maud to Little Barrier.

I have assumed that if Flossie can be successfully moved on Little Barrier Island that the chance of her being used as an experimental animal rises to 30%.

I have assumed that if Flossie is moved to Maud and is able to stay there there is a 90% chance that she will be able to used as an experimental animal.

Scores

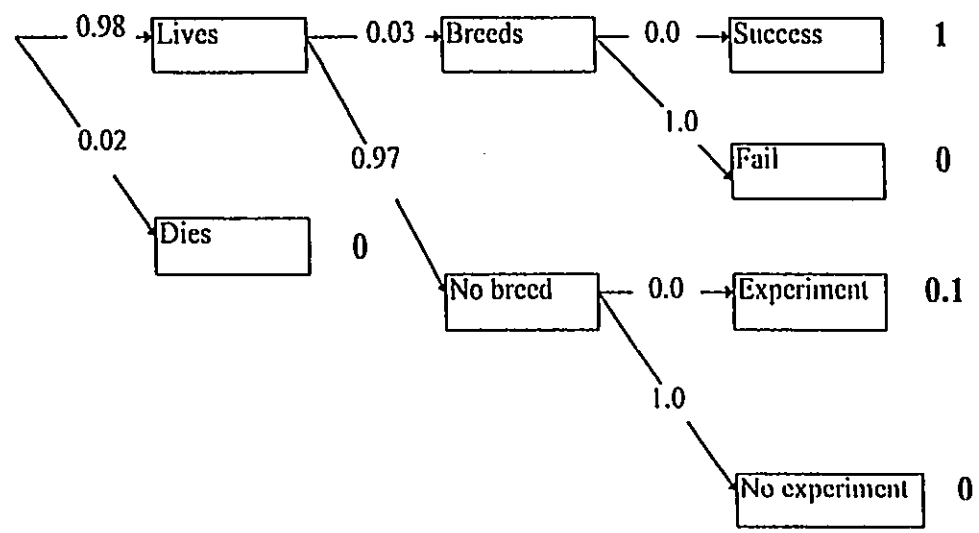
Scores are calculated by multiplying together the probabilities and the utility value of each possible chain of events and summing the scores of all chains of events.

The scores and decision trees are presented in the 3 appended figures.

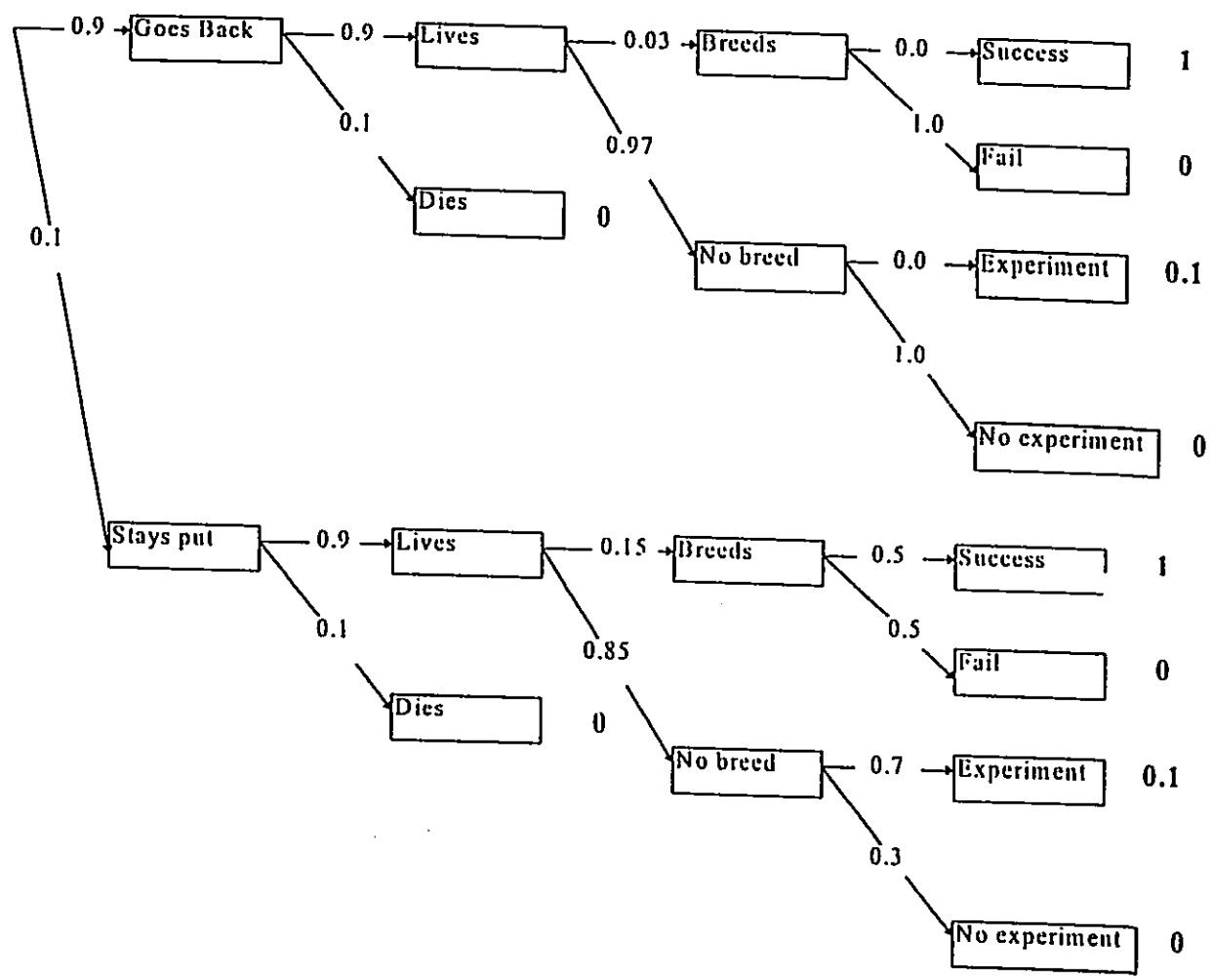
Moving Flossie to Maud is the clear winner.

Leave Flossie on Little Barrier and do nothing

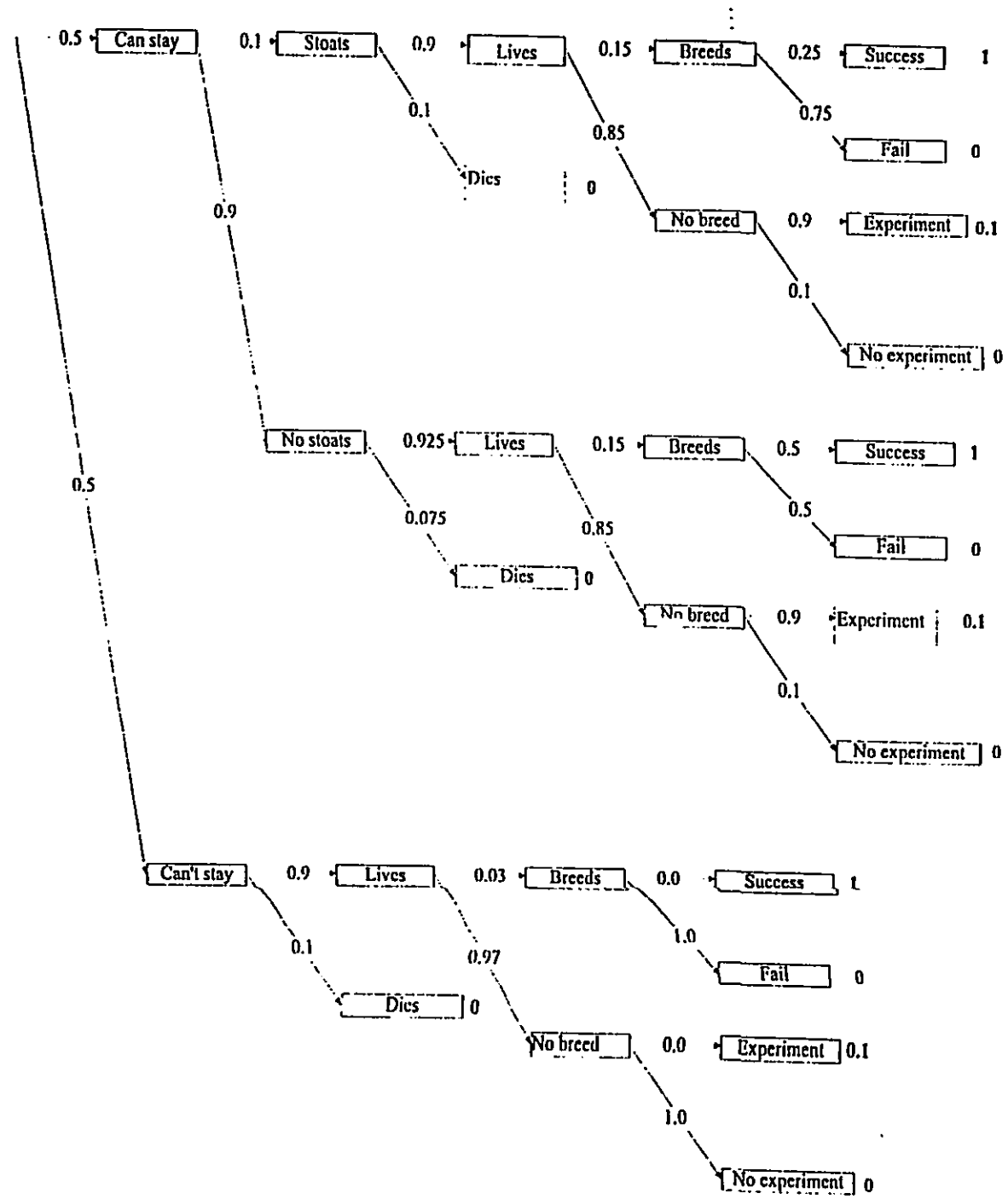
Score = 0



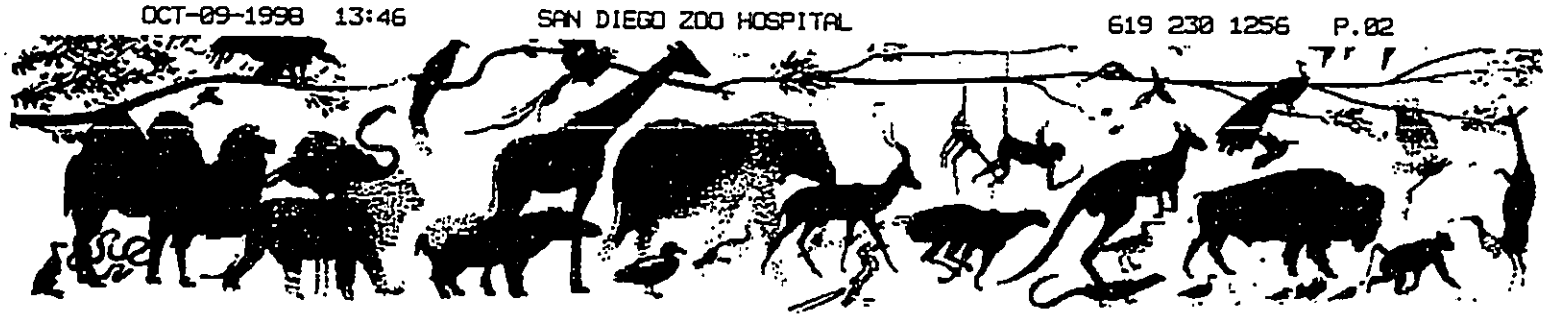
Move Flossie on Little Barrier
Score = 0.012



Move Flossie to Maud
Score = 0.068192



As it turns out. Flossie bred this year and produced 3 fertile eggs all of which hatched and have just fledged. Gives the old confidence a bit of a boost. EH??



The Zoological Society of San Diego

October 9, 1998

Michael G. Buck
Administrator
State of Hawaii
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street
Honolulu, Hawaii 96813
FAX: 808-587-0160

Re: Comments and Recommendations regarding Draft Environmental Assessment (EA) for Possible Management Actions to Save the Po'ouli.

Dear Mr. Buck:

Thank you for the opportunity to comment on this Draft Environmental Assessment. I have attached my letter from April 1998 which also addresses some of the same issues. I have three recommendations that I ask you to consider being added to or clarified in the EA.

1. **Include the sex-determination results in the body of the document, and do not use these conflicting results to make any pairing decisions until an independent panel of geneticists specializing in avian molecular sex-determination techniques can make recommendations for producing precise and accurate results.**

   A "best guess" is simply not good enough here. When only three birds are available, critical errors could occur if birds are inappropriately paired, either in a captive setting (Alternatives 3,4,5,6) or as a translocation (Alternative 2).

   After reading Appendix A: Summary of Po'ouli Sexing Results, it is apparent to me that the results are equivocal. The actual results and the fact that they are conflicting should be stated in the body of the EA. Unfortunately, without known-sex controls, similar reference species, or adequate materials it may not be possible to determine the genetic sex of the three known birds. This is something that independent experts should evaluate.

2. **Estimate more precisely and accurately the risk of acclimating wild-caught adult insectivorous passerines to captivity in the sections "Comparative Evaluation of Alternatives" (2.4) and "Summary of the Effects of the Alternatives" (4.5). Perform a mathematical risk analysis to show the likelihood of a successful outcome (i.e. the production of offspring and preservation of the species).**

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Having worked with a variety of insectivorous passerines in a captive environment, it is intuitive to me that there will be mortalities and failure to reproduce in any such group. The question is how large and significant will those losses be? Numbers are difficult to come by to preform accurate risk assessments in situations such as this. However, if one looks simply at the data presented in this EA in Appendix C: Hawaii Forest Bird Surrogate Project Summary, some approximations can be made. For example, of the 65 amakihi captured since 1988, 19 currently survive (30% survival) and 4 (2 pair) of those have produced surviving chicks (6.2% of total collected). This is a successful result, but only because of the large number initially captured. It does not take complex statistical analysis for one to see that, if the survival and production rates are similar, the probability that a pair of po'ouli will survive and produce young in captivity is very low indeed. Furthermore, one could reasonably argue that the survivability and production of po'ouli in captivity, a delicate species with unknown avicultural needs, would be significantly lower than for the amakihi.

Although not my area of training, I know that risk analysis technology is available for assessing these sorts of situations. I highly recommend that the technology be used here. Then, if my simple numerical analysis is determined to be correct and makes sense, alternatives that incorporates captive propagation of the only three known remaining po'ouli would be a reckless course of action, not an heroic last-ditch attempt to save a species. In any case, the data and objective analysis should be provided in the EA.

3. **Include a specific alternative that would provide emergency measures to substantially reduce mortality factors for po'ouli and other endemic forest birds in known <u>and potential</u> po'oli habitat.**

This alternative would be the equivalent of a "last-ditch" approach to save the species, but would emphasize habitat heroics (widely beneficial with possible success) rather than captive management heroics (narrowly beneficial with unlikely success). I rely on the expertise of the field biologists to determine the nature of emergency measures to control mortality factors. I certainly endorse the approach in section 2.2 (Habitat Mangement and Expanded Searches for Po'ouli: Features Common to all Alternatives), but would hope that it could be expanded to be more aggressive and innovative, and cut through as much bureaucratic red-tape as possible.

I understand the need to do <u>something</u> to preserve this species. Unfortunately, with the recent precipitous decline in the po'ouli population to three known birds, precious little can be done now. This situation is <u>not</u> comparable to other successful species salvage operations where captive propagation has been successful. For example, the California condor program, in which our institution has been a proud participant, was successful for many reasons, but importantly because of the larger size of the founder population and the more hardy nature of the species. I think that we all realize that the po'ouli situation is quite different.

And finally, there are few people or organizations that exist with the experience and talent to even attempt to pull off the captive propagation of wild-caught po'ouli. The Peregrine Fund Hawaii, for example, has that ability if anyone does. They are controlled risk-takers by necessity and do not shirk from a challenge. If they are telling us that captive propagation is an unwise risk, I would take that counsel most seriously. An alternative that requires aggressive emergency habitat management, however, could be a positive, heroic course of action that would benefit endemics in the entire Hanawi Natural Area Reserve. I think that environmental historians would look very kindly on this approach.

Sincerely,

Donald L. Janssen, D.V.M., Dipl. A.C.Z.M.
Director, Veterinary Services
619-557-3933 (office)
619-230-1256 (fax)

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

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96850

USDA

Our People...Our Islands...In Harmony

September 30, 1998

Mr. Michael G. Buck, Administrator
Department of Land and Natural Resources
Division of Forestry and Wildlife
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Buck:

Subject: Draft Environmental Assessment (DEA) - Possible Management Actions to Save the Po'ouli, Maui, Hawaii

We have reviewed the above mentioned document and have no comments to offer at this time.

Thank you for the opportunity to review this document.

Sincerely,

KENNETH M. KANESHIRO
State Conservationist

cc:
Mr. Robert P. Smith, Pacific Islands Manager, USFWS - Pacific Islands Ecoregion, P.O. Box 50088, Honolulu, Hawaii 96850

To: Robert Smith
United States Department of Interior
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Room 3-122
Honolulu, Hawaii 96850

Michael Buck
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

October 9, 1998

From: James R. Kowalsky
Research Associate (Field Supervisor)
Maui Forest Bird Recovery Project
2465 Olinda Road
Makawao, HI 96768
(808) 573-0280
dureck@mauigateway.com

RE: Comments on the Draft Environmental Assessment for Possible Management Actions to Save the Po'ouli.

NOTE: The opinions expressed in this letter are my own and not necessarily those of people and/or organizations involved with current efforts to save the Po'ouli.

Faced with the current situation the Po'ouli population exist, any decision could very well lead to the extinction of the Po'ouli as well as no decision at all. While the debate on what to do continues to be charged with emotion, seeking to find out why the Po'ouli declined is too little too late. Who would have ever known we would be faced with a situation where only three remnant birds are all that is left of the Po'ouli in the Hanawi Natural Area Reserve? When I joined the Maui Forest Bird Recovery Project, I came fully prepared for the worst and hoping for the best. Our goal should be to get as much reproductive output from the remaining Po'ouli. The draft environmental EA lays out clearly the options we have. I still believe that the Po'ouli can be saved. Now is the time to start increasing the Po'ouli population with the three remaining birds we have, look in areas where we can possibly find more, and develop methods to safeguard the environment they live in. Think of the solution, not the problem.

At the public meetings, several questions were spoken as to how old the three Po'ouli are and how long they could be expected to live. While we may never know exactly how old these birds are, I think we can get a rough estimation of the age of each bird. As stated on the bottom of page 5 in the EA, no Po'ouli were detected on the 1992 Forest Bird Survey. As a result, several search teams were organized to look for Po'ouli in 1993 and 1994 (pages 6-9 in the EA). In the areas of HR1, 2, and 3 the first documented sightings of a Po'ouli came on August 30, 1994, February 22, 1995, and October 21, 1993 respectively. All were tentatively identified as adults (that would be the first calendar year after the year they were hatched commonly referred to as "After Hatch Year" (AHY) when banding birds). During 1996, an adult and juvenile were seen together several time in HR1 (the last time two Po'ouli were observed together). If the juvenile was the bird that survived and is the bird still being observed today, then the HR1 bird would be in its third calendar year. If not, then each of the remaining Po'ouli would be a MINIMAL five years of age (assuming they were juveniles in 1993) as of 1998. They could very well be older than five years. As for how old they can be expected to live? The current banding records for birds about the same size and weight as the Po'ouli are somewhere in the range of 10-15 years (check out the bird banding lab's website at: http//www.pwrc.usgs.gov/bbl/resource.htm on longevity records for individual species).

Alternatives to save the Po'ouli (starting on page 19 of the EA).

2.3.1. Alternative 1. Current Management Actions - no manipulation of known birds.

"No action" is not an alternative. If the current management activities were going to save the Po'ouli, then the current EA would not be have been written and the public's input would never have been sought after. Even with an aggressive habitat management in and in between the current home ranges, the outcome would be the same - three disjunct Po'ouli in separate home ranges. It's been over two years since two Po'ouli were seen together. The three existing Po'ouli show no sign of moving outside of their existing home ranges. Despite intensive searching of the habitat around the home ranges and the area in between the home ranges, no new Po'ouli have been found. With the Hanawi Natural Area Reserve well searched and with searches extending west of Hanawi and into Haleakala National Park (Kipahulu Valley); the chances of finding even another single Po'ouli grow slim (but I remain ever optimistic that we will find more Po'ouli!). Extending the ground based habitat management between the home ranges will not be possible. The very large Kuhiwa drainage gulch system cuts off HR3 (our supposed male) from HR1 and 2 (our supposed females). The only way to cross the Kuhiwa drainage is the lower Hanawi enclosure fence (5300ft) and the Haleakala National Park boundary fence (7300ft). This leaves a large area in between the home ranges that would be difficult to access and maintain a ground based predator control.

2.3.2. Alternative 2. Translocate bird(s) of the opposite sex to the home range of another individual and either release the bird(s) immediately (hard release) or after a short acclimatization period in a holding cage (soft release).

A tanslocation with a hard or soft release has the highest probability of losing a bird. I would never even consider putting a radio transmitter on any bird with the current technology. The transmitters would last maybe three weeks tops. Furthermore, we would have a difficult time tracking the birds as the steep gulch riddled terrain will make picking up a radio signal very difficult. I had a similar problem when I worked for Biological Research Division of U.S.G.S. when we put a radio transmitter on a Crested Honeycreeper using a "figure eight" harness. We also had a transmitter slip off a Crested Honeycreeper soon after release. Affixing a transmitter to the bird is difficult and can often lead to interfering with the bird's movements. While working on a project tracking Wood Thrushes, we glued the transmitters to the bird's back. Five out of the eight Wood Thrush we put transmitters on ended up dead because the transmitters interfered with the bird's natural movements. Without certain methods of keeping track of the birds on the ground, we will most likely lose track of the released bird(s). Other translocations with Hawaiian birds show that most adult birds translocated will fly back to the area they were caught (Palila, I'o etc). No reproduction - no population.

2.3.3. Alternative 3. Capture and hold one, two, or all of the remaining three individuals in holding cages and/or aviary (ies) in Hanawi NAR until a pair bond is formed, then release the pair back into the wild.

While this may seem like a good option to leave the birds in their natural environment let us remember this is the Hanawi Natural Area Reserve we are talking about. Hanawi gets 300-400 inches of rain a year, is exposed to the predominant violent trade wind storms (gale force winds), and is only accessible by helicopter (unless you want to hike 6 hours across Haleakala Crater). To keep a required veterinarian and aviculturist on hand at all time would require at least two crews on a rotational basis in/out of the field (at least two vets and two aviculturist). The structures built to house the birds and staff would have to be strong enough to provide protection from rodents, mosquitoes, as well as weather. This would result in major impacts to one area of the Hanawi Natural Area Reserve such as erosion and an increased probability of introducing new weeds. The expenses of flying in the materials, constructing a field aviary, and maintaining the aviary with Po'ouli would be very high with no more guarantee of success as opposed to bringing them strait into captivity. Since weather dictates if a helicopter can reach this holding sight, an emergency or

need for new supplies could be delayed for days thus further jeopardizing the birds held in captivity. When studying the breeding biology of the Maui Parrotbill and Crested Honeycreeper with BRD, the number one reason for nest failure was weather. Weather is simply one variable we cannot control. Releasing the Po'ouli back into the wild after a pair bond is formed is not going to yield any increased nest success and reproductive output would be minimal.

2.3.4. **Alternative 4. Capture and hold two or all of the remaining three individuals in holding cages and an aviary (ies) in Hanawi NAR for attempted captive propagation and subsequent release of the adults and/or young back into the wild.**

Same reasons apply as in 2.3.3. Putting them in an aviary out in the wild will not guarantee any higher reproduction success than bringing them to a facility. It is still captive propagation. Furthermore, a FULL TIME staff of two veterinarians and two aviculturist will be needed permanently and any facility out in Hanawi will be permanent.

2.3.5. **Alternative 5. Capture and hold one, two, or all of the *remaining three individuals* in holding cages and an aviary (ies) in Hanawi NAR until a pair bond is formed and/or the birds are acclimated to captivity, then transfer the birds to MBCC or another approved facility for attempted captive propagation.**

Same reasons apply as in 2.3.3 and 4. Hanawi is a bad place to hold birds in captivity because of the remoteness and violent weather. However, if holding them temporarily (two weeks or less) in small cages in the field to acclimate them to captivity would give a better chance of survival in captivity at a facility; then part of this option should be pursued.

2.3.6. **Alternative 6. Capture two or all of the remaining three individuals and take them immediately into captivity at MBCC or another approved facility for attempted captive propagation.**

As with all the options, none guarantee success. However, propagation at a facility allows for the greatest control over variables that threaten the remaining Po'ouli (weather, rodents, disease). There are already facilities in Hawaii where the birds could be brought and qualified veterinarians and aviculturist that could look after the birds along with other species currently being held in captivity. There would be minimal impact on the Hanawi NAR. The current Maui Forest Bird Recovery Project staff would then have more time to develop better habitat management methods that would benefit all of the native ecosystems. The current Maui Forest Bird Recovery Project staff would have more time to devote to searching other areas for Po'ouli. To me, this seems to have the highest chance of success with the least amount of extra funding needed to accomplish a recovery effort.

Even if the Po'ouli were to die in captivity (and there is a high probability that it could happen), what we learn with the Po'ouli could be applied to recovery efforts for other Hawaiian Forest Birds. We know very little about the Po'ouli and there just isn't enough time to gather more information (not to mention the small sample size). But to do nothing would be the greatest waste of all.

I would recommend captive propagation for the remnant population of the Po'ouli. Continue searches for any possible remaining individuals and bring them into captivity (unless a breeding pair was found). Continue to develop better predator control methods such as aerial broadcast of rodenticide. Long term monitoring of the native ecosystem to ensure that other native populations do not end up in dire straits as the Po'ouli. Increase the amount of fenced in habitat to control feral ungulates.

Thank you for your consideration.

James R. Kowalsky

The Senate

The Nineteenth Legislature

State of Hawaii

October 1, 1998

Mr. Michael Buck
Administrator
Div. of Forestry & Wildlife
Dept. of Land & Natural Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Buck:

Thank you for affording me the opportunity to review and comment on the "Draft Environmental Assessment for Possible Management Actions to Save the Po'ouli".

The future survival of the Po'ouli is obviously at a critical stage and we are faced with a situation in which we may not have any options which have a particularly high possibility of success. In this case, we must choose that combination of actions which will do the most good while at the same time preventing the most harm.

I speak as a non-biologist, but one who is truly concerned with protecting and conserving the natural heritage of Hawaii in every way I can. It seems that the first priority in all of the expressed Alternatives is to do everything possible to protect the unique rain forest habitat that has produced the unique evolutionary examples of bird life. Alternative #1, with the promise of increased habitat management should be implemented as soon as possible. As a layman, it seems clear that the measures expressed in this option (i.e. increased predator control, weed eradication, removal of non-native birds, and maintenance of the protective pig and ungulate fence) offer the best chance that the three Po'ouli in question will be adequately protected. Moreover, the relatively low level of risk to survival seems intuitively preferable to the many risks of captive propagation. Unless one can make a credible argument, with scientific documentation, that the captive options are better than the field options, I believe it is clear which Alternative will provide the best and most predicable results.

Senate Hou
Nineteenth Legis
The Sta

Mr. Michael Buck

October 1, 1998

I must add that aggressive management of the habitat will not only protect the three known Po'ouli, but will provide an umbrella of protection for all of the other native species of birds, plants, and snails in this forest, both endangered and non-endangered. It is also apparent from the DEA that there remains a very good possibility that there are additional Po'ouli yet to be discovered in areas that have not had the benefit of exhaustive searches. If the habitat is managed, the "yet to be observed" population of Po'ouli will be afforded the best protection possible. From the point of view of cost effectiveness and return on the investment of our conservation dollars, this strategy quickly rises to the top. The old expression of "more bang for the buck" truly applies in this case.

Thank you once again for allowing me to comment on this difficult conservation situation.

Very truly yours,

ANDREW LEVIN
Senator, Third District

AL:CSY

The Peregrine Fund
KEAUHOU BIRD CONSERVATION CENTER
Focusing on birds to conserve nature.

Statement by Alan Lieberman and Cyndi Kuehler
Hawai'i Program Director and Program Scientist
The Peregrine Fund

Informal Response to: "Draft Environmental Assessment for Possible Management Actions to Save the Po'ouli". Formal recommendations will be submitted on October 11, 1998 to DOFAW and the USFWS for consideration in the Record of Decision.

Good evening. My name is Alan Lieberman. I am the Director of the Hawaiian Endangered Bird Conservation Program for The Peregrine Fund.

Before I begin, I would like to thank Michael Buck and Robert Smith for their leadership on the subject of today's Public Hearing, as well as their overall leadership in the conservation of Hawai'i's native flora and fauna. Recovering any species is a complex task. When the number of individuals of any species falls as low as perhaps three individuals, the complexity and urgency of the situation is magnified.

Since The Peregrine Fund is fairly new to Hawai'i, I would like to take this opportunity to give you some background on the organization.

The Peregrine Fund was founded in 1970 at Cornell University to address the catastrophic decline of the Peregrine Falcon. At that time the species was gone in the Eastern United State and 80 or 90 percent gone in the West. Just last month, the Secretary of the Interior, Mr. Bruce Babbitt, announced the intention to remove the Peregrine Falcon from the Endangered Species List. This success was directly the result of the government's ban on DDT which caused the decline and the recovery effort undertaken by The Peregrine Fund and others.

The techniques developed for the Peregrine Falcon have been adapted for use on other species including the Mauritius Kestrel, California Condor, Aplomado Falcon, Harpy Eagle, Philipppine Eagle, Madagacar Fish-Eagle, Madagascar Serpent-Eagle and many other species. We are headquartered in Boise and have field stations in Greenland, Panama, Madagascar, Arizona and now have facilities in Hawai'i. Today, in Hawai'i, The Peregrine Fund continues to develop the technology necessary to play a key role in endangered species recovery.

In our 28 year history, The Peregrine Fund has cooperated in dozens of projects in over 40 countries on five continents.

P.O. Box 39 • Volcano, HI 96785 • United States of America
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Overall, the organization has hatched and reared nearly 5,000 individuals of 34 species of passerines, owls, hawks, eagles, and falcons, accomplished successful releases of 14 of these species, and done research on over 60 species, resulting in more than 600 publications.

The Peregrine Fund was requested to come to Hawai'i in 1993 on an emergency basis by Robert Smith of the U.S. Fish and Wildlife Service to work with the endangered Hawaiian Crow, or 'Alala. The Peregrine Fund and its cooperators successfully hatched and reared seven chicks, and later released five of those young 'Alala into native forest in South Kona. Since then, we have hatched and reared 31 'Alala. Shortly after the 1993 breeding season, Mr. Smith requested, and The Peregrine Fund agreed, to construct and operate a captive breeding facility on the Big Island which would be dedicated not only to the restoration of 'Alala but also to the other endangered species of Hawaiian Forest Birds. In 1996, Mr. Buck requested, and The Peregrine Fund agreed, to take over the operation of the State's captive propagation facility at Olinda on the island of Maui.

I have been the Program Director in Hawai'i since 1994. Prior to coming to Hawai'i I spent 17 years in a variety of animal related positions with increasing responsibility at the San Diego Zoo. I was Curator of Birds for the San Diego Zoo for eight years, supervising the captive management of the largest collection of birds, and most notably the largest collection of passerines (songbirds) of any zoological institution in the world. Part of my responsibility during those years as Curator of Birds was the field capture, collection, transport and quarantining of over 300 individuals of 50+ species of wild birds for the zoo collection. These collections included many species of insectivorous passerines.

In addition to my years working in the San Diego Zoo, I have spent six years in South America working for The Nature Conservancy and the Peace Corps' Smithsonian Institution Environmental Program. During my tenure with the latter program I spent four years in the field, collecting (mist-netting) over 500 individual birds of over 200 species (many insectivorous) for both scientific collection and for maintenance in captivity at the Bogota Zoo while serving there as Curator of Collections.

I have also been responsible for the Andean Condor reintroduction program in Colombia, South America, now in its tenth successful year. Along with my co-worker Cyndi Kuehler, I am one of the investigators in the Ultramarine Lory translocation program in the Marquesas Islands.

As I have just mentioned, The Peregrine Fund's Hawai'i Team also includes Cyndi Kuehler. Ms. Kuehler is the foremost expert in the world on the artificial incubation and neonatal care of wild birds hatched from eggs in captivity. Ms. Kuehler has hatched and reared over 300 species of birds – more species than anyone else in the world and in fact was the biologist who hatched the first California Condor in captivity in 1983 while at the San Diego Zoo. She also managed the restoration program for the critically endangered San Clemente Island Loggerhead Shrike. Ms. Kuehler worked at the San Diego Zoo for 14 years and was the Zoological Society of San Diego's Curator of Zoology for her last four years at that institution. She was a member of the National Academy of Science

committee which recommended recovery actions for the 'Alala.

The other members of The Peregrine Fund's Hawai'i Team are Joop and Marla Kuhn, John Turner and Barbara McIlraith, who collectively have 75 years experience working with captive birds at the San Diego Zoo, The International Crane Foundation and Sea World of San Diego. The Hawai'i Team is completed by Peter Harrity with over 15 years experience of bird keeping and releasing while at The Peregrine Fund, Tracey Powers, Paul Oesterle, Lynne Neibaur, Linda DiSante and Stephen Bailey.

Since we began work in Hawai'i in 1993, The Peregrine Fund has hatched and reared 160 individuals of 12 species of native Hawaiian Forest Birds, to include the 'Alala, 'Akepa, 'Amakihi, 'Apapane, 'Akohekohe, 'Elepaio, Hawai'i Creeper, 'I'iwi, Maui Parrotbill, 'Oma'o, Puaiohi, and Palila. The 'Akepa, hatched this year, is the smallest bird ever to be artificially incubated, hatched and reared in captivity, with an egg weighing 1.4 grams and the hatchling weighing 1.13 grams. By the end of this year we will have successfully released five of these species. Although the released birds were independent of human care, the long-term failure to survive for many of these birds again points out the need to not only produce birds, but to initiate and expand the management of their habitat.

The avicultural and biological experience of The Peregrine Fund's staff in Hawai'i has given us the unique perspective of knowing first-hand the risks involved in all aspects of today's discussion; the capture, collection, "holding", transport, pairing, breeding, incubation, rearing, and translocating of insectivorous songbirds... in this case, the Po'ouli.

With this historical background, I would like to turn our attention to the Draft Environmental Assessment for the conservation of the Po'ouli. The Peregrine Fund will provide the State and the Service our recommendations with a detailed analyses of the strengths and weaknesses of each of the six options by the closing date of October 11, 1998.

In my allotted time today, I would like to present The Peregrine Fund's recommended steps which we firmly believe maximize the chances of saving the Po'ouli and minimize the risks to the species.

1. **Implement an Ecosystem Based Habitat Mangement Plan.** We firmly believe immediate implementation of an expanded Habitat Management Plan provides the best chance to save the Po'ouli. We recommend that this strategy be included as a proposed alternative for evaluation in the Draft EA. Comprehensive ecosystem restoration strategies have been designed, implemented and proven successful for endangered species in other conservation programs. Although not presented as one of the six Conservation Alternatives, expanded habitat management is recognized as an effective strategy in the EA, which states, *"An expanded ecosystem management approach could reduce the potential for further losses and restore habitat for any undetected individuals that remain alive in areas outside of the existing managed units and home ranges"*. We are recommending expanded ground-based predator control for all predators (cats, rats, mongoose), continued aggressive

ungulate and pig control, weed eradication, non-native bird reduction, and avian disease control (where necessary) in the East Maui forest (which by its comprehensive nature includes Po'ouli). This action should be implemented as soon as possible. The plan for implementation should be developed in cooperation with biologists from other ecosystem restoration programs (New Zealand, Australia, U.S.) that can assist and review the scientific development of such a plan.

An extremely important side benefit of this recommendation is the fact that this option benefits all (endangered and non-endangered) native bird (including the Po'ouli), insect, and plant species in the East Maui forest which also makes it the most cost effective.

2. **Egg searches.** We are prepared to collect Po'ouli eggs from the wild for captive rearing. Since The Peregrine Fund began working in Hawai'i in 1993, our program has been based on bringing eggs in from the wild. Through the collection of wild eggs, we have established the technology to manage 12 species of birds in captivity. Most recently the Puaiohi – a flock of 11 birds reared from wild eggs collected in 1996 and 1997 have gone on to produce 23 chicks in our captive rearing facility. These chicks are now scheduled to be returned to their native habitat in the Alaka'i Swamp on Kaua'i.

3. **Definitively determine the sexes of the three known birds.** The sexes of the three Po'ouli are not known. Three laboratories that were asked to determine the sexes arrived at differing or inconclusive results. The procedures of these labs should be reviewed by geneticists familiar with the techniques. This is an essential step to minimize or eliminate any doubt about the sexes.

4. **Translocation.** After the above steps are taken, the female Po'ouli should be translocated into the home range of the male Po'ouli. This is often called a "hard" release and is the only manipulation strategy endorsed by The Peregrine Fund and only recommended after steps one and two are implemented. To survive as a species, the Po'ouli must be allowed to reproduce in their native habitat.

There has been much discussion over the past few months that the remaining known Po'ouli should be brought into captivity. The Peregrine Fund is in the business of recovering species. We are best known for captive propagation and reintroduction. The organization has never brought a species into captivity without a solid knowldedge base that demonstrated that this was the best option for the species.

Our experience working with species similar to Po'ouli clearly indicates that the risks associated with catching, collecting, holding, transporting, pairing, breeding, incubating, rearing and releasing the Po'ouli far outweigh any benefits associated with captive propagation. The best chance for Po'ouli survival is in its native habitat – especially a habitat that will hopefully soon enjoy the benefits of increased management.

No one likes to be in the position that we currently find ourselves in with the Po'ouli, but we can only do what we know how to do. If we focus on what we know and what we can do, I think the way to proceed is clear.

Table 2-1. Comparison of Alternatives. Risk Assessment prepared by The Peregrine Fund for Po'ouli Draft EA.

ISSUES Pertinent to all Po'ouli.	1. Current MP. Limited habitat management in current Home Ranges.	2.a Hard release translo-cation. No hold-ing or trans-mitters.	2.b Soft release translo-cation. Holding with trans-mitters.	3. Hold birds in field aviary for pair formation and release.	4. Hold birds in long-term field aviary captivity.	5. Hold birds in field aviary and transfer to artificial captivity.	6. Move birds directly to long-term artificial captivity.	7.* Expanded Ecosystem Based Management for all Po'ouli Habitat.
Likelihood of survival.	0	0	-	- -	- -	- -	- -	+
Likelihood of successful breeding.	0	+	+	+	0	-	-	+
Positive impacts on entire natural environment.	0	0	0	-	-	-	-	+ +
Cost	0	0	-	-	- -	-	-	- -
Total	0	+1	-1	-3	-5	-5	-5	+2

+ + = strongly positive effect; + = moderately positive effect; - - = strongly negative effect; - = moderately negative effect; 0 = no change

* We recommend including an alternative focused on Expanding Ecosystem Based Habitat Management in the Draft EA risk assessment.

Expanded Ecosystem Based Habitat Management (#7) in <u>all</u> Po'ouli habitat has the highest probability for promoting recovery of this species. This strategy protects the birds and enables them to remain in the wild where they are most likely to successfully reproduce. This recommendation is based on scientific evidence from recovery programs for other endangered insect-eating songbirds. Ecosystem management will also benefit <u>all</u> species in the Maui forest. TPF has declined to participate in the captive management of adult Po'ouli collected from the wild because the mortality risks for bringing adult, insect-eating songbirds into captivity are unacceptably high. If Po'ouli eggs are found The Peregrine Fund will collect the eggs for artifical incubation. Wild, adult Po'ouli would probably not adjust to living in captivity after growing up in the wild. They would probably not breed in a cage and are likely to suffer nutritional and stress-related problems.

To: U.S. Fish and Wildlife Service, Pacific Islands Ecoregion Office

State of Hawai'i, Department of Land and Natural Resources

From: The Peregrine Fund

Re: Response to Draft Environmental Assessment for Po'ouli

Date: October 10, 1998

Decision Analysis and Risk Assessment (The Deliberation Process):

Thank you for the opportunity to review the Possible Management Actions to Save the Po'ouli. The Peregrine Fund's (TPF) decision-making process for evaluating the Draft EA involved the careful analysis of the possible benefits of the listed alternatives, versus the risks associated with each of the proposed actions. The primary goal of our deliberations was to recommend and prioritize conservation strategies for Po'ouli that have the greatest likelihood of establishing a self-sustaining population in the wild.

TPF's analysis of the Draft EA relied on integrating scientific data regarding passerine biology with the knowledge and experience gained by our biologists working on bird recovery programs on five continents for 28 years. To date, TPF staff have worked with over 400 bird species (propagated in captivity, artificially incubated, hand-reared, released, collected and/or translocated) and has managed more "hands-on" bird restoration programs than any other conservation organization. Prior to the construction of the Keauhou Bird Conservation Center (KBCC) our staff in Hawai'i: a) worked with research programs for the Smithsonian Environmental Program/Peace Corps and The Nature Conservancy mist-netting and collecting birds b) managed the San Clemente Island Loggerhead Shrike and Andean Condor restoration programs c) translocated Pacific Island Lories in French Polynesia and d) managed the largest zoo collection of passerines in the world at the San Diego Zoo. We bring this wide breadth of knowledge and experience working with many aspects of endangered bird management to our analysis and subsequent recommendations. To date, TPF has hatched and raised over 160 endemic Hawaiian passerines (Burnham, 1998; Kiff, 1997; Kuehler et al., 1997; Kuehler and Lieberman, 1994; Kuehler and Good, 1990; Lieberman et al., 1997; Lieberman, 1988; Lieberman et al., 1989; Lieberman et al., 1990; Von Hildebrand, 1981; TPF Annual Reports to the Service 1993-1997; Kuehler et al., in press).

History of The Peregrine Fund in Hawai'i:

TPF is a non-profit conservation organization founded in 1970 in response to the catastrophic decline of the Peregrine Falcon. Today, the Peregrine Falcon is being de-listed

and TPF now works with more endangered bird species in the U.S. than any other non-governmental organization. In 1993, we began implementing the recovery actions recommended by the NRC committee for 'Alala, at the request of the U.S. Fish and Wildlife Service (Service) (Duckworth et al., 1992). Based on the success of this program (to date, TPF has hatched and reared 31 'Alala) and TPF's wide range of experience working with bird recovery programs world-wide, the Service and the State of Hawai'i's Division of Forestry and Wildlife (DOFAW) asked us to expand our activities to include working with additional species of endangered Hawaiian forest birds. TPF's current responsibilities include the design, construction and management of the Keauhou Bird Conservation Center (KBCC) on the Big Island, and the management of the Maui Bird Conservation Center (MBCC) on Maui. Our funding comes from the Service, Section 6 of the ESA, and the private sector through grants and donations.

TPF's 1993 proposal to the Service outlines our willingness to work towards the restoration of all Hawaiian forest birds through the acquisition of wild-eggs, captive propagation and release. In our proposal we stated: *to establish captive breeding stock for endangered Hawaiian birds, TPF suggests building breeding stock from eggs or nestlings whenever possible and avoiding removal of behaviorally independent birds. We also emphasize utilizing the potential for management of wild pairs for increased egg production as a potential source of young for establishing captive breeding populations for release.* This was written as the preferred conservation strategy for all endangered Hawaiian forest birds because the removal of eggs has less impact on wild populations than the collection of adults, and captive propagation of wild-caught adult passerines is generally unsuccessful (ISIS; Bocetti and Swayne, 1995; Muller, 1976; Kuehler and Lieberman, ZSSD unpubl. data).

In our Workplan to the Service, we outlined the following: <u>Six Key Elements Required for Successful Restoration of Hawaiian Passerines</u>:

1) Information about the birds in the wild - natural history, diet, behavior and habitat requirements.

2) Knowledge about the cause of decline in the wild and ongoing problems to reverse the trend - loss of habitat, predators and disease.

3) Captive propagation technology - the ability to successfully collect, maintain, artificially incubate eggs, hand-rear chicks and breed the species in captivity.

4) Release technology - hacking techniques and the ability to evaluate the release through radio-telemetry or capture/recapture.

5) Practical considerations - captive facilities, labor, accessability to the birds and long-term financial support.

6) Acceptable release sites where there is minimal risk from threats - suitable habitat.

Note: These elements would all be essential for a successful restoration program for Po'ouli.

TPF continues to follow this conservation philosophy in our work with endemic Hawaiian forest birds. For the last five years we have focused our efforts on developing techniques to artificially incubate, hand-rear and reintroduce passerines; techniques that will enable us to restore endangered bird species without removing adult birds from the wild. To date we have successfully hatched and hand-reared 'Akohekohe, 'Alala, 'Apapane, 'Elepaio, 'I'iwi, 'Oma'o, Palila, 'Amakihi, Hawai'i Creeper, 'Akepa, Maui Parrotbill and Puaiohi. TPF is the only conservation organization that successfully artificially incubates and hand-rears Hawaiian Honeycreepers. During the last two years we specifically targeted our research towards insectivorous species to develop techniques for endangered birds, like Maui Parrotbill and Po'ouli. In 1998, we hatched and reared a 1.13 g 'Akepa, which is probably the smallest passerine ever hand-reared (Fancy et al., in review; Kuehler et al., 1994; Kuehler et al., 1996; Kuehler et al., in review).

Comment 1: The Peregrine Fund has developed successful artificial incubation and hand-rearing techniques for endemic Hawaiian forest birds. Based on our research we are prepared to collect Po'ouli eggs from the wild for captive rearing. Based on our experience, if captive propagation technology is required to recover Po'ouli (in concert with Ecosystem Based Habitat Management); collection of eggs is the best conservation strategy with the highest probability of success, and the lowest risk of mortality.

General Comments on Information Presented in the Draft EA:

Coping with any risk situation requires a broad understanding of the benefits as well as the relevant losses, harms and consequences of the proposed options. It is important for any biological risk assessment to "Get the Science Right (i.e. the underlying analysis meets high scientific standards) and to "Get the Right Science" (i.e. the analysis addresses the significant risk-related concerns and the level of uncertainty). But most importantly, an accurate, balanced and informative synthesis that presents the state of knowledge, uncertainty and disagreement must be presented. We recognize that it is a challenge to present an unbiased summary of existing knowledge for any controversial situation.

In June, 1998 the Service requested our review of a Pre-Draft EA outlining possible conservation strategies for Po'ouli. We submitted our comments June 26, 1998 and requested that the Service and DOFAW revise the Pre-Draft EA paying particular attention to the document's a) preferential inclusion of information, b) omission of relevant precedent information and c) biased interpretation of information. Based on our experience, we believe this second document still does not represent an accurate summary reflecting all of the reasonable alternatives for conserving the Po'ouli and the risks associated with those alternatives. Additionally the "science" presented is insufficient to evaluate the proposed alternatives. The controversial information is presented in an

encyclopedic form, lacking analysis or independent scientific review. Relevant data on passerine biology and aviculture that would support the inclusion of additional alternatives or different opinions is missing (e.g. Maui Creepers, Bridled White-eyes, Saddlebacks, San Clemente Shrikes, Seychelles Warblers, Kakerori, Stead's Wrens, Kirtland's Warblers etc.). And, most importantly, not all of the critical issues (risks) are adequately addressed regarding the collection and captive propagation of adult, insectivorous, passerines.

The Service and DOFAW asked TPF to participate in the management of captive Po'ouli. Prior to the publication of the Draft EA, TPF notified the Service and DOFAW that we are unable to undertake captive propagation of Po'ouli because the necessary biological information is unavailable and the mortality risks for insectivorous passerines in captivity are very high. We believe ecosystem management has a much higher probability of promoting successful recovery of Po'ouli.

We request that the Draft EA accurately present future organizational responsibility and involvement in Po'ouli recovery. On page 14 (1.6 Project Area), the Draft EA says that all the proposed alternatives could possibly be undertaken at the MBCC or KBCC (or perhaps at another approved facility of unknown designation). It is mentioned later in this section that these facilities are currently leased and operated by TPF. For accuracy and clarity this section needs to be revised. The Draft EA should clearly explain that if the proposed alternatives (2-6) are implemented, TPF is unable to participate and accept responsibility for the management of adult Po'ouli collected from the wild, because we believe the biological information necessary to propagate Po'ouli in captivity is unavailable. In our experience the mortality risks are unacceptably high, the probability of success very low, and an immediate focus on Expanded Ecosystem Based Habitat Management would have a greater likelihood of restoring a viable, self-sustaining population of Po'ouli in the wild.

Comment 2: We request that section 1.6 Project Area (p. 14) be rewritten to clarify that The Peregrine Fund is unable to participate in captive management of adult, wild Po'ouli collected from the wild because the necessary biological information is unavailable and mortality risks for insectivorous passerines in captivity are very high. We believe Expanded Ecosystem Based Habitat Management has a much higher probability of promoting successful recovery for Po'ouli.

The Controlled Propagation Policy of the Service was written to ensure that implementation of the Endangered Species Act is based on sound scientific principles. A fundamental aspect of the proposed policy is to ensure that controlled propagation is not undertaken simply as an end to itself; it must have the potential to reestablish or supplement wild populations with a goal of recovering those species (Service, 1996). We believe there is insufficient scientific evidence in this Draft EA to support the proposed action that collecting adult Po'ouli for captive propagation will result in a self-sustaining population in the wild. Additionally, there is no relevant precedent for a successful endangered species recovery program for an insectivorous passerine where removing <u>all</u> the adult birds from the wild for a captive propagation and reintroduction program resulted in

the establishment of a self-sustaining population in the wild.

On page 25, the Draft EA implies that the removal of some or all wild 'Alala, Laysan Ducks, Nene, Bali Mynahs, Guam Kingfishers, California Condors etc. for captive propagation are relevant precedents for Po'ouli. It is important to clarify that a) none of these bird species are insectivorous passerines (passerine husbandry is very difficult), and b) surrogate information existed prior to removal of these birds from the wild (e.g. Andean condors, Black Vultures, Turkey Vultures, King Vultures, many species of Crows and Ravens, many species of Ducks and Geese, several species of Kingfishers, many species of Starlings and Mynahs and several species of Rails etc.). Surrogate information is not available for a species like Po'ouli and there is no relevant precedent for using captive propagation as the preferred recovery strategy for an endangered insectivorous passerine.

Request for an additional Alternative in the Draft EA: Expanded Ecosystem Based Habitat Management

The Draft EA does not include an alternative which proposes substantially increasing (expanding) **Ecosystem Based Habitat Management** (with a faster time-line). In Chapter 2 (Alternatives) the Draft EA states *...an expanded ecosystem approach is not considered a viable alternative, by itself, for saving the Po'ouli at this time.* We request the Draft EA present the biological evidence to explain this position, given that there is considerable scientific literature demonstrating that **Ecosystem Based Habitat Management** has proven to be a viable recovery strategy for insectivorous passerines (see pages 10-12 of this document).

The Draft EA implies that habitat management will continue and perhaps expand, at some future date, but the specific activities planned and an implementation time line are not presented. The current Management Plan (No-action Alternative) means that current research and management practices will continue at present levels, and that any future expansion or acceleration will be at the discretion of the managing agencies.

We agree with many of the comments expressed by the East Maui Watershed Partnership in their 8/22/1997 letter reviewing the Po'ouli Management Plan. *Given the scarcity of conservation dollars, we wonder whether accelerating research into the life history and demography of Po'ouli is a priority response to Hawai'i's extinction crisis - which involves hundreds of species endangered already and many more which could soon become endangered.* We agree with their recommendation to focus more attention on protecting Maui Parrotbill, Crested Honeycreeper and the entire East Maui ecosystem (which by its comprehensive nature includes the protection of the Po'ouli). It is more appropriate biologically, politically, and financially to focus on ecosystem restoration and maintenance, for the benefit of multiple endemic species. vs. the single species approach.

The Draft EA states on page 18, *With limited resources, there will always be a question of the appropriate balance between the needs for aggressive habitat management while still addressing*

the critical condition of the Po'ouli and other rare forest birds. The NEPA process should allow the proposal of an alternative that includes increasing and expanding **Ecosystem Based Habitat Management** (with a faster time-line) for public review. We believe the public should be provided the opportunity to comment on alternatives that clearly define what the *appropriate balance* between the needs for aggressive habitat management and the needs of three Po'ouli will be in the future. The alternatives should be clearly written to enable the public to comment on the prioritization of conservation tax dollars (e.g. should limited resource money be spent on continued monitoring of three birds or expanded habitat management to benefit the entire East Maui ecosystem). As written, the Draft EA does not provide this choice.

Additionally, **Ecosystem Based Habitat Management** has been demonstrated to be successful for the recovery of other endangered passerines, reptiles, plants, and insects. Therefore from a biological standpoint, this is a reasonable conservation strategy which should be evaluated for Po'ouli recovery through the NEPA process. Many well documented, successful programs for endangered passerines have relied on habitat management and manipulation of wild birds, not on captive propagation. Successful techniques for all aspects necessary for passerine restoration; captive breeding, artificial incubation, hand-rearing and release, are either untested, unsuccessful, or unknown.

Following are specific examples of relevant precedents in endangered species conservation and the cited scientific evidence, which supports the need for inclusion of an **Expanded Ecosystem Based Habitat Management** strategy as a viable alternative for consideration during this NEPA process.

Documentation of the need for Expanded Ecosystem Based Habitat Management

Introduced Animals (Mammals) - Predator Control:

The negative impact of introduced animals on island ecosystems has been well documented. Of the 127 species of birds known to have died out by 1600, 92% were island forms and introduced predators are implicated in the extinction of 40% of these species (Newton, 1988). For example, cats are mainly responsible for the elimination of over 40 species of birds from New Zealand Islands, and there are documented cat kills of other endangered species such as California Gnatcatchers, Light-footed Clapper Rails, San Clemente Island Loggerhead Shrikes and Western Snowy Plovers (Short et al., 1997; Harvey, pers. comm.). Recognizing that introduced predators are such a major concern to endemic bird populations, the American Bird Conservancy has launched a major campaign to save birds from free-roaming cats. Additionally, introduced mammals consume native vegetation, snails and insects that are important food resources for birds (Tomich, 1969; Eddinger, 1970; Atkinson, 1977; Van Riper, 1978; Tomich, 1981; Sugihara, 1997).

Rats, cats and mongoose have all been implicated as causes of Hawaiian bird mortality

('Amakihi, Nene, 'Akohekohe 'Alala, 'Oma'o, Palila, 'Elepaio and Puaiohi). In 1998, Tom Snetsinger reported the following information on rat predation of the endangered Puaiohi: *Three nests were definitely predated by rats. In one case the female was killed and two eggs destroyed. In the other two instances two eggs were destroyed in each of the nests (rat hairs and feces were present). Two other nests failed after incubation started for unknown reasons with the eggs vanishing during the first week of incubation. Rats were potentially responsible for these failures. All in all, it appears that rats may be an important limiting factor.* Cats are also a major threat to endangered Palila on the north slope of Mauna Kea (Johnson, pers. comm.).

Granted, predator control is not easy in a steep, wet, muddy forest. And multiple species baiting systems and control methodology is complicated. But effective predator management has been demonstrated for islands and mainland reserves in difficult terrain in New Zealand and other areas of the world (Veitch, 1980; Rauzon, 1983; McFadden, 1992; Moors et al., 1992; Veitch, et al., 1992; Bradfield, 1993; Innes, 1995; Morgan et al., 1996; Wadsworth and McCabe, 1996; Sinclair, 1998). In Hawai'i, preliminary data have shown that predator control increased the fledgling rate of 'Elepaio from 45% to 75% (Wilhelm, 1998) and may have increased the fledgling rate in Hakalau (Fancy and Woodworth, pers. com.).

New Zealand integrates threatened species recovery into restoration of whole ecosystems, where single-species management is not viewed as the recovery of the species but rather the goal is the restoration of the species within its ecosystem. (Simpson, 1995). An entire recovery strategy which focuses on the hands-on manipulation of only three birds presents an unbalanced perspective on conservation management strategies for Po'ouli and other endangered Maui forest birds. Single-species manipulation or captive management should only be one aspect of any recovery effort in the larger context of habitat management, research and environmental education.

Government agencies maintain that New Zealand techniques cannot be used in Hawai'i due to forest ecosystem differences and regulatory problems. During the 1992 Predator Control Workshop in New Zealand a paper was presented on this topic entitled: "Predator control activities conducted in Hawai'i/Pacific Islands: Can New Zealand's model be applied to this area?" Following is an excerpt from that presentation:

Can the New Zealand model be applied in Hawai'i/Pacific islands?

Probably, not, because: 1) regulatory constraints frequently preclude the use of the most effective toxicant(s);

2) red tape in obtaining required permits and approvals is a formidable, time-consuming obstacle;

3) the cost of registering a toxicant and delivery medium is prohibitively expensive (minimum of

US $750,000) and lengthy (about 5-10 years);

4) resource agency staff lack the experience and skills of DOC (New Zealand Department of Conservation) staff; and it is more cost-effective to contract with APHIS (U.S. Dept of Agriculture, Animal and plant Health Inspection Service) APHIS for predator control work. (Kosaka, 1992).

New Zealand's techniques are not implemented in Hawai'i due to regulatory problems, not biological constraints. Regulations are implemented by government agencies, and as Lepson points out (1998); *island species can and do become extinct while in bureaucratic limbo awaiting federal action: for example, the Guam Flycatcher, the Guam subspecies of the Rufous Fantail and the Bridled White-eye were eaten to extinction by the brown tree snake while they were still candidates for federal listing. By the time listing action was undertaken it was too late for effective action.*

Many biologists have made repeated requests for prioritization of funding to complete basic management research and register the toxicants necessary to develop effective predator control methodology in Hawai'i. More than 30 avian species have been protected from predators in the U.S. as part of recovery recommendations (Wadsworth and McCabe, 1996). One of the only points of agreement in the April 27, 1998 DOFAW Po'ouli meeting was that predator control efforts should be increased.

The sections in the Draft EA referring to management of introduced mammals imply that the best possible methods for controlling introduced mammalian predators are currently being developed, and will continue to be implemented, via the current Po'ouli Management Plan. Given that a) predator control for Po'ouli is currently only being conducted in two home ranges, not historic habitat b) historically, predator control has not been consistently implemented and c) research required to register aerial toxicant broadcasting for predator management (helicopter toxicant broadcasts in steep terrain) has not been prioritized for funding; this assumption is not supported. To ensure that the public has the opportunity to participate in the decisions as to whether or not the increased habitat management necessary to protect known/undetected Po'ouli (and other endangered species in this Maui ecosystem) will be prioritized for funding, an **Expanded Ecosystem Based Habitat Management** alternative should be included in the Draft EA. This provides an opportunity for the public to review the prioritization of funding for all reasonable conservation strategies and should be included in the NEPA process. *The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment* (EA-EIS process as outlined by the NEPA, Part 1500, Sec. 1500.1(b) and (c).

Comment 3: The Draft EA implies that the remaining three Po'ouli are at significant risk with current habitat management. Reviewers cannot evaluate this assumption in the Draft EA and the alternatives proposed, unless the current management practices have been reviewed, and this information is subsequently presented. A scientific

analysis is necessary to determine the actual risks to known Po'ouli and undetected birds outside the currently protected areas. The Draft EA should present an independent review of the current predator management techniques and its efficacy (# of bait boxes and traps, specific area controlled compared to historical habitat, re-bait schedule, time period predator control has been consistently implemented in relation to the decline of the species).

Predator control is a complicated conservation discipline, requiring good scientific design to manage the multi-species baiting system needed in the Maui forest. An independent review may also provide critical information which would increase protection of wild Po'ouli.

Introduced Animals (Birds):

The sections in the Draft EA referring to competition from introduced bird species imply that management of introduced bird species may be coming sometime in the future after more research is conducted. The benefits to Po'ouli of initiating management efforts are not adequately discussed.

Hawai'i has an introduced avifauna greater than any other geographic area in the world. Currently, only about one-third of the passerine species in Hawai'i are endemic (Pimm, 1996). It is very difficult to disentangle the synergistic effects of habitat loss, avian disease, predators and competition with introduced birds species to determine the individual impacts of all these factors. But, the detrimental effects of non-native bird species introducing alien diseases in Hawai'i are well known (Atkinson et al., 1995).

It is difficult to believe that the continued existence of such a large non-native bird population does not have any detrimental effects on endemic birds. Introduced bird species have been suggested as competitors for food resources (invertebrates, snails and fruits) and nesting space. Alien species disperse seeds/weeds that out compete the native plants that are the food resources for endemic birds. And, non-native bird populations probably impact the insect ecology through selective foraging (Perkins, 1903; Berger, 1988; Russel, 1980; Mountainspring and Scott, 1985; Ralph and Van Riper, 1985; Erlich, 1986; Ralph and Noon, 1986; Morrison et al., 1988; Hadfield et al., 1993; Pimm, 1996; VanderWerf, 1997; Vitousek et al., 1997). Funding for research and management for control of introduced bird species could be prioritized under **Expanded Ecosystem Based Habitat Management.**

Po'ouli Food Resources:

The Draft EA referring to Po'ouli food resources did not supply sufficient information regarding the impact of introduced species and the possible decline of Po'ouli food resources. The potential benefits of increased **Ecosystem Based Habitat Management** to the native insect population (Po'ouli food) was not adequately addressed.

Po'ouli forage on insects and snails (Casey, pers. comm.; Baldwin and Casey, 1983;

Mountainspring et al., 1990; Pratt, 1996). Introduced birds and mammals also forage on snails and insects in the Maui forest, probably impacting the available food resources for Po'ouli. Evaluating the impacts of alien species competition on available food resources is complicated by the inherent difficulties involved with bird foraging ecology studies and determining adequate quantitative sampling techniques for snails and insects (Morrison et al., 1988; Hadfield, 1993; Brenner and Banko, 1997; Hess and Banko, 1997).

The diverse Hawaiian land snail fauna includes 770 species, but 41 species are listed as endangered and 424 are candidate taxa. Passerines depend on the intake of calcium rich food items for normal eggshell formation. In a recent review of food studies to evaluate calcium sources for wild bird diets, snails were most often reported as a calcium source (Graveland, 1996). Depressed reproductive performance, eggshell defects and egg-laying irregularities have been reported in a variety of passerine species where wild snail populations have declined and may be a factor in the disappearance of Po'ouli. We agree with Pratt (1996); the status of Po'ouli food resources, especially snails should be evaluated and monitored. And, management actions should be undertaken to increase the insect and snail population through the control of introduced birds and mammals.

Considerable soul-searching went into the decisions to suppress populations of native songbirds (Cowbirds) in favor of Scissor-tailed and Vermilion Flycatchers, Yellow-breasted Chats, Bell's and White-eyed Vireos, Painted Buntings, Field, Rufous-crowned and Black-throated Sparrow, not to mention Black-capped Vireos and Kirtland's Warblers. More recently the Service and Navy made the difficult decision to initiate the NEPA process required to begin management control of the State-listed San Clemente Island Fox; a significant predator of the critically endangered San Clemente Island Loggerhead Shrike (Egelend, pers. comm.). More than 30 species have been protected from predators as part of recovery efforts to regain ecological balance in key habitat areas for endangered species in the U.S. (Wadsworth and McCabe, 1996; ICBP, 1997). With management-oriented research, it can be done in Hawai'i too.

Following are some examples of conservation programs for passerines relying on Expanded Ecosystem Based Habitat Management (and in some cases translocation). Note, none of these programs were included in the Draft EA and should be cited as scientific evidence supporting the consideration of an alternative detailing Expanded Ecosystem Habitat Management for Po'ouli protection and recovery (as well as the other birds, plants and insects in this ecosystem).

Cuvier Island, NZ:
Cattle, sheep and wild goats altered the vegetation and habitat for birds on Cuvier island. Cats eliminated the North Island Saddleback, Pied Tit, Tui and Red-crowned Parakeet (Merton 1972). Burrowing seabirds were reduced to only two species and Tuatara declined to only seven adults. Island restoration began 30 years ago with fencing, and goat and cat eradication. With aerial toxicant drops the rats were removed in 1993 (Towns, 1995). Saddlebacks and Red-crowned parakeets were successfully restored and populations of

invertebrates and lizards increased.

Mangere Island, Chatham Islands, NZ:
After people arrived on Mangere Island, 22 species of landbirds disappeared. Habitat destruction by sheep, goats and rabbits, and cat predation, contributed to the decline of the endemic birds (Tennyson and Millener, 1994). By 1975 the entire Black Robin population was reduced to nine birds on Little Mangere Island in degraded habitat, and the habitat on Mangere was insufficient to support even this nine bird population; 80,000 flax and shrubs were planted on Mangere Island between 1974 - 1979. In 1976 and 1977 the entire population of Black Robins (then only 7 birds) was transferred from Little Mangere to Mangere Island. To bolster production in the wild population, eggs and chicks were cross-fostered under wild Chatham Island Tits. Two breeding pairs of Robins grew to a wild population of 200 birds on Mangere and South East Island. Additionally, the Chatham Island Snipe was successfully reintroduced in 1970 (Butler and Merton, 1992). With predator control and habitat restoration, forest birds were successfully restored to an island from which almost all forest had once been degraded and much of original bird fauna was extinct.

Mapara, NZ:
Mapara is a mainland reserve on North Island, New Zealand. Introduced pines, wild goats, possums, cats, stoats, weasels and ferrets contributed to the decline of Kokako and Wattlebirds in this habitat. In 1989 an aggressive program was initiated which included fencing, predator control and a campaign to improve the ecosystem. This effort resulted in increased numbers of insects, Long-tailed Bats, Tui, Bellbirds, Kereru, Whiteheads and Fernbirds. The success of this difficult mainland restoration program influenced New Zealand biologists to start focusing on developing strategies previously used only for island restoration and apply these techniques to mainland reserves. Techniques that can also be implemented in Hawai'i.

Saddlebacks, NZ:
Since 1964, 127 wild-captured North Island Saddlebacks were translocated to five predator-controlled islands. Each of the reintroductions resulted in the establishment of a viable population. Captive propagation was attempted but did not result in a self-sustaining population (Veitch, pers. comm.).

Seychelles Warblers, Seychelles Islands:
After extensive habitat management on Cousin island, the wild population of 26 individual Seychelles Warblers grew to a population of 300-360 birds. After this successful restoration effort the recovered population provided the founders for a translocation to Aride Island. One of the most interesting aspects of this translocation program was the "burst of nesting activity" immediately after release. Successful nesting occurred within a few weeks after reintroduction into new, restored habitat (Shah, 1998; Komdeur et al., 1991).

Seychelles Magpie-robins, Seychelles Islands:
BirdLife and the government of Seychelles eradicated rats and cats on Fregate Island approximately 15 years ago. After habitat restoration the wild population of Seychelles Magpie-robin increased from a low of 17 birds to 70 birds. Recently a rat was discovered on the island and BirdLife immediately consulted with the New Zealand Department of Conservation to advise the Recovery Programme Coordinators; demonstrating the need to react quickly to institute habitat management to protect fragile island ecosystems (Shah, 1998; Merton, 1996).

Tahitian Monarchs, Tahiti:
In French Polynesia a public education and predator control research and management program has been implemented to recover the Tahitian Monarch (Thibault, pers. comm; and Te Manu, 1998).

White-eyed Vireos, Bermuda:
Three pairs of White-eyed Vireo were translocated to Nonsuch Island in 1972. In the absence of mammalian predators the Vireos attained a population density almost twice as high as in the equivalent habitat on the mainland (Moors, 1985).

Kakerori, Cook Islands:
In 1989, only 29 Kakerori could be located on the island of Rarotonga, Cook Islands. A model insectivorous passerine recovery program was implemented that included: a) monitoring the wild population b) developing and implementing an effective predator control program c) protecting wild nests from predators and d) determining habitat requirements and e) increasing public awareness. By 1993 the wild population had grown to 60 birds (Robertson et al., 1994).

Kirtland's Warbler, U.S.:
Habitat management, control of Cowbirds and public support has aided the recovery of this species. The Service funded surrogate research to develop reintroduction techniques which demonstrated the avicultural "learning curve" required, and problems associated with captive handling of insectivores (Bocetti, 1991). Current recovery efforts for the Kirtland's Warbler rely on habitat management and environmental education, <u>not captive propagation</u> (Kepler et al., 1996; Fitzmaurice and Case, 1995).

The current Po'ouli Management Plan outlines a wide range of conservation recommendations but there is no prioritization of the action items both in terms of time or funding. Hence, there is no clear, agreed-upon implementation time-line for all the partner agencies and organizations; all who have different institutional missions, mandates and funding sources. Some recommendations may be acted upon today, others may take years. For example, predator control is recommended in the Management Plan, but was not consistently implemented until recently. And current management efforts are limited.

Comment 4: Incorporate a proposed alternative for Expanded Ecosystem Based

Habitat Management during this NEPA process which re-focuses Po'ouli conservation strategies towards an ecosystem approach to benefit the entire Maui forest ecosystem (which by its comprehensive nature includes Po'ouli). Establish a clear conservation focus for the Maui forest which prioritizes problem-solving activities, designates responsible agencies, and establishes a funding and implementation time-line. Cite examples of conservation programs for passerines relying on Ecosystem Based Habitat Management in the Draft EA.

This alternative should describe increased management efforts to control introduced species (rats, cats, mongoose, pigs, alien plants and non-native birds) in the Maui forest using scientifically proven methodology. For example, one aspect of the ecosystem approach may be to decrease the labor-intensive monitoring of only three birds, and prioritize funding to hire a predator control scientist (and team) to obtain necessary aerial toxicant registration for mammalian predators and oversee the implementation of alternative methods until aerial toxicants are registered (hand broadcast, bait stations and traps). This team could conduct the appropriate management-related research to obtain toxicant registrations and evaluate if control efforts effectively improve the health of bird, insect, snail and vegetation populations. Not only would this type of management driven research aid Po'ouli, but would also benefit the many other endangered species in Hawai'i.

Searches for Additional Po'ouli in the Wild (Section 1.2.4 and 1.2.8)

The Draft EA does not accurately disclose the possibility that additional Po'ouli remain in the wild. The results of searches to date are provided in an encyclopedic manner, but are not analyzed or reviewed. The document does not clarify which areas in historic habitat have not been adequately searched. In essence, the Draft EA did not accurately present the level of uncertainty. Several very good biologists in Hawai'i recommended additional survey work when queried by the Service and State about proposed conservation strategies for Po'ouli (recommendations to the Service in letter form or at the April 27, 1998 meeting) (T. Casey; T. Snetsinger; S. Fancy; and J. Jacobi). Additionally, in his 1997 report Baker stated:

We believe that we have now located all Po'ouli within the known historical distribution of the species, although the elusive nature of Po'ouli may mean that some individuals may not have been seen, but still live within home ranges three and four... Although it is unlikely that Po'ouli are to be found elsewhere on Maui, it is remotely possible that there are birds outside our study area. Parts of Kipahulu Valley have been searched, but large areas of the valley remain to be searched. The almost vertical valley "walls" which are densely vegetated are free from ungulate damage, and have never been searched. There are also areas of the valley that no humans are ever known to have visited. Habitat that may be suitable for Po'ouli also lies along the northern flank of east Maui from Hanawi, as far west as the Waikamoi preserve near Makawao, where there was one record of Po'ouli in 1983 (Mountainspring et al., 1990)...

In his letter of (4/20/98) S. Fancy (BRD) also stated: *Despite the tremendous search effort expended to date, I am not convinced that we have found all of the Po'ouli in the wild.* And T. Snetsinger (Coordinator for the endangered Puaiohi program) wrote: *Efforts should be a combined aggressive effort in predator control within all known home ranges and an aggressive search for unbanded birds within the territories occupied by banded individuals... The next greatest effort should be made in searches of outside areas...The next steps would in my mind be to confirm the absence of additional birds within these territories. I feel fifteen resights (on distinct days) of a banded bird with no detections of birds that were not banded, would be enough to "confirm" the absence of an unbanded bird within the immediate territory. Based on Tonnie Casey's, Christina Herrmann's and my trip to Hanawi in February, 1998, I do feel there were two birds within HR3. The ultimate tragedy would be to take an action which would separate a wild pair.*

Additional searches should also be made to cover the areas I suggested in my previous memorandum. I am ill-informed about the results and areas covered by the recent search efforts that took place in the Hanawi area, but feel that effort may have been mis-directed. My understanding was that a lot of effort was concentrated within the known home ranges. While necessary, from the description of the goals of the search, I thought search efforts would be concentrated in new, unsearched areas. Did these new areas get incomplete or no coverage?

In summary, there is uncertainty regarding the status of Po'ouli in the wild. And more importantly, we do not have sufficient evidence that these birds are unable to locate each other. There are long stretches of time between "re-sights" where we do not know where the birds go. What we perceive as disinterest between birds, may also be due to incompatible sexes or ages, or lack of "re-sight" data. Removal of Po'ouli from their home ranges may disrupt an undetected pair (Snetsinger, pers. comm.). In Section 1.2.9 the Draft EA says *Left to their own devices, it is highly unlikely that the known Po'ouli will form a pair and reproduce in the wild. The extinction of this species is believed imminent unless actions are undertaken immediately to assist in the formation of a reproductive pair of Po'ouli.* The, reviewed, scientific source to support these statements should be cited, or these statements should be clarified as the opinion of the authors.

Comment 5: Continue searches for additional Po'ouli in historical habitat and summarize the a) results of all areas that have been searched, b) the number of man-hours spent searching in these areas (with correlating weather data) and c) all the potential areas that have been searched. Present an independent scientific review of this additional information in the Draft EA.

<u>Sexing of Po'ouli (section 1.2.5)</u>

The section in the Draft EA referring to sexing (Section 1.2.5) needs to be revised to accurately represent the current level of uncertainty regarding the sexes of wild Po'ouli. After repeated inquiries regarding the sex of the three known Po'ouli, on July, 13th, 1998 we were informed that three different labs have attempted to sex the three banded birds

using molecular genetic sexing techniques based on feather samples. All three labs reported conflicting or inconclusive results. A summary of the Po'ouli sexing results sent to us July 17, 1998 and presented at a meeting with the Service and DOFAW on Aug. 20, 1998, confirmed the level of uncertainty (see appendix). The Draft EA should report these conflicting results in the text of the document (not just the appendix). Omitting this information is misleading to the reviewer.

Before any management plan can be implemented for Po'ouli the sexes of the birds must be identified with a high level of confidence. It would be risky to attempt any manipulation of wild birds, without knowing their sexes. Translocation of a male into another male's territory, or movement of the wrong bird, may result in aggression or the disruption of an unknown pair in the wild. Additionally money may be wasted on futile management strategies if the birds are all one sex.

Insectivorous passerines can be very aggressive (e.g. Maui Creepers, San Clemente Island Loggerhead Shrikes and Nashville Warblers). In surrogate work conducted for endangered Kirtland's Warblers, incorrect sexing of Nashville Warblers (and subsequent housing of two mis-identified males) resulted in aggression and death (Bocetti, pers. comm.). San Clemente Island Loggerhead Shrikes also must be housed in separate enclosures in the non-breeding season due to territorial aggression. Similar problems were encountered by DOFAW biologists in their attempts to house Maui Creepers, resulting in aggression-related trauma and death (Harvey, pers. comm; OESPF unpubl. necropsy records).

The UDL lab may be an excellent lab. And, their kindness in providing free services is appreciated. However, Po'ouli are taxonomically quite different from other Hawaiian Honeycreepers, and the technique is experimental. The sexing results need to be confirmed by an alternative laboratory using a different technique or undergo independent scientific review before wild Po'ouli are manipulated.

Comment 6: Report the sexing results of all three labs in the <u>text</u> of the Draft EA. Band and determine the sex of all known Po'ouli using established sexing techniques for passerines. These results should undergo independent scientific review or be confirmed by two different labs (using different techniques). Known sexes should be identified before any manipulation of wild Po'ouli is attempted, to decrease the probability of aggression-related mortality, or inadvertently causing the disruption of a wild pair. This information (or the results of an independent review) should be presented in the Draft EA to ensure that conservation dollars are not wasted on futile management strategies.

Comments on the Proposed Alternatives:

The alternatives presented in the Draft EA a) require additional information for accuracy and b) do not present all the risks involved in the captive management of insectivorous

passerines.

We are presenting essential background information that was not reported in the Draft EA that we believe is necessary to fairly evaluate the proposed alternatives. The following information provides the scientific support for our recommended revision of the risk assessment.

Risks Associated with the Collection of Wild Adult Insectivorous Passerines:

Po'ouli are insectivorous passerines. *Po'ouli forage primarily on the branches of trees, with extensive use of the subcanopy and understory. They seem to prefer the native hydrangia, kanawao (Mountainspring et al., 1990). Po'ouli glean, probe and peck under moss, lichens and bark for small invertebrate prey. Detailed examination of stomach contents from the two type specimens revealed a diet of mostly tiny snails, beetles, and other insects (Baldwin and Casey, 1978).*

The current Maui field crew reported Po'ouli fecals containing Olapa seed (Reilly, pers. comm.). When Po'ouli (and snails) were more abundant, T. Casey observed Po'ouli eating fruit very infrequently (<5% of total foraging time), but reported that birds often foraged for insects in fruit-bearing vegetation. Foraging observations of secretive birds in the wild are difficult. Even in captivity a bird which appears to be eating fruits or flowers may actually be consuming the insect contained within. Insectivorous Maui Parrotbill have been reported to pluck and bite open fruit in search of concealed invertebrates (Simon et al., 1997). Whether Po'ouli occasionally eat Olapa fruit may be debatable; but, the birds are primarily insectivorous.

Insectivorous passerines are very difficult to collect from the wild and acclimate to captivity in comparison to nectivorous, frugivorous and granivorous birds species. These "collection/acclimatization difficulties" are demonstrated by the fact that very few insectivorous passerines are successfully collected and displayed in zoo collections (ISIS; Muller, 1976; Delacour, pers. comm; Cordier, pers. comm.; Roots, pers. comm).

Why are insectivorous passerines so difficult to keep in captivity?

Psychologically, insectivorous passerines can be specialized, stenophagous feeding birds that instinctively search for prey displaying a specific repertoire of "hard-wired" and learned behavior patterns. Specialized feeders sometimes recognize and eat only a few food items. For example, the Everglade Kite feeds primarily on fresh-water snails of a certain size, which it extracts from their shells with its peculiar hooked beak (Limpkins eat snails of a different size in the same habitat). *The morphology of Po'ouli also appears to be adaptive for its feeding behavior. Mountainspring et al. (1990) suggested that the large, stout toes may be adapted for foraging for tree snails by prying up moss and bark. The stout bill may reflect the force needed to manipulate snails. And Bock (1978) noted that the species has a distinctive spoon-shaped tongue with strong associated musculature; this would appear to be adaptive for*

prying prey from substrate refugia and for extracting larger snails from their shells.

As a species becomes more specialized and refines the perfection of its feeding adaptations, it reduces competition with other species for food. But this also puts the specialized feeder at a behavioral disadvantage when faced with new environments, new foods, or when food resources are not presented in a manner in which they are accustomed to finding it. A bird that is used to turning over leaves and moss to glean snails is not likely to recognize mealworms or crickets in a metal food pan. Generalized feeders are more "behaviorally plastic" (e.g. Starlings or House Sparrows) and more willing to explore new foraging situations because they are not inhibited by certain feeding microhabitats or forms of behavioral stereotypy. Hence they adapt to captivity or new situations in the wild more easily than specialized feeders (Conway, 1957; Klopfer, 1967; Morrison et al., 1988). In aviculture the weaning of a wild bird to a new captive diet is called "meating off".

The perception by many people (and the Draft EA) is that collecting a wild insectivorous bird and attempting to induce it to "meat off" is in itself not risky, because the assumption is that if the bird doesn't eat - you can simply let it go. The concept that a, "wait and see if it eats" interlude, is in itself not detrimental or stressful to the bird - is simply not accurate. Once a bird is perceived to suffer from a captive situation, it is often too late. We do not know how neophobic or specialized Po'ouli are regarding foraging strategies. In the absence of this knowledge it is unwise to assume that we can provide a stress-free captive environment which will promote the correct feeding behaviors.

Insectivorous passerines often hesitate or refuse to feed from unfamiliar food resources. This neophobic behavioral response, differs in intensity between closely related species and may correlate to the level of ecological generalism (or specialization) of the species. *Whether or not particular food resources are used depends on morphological and behavioral limitations, learned patterns of behavior and physiological requirements. Neophobia (or passive avoidance - simply not eating) in new feeding situations can be associated with an acute stress response, a syndrome of physiological responses known as the flight or fight response. These types of responses can produce physiological responses correlated with acute stress, and have been documented (increase of circulating corticosteroid) (Morrison et al., 1988).* Hence, a bird in a new environment can be significantly stressed simply by the new environment and either a) will not eat, b) will eat an insufficient amount of food c) may display fright or abnormal behavior and injure itself or d) simply drop dead due to the stress and shock (Cordier, pers. comm.; Roots, pers. comm., Delacour, pers. comm; Kuehler and Lieberman, pers. obs.).

Additionally, *The alimentary canal of a small insectivorous bird is adapted to continuous digestion. If stomach and intestine are completely empty (e.g. after fasting following catching and transport) then immediately after the loss of the last intestine contents a hemorrhagic diathesis can develop. This can arise very quickly in small birds with a high metabolism level and leads rapidly to death. There is a minimum weight below which birds will die so it is clearly vital that the handling of birds and total time in captivity is kept at an absolute minimum to prevent their weight falling below this critical level. Komdeur (1997) showed that*

this occurs after ~3 hours in captivity for insectivorous males (~5.7% weight loss) and females (~7.1% weight loss). This observation has also been supported by other collectors (Delacour, pers. comm.; Bocetti, pers. comm.; Kuehler and Lieberman, unpubl. data).

The Pre-Draft EA included a collection protocol that describes waiting for a 10% weight loss before a stressed bird is released. Based on our experience and that of other biologists, if one waits that long before releasing a wild-captured, adult, insectivorous passerine, it has a good chance of dying. Additionally, if the birds are handled (bled, measured, health checks, weighed, transmittered, photographed) as proposed under the "soft release" alternative, the stress levels increase. **According to D. Veitch, stress-related mortality due to captive holding was one of the reasons the translocation of Stead's Wrens failed.** ***The simple reason for our failure is that we did not know how to keep this species in captivity. There were no helicopters then and captivity for a short time was a necessity (Serena, 1995; Veitch, pers. comm.).***

It is also important to note that young birds display more behavioral plasticity than wild-trapped adults. Hence, insectivorous passerines collected successfully from the wild are usually taken as nestlings (Delacour, pers. comm; Cordier, pers. comm.; Roots, pers. comm; Klopfer, 1967; Rutgers and Norris, 1977; Morrison et al, 1988; Muller, 1976). The Po'ouli being considered for collection in this Draft EA <u>are wild adults, not nestlings</u>.

The scenario of collection and maintenance of wild, adult, insectivorous passerines (possibly specialized feeder) is very risky. Palila, 'Oma'o, 'Amakihi and 'I'iwi are easier to collect and "meat off" because they are <u>not</u> insectivorous passerines. Yet, even in these species, collection and translocation mortality has been documented.

From (Fancy et al., 1997) report on Palila collection for translocation:

Two male Palila from the first group of translocated birds <u>died</u> during the day following their release. Both Palila lacked fat reserves when necropsied, and had been the last and third-to-last birds to be processed and released at Kanakaleonui... The male Palila <u>died</u> during transport; it had lost 7.5 g during the 40 hr. between capture and death, despite repeated observations of it feeding in the aviary. An adult female held overnight in the release aviary was found <u>dead</u> the next morning. <u>With one exception, all of the birds lost weight while in the aviary despite frequent observations of each bird feeding</u>.

From (Fancy et al., in review) report on 'Oma'o collection for translocation:

Wild 'Oma'o were captured in 12 m mist nets...Wild 'Oma'o were initially transported by vehicle to the BRD field station where each bird was weighed and measured, banded.. and fitted with a 1.5 g transmitter... Blood was drawn.. Birds were transported by vehicle to PWW where they were released the same day. One of the first 'Oma'o handled by this method <u>died</u> <24 h after release and it was obvious that the 6-8 hr. holding time necessary for transport and disease screening before same-day release was too long. We therefore held the next four 'Oma'o

overnight at the BRD field station in 30 x 30 x 60 cm cages provided with perches, water, and native fruits before transporting by vehicle to PWW the next morning. This approach was also abandoned, as three of the four 'Oma'o died <24 h post-release. The third strategy used was to hold Omao for 2-5 days in a 4 x 5 x 5 m aviary, transport them to PWW and then hold them individually for 1-2 days... Six 'Oma'o were successfully released by this method, but two mortalities occurred before birds were transported. The final strategy was to hold birds in 60 x 122 x 122 cm cages near the mist net where they were captured, and to release any birds that would not eat native fruits or fruit cocktail within 4 hr. of capture. Four birds were successfully translocated by this approach following a 2-5 day holding period at the capture site.. and another four were released at the capture site because they would not eat or lost >10% of their body weight while in captivity.

The Draft EA implied that if birds are caught and survive the initial acclimatization procedures that capture stress (and mortality risks) have been eliminated. This is an inaccurate assessment of the risks of collection. As Siegel (1980) points out, chronic stress may cause the suppression of the immune system and predispose birds to disease caused by opportunistic pathogens. These stress-related factors may manifest themselves in chronic stress-related diseases that cause mortality months after capture. For example, in the 1988 collection of wild 'Amakihi by the Mainland Zoo Consortium, 30 wild 'Amakihi were collected and transported to the mainland. Fourteen of these birds subsequently died within a few months. 'Amakihi are primarily frugivorous, nectivorous birds, and only facultative insectivores. **Additionally, stress related mortality due to confinement was proposed as one of the reasons why Hihi (Stitchbirds) that were released via a "soft release" had a lower survival rate than translocated birds that were "hard released" (Serena, 1995).**

It has also been suggested by proponents of captive propagation that a focused attempt to collect and acclimate Po'ouli would mitigate the risks of collection. However, we believe that irrespective of the collector's ability to "focus", there are inherent risks that no amount of experience and attention can mitigate. In dealing with this issue of "focus" we can only comment on our own experience. We have had the opportunity to collect and focus on the collection and acclimatization of the following insectivorous passerines: Wrens (5 species), Woodcreepers (13 species), Horneros, Spinetails, and Foliage-gleaners (7 species), Antbirds (13 species), Tapaculos (1 species), Gnatcatchers (1 species) and Neotropical Warblers (6 species). In dealing with these types of birds we can make several generalized statements regarding collection of insectivores for captivity: 1) never assume that any two species will behave the same in captivity 2) never assume that any two individuals from the same species will exhibit the same behaviors and acclimate to captivity (nesting females, vs. territorial males, vs. young birds vs. old birds) and that 3) in the case of insectivorous birds, their nutritional, behavioral and environmental needs are difficult or impossible to satisfy. Several of these species suffered 100% mortality in spite of "focused" attention, and in fact, we elected to discontinue collection attempts because we could not justify the high mortality, simply for the acquisition of a unique species for a zoo collection. Lastly, even after successful "meating off" after capture, this did not mean birds

continued to survive, or pair and breed successfully in captivity.

The successes and failures associated with mist-netting, collecting, acclimating, and translocating, wild birds are not unknown to us. During the period from 1992-1994 we mist-netted and translocated three founder groups of Ultramarine Lories from Ua Huka to Fatu Hiva, Marquesas Islands, with only one mortality. These translocated birds are surviving and breeding (Lieberman et al., 1997; Kuehler et al., 1997). Additionally, we have collected over 50 species of passerines for various programs in Costa Rica, the Andes, the Caribbean Coast, the Northwest Amazon, Hawai'i and in Southern California (Von Hildebrand, 1981; ZSSD unpubl. data).

Several well-meaning aviculturists (unfamiliar with the total spectrum of the issues) have recommended that Po'ouli can be collected and bred in captivity based on their experience with captive zoo animals. For example: M. Vince wrote: *I have established many newly imported insectivores immediately after importation:... produced chicks from bearded reedlings; and established 6 scarlet minivets and 4 white-throated bee-eaters.* This is of some interest but, it does not strengthen the argument that bringing wild Po'ouli into long-term captivity will lead to production of enough birds to build a reintroduction program. Demonstration of a self-sustaining captive population of insectivorous passerines (with surplus animals for a reintroduction program) would be more applicable – an achievement the zoo community cannot claim.

The avicultural literature has many notations of one-time collections of this insectivore, and/or maintenance of that insectivore. But establishing newly imported birds from quarantine is hardly collecting, acclimating and breeding wild adult birds. The San Diego Zoo routinely establishes more species of newly imported passerines than any other zoo in the world. By the time wild birds survive collection, quarantine, and are considered newly imported; much of the collection mortality has already occurred and the remaining surviving birds have acclimated to a captive diet. Note, even the optimistic M. Vince, was cautionary regarding breeding; *Overall, the chances of establishing the Po'ouli in captivity, whether at Olinda or in the forest, should be fairly good. Of course, the greater unknown is whether the birds will breed.* Survival through collection does not ensure long-term survival in captivity and successful reproduction in the future.

Summary of Pros and Cons for Hard Release vs. Soft Release (Holding Birds):

The scenarios regarding translocation (hard release vs. soft release) in the Draft EA were presented without sufficient scientific documentation to evaluate the "pros and cons" of the different strategies. It was implied that a "soft release" involving holding wild, adult, birds in field aviaries has a greater probability of success even though there is scientific information available contrary to this assumption. It is important to consider that many factors influence translocation success including: site fidelity, collection mortality, sex, age, habitat, foraging ecology, flying capabilities and sedentary tendencies, season, predation, etc.

Self-sustaining populations have resulted from habitat restoration, and translocations of as few as five birds to islands lacking predators (Craig 1991; Butler and Merton, 1992; Armstrong and McLean 1995; Lovegrove 1996). **Biologists have found no correlation between success of translocations and the number of birds released, or the number of releases, but the absence of important predators at the release site is critical (Craig, 1991; Armstrong and McLean 195; Lovegrove 1996).**

Many avian species disperse from the natal sites as juveniles or subadults and are philopatric once a breeding site has been chosen, especially after successful reproduction. Female biased natal dispersal occurs in the majority of species and female breeding dispersal is also based on the type of mating system (Greenwood, 1980). The dispersal pattern and mating strategy of Po'ouli is unknown. Whether Po'ouli, like the bark-foraging honeycreepers 'Akiapola'au and Maui Parrotbill, live as pairs on defended territories is unknown (Pratt, pers. comm.). Preliminary data from Maui Parrotbill indicate that pairs are established two to three months before the onset of breeding and loss of a mate may result in change of *breeding site and home range for females (Simon, et al., 1997).*

Translocation of Po'ouli will require a) accurately identifying the sexes of the wild birds b) translocating the correct sex into the range of a bird of the opposite sex and perhaps c) translocating at the correct time of year. Insectivores can be aggressive, and the introduction of the wrong sex at the wrong time, may prove detrimental.

The Draft EA proposes holding wild, adult, birds in forest cages to allow the birds to acclimate to a new area and enhance "site tenacity" in the new home range. There is insufficient scientific evidence presented, to support the concept that holding a wild, adult, bird in a cage will improve site tenacity over a simple "hard release" and increase the likelihood of translocation success. Holding any insectivore in captivity increases the risk of mortality, especially since collection and holding techniques for this species are untested.

It has been demonstrated in Hihi (Sitchbirds) that hard release translocations (immediate release) have a higher probability of success than: soft release translocations (delayed release): *Immediate v. delayed release - Delayed release Hihi disappeared faster than Hihi that were released immediately. Of the 24 Hihi released immediately, 75% were known to be alive four weeks after release, whereas only 46% of the 24 delayed-release birds were known to be alive four weeks after release. The greatest difference in survival in 1991 was recorded between immediate release females (83%) and delayed release females (50%) (Serena, 1995).*

Translocation experiments with Palila did not show greater site tenacity after holding (soft release). The Palila held overnight at Kanakaleonui did not have a greater tendency to remain together as a group, and increase the likelihood to remain at the release site as compared with Palila that were released immediately. But, mortality did occur during the temporary holding process (Fancy et al., 1997).

Translocations of Seychelles Warblers also showed that site tenacity is based on habitat.

Transferred birds will settle as close to the release point as possible when the surrounding habitat is of high quality; otherwise they move about and settle further away. The inter-island transfer of New Zealand Black Robins also reported that the transferred birds settled close to the release point, when the habitat was suitable (Flack 1977; Komdeur, 1997).

Translocation experiments with Helmeted Honeyeaters showed that birds held for months at a release site can/and will return to their natal sites if they choose to do so (Smales, 1996). Holding did not induce site tenacity.

It is interesting that during the 'Oma'o translocation, three of four wild 'Oma'o that were held in a hacking box for 7-9 days before release remained at PWW, suggesting that holding translocated birds in hacking boxes may have increased site fidelity (Fancy et al., in review). However this hypothesis was not rigorously tested and this example of site tenacity may be due to the fact that 'Oma'o held longer at the end of the translocation experiment were also reintroduced during a period of greater fruit availability. This may have been the reason for their greater site fidelity. This agrees with the conclusions reached by New Zealand biologists after many translocations, that good habitat quality (in this case abundance of ripe fruit) near the release site enhances site tenacity.

During the period from 1987 - 1989, the Service funded surrogate translocation studies for the endangered Kirtland's Warbler using the non-endangered Nashville Warbler. In 1987, three pairs of adult Warblers were collected and placed directly in a release aviary (to be held ten days prior to release). No birds survived to release time. In 1988, three more pairs were placed in a soft-release program (held in an aviary at least 10 days). Two birds died and were replaced, so a total of eight birds were translocated. None of the adult birds remained at the site after release, and one of the males returned to the capture site three days later. **This experiment showed the mortality risks associated with collecting and holding adult birds and demonstrated that a ten day holding period of wild, adult, insectivorous birds was insufficient to induce site fidelity** (Bocetti, 1991).

Site tenacity is also age-related. A translocation experiment conducted by Lohrl demonstrated that early age imprinting influences site fidelity in Collared Flycatchers. When juvenile flycatchers were translocated and released, ~20% returned to the release site the following year. When older flycatchers were translocated and released, none returned.

There was insufficient documented evidence in the Draft EA to support the concept that holding a wild, adult, passerine (soft release) will significantly improve site fidelity over a hard release scenario. **And, this strategy presents more risk to the bird, especially since captive husbandry (holding) techniques are unknown for this species.** Soft release strategies have also been proposed to enable wild birds to become "acquainted". From a practical standpoint, it is unlikely that a wild Po'ouli will approach a captive Po'ouli in a cage to "interact" when human biologists are in the area (especially if birds are housed in a tent, as proposed). We do not understand if the plan is to place the single Po'ouli in a remote unattended cage in the forest to promote "interaction" with a wild bird? If so, how

will the bird be monitored? Additionally, forced-pair bonding has been demonstrated to be unsuccessful in insectivorous passerines (see page 25 of this document). And, experiments with translocations of Whiteheads, North Island Robins and North Island Saddlebacks have demonstrated that *familiarity had no effects on survival, dispersal, aggression, pair bonding or reproductive success of the translocated birds (Serena, 1995).*

The Draft EA also implied that after a translocation the bird(s) will disperse and never be seen again. This may happen, but it is not guaranteed to happen. Usually translocated birds who do not stay at the release site, simply return to their collection site. However homing does not always occur. In the Palila study, thirty-five birds were caught, four died, thirty-one birds were translocated and released. Four pairs remained and nested at the release site and two pairs successfully fledged chicks (Fancy et al, 1997). And in 1994, Ramos and Rappole reported in their translocation experiments with migratory and non-migratory insectivorous passerines, that of 114 birds translocated, 84 birds returned to the capture site and 30 birds remained at the displacement site. *Also, delayed release Hibi disappeared faster that Hibi that were released immediately (Serena, 1995).*

The Norfolk Island Boobook Owl reintroduction program demonstrated that a bird without a mate, introduced to a new site inhabited by an unmated bird of the opposite sex, may be induced to remain at the new site. In 1986, a single female Norfolk Island Boobook survived in the wild. Two males were introduced. The female paired with one male and produced four offspring (Olsen, 1996).

A hard release has the advantage over a soft release in that it is less stressful to the bird (less risk of mortality) and enables the bird to return to a previously undetected mate (if the soft release takes months). This is an important consideration for Po'ouli because, infrequently detected mates may be a possibility in this secretive, relatively non-vocal species. In 1996, Baker located an adult male which was seen ten times during March and April, but the female was only seen twice (Baker, in review). Additionally, in February 1998, T. Snetsinger, C. Herrmann and T. Casey believed two birds were together in HR3. 1998).

In summary, site tenacity after translocation (in passerines) is probably influenced by these factors: a) species-specific behavioral dispersal patterns, b) species-specific foraging ecology, c) time of year (breeding season vs. non-breeding season), d) sex of the birds translocated, e) pairing status of the translocated birds (i.e. is a mate being left behind), f) habitat quality at the release site (predator density, vegetation and food resources) and g) age-related site fidelity imprinting. A holding period (soft release) will probably not increase site-tenacity over a "hard release" for a wild adult Po'ouli because there are many factors which influence site fidelity. And, forced pair-bonding has been demonstrated to be unsuccessful in insectivorous passerines. Holding a bird increases the risk of mortality, (especially if the bird is held for months) and may prevent a bird from returning to an unknown mate.

Comment 7: **If independent scientific review of a) unsearched areas and b) the**

molecular genetic sexing techniques - determine that three opposite-sexed Po'ouli inhabit disjunct home ranges; we recommend a hard release translocation. Birds should only be collected in the early AM and translocated immediately with minimal handling (no bleeding, measuring, photos, health checks, weighing or transmitters).

Note: In the Draft EA several alternatives describe waiting for *pair bond formation.* Some ornithologists feel this is an anthropomorphic term. The term - *pair bond formation* should be defined (description of specific behaviors). The Draft EA should also include a description of the specific criteria the field crew will follow when making the decision to release birds that are not acclimating well to captivity (e.g. weight loss, behavior etc.) and cite supporting data for this protocol.

Long-term Captive Propagation of Insectivorous Passerines:

The Draft EA implied that if all three Po'ouli are collected from the wild for captive propagation that this action will 1) protect Po'ouli 2) increase the likelihood of breeding success 3) provide excess birds for a successful reintroduction program and 4) establish a self-sustaining (growing) population in the wild. These are huge assumptions with too many "ands/or ifs", given that no self-sustaining populations of insectivorous passerines have ever been established in captivity and simple maintenance is problematic (Bocetti and Swayne, 1995; ISIS; Muller, 1976; Rutgers and Norris, 1977). **The erroneous concept that it is possible to a) collect wild adult Po'ouli and b) establish a population of Po'ouli which will be self-sustaining in captivity and c) produce enough birds for a successful reintroduction program and d) successfully reintroduce Po'ouli, is the greatest misconception in the Draft EA.** Survival through collection and acclimatization does not ensure successful pair-bonding, nor is there any level of assurance that there will be production of enough birds to off-set the expected high percentage of passerine mortality under captive conditions. The Draft EA does not include information about the many successful recovery programs for passerines which do not include captive propagation. These relevant examples were omitted (see pages 10-12 in this document).

A successful restoration project requires that many birds are produced through captive propagation efforts to maintain a breeding population and produce sufficient numbers of birds for reintroduction. This is highly unlikely for a recovery program starting with three, wild, adult, snail-gleaning passerines. Any mortality could mean the end of the program with no allowances made for an "avicultural learning curve". And, the captive-breeding and reintroduction techniques have not been developed for this genus, nor consistently and reliably for any member of this sub-family. But, more importantly for the Po'ouli - wild caught passerines take years to acclimate and breed in captivity, if at all. The earliest breeding of any of the wild Hawaiian forest birds collected by the mainland zoos was four years after collection. (Surrogate Report, 1998). **If Po'ouli, as a species, are going to survive, they must breed. The highest probability of breeding for any wild, adult, passerine is in its natural habitat in the wild; not artificial captivity. Wild-caught, adult, passerines take years to acclimate and breed in captivity, if at all.**

The Controlled Propagation Policy of the U.S. Fish and Wildlife Service was written to make certain that implementation of the ESA is based on sound scientific principles. A fundamental aspect of that policy is to ensure that controlled propagation is not undertaken simply as an end to itself; it must have the potential to reestablish or supplement wild populations with a goal of recovering those species (Service, 1996). There is insufficient scientific evidence to support the action that collecting adult Po'ouli from the wild for captive propagation will result in a self-sustaining population in the wild. In fact, there is more scientific evidence to support the view that captive propagation of wild-caught Po'ouli does not have the potential of reestablishing a wild population.

It is often incorrectly assumed that self-sustaining captive populations can be easily established for endangered species. However, in reality only a small percentage of all birds (9%) and mammals (19%) have bred in captivity (Conway, 1986; Rahbek, 1993). Obtaining consistent reproduction and survivorship under captive conditions has proven difficult with many species, and behavioral/nutritional "generalists" adapt better to captivity than endangered species with specialized husbandry requirements (Muller, 1976). Failure to reproduce well in captivity can be due to incorrect/inadequate captive environments, nutritional problems, behavioral incompatibilities and aggression, and disease. Determining adequate husbandry requirements to promote reproduction can be expensive, time-consuming, difficult, and may be impossible for some species. Often poor reproduction in captivity results in slowly declining, captive populations that takes many generations to die out (Muller, 1976; Rutgers and Norris, 1977; Ralls & Ballou 1983; Danielle & Murray 1986; Frankham, 1998; Synder et al. 1996).

Insectivores in general do not adapt well to long-term captivity due to territorial aggression and the difficulties involved with providing nutritionally adequate diets. Mineral and vitamin deficiencies are common and not easily rectified (Muller, 1976; Ficken and Dilger, 1961; Cummings, 1967).

It has also been suggested that endangered island species may require more "effort" than related mainland species and be more susceptible to stress and disease. Island populations may have lower reproductive fitness than related mainland populations and so may be less suitable for reintroductions (Frankham, 1998).

The surrogate program for Kirtland's Warblers using Nashville Warblers is an example of the problems associated with maintaining insectivorous birds in captivity (and these birds eat some fruit). In 1986, 54 juveniles (which are considered easier to acclimate to captivity than adults) were collected: 43 birds accepted captivity, (six birds did not accept captivity and were released, five died). Thirty-nine birds were transferred to captivity; 13 birds died in the following eight months. Twenty-six birds were moved to Michigan for release. Ten birds died in the soft release program. Sixteen birds were returned to the wild - long-term survival unknown. Also during the study, aggression related mortality occurred when birds were incorrectly sexed and two males were housed together. Bocetti (1991) *recommended that any technique that requires long-term captivity should be used with caution.*

After several years of surrogate work, captive manipulation was abandoned as a recovery strategy for Kirtland's Warbler. Instead, habitat management was implemented (and has been successful).

The Kirtland's Warbler surrogate study demonstrated that forced-pairing is unsuccessful in insectivorous passerines. Putting birds together (forced familiarity) does not induce pair-bonding (as implied in the Draft EA). Forced-pairing has also been unsuccessful in San Clemente Island Loggerhead Shrikes and other insectivorous passerine species. Bringing birds together in close proximity in captivity does not ensure pair bonding and may cause aggression (Bocetti, pers. comm.; Swayne et al., 1991; OESPF, unpubl. data; ZSSD unpubl. data, Plasse, pers. comm.). Forced familiarity also does not increase survival, pair-bonding or reproductive success of translocated birds (Serena, 1995).

Recovery efforts for the relatively large, hardy, insectivorous San Clemente Island Loggerhead Shrike began in the early 1990s with initial success in collection of wild eggs to develop a captive flock (Kuehler et al., 1993). Prior to recovery efforts, an extensive natural history study had been completed providing aviculturists with information on wild diet composition and natural behaviors. Surrogate work was also conducted on a non-endangered subspecies, prior to the collection of endangered Shrike eggs. Maintenance of the captive Shrike population has proven to be difficult due to behavioral incompatibilities, aggression, disease and nutritional problems. Excessive aggression in this species necessitates strict behavioral management where birds must be housed singly in the non-breeding season. Incorrect husbandry practices, nutritional problems and disease resulted in all 20 captive-reared chicks dying in 1997 (Harvey, pers. comm. Vissman - Service, pers. comm.). Although established in the early 1990s (through the collection of wild eggs) this captive population is not yet self-sustaining.

The work with Maui Creeper nestlings by DOFAW staff in 1995 demonstrated the difficulties of working with aggressive, territorial, insectivorous, Honeycreepers (and these birds eat some fruit). Even when collected as nestlings (acclimatization is easier) (n = 23), and under the intensive care of qualified aviculturists and an avian veterinarian, 11 birds died during attempts to acclimate, breed and develop a release program. Aggression/stress was the cause of mortality and injuries, and several attempts to house birds together as pairs was unsuccessful due to incompatibility (OESPF, unpubl. necropsy records). More recently the DOFAW Maui field crew collected two Maui Creepers to "practice" for Po'ouli; one died and the second bird was released because it did not acclimate well to captivity. **All of the surrogate work with Maui Creepers was not reported in the Draft EA and should be included** because a) it demonstrates the husbandry difficulties involved with caring for insectivorous passerines and b) this is possibly the most relevant surrogate data for Po'ouli.

Note: Current surrogate work is also being conducted on Bush Warblers which are probably not a neophobic species (demonstrated by their alien introduction success). This

species is probably not a good surrogate for Po'ouli.

J. Groves (MARS Coordinator) reported in 1998 that of the 30 Bridled White-eyes collected from Rota in the early 1990s, only nine birds still survive, and he was unaware of any successful reproduction (survival to maturity) in captivity. The program data from this Pacific Island insectivorous species was also omitted from the Draft EA.

Several proponents of captive propagation for Po'ouli cite the Hawaiian forest bird propagation work by mainland zoos, as evidence that captive propagation of Po'ouli will work. The concept that the information gained from collecting 'Amakihi and 'I'iwi (frugivorous, nectivorous, facultative insectivorous) is directly relevant to insectivorous Po'ouli is not valid. Especially in view of the fact that data from programs such as Kirtland's Warblers, Maui Creepers, Shrikes, White-eyes, Stead's Wrens and Saddlebacks was omitted from the Draft EA. To be unbiased and accurate the Draft EA should include data from other insectivorous passerine programs (e.g. Maui Creeper); information that is probably more applicable to Po'ouli, than the data presented for 'Amakihi and I'iwi.

The data from mainland zoos was presented in an encyclopedic manner in the Draft EA, but not analyzed. A critical analysis of the long-term survival and reproduction data of the birds collected does not support captive propagation of Po'ouli as a viable option. Overall, during the period from 1988 - 1998; 65 wild 'Amakihi were collected; 19 of these birds currently survive and 5 chicks successfully fledged. Total = 65 wild 'Amakihi collected; 24 in the total population - to date. This is not a self-sustaining population nor a demonstration of a breeding flock that could support a reintroduction program. An accurate analysis of this data (relevance in terms of whether or not the zoo captive populations are self-sustaining or could realistically support a reintroduction program) should be presented in the Draft EA.

The collection of wild-caught 'Amakihi adults in 1988 does however, demonstrate the "avicultural learning curve" necessary when working with a new species and the mortality that can be expected. Even though survival of birds from the first collection was poor, each successive collecting attempt was better than the previous one. Unfortunately, this knowledge is not directly applicable to an insectivorous passerine and it will not be possible to have second and third collection attempts for Po'ouli. Collecting Po'ouli would require a steeper "avicultural learning curve" than was faced with the first collection attempt for 'Amakihi in 1988, because there were several detailed natural history studies available to aviculturists prior to collection of that species (Van Riper, 1978; 1987). Much less is known about the behavior, foraging ecology and natural history of Po'ouli. Nor is there time or opportunity left for the "avicultural learning curve" necessary for Po'ouli.

In one of the Public meetings for the Draft EA, captive propagation efforts in Australia for Fairy Wrens was cited as a surrogate species demonstrating the feasibility of propagating passerines in captivity. Fairy Wrens do not represent a relevant precedent for Po'ouli for the following reasons: 1) Unlike Po'ouli, there is a great deal of natural history

information available regarding diet, behavior, breeding and habitat requirements for Fairy Wrens in general (Schodde, 1982) 2) Variegated Fairy Wrens are not neophobic insectivores. They are the most widespread Fairy Wren species in Australia and eat seeds in addition to insects and 3) The techniques required to propagate Fairy Wrens in captivity are a) tested and available and b) required over 30 years of bird-keeping to develop, with significant mortality during the learning process (Schodde, 1982; Roots, 1970). The wild Po'ouli population is not large enough to sustain the mortality required for a similar learning curve. And unfortunately, current Fairy Wren propagation techniques are not directly applicable to Po'ouli.

New Zealand's Department of Conservation biologists reported the following comments on captive propagation attempts for the insectivorous Saddleback. *At Mount Bruce birds settled down well and have since bred, but not multiplied. Although nesting has occurred each year, mortality of eggs and young have been high and few have survived to maturity...* During the period from 1970 to 1974, nine birds were collected for captive propagation, but only one chick was produced which survived to maturity. *Of all three basic methods of managing endangered wildlife -viz: preservation and, if necessary, manipulation of the natural habitat; propagation in captivity for retention or for release to the wild; or relocation where existing habitat is inadequate or threatened - only the latter has proved of value in conserving the Saddleback (Merton, 1974). Both subspecies of Saddleback have now been kept in captivity for intermittent periods over the last 50 years without anybody being able to sustain a captive population (Veitch, pers. comm.).*

In 1976, New Zealand was faced with developing a recovery plan for the critically endangered Chatham Island Black Robin. The recovery options that were proposed included: moving the birds to a better habitat, captive propagation, Sooty Shearwater control, improving the habitat, using wire mesh enclosures (this option involved putting hundreds of small enclosures around trees and shrubs, the appropriate size to let Robins in but keep Shearwaters out), supplementary feeding, and translocation.

Supplemental feeding had no clear support, some feeling it would be of more benefit to competitors like hedge sparrows, and others worried by the risks of disease and the sheer logistics of carrying out the feeding. Captive breeding had no supporters. Experience throughout the world suggested that the chances of successfully rearing a small insectivorous bird like the robin in captivity were slim" (Butler and Merton, 1992).

Information regarding the unsuccessful attempts to establish Saddlebacks in captivity and the decision-making process involved with Chatham Island Black Robin recovery options was not discussed in the Draft EA. Both conservation programs for endangered insectivorous passerines are relevant to Po'ouli and should have been included.

Long-term solutions are often politically more difficult than captive-breeding solutions, so it is tempting for managers to de-emphasize efforts for wild populations once captive populations are in place. Thus captive breeding can divert attention away from problems causing a species

decline and become a technological fix that merely prolongs rather than rectifies problems. Captive breeding can become an end to itself and may undermine rather than enhance habitat preservation by reducing the urgency with which this goal is pursued. The existence of a captive population can give a false impression that a species is safe (Snyder et al., 1995).

After all, if animals can be reintroduced later then perhaps we don't have to put such a priority on maintaining them in their natural environment. The reality, of course, is that once the animals have gone it is vastly more expensive and difficult to reintroduce them than it would have been to maintain them in the wild in the first place. Captive propagation and reintroduction can distract attention from the real issues (Bramwell, 1986; Conway, 1986; Knowles, 1986; Shepherdson, 1989).

Before completing this section on captive propagation, we are inclined to mention the extinction of the 'O'o. It has been suggested that captive propagation could have prevented the extinction of the 'O'o. And it has been said, "we have to take the Po'ouli into captivity. We don't want the same thing to happen to Po'ouli, that happened to the 'O'o." In discussing the 'O'o, it is important to consider how the extinction of the 'O'o differs from the current situation facing the Po'ouli. First, there was no habitat management in place to protect the 'O'o, there is predator control in the current home ranges of Po'ouli (although additional management is necessary in historical habitat). And secondly, the Po'ouli under discussion are not in an area with mosquito-transmitted disease. Therefore, the Po'ouli are being provided more protection than the O'o. Third, the 'O'o was not an insectivorous passerine. Frugivorous, nectivorous Honeyeaters similar to the 'O'o have been maintained and bred in captivity for years (ISIS; Smales et al., 1992). Competent aviculturists possibly could have helped the 'O'o because successful surrogate research existed. But, there is no such body of scientific knowledge demonstrating consistently successful avicultural techniques for a species like the Po'ouli.

Reintroduction:

By omission and lack of discussion, the Draft EA implies that reintroduction of Po'ouli will be possible and that there are few risks associated with releasing birds. It does not address the concept that captive-bred animals may not be as behaviorally competent as wild, parent-reared birds and it omits presenting the positive aspects of maintaining a wild flock. This is an inaccurate pro and con risk assessment, because the development of reintroduction techniques for passerines is still in the infancy stage, and no one can predict what the challenges will be for reintroducing captive-reared insectivores. Recent work by DOFAW biologists attempting to collect and release Maui Creepers (1995) demonstrates that aggressive, territorial birds are difficult, and reintroduction attempts often result in mortality (OESPF, unpubl. data). If all Po'ouli are removed from the wild, no parent-reared, guide birds will remain to teach captive-bred release candidates in the future.

The goal for a restoration effort involving captive propagation and release is the establishment of a self-sustaining wild population. The final measure of restoration success

is the percentage of release birds that survive and breed successfully in the wild. In their review of 145 reintroduction programs of captive-bred animals, Beck et al. (1994) found only 16 cases (11%) of successfully established wild populations. Captive-bred stocks also fared poorly in the reintroduction programs reviewed by Griffith et al., (1989). These results suggest major difficulties with establishing wild populations from captive-bred stock. Additionally, a recent assessment by Wolf et al. (1996) indicated that translocated birds are less successful than mammals and an omnivorous (generalist) diet was positively correlated with translocation success. Of 40 insectivorous San Clemente Island Loggerhead Shrikes released to the wild during the last several years, 0 have survived (Vissman, Service, pers. comm.). Clearly, successful reintroduction of captive-bred Po'ouli (if reproduction occurs) is not guaranteed.

Comment 8: There is insufficient scientific evidence to support the alternative of bringing all wild, adult Po'ouli into captivity. There are no self-sustaining captive populations of insectivorous passerines to provide surrogate information or to establish precedence. And, there is no time nor opportunity for the "avicultural learning curve" required to propagate Po'ouli. We do not believe collection of wild adult Po'ouli from the wild will *have the potential to lead to reestablishing or supplementing wild populations with a goal of recovering those species (Captive Propagation Policy).* We do not recommend collection of wild adult Po'ouli for captive propagation and reintroduction. Additionally, substantial biological evidence regarding the risks associated with captive propagation and reintroduction of insectivorous passerines was not cited in the Draft EA and should be included (e.g. Maui Creepers, Saddlebacks, San Clemente Shrikes, Nashville Warblers, Bridled White-eyes etc.).

Recovery Planning:

A. Saunders (1990) attributes New Zealand's success to a change in philosophy. *Twenty years ago conservation responsibilities were scattered across three different government agencies, each with their own legislation and each with mandates split between protection and exploitation. Some agencies were responsible for species, others for the habitats in which the species lived. The Department of Conservation was established in 1987 with an undivided conservation mandate backed by legislation that covered all indigenous natural resources. The establishment of clear conservation goals, mechanisms for setting priorities and integrated conservation management to achieve these goals were now possible.*

Endangered species recovery is controversial (Doak, 1989; Snyder and Snyder, 1989, Tilt, 1989; Thomas et al. 1990; Bangs and Fritts, 1996; Clark and Wallace, 1998; Reading et al. 1991). There is a strong need for prioritization of activities and public involvement and support during recovery planning and implementation. The Kirtland's Warbler recovery team recognized that community support was essential and that public support was necessary to implement recovery recommendations such as clear cutting, timber harvesting, and controlling Brown-headed Cowbirds. They initiated a comprehensive communications effort by hiring D.J. Case and Associates, communication specialists, and creatively worked

towards eco-tourism incentives (Fitzmaurice and Case, 1995). Today the Kirtland's Warbler is recovering and there is a publicly supported annual Kirtland's Warbler Festival. Bruce Babbit said, *This area has developed the federal model I would like to see on the entire landscape of the nation and is the message I want to take to every state in the Union.*

Effective recovery planning requires an efficient process that identifies environmental problems, prioritizes problem-solving activities, and funds these activities in a timely fashion. Public communication and support is a critical aspect of making ecosystem management work.

Comment 9: Before the decision is made to remove adult Po'ouli from the wild for captive propagation, we request an Environmental Impact Statement (EIS) be written due to the a) complexity of the issue, b) the level of scientific uncertainty, c) the incomplete presentation of risks reflected in the Draft EA d) the controversy over this issue and e) the lack of a relevant precedent for a successful endangered species recovery program for an insectivorous passerine (where removal of all the wild birds from the wild for captive propagation and reintroduction resulted in the establishment of a self-sustaining wild population). We request this EIS demonstrate scientific evidence that removal of all wild, adult, insectivorous Po'ouli for captive propagation and reintroduction, realistically has a greater potential to lead to the establishment of a self-sustaining population in the wild than Expanded Ecosystem Based Habitat Management.

Summary of Recommendations:

The Draft EA for the possible management strategies to save the Po'ouli is an example of endangered species triage. But, the fundamental conservation question which needs to be addressed is: *Are we trying to retrieve the man overboard while the ship sinks?* (Serena, 1995).

There exist many well documented cases in which aggressive and comprehensive **Ecosystem Based Habitat Management** has effectively restored critically endangered bird species (Kakerori, Seychelles Warblers etc.). Although the Draft EA states that these management actions will probably take place at some time in the future (on an undetermined schedule), The Peregrine Fund feels strongly that this is the one Alternative which holds the most hope for saving the Po'ouli. As well, the additional benefit which **Expanded Ecosystem Based Habitat Management** affords all of the native bird, insect and plant species, both endangered and non-endangered in the Maui forest long term, makes this the most cost-effective action of all the alternatives. **Expanded Ecosystem Based Habitat Management** should be included in the list of Alternatives proposed in the Draft EA and should be selected as the Preferred Alternative.

All of the Alternatives which include captive management are not endorsed by The

Peregrine Fund. Based on our experience working with insectivorous bird species in the field and in captivity, the known risks of catching, holding, transporting, pairing, breeding, incubating, rearing and releasing insectivorous songbirds are extremely high and far outweigh any anticipated benefits. In spite of over 100 years of recorded bird keeping on every continent, there has never been a self-sustaining population of obligate insectivores established in captivity. This Draft EA inaccurately proposes that such a scenario would be possible, beginning with three birds of questionable sexes, whose dietary requirements are unknown. In spite of the EA's encyclopedic documentation of all that has been done to date with the captive manipulation of native Hawaiian birds, none of the species cited can serve as a clear demonstration of a successful surrogate for the Po'ouli. In fact, in all cases where attempts were made to implement captive propagation in other insect-eating passerine conservation programs (Nashville Warblers, Bridled White-eyes, Saddlebacks, Maui Creepers, San Clemente Island Loggerhead Shrikes, etc.), none have successfully restored a wild population. The Draft EA fails to incorporate this relevant information to better inform the reviewer of the risks involved in evaluating all of the Alternatives.

If Po'ouli as a species are going to survive, they must reproduce. The best chance for breeding wild, adult, Honeycreepers is in their native habitat. The manipulation strategies endorsed by The Peregrine Fund, and only recommended in conjunction with the expanded habitat management alternative, are a) the collection of eggs and b) the "hard" release of a female Po'ouli into the Home Range of the male Po'ouli. This should only be undertaken after the sexing procedures attempted thus far are reviewed and judged accurate. Predator control methodology and the results of searches for Po'ouli in current and historical habitat should also undergo independent scientific review. It would be a tragedy to manipulate birds and disrupt undetected breeding pairs.

Endangered species policy decisions are complex, controversial, and often influenced by politics. *Thus, the Society for Conservation Biology urges that governmental decisions and policy related to the environment be made in an independent manner with the best available science* (Meffe et al., 1998).

1. The Peregrine Fund has developed successful artificial incubation and hand-rearing techniques for endemic Hawaiian forest birds. Based on our research we are prepared to collect Po'ouli eggs from the wild for captive rearing. Based on our experience, if captive propagation technology is required to recover Po'ouli (in concert with Ecosystem Based Habitat Management); collection of eggs is the best conservation strategy with the highest probability of success, and the lowest risk of mortality.

2: We request that section 1.6 Project Area (p. 14) be rewritten to clarify that The Peregrine Fund is unable to participate in captive management of adult, wild Po'ouli collected from the wild because the necessary biological information is unavailable and the mortality risks for insectivorous passerines in captivity are very high. We believe Expanded Ecosystem Based Habitat Management has a much higher probability of promoting successful recovery for this species.

3: The Draft EA implies that the remaining three Po'ouli are at significant risk with current habitat management. Reviewers cannot evaluate this assumption in the Draft EA and the alternatives proposed, unless the current management practices have been reviewed, and this information is subsequently presented. A scientific analysis is necessary to determine the actual risks to known Po'ouli and undetected birds outside the currently protected areas. The Draft EA should present an independent review of the current predator management techniques and its efficacy (# of bait boxes and traps, specific area controlled compared to historical habitat, re-bait schedule, time period predator control has been consistently implemented in relation to the decline of the species).

4: Incorporate a proposed alternative for Expanded Ecosystem Based Habitat Management during this NEPA process which re-focuses Po'ouli conservation strategies towards an ecosystem approach to benefit the entire Maui forest ecosystem (which by its comprehensive nature includes Po'ouli). Establish a clear conservation focus for the Maui forest which prioritizes problem-solving activities, designates responsible agencies, and establishes a funding and implementation time-line. Cite examples of conservation programs for passerines relying on Ecosystem Based Habitat Management in the Draft EA (Kakerori, Seychelles Warblers etc.).

5: Continue searches for additional Po'ouli in historical habitat and summarize the a) results of all areas that have been searched, b) the number of man-hours spent searching in these areas (with correlating weather data) and c) all the potential areas that have <u>not</u> been searched. Present an independent scientific review of this additional information in the Draft EA.

6: Report the sexing results of all three labs in the <u>text</u> of the Draft EA. Band and determine the sex of all known Po'ouli using established sexing techniques for passerines. These results should undergo independent scientific review or be confirmed by two different labs (using different techniques). Known sexes should be identified before any manipulation of wild Po'ouli is attempted, to decrease the probability of aggression-related mortality, or inadvertently causing the disruption of a wild pair. This information (or the results of an independent review) should be presented in the Draft EA to ensure that conservation dollars are not wasted on futile management strategies.

7: If independent scientific review of a) unsearched areas and b) the molecular genetic sexing techniques - determine that three opposite-sexed Po'ouli inhabit disjunct home ranges; we recommend a hard release translocation. Birds should only be collected in the early AM and translocated immediately with minimal handling (no bleeding, measuring, photos, health checks, weighing or transmitters).

8: There is insufficient scientific evidence to support the alternative of bringing all wild, adult Po'ouli into captivity. There are no self-sustaining captive populations of

insectivorous passerines to provide surrogate information or to establish precedence. And, there is no time nor opportunity for the "avicultural learning curve" required to propagate Po'ouli. We do not believe collection of wild adult Po'ouli from the wild will *have the potential to lead to reestablishing or supplementing wild populations with a goal of recovering those species (Captive Propagation Policy).* We do not recommend collection of wild adult Po'ouli for captive propagation and reintroduction. Additionally, substantial biological evidence regarding the risks associated with captive propagation and reintroduction of insectivorous passerines was not cited in the Draft EA and should be included (Maui Creepers, Saddlebacks, San Clemente Shrikes, Nashville Warblers, Bridled White-eyes etc.).

9: Before the decision is made to remove adult Po'ouli from the wild for captive propagation, we request an Environmental Impact Statement (EIS) be written due to the a) complexity of the issue, b) the level of scientific uncertainty, c) the incomplete presentation of risks reflected in the Draft EA d) the controversy over this issue and e) the lack of a relevant precedent for a successful endangered species recovery program for an insectivorous passerine (where removal of all the wild birds from the wild for captive propagation and reintroduction resulted in the establishment of a self-sustaining wild population). We request this EIS demonstrate scientific evidence that removal of all wild, adult, insectivorous Po'ouli for captive propagation and reintroduction, realistically has a greater potential to lead to the establishment of a self-sustaining population in the wild than Expanded Ecosystem Based Habitat Management.

Revisions to the Pros/Cons Table 2-1:

Alternative 1:

Pros
1) Keeps previously undetected wild pairs from being disrupted.
2) Leaves "guide birds" in the wild for future release candidates.

Cons
1) Reintroduction techniques are untested (for chicks produced from egg collection).
2) Lack of timely Ecosystem Based Habitat Management may not protect Po'ouli outside of the 2 home ranges.

Alternative 2a Hard Release:

Pros
1) Minimal handling of adult Po'ouli; therefore, low risk of death or injury attributable to hands-on management techniques.
2) Enables previously undetected wild pairs separated by translocation to return to their

mate.
3) Leaves "guide birds" in the wild for future release candidates.

Cons
1) Reintroduction techniques are untested.
2) Lack of timely Ecosystem Based Habitat Management may not protect Po'ouli outside of the 2 home ranges.

Alternative 2b Soft Release:

Pros
1) Leaves "guide birds" in the wild for future release candidates.

Cons
1) Birds may not adapt to captivity (or be stressed by handling) and may die (note this statement is included in alternatives 3-6 in the Draft EA and should also be included for soft release translocations).
2) Reintroduction techniques are untested.
3) Lack of timely Ecosystem Based Habitat Management may not protect Po'ouli outside of the 2 home ranges.
4) May separate mates from previously undetected pairs.

Alternative 3-4:

Pros
1) Leaves "guide birds" in the wild for future release candidates.

Cons
1) Reintroduction techniques are untested.
2) Lack of timely Ecosystem Based Habitat Management may not protect Po'ouli outside of the 2 home ranges.
3) May separate mates from previously undetected pairs.

Alternative 5-6:

Pros
1) the statement *since captive propagation facilities are already built and operating, cost is minimized* needs to be re-written. Additional operating costs for maintenance of Po'ouli will need to be considered under the cost analysis (TPF has declined this responsibility).

Cons
1) All potential "guide birds" for future reintroductions will be removed from the wild.
2) Reintroduction techniques are untested.
3) Lack of timely Ecosystem Based Habitat Management may not protect Po'ouli outside of

the 2 home ranges.
4) May separate mates from previously undetected pairs.

Add Alternative 7: Expanded Ecosystem Based Habitat Management

Pros
1) Keeps previously undetected wild pairs from being disrupted.
2) Leaves "guide birds" in the wild for future release candidates.
3) No manipulation of adult Po'ouli; therefore, low risk of death or injury attributable to hands-on management techniques.
4) Benefits previously undetected Po'ouli in historic habitat and all birds, plants and insects in the Maui forest.
5) Keeps birds in natural habitat.

Cons
1) If remaining Po'ouli exist in disjunct home ranges, the birds may not connect in the wild.

Revisions to the Comparison of Alternatives Table 2-1:

Based on the biological information we have presented in this document we believe the risk assessment presented in the EA should be revised. Also, the ranking system should be more sensitive and reflect positive and negative effects to all wild Po'ouli (detected and undetected) and the entire Maui forest environment (e.g. +/- not high, medium and low). This system has been used in other NEPA documents.

Additional revisions are:

1) An Expanded Ecosystem Based Habitat Management alternative should be included in the Draft EA risk assessment for public review.

2) The likelihood of pair bond formation should not be considered when comparing alternatives. The likelihood of successful breeding is the important issue which should be evaluated.

3) Given that TPF has declined participation in captive management of adult Po'ouli collected from the wild, captive propagation may incur additional costs.

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Table 2-1. Comparison of Alternatives. Risk Assessment prepared by The Peregrine Fund (TPF) for Po'ouli Draft EA.

ISSUES Pertinent to all Po'ouli.	1. Current MP Limited habitat management in current Home Ranges.	2.a Hard Release Translo-cation. No hold-ing or trans-mitters.	2.b Soft Release Translo-cation. Holding with trans-mitters.	3. Hold birds in field aviary for pair formation and release.	4. Hold birds in long-term field aviary captivity.	5. Hold birds in field aviary and transfer to artificial captivity.	6. Move birds directly to long-term artificial captivity.	7.* Expanded Ecosystem Based Management for all Po'ouli Habitat.
Likelihood of survival	0	0	-	- -	- -	- -	- -	+
Likelihood of suc-cessful breeding.	0	+	+	+	0	-	-	+
Positive impacts on entire natural environment	0	0	0	-	-	-	-	+ +
Cost	0	0	-	-	- -	-	-	- -
Total	0	+1	-1	-3	-5	-5	-5	+2

+ + = strongly positive effect; + = moderately positive effect; - - = strongly negative effect; - = moderately negative effect; 0 = no change

* We recommend including an alternative focused on Expanding Ecosystem Based Habitat Management in the Draft EA risk assessment.

Expanded Ecosystem Based Habitat Management (#7) in <u>all</u> Po'ouli habitat has the highest probability for promoting recovery of this species. This strategy protects the birds and enables them to remain in the wild where they are most likely to successfully reproduce. This recommendation is based on scientific evidence from recovery programs for other endangered insect-eating songbirds. Ecosystem management will also benefit <u>all</u> species in the Maui forest. TPF is unable to participate in the captive management of adult Po'ouli collected from the wild because the necessary biological information is unavailable and the mortality risks for bringing adult, insect-eating songbirds into captivity are unacceptably high. If Po'ouli eggs are found, TPF will collect the eggs for artificial incubation. Wild, adult Po'ouli would probably not adjust to living in captivity after growing up in the wild. They would probably not breed in a cage and are likely to die due to nutritional problems and stress-related disease.

Honolulu Zoo
151 Kapahulu Ave.
Honolulu, Hawaii 96815

Honolulu Zoo

October 12, 1998

Michael G. Buck
Administrator
DLNR-DOFAW
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

Dear Michael:

I have read the EA on the Po'ouli and would like to make comments on the actions which are being proposed for this species. Please note that the opinions expressed here are my own and do not necessarily reflect the position of the Honolulu Zoo or the City and County of Honolulu.
The Po'ouli is on the verge of extinction and unless we take drastic measures we will lose this species. The only way we are going to save this species is by implementing an intensive management program which will maximize their reproductive potential and minimize mortality. An intensive management program would entail getting the remaining three birds together and facilitating pair formation and nesting. If a pair did form than the birds would have to be monitored closely. When a nest is located than the eggs, which are produced, would be removed and taken to a captive facility for incubation and raising. The removal of the eggs would than hopefully stimulate renesting and more eggs for removal.

The decision on what conservation option should be used, should be based on:

1. The potential for the option to facilitate a pair formation.
1. The potential for the option to induce reproduction.

1. The ability of staff to monitor the birds to determine reproductive activity.
1. The ability of staff to identify and locate all nests.
1. The ability of staff to access all nests to remove eggs for captive management.

The conservation options outlined in the EA have not been fully developed and are only concepts on how to approach this dilemma. I feel that we must put together a team of individuals who can develop these conservation options. For each option, we must address the five concerns listed above. After this has been accomplished, we can than thoroughly review the options to review their potential benefits and liabilities.
The options which are being suggested could also be reviewed by the techniques which would be required for their implementation. The techniques which have been identified are: capturing birds, acclimating birds to captivity, monitoring birds in the field, accessing nest, egg management, chick management, release of birds from captive environment to wild, translocation, and captive breeding. There has been a history of success on everyone of these techniques. Whether these techniques have *been developed to an appropriate level and could be used on the Po'ouli is another question. One of* my main concerns has been the lack of effort to develop and refine the basic techniques, which have been identified. All of the techniques identified need additional work and refinement. The techniques which are most critical for Po'ouli conservation are; acclimating avian insectivores to captivity, monitoring birds in the field, accessing nest, and captive breeding.

Whether or not the techniques are used on the Po'ouli conservation program they should all be developed and refined to the point where they can be used on any critically endangered species here in Hawaii. By developing and refining these techniques, we broaden the options that can be used on all of our species. Before any of these techniques are used on the Po'ouli, the techniques must first be tested and evaluated. Our decision on how to proceed should only be made, when we have had an opportunity to review and evaluate all of the techniques which are being proposed.

My general feeling about this situation is that we should bring the species into captivity. We would than have the control necessary to implement an intensive management program. I seriously do not think that, we can implement intensive management techniques on this species in the field. It is unlikely that we will be able to monitor the species in the wild to a point where we would be able to locate nest and initiate egg collection. We have tried to locate the nest of the Maui Parrotbill this last year. Even with hundreds of man-days of effort, we were unable to locate any Parrotbill nest. This is a species with a population count at least 100 times larger than that of the Po'ouli.

I do not think we are at the point where we can implement any of these options. We will need to develop an aggressive program to develop and refine our techniques. For all of our techniques, we will need to define how the techniques will be evaluated and at what point will we consider them appropriate for the Po'ouli. Our evaluation of techniques must be based on quantitative versus qualitative information. We will need to accurately identify the benefits and liabilities of each technique being considered. The development of the techniques should not take much time. I would think that many of the concerns could be resolved by the end of the year if an aggressive program to work on techniques is implemented now.

There has been a lot of discussion about how to proceed with the Po'ouli, unfortunately most to the comments that I have heard, have dealt with why one option or another can not work. To give this species the best chance of survival, I think we need to look at all of the options and see how we can make them work. I know there is great concern about the capture and acclimatization of avian insectivores. It has been generally presumed that there would be high mortality with this technique. Our preliminary results in capturing and acclimating avian insectivores in Hawaii indicate that we can acclimate avian insectivores to captivity and mortality is not as high as was assumed. Kevin Evans the taxon advisory group leader for Australian passerines has indicated that the Australian Zoos have been able to successfully capture, acclimate to captivity and then breed several species of fairy wrens. (species which are obligate insectivores). The techniques to capture and acclimate avian

insectivores are risky, but there is a history of success in using the techniques as well. If we continue to refine our techniques and utilize the experience of the leading experts in this area from around the world, I am sure we can develop this technique and minimize mortality.

In 1978 I was asked by Fish and Wildlife Service staff to develop techniques to bring the O'o into captivity and to develop a captive program for its conservation. Because of possible public controversy, I was latter told to give up the program and let the O'o go. It was felt that a failure at that time would have had a negative impact on all future captive work in Hawaii. I will always regret that decision even though I knew it was the best decision at the time. I latter was able to work with the staff from DLNR to hand raise the first A'lala chicks in captivity. Captive management techniques are now commonly used in our conservation programs. There has been a history of using captive management techniques on critically endangered species. The concern of the public responding to a failure is no longer a reason for not attempting a captive management option.

If we are to save this species we will need to implement intensive management techniques. The decision on how to proceed should be based on what options will give this species the best chance of survival. I strongly feel that the best chance of survival for the Po'ouli is in a captive program. A captive program will give you the best options for implementing an intensive management program.

If there is anything that I can do to assist with this program please do not hesitate to contact me.

Sincerely,

Peter Luscomb
General Curator

Response to draft Environmental Assessment for Possible Management Actions to Save the Po ' ouli.

This communication is a response to the draft sent dated Sept 1998 prepared by Rosa, Hooper, and Reilly. In this response I will attempt to define what I think are the factors affecting Po'ouli, examine the management options as detailed in the draft, and tease out the components of those options that can be managed. The current status of Po'ouli demands emergency measures are put into action now in an attempt to provide breathing space.

The six options as listed provide details of management options that can be grouped into two basic scenarios for Po'ouli. The first scenario is options one, and two, which leave remaining Po'ouli in the Hanawi NAR in a free state. Scenario two is the other 4 options which all involve a captive management factor that involves holding the actual birds. Currently there are known to be 3 Po'ouli which means there is little ability to carry out field observations. Put simply. there are now too few birds to enable biologists to be able to monitor birds, or nests, to determine which predator is responsible.

Expert advice from Al Lieberman and Cyndi Keuhler, The Peregrine Fund, is that captive breeding is not an option. This opinion is based on their experience with captive breeding of other species of Hawaiian birds and is probably the best for Po'ouli. Not enough is known about captive breeding of related Hawaiian species to be able to transpose that knowledge over to Po'ouli, accordingly the risk to the remaining 3 birds would be immense. There are significant risks in leaving the birds in situ (hence the reason for their demise) but by chosing any option that involves holding the birds for any length of time they will be exposed to an additional risk. This should be avoided if at all possible. For this reason alone captive breeding is not an option at this point in the recovery plan.

The possibility of avian disease carried by mosquito, or some other vector needs to be considered but would be very difficult to manage other than locally. Whilst it is not known for sure if mosquito affect Po'ouli, other species of Hawaiian bird are known to be affected. It is more than likely disease has contributed to the suite of factors affecting Po'ouli but control of disease may not be practicable.

That leaves control of introduced predators as the best option for immediate action. There are sound, proven, and efficient methods for controlling all the introduced predators in the Hanawi NAR . If implemented now it is possible that the situation will be stabilised. If that happens then there may be time to manipulate the remaining birds in accordance with Alternative 2.

New Zealand has a suite of introduced mammals which is similar to those of Hawaii. They are all known as predators of, or to affect adversely, native and endemic species. Because of this similarity management options in New Zealand are relevant to Hawaii. In fact throughout the world there are numerous places where introduced predators cause the same problems and are vulnerable to the same management options. In general terms this relates to locations where there were no mammalian predators (carnivores) prior to deliberate or accidental introductions. This situation is quite unlike most of Europe, Africa, or Canada, and USA, where there are several species of native and / or endemic carnivore.

On Hawaii, as is the case in NZ, feral cats, and ship rats are mammals introduced by man into an environment that evolved without this type of predator. When combined with habitat modification from ungulates, the effect of mongoose (if known to adversely effect Po'ouli) and possibly disease, both cats and rats are known to have played a role in the decline of several species of bird on the islands of Hawaii. For example, prior to the arrival of the pacific rat (*R exulans*), there was no species of rodent eating native or endemic species on any of the islands within the Hawaiian chain. Similarly there was no species of rodent that was capable of eating an incubating Po'ouli prior to the arrival of ship rat (*R rattus*). Regardless of other factors that may, or may not, be affecting birds like the Po'ouli there are factors which are known to be, or most likely to be affecting Po'ouli. There are very simple ways to remove those components out of the equation. Aggressive predator control will at least remove those effects.

The consensus here in NZ is that aggressive predator control of ship rat, feral cats, and mongoose is carried out in the Hanawi NAR. This would involve commencing control well before the start of the known breeding season. Also intensive searches should be carried out to locate additional Po'ouli, perhaps outside the fenced units. New single birds can then be translocated into the NAR. If any nests are located outside the NAR they should be protected by a localised grid of traps/bait stations.

Once the situation has stabilised then other options as outlined in Alternatives 3 through 6 can be re evaluated.

I. McFadden.

12.10.98.

From: Shareilly@aol.com
Date: Thu, 15 Oct 1998 11:52:30 EDT
To: wildlife@pixi.com
Subject: Fwd: Po'ouli DEA comments
X-Mailer: AOL 3.0 16-bit for Windows sub 38

Return-Path: <jamo@hgea.org>
Received: from rly-zb02.mx.aol.com (rly-zb02.mail.aol.com [172.31.41.2]) by air-zb03.mail.aol.com (v50.18) with SMTP; Tue, 13 Oct 1998 18:09:22 -0400
Received: from hgea.org (hgea01.hgea.org [205.172.0.2]) by rly-zb02.mx.aol.com (8.8.8/8.8.5/AOL-4.0.0) with ESMTP id SAA03027 for <shareilly@aol.com>; Tue, 13 Oct 1998 18:09:18 -0400 (EDT)
Received: from operations (ppp15-annex1.hgea.org [205.172.3.15]) by hgea.org (8.9.0/8.9.0) with SMTP id MAA08036; Tue, 13 Oct 1998 12:07:35 -1000 (HST)
Message-Id: <3.0.1.32.19981013120905.006f57fc@hgea01.hgea.org>
X-Sender: jamo@hgea01.hgea.org
X-Mailer: Windows Eudora Pro Version 3.0.1 (32)
Date: Tue, 13 Oct 1998 12:09:05 -1000
To: karen_rosa@mail.fws.gov, shareilly@aol.com
From: James Mejeur <jamo@hgea.org>
Subject: Po'ouli DEA comments
Cc: luscom@hgea.org
Mime-Version: 1.0
Content-type: text/plain; charset=US-ASCII
Content-transfer-encoding: 7bit

Aloha Karen and Sharon,

I apologize for the lateness of my reply. Here are my comments for the Po'ouli.

Comments on Po'ouli DEA

There is much concern over what needs to be done to "save" the Po'ouli. At the time there are 6 proposed alternatives.

Alternative #1 is not acceptable. If we continue the current management program, this species will go extinct. It is not what is currently being done is wrong, it is just not enough. Some form of manipulation needs to be done to form pair bonds and achieve reproduction.

Alternatives #2 - #6 all hold some risks for the birds but at the least hold out some potential to increase to chances of survivability for the species. Doing nothing (Alternative #1 i.e. continuing current management techniques) will guarantee the eventual extinction for the species.

Alternative #2 would be a more ideal solution if the population were not at such a low level. If birds are relocated to the territory of one of the other birds there is no guarantee that they would develop site fidelity to the new location. At present, there are not transmitters that will last long enough to allow monitoring of the relocated bird. If the relocation is successful, it seems it will be virtually impossible to know if the birds have bonded and or built a nest. There is no guarantee that the birds will find each other once they are relocated. From the information that I have received from the DEA and conversations with the Po'ouli field crew I understand that the birds are difficult to locate at any given time. Sometimes it is days or even weeks between sightings. If a nest is located, there is the chance that the nest will be located in an inaccessible area. If a nest is accessible, poor weather conditions may prevent flying the egg out by helicopter to the Peregrine Fund for hand rearing. Often there is only a small window of opportunity for the optimum transport of eggs.

Alternative #3 may help with pair bonding and slightly increase the probability of site fidelity to the new location, but the problems with

monitoring the birds and egg retrieval are the same as with Alternative #2.

Alternative #4 is a somewhat better option in that the problems with site fidelity, locating birds and nests, egg retrieval are mitigated or eliminated. The down side is the logistics of operating a field aviary. If there is a medical problem it may be difficult to get the bird to a vet quickly or bring a veterinarian into the site in a timely manner because of poor flying conditions. Also, getting fertile eggs out to the Peregrine Fund facility could be hampered by the same weather related constraints. There has been some thought that a field aviary would provide the proper climatic conditions and plant material that is essential for the birds well being. It has been shown that the Po'ouli formally occurred in habitat that is very different from the current habitat. This brings up the possibility that the Hanawi site is merely a refugia for the species and not optimum habitat. The birds may be adaptable to conditions in a different location. Hanawi's exact climate may not be essential to the Po'ouli's survival and breeding. It is not be imperative to provide identical climatic conditions in situ in order to achieve captive breeding.

Alternative #5 may be a fair compromise. It would give the birds a chance to adapt to captive environment and a novel diet. Once the birds have been acclimatized they could be moved to a breeding facility that would be closer to veterinary care and if eggs are produced they would have a better chance of being directly transported to the Peregrine Fund facility for hand rearing. While the birds are in the temporary field aviary they would still be vulnerable to the vagaries of weather for veterinarian care and logistics in servicing the field aviary.
The one advantage would be in acclimating the birds to captivity and captive diet. If the birds appear not to adjust quickly, there is the option that the birds can be immediately returned to the habitat.
There still remains the problem of finding or building a breeding facility and hiring trained personnel to operate it. At present, there is not a facility available to house the captive-breeding project. It is important not to turn these birds over to anyone that does not have the desire or courage to take on the challenge of this important project.
Alternative #5 is my choice of options for the Po'ouli.

Alternative #6. Captive propagation should, in most circumstances, be considered the last resort for population restoration. This is a last resort situation.

Due to the urgent nature of the problem, action needs to be taken quickly. It is not known how old these birds are, what their life expectancy is or their total reproductive potential. How long do they have to live even under optimal circumstances? We need to be prudent but act quickly and decisively. Every breeding season lost pushes them closer to extinction.

The current practices of habitat conservation need to be stepped up and solutions to problems inhibiting effective predator control must be aggressively pursued. The habitat must be protected and made safe from introduced predators. Not only for Po'ouli, but for other endangered birds, plants and invertebrates in the Hanawi NAR.
I agree with the Peregrine fund on aggressive habitat maintenance and Tonnie Casey on rodent control. But, there needs to be more intervention. Birds do not maintain a seed bank and rebound quickly like plants when predators are removed. They cannot be propagated vegetatively or cloned like plants. We need to get offspring that represent all three birds if possible. The only way to do it is do some form of intensive manipulation or captive management.

In conclusion, I recommend Alternative #5. This may give the birds a chance to acclimate in a more familiar environment and give a bit more time to work out the logistics of where and who will operate the captive propagation site.

James Mejeur
Curator of Birds
Honolulu Zoo

Jeffrey M. Melrose
1405 Waianuenue Ave.
Hilo, HI 96720

October 12, 1998

Mr. Michael Buck
Administrator
DLNR-DOFAW
1151 Punchbowl St., Rm. 325
Honolulu, HI 96813

Possible Management Actions to Save the Po'ouli: Comments on Draft Environmental Impact Statement

Dear Mr. Buck;

I have had an opportunity to review the joint USFWS and DLNR Environmental Assessment on the Po'ouli and would like to offer several comments.

First, the plight of the Po'ouli should not be looked at in isolation from the challenges that have shaped our endangered species crisis statewide. This is not a struggle simply to keep three individual birds alive in hopes of future propagation. Rather, the birds should be viewed more holistically, as extensions of the natural resources and niche environment in which they evolved. If current habitat conditions will not sustain a species then we should focus our primary efforts on improving and defending the habitat so they can survive in the wild. If, collectively, we can not master the art of broad-scale habitat management then our species crisis will continue unabated and we, as a society need to learn how to say "good bye" to rare species as they become victims of the changing habitats that once supported them.

In the case of the Po'ouli, there are as many as five other endangered forest birds that share the Hanawi habitat along with another 18 rare plants, various snail species and an unknown number of native insects. Given the amount of endemism in Hanawi, it seems unreasonable to focus the bulk of our attention on manipulating the future of three individual birds rather than investing more in a comprehensive habitat management effort aimed at sustaining an entire ecosystem with its many dependant parts.

I strongly recommend that the EA be revised to include a new alternative that is focused primarily on habitat management. This alternative should lay out the full range of management efforts to control predators, reduce avian diseases, increase natural food sources, and to control exotic plants and animals. This alternative should be coupled with increased efforts to locate additional Po'ouli in Hanawi and to target initial management efforts in the immediate ranges where these birds are found. This alternative should not involve any direct manipulation of the surviving

individuals until there is adequate information to support invasive actions.

Secondly, **the Peregrine Fund's stated refusal to accept captive control of the Po'ouli should not be taken lightly.** Over the past five years I have watched with great appreciation as the Peregrine Fund has entered statewide initiatives to preserve endangered bird species. They have proven to be practical and well studied contributors to the dialogue and they have an admirable track record in the work they do, both in Hawaii and internationally. Their ability to assess the risks associated with physical manipulation of rare birds is based on their own extensive experience and the work of many others around the world. I encourage USFWS and DOFAW to heed the advise that the Peregrine Fund has offered. They offer a prudent alternative approach to addressing the Po'ouli situation without the high risk of loss from capture or other external manipulations. The Peregrine Fund understands full well that the answer lies first and last in the management of natural habitat, and beyond that, "we can only do what we know how to do".

I encourage the agencies involved to move aggressively to manage the habitat of the Po'ouli and other endangered species at Hanawi and to proceed cautiously when it comes to physical manipulation of any kind that will put the birds at early risk of death in the hands of well intentioned scientists.

Thank you for the opportunity to comment.

Sincerely,

Jeffrey Melrose
Land Planner/Resource Manager

cc: Robert Smith, USFWS

Theresa Menard
University of Hawaii
Department of Zoology
2538 The Mall
Honolulu, Hawaii 96822

October 9, 1998

Sharon Reilly
Wildlife Biologist
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

RE: DRAFT ENVIRONMENTAL ASSESSMENT FOR POSSIBLE MANAGEMENT ACTIONS TO SAVE THE PO'OULI

Dear Sharon,

I care deeply about the preservation of native Hawaiian plants and animals. However, I do not want to see hundreds of thousands–or more likely millions–of tax dollars spent on actions that would benefit only the Po'ouli when so many endangered species would benefit if that money was spent on habitat management instead. I favor an "ecosystem approach", which from here on I'll refer to as Alternative 7, because this approach benefits the Po'ouli and other native Hawaiian species.

According to the DEA, management of the Po'ouli's habitat has consisted of fencing, ungulate control, predator control, and weed control. These actions improve the habitat for many rare animals and plants and should be continued. I am not advocating taking funds away from the Maui Forest Bird Project (which receives approximately $300,000 a year from the US Fish and Wildlife Service) to implement these actions. Rather, I am advocating that money allocated for Po'ouli-specific programs (Alternatives 1 through 6 in the DEA) be reallocated to programs that focus on intensive habitat management (Alternative 7).

Actions benefiting only Po'ouli

From a review of Alternatives 1 to 6, I have identified 13 actions that benefit only the Po'ouli (Table 1). Alternative 5 (hold in field aviary and transfer to captivity) requires all 13 actions. Alternative 1 (current management - no manipulation of birds) might require as few as 2 actions if no eggs are discovered or up to 6 actions if eggs are discovered and a successful captive propagation program results. The ecosystem approach, Alternative 7, does not entail any of the 13 actions.

Table 1. Po`ouli Recovery Actions Requiring Money, by Proposed Alternative

	Alternatives (refer to draft environmental assessment)							
	1		2	3	4	5	6	7
Actions requiring $$	no eggs	eggs found						
1. intensive mist-netting & monitoring of known Po`ouli by current field crew	X	X	X	X	X	X	X	
2. searches for additional Po`ouli	X	X	X	X	X	X	X	
3. hiring of aviculturist		X	X	X	X	X	X	
4. hiring of aviary staff					X	X		
5. construction of living space for aviary staff in the immediate vicinity of aviary					X	X		
6. hiring of avian veterinarian			X	X	X	X	X	
7. hiring of helicopter to transport eggs out of forest		X	X	X	X	X		
8. hiring of helicopter to translocate bird within forest			X	X	X	X		
9. hiring of helicopter to remove birds from forest						X	X	
10. construction & maintenance of one or two field aviaries & holding cages				X	X	X		
11. improvements to existing breeding facilities			X	X	X	X	X	
12. construction of release structures		X	X	X	X	X	X	
13. post-release monitoring		X	X	X	X	X	X	
TOTAL NUMBER OF ACTIONS	2	6	9	10	12	13	8	NONE

Example: cost of one of the alternatives that would benefit only Po`ouli

In Appendix 1, I estimate the cost of an alternative requiring a medium number of actions, namely Alternative 6, captive propagation. If we bring wild Po`ouli into captivity at a facility other than the Peregrine Fund's Keauhou Bird Conservation Center and enough birds breed in captivity such that some can be released back into their habitat, then we must budget for at least 8 actions. The total costs of these actions (based on what I consider to be reasonable assumptions) is **$357,200**. (No doubt, a more realistic estimate could be provided by state and federal wildlife agencies.)

I likely underestimated this total as I did not budget for the salaries beyond the first year for an aviculturist and assistant, nor did I include the cost of an avian veterinarian. Moreover, the helicopter time may be underestimated. Also, I did not include the cost of field supplies and equipment, such as radio-transmitters, batteries, radio-receivers, computers, mist nets, mist net poles, etc. And finally, I only estimated the cost of post-release monitoring for one year, whereas several years may be warranted.

At nearly $160,000 a year, the expense of a post-release monitoring program could add up quickly. Indeed, New Zealand's Department of Conservation is having difficulty funding the post-release monitoring of the rare Chatham Robin. Below are pertinent excerpts from an email on the subject found on the internet[1]. The entire message is in Appendix 2.

> New Zealand's Department of Conservation is presently reviewing its commitment to close-order monitoring of the Chatham Island black robin (Petroica traversi). The review is prompted by the need to consider competing species management priorities, in the context of severe resource constraints.
>
> Active management of the robins ceased in 1989, but because the species is so intensely inbred (all living robins are descended from one female – the revered 'Old Blue'), its populations have been monitored very closely since that time.
>
> From the point at which Don Merton intervened to rescue the species 22 years ago, the genealogical record of the robins is almost entirely intact. Trends in abundance, fertility, distribution and behaviour have been recorded also.
>
> A substantial investment has been made to rescue the robins from extinction and to guard against decline. For this reason, the Department is anxious to ensure that it has considered all authoritative views on alternative monitoring regimes and the research potential of the robins before it abandons or reduces contact with the populations. It seeks comment on the wisdom of these two options.

Pros of the Ecosystem Approach (Alternative 7)

1. Intensive habitat management benefits all native Hawaiian species, including the Po`ouli.

With the hundreds of thousands of dollars intended for Po`ouli-specific actions, habitat management could accelerate at Hanawi. For example, a program could be funded to control non-native birds. Non-native birds, like the Red-billed Leothrix, act as disease-reservoirs (Leonard Freed, personal communication). Thus, reducing the population of non-native birds would likely reduce the incidence of disease in many species of native forest birds at Hanawi. Moreover, eliminating the Red-billed Leothrix might benefit the Po`ouli because the two species are thought to compete for food.

[1] source: http://www.cse.unsw.edu.au/birding-aus/hypermail/1997/3026.html

Furthermore, money could be spent on studies to promote the Environmental Protection Agency's registration of aerial broadcast of rodenticide. According to Catherine Swift, who completed the first phase of rodenticide studies, additional monies are needed. Below I quote a pertinent passage from her master's thesis[2].

> Prospects for a Broadcast Registration of a Rodenticide in Hawaii
>
> Finally, and most crucial for the future success of conservation-use rodenticide registrations in Hawaii, upper-level agency personnel in Hawaii must increase financial support for research required by the EPA. William W. Jacobs, of the Registration Division, Office of Pesticide Programs, U.S. EPA, stated in his 1992 address to the Vertebrate Pest Conference that "... the data needed to support a large-scale, outdoor non-food use can cost hundreds of thousands of dollars or more." Close to one hundred thousand dollars have already been spent on the Ramik Green® laboratory bioassays and field study preparations, with the largest contributions coming from the NWRC Hawaii Field Station and the State Division of Forestry and Wildlife. Smaller contributions were made by Hacco, the Hawaii Audubon Society, and the US Fish and Wildlife Service. To complete the field marker study and other EPA registration data requirements for rodenticide broadcast in Hawaii for conservation purposes, approximately one million dollars more will most likely be needed (Campbell, pers. comm.). Given that millions of dollars have been spent in Hawaii on efforts to save single species from extinction, it seems reasonable to spend a comparable amount on a technique that has the potential to benefit all native Hawaiian species.

2. Legal protests associated with bringing in the remaining wild birds may be avoided.

When the remaining wild condors were being brought into captivity, the National Audubon Society attempted legal maneuvering to halt the action[3]. If a legal challenge were

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[2] Swift, Catherine E. 1998. Laboratory bioassays with wild-caught introduced black (*Rattus rattus*) and Polynesian (*R. exulans*) rats to determine minimum amounts of Ramik Green® (0.005% diphacinone) and exposure times for field broadcast applications in Hawaii. Unpublished Master's Thesis submitted to University of Hawaii, Manoa.

[3] source: http://www.cerf.net/lazoo/ctime.htm

1986

January -- Chumash Indians, who view the condor as a sacred bird, raised first concerns about removal of condors from the wild; insisted that all trapping cease and condors be released on Santa Cruz Island.

USFWS announced decision to capture all three remaining wild condors; National Audubon Society sued USFWS to prevent further capture of wild condors; U.S.; District court granted preliminary injunction, later modified to allow capture of certain birds.

1987

April 19 -- The last free-flying representative of its species, 19-pound, 7-year-old adult male, AC-9, captured. AC-9 destined for L.A. Zoo, but taken to SDWAP because protestors had chained themselves to the Zoo's front gate. AC-9 returned to L.A. Zoo a year later.

June -- U.S. Court of Appeals reversed lower court and lifted trapping injunction.

made to stop the Po'ouli from being taken into captivity, then money that could have otherwise gone to endangered species might be used to pay for litigation.

3. The regional office of the US Fish and Wildlife Service would be implementing the vision held by the Service's Directorate.

An internal US Fish and Wildlife Service investigation[4] found that "the US Fish and Wildlife Service is in the preliminary stages of implementing the Ecosystem Approach, despite three years of activity". Here is an opportunity for the USFWS in Hawaii to implement the Ecosystem Approach. This approach has already been sanctioned by the Service's Directorate. Below are excerpts from the USFWS web page that attest to the Directorate's resolve.

> The Directorate is fully committed to implementation of the Ecosystem Approach to Fish and Wildlife Conservation...The Directorate expects leaders at all levels in the Service to be visible proponents of the concept, philosophy, and application of the Ecosystem Approach. Leaders must increase their level of education in ecosystem management, celebrate ecosystem success stories, and recognize and reward employees who model behavior that is supportive of the Ecosystem Approach. Leaders must personally communicate the importance of the Ecosystem Approach for conservation of fish and wildlife resources to the Service. The Directorate agrees that those of us who will not support the direction of the Service must be prepared to step aside...The Directorate is committed to fully embracing the Ecosystem Approach and supporting all aspects of its implementation. Furthermore, we will provide clear and consistent guidance through both formal and informal means of communication to Service management who will, in turn, ensure that all Service employees are knowledgeable and equipped to implement the Ecosystem Approach.

4. Expensive single-species recovery actions are frowned upon by taxpayers and are fodder for those who oppose the Endangered Species Act.

There is a growing resentment of the Endangered Species Act, which stems in part from the cost associated with rescuing species on the brink of extinction. The National Endangered Species Act Reform Coalition supports reforms of the ESA that would mandate "cost-effective recovery plans"[5]. If we do not implement an Ecosystem Approach and instead choose to fund expensive single-species recovery actions, then the National Endangered Species Act Reform Coalition (or another such group) may point to the Po'ouli project as an example of a *cost-ineffective* recovery plan.

<u>Cons of the Ecosystem Approach (Alternative 7)</u>

1. The Po'ouli may go extinct in the wild.

Admittedly, there is no guarantee that the Ecosystem Approach will save the Po'ouli from extinction. Likewise, there is no guarantee that Alternatives 1 through 6 will work either.

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[4] source: http://www.fws.gov/ecoreport/execfin.html

[5] source: http://www.nesarc.org/index.htm

What's certain, however, is that Alternatives 1 through 6 involve costly actions that will benefit only the Po'ouli; whereas the Ecosystem Approach may benefit the Po'ouli and many native species. Now is the time to act if we want to restore habitat for the endangered Maui Parrotbill and 'Akohekohe, and for the more common, Maui 'Alauahio, 'I'iwi, 'Apapane, and 'Amakihi.

2. There may be a public outcry that more was not done.

If the Ecosystem Approach is tried, then some citizens are going to be upset that efforts as grand as those to save the 'Alala were not made to save the Po'ouli. Explaining the rationale behind the Ecosystem Approach will go a long way in assuaging the public's anger. Moreover, the public will not come to expect single-species recovery actions when the next species is on the brink of extinction.

Other issues and specific questions

I offer the following comments on the draft environmental assessment. My questions are in boldface type by section.

1. Problems with propagation

⇒ The DEA mentions that captive propagation "has been used in several recovery programs nationwide and internationally (e.g. Alala, Laysan Duck, Nene, California Condor, Puerto Rican Parrot, Guam Rail, Micronesian Kingfisher, Bali Myna, etc.), but none of these programs were initiated when only 3 birds were left in the wild[6]. I am aware that the Chatham Robin was down to 5 birds at one point, and since the initiation of a recovery program the numbers have increased. As best I can tell from the web page[7], the wild

[6] Alala: propagation started with 12 captive birds
Laysan Duck: lowest population size was 20
Nene: lowest population size was 30
California Condor: propagation started when wild population totaled 21 birds
Puerto Rican Parrot: propagation started when wild population totaled more than 13 birds
Guam Rail: propagation started when wild population totaled 100 birds
Micronesian Kingfisher: propagation started with 29 birds
Bali Myna: propagation started when wild population totaled 250 birds

[7] source: http://www2.wcmc.org.uk/species/data/species_sheets/chatham.htm
Chatham Robin - *Petroica traversi*.
CONSERVATION PROJECTS Following the deterioration of scrub-forest habitat of Little Mangere Island in the 1970s the entire population of seven birds was transferred to Mangere, and when by 1980 numbers fell to just five birds, including only one viable pair, an egg manipulating, cross fostering programme was instigated by the New Zealand Wildlife Service; resulting in 100 birds in 1988, distributed between Mangere and South East Islands.

SPECIAL FEATURES The Chatham Islands Robin was reduced to a single breeding pair during the 1980s. Since then an intensive conservation programme has brought this species back from the edge of extinction, giving hope to other breeding programmes for critically endangered bird species.

Chatham Robins were not brought in captivity, although their eggs were involved in a cross fostering program. **Has any species of bird recovered with only 3 wild individuals? If not, then the final EA should plainly state that trying to recover a species with only 3 wild birds has never been attempted before.**

⇒ Dr. Paul Baker, who studied the Po`ouli in 1997, published a paper in the most recent volume of the *Wilson Bulletin*[8]. Based on plumage and behavior[9], Dr. Baker claims this bird (HR-2) is male; this determination was not supported by genetic analysis. **Since the gender of bird HR-2 is controversial, will aviculturists use this bird in propagation efforts? And if so, will it be mated to a male (HR-3) or a female (HR-2)?**

⇒ The DEA states that the Po`ouli "population may total only 3 birds". If the actual population size is higher, then removing these birds from the wild (by moving them to a breeding facility or sheltering them in a field aviary) *would reduce the chance that any undetected* birds could find mates. **Shouldn't the final EA list this as a major disadvantage associated with Alternatives 3 through 6?**

2. Captive propagation issues

⇒ According to the DEA, the cost of captive propagation (Alternative 6) will be minimal because the propagation facilities have already been built. However, should the Peregrine Fund decline the honor of accepting the last 3 Po`ouli, as they have indicated are inclined to do, there is no other facility in the state that is equipped to rear the Po`ouli. The breeding facility on Maui could be set up for the propagation of these birds. **Shouldn't the final EA state that this would increase the costs associated with Alternative 6?**

⇒ The process outlined in the DEA for captive propagation (Alternative 6) does not mention the need to construct release towers and aviaries. According to the Peregrine Fund's web page[10], release towers and aviaries were erected at Puu Waawaa during the release of Omao and are currently being erected in the Alakai Swamp for the release of Puaiohi. **If release towers and aviaries will be constructed for the release of Po`ouli, shouldn't this**

---

[8] Baker, Paul E. 1998. A description of the first live Po`ouli captured. *Wilson Bulletin* 110 (3):307-310.

[9] In an email reply to me, Baker wrote, "You probably noticed that yes I think it's a male. All the plumage evidence points to that (ref. the Engilis et al 1996 paper in WiBulletin), plus it presented nest material to a female parrotbill, and was also seen courtship feeding a female Po'ouli on one occasion."

[10] source: http://www.peregrinefund.org/hawaiiup.html
This week (Sept. 22-27) Paul Oesterle with the support of DOFAW's biologists will be erecting two release towers, topped by two release aviaries. These are structures that will get the young birds up off the ground and into the lower canopy. The towers will be rat-proofed to keep the predators at bay during the first weeks of release. The entire release area will get the additional protection of predator protection with rat bait and cat traps covering the area. The intrepid staff from BRD will get the honors of rat and cat control in the area. All of the native birds, insects, tree snails and seedlings breath a sigh of relief whenever predator control goes into an area. There may be nothing that can restore the balance of the forest faster that predator control.

additional expenditure be discussed in the final EA since it increases the costs associated with this alternative, perhaps making it less attractive to some?

⇒ The DEA mentions that one possible disadvantage of captive propagation (Alternative 6) is that captive birds could become ill or suffer stress-related injuries resulting in death. **Shouldn't the final EA mention that an outbreak of aspergillosis killed 8 endangered birds this year at the Keauhou Bird Conservation Center (Alan Lieberman, personal communication) since this fact makes Alternative 6 less attractive?**

⇒ **Given that the experts in the field of captive propagation (The Peregrine Fund) are hesitant to take the 3 remaining Po'ouli and are in fact advocating better habitat management and predator control[11], shouldn't we follow their advice?**

3. Significance criteria

⇒ The DEA states, "The proposed actions will not adversely affect a rare, threatened, or endangered species, or its habitat." However, this claim has not been established. In fact, the DEA admits that under each Alternative a proposed action may indeed, despite biologists best efforts, adversely affect the Po'ouli:

Alternative 1
"Under the Current Management Actions - No Manipulation Alternative, it is almost certain that the Po'ouli **will become extinct** in the next few years." (pg. 44)

Alternative 2
"Under the hard release option, while the bird(s) might not die while in the possession of the biologists, the bird(s) **could still suffer due to stress or other injury** that was incurred during capture and transport." (pg. 27)

Alternatives 3 and 4
"The field aviary and the captive birds would be susceptible to damage from harsh weather conditions, and any breach of the enclosure by predators (*e.g.*, mongooses, rats), **would likely be fatal** to one or all of the birds." (pg. 28)

---

[11] source: http://www.peregrinefund.org/hawaiiup.html
We look forward to propagating the Akiapolaau, Maui and Hawai'i Akepa, Kamao, and Olomao, if and when eggs are found, and the ultimate challenge -- the Po'ouli, the rarest known species in Hawai'i.
It is our hope that the Po'ouli can be managed successfully in the wild, providing the eggs that will ultimately become the founder stock for a captive propagation and restoration effort in the near future. With only three known individual Po'ouli in the forests of East Maui, management of their habitat and reduction of known threats is critical to this species' survival. Good luck to the field crew from the State of Hawai'i's Division of Forestry and Wildlife. Good luck to us all if they should find a nest with eggs.

Alternative 5
"In addition, once the birds are transferred to MBCC or another approved facility, it bears the same risks inherent in bringing birds into captivity (*e.g.*, stress, inability to quickly release the birds into the field)..." (pg. 29)

Alternative 6
"Should illness of stress-related injury or poor health become evident, **there is a chance that the birds would not recover.**" (pg. 30)

Therefore, even though the intent is to save the Po'ouli, the DEA admits that each of the proposed alternatives may have a significant impact (i.e., extinction of the species). **Shouldn't the final EA state that the proposed project *might* not (as opposed to "will not") adversely affect an endangered species?**

In closing, I respectfully ask those involved in making the final decision on which alternative will be implemented to heed the consensus of the scientific community. Thank you for the opportunity to participate in the environmental review process.

Sincerely,

Theresa C. Menard

Theresa Menard
Graduate Student in the
Ecology, Evolution and
Conservation Biology Program
University of Hawaii, Manoa

APPENDIX 1

Cost Estimate for Captive Propagation

1. Intensive mist-netting and monitoring of known Po'ouli: $20,600

The time it will take to capture two or three Po'ouli is unknown. A field crew and their supplies must be flown in and out of Hanawi by helicopter. Let's assume 6 people fly in (2 people per Po'ouli home range): an avian veterinarian, an aviculturist, and four field crew from the Maui Forest Bird Project. This portion of the field work should be funded by monies other than that allocated to the Maui Forest Bird Project since this task takes time away from the Project's other objectives such as predator and weed control and the monitoring of other native species. Although the state already employs an avian veterinarian and perhaps an aviculturist, these people may be presently caring for birds and eggs (e.g. alala, nene, Laysan duck) and are unable to spend blocks of time at Hanawi awaiting the capture of Po'ouli. For this reason, I include the cost of hiring an avian veterinarian and aviculturist. Assuming a team goes into the field for trips lasting 10 days and 2 trips are required, the total cost would be $20,600:

Helicopter $4,200
($700 per hour x 3 hour per trip (includes flying people and sling load in and out) x 2 trips = $4,200)

Personnel $14,000
Avian veterinarian
($150 per day x 20 days = $3,000)

Avian aviculturist
($150 per day x 20 days = $3,000)

Field assistants
($100 per person per day for 20 days x 4 people = $8,000)

Camping Per Diem $2,400
($20 per person per day x 6 people x 20 days = $2,400)

2. Searches for additional Po'ouli: $24,900

This portion of the field work should also be funded by monies other than that allocated to the Maui Forest Bird Project since this task takes time away from the Project's other objectives such as predator and weed control and the monitoring of other native species. If the state sends out three teams of 2 people for 4-day searches on 5 occasions a year, the total cost would be $24,900:

Helicopter $10,500
($700 per hour x 3 hours (includes in and out trip of people and gear) x 5 trips = $10,500)

Personnel $12,000
($100 per person per day x 4 days x 6 people x 5 trips = $12,000)

Camping Per Diem $2,400
($20 per person per day x 6 people x 4 days x 5 trips = $2,400)

3. Hiring of aviculturist and assistant: $120,000

A full time aviculturist will probably be needed unless the state already has one on hand who is available to take on this project. This aviculturist will need a lab assistant. This expense would need to include salaries, worker's compensation insurance, health insurance, social security taxes, etc. and might amount to $120,000 (Karen Rosa, personal communication).

Personnel $120,000
Aviculturist
($80,000 for first year)
Assistant
($40,000 for first year)

4. Hiring of avian veterinarian (no additional expense)
The veterinarian may only be needed during the field portion of the project (see above). Since the state has a avian veterinarian on hand, there may be no need to hire an additional veterinarian.

5. Hiring of helicopter to remove Po`ouli from forest: $2,100
It is possible that the three Po`ouli may be caught on three different days, thus necessitating three different trips. The total cost might be $2,100.

Helicopter $2,100
($700 per hour x 1 hour x 3 trips = $2,100)

6. Improvements to existing breeding facility: $10,000
If the Peregrine Fund declines to accept the 3 wild birds, then improvements would need to be made at another breeding facility (possibly the Maui Bird Conservation Center). The details of the upgrading are unknown to me, but at the public meeting on Oahu Karen Rosa estimated this cost would be about the same as constructing a field aviary or $10,000.

7. Construction of release structures: $20,000
If enough birds are bred to be released, then the release phase of the project will require the construction of release towers and personnel to supervise the release. Alan Lieberman (personal communication) of the Peregrine Fund estimated the cost of a release program at $20,000.

8. Post-release monitoring: $159,600
This is likely to be one of the most expensive aspects of Po`ouli recovery. A field crew will likely monitor the birds very closely to determine survivorship and learn more of the birds habits. In addition, because of the genetic bottleneck, scientists will want to follow these birds for several years to learn who is mating with whom. Additional staff will be required, as the present staff of the Maui Forest Bird Project will not be able to intensively monitor Po`ouli and fulfill the Project's present tasks of predator and weed control and the monitoring of other native species. I foresee the need to hire 4 additional field assistants for post-release monitoring during the first year of release. The post-release crew might fly in every month. Three hours per month might be required to shuttle four people and a sling-load in and out of site. The total cost would be $159,600:

Personnel $120,000
Field Assistants
($30,000 for first year x 4 people = $120,000)

Camping Per Diem $14,400
($20 per day x 15 days per month x 4 people x 12 trips per year = $14,400)

Helicopter $25,200
($700 per hour x 3 hours per month x 12 months = $25,200)

APPENDIX 2

Email message concerning post-release monitoring of Chatham Robins (http://www.cse.unsw.edu.au/birding-aus/hypermail/1997/3026.html)

>Delivered-To: pop-conservation@RAOU.COM.AU
>Approved-By: Jeanette Bider <jbider@OBSSUN02.BIO.OU.EDU>
>Date: Thu, 18 Dec 1997 08:19:39 -0600
>Reply-To: The scientific discussion of Ornithology
> <ORNITH-L@UAFSYSB.UARK.EDU>
>Sender: The scientific discussion of Ornithology
> <ORNITH-L@UAFSYSB.UARK.EDU>
>From: "KENNEDY, Euan [EPU,CHC]" <EKennedy@doc.govt.nz>
>Subject: Black robin monitoring
>To: ORNITH-L@UAFSYSB.UARK.EDU
>
>New Zealand's Department of Conservation is presently reviewing its
>commitment to close-order monitoring of the Chatham Island black robin
>(Petroica traversi). The review is prompted by the need to consider
>competing species management priorities, in the context of severe
>resource constraints.
>
>Black robins survive in two small populations on the island reserves of
>Mangere and Rangatira (South East) in the Chatham Islands group. The
>species now numbers in excess of 200 birds, each of them individually
>colour-marked and behaviourally conditioned for easy observation.
>
>Active management of the robins ceased in 1989, but because the species
>is so intensely inbred (all living robins are descended from one female
>— the revered 'Old Blue'), its populations have been monitored very
>closely since that time.
>
>>From the point at which Don Merton intervened to rescue the species 22
>years ago, the genealogical record of the robins is almost entirely
>intact. Trends in abundance, fertility, distribution and behaviour have
>been recorded also.
>
>In these respects, the species offers a rare opportunity to observe the
>recovery of a geographically isolated forest-dwelling insectivorous
>species as it emerges from a very severe genetic bottle-neck.
>
>A substantial investment has been made to rescue the robins from
>extinction and to guard against decline. For this reason, the Department
>is anxious to ensure that it has considered all authoritative views on
>alternative monitoring regimes and the research potential of the robins
>before it abandons or reduces contact with the populations. It seeks
>comment on the wisdom of these two options.
>
>It should be noted that once monitoring is reduced from its current
>intensity, contact with entire populations will be lost rapidly, and
>recovered only with the greatest of expense and difficulty. The lapse in
>the genealogical record will never be remedied.
>

>A discussion document has been produced which traverses the history of
>the robin recovery programme, the quite significant threats confronting
>the species, and the implications of concluding or reducing the
>monitoring regime. This paper is obtainable from the address below, or
>electronically from <ekennedy@doc.govt.nz>.
>
>Comment is invited by the end of February 1998. Expressions of research
>interest are also welcome.
>
>Euan Kennedy
>Co-ordinator, Black Robin Recovery Group
>Department of Conservation
>Private Bag
>Christchurch
>New Zealand
>
>Phone 64 3 379 9758
> 64 3 371 3715 (Direct Line)
>Fax 64 3 365 1388
>
>
Hugo Phillipps,
Birds Australia Conservation & Liaison,
Australian Bird Research Centre,
415 Riversdale Road,
Hawthorn East, VIC 3123, Australia.
Tel: (03) 9882 2622. Fax: (03) 9882 2677.
O/s: +61 3 9882 2622. Fax: +61 3 9882 2677.
Email: <conservation@raou.com.au>

Shawn

STATE OF HAWAII
OFFICE OF PLANNING
P O Box 2359
Honolulu, Hawaii 96804

Ref. No. P-7718

October 1, 1998

Mr. Robert P. Smith
Pacific Islands Manager
U.S. Fish and Wildlife Service
Pacific Islands Ecoregion
Box 50088
Honolulu, Hawaii 96850

Dear Mr. Smith:

Subject: Draft Environmental Assessment for Possible Management Actions to Save the Po'ouli (Bird)

We have reviewed the above assessment to save the Po'ouli. Over the years, public and private organizations have worked cooperatively to preserve the Po'ouli's native habitat. Recent field studies have found that only three Po'ouli remain in the wild. The six alternatives, except for the no action alternative, describe methods to increase breeding and propagation of the remaining birds. We hope there is still time to act on the alternatives represented. Consideration should also be given to preserving the genetic material of the Po'ouli for future research.

If there are any questions, please contact Christina Meller of our Coastal Zone Management Program at 587-2845.

Sincerely,

Bradley J. Mossman

Bradley J. Mossman
Director
Office of Planning

cc: Michael G. Buck, DLNR-DOFAW

BENJAMIN J. CAYETANO
Governor

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 South King Street
Honolulu, Hawaii 96814-2512

JAMES J. NAKATANI
Chairperson, Board of Agriculture

LETITIA N. UYEHARA
Deputy to the Chairperson

Mailing Address
P.O. Box 22159
Honolulu, Hawaii 96823-2159

Fax 808 973-9613

October 2, 1998

To: Mr. Michael Buck, Administrator
Department of Land & Natural Resources
Division of Forestry and Wildlife

From: James J. Nakatani, Chairperson
Board of Agriculture

Subject: Comments on draft EA for Possible Management Actions to Save the Po'ouli

Thank you for allowing my department to comment on the draft environmental assessment (EA) to save the endangered Hawaiian honeycreeper, the Po'ouli. After reviewing the document, we have concluded that none of the six proposed alternatives for management of the Po'ouli will adversely impact agriculture on Maui.

We commend the Hawaii Division of Forestry and Wildlife and the U.S. Fish and Wildlife Service for exploring all options in trying to save this species in imminent peril of extinction. Our staff is not qualified to comment on the advantages or disadvantages of any of the proposed alternative management plans with respect to the welfare of the Po'ouli. However, alternative four presents the greatest risk for the introduction of alien weeds into the East Maui watershed via the increased foot traffic. This risk should be given serious consideration since the effort to save one species could adversely impact the entire watershed. The East Maui watershed contains some of the largest tracts of intact native rain forest left in the state.

Alien plants invading these forests could degrade the ability of this forest to prevent erosion and catch water.

As the draft EA points out, most of the habitat of the Po'ouli is within the Hanawi Natural Area Reserve (NAR) which is already managed to conserve native flora and fauna and protect the East Maui watershed. Proper management of this important watershed is critical to maintaining productivity of large areas of agricultural lands on Maui. More intensive management

of the habitat in and around the Hanawi NAR (such as feral pig and weed control) to save the Po'ouli should be an added benefit for the East Maui watershed.

We hope that our comments will be useful to you in your difficult task ahead. Thank you again for giving us the opportunity to provide them.

JJN:PC:li
1652:PDCB

IN\dw

12 October 1998

Dr Michael G. Buck
Administrator
DLNR-DOFAW
1151 Punchbowl Street, Room 325
Honolulu
Hawaii

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Dear Dr Buck

Management actions for the Po'ouli

We met briefly a couple of years ago when I was on Hawaii for a Peregrine Fund meeting, and I have read with great interest the draft environmental assessment for the Po'ouli. If it is not too late, I would like to offer the following comments on the various proposals and options:

1. *Habitat management.* It seems essential to maintain a high level of habitat management and predator control in at least the area currently under management. This is a bare minimum, however, and I believe there are strong grounds for intensifying these management measures, and for extending them over a wider area, including other potential Po'ouli habitat (see below). Aerial broadcasting of rodenticide could become essential to save many forest birds and the background research for this seems a matter of great urgency.

2. *Management actions for the Po'ouli.* Two major uncertainties still underlie the proposals, namely the number of birds remaining and their sexes.

Given the nature and extent of potential habitat, and the difficulties of locating the species, it is not impossible that more individuals than those identified still remain. This does not reduce the urgency of the situation, but argues for an expanded search effort into other suitable areas, and an expanded programme of habitat/pig/predator management (which should anyway benefit a wider range of native species).

In most species of birds, site-fidelity (and hence tendency to disperse or return home after translocation) depends on sex, with male passerines being more site-faithful and less dispersive than females. Translocation is therefore more likely to be successful if a female, rather than a male, is moved. But this is dependent on reliable sexing criteria, and is probably not worth attempting if sexes are uncertain. It is anyway a high risk procedure, because translocated adults of either sex may simply return home, or attempt to.

None-the-less, if sex can be determined with certainty, I would favour moving one female into the home range of a male at the start of a breeding season, having ascertained carefully beforehand that neither bird is already paired.

3. *Captive birds.* With present knowledge, it seems to me to be very risky to try and keep adults in captivity for long periods, while the chances of breeding from wild-caught adults are probably close to zero. My feelings are therefore that existing adults should not be taken into long-term captivity.

However, if a bird is to be translocated, the experience of holding that bird in captivity for part of a day may give clues to how the birds would adjust to captivity - for example whether they would eat any of the foods offered. This might help in later decisions.

If a captive population is to be built-up, it seems best to do this using eggs from the wild, rearing the resulting young, and learning from this experience. Given the likelihood of nest-failure in the wild, I would be in favour of the removal of a clutch of eggs for captive rearing. We should accept, however, that even in the best of hands, this may not be successful. It is a risky, but potentially high reward strategy, for if birds can be raised, they may themselves breed in captivity, or at the least might be releasable to the wild.

In summary, then, on the basis of my extremely limited local knowledge, I would favour (1) intensified and expanded habitat management (especially pig and predator control); (2) continued searches for birds in areas outside the known current home ranges; (3) experimental translocation of a known female to a known male at a time of year when they should be interested in one another; and (4) removal of a clutch of eggs for experimental captive rearing.

Your sincerely

Ian Newton

Ian Newton
Professor of Ornithology

USGS
science for a changing world

U. S. Department of the Interior
U. S. GEOLOGICAL SURVEY
BIOLOGICAL RESOURCES DIVISION
PACIFIC ISLAND ECOSYSTEMS RESEARCH CENTER
Kilauea Field Station
PO BOX 44, Building 344
Hawaii National Park, Hawaii 96718
(808) 967-7396 ext. 234, FAX (808) 967-8568
Email: Thane_Pratt@USGS.GOV

15 September 1998

Karen Rosa, Acting Field Supervisor
Ecological Services
U.S. Fish and Wildlife Service
P. O. Box 50088
Honolulu, HI 96850

Dear Karen,

Thanks for the recent drafts of the Poouli Environmental Assessment. I'll be very interested to see how the public review of the project goes. A lot of work was put into the EA, and it looks in very good shape.

A few very minor corrections.

p 1, last line. I would say "Hana and Koolau Forest Reserves."

P 2, paragraph 2, last line. 121 ha is too small. Without measuring it, I would say 200 ha at least.

P 7, paragraph 3. Monitoring invasion of non-native plants into the NAR was not one of our main objectives. We mainly did it to alert NAR staff and to prevent ourselves from introducing weeds.

P 11. Avian Disease. There has actually been quite a bit more disease work done at Hanawi: Lenny and crew sampled birds, Carter went back a second time, John Simon's crew scored all banded birds for pox lesions, they also monitored presence of mosquitoes. I don't think though that you need to go into all that here.

You needn't include these comments with official response to the EA that goes in the back of the document.

Sincerely yours,

Thane K. Pratt, PhD
Wildlife Biologist

Thank K PJC

ROBERT L. PYLE
1314 Kalakaua Ave. #1010
Honolulu, Hawaii 96826

September 25. 1998

Michael G. Buck, Administrator
DLNR-DOFAW, 1151 Punchbowl St., Rm 325
Honolulu, Hawaii 96813

Ref: EA for Po'ouli

Dear Mr. Buck:

Thank you for sending me the draft EA for possible actions to save the Po'ouli, and for inviting me to attend the stimulating and informative meeting last evening in Honolulu. After reviewing the EA and attending the meeting, I would like to pass on some of my personal views.

Most important immediate action. in my view. is to improve and manage the forest habitat in Hanawi NAR as a valued native ecosystem for the benefit of all of its species, but with Po'ouli as the flagship species.

---use of available funds this way will produce a certain and long-lasting benefit for many species, even if the Po'ouli is not saved.

---actions directly benefiting Po'ouli would have preference over actions not benefiting Po'ouli, even if the latter actions may benefit other species.

---program should be expanded toward goal of protecting/preserving entire Hanawi NAR and surrounding native forest. including elimination of worst predators, fencing for pigs, removing the worst alien plants, controlling disease vectors and erosion.

---actions should be taken and expanded as quickly as possible. given the uncertain lifetimes remaining for the three birds.

Alternatives involving translocation and captive management are viable options. But at this time, in my view, the physical and behavioral risks to the birds and the uncertainty of breeding success outweigh the uncertain chances for benefits. ----- Another important immediate action is to begin serious investigation of the factors and uncertainties responsible for these risks, with the goal that better knowledge and understanding may improve the benefit/risk ratio to make some of these alternatives more attractive while there is still time.

---sex of each of the three remaining birds should be verified to the highest confidence possible from all available scientific techniques, before any translocation action is taken.

---experienced experts on capture procedures and captive breeding of small insectivores should be consulted to focus on Po'ouli's special problems of inaccessibility and limited knowledge of its physical and social requirements.

---surrogate species should be captured in the Po'ouli home range and translocated, to test these procedures in this unique situation. Experience with current captive breeding of Hawaiian honeycreepers probably will be useful, but not definitive, for Po'ouli.

---these actions should be considered urgent. Limited remaining lifetime of the three birds indicates that any of the translocation/captive management options should be undertaken soon, if such is decided to be justified and feasible.

I appreciate the opportunity to review the EA and attend the Honolulu meeting, and I hope some of these resulting views may be pertinent.

Sincerely,

Robert L. Pyle, Manager
Occurrence & Status of Birds in Hawaii, Bishop Museum

→ Sham
file

United States Department of the Interior

NATIONAL PARK SERVICE
Haleakalā National Park
P.O. Box 369
Makawao, Maui, Hawai'i 96768

IN REPLY REFER TO

October 6, 1998

Mr. Michael G. Buck
Administrator
DLNR-DOFAW
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Dear Mr. Buck:

Haleakalā National Park does not necessarily have a single position on what is the best alternative to save the Po'ouli. Therefore others on the park staff have been encouraged to submit their thoughts and ideas on the issue.

It appears that all reasonable alternatives are well described. None seems very promising in saving the species. I don't recommend alternative #1 (no manipulation of the known birds). Some manipulative action needs to be taken. Considering the remaining alternatives I favor an attempt at one approach described in alternative #2. As soon as possible capture one female, translocate her to the home range of the male, and monitor what happens. I intuitively feel the bird should be moved as quickly as possible, not holding her overnight, if possible. I'm not enthusiastic about attaching a radio transmitter since it may reduce the chances for success. If she pairs with the male, great! If she disperses, she may survive for an attempt at another more manipulative approach in the future.

By all means, expand habitat improvement and predator control programs, including the aerial application of approved rodenticides.

Mahalo for the opportunity to comment. You can count on our support on whatever action you decide.

Sincerely,

Donald W. Reeser
Superintendent

The Zoological Society of San Diego

9 October 1998

Michael G. Buck
DLNR-DOFAW
1151 Punchbowl St., Rm. 325
Honolulu, HI 96813

Dear Mr. Buck:

Thank you for the opportunity to review the draft EA for the po'ouli. I have the following comments to offer.

1. First and most importantly, I feel that management alternative #1 has been misrepresented. It is repeatedly described as a "no action" option. This gives the impression that nothing would be done to save the po'ouli. This alternative actually represents a focusing of all efforts and resources toward managing the remaining individuals in the wild (the ecosystem management approach). At minimum this should involve dramatically increased predator and feral pig control, habitat restoration, and more comprehensive searches for additional birds. The benefits of this option were ignored in the comparative evaluation of alternatives, and the benefits are great in my opinion. This alternative not only provides the best chance for survival of the three known po'ouli, but also benefits the many other threatened species in this ecosystem. This type of misrepresentation is inexcusable in a document that purports to be an unbiased presentation of scientific data and a comprehensive description of all management options.

2. The incomplete descriptions of the field surveys in the draft EA make it impossible to evaluate the thoroughness of these searches. In addition, interpretations made regarding numbers of birds counted prior to banding of the three known individuals should be viewed with caution. At this point, I would have to view these surveys as incomplete, and any conclusions about the number of birds remaining as very tentative. This leaves a very real possibility that additional

Post Office Box 551, San Diego, California 92112-0551 USA Telephone (619) 231-1515 FAX (619) 231-0249

po'ouli exist, and this possibility should not be ignored when evaluating the management alternatives.

3. Alternatives 2-5 all involve manipulations of some or all of the three known individuals. Those alternatives that include captive propagation are the most problematic. The draft EA offers the experiences of various zoos with amakihi, i'iwi, oma'o, and apapane as a model for the likelihood of successful captive propagation of po'ouli. These are inappropriate comparisons in my view. A great deal of background information is available on the diet and natural history of these species, which is generally lacking for the po'ouli. In addition, the evidence I have seen so far suggests that po'ouli are greater dietary specialists than these other species. This means that captive maintenance, not to mention propagation, would be much more difficult with po'ouli than these other species. The mortality rate in captivity for wild caught, adult, insectivorous passerines is high. In the case of the po'ouli, this risk is unacceptable.

4. All of the alternatives that involve manipulation of individuals have the stated purpose of creating "pair bonds". Successful pairing would seem to require accurate knowledge of the gender of the birds. The lack of this information for the po'ouli creates significant problems for these management approaches. It is worth mentioning that forced pairings can be difficult enough under the best of circumstances. Attempting it in critically endangered birds of uncertain gender in a captive setting is hardly wise management. If forced pairings are essential for the survival of the po'ouli, I would suggest that translocation of one bird to the home range of another is the best means of accomplishing this.

5. The alternatives that involve captive propagation entail a number of additional hurdles that are not clearly stated in the EA. For example, a successful captive propagation program requires not only long term survival of the individuals, but successful pairing, breeding, nesting, fledging, production of a surplus of chicks, a proven reintroduction strategy, and suitable habitat for reintroduction. Viewing a captive propagation program from this realistic vantage point creates a very different (and much less optimistic) picture than that portrayed in the draft EA.

In summary, I think the draft EA misrepresents the true nature of alternative #1 and its associated benefits. It similarly underestimates the risks, and overstates the probability of success, with captive propagation. I am in favor of using very aggressive approaches in critical situations like the one facing the po'ouli. However, the approach taken should still be the most defensible one available. The most defensible strategy in this case is the one that combines the greatest benefits with the best allocation of scarce resources. That strategy is aggressive ecosystem based habitat management, with the

possibility of translocating one bird to the home range of another. Captive propagation is the least defensible, and should only be attempted with eggs collected from wild nests.

Thank you once again for the opportunity to comment on this draft EA. I look forward to hearing the outcome of the decision making process.

Sincerely yours,

Bruce A. Rideout

Bruce A. Rideout, DVM, PhD, Dipl. ACVP
Director of Pathology

cc: Anne Badgely

The Zoological Society of San Diego

October 8, 1998

Michael Buck
Administrator
Division of Forestry and Wildlife
Department of Land and Natural Resources
1151 Punch Bowl Street
Honolulu, HI 96813

Dear Mr. Buck:

I appreciate the opportunity to review and comment on the "DRAFT ENVIRONMENTAL ASSESSMENT FOR POSSIBLE MANAGEMENT ACTIONS TO SAVE THE PO'OULI." The situation described in the draft is indeed critical. Although the plight of the Po'ouli may be desperate, I believe the analysis and selection of the preferred alternative, must be done not in desperation, but rather be based on documented strategies which have succeeded in other similar, critical situations.

I believe my background as a senior staff member of the Zoological Society of San Diego (the world's largest collection of breeding animals) for the past 25 years, my academic endeavors, (M.S. in Wildlife Management, Ph.D. in zoology with an emphasis on ornithology, and former professor of biology), my 12 years as bird curator of the San Diego Zoo, and my participation in several endangered species recovery teams, working groups and advisory groups (California condors, San Clemente Island loggerhead shrikes, Bali Mynahs) qualifies me to evaluate the DEA and offer the following comments.

In general, I find the presentation of the history of the conservation of the Po'ouli to be encyclopedic in nature and somewhat difficult to evaluate. This section would better be presented in a form that allows the reader to clearly and objectively interpret several important points. For example, what is known about the present distribution of the Po'ouli? How many hectares of the possible Po'ouli habitat (historical and existing) have been covered by how many people, spending how many hours in what kind of weather? The presentation of the names, agencies, dates, and results presented

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kind of weather? The presentation of the names, agencies, dates, and results presented

in "story" form makes it extremely difficult to determine how much area still remains to be covered and how well the areas described could be considered "thoroughly" searched. My understanding from your description of the bird is that it is extremely shy and very difficult to observe, even by the best field biologists under the best of conditions.

I believe, under the difficult circumstances of poor detectability of the species, that one could assume there is still a Po'ouli population within the remaining historical habitat that is of high enough "quality" to have the potential of harboring a surviving population of the species. This area should be delineated (by GPS), fenced, and an immediate and aggressive habitat management plan designed and implemented.

I have a similar concern for the lack of analysis for the history of predator control. It is unclear how much of the Po'ouli habitat is/has been protected and by what measures. There are no references as to how this predator control program was designed, what are its target species and what are the long term goals and over how much area.

Although trained in biology, I must confess I am not a trained resources manager. However, I am familiar with several endangered species recovery actions designed to restore a single species through comprehensive habitat management, much as in the case of the Po'ouli in its current circumstances. New Zealand and other countries have successfully restored several species of insectivorous passerines through the combined actions of predator control, ungulate removal, weed control, etc., as in the cases of the Seychelles warblers, magpie robins, Chatham Isle black robin, and white-eyed vireos. Even in the US, habitat management has successfully increased the viable wild populations of the red cockaded woodpecker and the Kirkland's warbler, both species which were once considered to be salvageable only through captive propagation.

Being intimately familiar with the challenges and frustrations of keeping wild birds in captivity, I would like to offer my thoughts on Alternatives 2-6, all alternatives which involve some degree of captive manipulations, intervention and risk.

The concept of establishing a self-sustaining captive population of insect-eating passerines is still but a dream in the avicultural community. Although the Zoological Society of San Diego and the American Zoo Association (AZA) are justifiable proud of their long history of captive management of endangered bird species, in practically every case, the successful propagation programs have involved game birds, raptors, cranes, waterfowl, rails, and those song birds that can best be described as generalists (e.g. mynahs). Unfortunately, the much more difficult insectivorous species, when brought into captivity, suffer high mortality, breed infrequently, and to my knowledge have never bred beyond one or two generations. They have inevitably died out despite

fed, and the efforts to establish consortia and management plans to increase their captive numbers.

I have extensive knowledge of several endangered species programs and their respective literature which report on the results of the various programs. For the public review process, it is of utmost importance that the various strategies for captive propagation be fully identified and their merits and shortcomings openly discussed. To accomplish this analysis, a full set of citations must be included which would validate Alternatives 2-6. Although captive propagation (here defined as any action which holds the birds longer than a few hours) would be a wonderful option to explore, to my knowledge there are no programs which establish this action as a successful precedence. The examples cited in the DEA (bald eagle, Guam rail, California condor, Laysan teal, etc.) should not be considered valid examples and cannot be applied to the case of the Po'ouli. Even the AZA Bali mynah's Species Survival Program (SSP), often cited as one of the most successful captive breeding programs in the zoo community, is dealing with an omnivorous, hardy, generalist song bird that is easily maintained in captivity, has a long and documented history of captive reproduction, and has a long life span. To my knowledge there are no valid captive models for the Po'ouli.

The discussion in the DEA on the sexes of the remaining birds and the supporting appendix, are inconclusive. Without a higher confidence level in the sexes of the three birds mentioned, any manipulation is moot. To bring same sexes or those whose sex has not been positively determined, into any captive situation, and run the high risk of mortality is certainly ill advised. Accurate sex determination is the single most important piece of information upon which all captive manipulations will hinge.

In summary, the DEA requires:

1. Analysis of searches over time which include areas covered and time spent as well as the extension of areas not covered. How much Po'ouli habitat remains, and what is the likelihood that Po'ouli could still exist in these areas even without the confirmation of direct observation.
2. A clear description of the predator control program, how it is designed, what are its target species, the area to be covered and the ultimate goals.
3. A clear explanation why expanded habitat management is not considered to be an alternative in itself for the "saving" of the Po'ouli, even when this strategy has been known to restore single species in other countries. Can the statement ". . . an expanded ecosystem approach is not considered a viable alternative by itself, for saving the Po'ouli at this time," without references defending this position really be justified?

4. Documentation of the successes and failures of all aspects of captive propagation in species which can be considered as models (or near models) for the Po'ouli.
5. Review of all of the sexing techniques performed so far, and an indication of the confidence limits of the current sex determinations. A strategy which outlines steps taken to confirm the sexes of the three known individuals.

Saving this species from extinction is a daunting task. However, under the circumstances, I believe your choice is clear. FIX THE PROBLEMS WHERE THE BIRD IS KNOWN TO STILL SURVIVE. Allow the birds to remain and breed in their native habitat. Collect the wild eggs (if possible) and allow qualified biologists to *incubate and rear the birds in captivity and augment the population using this* technique. Protect and manage the habitat where the birds still occur. The Po'ouli and other Hawaiian endemic species in this forest (bird, plant and insect) will benefit from your protection. Resist the temptation to "study" interminably without taking some positive actions which can make a difference. These appear to be your best options.

Thank you again for allowing me an opportunity to participate in this process. I hope my comments will, in some way, help you in your difficult deliberations.

Sincerely,

Arthur C. Risser

Arthur C. Risser, Ph.D.
General Manager
San Diego Zoo

cc: Ann Badgeley

CLIVE ROOTS
International Wildlife Consultant
695 Pine Ridge Drive
Cobble Hill, British Columbia
Canada VOR 1L1
Phone: 250 743 5926. Fax: 250 743 9906

8 November 1998

Mr. Dave Hopper, USFWS, Honolulu. **FAX 1-808-541-3470**

Dear Mr. Hopper,

In response to your fax regarding the Po'ouli EA, first a short bio:
My professional wildlife career spanned 40 years in senior positions of zoo management, and included the following experience with exotic birds. I developed and operated the Winged World in England, which housed one of the worlds greatest-ever collections of softbills, and I was director of the zoo in Winnipeg for 22 years, of which the bird collection was Canada's largest and most varied. I have live-trapped birds in Amazonia, West Indies, Oceania and Indonesia. I have acted as a consultant on many projects involving bird display, breeding, rescue/rehab etc. I have written extensively on bird subjects, the most well known book being *Softbilled Birds* (1970). I have considerable experience with birds of that group, especially the so-called difficult hawking and probing insectivorous species, and 30 years ago achieved several first breedings of such birds.

Alterative 1.
The Po'ouli does indeed face seemingly impossible odds, but to take no action at all hardly seems right even at this late hour, for to give up after expending $1.25 million is too fatalistic. In view of the survivor's separation they obviously have no breeding potential at all unless they are artificially introduced, so even a field aviary has some merit, if mainly for its value at a later day for other species. But, it is quite obvious the species cannot survive in the wild, so to do nothing and leave the few survivors where they are, is not a viable option in my mind.

Alternative 2.
The translocation of birds to another's territory, and then release - whether hard or soft, is also not a viable alternative because of the total lack of control after release, the chance of the new bird moving away from the release area, plus all the disruption and stress, with no guarantee of acceptance or bonding. Also, as it is now obvious that the species cannot survive in the wild, how can its hopes continue to be pinned on two or three free-living birds.

Alternative 3.
Again, as there is absolutely no assurance that the Po'ouli can survive in the wild, it seems pointless to go to the trouble and expense of creating a field aviary just to turn them loose again (paired, bonded and ready to breed!) into conditions which have already taken about 280 of their kind over the past few years. And even with what now seems a relatively large population during those earlier years only two nests were ever documented. This exercise would surely be futile.

Alternative 4.
The difficulties you outline for the building and operation of a long-term field aviary system are certainly valid. I am very familiar with the problems encountered in trying to keep birds alive, let alone breed them in difficult and remote terrain, and I personally would not be at all enthusiastic about attempting to do this in such an environment with the last pair of anything.

Alternative 6.
Considering the fact that 'highly qualified staff' and 'state of the art facilities' were provided for the 114 birds collected for the Co-operative Program, with the outcome 10 years later of a net loss of 59 birds, and only 10 of the current numbers being captive raised specimens, to expect to save the Po'ouli from just one untried pair is obviously unreasonable. Also, the ease with which ducks, parrots and highly prolific rails have reproduced in successful recovery programs has little comparison with the breeding of many softbills

and should not be be allowed to exert undue influence. Even kingfishers and mynahs must be considered relatively easy species in comparision.
Also, none of these successfully recovered species were down to just 3 remaining birds. Therefore, to attempt to establish a captive line from just 2 or three founders, through their capture and immediate removal to an approved facility, would I believe, have a very low chance of success.

Having discounted the above alternatives and having nothing new to offer, this just leaves #5 as the probably the most effective alternative.

Alternative 5.
It is a fact that a high percentage of birds trapped are quickly released as unsuitable for any number of reasons This has been my experience over the years, and was certainly the case with the Co-operative Group (52 Amakihi caught, 30 transferred to zoos, 86 Iiwi captured but only 22 moved to zoos, etc.). It is almost inconceivable that a single pair of birds, plus the availability of one spare female, could be suitable and then overcome all the stresses to found a captive line of Po'ouli. However, in view of my belief that the effort should at least be made, I consider this to be the most logical option. To quickly establish a small, secure field holding facility, into which birds can be released soon after capture, with the ability to move them to an approved more accessible compound when they are acclimated (and not wait who knows how long until they have bonded), thus reducing the time they must spend in the less safe confines of a field aviary. Unsuitable specimens could then quickly be released, (but to what end I wonder), and in the unfortunate event of the last specimens being lost before the aviary's completion it would surely have future value for other species. Additionally, in view of the comments below regarding diet, this alternative seems the most practical.

There is one aspect to all of this which I believe to be valid, yet it seems to have not been given due consideration, and I mention it here as it may be of some value in future projects to preserve your rare birds. It is the fact that it has been obvious for many years that softbilled birds in which nectar figures as a major percentage of their diet are the most difficult to breed. Even many of the truly insectivorous hawking and aerial species are easier, and of course those with omnivorous habits are generally easier still. Therefore I believe that the care and breeding of the Po'ouli, at least from the dietary aspects - which are of course the most important, is in all probability not as difficult as the Drepanids. Consequently I was rather surpised to learn that the major captive breeding efforts over the past 10 years have involved nectivorous species - with total lack of success. (only 5 offspring surviving to adulthood out of an original stock of over 100 birds), whereas the omnivorous Omao of which only 9 were collected has been singularly successful, with the same number of surviving offspring. Of course, the Drepanids being practised with were common species, and the mere fact that such birds have proved difficult in the past could be argued in favour of attempting to correct this But I cannot help wondering what the Po'ouli's situation would now be if it had been a member of this group initially.

I hope these notes are of some value and wish you every success whatever action is taken. If I can assist you with any future efforts to conserve your unique birdlife, I would be very pleased to help

Yours sincerely,

Clive Roots

X-Sender: oryder@biomail.ucsd.edu
Date: Fri, 9 Oct 1998 12:29:30 -0800
To: "Sharon E. Reilly" <wildlife@pixi.com>
From: oryder@ucsd.edu (Oliver A. Ryder)
Subject: Po'ouli sexing review

Dear Sharon Reilly,

I have received and reviewed the materials you provided regarding the efforts to sex living specimens of po'ouli from feathers. These materials include the report of Barrie J. Melliars for University Diagnostics Ltd. in London and the report of Beth Slikas and Rob Fleisher of the National Zoological Park, Smithsonian Institution.

My laboratory conducts research in the fields of molecular evolution and population genetics of mammals, birds, reptiles and amphibians. Additionally, we have worked on the development of molecular genetic methods for sex identification utilizing PCR, especially of birds, the most notable of which is the California condor.

A major flaw in the effort to perform DNA-based sex determination of po'ouli is that there are no specimens of known sex available for controls, as identified in the reports provided. We concur with this reservation expressed by UDL and NZP.

The results of UDL utilize proprietary primers and the details of their procedure are not elaborated. In their study, poor amplification can, in some instances, result in the selectively inefficient amplification of a DNA product that identifies females (W-chromosome). The finding of the high molecular weight W-chromosome diagnostic fragment in only two of po'ouli specimens is the basis of the UDL identification.

The NZP group utilized the published Griffiths' primers and their procedures are clearly explained. They base their diagnosis of one of the first two po'ouli samples as male on is cleavage sensitivity to restriction endonuclease HaeIII. We have found that the HaeIII cleavage site is not universally conserved in the phylogeny of avian W-chromosomes and, thus, the diagnostic basis of the cleavage without reference to analysis of samples from known females remains conjectural.

In conclusion, all labs experienced difficulty in obtaining routine successful DNA amplification from the samples provided. While the UDL results provided are consistent with the conclusions of their report, it is not possible to use the data of the other labs to verify or refute their results. Without reference to verification that the UDL proprietary primers amplify a W-chromosome specific fragment in po'ouli, their results must be considered tentative, as must the implications of the studies undertaken at NZP. The amplification of a presumptive W-chromosome fragment in two po'ouli by UDL should be given priority for management considerations over the cleavage result obtained at NZP until known female po'ouli DNA can be used for controlled studies.

Please feel free to contact me if you have questions about this opinion.

Cordially,

Oliver Ryder

Oliver A. Ryder
Center for Reproduction of Endangered Species
Zoological Society of San Diego
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X-Authentication-Warning: phoenix.princeton.edu: sasandin owned process doing -bs
Date: Mon, 12 Oct 1998 15:52:46 -0400 (EDT)
From: "Stuart A. Sandin" <sasandin@Princeton.EDU>
To: wildlife@pixi.com
Subject: Po'o uli DEA

Ms. Reilly,

I have spent some time reviewing the Po'o uli management proposal, and I would like share my opinions with you and those of you with the difficult job of deciding on an alternative.

The DEA stated six different possible courses of action. Of these, I would have the most confidence in the two extreme possibilities. With no precedent set for field aviaries of a scale that are being proposed, I would not select these alternatives. The work done by NBS in the early 1990s with the Palila suggest that the translocation work does not have a good success record either.

Given the information that we have today, I would recommend one of two strategies. One is to do no manipulations with the birds, alternative number one. In the meantime, other work could be conducted to test the feasibility of field aviaries or ways to bring two similar honeycreepers together. Such work would be analogous to the 'Omao breeding program in anticipation of applying the knowledge to the Puaiohi. If the Po'o uli do nest, taking the first clutch into captivity and hoping for a renesting would seem to be the best strategy. This alternative would give us a chance to witness natural interactions of the banded individuals, this marking being a novelty and great asset to the study of the species.

The second option is to take all three birds into captivity. There is precedent from the work of the Olinda ESPF and the Peregrine Fund facility that captive propagation of honeycreepers is possible. With this history and the advice of groups such as the Old Blue group from New Zealand, captive propagation has a reasonable chance of success.

I am sorry that I cannot decide between the two options, but if this will be noted, I would be happy to be heard. One side note as to the history of the work on the species. I recall in the winter of 1995/6 seeing two Po'o uli together in what is today HR 1. This sighting was confirmed by other observers on future days. It is possible that due to some sort of limiting resource in the environment, the Po'o uli only pair up during short episodes of reproduction. If this is the case, it may still be possible that next breeding season some nesting behavior could take place. If you are not aware of these sightings, I could elaborate in future correspondence.

Thank you for bringing this current debate to my attention, and I would very much like to stay informed as to the progress of the work in Hanawi.

Good luck,

Stuart

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7 October 1998

Dr. Robert P. Smith
Pacific Islands Manager
Fish and Wildlife Service
Pacific Islands Ecoregion
300 Ala Moana Boulevard
Room 3-122, Box 50088
Honolulu, Hawaii 96850

Dear Robert,

Thank you for forwarding the Draft Environmental Assessment for Possible Management Actions to Save the The Po'ouli.

With only three know individuals existing in the wild the chances of successful recovery are indeed very poor. However, with extinction rates as much as five orders of magnitude higher than background rates, and the fact that the Po'ouli is found in a monotypic genus I believe we have a obligation to try to save the species from extinction.

After carefully considering the proposed options I believe the plan set forth previously by Mark Collins offers the best hope.

In general this includes:

1) capturing an individual and holding it in a cage near the territory or in the vicinity of another individual (of opposite sex). If the captive individual does not feed or appears not to adapt to the cage environment quickly, the individual should be released.

2) If the individual does adapt and feeds readily, a second individual of opposite sex should be captured.

3) once two individuals can be maintain in captivity on site both should be moved to a captive breeding facility.

Whatever plan is eventually adopted I do believe strongly that individuals should not, under any circumstances, be radio tagged, with so few individuals in the population this procedure would be too risky.

Please do hesitate to contact me if I can be of further assistance.

Sincere regards,

Thomas B. Smith
Associate Professor

September 30, 1998

Dear Mr. Buck:

We appreciate the opportunity to review the current version of the "Draft Environmental Assessment for Possible Management Actions to Save the Po'ouli." While no doubt this document required hundreds of hours to compile, we feel it lacks information essential to provide a balanced perspective of the possible management actions. While purporting to be an objective assessment of the viable management alternatives, the report dismisses alternative strategies without reason, regularly resorts to unproven assertions, and offers insufficient documentation of claims based on unpublished and unreviewed research. The conclusions of this research are central to the authors' arguments for captive propagation, but the assumptions on which they base their conclusions may be faulty. Lastly, we feel the risk assessment categories and evaluation of management alternatives results in a misrepresentation of the risks associated with captive propagation.

We feel the addition of a management option called "Expanded Habitat Management" would go a long way toward rectifying the skewed list of management alternatives considered in the proposal. In its current state, the reviewers are left with few options: the politically unacceptable, no additional action, or an invasive technique of capture and/or holding the birds in captivity long term. In fact there are other aggressive but non-invasive options. These would involve using the vast resources that managers would use for captive techniques to reduce immediate threats (suspected and proven) to the Po'ouli and improve habitat. Expanded habitat management could include expansion of the fenced area to a low elevation of 3500' or lower, control of and research into the role of introduced birds as competitors, continued rat control and other predator control, additional surveys carried out by contracted or volunteer individuals with extensive experience with Maui forest birds, and additional ungulate control.

Before a management decision is made, an independent scientific review needs to take place. This would improve the objectivity of the document, help in the evaluation of the results of the sexing techniques used by the various laboratories, and refine the presentation of what we know about the Po'ouli and its status. For example, the current document presents the reviewers with the fact that we only know of the existence of three individual birds and that unsuccessful searches have taken place to find additional Po'ouli. The authors did not attempt to evaluate what percent of the habitat researchers have searched and how thoroughly. Statistical techniques are available to evaluate the probability of birds being absent from areas. Using this type of evaluation will get us much further in determining the likelihood of the existence of additional individuals. This knowledge is critical in evaluating the management strategies. Independent reviewers are likely to point out this lack of information resulting in its addition.

Having spent a significant amount of time in the forest of Hanawi, we understand the difficulty in finding Po'ouli. One major concern about the research that they have conducted to date relates to the lack of information on resights of the Po'ouli since banding. Without this information, assessing the possibility that each home range is in fact occupied by a single Po'ouli is difficult. Using basic statistics and the number of resights of a banded individual within the territory, one can easily determine the probability of there not being a second Po'ouli within the home range. Our impression of the effort was that they intensively banded each territory until they caught a Po'ouli. At this point banding effort switched to a new territory. Depending on the subsequent resight effort and success, there may or may not be adequate data to conclude that

We feel a more invasive technique focused on establishing a self-sustaining captive flock has little chance of success. A quick glance at the summary of data from appendix C, The Hawai'i Forest Bird Surrogate Project Summary, reveals the lack of success that we have had maintaining and breeding wild-caught birds in captivity. Of all of the birds initially captured, 80% (326/404) were either released or died within one year of capture and would not have had time to pair and lay eggs. Furthermore, only nine pairs from the remaining 78 birds ever laid eggs that were successfully reared to fledging (by hand or parents). As The Peregrine Fund as routinely pointed out, the species used in this study were the far easier nectivorous or frugivorous species. Little work has been done with the much more difficult insectivorous species, and thus we must expect the likelihood of success to be much lower.

In closing, we believe that having the information on which they base this report independently reviewed either as a whole or along several lines of scientific inquiry (territory size, adequacy and extent of recent and historical searches outside known home ranges, adequacy and extent of within home range searches, sexing procedures and their validity) is essential to providing the balanced perspective required of this document. We urge you to consider such a step before submitting this document for final review by the managing agencies. We also feel the addition of an expanded habitat management alternative would balance the list of options presented.

We thank you for giving us the opportunity to review the proposal.

Aloha,

Tom Snetsinger

Christina Herrmann

Michael G. Buck
Administrator
DLNR-DOFAW
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

September 21, 1998
P.O. Box 16426
Portal, Arizona 85632

Dear Mr. Buck,

I appreciate the opportunity to comment on the draft Environmental Assessment for the Po'ouli. The six alternatives presented seem to cover the ground fairly well, but frankly none seems to have a very high probability of success. Nevertheless, I would like to offer support for alternative 6 as the least objectionable. Normally, I am extremely reluctant to offer support for captive breeding as a preferred alternative (see Snyder et al. 1996), but in this case there do not appear to be any other alternatives with higher chances of success.

I am impressed by the following features of the situation: (1) limiting factors in the wild have not been well identified so cannot be effectively countered at present, (2) the population decline is horrendously steep, (3) there is almost no time left for making a decision, and (4) National Zoo has had reasonably good luck breeding Hawaiian forest birds in captivity. These factors make alternatives 1 and 2 extremely unlikely to produce a satisfactory recovery, and among the other alternatives, the time element alone would argue for alternative 6.

From the population data supplied it appears that a population on the order of 200 individuals may have existed in 1975, but this dropped to 3 individuals at present. At a uniform rate of decline, this calculates out to roughtly a 15% decline per year. However, since we can assume reproduction has also been occurring through most of this period, the actual mortality rates of individuals in the population have presumably been much higher. Since no reproduction is occurring in the population at present, it would not be out of line to anticipate something on the order of a 50% rate of decline for the remaining birds per year. Actually random events could take them out even much faster. The first bird to go could be the single male. There is clearly no time to be lost. Taking time to construct new aviaries only raises the time element risk unnecessarily. I would advise you to adopt alternative six much sooner than your comment period deadline of October 11 and get cracking on trapping the last birds as fast as possible. By the time you read this letter the last male may already be gone and it may already be too late for success with any alternative, even assuming the birds may have a real potential to breed merrily in captivity. You are fiddling as Rome is about to ignite.

If all efforts fail, alternative 6 at least provides you with some DNA and specimens for scientific purposes. Best of luck!

Sincerely,

Noel Snyder

Valerie Stein & Jamie Bruch
Maui Forest Bird Recovery Project
2465 Olinda Rd.
Makawao, HI 96768

October 7, 1998

Michael G. Buck
Administrator, DLNR-DOFAW
1151 Punchbowl Street, Room 325
Honolulu HI 96813

RE: Po'ouli Management Options

Dear Michael Buck,

After careful consideration of the the six proposed management options to save the Po'ouli as proposed in the draft EA and attending the recent public meetings, we (Valerie & Jamie) as members of the field crew would like to submit to you this formal written response. We base the following opinions on knowledge which we have gained through continuous field work on this project pertaining to these birds since March of 1996 to the present time. During this time frame we have collectively encountered and observed these three birds more than anyone on the current or previous field crews and thus we do not come to our conclusions lightly. The situation at hand is an extremely difficult one and although we do not presume to have the right answer, we can only hope to assist you somewhat in making your decision by outlining from our perspective, the pros and cons of the management options.

It is our opinion, it is in the best interest of these three birds and the Hanawi forest as a whole that management option #1 be selected, however if some manner of manipulation is to be deemed necessary we 2nd option # 2, a hard release. We have seen no convincing evidence that any of the drastic intervention techniques to try and "force" a pair bond will yield any more success in the survival of this species then simply leaving them alone. In fact manipulation may send them on their way to extinction even faster. The scientific community simply does not know enough about these birds and the reasons why the Po'ouli population **really** has declined to justify moving them or removing them from their native forest at this present point in time. Furthermore, as biologists we haven't thoroughly studied how to make their environment secure so that their progeny may flourish. Isn't that the point of any manipulation? If we do not yet have the know how or ability to protect future Po'ouli generations in the wild, then all our efforts will be for naught. If they do not have a suitable environment then they will still go extinct even if we did manage to force a pair bond and initiate breeding. True success will only be accomplished when there is a breeding population of Po'ouli in the wild.

We have heard people talk about wasting time, and being negligent by not **actively** doing something, but realistically it will take a lot of time to accomplish the feats involved with manipulation while proving negligent to the **rest** of Hanawi. If the birds are removed, it is doubtful the research and management for the Po'ouli would continue in the Hanawi NAR, and we will have lost much information on understanding reasons why the Po'ouli

and other endangered forest birds are declining, and how to reverse this trend most effectively on East Maui. Further more the time spent trying to catch these birds, realistically would lead to neglect of other important field duties like monitoring other birds, invertebrates, mammals, etc..

We would like to outline the different management options and state the reasons why we feel the time and effort would be appropriate or inappropriate.

Management option #1
Current management- No manipulation of known birds

It is our view this has the most chance of success of all the management options. In keeping the birds in their natural state, we can gain inference on what factors may be limiting to these birds and other endangered forest components in the eco-region of the Hanawi area. We can also continue to study better and more effective ways to improve on the management techniques already used by the State. As researchers and managers we can test effectiveness of current and proposed predator removal techniques such as looking at non-target species effected by wide-scale ariel drops of diphacinone.. In addition to looking at predator control, we also feel the issue of competition from non-native and native bird species in regards to Po'ouli has not been sufficiently researched, we can begin some real organized investigation and research into this area. We would continue to look at limiting factors with our Po'ouli food resource studies in regards to aboreal snail abundance in Po'ouli home ranges . We have also begun surveying for insect pest species that might have adverse effects in the Hanawi NAR. With a lengthened runway at Kahului Airport, Maui not only runs the risk of bringing in new "pest" species but we also run the risk of not monitoring for invasions. The Po'ouli and other endangered birds and plants need a "front line" against these dangers. We have already fenced the critical core of habitat for the endangereds of Hanawi, this "front line" out of the core, could also be a buffer zone for new invasions. Regarding forest habitat, we could do further study on pig recovery zones vs. areas still inhabited by ungulates. All of this work will be beneficial to the recovery of the native forest's flora and fauna. This is some of the work we are currently doing and other work we could be doing under the management plan option #1. If any other management option is chosen for the Po'ouli most of this work would come to a halt.

Management option #2- Translocation and release

The "Po'ouli Project" would need to hire a doctor of veterinary medicine to have on hand at **all** times during the banding operations. To minimize his or her time in the field, we would need to set up 20-30 mist nets in an intensive effort to capture a Po'ouli. As you may or may not know setting up a banding operation in the cloudforest of Haleakala, involves netting lanes and the associated damage to the environment. Each "lane" would have to be cut and essentially become a trail, net runs on these trails are done every hour on an average 30 minutes throughout the day for the entire course of banding. In an intensive effort to capture Po'ouli , the home range would have a considerable amount of initial impact. These Po'ouli Home ranges are in the most pristine and intact forest in the state. Rare and endangered plants might be jeopardized as trails to net lanes are cut out in new areas. Understory would be compromised. These areas are also critical foraging areas the Po'ouli uses for reasons still unknown to us. Banding for these birds could lead to alternating the foraging cycles of the Po'ouli forcing them to move out of their regular foraging areas, should they "catch on" to us as many banded birds do. We feel we could capture the Po'ouli and attempt a translocation to another homerange, but at what cost? Lets look at unknowns. Perhaps these three birds are not together for a reason. If the HR3 bird is indeed a male , why

is it not singing and searching for a mate as most male birds do? Why has it stayed in the same territory? The previous field leader for BRD feels the HR2 Po'ouli is also a male. We are not totally convinced of the sex ratio and feel it would be a tragedy to subject these birds to the possibility of death due to habituating them to captivity, if in fact they are all females or the same sex. Lastly, what are the odds the birds will pair bond and breed if they are opposite sexes?

This option, however, would be less costly, risky, and environmentally impacting than management alternatives #3-6. Of course there is the chance we may not be able to relocate a bird once it has been moved, but at least it will be banded should it move to a new territory. One more concern is that all of our attention will be focused on bird care and capture, rather than other aspects of the recovery plan will be compromised; searching, invertebrate sampling, monitoring the effects of diphacinone. It is unrealistic to think the field crew would be able to expand any of these efforts, it will be difficult enough just to maintain them as is.

We do not advocate any use of radio transmitters. Usually when individuals are fitted with transmitters a significant amount of time has been spent fine tuning the transmitters to **that particular species.** We only have three birds to practice with, any mistake could be fatal. The technology to fit birds rarely captured, such as the Po'ouli, with transmitters is simply "not there".

Management option #3-Hold in field aviary for pair formation

The construction of **any** aviary in the Hanawi NAR will be logistically difficult and very expensive, the environmental impact will be great. Let me emphasize the importance of the **entire** ecosystem. Materials would need to be slung load in by helicopter which can only be done with minimal expense in helicopter terms, during periods of "good" weather, not a frequent occurrence in Hanawi. Catching one, two, three Po'ouli will have to be a simultaneous effort and will no doubt require a significant amount of time, detracting from the idea of ecosystem management and greatly increasing the possibility of new weed introductions. Most of the field crews time would be focused on bird care and capture, the only activities relating to ecosystem management would be the ones deemed most critical, like distributing diphacinone .Again, catching birds simultaneously means the project would need a vet for each capture effort. This would involve hiring at least two vets to have on staff to minimize time when a bird would be "alone" in an aviary. Realistically catching two Po'ouli to house in an aviary would take months. Catching these birds for the second time will take an extreme amount of time and energy, it is unrealistic to think they would be caught any time soon, recaptures are much more difficult then initial captures. In capturing the HR1 and HR3 birds, we were extremely fortunate with dry weather due to El Nino. If the rain is even a mist we are forced to shut down the nets, due to protocol .This alternative relies on the successful pair formation and release of these birds with transmitters back into the wild. We do not advocate any use of radio transmitters.

Management option #4-Hold long term in field aviary

Option #4 will be even more costly in terms of money an time spent. The logistics once again will be problematic, especially when factoring in the idea of crew rotation and personnel needed to man any kind of long term aviary. There will be too many uncontrollable factors involved environmentally such as weather,

catasrophic storm, and direct impacts on the birds such as predators. Hanawi is not predator free. These birds have learned to avoid predators in their natural habitat but if they are pulled into any artificial setting we will be taking on the responsibility of protecting them full time. Increased people in an area will mean more food for rats and more potential for predation. Let us emphasize, if we are to take these birds into captivity we are not studying the Po'ouli in their natural environment, we are studying captive birds, albeit rare in an artificial environment. The risks to captive birds is great, if they do not adjust, they are sure to die.

Management option #5-Hold in field aviary/transfer to captivity

Again unrealistic for the reasons stated above. The birds may never form a pair bond and much time and energy will have been spent monitoring and trying to protect them. In addition the three hour time limit from pulling the birds, to arrival at a propagation facility will be extremely difficult to meet, especially if that facility is not on Maui. *In addition, it is unrealistic to think we will have an avian vet at our beck and call 24 hours a day in the* field while the birds are initially captured and brought in.

Management option #6-Captive propagation

Once again pulling these birds out will require a significant amount of time by the field crew. In terms of logistics and caring for the birds in a controlled capacity this alternative **seemingly** would be the best, if we had **exremely willing and experienced aviculturalists.** It is apparent to me that the experts (Peregrine Fund) do not want to take on this endeavor. They have made some very convincing arguments, regarding the lack of knowledge and know how, on bringing an adult wild insectivore out of the wild and into captivity. If they are not comfortable doing this then we would not want them to do it. This would mean bringing in an outside party to work on the care of the Po'ouli. Is this feasible? Will the P-fund throw open the doors at MBCC and welcome these other "experienced aviculturalists"? Can we work together on this? If a bird is to die, this might lead to more finger pointing and blame. It is not fair to subject the Po'ouli to quarreling caretakers. We need the absolute best for this bird.

It had been suggested that we need to move past the insectivore "roadblock" so to speak. We agree that this is true but do we need to practice with the Po'ouli, just because it will go extinct any ways? If we are to use this type of manipulation and it is deemed advantageous to conservation, much more work should be done with surrogates on Maui, such as the Alauahio and Parrotbill. During our time here in Hawaii it has become very apparent, how unique each island is and how specialized all things are to each specific area. Thus experience with Maui insectivores which have a known population greater than three is a must. The only work that has been done with a Drepanid insectivore brought into captivity has been with the Omao. The survival rate for this species was less than half for adults pulled out of the wild. Are these the odds we want to subject the Po'ouli to? Keep in mind, we would be using the UDL sexing results and if the HR3 male was to die, we would have no more Po'ouli. In regards to choosing any options, we feel the notion of studying a Po'ouli that has died to gain information on genetics is **totally unacceptable**. In addition, even if the best case scenario did result in more Po'ouli, how long would they be held in captivity? What is the point of producing more if they do not have a ecosystem to return to in which they may flourish? How will we be able to figure out the reason for their decline and consequently fix the problem if we pull the three known birds with which we have been collecting natural history data on from the wild.

In conclusion

Due to the aforementioned reasons we advocate management option #1. It is the least risky for the three known birds, does not jeopardize the Hanawi NAR, and is the least costly. It will allow us to best continue work with regard to other aspects of the recovery plan while still gathering data on Po'ouli. We believe it is still possible a nest may be found outside of our study area. All of the manipulation strategies are more costly then this one and are not convincing that they will be successful in preventing the extinction of this bird. If however, it is deemed necessary that some active course of management has to be taken then we advocate a simple hard release of one of the birds in the territory of another, **without** transmitters (see comments for # 3).

These three birds play an important role in our work as we are currently able to locate them and study them in their wild environment. When the decision was made to pull the California Condor from the wild each of the individuals involved had been studied many years before doing so. We think we need to excercise the same type of caution with the Po'ouli. These birds are more then just the HR1, 2, and 3 Po'ouli to us, we have developed a relationship with these three birds from many observations and interactions. We feel that unless we can provide them with an over 50% chance of survival through any manipulation effort, the risk to them is just not worth it. We can not imagine a Hanawi without Po'ouli, however if a course of action which does not involve drastic intervention is chosen it does not mean we have been negligent or have done nothing to try and save this species. If any manipulation was to be done it should have been done 10 or more years ago. The wild Po'ouli should be a spokesbird for conservation in Hawaii. This is simply a case of too little too late, the odds are outstanding, the cost too great. If destiny has chosen the path of extinction for the Po'ouli. we would rather see it live out its last days in the wild, then in an artificial setting doctored by humans.

We agree that history will not judge us on if we save the Po'ouli or not, but how we came together regarding this issue. It is our own personal view that the public meetings on Maui, brought the concern of the whole ecosystem into light. If that is what we all agree on then lets start addressing this issue now. We have learned in Hawaii many things are told in story and with laughter, when it is time to tell the story of the Po'ouli, what kind of story will it be?

We wish you all the best in making this extremely difficult decision.

Aloha,

Valerie Stein, MFBRP

Valerie Stein

James Bruch, MFBRP

James Bruch

HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE

October 5, 1998

Michael G. Buck
Administrator
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Subject: Comments on Draft Environmental Assessment for Possible Management Actions to Save the Po'ouli

Dear Mike:

Although I admittedly have no personal experience with the Po'ouli or it's habitat. I feel compelled to make brief comments on the subject draft E.A. , as an appointed member of the Hawai'i Forest Bird Recovery Team, and having had a long term experience with various T & E species efforts in the past.

The apparent state of Po'ouli appears to be so critical that any costly or invasive action is difficult to justify. In view of the large numbers of T and E species we have to deal with, we need to view such efforts on the conservative side, and put a little faith in nature's ability to take care of it's own.

To me, alternatives 2 through 6 are very likely to result in direct man-caused losses of one or more of these critically rare birds. From personal experience, human intervention in the highly sophisticated behavioral and ecological lives of such rare creatures is likely to be more destructive than beneficial. Hands on capture and manipulation of these birds is a stress they do not need. Even if any of these translocation or captive alternatives were successful, the likelihood of preserving sufficient genetic diversity to produce viable offspring for a future wild population seems remote at best.

I believe that most forest bird species go through cyclical ups and downs. The Puaiohi was once considered one of the most rare of the six Kauai forest birds, and now is the most abundant. It is apparently doing quite well without any of man's interventions, than to try to keep pig populations down by liberal hunting. The Po'ouli on the other hand, was only discovered a couple of decades ago, and has evidently been very rare during all of recorded history. Expectation for it's recovery to viable populations even with

man's intervention is slim at best. when we keep in mind the ever increasing threat of new weeds, and alien animals becoming established in Hawaii.

Alternative 1 is by far the most justifiable to me. I would caution against any action that physically manipulates the birds within or outside their natural habitat.

If such resources and efforts are to be expended for rare birds in Hawaii, they would best be focused on those species that still exist in adequate numbers to sustain the risk of direct human intervention. We have to be practical, and assume that some species are depleted beyond our direct intervention.

Thanks for the opportunity to comment.

Thomas C. Telfer

Thomas C. Telfer
District Wildlife Manager

McCandless Ranch

130

September 29, 1998

Mr. Mike Buck
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hi. 96813

Mr. Robert Smith
United States Department of the Interior
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Rm. 3-122
Honolulu, Hi. 96850

Dear Mike and Robert,

Though the Alala and the Po'ouli are strikingly different birds, their present plight is frighteningly similar. I have been uncharacteristically quiet in the recent Alala/I'o discussions, more out of frustration, then from lack of thought. I have spent a good deal of time filtering through the various comments from the Alala Recovery Team, and there seems to be one consistent and underlying response: Steady the course.... look long-term.....take the high road. This is difficult in a society that has come to expect that if we take action today, we had better have results tomorrow. This will never be the case in conservation work, especially in Hawaii were we often find ourselves working with wild bird populations you can count with one hand.

What is the "high road"?

- PARTNERSHIPS We need to continue to forge conservation partnerships between Federal and State agencies, between conservation organizations such as The Nature Conservancy and The Peregrine Fund, and between private landowners. Work needs to continue on the Endangered Species Act to create incentives and alleviate threats to the private landowner. At the very least, when dealing with these critical populations, we must not alienate the very partnerships we have already established!

- HABITAT MANAGEMENT Building a fence tomorrow in Po'ouli habitat will not ensure the survival of the Po'ouli; but long term, these are the activities that will ensure that our grandchildren will be able to see an I'iwi in the wild. Good

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strategy include the plans the Nature Conservancy has for the Puu Waa Waa and the Honomolino areas on the Big Island, the purchase of 5300 acres of former McCandless Ranch lands by US Fish & Wildlife Service and the establishment of the 650 acre Kaliko Refuge on McCandless Ranch lands through the USFWS's Partnership for Wildlife Program. It is with great dismay that I continue to read in every Environmental Assessment Report that the leading cause of a demise in a particular bird population is habitat destruction. This is like saying that because of Habitat Destruction, there are no more I'iwi in the Volcanoes National Park. There were 200 Po'ouli in the wild in 1974, and habitat destruction has wrought that population to three in the past 25 years? My guess is that if we had 1,000 Po'ouli to release tomorrow into this managed Natural Area Reserve, most or all would die. Habitat Destruction is a cop out and is not the present reason for the demise of the Po'ouli. There is something in the habitat that is killing these birds and what is needed is specific research and dedicated, consistent habitat management to ensure long term survival of native species, with or without the Po'ouli.

Where then does that leave us with the Po'ouli today? My vote would be to "Take the High Road". Establish a crew to work with and learn more about the Po'ouli. Who would have ever thought that Toxoplasma gondii is killing Alala? Identify questions and initiate research projects. Plan and initiate long term habitat management. Contact adjoining private landowners and work with them, eliminating threats, to expand the boundaries of the present habitat. Capture two of the three remaining Po'ouli and release in the same territory as the third. Moniter and evaluate. It is an evolving and long-term process; we need to set up a flexible framework for recovery assuming constant evolution.

From a landowner's perspective, contracting with The Peregrine Fund was a vision of genius as they are the best and most respected organization in their field. Why jeopardize this relationship? We need to listen to them; not to do so does not bode well for any of us; mainly the endangered species! Aviculturists worldwide can draw lines in the sand and offer their opinion, but the voice that needs to be listened to the most are the people here in Hawaii who will be called upon to do the work... The Peregrine Fund.

The last wild population of Po'ouli should not be brought into captivity. For future generations, let's take the high road.

Sincerely,

Keith F. Unger

Keith F. Unger
McCandless Ranch

cc Ms. Anne Badgley

Eric VanderWerf

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Mr. Robert P. Smith
Pacific Islands Manager
U.S. Fish and Wildlife Service
P.O. Box 50088
Honolulu, HI 96850

4 October 1998

Dear Mr. Smith;

Below I have written some comments and suggestions on the Draft Environmental Assessment for Possible Management Actions to Save the Po'ouli. I hope these comments are useful in making the final decision of which alternative to choose. Please do not hesitate to contact me if you have any questions about these comments or if I can help in any other way.

Sincerely,

Eric VanderWerf

cc: Michael Buck

Several people at the meeting on Oahu expressed concern that too much emphasis and too many resources are being directed toward the conservation of a single species of bird, and that a more ecosystem-oriented approach is needed in Hawaii. In general I agree, but for the Po'ouli such an approach is no longer sufficient, and additional management is necessary to facilitate reproduction. It is highly unlikely that simply continuing the current management (alternative 1) will be successful. However, it could be made more clear in the EA that efforts at habitat restoration in Hanawi will not be discontinued if it is decided that alternative 1 is not the best option for conserving Po'ouli. Habitat restoration and ecosystem management should continue at Hanawi for many reasons, not just to protect the Po'ouli.

One extremely pertinent question asked at the meeting on O'ahu was whether there had been a quantitative assessment of the chances of success under any of the proposed alternatives, and apparently there had not. Dr. Leonard Freed and I have attempted to do this together, and Dr. Freed is sending you the results of this analysis. My contribution was to calculate the probabilities of survival in captivity over various time intervals, based on the data from previous attempts at bringing Hawaiian honeycreepers into captivity provided in the Appendix of the EA. I have attached a copy of those calculations here also. I believe the results of the analysis, together with testimony from people with experience in captive breeding, provide compelling evidence for NOT taking birds into captivity, for the following reasons:

1. Mortality during the first year of captivity was relatively high, 50% in 1988. Since nobody has experience caring for Po'ouli and we have only limited information on the behavior and ecology of this species, there is considerable risk that some mortality would occur rapidly in captivity. If even one bird died in captivity, and that bird happened to be the singleton sex, the entire project would fail.

2. There was very little mortality during capture and acclimation, suggesting catching and holding birds for a short time in the field would incur little risk. Also, as stated in the EA, if a bird did appear stressed while being held in the field, it could be released quickly if necessary.

3. The age of the remaining birds is unknown. It is possible they are near the end of their reproductive lifespan, in which case it is imperative to facilitate breeding quickly.

4. According to testimony given by Al Lieberman of the Peregrine Fund at the meeting, honeycreepers very rarely breed during their first two years of captivity. Breeding is only expected until the third or fourth year. Particularly since we do not know the ages of these birds, waiting three or four years before reproduction is attempted might be too long. It seems likely that the chances of reproduction during the first two years are greater in the wild than in captivity.

5. In order for a pair to form in the wild translocation will be necessary. Although we can only guess at the outcome of a translocation, steps can be taken to increase the chances of successful pair formation. Clearly, the translocated bird should only be released when its potential mate is nearby and after it is certain they are aware of each other. Playbacks of Po'ouli calls could be used to attract the wild bird to the release site and to spark its interest.

6. Some alternatives preclude all others, while some alternatives allow for contingency. If translocation of one bird to the home range of another did not work and the translocated bird returned to its own home range, the other options would still be available. In contrast, if all birds were captured and immediately taken to a captive facility, it might not be possible to attempt any other option thereafter. Starting with the simplest and least risky option seems most prudent. If the first attempt does not work, more extreme measures could be taken afterwards.

Calculation of probabilities of survival of birds taken into captivity
using data provided in the Environmental Assessment

METHODS

The estimates below are based on data from all species and years combined to increase the sample sizes. Values for some parameters have increased with each attempt, possibly because techniques have been improved by knowledge gained from past experience, but since this would be the first attempt with Po'ouli, the values from the earlier attempts might be more realistic.

There were a few inconsistencies in the data, the numbers don't always add up, e.g., number of surviving Iiwi in 1991 possibly should be 6, not 7, based on number transferred and mortality. These would make only small changes in the overall estimates of survival.

Survival estimates for 1 month, 6 month, and 1 year post-transfer are cumulative, i.e., the mortality 1 year after transfer includes mortality after 6 months and after only 1 month.

Annual survival for each cohort after establishment in captivity was found by taking the *nth* root of survival over *n* years. For example, in the 10 years since 1988, 13 of 15 birds taken into captivity have died, resulting in a cumulative survival rate of 2/15 = 0.13, and the 10th root of 0.13 = 0.82. Annual survival was calculated by simply taking the average of the 3 cohorts.

Probability of mortality during:	1988	1991	1992	total
capture	0/52 = 0	0/140 = 0	3/212=0.014	3/404=0.007
acclimation	0/30=0	0/52=0	1/61=0.016	1/143=0.007
transfer	0/30=0	0/52=0	0/28=0	0/110=0
within 1 month post transfer	12/30=0.40	4/52=0.08	3/28=0.11	19/110=0.17
within 6 months post transfer	15/30=0.50	8/52=0.15	4/28=0.14	27/110=0.25
mortality in first year of captivity	15/30=0.50	9/52=0.17	6/28=0.21	30/110=0.27
survival during first year	15/30=0.50	43/52=0.83	22/28=0.79	80/110=0.73
mortality after 1 year-present	13/15=0.87	25/43=0.58	3/22=0.14	N.A.
survival after 1 year-present	2/15=0.13	18/43=0.42	19/22=0.86	N.A.
annual survival to present	0.82	0.88	0.97	mean = 0.89

CONCLUSIONS

1. There was very little mortality during capture and acclimation, suggesting catching and holding birds for a short time in the field would incur little risk.

2. There was no mortality during transfer to zoos based on the data provided. Aviculturalists at the meeting seemed to think there often is some mortality, so this value might change if data from other attempts were included.

3. Most mortality occurred in the first year after birds were transferred to captivity. During the first attempt in 1988, 50% of birds died in the first year. Similar losses during a first attempt with Po'ouli probably should be considered unacceptable.

4. Annual survival in captivity after 1 year is quite high (89%), but this value applies only to birds that survive the first year, which apparently can be a relatively small proportion of those that start.

→ Shawn
wfr

Michael Buck
Administrator
DLNR-DOFAW
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

07 Oct. 1998

Dear Mr. Buck:

The following are my comments on the draft EA for possible management actions for the Po'ouli. The opinions are my own, and do not necessarily reflect the opinions of BRD-Hale.

If the sexes of the three known birds can be confirmed, I think the best plan of action would be that proposed in Alternative 2 in the draft EA. The pro's of a "soft" release may not out weigh the cons of a "hard" release, and I am undecided as to which of these two release types I think would be best to use. In any case, if the birds fail to form a pair, one can decide afterward whether or not to proceed with more manipulative alternatives.

Regardless of the alternatives which are implemented, I do not think transmitters should be put on any of the three birds. I am familiar with the technology and have used radio telemetry on a number of species. I have also researched the possibility of radio tracking Japanese white-eye in Hawaii rainforests. The size of the transmitter and battery would have to be very small, which means that the distance from which one could pick up the signal would be relatively short in good (open, flat) terrain. The terrain in which the Poouli occurs will interfere with the signal, thus decreasing the industry's stated signal detection distance. Also, the means by which the transmitter is attached (gluing on the back,or with a harness) could potentially harm the bird. Gluing requires cutting feathers from a small area on the back. This may allow significant heat loss from the bird, which is an important consideration in Hawaii's rainforests. A harness could abrade the bird in the area of attachment.

Given the odds of success of "saving" this species, in my opinion, if alternative 2 is unsuccessful at making a pair, alternative 1 should be implemented, and focus should be put on saving Maui's remaining forest birds. I feel the Maui Parrotbill should be getting attention equal to that of the Poouli. A bird with a population of 500+/-100 is in serious trouble, and yet efforts (including dollars) to save it have an immensely higher probability of succeeding.

Thank you for the opportunity to comment.

Sincerely,

Ellen VanGelder
BRD, Haleakala National Park
P.O. Box 369
Makawao, HI 96768

→ Sharon

October 10, 1998

Michael Buck
Hawai'i Deapartment of Land and Natural Resources
Division of Forestry and Wildlife
Honolulu, Hawaii

I agree with the Agency Determination that none of the alternatives are expected to cause significant impact. If, however, the statements and assumptions in this document carry on to help decide the course of conservation action, I have serious fears for po'ouli.

Table 4-1 summarises the effects and states that continuing current management will have no effect on native vegetation communities, no effect on native biological diversity, no effect on threatened species and no effect on non-native species. If those statements are true then the current management action of predator control is failing miserably. Either the staff are slacking or there is some factor which has not been seen anywhere else in the world which is not allowing results to be seen following predator reduction. Predator reduction should be causing a significant change in the ecosystem.

Alternative 3 shows an anthropomorphic approach which has never been shown to work in the past. Expecting birds to form a pair bond in an aviary which will hold through transfer to the big wide world is a load of nonsense. To start with birds do not have "pair bonds". The first attachment is to the site, be it nest or territory. Usually each sex will not worry which individual of the opposite sex shares this space. If it is an exclusive territory then each will chase others of the same sex away. She to preserve space to nest, he to preserve his genetic investment - or such other reasons. If it is an exclusive nest site then you are likely to see the pair together as they forage further afield. Humans call this a "pair bond" and that is a load of rubbish. She still needs him to feed her chicks and he still wishes to ensure that the chicks are his. The attachment is not to the individual per se but to the one that is sharing the space. This has been proven on a number of occasions in experiments involving removal of individuals or keeping in aviaries (Tim Lovegrove has data).

If those errors occur in this document in relation to the bits of biology I understand, what is the state of the rest of the document? It is not appropriate to treat this situation as five clear alternatives. The correct action, in my view, is making current management work and a translocation of one bird to start with.

Captive management is not an option, either in the field or

transferred to the best aviary in the world.

I hope those are helpful statements for the survival of Po'ouli. I am away to do some field work (repairing habitats) until near the end of November at which time I look forward to email telling me how Po'ouli are surviving.

Regards

Dick Veitch
48 Manse Road
Papakura
New Zealand

Phone/fax 64-9-298 5775

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The Nature Conservancy of Hawai'i

October 7, 1998

Mr. Robert P. Smith
Pacific Islands Manager
U.S. Fish and Wildlife Service
P.O. Box 50088
Honolulu, HI 96850

Mr. Michael G. Buck
Administrator
DLNR-DOFAW
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Dear Robert and Michael:

Thank you for the opportunity to provide feedback on the *Draft Environmental Assessment for Possible Management Actions to Save the Po'ouli*. We appreciate all the hard work and dedication of your staff in dealing with an extremely difficult situation in which there are no easy answers.

Whichever EA alternative is chosen for the po'ouli, the funding committed to that alternative cannot be at the expense of habitat management needed to reverse the serious threats to native birds (and many other native species) in the wild. In spite of the tremendous progress by the state, the Department of Interior, the Conservancy and others on East Maui and statewide over the past two decades, we must do even more to protect native forest habitat. As indicated in the draft EA, there are real limitations on the funding available to meet this enormous challenge. In light of this, the community must balance its investments in further recovery work for the po`ouli against the greater need to prevent many more Hawaiian species from reaching such desperately low numbers. The po`ouli's plight must be the rallying point from which we reverse the extinction trend for Hawaii's forest birds.

It is clear that all six alternatives described in the draft EA pose very high risks to the three known surviving po`ouli, that the alternatives designed to reduce risks in the wild bring along new risks in handling, holding, and other direct manipulation of these poorly-understood birds, and that it is impossible to achieve a high degree of certainty about the likely outcome of any of them. In light of these facts, the Conservancy supports the following course of action:

Regarding the remaining po`ouli in the wild:

- Reduce predation to the lowest levels that can be achieved with currently available technologies in the home range targeted to receive birds under Alternative 2.

- Conduct further work to confirm the sex of any surviving po`ouli only if a laboratory or technology is identified which can overcome the obstacles encountered by the three labs that have obtained conflicting or inconclusive results to date. Our point is that the risks to the birds that come with collection of specimens for sex determination are not worth taking unless there is a high degree of confidence that new tests will produce conclusive results.

- Implement Alternative 2 to move birds into the same home range as soon as possible.

Regarding the larger issue of reversing the extinction trend:

- First, we must collaborate to establish effective predator control methods for forest bird habitat and apply those methods in the field. EPA permitting and other needed testing and approvals for safe aerial broadcast of rat toxicants must be obtained and control begun as quickly as possible. Recent discussions have made it clear that this will be a monumental task, and that we cannot succeed in protecting wild birds without these new tools. This will benefit all native species that are currently impacted by rats.

- Second, there is important habitat for po`ouli and other endangered birds below the existing Hanawi contour fences and within the known home ranges of two of the existing po'ouli which continues to be damaged by feral pigs. The entire upper Hanawi NAR, below the existing 5,000'contour fence and above the 3,500' contour, should be fenced and all pigs removed as quickly as possible. Such a fence could link up with the currently proposed East Maui Watershed Partnership fence, protecting the majority of East Maui's primary forest bird habitat. This work should be carried out through the East Maui Watershed Partnership program already underway to engage local pig hunters and other community members in the stewardship of this precious forest. A key to successful, long-term management of this program is the addition of staffing and project funding to the NARS budget.

- Third, we must follow through now on work with the `akohekohe, Maui parrotbill, Maui creeper, and possibly `i`iwi to establish vigorous captive flocks and translocation programs in anticipation of the need to supplement wild populations to prevent the extinction of these species in our lifetimes. Let po`ouli teach us the value of acting in time.

Thank you for the opportunity to participate in this important decision, and please let us know if there is anything else we can do to facilitate your efforts.

Best regards,

Mark L. White
Director of Maui Programs
The Nature Conservancy of Hawaii

→ JKA02

United States Department of the Interior
U. S. GEOLOGICAL SURVEY
BIOLOGICAL RESOURCES DIVISION
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6 October 1998

Mr. Michael G. Buck
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Stret, Room 325
Honolulu, Hawaii 96813

Dear Mr. Buck,

Thank you for the opportunity of commenting on the "Draft environmental assessment for possible management actions to save the po'ouli" (September 1998). Although I have no experience with Hawaiian honeycreepers, I have been closely involved with the conservation of captive and wild populations of other critically endangered species (e.g., California condor, Puerto Rican parrot) for more than 25 years. Thus, I think I can offer an outside perspective built on that experience.

With a total known population of possibly only three individuals, the measures for conservation of the po'ouli obviously must be taken immediately and must be those that afford the effort the highest chance of success. The assessment presents a well-considered array of 6 alternative actions. I have reviewed each of these and, although each carries high risk, I believe one alternative is most likely to succeed given the conditions of the populations described in the draft environmental assessment. I conclude that most of the other options have substantial, unacceptable risks and should not be considered as reasonable management strategies. Below I comment on some of the proposed alternatives.

I strongly endorse Alternative 2, "Translocate and release of at least one individual to initiate pair formation," because I believe this option has the highest probability of success, as well as the lowest risk of mortality.

I do not see this as a viable option without the addition of another strong initiative: an aggressive effort to manage habitat for the subject species. Although the draft environmental assessment acknowledges the importance of habitat management to the survival of the species, I feel that a vigorous program of habitat maintenance should be included as essential to recovery of the po'ouli. Whichever management alternative is selected, habitat maintenance should be a strong component of that plan.

Habitat management must include aggressive control of known and potential predators (rats, cats, mongoose), non-native birds and plants, and ungulates and pigs. In addition, because of the known problems of avian disease in Hawaiian bird populations, vigorous control of disease and disease pathogens must be incorporated.

I encourage you to develop a habitat management component in view of the recognized success of such efforts elsewhere: most notably in New Zealand. Under any chosen strategy, the natural environment will need extensive and intensive management before the wild population of the po'ouli can be recovered.

In addition to the above-recommended actions, I urge you to intensify efforts of locating additional individuals of the po'ouli. Even if the probability of finding such an individual is small, the extreme value to the recovery effort is obvious.

I am vigorously opposed to all of the alternatives (3–6) that involve holding the birds in captivity. I believe the risks of injury and stress to the captive-held birds, even in the short term, are too great. I am particularly opposed to the captive options because, as far as I am aware, suitable protocols have not been developed for the husbandry of the po'ouli. My experience has shown that lengthy trial-and-error effort is needed to develop a suitable program for maintenance of wild birds in captivity. To breed such birds in captivity requires even more highly developed protocols.

I highly respect the fine team of Peregrine Fund biologists and their associates who are working on the problems of endangered bird species in Hawaii. Kuehler, Lieberman, and their team have had spectacular success in Hawaii and elsewhere. The prospects for saving the po'ouli through captive breeding are daunting, however, given the circumstances of only three known birds surviving and a lack of biologically based data upon which to build a captive propagation program.

In summary, I strongly endorse Alternative 2, to translocate and release individuals. But, an immediate, aggressive program of habitat management (to include control of predators, competitors, and disease) must be undertaken. Your task is formidable, but I think these strategies are your best options.

Sincerely yours,

James W. Wiley
Leader

→ Shawn

STATE OF HAWAII
DEPARTMENT OF EDUCATION
MOUNTAIN VIEW ELEMENTARY SCHOOL
P.O. BOX 9
MOUNTAIN VIEW, HAWAII 96771
Keakealani Outdoor Education Center

October 9, 1998

Michael Buck, Administrator
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawai`i 96813

Dear Mr. Buck,

I am writing regarding the draft environmental assessment for the Po`ouli (Melamprosops phaesoma). My concern is the removal of these few birds from the wild knowing that breeding in captivity may be unsuccessful. Since Po`ouli nests have been found in the past, perhaps it is a better idea to do nest searches, remove eggs, transport them to the Keauhou Bird Conservation Center for captive rearing while leaving the wild birds in their habitat.

In addition to egg collection, habitat management should be put into high gear. It makes most sense to me to have my money spent on ecosystem management rather than single species last ditch efforts. There are long term benefits with increased ecosystem management. Native species which may not be identified as extremely endangered have a better chance for species survival with habitat improvement. Removing birds from the wild in the hopes that they may be saved from extinction is money and credibility down the drain.

Let's be realistic and not political in our efforts. As Director of Keakealani Outdoor Education Center in Volcano, I am consistently asked by students, teachers and parents about the status of Hawai`i's forest birds. "Why is it called Bird Park if there's no birds here?" is a common question. The numbers of `I`iwi, `Elepaio, `Akepa as well as other endemic forest birds are decreasing, but there are still viable populations to save through habitat management. Extreme unrealistic measures for one species may cost other species their existence. Let's use our money for Hawai`i's wildlife wisely so that future generations will have a natural legacy. Egg searches for captive rearing of Po`ouli at the Keahou Bird Conservation Center and expanded habitat management for all native species in the target area make sense.

Sincerely,
Julia Williams
Julia Williams
Director/ Resource Teacher
Keakealani Outdoor Education Center

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
DEPUTY
GILBERT COLOMA-AGARAN

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF: HP-JEN

SEP 29 1998

Mr. Robert P. Smith
Pacific Islands Manager
U.S. Fish & Wildlife Service
P.O. Box 50088
Honolulu, Hawaii 96850

LOG NO: 22248
DOC NO: 9809RC20

Dear Mr. Smith:

SUBJECT: Draft EA for Possible Management Actions to Save the Po'ouli -- Historic Preservation Review
Hanawi Natural Area Reserve, Maui

The project requires compliance with two historic preservation laws -- the U.S. National Historic Preservation Act (Section 106) and the State of Hawaii's Chapter 6E (Section 8). Review is similar in both cases.

Land alteration impacts from this project seem minimal -- at most construction of 1-2 field aviaries and some staff support facilities in Hanawi NAR. However, there is no evaluation of whether historic sites are present and whether the above impacts could affect such sites. Page 24 simply states there will be no negative impacts, with no basis for that conclusion.

Because this is a high elevation forest area, precontact native Hawaiian use of the area would probably have been for forest resource exploitation (most probably for feather birds). Temporary campsites, exploitation sites and access trails are likely to have been associated with these activities. At the elevations of this area, use may have been infrequent, so the density of any historic sites is likely to be very low. Additionally, we have found that campsites and exploitation sites leave archaeological remains that are extremely difficult to identify in a survey (unless caves were used). Surface campsites and exploitation sites are often small, without stone architecture, and have been buried over the centuries. Access trails tend to be extremely difficult to identify, as most were simply worn paths in soil. Given this information, we believe that any historic sites in the project area will be in low densities, will be small, and will be extremely difficult to identify given traditional archaeological survey (unless in caves).

Given the small impact areas of your proposed field aviaries and staff support facilities, we believe that any impacts on the overall universe of forest exploitation historic sites are likely to be very minimal. Traditional archaeological survey is unlikely to be useful to identify any sites. Thus, we believe the proposed alternatives will have "no effect" on significant historic sites, with the following two conditions if field aviaries and support facilities are built:

1. If caves are found, construction will avoid such caves with a 20 meter buffer. The State Historic Preservation Division will then be notified of the presence of such caves, so a field inspection can occur to determine if historic sites are within the caves.

2. If construction uncovers any buried historic remains (stone pavings, food remains such as shell and bone, artifacts such as clusters of stone flakes, or firepits), construction will stop in those areas, and the State Historic Preservation Division will be notified to evaluate the finds and help work out mitigation needs.

This "no effect" determination can be used as our comments for both the National Historic Preservation Act review and the State's Chapter 6E review.

Aloha,

for Michael Wilson, Chairperson and
State Historic Preservation Officer

c: Michael Buck, DOFAW

X-Sender: davew@biomail.ucsd.edu
Date: Mon, 12 Oct 1998 12:08:38 -0700
To: wildlife@pixi.com, shareilly@aol.com
From: David Woodruff <dwoodruf@ucsd.edu>
Subject: Po`ouli sexing and the Draft EA
Cc: Steven_Fancy@nps.gov (Steven Fancy), markcoll@hawaii.edu (Mark Collins),
HTSU21B@prodigy.com (Cyndi Kuehler),
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10 October 1998

Sharon E. Reilly
Wildlife Biologist
DLNR-DOFAW
1151 Punchbowl Street, Room 325
Honolulu, HA

Dear Ms. Reilly,

At your invitation I have reviewed the Po`ouli Genetic Sexing Report dated September 15, 1998. I am a conservation geneticist and have worked with a diverse group of threatened mammals, birds, reptiles, amphibians and molluscs. I have no personal experience with Hawaiian honeycreepers but have worked with loggerhead shrikes and hornbills. In 1989 I was apparently the first to show that DNA could be obtained noninvasively from bird feathers and sequenced.

For the last 10 years my laboratory group has focused on the noninvasive genotyping of threatened species. We have shown how wild chimpanzees can be genotyped from shed hair, shrikes from shed and plucked feathers, and elephants from DNA amplified from their dung. This work is frustratingly difficult and most labs give up long before they solve the problems of working with such minute and degraded DNA samples. Nevertheless, it can be done and you have every reason to expect replicable results for the Po`ouli.

I think you were well advised to go to University Diagnostics Limited as they are in possession of proprietary methods for sexing birds that are currently the best available. Their duplicated determinations should be tentatively accepted until proven otherwise. I would, however, not base major policy decisions on these results (except for bird HR3, see below) until they are confirmed by an independent study. Their results show that both sexes are represented in their sample but their interpretation of the individual results is not proven based on the evidence provided for review. I am bothered by the lack of positive controls and puzzled by the gel photos; the demonstration of the product is by [now out-moded] Southern blot analysis according to Mellars' paper but the gel photos appear to be based on PCR and RFLP analysis. In future, you will also want to see a photo of the PCR products before they were cut or probed.

Unfortunately, we cannot expect to replicate UDL's results exactly elsewhere as their methods (the primers used to amplify the DNA and the probes used on the Southern blot) are proprietary. Nevertheless, there are probably a dozen laboratories in North America that can, using UDL primers or other methods, give you reliable determinations. Rob Fleischer's laboratory at the National Zoo is certainly one I would recommend and I think that his postdoctoral fellow Beth Slikas is technically capable of carrying out replicable determinations. Unfortunately, her numerous attempts failed and/or her results are compromised or ambiguous. Such frustrations are normal in my experience and typical of attempts to respond to requests for this type of emergency determination; I do not fault them

for their effort or their competency. Their results are useful in that they provide a separate and reasonable confirmation that bird HR3 is probably male.

I would not have recommended the Avian Biotech lab as their techniques are simply inappropriate for the Po`ouli at this time; their ambiguous results should be ignored. There are several small labs in the U. S. that sex birds of commercial interest (chickens, turkeys, parrots and ostriches); their methods are reliable and routine for some groups of birds but not immediately applicable to genetically unknown species.

I can assemble a list of additional scientists who should be able to sex Po`ouli from poor or degraded DNA samples if that would be useful. In the meantime I urge you to ensure that all possible DNA sources are carefully saved for examination. In our experience with loggerhead shrikes single body contour feathers provide adequate material, as long as the quill is intact.

You will see from my letter to Michael Buck in response to his request for comments on the Draft EA that the sex determination is, in my opinion, secondary for the next couple of years. This information is admittedly critical for planning Alternative 2 translocations and Alternative 3-6 ex-situ pairings, but as these Alternatives are too risky to contemplate I feel genetic issues are irrelevant to the decisions you need to make immediately. The problem of sexing will be solved in the next 12 months if more feathers become available and more scientists attempt the difficult determinations. In the interim, you should do everything possible to protect the known birds and their habitat and learn as much about them as possible. If effective predator control is the key to their survival then, in the long term, you can save them at far less cost in the forest than by moving them into a captive propagation mode which, at present, appears technically and biologically indefensible.

I wish you every success with this difficult work.

Thank you for your consideration,

Yours sincerely,

David S. Woodruff
Professor of Biology

□**********

10 October 1998

Michael G. Buck
Administrator
DLNR-DOFAW
1151 Punchbowl Street, Room 325
Honolulu, HA

Dear Mr. Buck,

At your invitation I have reviewed the Draft Environmental Assessment for Possible Management Actions to Save the Po`ouli dated September 1998. In a separate letter I will respond to Sharon E. Reilly's request for comments on the Po`ouli genetic sexing studies. I am a conservation geneticist and have worked with a diverse group of threatened mammals, birds, reptiles, amphibians and molluscs. I have no personal experience with Hawaiian honeycreepers but have followed the remarkable successes in the conservation of Hawaiian birds in the last few years with great interest.

The information available to me suggests that the Draft EA seriously underestimates the technical difficulties and risks associated with proposed management Alternatives 3, 4, 5, and 6. I strongly urge you not to attempt management involving bringing birds into captivity until enough is known about their ecology and behavior. You currently do not know enough about these birds to manage their short-term care, let alone propagation, in aviaries or captive propagation centers. The known risks of capturing and caging small insectivorous passerines (which are underestimated in the draft EA) coupled with the significant known or anticipated species-specific problems preclude Alternatives 3, 4, 5, and 6

at this time.

Alternative 2 is also problematic as the critical information on the sex of the individual birds is not available or uncertain. If this information were available I might support translocation and immediate release of a solitary female into the territory of a singing and apparently un-mated male. I cannot recommend this option, however, as I do not have the personal experience to defend it and as I do not think the current levels of predator and pest control are adequate. Alternative 2 should be considered only if supported by increased predator control and the risks were found to be tolerable by the Hawaiian Forest Bird Recovery Team.

I favor adoption of Alternative 1 with two modifications. First, you must increase the predator and pig control efforts. Money spent on excluding, eradicating or controlling the rats, cats, mongoose and pigs will benefit the entire native community. Until it can be established exactly what caused the decline of the Po`ouli it seems prudent to assume that all of these aliens are contributing (directly or indirectly) to its endangerment. □

Reducing their numbers in the forest will benefit not just the Po`ouli but all your other listed and candidate species. Second, you will have to increase the level of survey and observational work as it is inadequate for a secretive species like the Po`ouli. You will never get a statistically reliable estimate of surviving number of individuals or the necessary information on their diet and behavior with the current level of effort. You must either increase that effort or forgo Alternatives 2-6 because their associated risks are too high.

In summary, I recommend continuing a hands-off approach for 3-4 more years during which time you should double both the Po`ouli-focused observational work and the regional predator/pig control efforts. With that level of effort you will then have enough information to make an appropriately informed judgment regarding Alternatives 2-6. If the Po`ouli goes extinct in the meantime it will be for reasons that you could not have been expected to mitigate with any of the Alternatives presented.

Although I was originally consulted on the issue of genetic sex-determination it should be quite clear from the above recommendations that the sexing of the three known birds is, in my opinion, secondary. This information is admittedly critical for planning Alternative 2 translocations and Alternative 3-6 ex-situ pairings, but as these Alternatives are too risky to contemplate I feel genetic issues are irrelevant to the decisions you need to make immediately. The problem of sexing will be solved in the next 12 months if more feathers become available and more scientists attempt the difficult determinations. In the interim, you should do everything possible to protect the known birds and learn as much about them as possible. If effective predator control is the key to their survival then, in the long term, you can save them at far less cost in the forest than by moving them into a captive propagation mode which at present is technically and biologically indefensible.

Thank you for your consideration,
Yours sincerely,

David S. Woodruff
Professor of Biology

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United States Department of the Interior

U. S. GEOLOGICAL SURVEY-BIOLOGICAL RESOURCES DIVISION
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November 9, 1998

Memorandum

To: David Hopper (USFWS)

From: Thierry Work (USGS-BRD)

Subject: Po'ouli

Dear Dave:

Thank you for the opportunity to comment on the proposed management actions for the po'ouli. I recommend option 1 (leave birds in wild with intensive habitat management) for the following reasons:

1) Bringing birds into captivity has four major problems:
   -It will not answer why these birds are declining in the wild.

   -There is a significant risk of either mortality or failure to breed in captivity.

   -There are issues between the FWS and captive breeding facilities that need to be sorted out before a new captive breeding initiative is undertaken.

   -Removing birds from the habitat will focus all attention on captive breeding. This will decrease incentive to address the fundamental question of why these birds are declining in the wild. It may also decrease incentive to protect this habitat.

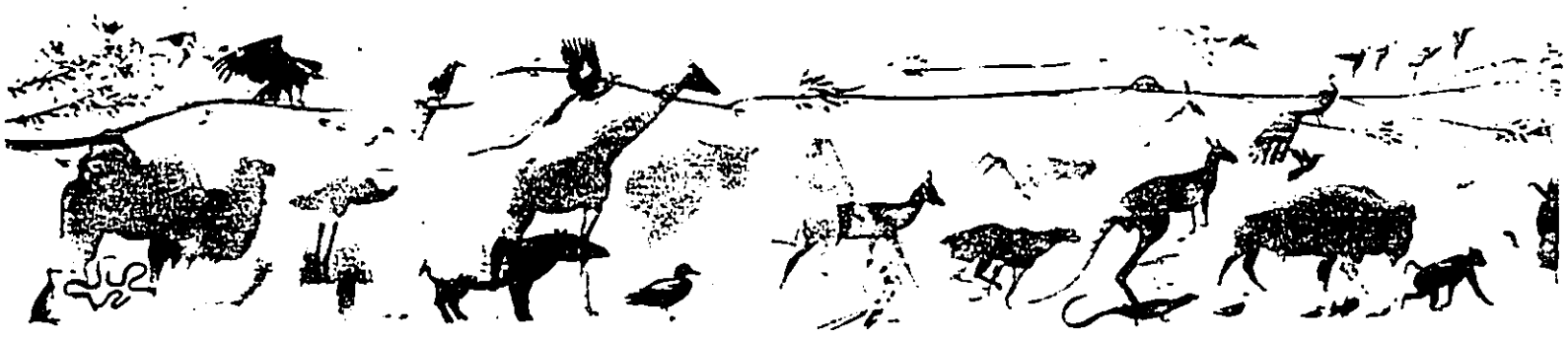
2) Translocation is not an ideal option.
   -This will not answer why these birds are declining in the wild.

   -Based on the palila experience, the older the bird, the less likely it is to remain at the translocation site. The numbers Luanne Johnson gave me for palila was that 88% of translocated hatch year birds remained at the release site while the percentage dropped to 55 % for second year birds. I believe the percentage decreases for adults but I do not have figures. I believe these po'ouli are adults.

It seems the most reasonable option is to leave the birds in the wild and to intensively investigate possible reasons why these birds are not thriving in their current habitat. This would be done with an eye to eventually managing the habitat so that these birds can once again form a viable population.

Sincerely,

Thierry M. Work
Wildlife Disease Specialist



The Zoological Society of San Diego

October 2, 1998

Michael Buck
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl St. Room 325
Honolulu, Hawaii 96813

Dear Mr. Buck:

Introduction: In response to the solicitation for review of the EA entitled: "Possible Management Actions to Save the Po'ouli (*Melamprosops phaeosoma*)," I offer the following analysis and commentary. I base my comments and professional opinion on my experiences in the field of avian medicine and surgery, zoo medicine and surgery, and resulting from my active participation in a number of restoration projects. Some of the more notable projects I have consulted with include the California Condor (served as a veterinary coordinator for the recovery project), Guam rail (currently the SSP veterinary advisor for the recovery project), micronesian kingfisher (San Diego Zoo having by far and away the most significant success in captive breeding of this species in captivity), Bali mynah (participating in SSP), Nene (consultant to The Peregrine Fund), and 'Alala (consultant to The Peregrine Fund). These are just a few of the programs I have and am currently participating in as a consultant, and which are referred to in the EA. In addition, I also have considerable experience as a senior veterinarian at the San Diego Zoo in the health management of the largest captive collection of passerines in the world. I hold a bachelor of science in Zoology from the University of California, Davis, a doctorate in veterinary medicine from the University of California, Davis, a residency training certificate in zoo and wildlife medicine from the University of Tennessee, Knoxville, a diplomate certificate from the American College of Zoological Medicine, and 15 years experience in two zoological institutions (Knoxville Zoological Gardens, and the San Diego Zoo). I am currently a senior veterinarian at the San Diego Zoo. My CV is available upon request should my credentials require validation.

My comments are directed to four main aspects of the proposed restoration activity for Po'ouli for which I feel qualified to render a professional opinion as a veterinarian with experience in the field, and as a trained zoologist; habitat maintenance, census activities, population demographics, and comments about the specific alternatives presented to manage Po'ouli.

Habitat maintenance: As pointed out in several areas of the EA, management of the habitat has achieved positive results for several plant and animal species. As part of a complete restoration attempt for Po'ouli, an expanded Ecosystem Habitat Management Alternative needs to be incorporated into the EA. This is absolutely vital to the overall, long-term successful management for Po'ouli (and other fauna and flora sharing the ecosystem) regardless of which immediate, short-term rescue alternative is chosen for Po'ouli.

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Census activities: In the historical review of previous census activities to locate Po'ouli the EA does not reflect the fact that historical home range census attempts are incomplete. There are regions known or suspected to have previously supported populations of Po'ouli that have not been extensively surveyed. I recommend that an independent scientific review of all survey results cited in the EA be conducted. That way it can be determined if additional surveys should be conducted in other areas to form a more complete understanding of the number of extant Po'ouli.

Population demographics: I am aware of the results of reports from attempted genetic sex determination of the individuals in the known population. In fact, the reported results indicate that the analysis is not completely reliable. This suggests that the management alternatives have been developed based on less than reliable results of sex determination of the individuals. This being the case, if it is discovered after implementing a management alternative based on a certain sex ratio that the sexes are other than anticipated based on the results, a serious mistake will have been made that could needlessly and further jeopardize the future of the species. I recommend an independent scientific review of the results of the sex determination analyses for Po'ouli cited in the EA to be conducted immediately by experts in the field of avian genetic sexing analysis, and that procedures be drafted immediately to rectify any concerns based on the reliability of the results. This is a critical step in the formation of sensible management plans for this species.

Analysis of suggested alternatives: I agree that the six management alternatives generated in the EA seem to be the reasonable and logical alternatives to evaluate to save the Po'ouli. However, I am concerned that there has been a hasty and insufficient assessment of these areas that is not based on a thorough review of available literature on endangered species restorations. In addition, based on the results of the EA there appears to have been insufficient consultation with available experts on some of the suggested alternative categories, especially those concerning the long-term captive management of Po'ouli.

First, the species offered as evidence in support of the argument for long-term captive management of Po'ouli (see section 2.3.6 - alternative 6) for which propagation programs have resulted in successful population enhancement are inherently hardy species, with the possible exception of the kingfisher. I have worked with and currently participate in the captive propagation programs for nearly all of these species. The species and associated programs cited are poor examples, and do not serve as relevant precedents for passerines, which are much more delicate birds. In addition, there are no surrogate studies that have been conducted as a prelude to establishing a captive breeding effort for Po'ouli. In the other species cited, surrogate studies in similar species were a vital prelude that provided the managers for those projects with a means of insuring success quickly in the targeted endangered species. As a result, the citation and the arguments offered in support of establishing a captive breeding effort for the three birds are not appropriate, and are of dubious value to address similar issues surrounding Po'ouli.

In reality, if one were to make the same attempt with many if not most passerine species, a more sensible approach to establishing and utilizing a captive colony of passerines to quickly amplify the extant population for repatriation would include surrogate studies to establish a model for proceeding with the targeted endangered passerine. Further, a thorough review of mortality percentages of captive managed individuals of similar species of passerines needs to be examined before making a decision to attempt captive management of an endangered passerine species. In my experience, these mortality figures are much higher for passerines than for the species/programs cited in the EA for which captive breeding appears to be succeeding to meet the goal of population amplification. I do not detect that any such attempts to evaluate surrogates, or to take into consideration observed mortality rates for other passerine species has been made in the course of drafting these alternatives. Indeed, in the matrix of expected effects ("issues") illustrated in Table 2.1, I see nowhere a category that expresses the issue of stress-related effects or post-capture intraspecific aggression. The expected effect under the captive management column would indicate a high degree of stress-related problems and intraspecific aggression. This very significant aspect of the long-term holding alternative has been submerged into the first category: "Likelihood of death or injury to the three known birds." To those with less experience in the captive maintenance of passerines it would appear that risks in this first category are nearly equal across all six alternative categories. In my opinion they are not.

Further, with regard to the assessment category in Table 2.1 "Likelihood of pair bond formation with three known birds," the expectation that simply placing three birds into captivity to form pair bonding having a "high" expected degree of success reflects a rather naive understanding of the reality of captive passerine management. In reality, the result of introducing one passerine to another in captivity very often results in aggression and injury as birds interact inappropriately due to the influences of captivity. An approach demonstrating more experience and knowledge of the reality of captive management would be to select many more birds to include in the founder captive population. Eventually, if the founding population is large enough, the formation of breeding pairs should occur, ***but only at the expense of a portion of the original captive group that will succumb as a direct result of stress-induced disease and injury from displaced aggression.*** These likely outcomes have been inappropriately eliminated as factors in the comparative risk assessment matrix in Table 2.1, creating a falsely elevated expectation of success upon uniting the three Po'ouli in captivity

Despite this, if one reads the EA thoroughly a hint of the expected mortality associated with the imposition of captivity on passerines can be seen in section 2.3.6, where a recounting is made of past experiences with the establishment of captive collections of Hawaiian passerines:

". . .although several birds died after arrival and holding at the zoological institutions."

And again, in section 2.4 (Comparative evaluation of alternatives):

"Cons: While possibly providing the highest conservation pay-offs of all of the alternatives, this alternative is also one of the most risky."

And finally in the same section:

"While insectivorous passerines have been successfully reared from eggs and chicks, bringing wild birds into captivity has a high likelihood of failure."

In my opinion, the risks of bringing Po'ouli into captivity under the conditions stated create a much greater risk of post-capture injury and stress-related disease than is presented in this document. The three birds have been followed in the wild for some time now, and are apparently in good health at the present time. The known predators include those species for which predator controls can be implemented with an expected degree of success in an intensively managed section of the current home range. As a result, a focused attempt to reduce the mongoose, rats, and cats in the area should meet with an expected degree of success that I feel are not correctly assessed in section 2.4, based on published observations of predator control programs used in other projects.

I am concerned that, with only three individuals known to remain of this species, due consideration has not been given to the effect of the expected mortality resulting from imposed captivity and intensive captive management (such as proposed by alternative 2.3.6) on what is most likely a delicate passerine species. Based on my experiences with captive passerine management, an expected mortality of one or more of these individuals above what has been estimated by the arguments in section 2.4 and in the matrix illustrated by Table 2.1 is higher than presented here. The citatoins in the EA regarding observed mortalities of other Hawaiian passerines serves as evidence of this effect. Were there more individuals in the founding captive population, I would be less concerned that the expected mortality of establishing an intensively managed captive population would have such a damaging influence on the desired outcome. This is because the expected morbidity and mortality associated with long-term captive management would likely be offset by successful establishment of one or more breeding pairs. With only three individuals, how can one justify an expected loss of even a single individual by imposing captivity as the preferred management strategy?

I urge the adoption of a less intense management strategy that allows the birds to remain in the wild under conditions of a hard relocation strategy, expanded habitat management alternatives, increased predator control efforts and increased vector control efforts to minimize the negative impact of existing population limiting factors. This will also allow the birds to have more frequent encounters with each other under natural

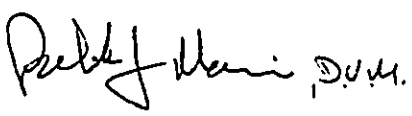
conditions that will encourage courtship and mating, rather than imposing the distractions and stressors of captivity on them. Then, if pairing and nesting should occur, eggs can likely be removed (as has been done many times in the past for Hawaiian species) to incubate in captivity for hand rearing as the preferred method of population enhancement. I am wholeheartedly of the opinion that the management strategy of choice in this situation is the recovery of eggs from wild nest(s), artificial incubation and rearing in captivity to create a captive population which would be used to quickly amplify the numbers of Po'ouli.

Conclusions based on the available information:

- **The best management strategy at this time is to leave the three birds in the wild, and to conduct hard translocations while simultaneously implementing expanded ecosystem management alternatives in Po'ouli habitat.**
- ***Immediately seek an independent scientific review of the analyses and methods used to determine sex in the three living individuals.***
- **Immediately seek an independent scientific review of the strategies, results, and interpretations of all the cited census activities in relation to the conclusions drawn in the EA.**

Please do not hesitate to contact me regarding any of the opinions and comments expressed in this reply.

Sincerely,



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