FINAL
ENVIRONMENTAL ASSESSMENT

‘A‘o (Newell's shearwater) Management Actions

AUGUST 2016

U.S. Fish & Wildlife Service
Kīlauea Point National Wildlife Refuge
Kaua‘i National Wildlife Refuge Complex

Final Environmental Assessment
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Executive Summary

The United States Fish and Wildlife Service (USFWS) Kaua‘i National Wildlife Refuge Complex (Refuge) is considering management actions for the conservation of the threatened ‘A‘o (*Puffinus auricularis newelli*, Newell's shearwater, NESH). In accordance with the National Environmental Policy Act (NEPA), this Environmental Assessment (EA) presents a review of the conservation efforts to date regarding ‘A‘o, examines a range of management actions that may be implemented by the Refuge, analyzes possible environmental effects of the alternatives, and serves as the basis for a decision by USFWS on which alternative to implement.

The management actions being presented in this EA include:

Alternative A	No-action alternative: continue existing management
Alternative B	Social attraction
Alternative C	Chick translocation combined with social attraction (preferred alternative)

None of the alternatives are expected to cause significant, irreversible impacts to the environment; therefore, the anticipated determination is a Finding of No Significant Impact (FONSI).

“*Kaua‘i holds 90% of the remaining population of the Newell's shearwater, making the island the last Refuge for this enigmatic species and critical to its survival. As this species is endemic to the Hawaiian Islands, this means that Kaua‘i also holds the largest breeding population of this bird on the planet.*”

Kaua‘i Endangered Seabird Restoration Project, 2016

Chapter 1. Introduction and Background

1.1 Introduction

In response to dramatic and ongoing population declines, the USFWS is considering potential management actions at Kīlauea Point National Wildlife Refuge (KPNWR) for the conservation of the ‘A‘o. The USFWS is the primary federal agency responsible for migratory birds, endangered plants and animals, certain marine animals and anadromous fish. The mission of the National Wildlife Refuge System is to administer a network of lands and waters for the conservation and management of fish, wildlife and plant resources of the United States for the benefit of present and future generations.

KPNWR encompasses 199 acres on the northeast coast of Kaua‘i, two miles north of the town of Kīlauea. The refuge is a coastal complex of steep cliffs abutting the ocean and is home to one of the largest seabird colonies in the main Hawaiian Islands (MHI). KPNWR supports breeding populations of threatened ‘A‘o, ‘Ua‘u kani (Wedge-tailed shearwater, *Puffinus pacificus*), ‘Ā (Red-footed booby, *Sula sula*), Mōlī (Laysan albatross, *Phoebastria immutabilis*), Koa‘e ‘ula (Red-tailed tropicbird, *Phaethon rubricauda*), Koa‘e kea (White-tailed tropicbird, *Phaethon lepturus*) as well as a large breeding population of the endangered Nēnē (*Branta sandvicensis*). In 2015, KPNWR participated in the first attempted translocation of endangered ‘Ua‘u (Hawaiian petrel, *Pterodroma sandwichensis*) chicks, and nine of the ten chicks successfully fledged from the 7-acre predator-free Nihoku fenced unit within KPNWR.

Refuge-specific goals at KPNWR, as outlined in its Comprehensive Conservation Plan (CCP), include to “protect, enhance and manage the coastal ecosystem to meet the life-history needs of migratory seabirds and threatened and endangered species” and to “restore and/or enhance and manage populations of migratory seabirds and threatened and endangered species” (USFWS 2016).

A primary seabird objective in the CCP is to restore viable breeding populations of ‘A‘o and other seabirds at Crater Hill and Mōkōlea Point, with trends suggesting (1) stable or increasing population sizes and (2) high genetic diversity. One strategy includes maintaining the ‘A‘o colony on the Point, while shifting emphasis for ‘A‘o recovery on Crater Hill and Mōkōlea Point (including the Nihoku predator-free fenced unit), where public uses are less intense, resulting in two sub-populations on the Refuge that may be managed to become one contiguous ‘A‘o colony.

This EA evaluates three management alternatives: no action, social attraction, and chick translocation combined with social attraction. The action alternatives (social attraction and chick translocation combined with social attraction) utilize recognized conservation techniques to encourage the establishment of a new ‘A‘o colony within the 7-acre Nihoku fenced unit, free of introduced mammalian predators at a protected location away from disorienting lights and utility lines.

1.2 ‘A‘o: Newell's shearwater (*Puffinus auricularis newelli*)

‘A‘o are a threatened species of shearwater that is endemic to the Hawaiian Islands. A pelagic seabird, ‘A‘o forage over deep waters for ommastrephid flying squid, ranging throughout the tropical Eastern Pacific up to 3,000 miles from the Hawaiian Islands south to the Equatorial Countercurrent (Ainley et al. 1997, Ainley et al. 2014). ‘A‘o are medium-sized, black above with a white belly, throat, and underwings, and a distinctive white patch on the flanks. ‘A‘o are characterized by a long lifespan (at least 20 years), low fecundity (one chick per year), and delayed recruitment (Ainley et al. 1997, Simons and Hodges 1998).

‘A‘o are found in the fossil and subfossil deposits of O‘ahu and other islands (Pyle and Pyle 2009). While the early Hawaiians knew the seabird well, naming it ‘A‘o after its distinctive call (which sounds like a braying donkey), for over a half-century subsequent reports of it virtually ceased and some thought it to be extinct by the early 1900s (Pyle and Pyle 2009). Offshore sightings were reported in 1938 and 1947; a few specimens were collected on Kaua‘i in 1956-57 (Pyle and Pyle 2009), and a colony was discovered on Kaua‘i in 1967 (KESRP 2016). ‘A‘o was listed as threatened under the Endangered Species Act in 1975.

‘A‘o are at least loosely colonial and nest in burrows, crevices or under vegetation in montane colonies in two habitat types: 1) high elevation, steep, wet montane forest dominated by native vegetation (ōhi‘a (*Metrosideros polymorpha*) forest with an uluhe fern (*Dicranopteris linearis*) understory) and 2) steep dry cliffs (predominantly along the Nā Pali coast). At KPWNR, the nesting pairs of ‘A‘o breed in a combination of artificial nest boxes placed under vegetation (typically beach naupaka (*Scaevola taccada*) and in naturally excavated tunnels or depressions under hala (*Pandanus tectorius*) debris (Raine and McFarland 2013). Nests are often in isolated locations and/or on slopes greater than 65 degrees and are extremely difficult to find (Ainley et al. 1997). Burrows on Kaua‘i ranged in depth from 46–175 cm (18–69 in) with an average of 87.78 +/- 22.2 SD (34 +/- 8.6 SD) (Telfer 1986, Planning Solutions et al. 2011).

‘A‘o breed from April to November (Ainley et al. 1997). In April, birds return to prospect for nest sites. A pre-laying exodus follows in late April and possibly May, and egg-laying begins in the first two weeks of June and likely continues through the early part of July (Planning Solutions et al. 2011). Pairs produce one egg per year, and the average incubation period is thought to be approximately 51 days (Telfer 1986). Parents take turns sitting on the egg and going out to sea to feed (KESRP 2016). Once the chick is hatched, both parents will go to sea during the day, with one returning each night to feed the chick (KESRP 2016). The fledging period is approximately 90 days. Most fledging takes place in October and November, with a few birds still fledging in December (Planning Solutions et al. 2011). Pairs are monogamous and show a high degree of nest site fidelity. Based on observations of similar burrow-nesting seabird species, imprinting on the natal site is believed to occur after the date of the chick's first emergence from the burrow (Miskelly and Taylor 2004, Miskelly et al. 2009). ʻAʻo are thought to start visiting their breeding colony at 2–3 years of age, but first breeding for ʻAʻo occurs at approximately 6 years of age (Ainley et al. 1997). No specific data exist on longevity for this species, but other shearwaters may reach 30 years of age or more (Planning Solutions et al. 2011).

ʻAʻo need an open downhill flight path or a tree to climb to become airborne (USFWS undated). Daily flights of breeding adults to and from the colonies occur only at night and just before dawn. On Kauaʻi, ʻAʻo were found to exhibit almost no movement until after complete darkness, whereupon they moved inland in a wave that peaked for 30 to 40 minutes (Day and Cooper 1995). After that peak, the rate of movement decreased steadily until 90 minutes after complete darkness, after which few birds were seen. In the morning, ʻAʻo begin moving to sea in numbers approximately 40 minutes before the first measurable light and movement rates increase rapidly and peak just before dawn (Day and Cooper 1995).

Today, the breeding population is primarily restricted to Kauaʻi; nests have also been documented on Molokaʻi and Hawaiʻi and are suspected on Maui, Lānaʻi, and possibly on Oʻahu (Ainley et al. 1997, Reynolds and Ritchotte 1997, VanderWerf et al. 2007, USFWS undated, Planning Solutions et al. 2011). The current distribution is thought to be an artifact of range constriction as a result of predation and habitat destruction, rather than a true preference—e.g., only the most inaccessible colonies are left.

Threats to ʻAʻo are many and varied and cannot be entirely eliminated. Like other birds in the order Procellariiformes, ʻAʻo exhibit strong natal philopatry (tendency to return to birth site to breed) and high nest-site fidelity. These behavioral traits, along with a protracted nesting period and ground nesting habitat, result in great vulnerability of eggs, chicks, and adults to predation by introduced mammals at the breeding colonies (Croxall et al. 2012). Predation by feral cats (*Felis catus*), feral pigs (*Sus scrofa*), rats (particularly black rats *Rattus rattus*), dogs (*Canis lupus familiaris*) and barn owls (*Tyto alba*) have all been documented (Planning Solutions et al. 2011, Raine et al. 2014a–b, Ainley et al. 1997); predation by small Indian mongoose (*Herpestes auropunctatus*) is likely on islands with established mongoose populations. Light attraction (fallout) and collision with artificial structures are also contributors to ʻAʻo mortality (Ainley et al. 1995). Fledglings are the main victim of light attraction-related fallout since it is thought they use the moon and stars to guide them to the ocean and become confused by other sources of light. Collision with artificial structures, predominantly utility lines, kills adults—particularly breeding adults moving to and from montane breeding colonies in the dark (Travers et al. 2014). Habitat loss and degradation from invasive plant species or natural catastrophe (e.g., hurricane or wildfire) is often compounded with predation as reduction in dense native canopy cover can provide access for predators into breeding colonies. ʻAʻo are likely susceptible to marine-based threats as well, such as Pacific-wide changes to food supply, but limited information exists on the scope and intensity of marine based threats.

1.3 Summary of Conservation Efforts for ‘A‘o to Date

KPNWR
A total of 90 ‘A‘o eggs were transported from montane burrows to Kīlauea Point and Moku‘ae‘ae Island (just offshore of KPNWR) and placed under incubating ‘Ua‘u kani in 1978 (65 eggs) and 1980 (25 eggs). Seventy-one (79%) of the eggs hatched and 67 chicks fledged (Byrd et al. 1984).

One of the banded chicks from the egg translocation returned as an adult in August 1987 (Pyle and Pyle 2009). Breeding was confirmed at KPNWR in 1997 when three unbanded adults and a nest with an egg were discovered near the Refuge headquarters area. One to two pairs bred each year from 1997–2002, resulting in successful fledging of chicks in all years except 1998 (Pyle and Pyle 2009); between 2002–2012, two to five chicks probably fledged each year from the Refuge (USFWS 2016). Ten chicks hatched and banded on the Refuge between 1997 and 2012 have returned as breeders or prospectors; of these, five chicks have been confirmed breeding successfully on site (from a minimum of 58 chicks fledged since 1997). Other colonists are assumed to be descendants of the original cross-fostered chicks, chicks from previously undetected nests, and new recruits attracted by the colony or the acoustic attraction system (USFWS 2016, BirdLife 2016, Pyle and Pyle 2009).

In 2007, KPNWR initiated a social attraction project in cooperation with the Kaua‘i Endangered Seabird Recovery Project (KESRP), in an effort to enhance the small breeding population. ‘A‘o calls were played continuously from sunset to sunrise between April and October from a weather-resistant stereo system, and 19 artificial burrows were added in 2008 (to increase available burrows to 27). The number of documented pairs increased from 2 in 2007, 3 in 2008–2010, 7 in 2011, and 11 in 2012 (McFarland et al. 2013). The four-year lag in the time between when the social attraction began (2007) and notable increase in the number of pairs identified (2011) may be due in part to increased survey efforts beginning in 2010 or an actual increase in the number of pairs at KPNWR (McFarland et al. 2013). Additionally, KPNWR has a 2 to 1 ratio of unbanded to banded birds, suggesting that for every returnee fledged on site, there are one or two fledged from elsewhere, indicating success at attracting birds that fledged from other colonies through acoustic attraction (Uyehara pers. comm.). The aging sound system at the Point was retired in 2014, to be replaced by an up-scaled social attraction system at the Nihoku predator-free fenced unit. The current program to control introduced predators that prey on endangered and migratory species includes a hogwire fence, occasional barn owl and feral chicken control, 50 Diphacinone rodenticide bait stations monitored with 20 rodent tracking tunnels, and five cat traps maintained year-round on the 12 accessible acres surrounding the existing ‘A‘o colony.

KESRP and KPNWR staff and volunteers also annually monitor burrows (20) known to have been used by ‘A‘o and conduct searches for additional burrows based on observations. Over the past five years, no deaths as a result of predation have been recorded, and between two and six chicks have fledged each year. However, ‘Ua‘u kani appear to have actively displaced several ‘A‘o pairs at KPNWR, starting with two displacements in 2012 and three more by 2014. Three of the ‘A‘o pairs relocated, and two bred successfully later nearby (Uyehara pers. comm.); the long-term impact on ‘A‘o and their ability to adapt to such interactions remains unknown.

Table 1.1 Summary of activity at KPNWR monitored burrows: 2011–2014

Year	# Burrows Monitored	# Confirmed Breeding	# Fledged
2011	7	4	2
2012	13	7	5
2013	17	9	7
2014	18	9	6

Data derived from Johnson et al. 2011, McFarland and Raine 2012, Raine and Banfield 2014c, Raine et al. 2015e, USFWS 2015b.

In 2014, KPNWR constructed a 7-acre predator-proof fenced unit and eradicated introduced mammalian predators as part of the Nihoku Ecosystem Restoration Project, approximately 4,300 ft (1,300 m) from the current breeding colony. The fenced unit provided an immediate benefit to breeding Nēnē and Mōlī, served as a translocation site for ‘Ua‘u chicks in 2015 (with future translocations planned for 2016–2019), and may be colonized in the future by other native seabirds.

Kaua‘i-wide

Conservation actions for ‘A‘o essentially started in the 1970s, with the development of the Save our Shearwaters (SOS) program, which coordinates the retrieval, treatment and release of downed seabirds. Since 1979, more than 30,000 ‘A‘o fledglings have been retrieved and released (Griesemer and Holmes 2011). These efforts result in about 90 percent of retrieved birds being returned to the wild each year, most of whom would likely have perished otherwise, due to the difficulty for downed birds to take flight from flat ground and their resulting vulnerability to predators (Planning Solutions et al. 2011).

Research in the mid-1990s examined threats to ‘Ua‘u and ‘A‘o on Kaua‘i and attempted to analyze the impacts of utility structures and artificial lights (Ainley et al. 1995). Since that time, the Kaua‘i Island Utility Cooperative (KIUC) completed a program of replacing more than 3,000 unshielded street lights with shielded lights and modifying facility lighting at Port Allen and elsewhere. KIUC also developed and is currently implementing a Short-Term Seabird Habitat Conservation Plan (STHCP) (approved in 2011) that outlines general and species-specific mitigation measures to address ongoing incidental take (Planning Solutions et al. 2011). The STHCP conservation measures were designed to provide a better understanding of seabird interactions with utility lines, assess the status and location of remote seabird colonies, and evaluate the effects of predation and the effectiveness of conservation actions at breeding colonies. Others, including the County of Kaua‘i, Chevron, Norwegian Cruise Lines and coastal hotels, have also shielded lights or made modifications to infrastructure to minimize the potential for light attraction and disorientation. The development of an island-wide Habitat Conservation Plan (HCP) to cover incidental take of listed seabirds due to light attraction is under development by the Hawaii Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW), and KIUC is developing a long-term HCP to address their seabird impacts from utility infrastructure and operations.

USFWS and DLNR-DOFAW established the "Newell's Shearwater Working Group," an informal working group of Hawaiʻi seabird experts from USFWS, DLNR, and the scientific community to focus on the recovery of ʻAʻo, ʻUaʻu, and ʻAkēʻakē (Bandrumped storm petrel, *Oceanodroma castro*) with an emphasis on ʻAʻo. In 2005, the group developed a five year workplan, followed by a draft workplan in 2011. KESRP was formed in 2006 as a project of DLNR-DOFAW, administered through the Pacific Cooperative Studies Unit (PCSU) of the University of Hawaiʻi, to focus on research and long-term conservation of endangered island seabirds.

KESRP conducts radar surveys to track the number of birds moving from the sea to inland breeding colonies to try to determine how the population is changing over time; coordinates auditory surveys at night or early morning at specific times of the year to try to determine the location of breeding colonies; monitors known burrows in several remote locations and collects data on fledging success rates, reasons for failure and site fidelity; bands individual birds to develop a better understanding of individual survival rates; and tracks individual birds at sea using geolocators and satellite tracking tags (KESRP 2015).

These monitoring activities are conducted in conjunction with active management (primarily predator control, searches for additional burrows, and monitoring of known burrows) at four of the largest and accessible montane seabird colonies (Upper Limahuli Preserve and three sites within Hono o Nā Pali Natural Area Reserve (NAR)) (supported in large part with funding from the KIUC STHCP). Low-level seabird monitoring and small-scale invasive predator monitoring without accompanying predator control (e.g., auditory surveys and camera monitoring) is conducted at other potentially active colonies, including Hanakāpīʻai and Hanakoa within Hono o Nā Pali and Upper Mānoa Valley (on privately owned land).

Of the four sites currently receiving predator control through the STHCP, Upper Limahuli Preserve and Pōhākea have active ʻAʻo burrows; the two other Hono o Nā Pali sites contain active ʻUaʻu or "unidentified procellariid" burrows. The remote nature of these colonies (limiting accessibility for predator control or other management) and the persistence of predators (despite predator control) remain the primary challenges. Based on auditory surveys and additional fieldwork, a breeding colony of ʻAʻo at Hanakāpīʻai within Hono o Nā Pali NAR was discovered by KESRP; initial monitoring of the colony has begun by KESRP (through funding from the National Fish and Wildlife Foundation and others) and more intensive management (e.g., predator control and additional surveys for burrows) is proposed to begin in 2016. Continued auditory surveys and fieldwork in other locations may potentially identify other colonies that can feasibly receive predator control and more intensive monitoring.

Ground surveys by KESRP demonstrate that finding individual active burrows is difficult and labor-intensive, due to the dense vegetation and steep topography in the areas used by ʻAʻo, the tendency of the birds to spread out over a relatively large area, and the depth of the burrows. In addition, the intensive searches required to find the burrows (and corresponding disturbance of vegetation) can make those birds vulnerable to increased predation pressure. The increase in the number of fledged chicks reported from the montane colonies is attributable to a combination of extensive predator control and more exhaustive monitoring (so that fewer fledged chicks went undocumented).

Table 1.2. Summary of reproductive activity and predation at montane colonies: 2014–2015

Site Year	# Burrows	# Active	# Confirmed breeding	# Reachable	# Nest Failures Due to Predation (predator)	# Fledged
Upper Limahuli Preserve						
2014	59	54	50	n/a	3 (rats)	42
2015	82	77	70	26	2	60
HNP: Pōhākea						
2014	20	18	16	n/a	7 (cats)	6
2015	22	16	8	5	3	5
HNP: Hanakāpī‘ai						
2014	n/a	n/a	n/a	n/a	n/a	n/a
2015	2	1	1	0	0	1

Data derived from Raine and Banfield 2015a-d; Raine et al. 2016b, 2016d, 2016e.

1.4 Purpose and Need for Action

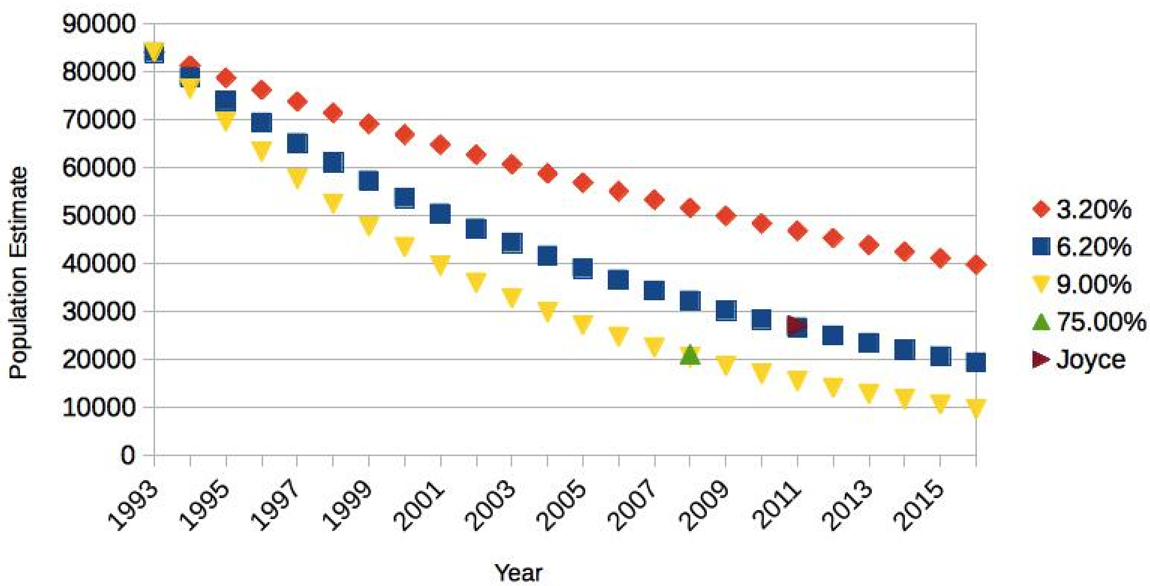
The purpose of the project is to increase the Refuge’s contribution towards the recovery of ‘A‘o on Kaua‘i. The project is needed because, despite ongoing conservation actions both on- and off-Refuge, population indices of ‘A‘o have declined precipitously in the past two decades (Griesemer and Holmes 2011). The dramatic population decline, the abandonment of formerly known breeding colonies, the logistical difficulty and low probabilities associated with identifying previously undiscovered colonies for management in situ, the persistence of introduced predators particularly cats and rats within the few managed areas, the possibility of future mongoose establishment on Kaua‘i, and the vulnerability of existing breeding colonies due to stochastic events such as hurricanes or wildfire contribute to a need for immediate action.

Accurate numbers and trend indicators for ‘A‘o are difficult to obtain; colony based methods for estimating population size (quantifying nest density and occupancy, counting seabirds on or above the surface of colonies, and conducting mark-recapture sampling) is not practical for ‘A‘o due to their cryptic breeding behaviors and the inaccessibility of many breeding colonies (Joyce 2013).

The most recent population estimate based on at-sea observations (from 1984 to 1993) is of 84,000 birds in 1993 (Spear et al. 1995). Approximately 90% of the population was believed to nest on Kaua‘i (Cooper and Day 1994, Spear et al. 1995, Ainley et al. 1997, Griesemer and Holmes 2011). Using this population estimate and allowing for an estimated 7,600 one-year-old birds that do not visit Kaua‘i, Ainley et al. (1995) estimated that the Kaua‘i island population in the mid-1990s was approximately 65,000 birds, with a breeding population of about 14,600 pairs (Planning Solutions et al. 2011).

Since 1993, all indications are that the 'A'o population has suffered a sharp decline. The number of fledglings retrieved by the SOS program on Kaua'i has steadily declined since 1979, from an average of about 1,500 per year between 1979 and 1990 to an average of less than 500 collected between 1999 and 2006 (Planning Solutions et al. 2011). In 2009, the SOS program handled 265 retrieved birds (Planning Solutions et al. 2011). Day et al. (2003) reported analysis of data trends from radar surveys showing an overall decline of roughly 50–70 percent in detection rates between 1993 and 2001; radar surveys show an apparent decline of 75 percent between 1993 and 2008 (Holmes et al. 2011); and preliminary indications are of a decline of up to 80 percent when considered from 1993 to 2015 (Raine pers. comm.). Using population models incorporating best estimates of breeding effort and success, Ainley et al. (2001) projected an annual population decrease of 3.2 percent. When anthropogenic variables influencing 'A'o mortality (e.g., predation, light attraction, and power line collision) were included, their models predict an annual population decline of 6.1 percent, or approximately 60 percent every 10 years (Ainley et al. 2001, Planning Solutions et al. 2011). Subsequent modeling by Griesemer and Holmes (2011) utilized radar and fallout data and estimated a more severe decline of about 9 to 10% per year during the last two decades. There is little empirical data to confirm which population estimate is more accurate, but an updated estimate of at-sea 'A'o populations analogous (though not identical to) the Spear survey was 27,011 birds (Joyce 2013). Figure 1.1 illustrates the projected 'A'o population based on these various models.

Figure 1.1 Projected population levels based on estimates of population decline.



Concurrently, several historical ‘A‘o colonies have been depleted to the point of extirpation over the past decade (Griesemer and Holmes 2011; Raine pers. comm.). The Makaleha colony has been regularly monitored using helicopter deployed song meters and auditory surveys from an adjacent ridge. A decade ago, the Makaleha colony had high call rates similar to the Upper Limahuli managed colony; today, call rates are sporadic at best (Raine pers. comm.). Colonies at Sleeping Giant, Kāhili/Kalāheo, North Fork Wailua, and Koluahonu are similarly reduced to near extirpation, with less than 20 birds spread out over a large area (KESRP unpublished data).

Despite ongoing efforts to identify other breeding areas and locate active burrows, the only stable breeding colonies at the current time are within existing managed areas with ongoing predator control: KPNWR, Upper Limahuli Preserve, and Hono o Nā Pali NAR. Due in part to ongoing immigration, predation cannot be entirely eliminated with current predator control methods. In 2014, predation caused ten nest failures in these two managed colonies (3 in Upper Limahuli Preserve attributable to rats and 7 at Pōhākea attributable to cats); in 2015, predation caused four nest failures in these colonies (2 in Upper Limahuli Preserve and 2 at Pōhākea all attributable to cats) (Raine and Banfield 2015a–d; Raine et al. 2016b, 2016d, 2016e). Rats visited 94% of the monitored seabird burrows (‘A‘o or ‘Ua‘u) in Upper Limahuli Preserve and Hono o Nā Pali NAR, and seven different cats (including 4 kittens) were observed on camera at the Pōhākea site (Raine and Banfield 2015a–d).

Mortality or injury of both fledglings and adults related to fallout remains a concern. The SOS program received 290 ‘A‘o in 2015; 171 birds (primarily fledglings) during the “fallout season” running from September–December 2015, and another 119 (primarily adults) during the first two weeks of September related to the Kōke‘e Air Force Station (Anderson 2016).

Until recent years, Kaua‘i was thought to be free of the small Indian mongoose (*Herpestes auropunctatus*). Mongooses are diurnal predators that primarily eat invertebrates and small mammals, as well as plants, birds, reptiles, and amphibians. They are a major threat to any ground-dwelling and ground-nesting bird species, as they are known to eat eggs, young, and adults of endangered Hawaiian birds, various seabirds, and migratory shorebirds (Mitchell et al. 2005, Hays and Conant 2007). Live mongooses were captured on two separate occasions in 2012, in Līhu‘e and Nāwiliwili Port, and credible sightings of mongoose across the island from Kōke‘e to the Mānā Plains have been reported (KISC 2012, 2013). Though no additional live mongoose have been captured, credible sightings continue, and the Kaua‘i Invasive Species Committee continues to investigate reports and move towards biosecurity planning with other partners on Kaua‘i and statewide. If this predator were to become established on Kaua‘i, an immediate and dramatic negative impact on the breeding seabird population would be expected.

The longer that management intervention is delayed, the more likely that management options would cease to be available. Within a decade, the currently managed colonies may be the only remaining breeding colonies, maintaining the species’ vulnerability to stochastic events. Establishing a new breeding colony within an accessible, predator-free area, adjacent to the ocean, away from utility lines and disorienting lights, would be a benefit to the species by greatly contributing to its recovery.

1.5 Legal and Policy Guidance

Implementing management actions to address the population decline of the ‘A‘o is consistent with the following laws and policies: the Endangered Species Act of 1973; the Migratory Bird Treaty Act of 1918; and the National Wildlife Refuge System Administration Act of 1966, as amended. Many other Federal laws, executive orders, Service policies, and international treaties govern the Service and Refuge System lands. For additional information on laws and other mandates, a list and brief description of Federal laws of interest to the Service can be found in the Laws Digest at http://www.fws.gov/laws/Lawsdigest.html. These outlined management actions also implement or are consistent with various state laws, including the Hawai‘i Endangered Species law.

Endangered Species Act of 1973
The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. The ESA requires all Federal departments and agencies to seek to conserve endangered and threatened species and utilize their authorities in furtherance of the ESA. The ESA also provides for programs for the conservation of endangered and threatened species in cooperation with State and local agencies.

Migratory Bird Treaty Act of 1918
Established in 1918 with subsequent amendments and provisions following, this act protects migrating birds between the U.S. and Canada, Mexico, Union of Soviet Republics, and Japan. This act makes it illegal for people to “take” migratory birds, their eggs, feathers or nests (take is any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof).

Hawai‘i Endangered Species law
Hawai‘i Revised Statutes (HRS) Chapter 195D (Hawai‘i's Endangered Species law) provides for the protection of threatened and endangered species of fish, wildlife, and plants within Hawai‘i.

National Wildlife Refuge System Administration Act of 1966, as amended
The National Wildlife Refuge System Administration Act states that the Director of the USFWS shall provide for the conservation of fish, wildlife and plants, and their habitats within the Refuge System as well as ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained. Under the Administration Act, each refuge must be managed to fulfill the Refuge System mission as well as the specific purpose(s) for which it was established.

1.6 Relationship to Other Planning Efforts

The goals and objectives of existing national, regional, state, and ecosystem plans and/or assessments were considered in the development of this EA. Proposed management alternatives attempt to be consistent, as much as possible, with existing plans and contribute to meeting stated conservation goals and objectives. This section summarizes some of the key related planning efforts.

Table 1.3 Related State, Federal, and County Planning Documents

Planning Document	Comment
Hawaiian Dark-Rumped Petrel and Newell's Manx Shearwater Recovery Plan (USFWS 1983)	30+ year-old Recovery Plan for the ‘Ua‘u and ‘A‘o (using the previously recognized names for these species) provides specific recovery objectives for the ‘A‘o and identifies the need for additional nesting colonies, translocation of chicks, and the development of additional colony establishment techniques (like acoustic attraction or use of decoys) as recovery objectives.
Newell's Shearwater, Hawaiian Petrel, and Band-rumped Storm-Petrel Recovery: A Five-Year Action Plan (Bailey et al. 2015)	Action plan to guide research and management and develop funding for a unified and standardized approach to the recovery of ‘A‘o, ‘Ua‘u, and ‘Ake‘ake. Objective #2 is “Reestablish/ expand distribution through social attraction and/or translocation”; with subobjective “strive to attain 100+ translocated chicks of each species within five years at 1-2 sites.”
KIUC STHCP (Planning Solutions et al. 2011)	Habitat conservation plan, approved by USFWS and DOFAW in 2011, in conjunction with incidental take authorization for the continued operation and maintenance of all KIUC facilities and the installation, operation and maintenance of certain future KIUC facilities for a period of up to five years for three federally and state listed species: ‘Ua‘u, ‘A‘o, and ‘Akē‘akē. Funding associated with implementation of the Plan supports current seabird monitoring work by KESRP (both in terms of colony monitoring and the monitoring of take at utility lines and through light attraction), as well as predator control by National Tropical Botanical Gardens and Natural Area Reserves System.
Kaua‘i Seabird HCP (in prep.)	Currently in development by DLNR-DOFAW, in cooperation with USFWS, to address incidental take of listed seabirds caused by the effects of light attraction (http://www.kauai-seabirdhcp.info/). The planning team is developing potential mitigation actions to include construction of a predator-proof fence and other measures to monitor, minimize, and

	mitigate unavoidable take of listed seabirds caused by the effects of light attraction.
Hawai'i Statewide Wildlife Action Plan (DLNR 2015), updating the Hawai'i Comprehensive Wildlife Conservation Strategy (Mitchell et al. 2005)	Statewide strategy for the conservation of native wildlife and plants. Identifies species of greatest conservation need. Specifically identifies the following conservation actions for the 'A'o: • continue predator and ungulate control at key colonies on Kaua'i and the island of Hawai'i, and initiate predator control at other known and potential colony sites;... • eradicate or control invasive plants from current and potential colony sites; • prioritize restoration projects at occupied and unoccupied nesting areas based on likelihood of success and existing threats at each site; • develop methods, test, and implement social attraction and translocation in order to create safe, managed colonies.
Hono o Nā Pali NAR Management Plan (DOFAW 2011)	Management plan for NAR identifies goals and objectives for management, including habitat protection and rare species restoration.
NTBG Revised Master Plan for Limahuli Garden and Preserve (NTBG 2008)	Master Plan outlining management strategy to protect Upper Limahuli Preserve, including fencing, feral ungulate, cat, and rat control, and invasive plant control.
Kīlauea Point NWR CCP (USFWS 2016)	The CCP for KPNWR presents goals, objectives, and strategies for management over the next 15 years. It specifically identifies the goal to contribute to 'A'o recovery through social attraction or translocation to Nihoku.
Kaua'i Watershed Alliance Watershed Management Plan (KWA 2005)	Management plan for critical watershed of the Kaua'i Watershed Alliance (KWA), a public private partnership. Plan outlines planned major threats and conservation needs, including ungulate management, weed management and watershed monitoring. Most of the existing known 'A'o colonies are located within the KWA boundary.
Regional Seabird Conservation Plan, Pacific Region (USFWS 2005)	Region-wide plan to identify USFWS priorities for seabird management, monitoring, research, outreach, planning and coordination.

Environmental Assessment and Finding of No Significant Impact (FONSI): Management Actions for Immediate Implementation to Reduce the Potential for Extirpation of ‘Ua‘u from Kaua‘i (USFWS 2015a)	EA and FONSI evaluating potential management actions for the benefit of ‘Ua‘u; preferred alternative of social attraction and chick translocation to Nihoku fenced unit selected and implementation began fall 2015.
Draft Programmatic Environmental Impact Statement (PEIS) for Invasive Rodent and Mongoose Control and Eradication (in prep.)	The draft PEIS is being developed by the USFWS and DLNR and seeks to: (1) increase the effectiveness of rodent and mongoose management in the main Hawaiian islands and make more efficient use of limited financial resources; (2) develop techniques for an integrated pest management approach to eradicate rodents from uninhabited islands within the main Hawaiian islands and from other US Pacific Islands within the National Wildlife Refuge System; and (3) avoid adverse impacts to human health, safety, the environment, and cultural rights, practices, and resources. The anticipated completion date for the EIS is currently unknown.

1.7 List of Permits Required

Table 1.4 Summary table of permits required

Applicable permit/approval	Alternative A: current management	Alternative B: social attraction	Alternative C: chick translocation combined with social attraction
Endangered Species Recovery Permit (USFWS) and associated Section 7 consultation	X (monitoring, banding)	X (monitoring, banding)	X (monitoring, banding, moving and handling of chicks)
Special use permit (USFWS Refuges)			X
Natural Area Reserves System permit (DLNR)			X (removal of chicks from NAR)
State Scientific Collection/Protected Wildlife permit (DLNR)	X (monitoring, banding)	X (banding)	X (moving and handling of chicks)
Coastal Zone Management Act consistency review			X

1.8 Scoping and Public Participation

Scoping for the proposal builds on existing conservation efforts relating to the ‘Ua‘u and ‘A‘o. The Newell's Shearwater and Hawaiian Petrel Recovery: 5 Year Action Plan (2011) was developed by a team of seabird biologists from DLNR-DOFAW, PCSU, USFWS, and the National Park Service and reviewed by partners, stakeholders, and scientists within and outside of Hawai‘i. The Action Plan was updated in 2015 to include the Band-rumped storm-petrel and specifically identifies the goal of translocating 100+ each of ‘A‘o and ‘Ua‘u chicks within five years at one to two sites (Bailey et al. 2015).

Planning for potential translocation of rare seabirds began in 2012. Biologists from Pacific Rim Conservation and KESRP traveled to New Zealand to view ongoing translocation projects and talk with local experts. A potential seabird restoration area was identified at KPNWR (the 7-acre Nihoku conservation unit), with predator-proof fencing constructed and all mammalian predators removed by 2014.

A draft translocation plan for both ‘Ua‘u and ‘A‘o was developed in 2014 and circulated for review and comment to seabird biologists, partners and stakeholders throughout the state. Because of difficulties identifying acceptable ‘A‘o source colonies, related to the declining ‘A‘o population numbers, the translocation plan was refined to address ‘Ua‘u only, with a corresponding EA prepared in 2015. Ten ‘Ua‘u chicks were translocated to Nihoku in fall 2015, and nine of the ten successfully fledged.[1] Planning for year 2 translocation in fall 2016 is in progress. A separate translocation plan for ‘A‘o has been prepared as part of this EA and is included as Appendix C.

After the success of the first-year ‘Ua‘u translocation, the possibility of translocating ‘A‘o was revisited by Refuge staff and local seabird experts. A scoping letter was sent to a variety of federal, state and county agencies, nongovernmental organizations, and interested individuals in February 2016. Six agencies and organizations provided comments; copies of the letters are included as Appendix D. Overall, the comments support taking action to conserve ‘A‘o.

1.9 Issues/Scope of Analysis

During the process of public involvement, agency coordination, and internal scoping, issues related to the status and future management of ‘A‘o were brought forward. An issue is a point of concern, debate or dispute with a proposed action based on some anticipated effects. Issues raised during the scoping process and addressed in this EA include:

- purpose and need for management action;
- impact of alternatives on other listed species, particularly the Nēnē; and
- impact of alternatives on other ongoing conservation and mitigation actions, specifically the KIUC STHCP and the long-term HCP in development.

1 The tenth chick was retrieved from a nest containing a dead adult bird and was seriously underweight when retrieved. An autopsy indicated that the chick was in poor health when moved and likely would have died if left at the source colony, and that its death was unrelated to the translocation.

Chapter 2. Alternatives Including the Proposed Action

2.1 Alternatives Considered but Eliminated

Alternatives were developed based on the best available scientific data and applicable conservation principles, involving consultation with seabird biologists (including those with experience in translocations) and existing planning documents. Early in the alternatives development process, the following management actions were considered but were ultimately eliminated from further consideration in this EA for the reasons provided.

Prior to 2014, management at KPNWR included utilizing social attraction (acoustic playback) to lure prospecting ‘A‘o to join the existing colony. The sound system failed in 2014, and the effort was suspended to consider whether future social attraction efforts should be centered at the existing colony or at the completed Nihoku predator-free fenced unit. After the successful translocation of ‘Ua‘u in 2015 to the Nihoku predator-free fenced unit, it was determined that future social attraction efforts should be centered around the Nihoku predator-free fenced unit to avoid confusion to future returning ‘Ua‘u and to encourage natural colonization by ‘A‘o in light of the ongoing negative interactions between ‘A‘o and ‘Ua‘u kani at the existing colony and the increased protection from introduced mammals offered by the Nihoku predator-free fenced unit. As such, continuing social attraction at the existing colony at KPNWR was considered but eliminated from further consideration for purposes of this EA.

Captive propagation was eliminated from consideration, as there are no known instances of successful captive propagation of shearwaters or petrels. While insectivorous passerines have been successfully reared from eggs and chicks, bringing wild birds into captivity generally has a high likelihood of failure. And, in contrast to passerines, seabirds regularly fly long distances around the ocean, and at-sea tracking data indicates that breeding petrels alternate between short, nearby foraging trips and long distance trips around the North Pacific while feeding chicks (Maui Nui Seabird Project 2015, Adams and Flora 2010). ‘A‘o require a pre-laying exodus at sea to gather nutrients to make eggs, which local seabird experts believe would be extremely difficult or impossible to replicate in captivity. Finally, captive propagation has never been identified as a priority item in any recovery plan or other strategy document developed by local experts familiar with ‘A‘o, their population status, and threats to their survival.

Egg translocation was considered because of past success, but eliminated from further consideration at this time for the following reasons: There are insufficient pairs of ‘A‘o at KPNWR to act as foster parents, and no ‘A‘o currently breed within the fenced Nihoku unit, a translocation site with the highest potential for long-term success. Moreover, while ‘Ua‘u kani successfully acted as foster parents for ‘A‘o eggs in 1978 and 1980, several negative interactions between ‘Ua‘u kani and ‘A‘o have been observed over the past decade, with ‘Ua‘u kani displacing ‘A‘o from previously used nesting sites. As a result, local seabird biologists have serious concerns that the use of ‘Ua‘u kani as potential foster parents could result in competition for nesting space and prevent successful establishment of ‘A‘o, and none currently nest within the fenced predator-free unit at Nihoku. Additionally, although the previous egg translocation project on the Refuge resulted in good chick hatching and fledging rates, return rates appeared to be much lower than desirable for a rapidly declining subspecies (<7 percent, compared to the 15 percent documented at KPNWR and 33 percent modeled in Griesemer and Holmes (2011)).

2.2 Alternative A. No-action Alternative: Continue Existing Management

Under this alternative, current management efforts would continue. At KPNWR, current management directed towards ‘A‘o consists of control of introduced predators within the Refuge, monitoring the coastal population, weed management, and continued habitat restoration of the predator-free Nihoku fenced unit, involving removal of invasive species, planting native coastal species, and the installation of artificial burrows.

Other entities fund and conduct management outside of KPNWR. DLNR-DOFAW is the primary land manager for Hono o Nā Pali NAR. Management by DOFAW involves habitat protection through the construction and maintenance of several ungulate proof fences, weed control, rare species monitoring and collecting, and non-native predator control (DOFAW 2015). The National Tropical Botanical Gardens (NTBG) owns and manages Upper Limahuli Preserve as a conservation area, with a focus since 1992 to mitigate the decline of this once pristine ecosystem caused by the impacts of Hurricanes Iwa and Iniki (wind damage and dispersal of non-native weeds) and the expansion of feral ungulate populations (NTBG 2015). Management includes maintenance of a perimeter ungulate-proof fence, invasive plant removal, ongoing predator control for cats, rats and barn owls, and seabird monitoring. Since 2011, KIUC has funded seabird specific management actions (monitoring and predator control) at four montane seabird breeding colonies in Upper Limahuli Preserve and Hono o Nā Pali (North Bog, Pihea, and Pōhākea) through its STHCP; and DLNR-DOFAW, USFWS, and non-profit organizations (including American Bird Conservancy and National Fish and Wildlife Foundation) provide funding to KESRP for additional seabird management and research not covered by KIUC.

2.3 Alternative B. Social Attraction

Alternative B is composed of the existing management activities outlined in Alternative A, combined with social attraction techniques to develop a protected breeding colony within the fenced predator-free unit at Nihoku. More than 95% of seabirds are colonial, meaning they are attracted to breeding sites by the presence of conspecifics and other seabirds (Jones and Kress 2012).

Social attraction aims to lure prospecting seabirds to restoration sites by utilizing acoustic playback of vocalizations, the use of decoys, mirrors, scents and artificial burrows, all of which replicate features of an established colony from a distance (Jones and Kress 2012). Acoustic attraction can be used for both diurnal and nocturnal species, but decoys are typically used only for diurnal species (Jones and Kress 2012). Decoys sometimes are supplemented with mirrors to give the appearance of a larger colony and movement in the colony, essentially making prospecting birds into living decoys by making each prospector appear to be multiple birds instead of just one (Jones and Kress 2012).

Because ‘A‘o come and go from colonies under cover of full darkness, social attraction may consist primarily of acoustic playback from a solar-powered sound system playing non-aggressive vocalizations of ‘A‘o and ‘Ua‘u from dusk to dawn late February through November and the maintenance of the existing fifty artificial burrows for use by ‘A‘o and ‘Ua‘u. In addition, this alternative would incorporate actions to discourage breeding by ‘Ua‘u kani within the Nihoku predator-free fenced unit. The entrances to the artificial burrows would be blocked during ‘Ua‘u kani pre-breeding and prospecting periods, ‘Ua‘u kani presence in the general area would be monitored, and removal or relocation of ‘Ua‘u kani may be considered to prevent displacement of ‘A‘o.

The Service would monitor for predators within and immediately surrounding the Nihoku area. If monitoring indicates that the use of social attraction increases predator presence, then predator control efforts would be implemented or increased in accordance with the KPNWR integrated pest management approach described within its CCP.

Social attraction is a long-term (5–10 year) management action that may require multiple years to attract enough prospecting subadult birds to begin breeding. However, when birds are within range, prospectors may respond within months or minutes (Sawyer and Fogle 2010), and these prospectors are subadults returning to land to breed. This technique is biologically non-invasive, and its cost is relatively low, consisting of the acquisition and maintenance of a solar-powered sound system and decoys (if used). Although the costs are approximately one-tenth that of chick translocation, “it may take longer to establish a breeding colony using these methods [acoustic attraction and provision of artificial burrows]” (Sawyer and Fogle 2010). Buxton et al. (2014) suggests the most influential variable affecting recolonization is a source colony within a range of 25 km (e.g., distance from Kīlauea and Līhu‘e); the existing KPNWR colony is well within that range, but other known colonies lie at the boundary of that range (20–25 km from potential source colonies).

2.4 Alternative C. Chick Translocation Combined with Social Attraction

Alternative C is composed of the existing management activities outlined in Alternative A and the social attraction techniques outlined in Alternative B, combined with the translocation of ‘A‘o chicks over a period of five years to the fenced predator-free unit at Nihoku, as outlined in more detail in the translocation plan attached as Appendix C. The proposed translocation plan utilizes information gathered during the first year of translocation of ‘Ua‘u chicks to Nihoku in 2015, is influenced by the successful translocations of burrow-nesting Procellariids undertaken in New Zealand since the early 1990s, and adheres to the guidelines for the appropriateness, planning, implementation and monitoring of such actions developed by the population and conservation status working group of the Agreement on the Conservation of Albatrosses and Petrels (ACAP) (Gummer 2013) and those adopted by the International Union for Conservation of Nature (IUCN) Species Survival Commission in 2012.

The Nihoku fenced predator-free unit at KPNWR is immediately available for a translocation project and meets the criteria established by ACAP:

- a suitable geographic site with respect to topography, access to the ocean, strength and direction of prevailing winds, ease of take-off and landing, nesting substrate, reasonable distance to adequate foraging grounds, and sufficient elevation to preclude periodic inundation from storm waves;

- free of predators and invasive species harmful to Procellariiformes, or fenced (prior to translocations) to exclude such species, or a regular control program to remove those detrimental species;
- surveyed prior to the translocation for the presence of any endemic species (flora or fauna) that could potentially be disturbed by the project, or that could influence the success of colony establishment;
- adjacent to a cliff, elevated above the surroundings, or relatively free of man-made or natural obstructions that could inhibit fledging and arrivals and departures of adults;
- relatively accessible to biologists, to facilitate delivery of supplies and monitoring;
- designated for long-term conservation use;
- a site for which other conflicting uses (e.g., local fishing, aircraft operations, city lights, busy roads, and antennae, etc.) have been considered and conflict avoidance measures are feasible;
- be free of, or have minimal, known human threats to the species (such as light attraction or power lines) within its immediate vicinity.

All mammalian predators (e.g., cats, rats, and mice) were removed from the Nihoku unit in 2014. Habitat restoration (removal of invasive vegetation and replanting native vegetation suitable for both the existing breeding bird populations (Mōlī and Nēnē) and for future seabird colonists), the maintenance of existing artificial burrows that recreate the physical condition of natural burrows (length, depth, temperature, substrate, and humidity), and the maintenance of predator-free status (monitoring for animal incursions and fence repair) are ongoing management actions.

Alternative C would be divided into several distinct phases: (1) identification of source donor colonies; (2) collection and retrieval of chicks from source locations; (3) chick care at the translocation site; (4) implementation of acoustic attraction; and (5) translocation monitoring and assessment. Both advances in chick rearing methods over time and variability in marine conditions during the project argue for multiple years of translocations to increase odds for success (Jones and Kress 2012). The total cost of the proposed action is approximately $95,000 in year one and $64,000 annually for each year of translocation, which would total $351,000 over five years.

<u>Identification of source donor colonies</u>
Auditory surveys (combined in some areas with burrow searching activities) conducted from 2010 to the present were utilized to identify and prioritize colonies for use as a source for chicks to be translocated. Initial efforts focused on “dying colonies” at Makaleha, Sleeping Giant, Kāhili/Kalāheo, North Fork Wailua, and Koluahonu, as these were considered most at risk for extirpation. However, the results of these surveys indicated that these low-elevation areas were not suitable as source populations for translocation because (1) the colonies are now sparsely populated (about 10–15 birds left), with the remaining breeding birds spread out over large areas, resulting in time-intensive searching conditions with extremely low success rates in locating active burrows, and (2) with no ongoing predator control at the majority of sites, intensive searching for burrows would make the remaining birds vulnerable to increased predation pressure (Raine at al. 2014). Declines over this period (6 years) have been drastic; Makaleha was utilized as a training site for auditory surveys six years ago due to the high number of calls, but there are no longer enough birds at this site to make regular auditory calls. (Raine pers. comm.).

In 2013, managed colonies were included in the analysis to prioritize colonies for use as a source for chicks and included KPNWR, Upper Limahuli Preserve, and Hono o Nā Pali NAR (Raine et al. 2014). Surveys conducted by KESRP in the higher elevation colonies were in addition to those undertaken under the KIUC Short-Term HCP, and were funded through the National Fish and Wildlife Foundation and the American Bird Conservancy.

The surveyed sites were evaluated in terms of suitability as a source population for translocation using the following criteria: (1) presence of a breeding colony (necessary for use as source colony); (2) number of known burrows present (sites with higher numbers of active burrows considered more appropriate as source colonies); (3) threat level (sites with high threat levels considered more appropriate as source colonies due to increased risk of extirpation); (4) on-site predator control (sites with control considered more appropriate as source colonies to reduce risk of predation associated with the search and monitoring of burrows required to inform translocation in any given year); (5) accessibility (sites with easy access considered more suitable than sites with more difficult access); and (6) proximity (sites far from planned translocation site more suitable than sites close by as birds from those colonies would be unlikely to be lured through social attraction methods).

The unmanaged colonies at highest risk for extirpation were considered unsuitable, because the drastic population declines combined with ongoing predation make these sites unlikely to have discoverable burrows with reachable chicks available for translocation.

Currently, the only colonies with known burrows are KPNWR, Upper Limahuli Preserve, Hono o Nā Pali NAR (Pōhākea and Hanakāpī‘ai) and Kāhili. The KPNWR colony is an accessible managed breeding colony with known burrows and ongoing predator control in close proximity to the Nihoku predator-free fenced unit. Upper Limahuli Preserve is a minimally accessible managed breeding colony with a relatively high number of known burrows and ongoing predator control. Pōhākea is a minimally accessible managed breeding colony with known burrows and ongoing predator control. Hanakāpī‘ai is a recently discovered unmanaged and minimally accessible breeding colony within the NAR; management and predator control is anticipated to begin in 2016. Kāhili is an unmanaged colony with one known active burrow, high threat levels, and no ongoing predator control. Of these five colonies, only KPNWR (10), Upper Limahuli Preserve (77), and Pōhākea (16) are currently considered suitable as source colonies, primarily due to the ongoing predator control in place (# in parentheses reflects # of active burrows in 2015).

Potential source colonies would be evaluated each year during planning for the next translocation, to ensure that the most up-to-date information is used to determine suitability. To maximize the possibility of translocating a total of ten chicks each year, chicks would be taken from more than one site whenever possible (as limited by the number of chicks available).

<u>Collection and retrieval of chicks from source locations</u>
Burrow-nesting seabird chicks are thought to gain cues from their surroundings during the emergence period shortly before fledging, and then use that information to imprint on their natal colony (locality imprinting). Chicks that have never ventured outside natal burrows can be successfully translocated to a new colony location. Success is optimized if chicks spend the

greater proportion of the rearing period with parents before being moved. For ‘A‘o, age of first emergence is likely to be in mid-late September based on on-going data collection at active burrows using Reconyx cameras (funded through the KIUC Short-term HCP). Monitoring would occur during planned management trips to source colonies in mid-September, and chicks that appear to be in good health meeting minimum criteria (wing chord and mass measurements) would be identified for translocation. Activities associated with monitoring, collection, and retrieval of chicks will be scheduled to coincide with existing management carried out under the KIUC STHCP whenever possible, to minimize the total number of visits to the colony and reduce the potential for disturbance.

In New Zealand, for established translocation programs for burrowing seabirds, a maximum of 100 chicks per year is considered appropriate, with this number reduced for the first year of a project or for a team new to seabird translocation. If the species has never been translocated before, protocol in New Zealand is to conduct a trial transfer of a small number of chicks (e.g., ≤10) to test burrow design and hand-rearing methods (Gummer 2013), which was the approach used for ‘Ua‘u and is the approach proposed for ‘A‘o.

If fledging in the first year is successful based on criteria from previous successful translocation projects and on expert advice (specifically, 90% of chicks removed survive transfer to the new site and 70% chicks removed fledge from the new colony), then increasing the number of chicks to be moved in each of the next four years to a maximum of 20 chicks would be considered, resulting in a total of 50 to 90 birds over five years. If fledging is below 50% in any given year, the project would be re-evaluated before proceeding.

Under the proposed translocation plan, up to 10 chicks would be moved in year one. Considering the rarity of this species, the number of active and reachable burrows will be the primary limiting factor in any given year. The number to be moved would depend on the availability of reachable chicks and the threat level at that colony. The overall number of chicks translocated may be less than ten if in any year, sufficient accessible burrows cannot be identified. Whenever possible, chicks would be removed from different burrows in different years (i.e., chicks would not be removed from the same burrow in consecutive years), to maximize representation of different parents and enhance the genetic variety of the translocation group.

The transfer box design used for most burrow-nesting petrel transfers in New Zealand would be used, which is based on a standard pet (cat) box and provides enough space and ventilation to prevent overheating and to minimize wing and tail feather damage. One box per chick would be used. Chicks would be removed from burrows by hand and placed into transfer boxes, which would then be transported from the source colony by helicopter and then by vehicle to the translocation site. Transfer is estimated to take a maximum of four hours. This transfer process was successfully used in 2015 to translocate 10 ‘Ua‘u chicks from colonies within Hono o Nā Pali NAR to KPNWR.

<u>Chick care at the translocation site</u>
After arrival at the Nihoku translocation site, each chick would be banded and placed in an artificial burrow. The artificial burrows utilize designs similar to those used in New Zealand for other Procellariiformes species but with lighter weight plastic. The burrows are 5-sided plastic

boxes with open bottoms, hinged lids, and corrugated plastic PVC tubes for burrow entrances. Sandbags are placed on top to regulate temperatures, and entrances would be initially blocked to ensure that newly translocated chicks do not wander out of the burrow prematurely (these would be removed based on chick development and proximity to fledging).

Because adults are not moved with chicks (as adults would readily abandon the new site), chicks would be hand-fed with dietary supplements until they fledge (Jones and Kress 2012). Chicks would be visited each day and burrows visited to assess the overall welfare of the chick, signs of regurgitation or abnormal excrement, and signs of digging in the blockaded burrow. Then chicks would be removed from the burrow individually, weighed, measured, fed, and returned to the burrow. The food recipe and amount to be used would be determined based on information from New Zealand translocations, the 2015 translocation of ‘Ua‘u, rehabilitation of ‘A‘o, the information known about the natural diet of the ‘A‘o, and available food products. Sterilization procedures would be followed to prevent infection to the translocated chicks.

The incorporation of social attraction techniques (specifically acoustic playback of calls and potentially use of decoys) would be used to provide visual and auditory stimuli to the developing chicks, which may encourage future return to the translocation site at breeding age. In addition, the use of social attraction may lure other potential breeders, such as juveniles, to the translocation site.

<u>Acoustic Attraction</u>
Playback of non-aggressive vocalizations through a solar-powered system would occur as outlined in Alternative B. Social attraction mechanisms that lure pre-breeders to translocation sites are recognized as an important aspect of colony establishment (Sawyer and Fogle 2010).

<u>Translocation monitoring and assessment</u>
Monitoring is planned for all facets of the chick translocation, including evaluating the future monitoring data from all source colonies to assess long-term effects of chick removal, monitoring of translocated chicks after transfer and before fledging, and long-term monitoring of the translocation site to determine the proportion that return after fledging, the number of prospecting birds from other colonies, and reproductive success at the translocation site.

Chick translocation is a long-term (5–10 year) management action to be implemented over the course of multiple years, and would be done in coordination with partners, including seabird biologists from New Zealand with expertise in translocations, KESRP, USFWS, DLNR-DOFAW, the American Bird Conservancy, the National Fish and Wildlife Foundation, and others. Translocation programs generally need 5 or more years of translocation cohorts to ensure adult returns reach a critical mass large enough to form a colony, and at least a decade to monitor results (Jones and Kress 2012). It is anticipated that by year 5, there would be at least one active breeding pair of ‘A‘o at Nihoku.

In the interim, milestones that would be quantified include:

- proportion of chicks that survive capture and transfer to new site
- proportion of chicks that fledge from the colony
- body condition of fledged chicks

- proportion of translocated chicks that return to the new colony from which they fledged
- number of prospecting birds fledged from other colonies that visit the translocation site
- number of birds fledged from other colonies that recruit to the translocation site
- reproductive performance (hatching success, fledging success) of birds breeding in the new colony
- natural recruitment of chicks raised completely in the new colony
- annual population growth within new colony.

Table 2.1 Metrics of success and targets used to evaluate success

Success metric	Target
% chicks that survive capture and transfer to translocation site	90% in year one; 100% afterwards
Body condition of fledged chicks	Wing and mass measurements ≥ wild chicks
% chicks that fledge from the new colony	70% in year one; 80% afterwards
% translocated chicks that return to the new colony (by age 4)	≥15% (estimated return rate of existing KPNWR colony) – 40% (cumulative survival rate from 0–4 years from Griesemer and Holmes (2011))
# birds fledged from other colonies that visit the new colony	> 0 (i.e., any visitors considered successful)
# birds fledged from other sites that recruit to the new colony	> 0 (i.e., any new recruits considered successful)
Reproductive performance of birds breeding in the new colony	Reproductive success ≥ wild colonies with predation
Natural recruitment of chicks raised completely in the new colony	≥ 15% (estimated return rate of existing KPNWR colony) – 33% (rate of survival in unprotected colonies from Griesemer and Holmes (2011)) and by year 6

Chapter 3. Affected Environment

3.1 Physical Environment

The island of Kaua‘i is characterized by its lush, green environment and high average rainfall. The island consists of a single shield volcano, deeply eroded and partly veneered from much later volcanic activity. ‘A‘o nest in burrows, crevices or under vegetation in high elevation, steep, wet montane forest dominated by native vegetation (ōhi‘a forest with an uluhe fern understory), steep dry cliffs (predominantly along the Nā Pali coast), and in coastal shrublands at Kīlauea Point National Wildlife Refuge.

Existing montane ‘A‘o colonies receiving management by KESRP are located within Hono o Nā Pali NAR and within Upper Limahuli Preserve, and are primarily accessible by helicopter. Hono o Nā Pali NAR occupies 3,579 acres in the Hanalei and Waimea Districts on the island of Kaua‘i and is surrounded by the Nā Pali Coast State Wilderness Park, the Nā Pali Kona Forest Reserve, the Alaka‘i Wilderness Preserve, and private lands (including Upper Limahuli Preserve). Hono o Nā Pali NAR was designated in 1982 to preserve native natural communities on Kaua‘i and includes perennial streams, riparian and ridgeline habitat, lowland and montane forests, rare plants, endemic stream fauna, and forest bird and seabird habitat. Upper Limahuli Preserve encompasses approximately 400 acres and is owned and managed in perpetuity for conservation purposes by NTBG.

The NAR stretches from sea level to the Reserve's highest point at Pihea (4,282 ft/1,305 m), while Upper Limahuli Preserve extends from about 1,600 to 3,300 ft (485 to 1005 m) elevation. Most of the soils are categorized as rough mountainous land with rocky outcroppings (rRo). Rainfall depends greatly on topography, and annual rainfall averages from 80 inches (203 cm) in the coastal lowlands to more than 160 inches (406 cm) in the upland forests (Giambelluca et al. 1986). Streams within the NAR include parts of the upper tributaries for the Waimea River (Kawaikōī tributary), Hanakāpī‘ai, Hanakoa stream, and all of the Waiahuakua and Ho‘olulu streams; Upper Limahuli Preserve contains Limahuli Stream. There is no data on ambient air quality specific to the NAR or Upper Limahuli Preserve.

KPNWR occupies 199 acres on the northernmost tip of Kaua‘i; it was established in 1985 with several refuge purposes, which include preserving and enhancing seabird nesting colonies (USFWS 2016). Elevation ranges from sea level to 568 ft (173 m); average annual rainfall at KPNWR is 67.4 inches (171 cm) with the highest rainfall occurring November to March and the least amount of rainfall in the summer months (USFWS 2016). Soils consist primarily of Līhu‘e silty clay; the ocean cliff surrounding Kīlauea Point is exposed bedrock consisting of basalt and andesite (USFWS 2016). There is no data on ambient air quality specific to the Refuge. Existing ‘A‘o burrows are located on the portion of the Refuge known as “The Point,” that is open to the public and contains the Lighthouse and administration buildings. A few burrows are located less than 30 ft (10 m) from the main entry driveway, and within 240 ft (73 m) of the staff and visitor parking areas. The Nihoku predator-free fenced unit consists of approximately 7 acres within KPNWR located away from the public areas of the Refuge. The unit faces the ocean, on sloping land (averaging 22% slope, ranging to nearly 40% slope) above steep sea cliffs, with an elevation range of approximately 140 to 250 feet (42 to 76 m) above mean sea level.

3.2 Biological Environment

Hono o Nā Pali NAR, Upper Limahuli Preserve, and KPNWR contain some of the largest remaining known and accessible ‘A‘o breeding colonies, and combined, these sites fledged a minimum of 54 ‘A‘o chicks in 2014 (Raine et al. 2015a–e).

Hono o Nā Pali NAR and Upper Limahuli Preserve can be broadly classified as containing three major ecosystems, including lowland mesic, lowland wet, and montane wet forest (DOFAW 2011, NTBG 2008). The upper portion of the NAR supporting the ‘A‘o colonies is an eroded plateau with a series of ridges and valleys covered with ‘ōhi‘a dominated montane wet forest communities. The steeper slopes contain an understory of uluhe (*Dicranopteris linearis*, *Sticherus owhyensis*, and *Diplopterygium pinnatum*) with emergent native trees and shrubs (DOFAW 2011). Upper Limahuli Preserve contains forest ecosystems classified as ‘ōhi‘a/‘ōlapa (*Cheirodendron* spp.) forest and ‘ōhi‘a/uluhe fern forest (NTBG 2008).

In general, both the NAR and Upper Limahuli Preserve are considered high-quality native forest habitat, supporting over 100 rare plant taxa (DOFAW 2011, NTBG 2008). These areas are characterized by a large elevation gradient providing habitat diversity and a high proportion of native plant communities, thus providing high quality bird habitat and greater robustness to disturbances (i.e., invasive plant invasion) (DOFAW 2011). The NAR is federally designated critical habitat for 69 rare plant taxa and two forest birds, as well as critical habitat for the following ecosystems: lowland mesic, lowland wet, dry cliff, wet cliff and montane wet (USFWS 2010, DOFAW 2013).

The plateau area of the NAR adjacent to the Alaka‘i Wilderness Preserve is important habitat for native forest birds, including the endangered ‘Akeke‘e or Kaua‘i ‘Ākepa (*Loxops caeruleirostris*), the endangered ‘Akikiki or Kaua‘i creeper (*Oreomystis bairdi*), ‘Apapane (*Himatione sanguinea*), Kaua‘i ‘Elepaio (*Chasiempis sclateri*), Kaua‘i ‘Amakihi (*Hemignathus kauaiensis*), ‘Anianiau (*Hemignathus parvus*), and ‘I‘iwi (*Vestiaria coccinea*)(DOFAW 2011). ‘Apapane and ‘I‘iwi have been observed within Upper Limahuli Preserve (NTBG 2008). In addition to supporting breeding colonies of both ‘Ua‘u and ‘A‘o, the coastal areas and cliffs also provide habitat for other seabirds, including ‘Ā (Brown booby, *Sula leucogaster*), Koa‘e ‘ula, and Koa‘e kea (DOFAW 2011).

The NAR also contains habitat for the Pueo (Hawaiian owl, *Asio flammeus sandwichensis*). The endangered Koloa Maoli (Hawaiian duck, *Anas wyvilliana*) occurs in the NAR and Alaka‘i swamp area, and the endangered ‘Ōpe‘ape‘a (Hawaiian hoary bat, *Lasiurus cinereus semotus*) has been observed by researchers on occasion in the NAR and in Upper Limahuli Preserve. Both the NAR and Upper Limahuli Preserve contain undiverted perennial streams with unique native aquatic biota, and limited sampling of terrestrial invertebrates indicates a diversity of native species. Numerous non-native birds are present in the NAR and Upper Limahuli Preserve, including barn owls, Japanese white-eye (*Zosterops japonicus*), melodious laughing-thrush (*Garrulax canorus*), and Erckel's francolin (*Francolinus erckelii*), as are a variety of non-native mammals including feral pigs, black-tailed deer (*Odocoileus hemionus columbianus*), feral goats (*Capra hircus*), rats (*Rattus* spp.), mice (*Mus musculus*), and cats.

KPNWR consists of three primary habitats: coastal mixed woodland-grassland, sea cliff, and beach strand (USFWS 2016). The current ‘A‘o breeding habitat at KPNWR is within the coastal mixed woodland-grassland, consisting of open-canopy hala forest with a naupaka understory. The Nihoku fenced unit was dominated by non-native invasive Christmasberry (*Schinus terebinthifolius*), but restoration with native coastal plants to support Nēnē, Mōlī, and other seabirds is in progress. The Refuge also supports rare coastal plants, through introduction of small numbers of listed taxa such as pokulakalaka (*Munroidendron racemosum*), alula (*Brighamia insignis*), dwarf naupaka (*Scaevola coriacea*), and lo‘ulu (*Pritchardia aylmer-robinsonii* and *P. napaliensis*).

Thirty-three different seabird species have been observed at KPNWR, and the Refuge supports breeding populations of ‘A‘o, ‘Ua‘u kani, ‘Ā (red-footed booby), Mōlī, Koa‘e ‘ula, and Koa‘e kea. The Refuge supports a large breeding population of the endangered nēnē, and provides habitat for migratory birds including the Kōlea (Pacific golden plover, *Pluvialis fulva*), ‘Akekeke (Ruddy turnstone, *Arenaria interpres*), and ‘Ūlili (Wandering tattler, *Heteroscelus incanus*), for the endangered ‘Ōpe‘ape‘a, and for the endangered ‘Īlio-holo-i-ka-uaua (Hawaiian monk seal, *Monachus schauinslandi*). Nine ‘Ua‘u chicks successfully fledged from the Nihoku fenced unit in 2015 after translocation; another cohort will be translocated in fall 2016. No juvenile or adult ‘Ua‘u have been separately observed at KPNWR to date.

Non-native birds are present in KPNWR, including barn owls and cattle egrets (*Bubulcus ibis*). Year-round control reduces rat and cat populations within the Refuge, while maintenance and repair of perimeter fencing limits entry by dogs and pigs. Within the Nihoku fenced unit, all introduced mammalian predators (dogs, cats, rats, and mice) have been successfully eradicated.

3.3 Cultural and Historic Resources

The following steps were taken to identify potential cultural and historical resources: (1) general literature search on the cultural importance of or legends associated with seabirds, and ‘A‘o in particular; (2) review of the 2013 Archaeological Assessment for construction of the fence at Nihoku and 1989 Archaeological Inventory Study for Kīlauea Point NWR expansion; (3) review of the Cultural Impact Assessment included in the 2013 Final EA for the Hono o Nā Pali NAR Management Plan; (4) review of cultural resources summarized in the 2008 Final EA for the Revised Master Plan for Limahuli Garden and Preserve; (5) review of the 2016 CCP for KPNWR; and (6) informal consultation with a variety of organizations and individuals who might have additional information or insight, including the Kīlauea Point Natural History Association, Office of Hawaiian Affairs, State Historic Preservation Division, and others.

Seabirds themselves are of cultural importance, valuable to Native Hawaiians for feathers and food (Boynton 2004, Xamanek Researches 1989). Seabirds that feed at sea and return to shore at night were used to navigate back to land from fishing or trading voyages (KESRP 2016). Hawaiians observed seabird behavior to indicate changing weather patterns (KESRP 2016).

Hawaiian proverbs also reflect the role of seabirds and finding fish: “Ka i‘a ‘imi I ka moana, na ka manu e ha‘i mai”, or “The fish sought for in the ocean, whose presence is revealed by birds” and “Pōhai ka manu maluna, he i‘a ko lalo” or “When the birds circle above, there are fish below” (Pukui 1983). In modern times, seabirds continue to play a role for aku (skipjack tuna) fishermen, as the behavior of seabirds at sea tells what is happening in the ocean miles away, providing valuable information for a successful fishing trip (Boynton 2004). The ‘A‘o is specifically noted in one proverb referring to a family with an only child: “Ho‘okāhi no hua a ka ‘a‘o,” or “The ‘a‘o bird lays but a single egg” (Pukui 1983).

A summary of the relevant findings contained in the Cultural Impact Assessment for Hono o Nā Pali NAR is as follows: The valleys of the Nā Pali coast were inhabited and intensively cultivated by the Native Hawaiians, and overland trails connected many of these valleys. The upland portions of Hono o Nā Pali NAR are less studied, but cultural impact assessments have been prepared for the adjacent, and similarly forested and remote, upland areas of the Alaka‘i and Wainiha. The studies indicate that in addition to containing the trails used to connect areas, the upland forests were sacred to Hawaiians and were used for traditional and cultural practices such as bird hunting, harvesting timber, collection of plants for medicinal use, and ceremonial purposes (hula, oli, or chant) (DOFAW 2013). No evidence of habitation or burial was found in the adjacent remote upland areas; instead these areas bear significance as the wao nahele (forested zone) containing native plants and animals of cultural value and as wahi pana (legendary places) (DOFAW 2013).

A summary of the relevant findings for Upper Limahuli Preserve is as follows: No archaeological sites are known or anticipated to be found within Upper Limahuli due to the inaccessibility of the perched upper valley and a review of existing oral histories, surveys, and field observations (NTBG 2008).

A summary of the relevant discussion of cultural resources found within KPNWR CCP is as follows: Kīlauea has a history steeped in the plantation days of old Hawai‘i and World War II and is also an area rich with stories of Pele. The lighthouse, completed in 1913, is on the State and National Register of Historic Places. Archaeological surveys of the Refuge in 1987 and 1989, have documented historical structures, but have found no evidence of remains related to Native Hawaiian culture (USFWS 2016). The Nihoku predator-free fenced unit contains no documented cultural resources (Cultural Surveys Hawai‘i 2013).

3.4 Social and Economic Conditions

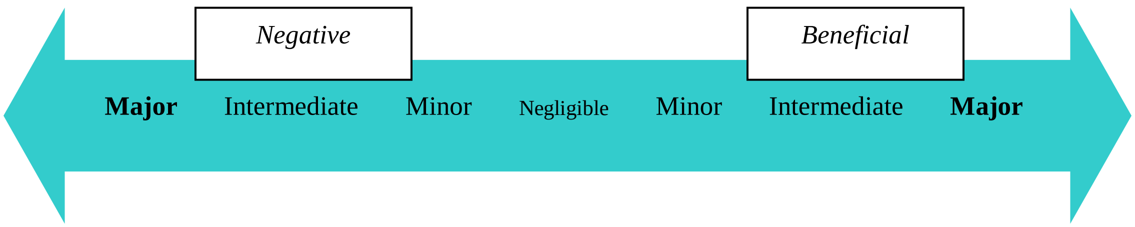
Hono o Nā Pali NAR is state-owned land set aside as a natural area reserve, designated to “preserve in perpetuity specific land and water areas which support communities, as relatively unmodified as possible, of the natural flora and fauna, as well as geological sites of Hawai‘i” (HRS Chapter 195). Public access is allowed for recreational and cultural uses, and current public use primarily involves hiking, bird watching and hunting. Most visitors stay on marked hiking trails and away from the remote steep areas containing the existing seabird colonies (DOFAW 2011). Upper Limahuli Preserve is private property that is not open for general public use; access to the area is severely limited by the steep terrain and surrounding topography, and hunters do not use the area (NTBG 2008).

From 2010 to 2013, the Kīlauea Point NWR visitor center averaged about 189,963 visitors per year and is among the top 5 in public visitation for all national wildlife refuges (USFWS 2016). Upon entering the Refuge, vehicles (no pedestrian access currently allowed) descend a steep, narrow, curving, paved road that leads directly to two paved parking lots and two gravel areas (parking capacity for 51 vehicles). Several active burrows are within 30 ft (10 m) of the entry road and within 250 ft (80 m) of the visitor parking area. However, due to the cryptic behavior of these seabirds (burrowing nests under vegetation, transiting to and from the nest only after dark), few, if any, visitors see ‘A‘o or their nests. The Nihoku predator-free fenced unit is located in an area designated for wildlife protection and restoration and is closed to the public; tours to the area are generally limited to less than 5 guided educational interpretive tours annually.

Chapter 4. Environmental Impacts

4.1 Overview of Effects Analysis

This chapter assesses the potential effects to the physical and biological environment and to cultural and socio-economic resources as a result of implementing each alternative. The qualitative terms moderate (intermediate), minor, and negligible are used to describe the magnitude of the effect. To interpret these terms, intermediate is a higher magnitude than minor, which is of a higher magnitude than negligible.



The terms below were used to describe the scope, scale, and intensity of effects.

Neutral or Negligible. Resources would not be affected (neutral effect), or the effects would be at or near the lowest level of detection (negligible effect). Resource conditions would not change or would be so slight there would not be any measurable or perceptible consequence to a population, wildlife or plant community, recreation opportunity, visitor experience, or cultural resource. If a resource is not discussed, impacts to that resource are assumed to be neutral.

Minor. Effects would be detectable but localized, small, and of little consequence to a population, wildlife or plant community, other natural resources; social and economic values, including recreational opportunity and visitor experience; or cultural resources. Mitigation, if needed to offset adverse effects, would be easily implemented and successful based on knowledge and experience.

Intermediate or Moderate. Effects would be readily detectable and localized with measurable consequences to a population, wildlife or plant community, or other natural resources; social and economic values, including recreational opportunity and visitor experience; or cultural resources within the Refuge but not readily detectable or measurable beyond the Refuge. Mitigation measures would be needed to offset adverse effects and could be extensive, moderately complicated to implement, and probably successful based on knowledge and expertise.

Significant or Major. Region-wide effects would be obvious and would result in substantial consequences to a population, wildlife or plant community, or other natural resources; social and economic values, including recreational opportunity and visitor experience; or cultural resources. Extensive mitigating measures may be needed to offset adverse effects and would be large-scale in nature, possibly complicated to implement, and may not have a high probability of success. In some instances, major effects would include the irretrievable loss of the resource.

4.2 Effects on the Physical Environment

Topics addressed under the physical environment section include effects to soils, water quality, and air quality. No significant effect is expected on the physical environment under any of the alternatives.

Negligible disturbance to soils would occur under all alternatives through trampling of soils by those conducting monitoring of bird nesting sites based on observations from similar monitoring activities occurring throughout the state; these impacts are extremely limited in area (to existing trails), duration (less than six trips per year), and intensity.

Negligible impacts to water quality or quantity are anticipated under any alternative; activities associated with all alternatives (e.g., monitoring, acoustic attraction, moving chicks) are not anticipated to result in any discharges into existing streams or the ocean.

Negligible impacts to air quality are anticipated under any of the alternatives because effects on air quality from activities associated with all alternatives (use of small mechanized equipment or application of herbicide associated with habitat restoration or fence maintenance, use of helicopters for transportation) would be localized to the Nihoku predator-free fenced unit or near montane colonies, located away from urban or residential, and would be of short-term duration given the size of the fenced unit and the limited number of helicopter trips.

4.3 Effects to the Biological Environment

Topics addressed under the biological environment section include effects to federally listed species, native vegetation, birds, invertebrates, and invasive species. No significant effect is expected on the biological environment under any of the alternatives.

4.3.1 Effects on federally listed species

<u>‘A‘o - endangered</u>
Given the decline of ‘A‘o in the wild, it is possible that the existing breeding population could disappear due to predation, light attraction, collision with utility lines, natural causes of mortality, habitat modification, or natural disaster (e.g., hurricane, forest fire). The longer management intervention is delayed, the more likely that management options would cease to be available.

Under Alternative A, the overall population of the ‘A‘o on Kaua‘i would be expected to continue to decline, but potentially stabilize or increase in the managed colonies within KPNWR, Upper Limahuli Preserve and Hono o Nā Pali NAR. Current management provides localized protection from predation to breeding birds in those colonies. No other active ‘A‘o breeding colonies have been identified in locations that are accessible for in situ management actions, such as predator control. This alternative takes a passive approach to establishing an ‘A‘o colony at a new site; the Nihoku predator-free fenced unit is available for use by any ‘A‘o that discover the site and the installed artificial burrows on their own. Given the philopatric nature of ‘A‘o, actual use of the site by ‘A‘o is unlikely without taking active management steps to attract them.

Under Alternative B, a breeding colony could be established over time at the Nihoku predator-free fenced unit through a social attraction program designed to lure prospecting birds to the site. This alternative is consistent with the primary seabird objective in the Refuge's CCP to restore viable breeding populations of ʻAʻo and other seabirds at Crater Hill and Mōkōlea Point. Maintaining the existing ʻAʻo colony on the Point while shifting emphasis for ʻAʻo recovery to the Crater Hill area (including the Nihoku area) where public uses are less intense, resulting in two sub-populations on the Refuge that could be managed to become one contiguous ʻAʻo colony.

Some biologists recommend using social attraction for one or more years before attempting the more expensive alternative of chick translocation (Gummer et al. 2014). A potential downside is that use of social attraction as the primary management response could limit the future use of ʻAʻo chick translocations if social attraction is unsuccessful because finding candidate chicks for translocation could become more difficult over time with continued declines in population or changes to the existing managed colonies (disease, natural disaster, reduced funding for management and predator control).

Under Alternative B, there is no risk associated with handling birds, and the success or failure of social attraction can be evaluated relatively quickly since it focuses on juvenile and adult birds who are likely to breed within a few years (rather than waiting three to six years for chicks to survive, mature and return to the site). However, the probability of success for social attraction used alone is unknown. Even at KPNWR, where the social attraction efforts are considered a success based on the ratio of unbanded to banded birds (2:1), there was a four-year lag in the time between when the social attraction efforts began (2007) and a notable increase in the number of pairs identified (2011), and it was unclear whether the increase was due to increased survey effort beginning in 2010 or to an actual increase in the number of pairs at KPNWR (McFarland et al. 2013). Buxton et al. (2014) suggests the most influential variable affecting recolonization is a source colony within a range of 25 km. The KPNWR colony is within this range, but other known active breeding colonies lie at the boundary of that range (20–25 km from the Nihoku predator-free fenced unit). The existing KPNWR colony is relatively small (11–12 pairs) and may not have sufficient birds to attract to form a sustainable new colony, and it is uncertain how many pre-breeding recruits born in other colonies will fly near enough to Nihoku to hear the recordings. Because of these potential unknowns for this alternative, but considering the limited success demonstrated by past efforts, a minor to moderate positive effect on ʻAʻo would be anticipated.

Under Alternative C, chick translocation has the potential to establish a breeding colony of ʻAʻo at a new location protected from predators and accessible for regular monitoring; in other translocations of Procellariids, translocated chicks have returned to the translocation site as adults to breed and these colonists have lured immigrant conspecifics (Jones and Kress 2012). A maximum of 90 ʻAʻo chicks would be moved over a five year period (up to 20 per year limited by various factors, such as the number and accessibility of available chicks and success of translocation efforts), taken from more than one colony whenever possible. Chicks would be removed prior to the time when they are most vulnerable to predation by cats (when they are exercising outside the burrow prior to fledging); removal of chicks would arguably decrease their vulnerability to predation as compared to chicks remaining in a colony, at least within Hono o

Nā Pali NAR. Chicks could be more prone to barn owl predation at Nihoku because of early successional vegetation and bare ground near the artificial burrows. The preferred alternative incorporates monitoring and control of barn owls to prevent predation of translocated chicks and native species inside and outside the fence. None of the translocated ʻUaʻu chicks were predated by owls in 2015, and the restored native vegetation continues to thrive around the artificial burrows, and is anticipated to provide more extensive cover in 2016 and in the future.

The three currently suitable source colonies (KPNWR, Upper Limahuli Preserve, and Pōhākea) fledged a minimum of 6, 42, and 6 chicks in 2014. New burrows have been found each year in these managed colonies through additional search effort, and these colonies also have several monitored burrows where monitoring has been insufficient to determine whether it contained a ʻAʻo or ʻUaʻu chick, so there may be more ʻAʻo chicks fledging from these colonies than has been documented to date. In other seabird species, high proportions of nestlings have been transported from at-risk colonies to protected sites for conservation purposes (including nearly 100% of the chicks produced by the critically endangered Cahow (*Pterodroma cahow*) and Taiko (*Pterodroma magentae*) since each is restricted to a single colony), with no measurable negative impact on the source colony (Carlile et al. 2012).

Under Alternative C, chicks may be removed from KPNWR. However, due to the proximity of that potential source colony to the Nihoku predator-free fenced unit and the associated higher likelihood of success for social attraction, the initial suitability of KPNWR as a source colony for translocation would be considered lower, thus minimizing the risks to the KPNWR population. However, the Service would evaluate source population suitability for translocation year-to-year using the criteria in Section 2.4.

Under Alternative C, chicks may be removed from colonies receiving management attention through the KIUC STHCP (Upper Limahuli Preserve and Pōhākea within Hono o Nā Pali NAR). KIUC's actions are intended to improve breeding success of ʻAʻo in these colonies, and thereby increase the population of the species compared to what would otherwise occur. Removing these chicks, so that they imprint upon the Nihoku predator-free fenced unit instead of the montane breeding colony, is anticipated to remove these individual birds from the source colony (see KIUC comment letter reproduced in Appendix D). Over time, this could have the impact of reducing the population and breeding productivity in the managed colonies compared to what would have occurred without the translocation. As a result, particularly given the limited number of active breeding colonies where seabird-specific management actions are feasible, KIUC has repeatedly expressed concern regarding the impact of nestling removal on the success of their mandatory mitigation efforts and intended future efforts. KIUC does not oppose seabird translocation work, so long as the USFWS provides KIUC with written assurance that the removal of ʻAʻo chicks from KIUC-managed colonies will not adversely affect the evaluation of the value or success of KIUC's mitigation efforts in those colonies. KIUC further advocates for mitigation credit associated with the subsequent generations of ʻAʻo chicks that result from chicks translocated from the KIUC-managed colonies. KIUC expressed similar concerns during planning for the ʻUaʻu translocation efforts. The USFWS provided written assurance that the adverse impact associated with the removal of up to 100 ʻUaʻu chicks from KIUC-managed colonies and the beneficial impacts to the ʻUaʻu at the translocation site are properly considered as part of the species' baseline and as such, would be considered when the USFWS evaluates the value and effectiveness of KIUC's mitigation actions. Moreover, “[a]t the conclusion of [the] environmental review process, the Service expects that any effects from shearwater translocation activities will be properly considered as part of the species' baseline when the Service evaluates the value and effectiveness of KIUC's mitigation actions for the Newell's shearwater at KIUC-managed breeding colonies” (see Appendix D).

Under Alternative C, desertion of breeding pairs in future years from burrows where chicks have been removed for translocation purposes or where chicks have been lost to predation is not anticipated. In a number of other translocation studies, it was found that adults return the following year despite the removal of their chick prior to fledging (Miskelly et al. 2009). There is also some suggestion in related species that by removing chicks before fledging, the breeding pair may have a higher survival rate as they are able to spend more time foraging for self-maintenance compared to pairs raising a chick (VanderWerf and Young 2011). In ‘A‘o burrows currently monitored on Kaua‘i, breeding pairs return in subsequent years after their chicks have been lost to predation and successfully fledge young in the following year (KESRP unpublished data). To reduce the potential for impact on breeding pairs, chicks will not be selected for translocation from the same burrow in consecutive years.

Under Alternative C, moving chicks carries the risk that the birds may be injured or may die during capture and transport and/or may not acclimate to the translocation site, and ultimately may die from stress or related illnesses. However, based on recent developments in New Zealand, the likelihood of success for chick translocation has improved since the concept was identified as a recovery objective. Translocation has been particularly successful with multiple *Pterodroma* and *Puffinus* species (Miskelly et al. 2009). Eight species from four different genera were translocated by 2008 in New Zealand, and several more species have been translocated since, including successful translocations for the highly endangered Bermuda Cahow and New Zealand Taiko (Miskelly et al. 2009, Gummer 2013, T. Ward-Smith pers. comm.). Techniques have been developed and refined to a level where health issues are minimal and transferred chicks fledge at measured condition parameters similar to, or exceeding those, of naturally raised chicks (Gummer 2013). Hand-rearing methods are now well-established for many seabird species, especially burrow nesters, leading to 100% fledging success in many cases (Jones and Kress 2012). Implementing these established techniques would be anticipated to reduce the potential for harm from overheating, injury in the carrying containers, or stress from unfamiliar stimuli. To further minimize negative impacts, any injuries or problems attributable to the translocation process would be evaluated and appropriate modifications made to prevent future injuries or problems. Based on assessment and review of the ‘Ua‘u translocation conducted in 2015, the planned translocation method does not appear to cause undue stress to chicks; nine of the ten ‘Ua‘u chicks translocated fledged successfully and an autopsy of the dead chick indicated health problems unrelated to the translocation.

Most of the New Zealand translocations have been undertaken too recently to have published reports of return rates and breeding success of fledged chicks; the ‘Ua‘u translocation is also too recent to have return rates and breeding success. However, by 2009, 11 species of petrel of five genera had been recovered back at release sites following translocation (Miskelly et al. 2009). However, it takes time to determine success and to establish a breeding colony. Forty translocated Hutton's shearwaters fledged from Kaikoura's (artificial) Te Rae O Atiu colony between 2005 and 2008, but the first chick to hatch and fledge from the colony was not until 2012 (Experience Kaikoura 2016). In 2016, 7 chicks hatched and fledged from the site (Experience Kaikoura 2016).

Return rates for translocated birds are anticipated to be the same as for wild birds, as translocated chicks who fledge would face the same challenges as wild birds when at sea. Griesemer and Holmes (2011) estimated a 33% rate of survival for wild chicks. Using this number, approximately three birds would be expected to return from each translocation of ten chicks. If 50 birds fledge over five years (2016–2020), the translocation site could have a population of 15–16 (translocated) pre-breeding and breeding birds when the last cohort of translocated chicks returns (2026), as well any additional birds who colonize due to the social attraction techniques or the return of the translocated birds (3 birds/year X 5 years = 15; 33% of 50 = 16).

Under Alternative C, a moderate long-term positive impact to ‘A‘o would be anticipated. Benefits would be delayed, as it may take as long as ten years for the first translocated chick to return and successfully breed. However, over time, as additional chicks return, the colony could be expected to grow (rather than decline) over time, as the Nihoku predator-free fenced unit is within an accessible NWR, managed for conservation, located away from disorienting lights and utility lines and feasible to maintain as predator free.

Under all alternatives, ‘A‘o could be harmed through damage to nesting habitat by repeat visits (although this has not been reported at any managed site), disturbance resulting in temporary or permanent burrow desertion by adults (although this has not been observed by current burrow monitoring), and the creation of physical and scent trails to burrows that could be used by introduced predators. To prevent or minimize negative impacts,

- Existing trails would be followed whenever possible, and the creation of new trails would be avoided;
- Any burrows damaged accidentally by trampling would be repaired;
- Use of lotions or insect repellents that may leave a human scent trail and lead introduced mammalian predators directly to burrows would be avoided;
- The total number of visits to each burrow would be minimized and burrow cameras would be used to monitor reproductive success or assess viability of any given burrow for use as a source bird for translocation;
- Intensive monitoring and burrow searching would be concentrated, where possible, in areas with existing predator control activities.

<u>‘Ua‘u – endangered</u>

Because ‘A‘o breeding habitat is similar and overlaps with ‘Ua‘u breeding habitat, management and monitoring activities associated with Alternative A also provide valuable protection from predators and information on the status of ‘Ua‘u. Under Alternatives B and C, the ‘Ua‘u chicks to be translocated to the Nihoku predator-free fenced unit in 2016–2020 and the ‘Ua‘u birds that are attracted to the site or return to breed could be affected by the establishment of a new breeding ‘A‘o population. While the impacts of interactions between ‘Ua‘u and ‘A‘o within the 7-acre, lowland Nihoku fenced area are largely unknown, there is subfossil evidence that these two seabird species were historically sympatric. Although ‘Ua‘u and ‘A‘o appear to use distinct habitat patches, there is overlap of individuals, and some currently nest in close proximity to one another in the montane colonies of Upper Limahuli Preserve and Hono o Nā Pali NAR.

Because ‘A‘o would be translocated a few weeks before ‘Ua‘u chicks, the period that both species’ chicks would be at Nihoku together is anticipated to be relatively short. To minimize disturbance to translocated chicks before fledging and to prevent unnecessary interactions, ‘Ua‘u and ‘A‘o chicks would be placed in artificial burrows on opposite sides of the nesting area within the Nihoku predator-free fenced unit. Because the care for both species is similar, caring for the remaining ‘A‘o chicks that have not fledged is anticipated to have a negligible impact on the translocated ‘Ua‘u chicks.

Monitoring of ‘Ua‘u and ‘A‘o interactions inside the Nihoku fenced site would likely help inform future Hawaiian seabird conservation projects.

<u>Nēnē - endangered</u>
KPNWR supports one of the largest concentrations of Nēnē on the island. Endangered Nēnē nest throughout the Refuge at average densities as high as 4 pairs per hectare, and at least nine pairs nest near or within the Nihoku predator-free fenced unit. Peak breeding occurs mainly October to March and molting March to June, when adults become flightless for four to six weeks while they grow new flight feathers. During this period, they become secretive and are extremely vulnerable to attacks by introduced predators. During the rest of the year, from June to September, Nēnē disperse or flock with other family groups on the island and in non-breeding areas where young Nēnē have opportunities to find mates.

There are no anticipated negative impacts on the Nēnē under Alternative A; the existing management activities at Nihoku (predator control and habitat restoration) provide a positive long-term benefit to Nēnē by expanding the acreage of protected predator-free habitat Under Alternatives B and C, an existing Nēnē breeding population at KPNWR within and adjacent to the Nihoku predator-free fenced unit could be affected by the establishment of a new breeding ‘A‘o population. Noise and activities associated with social attraction (such as the installation and playing of acoustic recordings of petrel and shearwater calls) or chick translocation (feeding and monitoring translocated chicks prior to fledging) may temporarily disrupt the activities of the Nēnē. Social attraction recordings would be projected from late February (just before breeding or prospecting ‘A‘o would arrive) through November (continuing through estimated fledging of ‘A‘o), while actions related to chick translocation would be concentrated in September to October. Thus, the projection of acoustic recordings and chick translocation and feeding and monitoring activities would overlap with the Nēnē peak breeding season (October–March).

To minimize disturbance to breeding pairs and families during the Nēnē breeding season, biologists feeding ‘A‘o chicks at the translocation site would enter the fenced unit on foot through an alternative access easement (245 ft (75 m) to project site) in the adjacent SeaCliff Plantation neighborhood instead of driving 3,900 ft (1200 m) multiple times daily through Nēnē Crater Hill breeding grounds. All Nēnē nests and broods in the Nihoku predator-free fenced unit would be mapped and monitored, and any pairs or family groups in the area would be avoided (as Nēnē have high site fidelity and would likely return to that site).

In addition, the Service would monitor for predators within and immediately surrounding the Nihoku area. If monitoring indicates that the use of social attraction increases predator presence, then predator control efforts would be implemented or increased in accordance with the KPNWR integrated pest management approach described within its CCP.

With these mitigation measures in place, minor short-term negative impacts on Nēnē would be anticipated and over the long-term, existing Nēnē populations would be expected to remain stable and continue on their current trajectories of increasing populations on Kaua‘i.

<u>‘Ōpe‘ape‘a – endangered</u>
There are no anticipated negative impacts on the ‘Ōpe‘ape‘a under any of the alternatives. Since the ‘Ōpe‘ape‘a primarily roosts among foliage in trees and can forage over many habitat types, including native and non-native vegetation (NRCS 2009), negligible to minor positive impacts to the species are expected as habitat restoration efforts would not provide much additional and/or higher quality roosting or foraging habitat. ‘Ōpe‘ape‘a have been observed within the fenced predator-free unit, foraging within the restored habitat.

The bats are primarily vulnerable to predation from introduced predators during the rearing and fledging period (NRCS 2009); since the project area does not likely provide habitat for these life-history stages, the benefits of a predator-proof site to the bat would be negligible.

Activities associated with Alternatives B or C (playing of seabird calls, caring for translocated chicks) are not anticipated to negatively impact ‘Ōpe‘ape‘a. ‘Ōpe‘ape‘a are crepuscular, while activities related to chick care would occur during the day. Negative interactions between ‘Ōpe‘ape‘a and existing seabird colonies (with associated calling patterns) have not been reported, and evening monitoring of translocated chicks pre-fledging will include observation of ‘Ōpe‘ape‘a to confirm that social attraction efforts do not negatively impact ‘Ōpe‘ape‘a.

<u>Listed Forest birds - endangered</u>
There are no anticipated impacts on endangered forest birds under any of the alternatives as existing forest bird populations have not been found to occur within any of the project areas and thus have not been impacted by existing activities directed towards ‘A‘o conservation (Alternative A) or likely to be harmed or negatively affected by activities proposed under Alternatives B or C.

<u>Listed plants and invertebrates</u>
Negligible to minor negative impacts on listed plant or invertebrate taxa are anticipated under all alternatives as existing populations have not been shown to be impacted by existing activities directed towards ‘A‘o conservation (Alternative A) and negligible disturbance of rare plants or invertebrates is likely under Alternative B or C. To prevent or minimize negative impacts to federally designated critical habitat (plant, invertebrate, ecosystem), best management practices for conservation fieldwork (e.g., existing trails would be followed whenever possible, creation of new trails to be avoided, implementation of invasive species protocols) would be incorporated. As such, impacts to listed plants and invertebrates and to rare plant and invertebrate habitat is anticipated to be negligible to minor negative.

4.3.2 Effects on native vegetation

Under all of the proposed alternatives, there would be no prolonged or intensive impact to the native vegetation. It is possible that activities associated with all three alternatives may increase the opportunity for the introduction of invasive species into these areas, particularly into native forest habitats, but invasive species protocols would be incorporated into all alternatives to prevent the introduction or spread of invasive species during fieldwork. Documenting and eliminating as soon as possible any incipient populations of new non-native weed species or other invasive species would be part of the biological monitoring program. Absent the introduction or spread of non-native weed species or invasive organisms, native vegetation communities should remain largely intact and unaffected, with few to no measurable consequences, under all three alternatives.

4.3.3 Effects on native animals

Under Alternative A, overflying native seabirds, such as ‘Ā (known to nest nearby) and ‘Ua‘u kani (known to nest in similar areas) might colonize the Nihoku predator-free fenced unit on their own without management intervention. The breeding population of the Mōlī currently using the Nihoku predator-free fenced unit (2 nests in 2015) could be expected to double over the next 5 years, as a result of predator control activities.

Under Alternatives B and C, with the exception of ‘Ua‘u kani, no negative interactions are anticipated between ‘A‘o and any other native animal at the translocation site. Mōlī eggs are laid November–December, generally after the fledging of ‘A‘o, and Mōlī chicks fledge in July soon after ‘A‘o would arrive at the breeding colony. Mōlī are known to co-exist with numerous other smaller species of burrow nesting seabirds without negative impacts to either species, and it is expected that they would have limited interaction with ‘A‘o. ‘Ā breeding overlaps with ‘A‘o; ‘Ā eggs are laid February–April, with fledging generally by September. However, ‘Ā typically nest in bushes and trees, and no negative interactions between the existing colonies of ‘Ā and ‘A‘o within KPNWR have been documented.

Under Alternatives B and C, measures to deter nesting by ‘Ua‘u kani within the Nihoku predator-free fenced unit would be implemented. ‘Ua‘u kani have been known to displace ‘A‘o from breeding burrows (USFWS unpublished data; Raine and Banfield 2014c). As of 2015, the closest ‘Ua‘u kani nest is less than 250 meters away; one ‘Ua‘u kani pair has been observed immediately outside the fenced unit (Raine pers. comm., Young pers. comm.). To deter use by ‘Ua‘u kani, the artificial burrows have been designed with long entrance tunnels, with a U-bend. Blocking the entrances during ‘Ua‘u kani pre-breeding and prospecting periods, continuing to monitor inter-species interactions, and removing or relocating ‘Ua‘u kani may be considered to prevent displacement of ‘A‘o. ‘Ua‘u kani are the most abundant bird species at KPNWR (with an estimated 8,000–15,000 breeding pairs) (USFWS 2016). As such, actions to deter use of the Nihoku predator-free fenced unit by ‘Ua‘u kani would be anticipated to have a minor negative short-term impact on this indigenous seabird.

Under all alternatives, repeat visits to ‘A‘o nesting habitat could lead to the creation of physical and scent trails that could be used by introduced predators. However, there would be negligible to minor negative anticipated impacts on native animals located near ‘A‘o nesting habitat as existing populations have not been shown to be impacted by existing activities directed towards ‘A‘o conservation (Alternative A) and under Alternative B, no additional activities likely to harm or negatively affect native animals in ‘A‘o nesting habitat, with the exception of ‘Ua‘u kani, are proposed. Under Alternative C, there would be an increase in the number of visits to ‘A‘o nesting habitat; however, minimization measures such as those implemented under all alternatives and as described above in the effects on ‘A‘o section would be implemented to help reduce any potential impacts.

4.3.4 Effects on non-native species

The control of harmful non-native species is an ongoing problem throughout the state of Hawai‘i. Indeed, predation by non-native species is a primary threat to ‘A‘o survival. All alternatives incorporate some level of control of introduced predators to reduce or eliminate the threat of predation to ‘A‘o. Under Alternative A, control of introduced predators would be directed to cats, pigs, rats, or barn owls found at or near the existing KPNWR colony (and at montane managed colonies by KIUC); under Alternatives B and C, control of introduced predators would be directed to monitoring the Nihoku predator-free fenced unit for incursions by cats, pigs, and rodents and preventing predation by barn owls. Under Alternative B, control during the recruitment period would be done on an as-needed basis; under Alternative C, barn owl control would be implemented during the translocation period while ‘A‘o chicks are on-site. All methods of predator control would be consistent with State and Federal law and incorporate best practices identified through knowledge and experience. The effect on predatory non-native species would be minor, especially given that the non-native species were introduced to Hawai‘i and that these species exist in sizable populations throughout Kaua‘i and the state.

4.4 Effects to Cultural and Historic Resources

The National Historic Preservation Act (NHPA), as amended, requires Federal agencies to 1) evaluate the effects of any Federal undertaking on cultural resources; 2) consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological, and historic resources; and 3) consult with appropriate Native Hawaiian groups to determine whether they have concerns for traditional cultural resources in areas of these Federal undertakings. Scoping letters were sent to the State Historic Preservation Office as well as to the Kauai Island Burial Council, the Office of Hawaiian Affairs, the Native Hawaiian Legal Corporation, and local Native Hawaiian groups and non-profit organizations (e.g., Hawaiian Civic Clubs) to determine if there were cultural concerns regarding the proposed ‘A‘o management actions. No concerns or objections have been received.

None of the alternatives is anticipated to result in negative impacts to archaeological or historical resources. There are no resources eligible or listed on the National Register of Historic Places within the project areas identified under Alternatives A, B, or C. Management actions proposed under all three alternatives are either located in areas in extremely remote, rugged, heavily vegetated mountainous terrain with no known archaeological or historic sites (montane colony sites), and/or an area that has been previously surveyed (KPNWR) and proposed management actions under all alternatives are limited in scope and involve minimal ground disturbance (e.g., monitoring, retrieval of chicks). However, should evidence of any archaeological or cultural properties be encountered, any activity that could impact the discovered property would immediately cease and the appropriate parties would be consulted immediately.

The native Hawaiian ecosystems and the native species found therein are an essential part of the overall cultural landscape. For many indigenous communities, natural resources are cultural resources. Seabirds, and in particular the ‘A‘o, have cultural importance to Native Hawaiians and fishermen. The purpose of the project is the long-term recovery of the ‘A‘o, and a project designed to prevent the extinction of a native seabird could be considered to have a minor positive impact on cultural resources.

4.5 Effects to Social and Economic Resources

The potential source colonies are managed for conservation, and aside from their importance as watershed or wildlife habitat, these lands are not currently used for resource extraction. The montane colonies are zoned as protected conservation land and due to their remoteness, are not heavily used for recreation. All alternatives are consistent with the current land use and zoning, and no changes in land use would occur under any of the alternatives.

No local communities occur in either the area of the existing managed colonies or the proposed translocation site. None of the alternatives would result in changes to agriculture, farming, or the visitor industry.

All alternatives are conducted collaboratively with other agencies, educational institutions, or non-profit organizations. Spending to implement the alternatives generates secondary benefits by providing jobs in other industries where monies are spent. Personal spending could include rent, utilities, food, entertainment, food services, gas, etc. A successful chick translocation under Alternative C could encourage additional related conservation spending – either through related conservation actions within the fenced unit (e.g., restoration of rare plant taxa), translocation of other species into the translocation site, or the development of additional predator-free units elsewhere on the island. However, given the size of the project relative to the overall state budget or to other economic inputs into the local economy, effects to economic resources under all alternatives would be expected to be minor.

Table 4.1 Summary of effects

	Alternative A	Alternative B	Alternative C
EFFECTS TO PHYSICAL ENVIRONMENT			
Effects on soils	Negligible	Negligible	Negligible
Effects on water	Negligible	Negligible	Negligible
Effects on air quality	Negligible	Negligible	Negligible
EFFECTS TO BIOLOGICAL ENVIRONMENT			
Effects on listed species: ‘A‘o	Minor long-term positive	Minor to moderate long-term positive	Moderate long-term positive

Effects on listed species: ‘Ua‘u	Minor long-term positive	Minor long-term positive	Minor long-term positive
Effects on listed species: Nēnē	Minor long-term positive	Minor short-term negative; minor long-term positive	Minor short-term negative; minor long-term positive
Effects on listed species: ‘Ōpe‘ape‘a	Negligible to minor long-term positive	Negligible to minor long-term positive	Negligible to minor long-term positive
Effects on listed species: forest birds	Negligible	Negligible	Negligible
Effects on listed species: rare plant/invertebrates	Negligible to minor short-term negative	Negligible to minor short-term negative	Negligible to minor short-term negative
Effects on native vegetation	Negligible to minor short-term negative	Negligible to minor short-term negative	Negligible to minor short-term negative
Effects on native animals, except ‘Ua‘u kani	Minor long-term positive	Minor long-term positive	Minor long-term positive
Effect on native animals: ‘Ua‘u kani	Minor short-term positive	Minor short-term negative	Minor short-term negative
Effects on non-native species	Minor long-term negative	Minor long-term negative	Minor long-term negative
EFFECTS TO CULTURAL AND HISTORIC RESOURCES			
Effects on cultural and historic resources	Minor long-term positive	Minor long-term positive	Minor long-term positive
EFFECTS TO SOCIAL AND ECONOMIC RESOURCES			
Effects to social and economic resources	Minor short-term positive	Minor short-term positive	Minor short-term positive

4.6 Cumulative Effects

The Council on Environmental Quality (CEQ) regulations for implementing the provisions of NEPA defines several different types of effects that should be evaluated in an EA including direct, indirect, and cumulative. Direct and indirect effects are addressed above. This section addresses cumulative effects. The CEQ (40 CFR § 1508.7) provides the following definition of cumulative effects:

"The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."

Cumulative impacts are the overall, net effects on a resource that arise from multiple actions. Impacts can "accumulate" spatially, when different actions affect different areas of the same resources. They can also accumulate over the course of time, from actions in the past, the present, and the future. Occasionally, different actions counterbalance one another, partially canceling out each other's effect on a resource. But more typically, multiple effects add up, with each additional action contributing an incremental impact on the resource. In addition, sometimes the overall effect is greater than merely the sum of the individual effects, such as when one more reduction in a population crosses a threshold of reproductive sustainability, and threatens to extinguish the population.

4.6.1 Related Conservation Actions

Other conservation actions on the island either directly, or indirectly, benefit ʻAʻo; many of the efforts noted below are also listed in section 1.6. Native ecosystem and watershed management in areas containing known ʻAʻo colonies indirectly and directly benefit ʻAʻo by protecting habitat and reducing predation pressure. Hono o Nā Pali NAR management by DOFAW involves habitat protection through the construction of several small fenced enclosures, weed control and habitat restoration, rare species monitoring and non-native predator control over portions of the NAR, including areas of known or suspected seabird habitat (DOFAW 2015). NTBG has focused management activities at Upper Limahuli Preserve since 1992 to mitigate the impacts of Hurricanes Iwa and Iniki (wind damage and dispersal of non-native weeds) and the expansion of feral ungulate populations (NTBG 2015). Conservation actions to protect approximately 144,000 acres of high-elevation forest implemented through the Kauaʻi Watershed Alliance indirectly benefit ʻAʻo through habitat protection; management programs include fence construction and maintenance, ungulate control, invasive weed control and monitoring (HAWP 2015). Mongoose monitoring and trapping efforts by the Kauaʻi Invasive Species Committee directly benefit ʻAʻo by delaying or preventing the establishment of this predator on island. Other conservation actions targeted towards rare plants or listed forest birds (e.g., actions by the Plant Extinction Prevention Program, PCSU projects, DOFAW or private landowners) or listed forest birds may indirectly benefit ʻAʻo through fencing, predator control, and native habitat restoration.

In addition, mandatory mitigation actions by KIUC and other landowners implemented to address take of listed seabirds, including shielding of lights and modification of structures, supporting the operation of the SOS program, and funding management actions at known seabird colonies, directly benefit ʻAʻo,

Funding for many of these projects varies from year to year. When combined with the management alternatives presented in this EA, these conservation efforts could result in a cumulative positive impact on ʻAʻo, listed species, and native ecosystems. However, the constant predation pressure presented by introduced non-native mammals and other threats to ʻAʻo require these efforts to be maintained over time, and any positive conservation impact could be eliminated quickly by reduced conservation funding, the introduction of a new predator, a new avian disease, or a natural disaster such as wildfire or hurricane eliminating existing habitat. And despite the cumulative beneficial effect of these actions, the ‘A‘o population is still declining dramatically. As such, the cumulative impacts of related conservation actions are anticipated to be minor and beneficial.

4.6.2 Translocation

The translocation of ‘A‘o chicks would contribute additional information on the feasibility of seabird translocations as an effective conservation measure in Hawai‘i to reduce the potential for extirpation or extinction of seabirds. Translocation to predator-free areas has been identified as a high priority for the recovery of listed seabird species. To date, however, there are few predator-free protected areas within the state, including Makamaka‘ole on Maui (2 4-acre units), Ka‘ena Point NAR on O‘ahu (approximately 60 acres), and nearly all the offshore islets of O‘ahu, including Mōkapu (10 acres) and Mokoli‘i (12.5 acres) (Hess and Jacobi 2011). Each of these spaces alone is insufficient to support the recovery of listed and rare seabirds, but might be sufficient to prevent island extirpation, and species extinction, while a sufficiently-sized network is being developed.

If translocation techniques are successful, and additional predator-free units created to support translocation efforts, these actions would almost certainly benefit other native species, including other endangered species such as the ‘Ua‘u and listed plants. As such, cumulative effects are moderate and beneficial.

4.6.3 Climate change

Global climate change is supported by a continuously growing body of unequivocal scientific evidence. Global forecasting models offer a variety of predictions based on different emission scenarios. The U.S. Government agency Overseas Private Investment Corporation suggests that a further increase in greenhouse gas emissions could double atmospheric concentrations of CO_2 by 2060 and subsequently increase temperatures by as much as 2–6.5°F over the next century. Recent model experiments by the IPCC show that if greenhouse gases and other emissions remain at 2000 levels, a further global average temperature warming of about 0.18°F per decade is expected. Sea level rise is expected to accelerate by two to five times the current rates due to both ocean thermal expansion and the melting of glaciers and polar ice caps. Recent modeling projects sea level to rise 0.59–1.93 feet (0.17–0.59 m) by the end of the 21st century. These changes may lead to more severe weather, shifts in ocean circulation (currents, upwelling), as well as adverse impacts to economies and human health. The extent and ultimate impact these changes will have on Earth's environment remains under considerable debate (Buddemeier et al. 2004, Solomon et al. 2007, IPCC 2007).

Small island groups are particularly vulnerable to climate change. The following characteristics contribute to this vulnerability: (1) small emergent land area compared to the large expanses of surrounding ocean; (2) limited natural resources; (3) high susceptibility to natural disasters; and (4) inadequate funds to mitigate impacts (IPCC 2007). Thus, Hawai‘i is considered to have a limited capacity to adapt to future climate changes.

Though none of the management alternatives would have an impact on climate change, the activities associated with them would provide enhanced protection for vulnerable species from some of the anticipated effects of climate change, including the anticipated loss of habitat associated with sea level rise.

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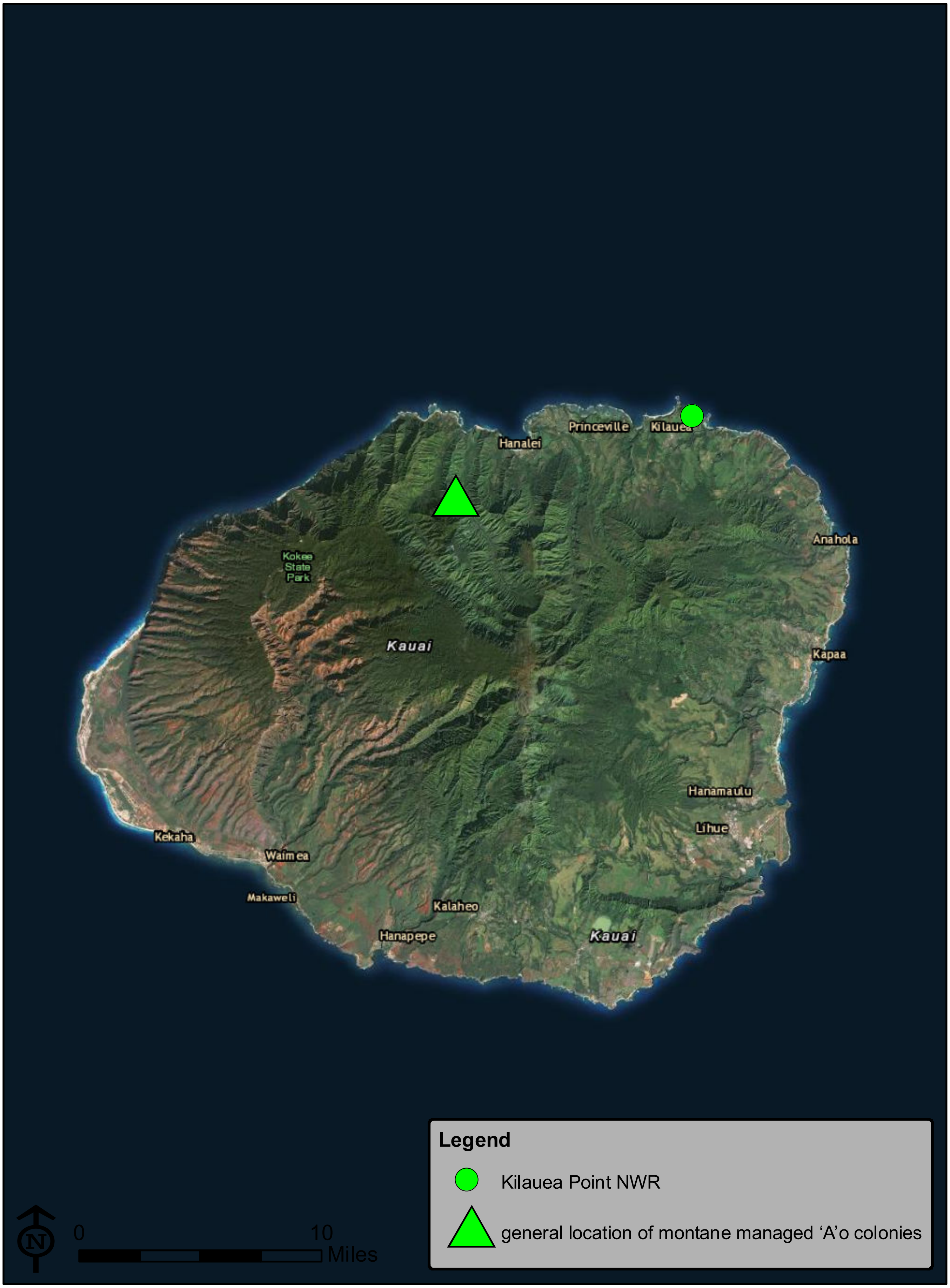
Appendix A: Common Acronyms and Abbreviations

ACAP	Agreement on the Conservation of Albatross and Petrels
CCP	Comprehensive Conservation Plan
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DLNR	Hawai‘i Department of Land and Natural Resources
DOFAW	Hawai‘i DLNR Division of Forestry and Wildlife
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act of 1973
FONSI	Finding of No Significant Impact
Ft	Feet (foot)
HCP	Habitat Conservation Plan
HRS	Hawai‘i Revised Statutes
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
KESRP	Kaua‘i Endangered Seabird Recovery Project
KIUC	Kaua‘i Island Utility Cooperative
KPNWR	Kīlauea Point National Wildlife Refuge
KSHCP	Kaua‘i Seabird Habitat Conservation Plan project
KWA	Kaua‘i Watershed Alliance
MHI	main Hawaiian Islands
M	Meter(s)
NAR	Natural Area Reserve
NEPA	National Environmental Policy Act
NESH	Newell's Shearwater
NHPA	National Historic Preservation Act
NTBG	National Tropical Botanical Garden
NWR	National Wildlife Refuge
NWHI	Northwestern Hawaiian Islands
PCSU	Pacific Cooperative Studies Unit
SOS	Save our Shearwaters Program
STHCP	KIUC's Short-Term Seabird Habitat Conservation Plan
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service

Appendix B:
Map of translocation site and potential source colonies



Map Source: oceanmapper@gmail.com Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Appendix C:
Newell's shearwater (*Puffinus newelli*) Translocation Plan

NEWELL'S SHEARWATER (*Puffinus newelli)*

TRANSLOCATION PLAN

April 2016

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Executive Summary

Newell's Shearwaters (*Puffinus newelli;* NESH) are listed as threatened under the Endangered Species Act of 1973 and are declining due to habitat degradation by feral ungulates (pigs, goats) and invasive exotic plants, predation by feral domestic cats, pigs, rats, and introduced Barn Owls, collisions with power lines and other human structures, and fledgling fall-out due to artificial light attraction. Protection of shearwaters on their nesting grounds and reduction of collision and lighting hazards are high priority recovery actions for the species. Given the challenges in protecting nesting birds in their rugged montane habitats however, it has long been desirable to create NESH populations in more accessible locations that offer a higher level of protection. Translocation to breeding sites within predator proof fences is ranked as priority 1 in the interagency 5-year Action Plan for Newell's Shearwater and Hawaiian Petrels (*Pterodrom sandwichensis;* HAPE). In 2012, funding became available through several programs to create such a population at Kīlauea Point National Wildlife Refuge (KPNWR) which is home to one of the largest seabird colonies in the main Hawaiian Islands. The project was named the "Nihoku Ecosystem Restoration Project" after the area on the refuge where the placement of the future colony was planned. There are four stages to this multi-faceted project: permitting and biological monitoring, fence construction, restoration and predator eradication, followed by translocation of the birds to the newly secured habitat. The translocation component is expected to last five years and translocate up to 90 NESH (10 chicks per year in year one and a maximum of 20 per year afterwards if enough donor burrows can be located) and up to 100 HAPE (20 chicks per year). Year one would began with HAPE only and NESH are to be added in year two. This time frame and minimum number of chicks needed are informed by the life history characteristics of the birds (age of first return is five to seven years), as well as the logistics involved in locating donor colonies and appropriate donor burrows. Other translocations of similar species have demonstrated a 12% return rate. Once the project has demonstrated success with high fledging rates, we would seek greater numbers of chicks in year two to increase the potential number of chicks returning to the fully protected site.

From 2012-2015 potential source colonies of both species were located with visual, auditory and ground searching methods at locations around Kaua`i. The sites that were selected as sources for Newell's Shearwater are on both state and private land. Most currently monitored endangered seabird colonies fall within the Hono o Na Pali National Area Reserve system (HNP NAR) and are North Bog, Pohakea, Pihea and Hanakapii. On private lands, a key colony is Upper Limahuli Valley owned by the National Tropical Botanical Garden (NTBG) and a small, dying colony at Kāhili. Lastly, the colony at Kilauea Point NWR, which is federally owned, also has accessible NESH burrows. These sites (with the exception of Kāhili) have high call rates, high burrow densities to provide an adequate source of chicks for the translocation, and have active predator control operations in place to offset the impacts of the monitoring required to select translocation burrows which may also potentially attract predators.

A predator proof fence has been constructed at Nihoku and all known NESH predators have been removed. By the end of summer 2016, 30% of the fenced area within Nihoku will be restored with native vegetation and outfitted with 50 artificial burrows. Habitat restoration will be done in phases (15% was done in 2015 along with installing the artificial burrows) until the majority of the area has been restored. In 2016, 10 NESH chicks that are one month before their expected fledging date (~ mid-September) will be removed by hand from burrows in their montane colonies, and transported by helicopter in a pet carrier to the translocation site. There they will be placed in artificial nest boxes and hand-fed a fish and squid mixture developed by

previous translocation projects, until they fledge (~October). Morphometric monitoring, and periodic blood panels will be done to assess chick age and health. Both the translocated chicks, as well as the source colonies will be monitored during and post- translocation to detect any adverse impacts and to document project outcomes. From 2017-2020, 10- 20 NESH chicks will be taken each year to provide an adequate translocation cohort for an ultimate goal of translocating a total of 90 birds over a five year period. Hawaiian Petrels will also be simultaneously translocated during this period.

Once complete, this project will both accomplish multiple refuge-specific goals of seabird and Nene conservation, and will result in a new, secured and accessible breeding population of NESH which will be crucial to helping to prevent the extinction of this species.

Background

Translocation as a tool for seabird conservation

Birds in the Order Procellariiformes exhibit strong natal philopatry and high nest-site fidelity. These behavioral traits, along with a protracted nesting period, and ground nesting habit, result in great vulnerability to predation by introduced mammals and exploitation by humans at the breeding colonies (Croxall *et al*. 2012). This vulnerability has led to the extirpation of many island populations of shearwaters and petrels around the world and made the consequences of stochastic events such as hurricanes, volcanic eruptions, epizootics, or fires at the remaining safe breeding sites much more significant (Croxall *et al*. 2012).

Translocation of birds to restore former breeding colonies or to create new colonies that are protected is a strategy that is being used as a conservation measure with increasing frequency, particularly in situations where social attraction techniques are not adequate on their own. Guidelines for the appropriateness, planning, implementation, and monitoring of such actions have been written for the Agreement on the Conservation of Albatrosses and Petrels (ACAP; Jacobs et al. 2013) and similar guidelines were adopted by the IUCN Species Survival Commission in 2012 (http://www.issg.org/pdf/publications/Translocation-Guidelines-2012.pdf). The key methods employed to establish new colonies of burrow-nesting seabirds are acoustic attraction, provision of artificial burrows, and chick translocation.

Translocations involving hand-rearing of burrow-nesting Procellariids have been undertaken around the world, but particularly in New Zealand since the early 1990s (Bell *et al*. 2005; Miskelly and Taylor 2004; Carlisle et al 2012). Eight species from four different genera were translocated by 2008 (Miskelly *et al*. 2009) and several more species have been translocated since (Gummer 2013; T. Ward-Smith, pers. comm.) with each success building upon the last. Furthermore, translocations have been undertaken successfully for highly endangered Procellarids including Bermuda Cahow and New Zealand Taiko, where the World population has numbered at fewer than 100 breeding pairs. Techniques have been developed and established for most of these species to a level where health issues are minimal and all transferred chicks fledge at measured condition parameters similar to, or exceeding those, of naturally-raised chicks (Gummer 2013). Transferring Procellariiform chicks to a new colony site is just the beginning of a long process of colony establishment that depends on survival of the translocated birds, their recruitment to the new colony site, and the social attraction of other pre-breeding individuals that will accelerate the growth of the colony into a viable population.

While successes in early years of translocation development varied (Miskelly et al. 2009), recent years have seen large successes as measured by recruitment of translocated chicks to the translocation site for a variety of species. The Chatham Island Taiko has seen 60% of the 21 chicks transferred over 2007 and 2008 recaptured as adults (M. Bell, Chatham Islands Taiko Trust, pers. comm. 2013), and up to 20% of translocated cohorts of Chatham and Pycroft's petrels translocated in the early-mid 2000s have returned to their respective release sites as adults (H. Gummer and G. Taylor, pers. comm.). Miskelly and Gummer (2013) report that 20 of 240 fairy prions transferred by 2004 were recovered at the release site despite 25 translocated birds being attracted back to the abundant source population. In addition, there has been some recruitment of non-translocated birds at new colony sites of multiple species supporting the use of acoustic attraction (H. Gummer, pers. comm.). Miskelly and Taylor (2004) report that 17% of Common Diving-Petrels transferred in the late 1990s were recovered at the release site. That project has also shown the highest recruitment rate of non-translocated birds compared to all other New Zealand species, with 80 immigrants recorded within 11 years of the first chick translocation (Miskelly et al. 2009). During the first year of HAPE translocations to Nihoku, 90% (9/10) chicks survived to successfully fledge. In summary, the numerous well-documented efforts that have been undertaken over the last 20 years have laid a solid foundation for translocating new species on islands outside of New Zealand.

In Hawaii, there are two seabirds listed under the Endangered Species Act: the threatened Newell's Shearwater (*Puffinus auricularis newelli;* NESH) and the endangered Newell's Shearwater (*Pterodroma sandwichensis;* NESH), whose recovery plans specifically list translocation as a highly ranked recovery action. The purpose of this document is to outline the steps required to initiate translocation for NESH.

Newell's Shearwater biology

Newell's Shearwaters are a threatened species of shearwater that is endemic to the Hawaiian Islands. It is closely related to, and until recently, was a subspecies of the Townsend's Shearwater (*Puffinus auricularis*) found in the eastern Pacific. Newell's Shearwaters are a medium-sized shearwater (391 g; King and Gould 1967). They are black above with a white belly, throat, and underwings, and a distinctive white patch on the flanks. Newell's Shearwaters are highly pelagic and forage over deep waters. They range throughout the tropical Eastern Pacific up to 3,000 miles from the Hawaiian Islands south to the Equatorial Countercurrent (Ainley et al. 1997). Their primary prey are ommastrephid flying squid (99%) and flying fish (*Exocoetus* sp.; Ainley et al. 2014), which are taken by dipping, surface seizing, pattering, and scavenging, often in association with tuna and other sub-surface predators.

The population of NESH was estimated to be 84,000 birds including 14,600 breeding pairs in the 1990's (Cooper and Day 1994, Spear et al. 1995, Ainley et al. 1997). Newell's Shearwaters are now primarily restricted to Kauai which supports ~ 90% of the breeding population; very small numbers may also breed on Lehua Islet, Oahu, Molokai, Maui and Hawaii Island (Ainley et al. 1997, Reynolds and Ritchotte 1997, VanderWerf et al. 2007). The population on Kauai is thought to have declined by over 80% from 1993-2013, based on radar and fallout data, indicating that the current population is likely much lower (Harrison 2009, KESRP, unpublished data), although accurate numbers and trend indicators are difficult to obtain due to the inaccessibility of breeding colonies. Identified causes of the decline include predation by introduced predators, habitat loss and degradation, urbanization including collisions with utility lines and light attraction and subsequent disorientation/fallout, and natural catastrophes (Ainley et al. 1997, Raine et al 2014a&b, Travers et al 2014).

Newell's Shearwaters are at least loosely colonial and nest in burrows, crevices or under vegetation. They breed in two habitat types: 1) high elevation, steep, wet montane forest dominated by native vegetation (ōhiʻa (*Metrosideros polymorpha*) forest with an uluhe fern (*Dicranopteris linearis*) understory) and 2) steep dry cliffs (predominantly along the Na Pali coast). Newell's Shearwaters breed from April to November (Ainley et al. 1997) and are K-selected species and are characterized by a long lifespan (at least 20 years), low fecundity (one chick per year), and delayed recruitment (3-7 years; Ainley et al. 1997, Simons and Hodges 1998). Pairs are monogamous and show a high degree of nest site fidelity. A single egg is laid in a burrow or on the ground and parental care is equally distributed between the sexes. The incubation period is 62 days and the chick-rearing period is 92 days. Chicks are fed a regurgitated mixture of squid and fish: of samples regurgitated at burrow entrances during one study (N=9), squid were the only prey item (Ainley et al. 1997). Fledglings collected dead under power lines from 1993-94 (N=19) and 2001-2009 (N=79) had their stomach contents analyzed to determine their diet (Ainley et al. 2014). Their diets were 94-99% squid, dominated by ommastrephid (flying) squid (57%) and cranchiid squid (37%). Fish were found in 0.1-4% of their diet, with the primary species being *Exocoetus* flyingfish. Chicks are fed every 1-3 days (Ainley et al. 1997; Ainley et al. 2014) by their parents. Imprinting on the natal site appears to occur after the date of the chick's first emergence from the burrow, which, based on remote camera data from the Kauai Endangered Seabird Recovery Project (KESRP) is 14.9±1.8 days before fledging (n=9, min=7, max 25) (Kauai Endangered Seabird Recovery Project (KESRP; unpub data). Average fledging mass of chicks is 430g and fledging occurs at ~86 days of age based on data gathered from 2003-2005 and in 2014 at Kīlauea Point National Wildlife Refuge (KPNWR; USFWS unpubl. Data; PRC unpub data).

Threats to NESH and many and varied. Predation from non-native animals on the breeding colonies, including feral cats (*Felis catus*), feral pigs (*Sus scrufa*), rats (particularly Black Rat *Rattus rattus*), and Barn owls (*Tyto alba)* have all been documented (Raine et al 2014a&b). Additionally, the presence of small Indian mongooses (*Herpestes auropunctatus*) on Kauai was confirmed recently when two animals were captured in May and June 2012 near the airport and the harbor (Honolulu Star-Advertiser 2012). Numerous other sightings have been reported but have not been confirmed. If this predator were to become established on Kauai it would likely be catastrophic for NESH.

Light attraction (fallout) and collision with artificial structures is also a large source of mortality for NESH. On Kauai, more than 32,000 Newell's shearwaters have been collected by SOS as victims of fallout from 1979-2008, with the numbers decreasing over time in tandem with an overall population collapse (Day et al 2003). Fledglings are the main victim of light attraction related fall-out since it is thought that they use the moon and stars to guide them to the ocean on their maiden flight out to sea and thus become confused when other sources of light are present. Collision with artificial structures, predominantly powerlines, is also a major source of mortality for adults – particularly breeding adults moving to and from montane breeding colonies to the sea (Travers et al 2014). Habitat loss is often compounded with predation from non-native animals as reduction in dense native canopy cover can provide access for predators into breeding colonies (Raine et al 2014 a&b). Finally, NESH are likely susceptible to marine-based threats, but little is known about threats in the marine environment. Newell's Shearwaters depend on tuna to force prey within reach (Harrison 1990). Tuna schools in eastern tropical Pacific are the target of widespread and efficient commercial fisheries, and several tuna species now are considered to be in jeopardy (IUCN 1996). Determining possible food web impacts remains key, as will the impacts of a warming ocean on their prey distribution (Young et al. 2012).

As a result of the suite of threats that have been observed to impact the species over many decades, NESH were listed as threatened under the U.S. Endangered Species Act (ESA) in 1975 (USFWS 1982). Conservation actions were begun in the 1970's, most notably the Save our Shearwaters (SOS) program, in which the public was encouraged to bring fallout birds to rehabilitation facilities. Predator control, habitat restoration and other conservation measures have followed in recent years (Raine & McFarland 2013a; Raine & McFarland 2013b, Raine et al 2014 a&b).

At Kīlauea Point Point National Wildlife Refuge (KPNWR) on Kauai, a single record of NESH nesting at the site exists from 1945 (Pyle and Pyle 2009), but nothing beyond that date until NESH eggs were moved in the late 1970's. In response to declines in the montane colonies, in 1978 and 1980, 65 and 25 NESH eggs were translocated to Kīlauea Point and Moku'ae'ae Island (just offshore of KPNWR), respectively, and cross-fostered by Wedge-tailed Shearwater

(*Puffinus pacificus*; WTSH) pairs in an attempt to establish a NESH colony at a protected site. Seventy-nine percent of these eggs hatched and 94% of the chicks fledged (Byrd et al. 1984) and several pairs of NESH now breed at KPNWR today. These NESH pairs are assumed to be descendants of the original cross-fostered chicks as well as new recruits attracted to the acoustic attraction system (USFWS pers comm). The current breeding habitat at Kīlauea Point is open-canopy hala (*Pandanus tectorius)* forest with a Naupaka (*Scaevola taccada*) understory. Between one and three pairs were known to breed at the Refuge since the 1970's, but with the advent of a social attraction project at the site in 2006 the population has steadily grown with up to 17 known nest sites monitored – 11 of which were active in 2013 (Raine et al 2013 a & b; Raine & Banfield 2014), 11 in 2014 (Raine et al 2015a) and nine in 2015 (Raine et al 2015b). Three chicks hatched and banded on Refuge in 1997, 2006, and 2009 have returned as breeders or prospectors. All nests are located on the parcel of the refuge that contains the lighthouse and administration buildings and is open to the public.

In recent years, WTSH appear to have actively displaced several NESH pairs at KPNWR – with two being displaced in 2013 (Raine & Banfield 2014, Raine et al 2015b) and seven now holding incubating WTSH in 2015, and it is thought that the two species may compete for nesting space at lower elevations. These observations could partly explain the paucity of NESH in the coastal fossil record relative to WTSH (Olson and James 1982a and 1982b). Being the larger and earlier arriving species, WTSH often are the winner in these confrontations, and it is unknown whether they simply displace NESH adults from preferred burrows, or if they inflict harm on the adults themselves. Recent survey work at KPNWR has recorded aggressive encounters between WTSH and NESH, with WTSH charging NESH with wings outstretched and chasing them away from previously occupied burrows.

Additional conservation actions are needed to help counter the ongoing decline in Newell's Shearwater numbers. Managing threats on their remote colonies is critical, but is also logistically challenging and costly. Creating (and augmenting) colonies at sites that are easier to access and have been secured against predators is however an additional method for ensuring the on-going persistence of this specie and is a high priority conservation action.

Project background

Given the challenges in protecting nesting seabirds in Kaua`i's rugged interior, it has long been desirable to create populations in more accessible locations that offer a higher level of protection. Translocation has been part of the recovery planning since 1982 for NESH (USFWS 1982), and translocation within predator proof fences in particular is ranked as priority 1 in the interagency 5-year Action Plan for Newell's Shearwater and Newell's Shearwater (Holmes et al 2011). In 2012, funding became available to construct a predator-proof fence and conduct a translocation to create such a population at KPNWR. The refuge is home to one of the largest multi-species seabird colonies in the main Hawaiian Islands. The project was named the "Nihoku Ecosystem Restoration Project" after the area on the refuge where the fence and translocation are planned. The Nihoku Ecosystem Restoration Project is the result of a partnership between the U.S. Fish and Wildlife Service (USFWS), the Kaua`i Endangered Seabird Recovery Project (KESRP – a project of DOFAW), Pacific Rim Conservation (PRC), the American Bird Conservancy (ABC), and the National Fish and Wildlife Foundation (NFWF). There are four stages to this project: 1) planning, permitting, regulatory compliance, and baseline biological monitoring; 2) fence construction; 3) predator eradication and habitat restoration; and 4) translocation of birds into the fenced area. This translocation plan is the final step in a multi-year planning effort to prepare for the translocation of these species to Nihoku.

This plan has been developed specifically for translocating NESH from nesting sites on Kaua'i where predation is occurring, to the predator proof fence area at Nihoku within KPNWR; a separate (but highly similar) plan exists for HAPE whose translocations began in 2015 (Young and Raine 2015). This plan will outline the information necessary to conduct the translocation. Kīlauea Point National Wildlife Refuge was established in 1985 to "preserve and enhance seabird nesting colonies" and this translocation project will help the refuge meet that objective, as well as accomplishing a major recovery action listed in the recovery plan for NESH. The translocation of NESH to the refuge will be undertaken via a separate recovery permit.

Translocation site

Translocation site selection and preparation considerations

Conservation practitioners are obligated to ensure that a proposed translocation site is safe and under a land management regime that ideally provides protection in perpetuity with a management plan in place. Based on guidelines set out by the population and conservation status working group of the Agreement on the Conservation of Albatrosses and Petrels (ACAP; Jacobs et al. 2013), a translocation site should fulfill the following criteria:

- A suitable geographic site with respect to topography, access to the ocean, strength and direction of prevailing winds, ease of take-off and landing, nesting substrate, reasonable distance to adequate foraging grounds, and sufficient elevation to preclude periodic inundation from storm waves;
- Free of predators and invasive species harmful to Procellariiforms, or fenced (prior to translocations) to exclude such species, or a regular control program to remove those detrimental species;
- Surveyed prior to the translocation for the presence of any endemic species (flora or fauna) that could potentially be disturbed by the project, or that could influence the success of colony establishment;
- Adjacent to a cliff, elevated above the surroundings, or relatively free of man-made or natural obstructions that could inhibit fledging and arrivals and departures of adults;
- Relatively accessible to biologists, to facilitate delivery of supplies and monitoring;
- Designated for long-term conservation use;
- A site for which other conflicting uses (e.g., local fishing, aircraft operations, city lights, busy roads, and antennae, etc.) have been considered and conflict avoidance measures are feasible;
- Be free of, or have minimal, known human threats to the species (such as light attraction or power lines) within its immediate vicinity.

<u>Site preparation</u>

Ideally, the site selected for the translocation should already have substrate and vegetation structure preferred by the species to be translocated. If there are plants that create collision hazards or block the wind and cause over-heating by preventing convective cooling, they should be removed. For burrow-nesting species, artificial burrows will need to be installed to accommodate translocated chicks and to provide suitable nesting sites for prospecting adults.

It is also important to have a sound system (solar-powered) continuously playing species-specific calls from existing breeding colonies. While decoys are not commonly used for burrowing seabirds, they may help attract birds to the area (this is currently being trialed by First Wind for both NESH and NESH at two predator proof fenced enclosures at Makmakaole on Maui, although the utility of these decoys in attracting NESH are not yet known). The decoys and sound system serve two purposes: (1) They provide visual and auditory stimuli to the developing chicks, which may allow them to re-locate the site when they attain breeding age; and (2) The calls and visual cues may attract others of the species to the site. Juveniles that were not reared at the site and have not yet bred may choose to breed at the site, thereby helping to increase the population.

Nihoku site selection

The site selected for Hawaii's first translocation of listed seabirds is the Nihoku section of Kīlauea Point National Wildlife Refuge. This site fulfills all of the criteria described above. Kīlauea Point National Wildlife Refuge was set aside in perpetuity in 1985 by the federal government "to preserve and enhance seabird nesting colonies and was expanded in 1988 to include Crater Hill and Mōkōlea Point" (USFWS). Located at the northern tip of the island of Kaua`i, the 203 acre Kīlauea Point National Wildlife Refuge is home to thousands of nesting seabirds, including Laysan Albatrosses (*Phoebastria immutabilis)*, Red-footed Boobies (*Sula sula)*, Red-tailed Tropicbirds (*Phaethon rubricauda*) and White-tailed Tropicbirds (*P. lepturus*), Wedge-tailed Shearwaters and several pairs of Newell's Shearwater as well as numerous pairs of Nēnē or Hawaiian Goose (*Branta sandvicensis*). In addition, many migratory and resident seabird species frequent the area when not nesting. The area is managed for native birds by the U.S. Fish and Wildlife Service through predator control, habitat management (both weeding and outplanting), and fencing

The Nihoku project site consists of approximately 7.8 acres between Crater Hill and Mōkōlea Point, just south of Makapili Rock and approximately 1.5 kilometers northeast of Kīlauea town (Figure 1). Nihoku faces the ocean, on sloping land (approximately 23° slope) above steep sea cliffs. The elevation ranges from approximately 140 to 250 feet above mean sea level; well above all projected sea level rise scenarios as a result of climate change. The area has a natural 'bowl' shape and the orientation facing towards the ocean and prevailing northeast winds make it an ideal location for birds to be directed straight out to sea. The natural cliffs and ridgelines make it ideal for placing a fence to reduce the possibility of birds colliding with the fence, to facilitate take-off for flight and to reduce light pollution from private residences adjacent to the refuge. It was also a relatively simple location on which to build a fence and conduct a translocation due to easy access from a nearby road.

Figure 1: Map of the translocation site with pest proof fence alignment in red.

Figure 2: Photograph of the Nihoku site facing northeast

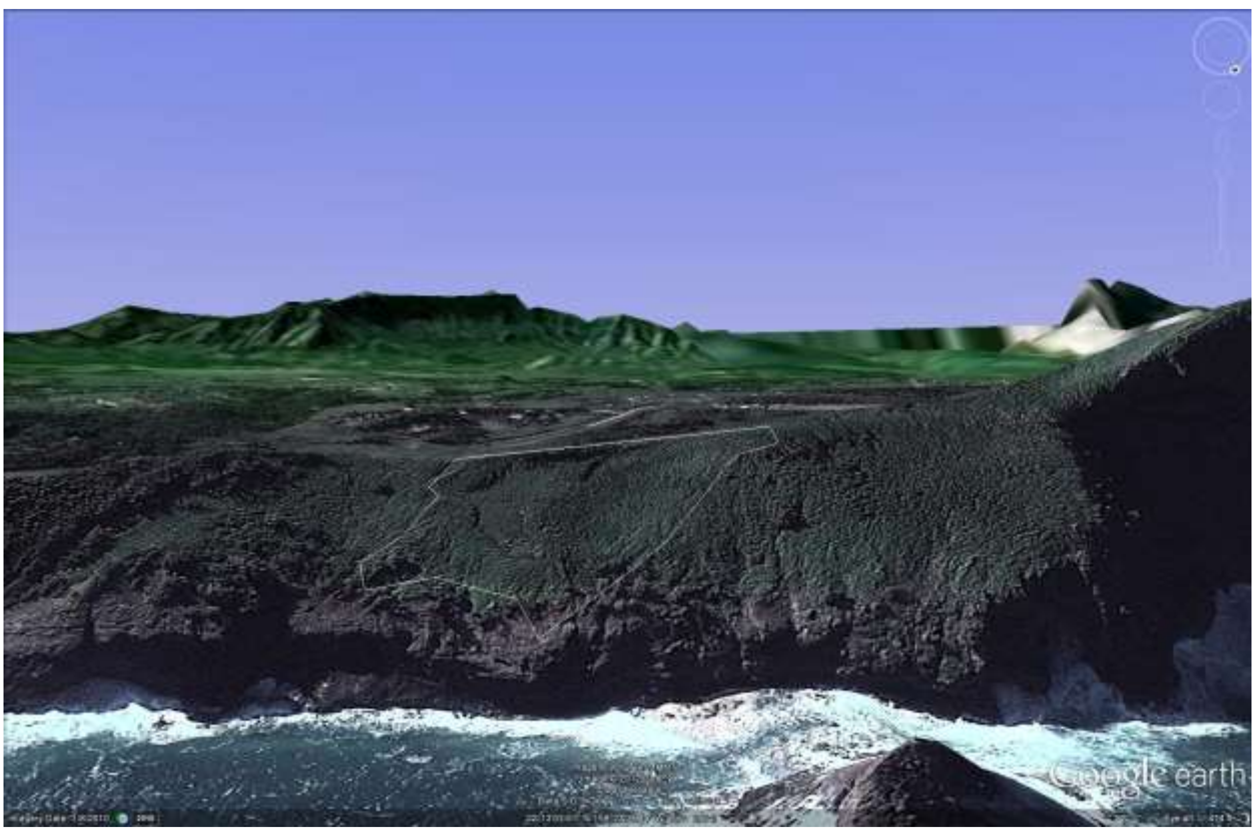

Figure 3: Elevation view of the site facing southwest

Biologically, the site contains few native plants, none of which are listed under the U.S. Endangered Species Act. Plant species composition in the unrestored project area is 95% alien species, with Christmas berry (*Schinus terebinthifolius)* being the dominant species at 70% cover. Native plant species present include naupaka, ‘ūlei (*Osteomeles anthyllidifolia)* and hala (*Pandanus tectorius)*. Most vegetation at the site is low in stature (<12’ in height) and, aside from a small grassy patch in the center, relatively uniform in composition, particularly in the canopy strata. While this site is currently being used by a small number of breeding Nēnē and Laysan Albatross (which will benefit from increased protection at the site) it is not being used by any burrowing seabirds as it likely is not suitable habitat for them in the unrestored sections. Wedge-tailed Shearwaters are absent from the immediate site (with the exception of one pair immediately below the fence line) and the closest colony is >250m away. The fence alignment is approximately 728m long and encloses 7.8 acres, which is similar to or larger than most existing translocation sites for related seabird species in New Zealand. The fence design is such that it is high enough that animals cannot jump over it, has a curved hood to prevent climbing, small aperture mesh to prevent squeezing through and a skirt laid just under the ground to prevent digging (see Figure 4). There is a single pedestrian gate and a vehicle gate to facilitate access for monitoring and habitat management.

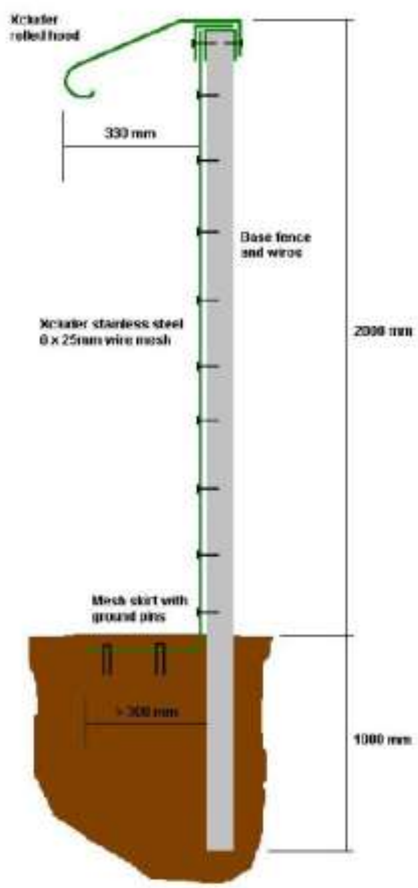

Figure 4: Schematic diagram of the Nihoku pest-proof fence

Nihoku site preparation

Site preparation at Nihoku consisted of three phases: fence construction, predator removal, and habitat restoration. The predator removal and habitat restoration components each have their own implementation plans, but are summarized below for context.

Fence construction was undertaken by a contractor specializing in fence construction and took three months. Immediately after fence construction, all remaining invasive mammalian predators were removed. Based on monitoring results and regulatory restrictions, a combination of diphacinone in bait boxes spaced 25m apart was used to eradicate rats and mice, and live traps were used to remove cats. Eradication of cats and rats took approximately two weeks, and mice took approximately three months (Young unpub data).

In August of 2015, approximately 0.45ha (15%) of the project area was cleared of invasive alien plants and suitable native species were outplanted. The restoration area was chosen so that it could comfortably fit over 100 artificial burrows at a density typical of *Pterodroma* colonies and still provide adequate open space for optimal take-off and landing zones. In subsequent years, more habitat will be restored with the ultimate goal being more than 50% of the area being dominated by native plant communities. Artificial burrows will only be installed in restored areas.

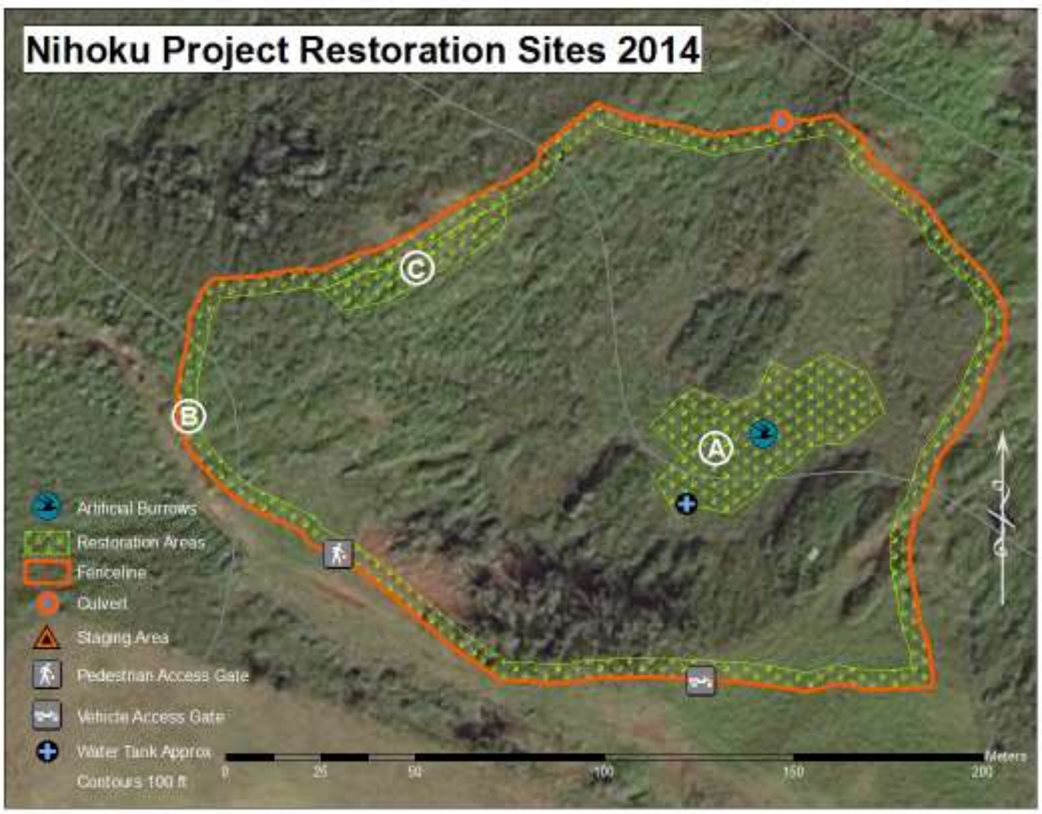

Figure 5: Project area with habitat restoration and artificial burrow locations shown.

Christmas berry (the dominant invasive) was mechanically removed or manually cut and followed with application of Garlon on the stump, leaving the root system in place to maintain soil integrity while the plants died. This method has been used in multiple restoration projects in Hawai‘i with proven success (Oahu Army Natural Resources Program pers. comm.). Slash was chipped on-site and spread around the fence perimeter to facilitate weed suppression on the fence skirt. The native plant species that were out-planted after invasive weed removal (see table 1 below) were selected based on historical and current distribution of suitable native coastal plants, as well as species that will provide seabird and Nēnē habitat. Over 10,000 plants were outplanted in the first year of restoration. The native plants are low-in-stature, thus making burrow excavation easier for the birds, while simultaneously being low-maintenance and providing forage for Nēnē.

Species name	**#**
Artemisia australis	46
Boerhavia repens	45
Canavalia kauaiensis	58
Capparis sandwichiana	16
Carex wahuensis	16
Chenopodium oahuense	74
Colubrina asiatica	5
Cyperus javanicus	1145
Dodonaea sp.	124
Dodonaea viscosa	100
Euphorbia celastroides	32
Euphorbia celastroides var. stokesii	19
Fimbristylis cymosa	801
Gossypium tomentosum	2
Heteropogon contortus	358
Jacquemontia ovalifolia	4
Kadua littoralis	55
Lycium sandwicense	25
Myoporum sandwicense	211
Nototrichium sandwicense	40

Osteomeles anthyllidifolia	622
Pandanus tectorius	8
Peperomia blanda	56
Plumbago zeylanica	288
Psydrax odorata	50
Scaevola taccada	350
Sida fallax	177
Sporobolus virginicus	4566
Vigna marina	173
Vitex rotundifolia	624
Total # planted	**10090**

Table 1: List of native plants that were outplanted at the Nihoku seabird translocation site.

The current distribution of NESH is thought to be an artifact of range constriction as a result of predation and habitat destruction rather than a true preference- i.e. only the most inaccessible colonies are left. The breeding habitat of extant Newell's shearwater populations currently being monitored on Kauai at Upper Limahuli Preserve and Hono o Na Pali NAR are characterized by burrows located on steep slopes within areas dominated by native vegetation such as Ōhi'a and Uluhe fern (KESRP unpublished data). Other known breeding areas are the steep cliff walls of the Na Pali coast (KESRP unpublished data). Ainley et al 1997 characterized their habitat as being burrows and deep rock crevices at higher elevations (525-4000') on steep (65˚) slopes with densely matted uluhe fern. Several fossil records of this species exist at low elevation (including the 1945 record from KPNWR) indicating they once nested closer to the coastline (Pyle and Pyle 2009), but the majority of fossil evidence is at higher elevations than the project site. At KPNWR, the nesting pairs of NESH on the refuge breed in a combination of artificial nest boxes placed under vegetation (typically naupaka) and in naturally excavated tunnels or depressions under Hala debris (Raine & McFarland 2013, Raine et al 2015b).

In numerous seabird translocation projects undertaken on related Procellariform species in New Zealand over the last twenty years, the issue of actual vs. artifact habitat preference has been addressed by re-creating the physical condition of the burrows (length, depth, temperature, substrate and humidity) and canopy cover (open, shrubby, full canopy etc.) as much as possible at the sites where birds have been translocated, but not worrying extensively about the precise plant species composition. At many of the sites that were visited as a training exercise for this project, non-native understory grass species were left in place for easy maintenance, and the focus was on the larger shrub/canopy layer when undertaking restoration (if restoration was done at all). Therefore, we feel that the approach outlined in this plan of a partial restoration will adequately prepare the site for seabird translocations, and have the added benefit of improving the habitat for existing native bird species while reducing maintenance needs, such as mowing and weeding.

Fifty artificial burrows were installed in the center of the reserve forming the core of the restoration area; artificial burrow design is described in more detail below.

Interactions and impacts with other species

Based on the species currently present in the project area, with the exception of Barn Owls and possibly Wedge-tailed Shearwaters (WTSH), no negative interactions are anticipated between NESH and any other animal or plant in the fenced area site. The successful establishment of these seabirds on the site would likely increase soil fertility, with benefits for a wide range of species. However, the presence of Barn Owls at the site is a concern since they cannot be excluded from the area and are known seabird predators. During the translocation period and throughout the life of this project, Barn Owl control would need to be implemented to prevent any of the fledglings from being taken by Owls. Control during the recruitment period will be done on an as-needed basis.

While there are no WTSH nesting currently in the project area, they do nest nearby (closest colony is <250m and one pair is immediately outside the fenced area) and it is possible that the area may become attractive for this species and that they may move into the project area. Wedge-tailed Shearwaters have been known to displace NESH from breeding burrows (USFWS unpub data; Raine & Banfield 2014, Raine et al 2015b) and potentially inflict harm on NESH adults. We have attempted to make the artificial burrows less attractive to WTSH by creating long entrance tunnels with a U-bend in them. WTSH at KPNWR tend to nest close to the surface, whilst NESH in montane colonies can be in burrows many meters deep. By altering the burrows in this way, we might also reduce the chance that WTSH will colonize artificial burrows. In the event that a WTSH occupies a NESH burrow, it is hoped that by having a sufficient number of burrows available, that there will be alternative nesting options nearby. In the event that all artificial burrows are occupied, additional burrows will be installed on an as-needed basis if birds will not use the naturally occurring features at the site. Removal or relocation of WTSH may need to be considered if WTSH pose a problem which has been done in similar seabird translocation situations in New Zealand where other species directly competed with those of conservation concern (Gummer et al 2014).

Source site selection

Surveys to locate potential donor colonies

From 2012-2015, KESRP undertook a series of surveys at known NESH breeding sites to locate potential donor colonies for this project. These surveys were initially undertaken at colonies which were considered to have the highest threat of extirpation – due to fallout, powerline collision, predation, and habitat loss as well as the colony at KPNWR due to its proximity to the Nihoku site. For a full description of methods and results see Raine & McFarland 2013 a & b and Raine et al 2014.

Surveys at these sites were conducted using a standardized auditory survey protocol developed by KESRP, with 2 hour evening surveys beginning at sunset and 1.5 hour morning surveys beginning 2 hours before sunrise. Surveys were conducted during the peak breeding season when birds are most vocal – June to beginning of September. Surveys were accompanied by burrow searches in areas where the highest levels of NESH ground calling activity were identified.

In 2012, a total of 167 surveys were conducted at five colonies – KPNWR, Makaleha, Kahili/Kalaheo, North Fork Wailua and Koluahonu. The highest call rate was found at the North Fork Wailua Colony (an average of 217 calls/ hour), and the lowest at the Koluahonu Colony (56 calls/ hour). Three new burrows were located in the Kahili region, one at the Kalaheo colony and 11 burrows were found to be active in KPNWR. Additionally, locations of high calling rates or potential ground calling were identified at all sites.

In 2013, the focus shifted somewhat. As well as undertaking surveys at five low elevation sites with high risk of colony extirpation, three higher-elevation sites were also included. These areas had known colonies of both NESH and HAPE, and had higher levels of activity when compared with the low elevation sites and had active colony management. These sites were included in the surveys due to the low success of locating nest sites in the low elevation sites (due to the fact that there were very few birds left at these sites). As with 2012, KPNWR was also included in the surveys. A total of 165 surveys were therefore conducted at nine colonies in 2013 - KPNWR, Makaleha, Kahili/Kalaheo, North Fork Wailua, Koluahonu, Sleeping Giant, Upper Limahuli Preserve and Hono o Na Pali North Bog. The highest call rate was found at one of the higher elevation sites, Upper Limahuli Preserve (an average of 363 calls/ hour), and the lowest at the Koluahonu Colony (79 calls/ hour) and KPNWR (77 calls/hour).

In 2014, due to the very low number of burrows located in colonies with a high risk of extirpation, surveys focused on higher elevation sites with large concentrations of birds as well as KPNWR. A small number of surveys were also undertaken at North Fork Wailua, Kahili and Kapalaoa. At the end of this period, all sites surveyed over the last three years were considered for feasibility for a translocation project. These were ranked on the following criteria: (i) presence of breeding colony, (ii) known burrows present, (iii) threat level, (iv) on-site predator control and (v) accessibility. For full details regarding the ranking procedure and criteria, see Raine et al (2015)a. For Hawaiian Petrel, the four sites that scored the highest ranking were (in descending order): Pihea (HNP), Upper Limahuli Preserve, North Bog (HNP) and Hanakapia'i. For Newell's Shearwater, the four sites that scored the highest ranking were (in descending order): Kilauea Point NWR, Upper Limahuli Preserve, Pohakea (HNP) and Kahili.

In 2015, the first translocation of ten Hawaiian Petrels occurred. Over the course of the season, in preparation for the translocation, surveys were again undertaken in Upper Limahuli Preserve, Pihea, Pohakea, North Bog and Hanakapaia – as well as KPNWR. A large number of new burrows of both species were located over this period, as well as the identification of new ground calling hotspots which will be targeted for ground searching in 2016.

Potential effects of removal

The proposed removal of up to a maximum 90 NESH chicks from up to four colonies (with a minimum of 158 active nests) over a five year period (10-20 per year depending on the year) will likely have minimal impacts on the local, or species level population of NESH. The largest colony (Upper Limahuli Preserve) has a minimum of 82 NESH burrows and in 2015 produced a minimum of 60 chicks. If one considers the number of known NESH burrows in Upper Limahuli Preserve and assumes all are active in the first year of translocation then the proposed total take of 10 nestlings based on 2015 numbers is a small proportion (12.2%) of total production at that site. However, Upper Limahuli Preserve is a very important colony and under its current management regime (through the Kauai Island Utility Cooperative {KIUC} Habitat Conservation Plan) has a very high fledging success rate. Therefore, chicks would not only come from this site - under the proposed removal regime for the translocation project only 3-4 nestlings would be removed from each site – in which case 4 nestlings would represent 4.9% of total known burrows at this site. It should also be noted that new burrows are found each year (ie in 2015 a further 18 NESH burrows were located at Upper Limahuli Preserve alone) and therefore there are almost certainly many more birds breeding within the Upper Limahuli Preserve area. Furthermore, smaller numbers of NESH burrows are monitored at several other colonies and a new management site will be initiated in 2016 (through funding from NFWF, KESRP and ABC) where this species is known to breed. Thus the estimate proportion of chicks removed is likely much lower.

Site	# burrows	Active	Confirmed	Reachable	Fledged	Fledged/Confirmed	Fledged/Active	Fledged/Total	Notes
ULP	82	77	70	26	60	85.7	77.9	73.2	*ungulate fence, extensive predator control, HCP site*
POHK	22	16	12	4	8	66.7	50.0	36.4	*extensive predator control, HCP site*
KNPWR	19	12	8	5	5	62.5	41.7	26.3	*predator control, NB 7 previously occupied by NESH now c*
KALAHEO/KAHILI	7	1	1	1	1	100	100	14.3	*No predator control, "dying" colony*
HNKP	2	1	1	0	1	100	100	100	*very low levels of searching to date, if pred control in plac*
HANAKOA	0	0	0	0	0	*na*	*na*	*na*	*very low levels of searching to date, if pred control in plac*
NBOG	0	0	0	0	0	*na*	*na*	*na*	*extensive predator control, HCP site*
PIHE	0	0	0	0	0	*na*	*na*	*na*	*extensive predator control, HCP site*
WAILUA	0	0	0	0	0	*na*	*na*	*na*	*No predator control, "dying" colony*
SLEEPING GIANT	0	0	0	0	0	*na*	*na*	*na*	*No predator control, "dying" colony*
KOLUAHONU	0	0	0	0	0	*na*	*na*	*na*	*No predator control, "dying" colony*
TOTAL	**132**	**107**	**92**	**36**	**75**				

Table 2: All potential NESH source colonies and 2015 reproductive success rates. *Reproductive success rates are presented as (i) total fledged/total confirmed breeding, (ii) total fledged/total burrows confirmed active and (iii) total fledged/total burrows monitored*.

Considering the small number of chicks taken out of any colony in a given year, coupled with the fact that we would use different burrows in different years (i.e. chicks would not be removed from the same burrow in consecutive years), it is unlikely that this will have a measurable impact on the local, or species level population of NESH since the vast majority of the translocation chicks are expected to fledge. In other species, much higher proportions of nestlings are removed from the colonies for conservation purposes. In the critically endangered Cahow (*Pterodroma cahow*) and in the Taiko (*Pterodroma magentae*) 100% of the chicks produced for the species are removed each year to start a new colony (since both species are restricted to a single colony; Carlisle et al. 2012).

It is important to consider predation levels at current colonies. In areas where no predator control is occurring, predation levels of breeding seabirds and their chicks can be extremely high. For example, several historical NESH colonies on Kauai (such as Makaleha and Koluahonu) have been depleted to the point of extirpation in the last decade. Makaleha in particular is an interesting case as this site has only been monitored using helicopter-deployed song meters and auditory surveys from a ridge on the other side of the valley, so there has been no human ingress to this site at all and no management. In the span of ten years this site has gone from having call rates as high as Upper Limahuli to having call rates that are sporadic at best (Raine *pers comm*). Ainley et al (1995) reported 23 NESH killed by cats in the Kahaleo colony in 1993 alone and Jones (2000) found that New Zealand shearwater colonies would disappear within the next 20-40 years on the mainland of New Zealand without significant management actions to eliminate predation by introduced mammals. Chicks that would be removed and hand-reared at a translocation site would likely have higher survival than chicks from sites without predator control. Furthermore, monitoring of predation levels of nesting endangered seabirds in areas on Kaua`i where predator control is currently on-going has revealed that predation of chicks - in particular by feral cats, pigs and Black Rats - is still an issue (Raine and McFarland 2014a; Raine and McFarland 2014b, Raine et al 2014a&b). For example, at North Bog in Hono o Na Pali NARS, 25% of all monitored NESH chicks were killed by rats in 2013 and 9.2% in 2014. Cats continue to predate upon both species at all sites every year, with cat predation events recorded in all three Hono o Na Pali sites in 2014 and 2015. Cat predation has been particular bad on Newell's Shearwater at Pohakea, for example. Therefore survival to fledgling of birds in these colonies is already reduced. With the above being the case, the removal of three or four chicks in a given year from several different colonies, regardless of whether predator control is occurring, is unlikely to cause any issues with the overall recruitment of source colonies since a portion of the translocation chicks would not have survived to fledge in the source colonies regardless.

Another concern is the potential desertion of breeding pairs from burrows where chicks have been removed for translocation purposes. This has not been a serious issue in previous projects. In a number of other translocation studies (Miskelley et al. 2009), it was found that adults return the following year despite the removal of their chick prior to fledging. There is also some suggestion in related species that breeding pairs whose chicks die (or in the case of translocation are removed) may have a higher survival rate as they are able to spend more time foraging for self-maintenance compared to pairs with an active chick (VanderWerf & Young 2011). In NESH burrows currently monitored on Kaua`i, breeding pairs return in subsequent years after their chicks have been predated and successfully fledge young in the following year (KESRP unpub data).

The proposed translocation to Nihoku is also likely to be neutral from a genetic perspective since very few seabirds (or land birds) have distinct genetic structure of populations on the same island. It is likely that many NESH populations on Kaua`i were at one point continuous and are only now discrete as a result of habitat fragmentation and population declines (Olson and James 1982a and 1982b). Potential impacts of human visitation at source colonies that could be considered are damage to nesting habitat by repeat visits, disturbance resulting in temporary or permanent burrow desertion by adults (although this has never been recorded in areas currently monitored on Kaua`i at a frequency of up to eight visits per year), and the creation of trails to burrows that could be used by introduced predators. These potential impacts will be minimized by:

- Following existing trails whenever possible, and avoid creating new trails
- Concentrate only on areas where predator control is on-going, so that animals that may be attracted to the area will have reduced impacts
- Repairing all burrows damaged accidentally by trampling
- Minimizing the number of visits to each burrow and using burrow cameras to help assess viability of any given burrow for use as a source bird for translocation; and
- Using a team of two trained people on nestling collection trips to minimize disturbance levels.

Collection and removal of donor chicks

Age at translocation

Age of the chick at translocation is an important variable that needs to be optimized to allow chicks the longest time possible with their natural parents for species imprinting, transfer of gut flora, and expert parental care without losing the opportunity for the chicks to imprint on the translocation site and increase the probability that they will eventually recruit to the new site. In addition to thermoregulatory and nutritional benefits, it is possible that rearing by parent birds for the first month minimizes the chance that the chicks will imprint on humans, and allows transfer of parents' stomach oil (and possibly unknown species-specific micronutrients or antibodies) to the very young chicks.

Burrow-nesting seabird chicks are thought to gain cues from their surroundings during the emergence period shortly before fledging, and then use that information to imprint on their natal colony (‘locality imprinting). Chicks that have never ventured outside natal burrows can be successfully translocated to a new colony location. Success is optimized if chicks spend the greater proportion of the rearing period with parents before being moved.

For NESH, age of first emergence is 14.9±1.8 days before fledging (n=9, min=7, max 25) (KESRP unpub data). Based on morphometric measurements collected (USFWS unpub data, PRC unpub data), this would appear to be when at a minimum mass of 400g and wing cord of 189mm, or a ratio of 2.1 mass/wing cord. This will likely be in mid-late September based on on-going data collection at active burrows using Reconyx cameras. Trips will be made to source colonies in mid to late September, and chicks that appear to be in good health with the minimum mass and wind cord lengths described above will be selected.

Number of chicks in each translocation cohort, and number of cohorts

Factors important in choosing a cohort size for a chick translocation are genetics, rate of growth of the new colony, size of the source colony and the practical limitations of logistical capability and labor to care for the translocated chicks. Since these translocations involve only chicks of long-lived birds, it is unlikely that taking the proposed number of the chicks from the parent colony will affect the viability of that source population as it might have if one moved adult animals.

In New Zealand, for established translocation programs for burrowing species, a maximum of 100 chicks a year is considered appropriate to transfer for project totals of up to 500 birds over a five year period. The recommended number of chicks to transfer to a new site in the first year of a project is generally 50 chicks if the team is new to seabird translocations, and/or there are anticipated logistical issues to resolve at the release site (Gummer 2013). If the species has never been translocated before, a trial transfer of a small number of chicks (e.g., ≤10) may be appropriate to test artificial burrow design and hand-rearing methods. The conservative approach of 10 chicks in year one is what will be taken with NESH.

Translocation projects ideally should span several years to increase the genetic heterogeneity of the translocated population, to accelerate the development of a natural population age structure at the new site, to increase the size of the translocation group within the staff capabilities for chick rearing, and to “spread the risk” associated with environmental stochasticity. Transferring a minimum of 200 chicks of burrow-nesting species over a 3−4 year period has now been tested on several projects in New Zealand. With increased confidence in techniques, it is now considered advantageous to move more than this to increase the pool of birds returning to the establishing colony site and the encounter rate of conspecifics, which is thought to be important in encouraging adults to settle there (Gummer 2013). Supplementary translocations in later years may also need to be considered to achieve this goal. It should be noted that even with the expertise to manage large numbers of birds on the translocation site, it is unlikely that enough suitable donor burrows will be located for such large cohorts. Thus a doing more transfers of smaller cohorts will be used to achieve the same objective.

For the first year of NESH translocations, 10 chicks will be removed and transferred to Nihoku following recommendations developed in New Zealand for new translocation projects. If fledging exceeds 70%, then between 10-15 birds will be moved in year two. If fledging of year two birds meets or exceeds 80% then between 10-20 birds will be moved in each of years 3-5 for a total of 50-90 birds. Considering the rarity of this species, available nesting burrows in multiple colonies will be one of the main limiting factors in any given year. If fledging is below 50% in any given year, the project will be re-evaluated before proceeding. If fledging criteria are not met at any stage, numbers will not be increased until those numbers are met (see figure 6 below). The number of birds may also depend on whether additional suitable donor burrows can be located. The goal of this project is to transfer a minimum of 50 and up to 90 chicks over a five year period.

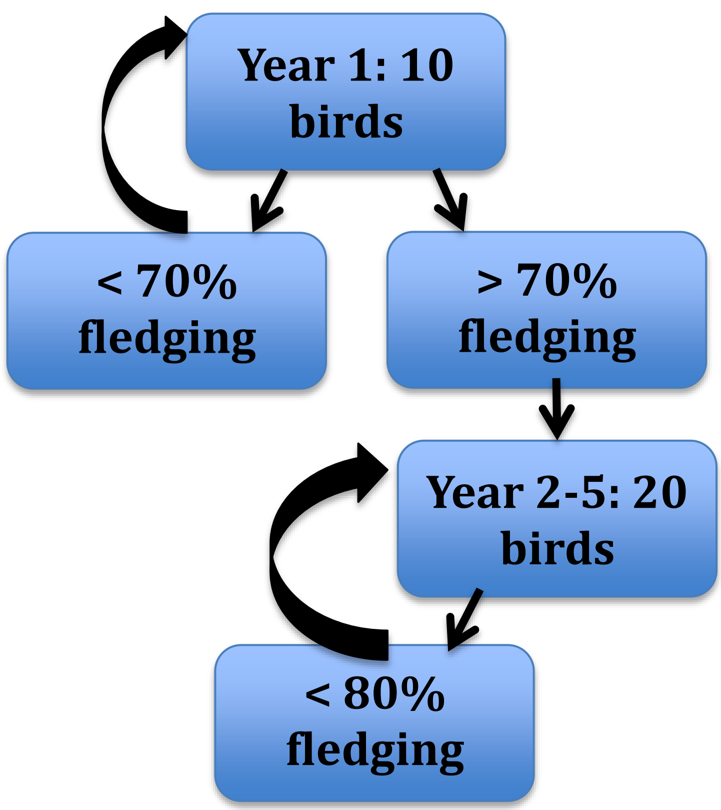

Figure 6: Proposed number of Newell's Shearwater chicks to be translocated in each year with the minimum fledging criteria required to increase the number of birds removed in subsequent years.

Pre-capture monitoring

All potential source colonies are being monitored on a regular basis by the KESRP. Ten monitoring trips are carried out to these sites each year, and are undertaken once a month. Trips are made, based on the following schedule: (i) pre-arrival, to deploy cameras and song meters (late February), (ii) arrival of breeding NESH (March), (iii) arrival of breeding NESH (April), (iv) incubation period (1 or 2 trips in June-July), (v) early chick-rearing period (1 or 2 trips in August-September), (vi) fledging or late chick-rearing period for Newell's Shearwater in October and (vii) fledging or late chick-rearing period for Newell's Shearwater in November. This schedule is flexible depending on logistical considerations and project priorities.

During each visit, identified burrows are inspected to assess breeding status as per the standardized protocols outlined below. At all times, care is taken to minimize damage to surrounding vegetation and burrow structure through careful approach to and from the burrow site, with staff paying particular attention to vegetation and potential areas where the ground could collapse.

At each check, notes are made on any signs of activity within or around the nest. This includes (i) the presence of adult, egg or chick, (ii) scent, signs of digging or trampling, and/or (iii) presence of feathers, guano or egg shell. A note is also be made as to whether or not it was possible to see to the back of the burrow (e.g. was the burrow fully inspected, or was there a possibility that something was missed). Any signs of predation (such as a dead adult or chick in front of burrow or inside burrow), or the presence of scat/droppings/prints that indicate a predator has been in the vicinity of the nest, are also recorded.

A sub-set of burrows (30) are also monitored by cameras (Reconyx Hyperfire PC900). These cameras are mounted on poles located 3-10ft away from the burrow entrance and set on a rapid fire setting (motion sensor activated, with a trigger speed of 1.5sec). 8GB SD cards are used to record photographs, and these (along with the rechargeable batteries) are switched out on each visit to ensure continuous coverage over the season. If a burrow fails during the season or the chick successfully fledges, then the camera is moved to a new active burrow until the breeding season is over.

At the end of the season, a final status is assigned to each nest using the following categories:

- *Active, breeding confirmed* – breeding was confirmed as having been initiated during the season through the presence of an egg or chick. For this category, the outcome is noted as either:
  - *Success* – Nest successfully fledged a chick. As the site is remote and not visited regularly enough to actually see the chick fledge, a successful fledging is considered in the following scenario – A chick was confirmed in burrow up until typical fledging month (November/early December) and on the following check (i) the presence of small amounts of down outside the nest site indicate that the chick was active outside the burrow and subsequently fledged and/or (ii) there are no signs of predation or predator presence. Burrows with cameras provide information on exact fledging date and time. Translocated chicks would be considered as being in this category for the purposes of colony monitoring.
  - *Failure* – Nest did not fledge a chick. The failure stage (egg or chick) and cause of failure (predation of chick or egg, abandonment, predation of breeding adult, etc.) is recorded where known. Burrows with cameras can provide information on predation events and predator visitations pertinent to nest failure.
  - *Outcome Unknown*- Breeding was confirmed at the site, however no subsequent visits were made, no visits were made late enough in the season to confirm

fledging, or signs were inconclusive. Only a very small number of burrows fit into this category as every effort is made to assess the final status of all burrows.

- *Active, unknown* – the presence of an adult bird, or signs of an adult bird (guano, feathers, trampling, etc.) indicate that a bird was present during the breeding season but it was not possible to confirm whether breeding occurred and failed or breeding was never initiated. Either way no chick fledged. Situations like this arise in instances where (i) it was not possible to examine the back of the nesting chamber due to the structure of the burrow, (ii) an adult bird was confirmed in the burrow during the incubation period, but it was not possible to determine if it was incubating an egg, or (iii) the burrow is discovered late in the breeding season and, as it was not therefore monitored during the egg-laying period, it is not clear if breeding had been initiated (even if eggshell fragments are recorded, as they could have been from previous seasons).
- *Active, not productive* - the presence of an adult bird, or signs of an adult bird (guano, feathers, trampling, etc.) indicate that a bird was present during the breeding season but burrow inspections reveal that no breeding took place (i.e. no egg was ever laid).
- *Prospecting* – bird(s) recorded visiting nest, but signs are indicative that these are prospecting and not breeding birds. Examples would be new excavations within a previously inactive burrow, a single visit during the breeding season to a previously inactive burrow, a visit to a burrow where both adults had been confirmed killed the year before, or the preliminary excavation of a burrow-like structure combined with the confirmed presence of a seabird.
- *Inactive* – no sign that the burrow has been visited in that breeding season.

Additional visits are made to the sites each year to actively search for new burrows. These trips are funded through a NFWF grant administered by ABC. Burrows that are found during these trips are added to the overall monitored group of burrows at the site, as detailed above.

Selection of individual chicks to be moved

Chicks selected for translocation will be chicks that appear healthy and in good condition and are in burrows where they can be safely (and easily) removed. Chicks fledging in optimum condition have an improved chance of surviving and returning as adults. Ideally, chicks will meet species-specific criteria on the day of transfer (Gummer 2013), and thus, a combination of wing cord and mass measurements will be used to select chicks if enough burrows exist to allow for selection criteria to be implemented (see below for target measurements). Setting a transfer wing-length range ensures that only chicks of appropriate age are taken. Setting minimum transfer weights for different wing-length groupings ensures chicks can recover weight lost during transfer and while adapting to the hand-rearing diet, and still fledge in optimum condition. In addition, it is vital that chicks have not emerged at the source colony yet for even a single night to avoid imprinting on their natal site. Since all potential donor burrows will be monitored with cameras, it will be known if the chick has emerged.

Due to the limited number of burrows available from which to select chicks, every effort will be made to select chicks that meet the age (size) criteria set above. In the event that there are not enough burrows to choose from, we will select burrows where the chicks a) are reachable by hand from the burrow entrance and b) have not yet emerged from their burrow based on nest camera information/data.

Over multiple transfer years, efforts to maximize representation of different parents from different parts of the source colony. This prevents the same adult pair from being targeted for chick removal in subsequent years, potentially disrupting their pair bond by forcing them to 'fail' multiple times in their breeding attempts. Therefore, burrows that were used for a translocation in the previous breeding season will not be used in a second consecutive season but may be used every other season if necessary.

Chick capture and transport
Minimizing the risks of overheating and injury in the carrying containers, and stress from unfamiliar stimuli, are major considerations for the chick capture and transport phase. The transfer box design used for most burrow-nesting petrel transfers in New Zealand is based on a standard pet (cat) box (Gummer 2013) and will be used for NESH. There must be enough space and ventilation to avoid overheating issues, and to minimize wing and tail feather damage of the more advanced chicks. Boxes will also be heat-reflective, dark inside to reduce chick stress levels, and have padded flooring (yoga mats) that provides grip and absorption of waste or regurgitant. Since only a small number of chicks will be taken, one box per chick will be used. Chicks will be removed by hand from the burrow, and placed into transfer boxes. Boxes will then be loaded into the cabin of the helicopter and secured to a seat for flight using rope. Once they have arrived at the Princeville airport (~15 minute flight from the natal colonies), they will be transferred into a vehicle and likewise secured into a passenger seat for transfer to the translocation site (~30 minute drive). It is expected that birds will be in their transfer boxes for 4 hours maximum and every effort will be made to ensure that transfer time is as short as possible. This transfer process was successfully used in 2015 to translocate HAPE from colonies within Hono o Na Pali NAR – the same general area that some of the NESH will be removed from. Upon arrival at Nihoku, each chick will be banded to help with individual identification.

Post-collection donor colony monitoring
Each year, all of the colonies being used as source colonies will be monitored to assess potential effects of the translocation of chicks on the future breeding efforts of donor burrows. If birds are transferred from areas already under management and monitoring regimes then all burrows will already be monitored ten times spanning the breeding season to assess whether the burrow is active, breeding has been initiated, whether a chick has hatched and whether a chick has fledged (see pre-collection monitoring for details). As all burrows are given a unique identification tag, the progress of each burrow in any given season is known. It will therefore be possible to assess whether burrows used as donor burrows in the previous season show any change in productivity in the following year. If a negative effect is noted, then the translocation protocols will be re-assessed.

Chick care at the new colony site

Artificial burrow design and burrow blockage procedures

Standard artificial burrow designs used in New Zealand for similar Procellariformes species are 5-sided wooden boxes (four sides plus a lid) with open bottoms and corrugated plastic PVC tubes for burrow entrances. A similar design will be used for NESH, but with a lighter weight plastic that has been used for the tropical nesting Bermuda Cahow and Audubon's Shearwater in the Carribean (see figure 7).

Figure 7: Example of the artificial burrow design that will be used

The nest boxes that will be used are manufactured in 0.3 cm thick High Density Polyethylene (HDPE) and fabricated in a size for accommodating all burrow/cavity nesting seabirds in the weight range 250 – 600g (see attached specifications). HDPE is chemically inert and very durable and the thickness is strong enough to resist warping or physical damage from trampling, tree-fall and rock-fall in most circumstances, especially when buried in soil substrate. The burrows (pictured above) are square boxes measuring 50 x 50 cm and are 38 cm high. They have hinged lids for easy access and a modular tunnel component that can be cut to any length and with 225˚ angled sleeves to allow the tunnel to make turns (to keep out light). The opening of the tunnel is 15cm in diameter. Burrows were placed in 2015 and were dug into the ground so that just the lid was exposed. The lids were painted white and had holes drilled in the side to allow for airflow. Finally, sandbags were be placed on burrow lids to reduce thermal fluctuations. Temperatures were monitored for several weeks, and by painting, drilling and covering the lids, we reduced the average temperature by 2°C, and most importantly reduced the upper end of the range from 30°C to 25°C. Temperature monitoring continued during the initial HAPE translocation and all chicks appeared to thermoregulate normally within this temperature range. The burrow floor, which is open to the ground, was covered with a layer of pea gravel topped with wood shavings prevent flooding and mud accumulation.

In order to ensure that newly translocated chicks do not wander out of the burrow prematurely, entrances will be blocked on both ends of the entrance tube. The interior entrance to the burrow chamber from the tube will be blocked with a square panel of metal mesh screening to allow airflow, and the exterior entrance will likewise be blocked with a similar mesh screen to allow for airflow. Because of the curve in the burrow tunnel, light penetration into the burrow chamber is minimal. A double sided blocking procedure is done to ensure that chicks do not get trapped in the tunnel if they attempt to leave the burrow are unable to turn around if just the exterior burrow entrance block is placed. The exterior entrance block is to prevent newly emerged chicks from adjacent burrows wandering into the burrow opening and similarly are unable to turn around when they reach the chamber mesh screening.

Burrow blocks will be removed on an individual basis depending on chick developmental stage and proximity to fledging. Blocks will not be removed until NESH chicks have reached the minimum wing cord length required to fledge.

- Wing length: ≥220 mm
- Weight: ≥350 g
- Down cover: Not exceeding 60% (looking down on chick from above)
- Wing growth rate: Slowed from up to 9 mm/day, down to <5 mm/day

Down cover should not be relied on as a sole guide to gate removal as it can be prematurely lost on the transfer day, or through handling, especially in wet weather. Down coverage is recorded by visually estimating the percentage of down left when looking down on the chick from above. Down-cover percentage is used as a cue to preventing premature blockade removal; chicks with ≥60% estimated cover are not allowed to emerge, especially if they are lighter in weight, as they are considered to be too far from fledging and may be compromised without further meals if they disappeared.

Blocking the entrances of burrows will also be undertaken prior to the NESH breeding season to minimize the possibility that WTSH will take over the nesting sites. Burrows will be blocked once all birds have fledged and will remain blocked until the start of the NESH breeding season at the beginning of April and will have cameras deployed on them to determine if WTSH are actively investigating the burrows.

Diet and feeding procedures

All meals will be prepared off-site either at a private residence with access to electricity and water. All meals will be prepared at room temperature and transported to the translocation site in a cooler each day and all clean-up will be done at the same location to maintain hygienic standards (outlined below).

<u>Recipe</u>

Previous projects in New Zealand have used 1 (106 g) tin Brunswick™ sardines (89%) in soy oil (10%) (including oil contents), one-third Mazuri™ Vita-zu bird tablet (vitamin supplement) coupled with 50 ml cold (boiled > 3 min) water. This diet is stable at room temperature (prior to preparation) and is easy to obtain and bring into the field. It also was the clear winner in a feeding trial conducted by Miskelley et al. (2009) of translocation projects in New Zealand.

However, based on the approximated nutritional content compared to that of the natural diets of NESH the caloric levels are different.

The current formula used for NESH being rehabilitated at facilities in Hawaii (including the SOS program and Hawai`i Wildlife Center) consists of half Capelin and half Lake Smelt (both fresh frozen), powdered Piscivore formula from Lafeber, Mazuri Vita-Zu and Centrum vitamins and enough water to pass through a rubber feeding tube (T. Anderson and J. Ellal, pers comm).

Table 4: Approximate nutritional content of natural and artificial NESH diets (Ainley et al. 2014).

Diet	**Calories per 100g**	**Protein (%)**	**Fat (%)**	**Carbohydrate (%)**
Brunswick sardine diet	236	17.9	18.9	0
Capelin and Lake Smelt diet	137	16.8	7	0.25
NESH Natural diet (50% squid; 50% flying fish)	92	18.5	1.2	1.5

Preparing food:

Mazuri tablets (or portions of tablets) will be crushed to as fine a powder as possible. The tablets do not dissolve, so crushing to a fine dust allows the vitamins to be equally distributed in the mixture. If making four tins of fish (700ml total volume), 200 ml cold (boiled > 3 mins) water (or unflavored pedialyte) will be placed in a blender with two tins of fish and blended until runny (at least 30 sec). A third tin of chopped fish (or equal mass of fresh fish) will then be added and blended until runny. Vitamin powder will then be added through hole in lid while blender running at low speed. The fourth tin of chopped fish will be added and blended until smooth. The mixture will be kept cold until immediately before feeding.

Food will be warmed immediately (<10 min) before feeding to prevent bacterial build up. Temperature will be tested on with a thermometer and will not exceed 33°C (cold mix e.g. <30°C may be rejected by chick; hot mix e.g. >35°C may damage chick's internal tissues). Food temperature will be monitored regularly (aiming for ~ 33ºC) and stirred with a spoon before drawing up food (the thick part of the mix can settle).

Retrieving chicks from burrows:

The methods outlined below are for a two person teams (a feeder permanently at the feeding station located by the artificial burrows and a handler/runner collecting, holding and returning chicks). Prior to starting feeding for the day, complete rounds of all occupied burrows to check on welfare of all birds will occur. Each burrow will be visited in numerical order (to ensure all are checked), and the overall welfare of the chick will be checked in addition to signs of regurgitation in burrow, or abnormal excrement, and for any signs of digging in blockaded burrows. Any missing chicks will be searched for, including in un-occupied artificial burrows, in the event that they wander into an adjacent burrow.

Chicks will be processed in the following order:

1. Extract from burrow
2. Weigh (to obtain pre-feed or base weight)
3. Check band
4. Measure wing length (right wing) if wing measuring day
5. Any other handling (e.g. physical examination, down coverage estimates)
6. Feed (recording amount delivered in ml; no post-feed weight required)
7. Return to burrow

When birds are removed, they will be placed in a carrying box. Carrier boxes will have a clothes pin that is attached from each burrow with the burrow number on it to ensure birds are placed back in their proper burrow. After feeding, the chick is returned to its burrow and the clothes pin is clipped to it's burrow lid. This helps to prevent confusion during feeding, and eliminated the carrier's need to remember which burrow their chick came from.

Figure 8: Example of colony transport box

Feeding chicks:

All feeding will be done on a clean surface (folding table) located in the shade above the colony. On rainy day, a pop up tent will be erected to provide cover. The handler will hold the chick firmly on a surface (with towel) with a loose hand grip—the chick must not be tightly gripped or it will not feed properly and the crop area in particular needs to be unrestricted. The feeder will hold open the bill (mainly grasping the upper bill), stretching the head and neck out (at approx. 30–40º angle from the horizontal). With other hand holding the syringe, the feeder inserts the crop tube to the back and side of the throat (to keep airway clear). Food delivery will be at least 30 seconds for a 40 g batch, with at least one rest approximately half way (c. 20 ml) through syringe load to check for any signs of meal rejection. Food delivery will stop at the pre-determined amount or earlier if signs of food coming back up throat. The bill will be immediately released as the crop tube is withdrawn, so that if there is any regurgitation the food can be projected clear of the plumage and risk of aspirating food is reduced.

Figure 9: Demonstration of proper feeding technique, and apparatus from the 2015 HAPE translocation to KPNWR.

After feeding, the chick will be cleaned with a soft tissue so that there is no food on the bill or plumage. Soiling of the plumage with foreign materials can disrupt water-proofing and insulation. Particular attention will be paid to the base of the bill where food can build up and form a crust if not cleaned away. The amount of food actually taken by chick will be recorded. Any details regarding food delivery e.g. regurgitation, overflow, appears full, difficult feeder requiring plenty of breaks, resists food, good feed etc. will be recorded to help with the planning of subsequent meal sizes.

Chicks will be fed amounts according to the following table, after obtaining weights on the day after transfer. These amounts are based on translocation data from the related Fluttering Shearwater translocation, and while they are expected to be similar for NESH, they may be changed on an as-needed basis. The food amounts below are comparable to known meal sizes for NESH chicks in the wild (Ainley et al. 2014) despite NESH being 33% larger in mass (424g) than Fluttering Shearwaters.

	Meal plans for chicks at particular weights / wing lengths on day after transfer		
Feeding day	<300 g / all wings	>300 g / <170 mm	>300 g / >170 mm wing
Day 1	0 mL	0 mL	0 mL
Day 2	30 mL	40 mL	50 mL
Day 3	40 mL	50 mL	60 mL

Day 4	40 mL	50 mL	70 mL
Day 5	50 mL	60 mL	70 mL
Day 6	50 mL	60 mL	70–80 mL
Day 7	60 mL	70 mL	Etc.
Day 8	60 mL	70 mL	
Day 9	70 mL	70–80 mL	
Day 10	70 mL	Etc.	
Day 11	70–80 mL		

Table 5: Recommended daily meal sizes for NESH chicks hand-fed on Brunswick Sardines in soy oil.

Criteria are developed around weights taken on day after transfer rather than transfer day, because chicks can lose weight in the 24 hours after collection from burrows at the source colony. Food volumes will be increased more rapidly for more advanced chicks (wings >270 mm) as they will have a shorter period of time to make the appropriate weight gains before fledging. Meal sizes in Fluttering Shearwaters peak around 70–80 ml and are then gradually reduced (usually 10 ml increments) when:

- Chicks show signs of overflowing during feeding; and/or,
- Chicks are not emerging when expected, especially if wing growth had slowed down or ceased and down coverage had reduced; and/or,
- Chicks appear to be gaining weight during the emergence period.

If chicks are allowed to gain too much weight, e.g. reach weights >500 g, then they are likely to take longer to emerge and longer to depart, because in most cases chicks fledge at 434 g. A cap of 500 g is suggested before they lose weight prior to departure.

<u>Sterilization procedures</u>
Maintaining sterile conditions for husbandry tasks will be crucial to preventing infections in the transferred chicks. Food storage, preparation and cleaning will all occur at the refuge where there will be access to electricity, a sink and refrigerator; meals will be carried in a cooler to Nihoku immediately prior to feeding. Microshields™ chlorhexidine (5%) will be used for all disinfecting tasks. All feeding and food prep instruments and tools will be disinfected using chlorhexidine and rinsed using boiled water prior to commencing feeding and each individual bird will have its own sterile syringe and stomach tube each day to avoid cross-contamination between feedings. All work surfaces will be wiped down with kitchen towels and disinfectant spray (or leftover sterilizing solution), or with antibacterial surface wipes both before and after feedings. Any weigh boxes that have been used will be washed and rinsed, and set out to dry.

Chick health and morphometric monitoring
As well as the physical health check made prior to transfer, a full physical examination will be given when chicks arrive at the release site, and at any point thereafter where there is unexpected

and/or unusual chick behavior or posture. The Short-tailed Albatross translocation team collected blood samples to compare 9 different blood chemistry parameters with the same ones in naturally reared chicks (Deguchi *et al*. 2012a,b) and to characterize the effects of transmitter attachment and handling on hand-reared chicks. These measures provided insight into health status and body condition of the artificially reared birds indicating better nutritional status in hand-reared birds than those raised by wild parents but evidence of possible muscle damage or capture myopathy in birds handled for transmitter attachment. At a minimum, NESH chicks to be transferred will have baseline blood panels and disease screening conducted on the day of transfer, and then again close to fledging.

All efforts will be made to minimize incidences of regurgitation, and to handle chicks in such a way that regurgitant can be projected away from the body. Regurgitation can have serious consequences, including soiling of plumage spoiling water-proofing and insulation; possible asphyxiation; and, aspiration of food particles leading to respiratory illness. Burrows will be carefully inspected for signs of regurgitation, especially while chicks adjust to a new diet and feeding regime, and to ensure chicks are passing normal feces and urates.

Other serious health issues that staff will be aware of include: ventriculitis/ proventriculitis injury (caused by gut stasis or food contamination); aspiration of food (caused by regurgitation or poor feeding technique); and dehydration and heat stress. Appropriate first-aid treatment will be available if chicks injure themselves during the emergence period (see veterinary care and necropsy section).

Aside from basic health checks, one of the most important measurements that will be used in decision-making will be chick mass. Chicks will be weighed by placing them in a tared weigh box onto a table-top scale. The box will be cleaned between each chick measurement. Weight will be recorded in grams.

Wing measurements may be made every 2-3 days to assist with planning meals and gate removal. Wing measurements will be taken at the following intervals and done less frequently than weight since a higher chance of injury is associated with wing measurements:

- Day of transfer in natal colony
- Soon after transfer on translocation site
- When wings are predicted to be around 210 mm in length (based on a daily growth rate of up to 8 mm/day);
- 3–5 days later to determine the wing growth rate once chicks had reached or exceeded 220 mm (to help schedule blockade removal).
- On alternate days once blockades are removed to record departure wing lengths. Wing measurements can stop being measured once three measurements read the same (i.e. wing has stopped growing).
- Younger chicks can also be measured at opportunistic intervals, to monitor progress,

To measure wing length, birds will be kept in bags (to keep calm), and the right wing will be removed to measure—straightened and flattened to record maximum wing chord. Whenever possible, this measurement will be done by the same person to reduce inter-observer bias. If the potential exists for two observers to take measurements, they will be calibrated against each other to apply any needed corrections to the data.

Fledging criteria

Chicks of New Zealand species are not allowed to exit burrows before they have reached the minimum known first emergence wing-length for the species (emerging species), or are just short of the minimum known fledging wing-length (species fledging on the first night outside the burrow). Burrow blockade removal strategies have been developed to ensure that chicks do not leave the burrow prematurely and still have a good chance of fledging, even if at the lower end of the target fledging weight range for the species. Secondary criteria are species-specific and include weight, wing-growth rates and down coverage (Gummer 2013).

These strategies are necessary since it can be difficult to find chicks that have left their burrows. Lighter chicks that need to be fed daily are at the greatest risk if they can no longer receive meals, and some species are more prone to disappearing than others (e.g. Fluttering shearwaters; Gummer and Adams 2010). For NESH, fledging criteria will be a combination of the measurements described below, a slowing of wing growth and reduced down.

Veterinary needs and necropsy protocols

Veterinary care will be provided locally by Dr. Joanne Woltman, DVM at Kauai Veterinary Clinic and all efforts will be made to stabilize chicks in the field so that they can remain at the translocation site. In the event that a chick cannot be stabilized in the field, it will be sent to the Save our Shearwaters facility at the Kauai Humane Society in Lihue for intensive care. Any chicks that expire during the process will be sent to Dr. Theirry Work at USGS for a full necropsy to determine the cause of death.

Translocation assessment

Measuring success

Establishment or restoration of colonies of Procellariiforms is a long-term commitment and markers of success will be incremental. Milestones that can be quantified include:

- Proportion of chicks that survive capture and transfer to new site
- Proportion of chicks that fledge from the colony
- Body condition of fledged chicks
- Proportion of translocated chicks that return to the new colony from which they fledged
- Number of prospecting birds fledged from other colonies that visit the translocation site.
- Number of those birds fledged from other sites that recruit to the new colony.
- Reproductive performance (hatching success, fledging success) of birds breeding in the new colony.
- Natural recruitment of chicks raised completely in the new colony
- Annual population growth within new colony

Most projects involving transfers of burrow nesting species in New Zealand have employed most, if not all, of the methods described above to monitor their success.

Monitoring success at Nihoku

Success at Nihoku will be monitored at various stages of the project. Items 1-3 from table 6 below will be measured in each year during the translocation itself. Items 4-8 will be measured over time- starting 3-5 years after the first translocation cohort fledges (i.e. after sufficient time has passed for birds to return to the site as adults). If birds are identified during these checks, the burrows will be regularly monitored through the duration of the breeding season. It is hoped that by year five, there will be at least one active breeding pair at the site.

Table 6: Metrics of success and targets that will be used to determine translocation outcomes

	Success Metric	**Nihoku Target**
1	% chicks that survive capture and transfer to new site	90% year one; 100% afterwards
2	Body condition of fledged chicks	Wing and mass measurements ≥ wild chicks
3	% chicks that fledge from the new colony	70% year one; 80% afterwards
4	% translocated chicks that return to the new colony (by age four)	≥ 15% (estimated return rate of existing KPNWR colony)- 40% (cumulative survival rate from 0-4 years from Greisemer and Holmes 2011)
5	# birds fledged from other colonies that visit the translocation site	>0 (i.e. any visitors considered successful)
6	# birds fledged from other sites that recruit to the new colony	>0 (i.e. any new recruits considered successful)
7	Reproductive performance of birds breeding in the new colony.	Reproductive success ≥ wild colonies with predation (0.2-0.5; Greisemer and Holmes 2011)
8	Natural recruitment of chicks raised completely in the new colony	≥15% (estimated return rate of existing KPNWR colony) - 33% (rate of survival in unprotected colonies from Greisemer and Holmes 2011) and by year 6

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APPENDIX 1: EQUIPMENT LIST

Source colony (chick selection, collection and transfer)

ITEM	#	COMMENTS
Flagging tape 3 colours	2 rolls each	For marking burrows of suitable chicks
Holding bags	20	Strong cloth bags, ideally dark colour to keep birds calm. Soiled bags are washed on a daily basis.
Wing rule (300 mm)	2	End stopped
Pesola scales 600g	2	Allow for bag weight
Banding kit plus X bands	2	X-bands (at least 200), pliers, circlips
Pet-carry boxes (with divisions)	10	White corflute boxes for up to 20 chicks.
Brown packing tape (wide)	2 rolls	Stick on top of boxes and write on in vivid marker – can then be removed so boxes are not permanently marked
Permanent marker pens	2	
Waterproof notebooks	2	
First aid kit (for birds)	1	
Newspaper	Lots	To line transfer boxes,
Anti-bacterial handwash		For cleaning hands prior to eating
First aid kit (for people)	1	
Tarpaulins and poles		To create a shade house for the birds awaiting transport
Spray bottle	2	To spray plumage for cooling if overheating occurs

Artificial burrow supplies

ITEM	#	COMMENTS
Artificial burrows (numbered)	100	
Internal mesh blockades	100	Bill-friendly design required; plastic to prevent bill abrasion and so that bills can't bet stuck.

Firm external blockades, e.g. rocks on island	1 per burrow	To block in chicks for appropriate number of nights following transfer
Fresh, dry grass reserve or leaf litter	Lots!	To be collected and dried well before the transfer day.

Morphometric supplies

ITEM	#	COMMENTS
Tool boxes	4	For carrying birds from burrows to shed (or transfer boxes used if preferred)
Newspaper	Lots	To line carry buckets or boxes
Holding bags	20	Strong cloth bags, ideally dark colour to keep birds calm. Soiled bags are washed on a daily basis.
Wing rule (300 mm)	1	Full stopped end
Digital table-top scales for shed	2	For daily weighing
Lithium cell batteries	4	For table-top scales. 1 battery lasted the month in 2012
Bird weigh boxes	2	To weight birds in bags on table-top scales
Pesola scales 600g or 800 g depending on bag weight.	2	Allow for bag weight (e.g. pillow cases weigh up to 100 g; home-made bags may be heavier). Ideally need a third back-up set.
Bulldog clip	2	To attach to scales for better grip of holding bags
Banding kit (with circlips)	1	To remove/replace bands if required; band new immigrants.
Washing line and clothes pegs	1 + lots	To hang up soiled holding bags and towels if needed

Food supplies

The following items are based on a canned sardine in soy oil diet. The list will need amending if any alterations, such as the use of fish oil, are made.

ITEM	QUANTITY	COMMENTS
Brunswick sardines *in soy oil* (106 g tins)	TBD	Ring-pull tins only. Diet recipe is 1 can sardines to 50 ml fresh water. 1 tin will feed approx. 2 chicks with 70 g meal size.

Mazuri Vita-zu seabird tablets	TBD	
Hartmann's Solution	375 mL	For hydrating birds on the transfer day (30 ml/bird plus some waste in hygiene process)

Food preparation and feeding supplies

ITEM	QUANTITY	COMMENTS
Kettle (large)	1	To boil water for > 3 mins if from remote source. Heat water for flasks
Blenders (SuNote:eam Pro–800 W)	1	Do not exceed 4 tins with 200 ml water as motor may burn out. Blades need to be removed for daily cleaning. Sharpen blades before storage.
Extension cable	1	For generator to blender
Small kitchen knife	1	Chopping sardines in tin
Measuring jug	1	Must be able to read to 10 ml (for water)
Plastic spatula (narrow preferable, not rubber)	1	To scrape blended fish from blender
Plastic spatulas or long spoons	2	To stir new food during warming
Plastic 1 liter pots (with lids)	2	Storing blended food (must be able to fit in hot-water bath)
50 ml Plexi-vet syringes	2	Easy to clean plexi-glass and should last a long time if looked after
Crop-feeding tubes (6.3 mm x 120 mm Teflon)	2	HG can make at $10/tube
Castor oil	1 small bottle	Lubricating syringes
Clean thermos flasks (2 liter)	2	Carrying boiled water to site for use in hot-water bath etc.
Yogurt-makers	1	Warming food prior to feeding
Small coolers	2	Keeping food cool, or warming food prior to feeding
Rectangular plastic boxes	2	Rinse baths for crop tubes
Clean plastic bottles (3 liter)	2	Carrying fresh/clean water (boiled > 3 mins) to feeding site
Plastic funnel	1	To fill flasks and bottles
10 liter bucket	1	Carrying gear to feed site. Doubles up as 'slops' bucket
20 liter bucket	1	Carrying gear to feed site. Doubles up as tissue bin
Medium-sized cooler	1	In hot weather, pots of food need to be kept cool for use later in the day.
Ice Packs	4	See above. Also used to keep dead chicks cool if needed
20 liter water container	1	Storing fresh (non-boiled) water for cleaning, hand-

(with tap)		washing etc.
Small hand towels	10	To rest birds on surface during feeding – t-towel size.
Soft tissues	10 boxes	For hygiene regime between chicks (not Budget or Pams brand as difficult to separate!)
Big container, e.g. fish bin	2	To store gear in at feeding shed.

Hygiene supplies

ITEM	#	COMMENTS
Dettol anti-bacterial flowing soap	2 (+ refill)	Cleaning hands before food prep., and one for use at colony site during feeding
Anti-bacterial hand-wipes	1 large	Cleaning hands during feeding events
Microshields chlorhexidine sol. (5% dilute)	1 liter	For short-term sterilization of feeding equipment between chicks. Usually has expiration date
Small measuring jug	1	For measuring chlorhexidine. Different to that used in food prep.
Bottle with lid	1	For holding freshly made chlorhexidine solution
Tall jars (e.g. 100ml caper jar)	2	For sterilizing solution (tubes stand upright, solution covers entire length). Economic use of chlorhexidine; larger jar can be used if antibacterial sol. Used
Old ice-cream tubs to stabilise jars	1	
Milton antibacterial tablets (1 tab/2 L water)	2 packets	Min soak time: check packet (different time for different brands)
15 liter bucket or similar	1	Antibacterial solution
Rubber gloves	Lots	Volunteers (for dishes)
Dish-washing liquid	1 L	Biodegradable type. Washing oily equipment daily
New washing-up brush	2	Washing equipment daily – need one for bird dishes and one for oily fish cans
Bottle brush	1	Washing sterilizing jars
Thick sponge wipes	1-2	Roll up to wash syringe barrels without scratching
Pipe-cleaners	Few packets	From Spotlight Stores craft section. For cleaning inside crop tubes.
Dishwash tub	2	For laundry sink – to save hot water amounts
Drying rack/basket for dishes	3	For laundry bench
Napisan (antibacterial) sanitiser (powder)	1	Soaking holding bags daily.
Kitchen towels	4 rolls	Handy at the feeding site for spillages, and cleaning out

		pipes/tunnels
Small disposable bin bags	1 roll	For daily load of fishy clean-up tissues! To fit in a 20 l bucket. (Preferably use recycled shopping bags)
Trigene	1 small bottle	For cleaning transfer boxes etc.

Chick health

The following list includes a precautionary first-aid kit, but does not contain drugs (such as Baycox) that would be prescribed and supplied by vets.

ITEM	#	COMMENTS
Spray bottle	1	To spray plumage if needing to stimulate preening
1 mL disposable syringes	As required	Easiest way to administer drug on an individual basis
Small ziplock bags	40	For faecal collections of 30 birds (plus spares)
Betadine gel	1	For open wounds.
Bandage (flexi-cohesive)	1 roll	Type that stretches and sticks to itself; for strained wings etc. following transport.
Saline	10 ml lots	To flush out eyes or wounds if required
Small sharp scissors	1	
List of vet contacts	1	Current phone nos./email address, including

Chick mortality

ITEM	#	COMMENTS
Plastic zip-lock bags	20+	A4 size; sending dead chicks, samples etc.
Plastic disposable gloves	20+	For handling dead birds, faeces etc
Polystyrene coolers (c. 300 x 200 mm)	3	For sending dead chicks with ice-pack off island for post mortem
Ice-packs (chilly slicks)	See food preparation	For sending dead chicks off island for post mortem (2 per box as boxes are quite large). These slicks are additional to those needed to keep food cool.

Record keeping

ITEM	#	COMMENTS
Water-proof notebooks	2	Minimum of two required for roll-calls.
Data recording sheets	1 per chick	These may be more efficient in the shed than waterproof notebooks
Special notes sheets	Several	For adding extra notes on health issues etc.
Clipboards or folders	2	1 per team for new-style data sheets in shed
Band/burrow list (printed after transfer)	2	In band order, to locate home burrows of wandering birds
Laptop and USB flash drive (backing up)	1	Require replacement if contractor takes one away from island

Appendix D:
Written Comments Received During Pre-Consultation

Written comments were received from the following agencies and organizations during pre-consultation and are reproduced in this Appendix:

US Fish and Wildlife Service – Pacific Islands Fish and Wildlife Office
Department of Land and Natural Resources
Hawai‘i Office of Planning
Hawai‘i Office of Environmental Quality Control
University of Hawai‘i Water Resources Research Center
Kaua‘i Island Utility Cooperative

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2016-TA-0176

MAR 03 2016

Mr. Mike Mitchell
Kauai National Wildlife Refuge Complex
PO Box 1128
Kilauea, Hawaii 96754
Attn: NESH Management Action

Subject: Newell's Shearwater at Nihoku Conservation Area

Dear Mr. Mitchell:

Thank you for the opportunity to provide input regarding the planned translocation of Newell's shearwater (*Puffinus newelli*) to the Nihoku Conservation Area at Kilauea Point National Wildlife Refuge.

Our office fully supports this effort as translocation is an important step toward recovering the species. Translocation and social attraction to predator-free areas are management tools identified in the Newell's Shearwater Recovery Strategy, and Nihoku Conservation Area is a suitable area to begin testing implementing these techniques. We respectfully request you continue to coordinate with our office regarding the colony sites from which the birds will be collected, and regarding the impact this project could have on the Newell's shearwater population on Kauai.

If you have any questions or concerns regarding these comments, please contact Megan Laut, Fish and Wildlife Biologist, at 808-792-9400.

Sincerely,

for Mary Abrams
Field Supervisor

DAVID Y. IGE
GOVERNOR OF
HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

KEKOA KALUHIWA
FIRST DEPUTY

JEFFREY T. PEARSON, P.E.
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

March 8, 2016

Attn: NESH Management Actions
Kauai National Wildlife Refuge Complex
PO Box 1128
Kilauea, HI 97654

Dear Mr. Mitchell,

Thank you for your February 1, 2016 letter requesting preliminary input on the Kīlauea Point National Wildlife Refuge (KPNWR) conservation actions planned for the translocation of the threatened ‘A‘o or Newell’s Shearwater (*Puffinus newelli*) to the Nihoku predator-free conservation area within the KPNWR. The Department of Land and Natural Resources Division of Forestry and Wildlife (DOFAW) recognizes that this project is an important part of Newell’s shearwater recovery on the island of Kaua‘i and for the species as a whole.

DOFAW believes that social attraction should be considered to increase the potential for seabird recruitment and success of the project but notes that the use of social attraction could potentially increase predator presence in the area. DOFAW recommends that predator control for potential predators including feral cats and Barn Owls (*Tyto alba*) be implemented or increased and that monitoring of these species be conducted to ensure that the large number of Nēnē (*Branta sandvicensis*) and seabirds occupying areas outside of the predator proof fence are not negatively impacted by this project.

DOFAW also recommends that the community surrounding the project area be notified and engaged if they have concerns with the project and that monitoring for potential fall-out issues be conducted.

DOFAW appreciates the opportunity to provide preliminary input and look forward to commenting on the draft Environmental Assessment documents later this year. If you have any questions, please contact James Cogswell, Wildlife Program Manager, at 808-587-4187.

Sincerely,

David G. Smith
Administrator
Division of Forestry and Wildlife

OFFICE OF PLANNING
STATE OF HAWAII

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
DIRECTOR
OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

Ref. No. P-15041

February 8, 2016

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FEB 23 2016
USFWS KAUAI NWRC

Mr. Michael Mitchell
Acting Project Leader
Kauai National Wildlife Refuge Complex
U.S. Fish and Wildlife Service
P.O. Box 1128
Kilauea, Hawaii 96754

Dear Mr. Mitchell:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency Review for Management Actions for Immediate Implementation for the Conservation of \`A\`o (Newell's Shearwater) on Kilauea Point National Wildlife Refuge, Kauai

This responds to your letter dated February 1, 2016, requesting preliminary input on conservation actions for the \`A\`o (Newell's Shearwater) on Kilauea Point National Wildlife Refuge, Kauai, similar to the recent translocation of \`Ua\`u (Hawaiian petrel) chicks to the predator-free conservation area on the Refuge. The Hawaii CZM Program previously reviewed and issued federal consistency concurrence on October 12, 2015, for the conservation actions for the \`Ua\`u. Similarly, Coastal Zone Management Act federal consistency review requirements are applicable to the conservation actions for the \`A\`o because it is a coastal resource of the State of Hawaii that is protected by CZM enforceable policies: Hawaii Revised Statutes Chapter 195D – Conservation of Aquatic Life, Wildlife, and Land Plants; and Hawaii Administrative Rules Chapter 13-124 – Indigenous Wildlife, Endangered and Threatened Wildlife, Injurious Wildlife, Introduced Wild Birds, and Introduced Wildlife. CZMA federal consistency review requirements also apply if \`A\`o chicks will be translocated from sites located on non-federal land.

We recommend that you consider submitting a request to exclude conservation actions for the \`A\`o, and/or generally for all conservation actions for protected birds, from CZMA federal consistency review as an "environmentally beneficial activity," which is an activity that protects, preserves, or restores the natural resources of the coastal zone (15 CFR § 930.33(a)(4)). Under this provision, the Hawaii CZM Program and your agency may agree to exclude environmentally beneficial federal agency activities, either on a case-by-case basis or for a category of activities, from further CZM program consistency review. Should you decide to submit such a request, we are required to publish a public notice, and provide for public review

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USFWS KAUAI NWRC

and comment, to establish the exclusion. If the exclusion is established for a category of activities, then further CZM review is not required.

If you have any questions, please call John Nakagawa of our CZM Program at 587-2878.

Sincerely,

Leo R. Asuncion
Director

c: DLNR, Division of Forestry and Wildlife
County of Kauai Planning Department

OFFICE OF ENVIRONMENTAL QUALITY CONTROL

DAVID Y. IGE
GOVERNOR

SCOTT GLENN
INTERIM DIRECTOR

DEPARTMENT OF HEALTH, STATE OF HAWAIʻI
235 South Beretania Street, Suite 702, Honolulu, HI 96813

Phone: (808) 586-4185
Email: oeqchawaii@doh.hawaii.gov

March 8, 2016

Mr. Mike Mitchell
Kauai National Wildlife Refuge Complex
U. S. Department of the Interior
Fish and Wildlife Service
P.O. Box 1128
Kilauea, HI 96754

Dear Mr. Mitchell:

SUBJECT: Management Actions at Kilauea Point National Wildlife Refuge for immediate implementation to the threatened Newell's Shearwater (*Puffinus newelli*)

Having received your February 1, 2016, letter, requesting comments on the subject matter, the Office of Environmental Quality Control offers the following comments for your consideration:

1. Please consult with cultural practitioners who use the Wildlife Refuge as a cultural resource.
2. Please consult with the County of Kauaʻi Department of Planning, as well as the State of Hawaiʻi, Department of Land and Natural Resources, Division of Forestry and Wildlife.
3. Best Management Practices (BMPs): Before work, the OEQC strongly encourages the U.S. Fish and Wildlife Service to consult with the Clean Water Branch of the Department of Health regarding BMPs to minimize water runoff from the project site.
4. Native vegetation: Please consider voluntarily using the requirements of Act 233, Session Laws of Hawaiʻi (native vegetation in landscaping).

Thank you for the opportunity to review and comment. If there any questions, please contact Leslie Segundo of our office at (808) 586-4185.

Sincerely,

Scott Glenn
Interim Director

16-216

Water Resources Research Center

UNIVERSITY of HAWAI'I®
MĀNOA

February 23, 2016

Kaua'i National Wildlife Refuge Complex
PO Box 1128
Kilauea, HI 96754
Attn: NESH Management Actions

Mr. Mitchell:

This is to acknowledge receipt of your letter for review of an Environmental Assessment.

Unfortunately, the Water Resources Research Center does not have the capacity to review the environmental impact statement at this time due to the faculty position vacancy.

While we continue to explore filling the current vacancy, the Center will exclude itself from commentary on this specific environmental assessment study.

Sincerely,

Darren T. Lerner, PhD
Interim Director

2540 Dole Street, Holmes Hall 283
Honolulu, Hawai'i 96822
Telephone: (808) 956-7847
Fax: (808) 956-5044

Kaua'i Island Utility Cooperative
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March 8, 2016

Mike Mitchell
Acting Project Leader
Kauai National Wildlife Refuge Complex
P.O. Box 1128
Kilauea, HI 96754

ATTN: NESH Management Actions

Dear Mr. Mitchell:

This letter responds to your February 1, 2016 letter requesting preliminary input for consideration in your preparation of an Environmental Assessment (EA) for your proposed Newell's shearwater (NESH) translocation project.

For several years, KIUC has implemented extensive seabird colony management actions in several locations on Kauai as required by its Short-Term Habitat Conservation Plan (STHCP) and the associated Incidental Take Permit (ITP) issued by the U.S. Fish and Wildlife Service (USFWS) in 2011. KIUC's actions (which consist of both predator control and intensive monitoring) are intended to improve breeding success of both NESH and Hawaiian petrels (HAPE) in those colonies, and thereby increase the populations of both species in those managed colonies compared to what would otherwise occur. KIUC intends to continue such actions.

The USFWS, through its Kauai National Wildlife Refuge Complex, now seeks to remove NESH chicks from these KIUC-managed colonies, and translocate them to the Kilauea Point National Wildlife Refuge (NWR). The goal of this translocation project is "imprint" the NWR location on these chicks before they fledge and fly out to sea, such that when they reach breeding age in five or six years they will never return to their birth colony but will instead return to the NWR to breed. Thus, this translocation project will permanently remove NESH nestlings from KIUC-managed colonies, and prevent any of those nestlings from ever returning to those KIUC-managed colonies to breed. This USFWS translocation project will therefore reduce the population and breeding productivity of the KIUC-managed colonies compared to what would have occurred without the translocation project. Of course, that reduction will be compounded over time as transplanted chicks mature into breeding adults that fail to return to their birth colony and thus fail to produce additional future breeding adults there.

Last year the USFWS began implementing an identical project using HAPE chicks which it removed from KIUC-managed colonies. KIUC learned of that project when the USFWS released a Draft EA for public review and comment in July 2015. KIUC had very significant concerns about that project and the Draft EA, and KIUC submitted a 6-page comment letter to the USFWS on August 20, 2015. Although the comment letter addressed numerous issues, KIUC's greatest concern was that the Draft EA (and indeed that HAPE translocation project as a whole) failed to consider or address the impacts of nestling removal on the success of KIUC's mandatory STHCP/ITP mitigation efforts and intended future mitigation efforts.

After KIUC submitted its Draft EA comments, KIUC had numerous meetings and conference calls with the USFWS during which this topic was discussed. The USFWS repeatedly committed to address KIUC's concerns in the Final EA, and several times the USFWS proposed specific language to KIUC for inclusion in the Final EA. Much to our frustration, however, the Final EA did not include any such language, and completely failed to address KIUC's concerns. This led to numerous subsequent conference calls and correspondence, ultimately resulting in a letter from the USFWS dated February 18, 2016, a copy of which is attached for your reference.

KIUC does not oppose these translocation projects, so long as the USFWS provides KIUC with written assurance that the Service's removal of HAPE and NESH chicks from KIUC-managed colonies will in no way adversely affect the evaluation of the value or success of KIUC's mitigation efforts in those colonies. Indeed, KIUC believes it should also receive mitigation credit for the subsequent generations of HAPE and NESH which will result from these translocated chicks. The non-agency participants in the project support this position.

Accordingly, KIUC requests that the USFWS specifically address these concerns in the Draft EA and related project documents for this NESH translocation project.

Sincerely,

Carey Koide

Carey Koide
Transmission & Distribution Manager

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai'i 96850

In Reply Refer To:
01EPIF00-2016-TA-0198

FEB 18 2016

Mr. Carey Koide
Transmission and Distribution Manager
Kaua'i Island Utility Cooperative
4463 Pahe'e Street, Suite 1
Līhu'e, HI 96766

Subject: Assurance to the Kaua'i Island Utility Cooperative Concerning the Use of KIUC-Managed Seabird Colonies as Sources for Kilauea Point National Wildlife Refuge Seabird Translocation Project

Dear Mr. Koide:

This responds to your January 13, 2016, request that the U.S. Fish and Wildlife Service (Service) formally clarify the implications of the Kilauea Point National Wildlife Refuge (NWR), Hawaiian Petrel Translocation Project with respect to the Service's evaluation of the value and effectiveness of KIUC's past, present, and future mitigation actions for the petrel at KIUC-managed breeding colonies. As noted in your email, the Translocation Project will permanently remove 100 petrel nestlings from KIUC-managed colonies, effectively precluding any of those nestlings from ever returning to those KIUC-managed colonies to breed. This adverse impact to KIUC-managed colonies and the beneficial impacts to the petrel at the translocation site are properly considered as part of the species' baseline. As such, this information will be fully considered when the Service evaluates the value and effectiveness of KIUC's mitigation actions for the petrel at KIUC-managed breeding colonies. The Kaua'i NWR Complex is currently evaluating the potential for similar translocation actions for the Newell's shearwater. At the conclusion of that environmental review process, the Service expects that any effects from shearwater translocation activities will be properly considered as part of the species' baseline when the Service evaluates the value and effectiveness of KIUC's mitigation actions for the Newell's shearwater at KIUC-managed breeding colonies.

We thank you for your efforts to conserve and protect Kaua'i's threatened and endangered seabirds. If you have any questions regarding this letter, please contact Lasha-Lynn Salbosa, Fish and Wildlife Biologist (phone: 808-792-9400 or email: Lasha-Lynn_Salbosa@fws.gov).

Sincerely,

Mary M. Abrams Ph.D.
Field Supervisor