

Kaua‘i Seabird Habitat Conservation Plan

State of Hawai‘i
Department of Land and Natural Resources,
Division of Forestry and Wildlife

DRAFT 2018

5 KSHCP Conservation Program

This chapter identifies the KSHCP conservation goals and objectives and outlines the:

- Avoidance and minimization measures to reduce take of the Covered Species
- Conservation measures to mitigate for the unavoidable effects of authorized take of the Covered Seabirds

5.1 Biological Goals

Section 10(a)(2)(AB) of the ESA requires that an HCP Participant specify the measures that the will be implemented to minimize and mitigate, to the maximum extent practicable, the impacts of the taking of any Federally listed animal species as a result of activities addressed by the plan.

As part of the “Five Point” Policy adopted by the USFWS and NMFS in 2000, HCPs must establish biological goals and objectives (65 *Federal Register* 35242, June 1, 2000). The purpose of the biological goals is to ensure that the operating conservation program in the HCP is consistent with the conservation and recovery goals established for the species. These goals are developed based upon the species’ biology, threats to the species, the potential effects of the Covered Activities and the scope of the HCP.

The biological goals described below serve as the foundation for the conservation measures that will be undertaken as part of the KSHCP.

Goal 1: Under the KSHCP, avoid and minimize take impacts to the Covered Seabirds caused by nighttime lighting on Kaua’i to the maximum extent practicable for the 30-year term of the KSHCP. The effects of nighttime lighting on the Covered Seabirds represent a major threat to their survival and recovery.

Goal 2: Under the KSHCP, mitigate authorized take impacts of the Covered Seabirds by enhancing, protecting and managing suitable seabird breeding habitat on Kaua’i to facilitate successful production of fledglings at a level that over the 30-year term of the Plan offsets or exceeds the impacts of take caused by Covered Activities on the production of fledglings in the wild.

5.2 Biological Objectives

The biological objectives defined below are intended to **provide specific and measurable targets** for achieving the goals of the KSHCP. The regulatory requirements to minimize and mitigate the impacts of the taking of the Covered Species form the foundation for the goals and objectives described in **Table 5-1**. This table lists all goals and objectives relevant to the KSHCP; however, not all objectives are relevant to all Participants. The explicit responsibilities

that each Participant must uphold in order to meet the objectives of the KSHCP are described in detail in the individual Participant Inclusion Plans (PIPs) (see *Appendix D: PIP Template*).

It is important to note that since ‘a‘o take impacts comprise the majority of the take anticipated to be covered under the KSHCP, mitigation strategies under the KSHCP are primarily geared towards increasing productivity for this species. The minimization measures and conservation actions of the KSHCP will also serve to minimize the impacts on and offset requested take for the ‘ua‘u and the ‘akē‘akē.

Each PIP submitted in support of an ITL/ITP application must define the specific combination of minimization strategies to be implemented by the individual Participant (permittee) at their respective facility. The PIP must also define the level of funding that the Participant will provide to support implementation of KSHCP conservation measures to mitigate for the effects of their unavoidable take of the Covered Species. The proposed minimization plan should consider the needs and uses of lights, any regulations pertaining to the uses of lights, and the guidelines defined in Section 5.3 (Avoidance and Minimization) below.

Under the KSHCP, conservation measures will be implemented to mitigate the impacts of authorized take on the Covered Seabirds by all Participants in the Plan. While the KSHCP conservation measures follow the goals and objectives of approved recovery plans for the Covered Species, the actions are not, in and of themselves, intended to achieve recovery of the Covered Species. State of Hawai‘i law (HRS Ch. 195D) requires that mitigation provide a net benefit to the Covered Species and the HCP shall “increase the likelihood that the species will survive and recover.”

Federal law requires that in order for an ITP to be issued, the taking will be minimized and mitigated to the maximum extent practicable and will not appreciably reduce the likelihood of survival and recovery of the listed species in the wild (16 USC 1539). In that regard, a combination of applicable minimization and mitigation measures in a PIP should be applied that are likely to avoid and/or minimize the impacts of the taking and mitigate unavoidable take impacts commensurate with the impact on the Covered Species. That determination will be made on an individual PIP basis according to the requirements for issuance of an ITP under Section 10(a)(2)(B) of the ESA.

Development of the conservation objectives (**Table 5-1**) for the KSHCP relied on various USFWS and DLNR recovery and management planning documents, including:

- USFWS Newell’s Shearwater Landscape Strategy (USFWS 2017c)
- USFWS Appendix II. Modelling Methods and Results used to Inform the Newell’s Shearwater Landscape Strategy (USFWS 2017a)
- Newell’s Shearwater and Hawaiian Petrel Recovery: Five-year Action Plan (Holmes et al. 2015)

- Newell’s Shearwater Population Modeling for HCP and Recovery Planning (Griesemer and Holmes 2011);
- USFWS Seabird Conservation Plan – Pacific Region (USFWS 2005)
- DLNR Hawai‘i’s Comprehensive Wildlife Conservation Strategy (Mitchell et al. 2005);
- USFWS Recovery Plan for the Hawaiian Dark-rumped Petrel and the Manx Shearwater (USFWS 1983).

An emphasis was placed on considering most current available scientific information in developing the conservation objectives of the KSHCP relative to Covered Seabirds. Much of the current data (including the results of colony-based conservation and monitoring work) has been gathered by KESRP under the KIUC Short-term Seabird HCP, which funded KESRP to conduct this work (Raine et al. 2017h, f, i, g). Funding has also been provided by National Fish and Wildlife Foundation (NFWF), St. Regis, and State Wildlife Grant (SWG) program monies.

Table 5-1 lists the biological goals and objectives of the KSHCP. These are a key piece of the conservation framework for the KSHCP. Objectives will be met annually if a year is not specified. Additional tables in subsequent sections and in *Appendix A: Kahuama‘a Seabird Preserve Management Plan* detail how these objectives will be achieved and monitored, and how mitigation credit will be determined for each objective. Objectives 1.E and 2.I address honu, and all details on these objectives are provided in Chapter 9.

Table 5-1. Biological goals and objectives of the KSHCP.

Biological Goals	Biological Objectives
Goal 1: Under the KSHCP, avoid and minimize take impacts to the Covered Seabirds caused by nighttime lighting on Kaua‘i to the maximum extent practicable for the 30-year term of the KSHCP. The effects of nighttime lighting on the Covered Seabirds represent a major threat to their survival and recovery.	1.A. Avoid and minimize the impacts of the taking of Covered Seabirds due to light attraction by removing or turning off lighting, and altering light structure and light function by the end of Year 1, as specified in PIPs.
	1.B. Minimize mortality of Covered Seabirds downed due to light attraction by implementing actions to reduce presence of free-roaming seabird predators such as cats and dogs at Participant facilities, as specified in PIPs.
	1.C. Minimize mortality of Covered Seabirds downed due to light attraction by conducting annual Worker Seabird Awareness and Response Training (WSART), as specified in PIPs.
	1.D. Minimize mortality of Covered Seabirds downed due to light attraction by implementing seabird awareness outreach to the public, guests, and customers at Participant facilities as specified in PIPs.
	1.E. Avoid and minimize honu hatchling disorientation due to lighting at beachfront facilities by implementing best lighting practices as specified in PIPs, and protecting any nests at facilities via shielding as needed

	1.F. Implement recovery and release of Covered Seabirds downed due to light attraction through the Save Our Shearwaters (SOS) program or other certified rehabilitation facility.
Goal 2: Under the KSHCP, mitigate authorized take impacts to the Covered Seabirds by enhancing, protecting and managing suitable seabird breeding habitat on Kaua‘i to facilitate successful production of fledglings at a level that over the 30-year term of the Plan offsets or exceeds the impacts of light attraction take caused by Covered Activities on the production of fledglings in the wild.	2.A. Construct a predator-proof fence and install social attraction equipment (nest boxes, speakers) within the fenced area at the mitigation site in Year 1 of KSHCP implementation.
	2.B. Remove predators from within the fenced enclosure with monitoring confirmation of their absence, and activation of the social attraction equipment by Year 2; predator eradication within fenced enclosure maintained for the life of the project.
	2.C. Ground activity by Covered Seabirds documented at the mitigation site by Year 4 of KSHCP implementation.
	2.D. Breeding activity by Covered Seabirds documented at the mitigation site by Years 5-7 of KSHCP implementation.
	2.E. Cumulative upward trend in Covered Seabird breeding documented at the mitigation site by Year 10 of KSHCP implementation.
	2.F. Continued cumulative upward trend in Covered Seabird breeding documented at the mitigation site by Year 20 of KSHCP implementation.
	2.G. Maintain high quality seabird habitat at the mitigation site by removal of habitat modifying invasive plants in Year 1 and annually throughout the 30-year duration of the KSHCP.
	2.H. Protect nesting birds inside mitigation fence and in nearby source colonies by implementing predator control of 1) Barn Owls within the area surrounding the fenced enclosure and the Kalalau Valley, and 2) feral cats at ingress points to source colonies in the Kalalau Valley, beginning in year 1 and annually throughout the 30-year duration of the KSHCP.
	2.I. Annual protection of any honu nests adjacent to facilities via shielding or other measures to avoid light attraction take.

5.3 Measures to Avoid and Minimize Take Impacts (Biological Goal 1)

Measures to avoid and minimize the impacts of light attraction on the Covered Species are an integral part of the KSHCP. Avoidance measures and minimization measures aim to reduce the potential for take of a Covered Species. The avoidance and minimization efforts outlined below, and detailed in *Appendix E: Guidelines for Adjusting Lighting at Facilities* reflect the best available science on seabird friendly lighting.

5.3.1 Adjusting Lighting at Facilities

Appendix E: Guidelines for Adjusting Lighting at Facilities includes the following measures to avoid and minimize take impacts to Covered Seabirds:

- Deactivate non-essential lights
- Install full cut-off light fixtures
- Shield light fixtures
- Angle lights downward
- Place lights under eaves
- Shift lighting according to moon phase (during the fall-out period)
- Install motion sensors for motion-activated lighting
- Decrease lighting levels
- Decrease visibility of interior lights
- Use light-less technologies
- Plant vegetation around lights to reduce light visibility
- Lower height of lights
- Use longer light wavelengths

These guidelines are intended to be utilized in individual PIPs submitted to the USFWS and DLNR as part of the application process. Under the KSHCP, all minimization measures must be implemented within Year 1 of an ITP/ITL and maintained throughout the life of the permit/license. Compliance with the avoidance and minimization measures in PIPs will be monitored and reported at the onset of the KHSCP, and annually thereafter (see Section 6.8.1). New facilities or expansion of existing facilities identified in PIPs shall use, as appropriate, the avoidance and minimization measures described in this section.

The installation of “new” lights (those that are proposed or planned but do not exist at the time of the application for take permit/license) has the potential to exacerbate existing adverse light attraction impacts on Covered Seabirds and cause fallout (i.e. take) of seabirds. Participants in the KSHCP shall consult with the USFWS and the DLNR in advance on their plans to install new lights at existing facilities or to construct new facilities to determine the required avoidance and minimization measures. Installation of new lights at an existing Participant’s facility may require an amendment to a PIP and the permit that has been issued to a Participant.

5.3.2 Reducing Predators at Facilities (Objective 1.B)

Where minimization measures are not likely to result in the avoidance of seabird take, minimizing mortality of downed seabirds is critical. Seabirds that are downed at Participant facilities are vulnerable to direct mortality from predation by free-roaming dogs, cats, rats and other predators. Downed seabirds that subsequently become predated must be considered lethal take (see Section 4.2.1). In order to receive incidental take authorization from the USFWS and DLNR, Participants are required to reduce the presence of predators at their facilities.

The following measures are required, where applicable, to reduce the potential for Covered Seabird predation at Participant facilities:

- 1) Prohibit loose, free-roaming cats and dogs (e.g. leash and/or restrain).; This prohibition should be clearly communicated with appropriate signage.
- 2) Conduct a trapping and removal program at the facility for feral cats and dogs; feral animals should be taken to the Humane Society and not returned to the facility even if neutered;
- 3) Prohibit the feeding of feral animals anywhere on the property. Feeding of feral animals attracts them to the facility where they pose a threat to downed seabirds. In particular, feral cats are known to hunt and predate even if they are well-fed (Longcore et al. 2009).

Measures should be described in individual PIPs submitted to the USFWS and DLNR as part of the application process. All measures to reduce presence of predators must be implemented within Year 1 of an ITP/ITL, and as needed throughout the life of the permit/license, if predators are present at Participant facilities (see Section 6.8.3 and requirement to record predator presence).

5.3.3 Conducting Seabird Awareness Training and Outreach (Objectives 1.C & 1.D)

An important step in reducing mortality of downed seabirds is quickly finding and recovering (i.e. capturing) them efficiently. This is most likely to occur when on-site staff and workers are properly able to identify Covered Seabirds, understand and fully implement the protocol for their detection and safe capture, and have a clear search strategy.

Under approved PIPs, each Participant is required to conduct annual outreach and training for workers at their facilities that is specific to Covered Seabirds, beginning in Year 1 of the KSHCP. A detailed slideshow presentation that was developed on this subject to include all relevant topics will be provided by IE Staff upon request; handouts are also provided in this document under *Appendix F: Training and Outreach Materials*. Other presentations or programs could be developed to meet this objective, subject to approval by the IE. The goal is to properly train workers who will be responsible for the monitoring of downed seabirds at facilities, and who may find a downed seabird incidentally while performing other duties.

Each Participant will also produce seabird outreach materials tailored to their customers, guests, or the public who may be present at their facilities during the seabird fallout season. These materials will supplement efforts of Participant staff members by encouraging more “eyes on the ground” to identify and recover downed seabirds. Outreach at facilities can also help increase general awareness of endangered species issues on Kaua‘i.

Outreach materials may include, but are not limited to:

- Making guests / residents aware of the requirement to close blinds/curtains during seabird fallout season, to reduce light attraction caused by interior lights;
- Seabird identification information;
- Location of nearest SOS aid station;
- Instructions for handling seabirds and notifying appropriate staff;
- Coloring books, children's activity books, cartoon depictions, or other means of educating young age groups.

5.3.4 Recovery and Release of Downed Seabirds (Objective 1.E)

5.3.4.1 Recovery of Downed Seabirds

To adequately achieve Objective 1.E, all Participants are required to strive to recover all downed birds at their facilities and to notify the SOS program and IE as soon as possible as to the location, time and condition of all Covered Seabirds found and recovered. This objective requires that PIPs include a formal, organized search strategy to find downed seabirds. Participant Monitoring Plans, included in PIPs are required to include details on the search strategy, including a map of search routes (which should vary), the frequency of searches, likely problem locations and how these locations will be searched, the personnel involved, time required to complete the searches, date(s) on which searching will be conducted and how data will be collected and presented. PIPs will also include specific procedures for handling downed seabirds that are recovered. See *Appendix D: PIP Template*.

5.3.4.2 Rehabilitation and Release of Downed Seabirds

KSHCP Participants must submit downed seabirds to an appropriately permitted rehabilitation facility where the birds can be evaluated, treated as needed, and released if possible. Currently all downed birds on Kaua'i are turned into the SOS program. This program has been in existence since 1978, when the DLNR initiated this community-based conservation effort. Funding to perpetuate the SOS program has come from various sources, but has been primarily funded via Kaua'i Island Utility Cooperative (KIUC) since 2005, initially as part of their Short Term HCP. KIUC has stated their intent to continue funding the SOS program for a portion of their long term HCP (i.e. the KIUC Long Term HCP, in prep). In the event that the SOS program is no longer available, a veterinarian which appropriate permits to handle listed species would be hired by the IE to accomplish this minimization measure (see Section 6.11.12).

The SOS program facility is Federal and State licensed. SOS staff process all downed seabirds and rehabilitate those that require additional care to improve their health and overall condition before release. Downed seabirds are assumed to be able to contribute successfully to population productivity if they are deemed healthy and are successfully released. Through the SOS evaluation process, downed seabirds receive a thorough physical examination including testing of feather waterproofing and treatment of injuries as necessary. In addition, any downed seabirds

found dead at a Participant facility property will be turned into the SOS program for research (autopsy, discovery of cause of death, stomach contents analysis) and record keeping purposes.

5.4 Conservation Measures to Mitigate Unavoidable Impacts (Biological Goal 2)

Mitigation to offset authorized incidental take of the Covered Seabirds consists of conservation activities to increase breeding probability, breeding success and survival of the Covered Seabirds, and provide a net conservation benefit over the 30-year duration of the KSHCP.

To achieve this objective, a seabird preserve (the Kahuama‘a Seabird Preserve) will be created. Conservation actions at this site will include terrestrial predator proof fencing, predator eradication and the implementation of social attraction (playing of Covered Seabird calls to attract birds on the flyway to neighboring colonies to breed inside the protected predator proof fence) as well as feral cat control to prevent the ingress of cats into the Kalalau Valley colonies and to keep them away from the fenceline to prevent reinvasion inside the predator proof fence, and Barn Owl control.

Predation at breeding colonies is a primary threat to the survival of the Covered Seabirds (Ainley et al. 2001, Griesemer and Holmes 2011, Raine et al. 2017c, Raine et al. 2017e). Abating the threat of predation through fencing, predator removal, and social attraction is likely to mitigate for the effects of the take authorized under the KSHCP by increasing the breeding production of the Covered Seabirds from the baseline existing condition. The seabird preserve site is located in the north-west of Kaua‘i, along the rim of the Kalalau Valley, straddling two State parks: Kōke‘e and Napali Coast (**Figure 5-1**). The site is located in a geographic area known as Kahuama‘a Flats (hence the name). Full details on the creation and management of this seabird preserve are included in *Appendix A: Kahuama‘a Seabird Preserve Management Plan*.

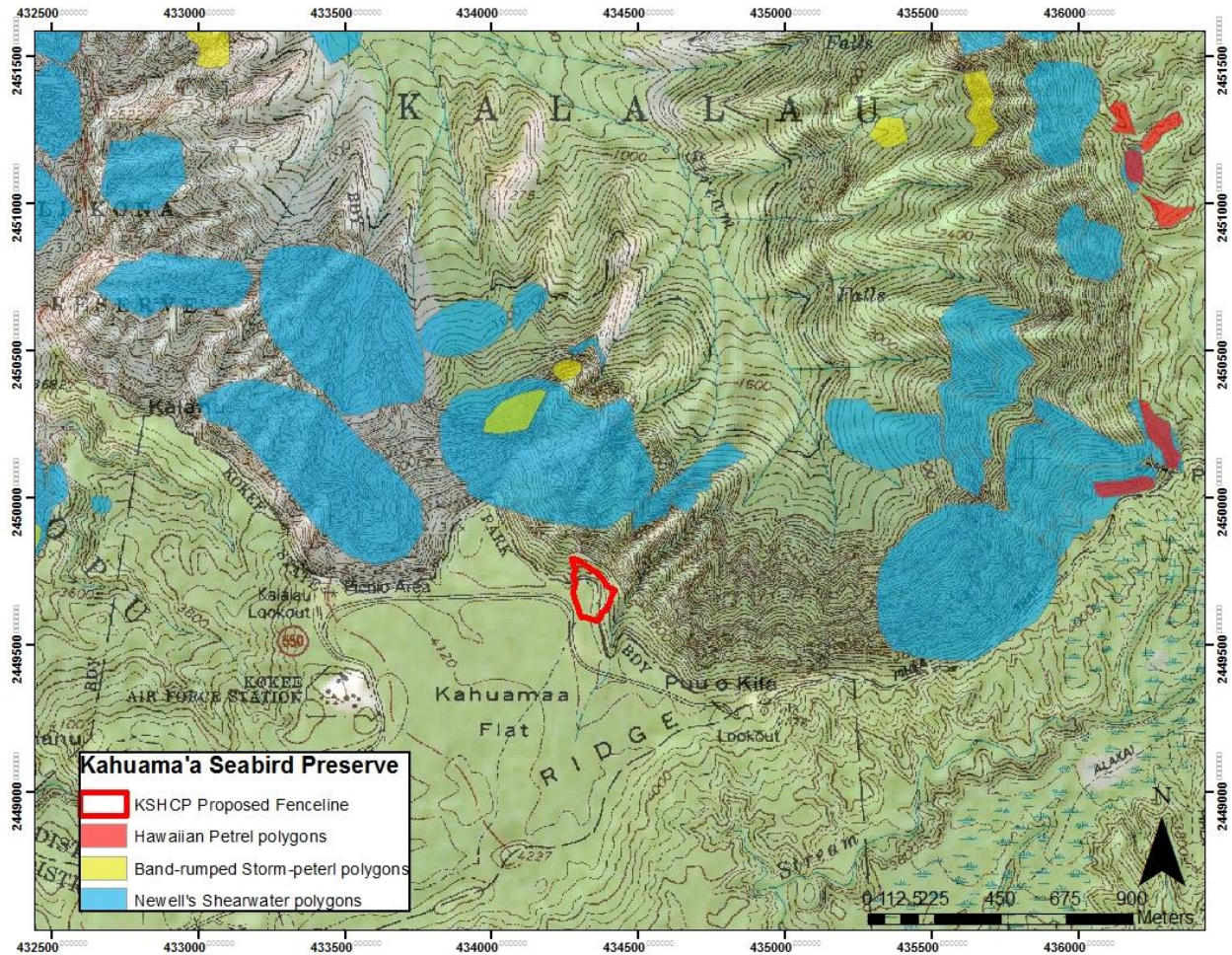


Figure 5-1. Kahuama‘a Seabird Preserve, located on the rim of the Kalalau Valley.

‘A‘o are the primary target of the conservation measures proposed at the Kahuama‘a Seabird preserve. This is because the amount of take likely to be requested by the ITP/ITL Applicants is primarily associated with this species. The lower levels of anticipated take of ‘ua‘u and ‘akē‘akē by Participants will be offset through active predator control for the introduced Barn Owl around the preserve and the Kalalau Valley, where both of these seabird species are known to nest (see **Figure 5-1**).

The selection of a site for a predator proof fence and social attraction project as the primary mitigation strategy to offset take impacts under the KSHCP was based on extensive consultation with conservation agencies and experts in seabird biology using the latest scientific information and analysis. Construction and maintenance of a fenced, predator free enclosure is a preferred conservation measure because it creates a sanctuary for seabird breeding, and is the only assured way to remove all predators. Predator control work alone (without a fence) is not sufficient to prevent depredation of seabird eggs, chicks and adults and guarantee a sufficient level of productivity to offset the take impacts anticipated under the KSHCP.

Table 5-2 lists the selection criteria that were used to evaluate the preserve site, how the site ranked in relation to these criteria, and the data source used for the evaluation. These criteria were adapted from an unpublished social attraction site ranking system that was developed by KESRP and a group of experts working on Hawaiian seabirds in 2014 (A. Raine, 2016, pers. comm.), (Raine et al. 2014). Local experts, such as KESRP Coordinator, fencing experts and other seabird biologists were consulted in the evaluation process. Through this process, it was clear that this site is ideal for the purposes of creating a mitigation site that is likely to contribute to the conservation of ‘a‘o.

Table 5-2. Ranking of mitigation site selection criteria.

Criteria	Kahuama‘a Seabird Preserve ranking	Data Source
Presence of breeding seabirds (at site, adjacent or transiting)	Yes: Adjacent and transiting	KESRP auditory surveys in surrounding area (2011_2016); song meter deployed at site in 2016; KSHCP auditory surveys on site (2016 & 2017)
Habitat Quality	High presence of native plant communities	Site visits; initial plant surveys
Line collision threat	Low	Powerline distribution maps
Light attraction threat	Low	No Light Conservation Zone (NLCZ) mapping (USFWS 2016)
Feasibility of predator removal	High	Expert opinion
Feasibility of fence construction	High	Expert opinion
Socio-political feasibility	High	Low hunting use; State Parks (land owner) willing
Site Access	High	Easy road access to site

The Kahuama‘a Seabird Preserve will enclose 2ha of high quality seabird breeding habitat and provides terrain desirable for nesting colonies in terms of slope, aspect and access. The proposed size of the preserve is consistent with other seabird social attraction sites in Hawai‘i (e.g. Makamaka‘ole on west Maui, Nihoku on Kaua‘i). An enclosure of this size allows for adequate space for both installation of artificial burrows, and also excavation of natural burrows.

A social attraction site has a lag time between the inception of seabird social attraction activities and the successful breeding of seabirds utilizing the site. This is due to several factors, including seabird life history (birds usually begin breeding in year 6), and the time needed for the newly created colony to become established. In order to offset the seabird take impacts that will occur during this lag time, the KSHCP conservation program will provide immediate benefit to the Covered Seabirds via a Barn Owl and feral cat control in the Kalalau Valley.

Barn Owls are a known predator of endangered seabirds on Kaua‘i (Raine et al. 2017e). They are aerial predators with a large home range of up to 31 km² (Martin et al. 2014) which makes multiple seabird colonies vulnerable to predation. In addition, when one Barn Owl is removed from its territory, others quickly move in to occupy the empty territory (G. Reid, 2016, pers. comm.), thus Barn Owl Control needs to be ongoing in any given area. Barn Owl control removal is likely to provide both immediate and ongoing benefit to seabirds that breed inside the fence site, in the area around the fence site, and in surrounding source colonies. In this way, this action is likely to offset the take impacts of ‘ua‘u and ‘akē‘akē and help offset the take impacts of the ‘a‘o covered under the KSHCP.

Feral cat removal is also key to fulfilling Biological Goal 2 as it provides direct benefit to ‘a‘o source populations by removing a significant predator of seabird colonies in the Kalalau Valley. It also provides secondary benefit to the Kahuama‘a Seabird Preserve by reducing the number of feral cats in the vicinity that might attempt to scale the fence.

Barn Owl and feral cat control are components of the KSHCP mitigation package that have the potential to be scaled marginally as an Adaptive Management response (Section 6.9.2). For example, cat trapping lines could be extended into hanging valleys where topography allows or barn owl control could be conducted in smaller adjacent valleys. However, at this time, based on known information on breeding colonies, Covered Seabird life history and habitat, it is not anticipated that expanding predator control within Kalalau Valley alone would provide benefits to completely offset take impacts anticipated under the Plan.

If Covered Activities under an HCP cause take in the form of harm by to permanently altering or destroying the habitat of a listed species, then permanent mitigation must occur to offset this impact. In the case of the KSHCP, the Covered Activities will impact individual birds, not habitat (see Chapter 4). Under these circumstances, the mitigation offset must occur for the duration of the period where the take impacts caused by the Covered Activities are expected, but not into perpetuity. For the KSHCP, it is expected that at the end of the 30 year term the social attraction site will be heavily colonized and productive for seabirds, and will be a desirable ongoing project for either extension of the KSHCP, or as mitigation for a different program that must offset take impacts on the ‘a‘o. In the latter case, implementation of management activities as the social attraction site would then transfer to the appropriate program. However, in the circumstance that there is no funding available to continue management at this site past the current KSHCP permit term, then funds for Changed Circumstances/Adaptive Management will be used for decommissioning of the fence (see Contingency Funding discussion in Section 7.1).

The details on how the fence and social attraction site will be implemented are presented in *Appendix A: Kahuama‘a Seabird Preserve Management Plan*. This plan includes methods and protocols for specific tasks, timelines, work plans, expected staffing requirements, best management practices, as well as monitoring.

5.4.1 Conservation Measure Alternatives Not Selected

A larger predator proof fence enclosure was considered, but modeling results showed that due to expected high density of nesting, within the enclosure that will result from management at the site, even an enclosure larger than 2ha would not reach carrying capacity within the 30 year permit term. Thus expanding the size of the enclosure would not result in higher seabird production (see Discussion in *Appendix C: Social Attraction Estimator Model*).

The potential for a smaller predator proof fence enclosure was also considered, to determine if this could achieve necessary production of Covered Seabirds to offset the impacts of take under the KSHCP for a lower cost. It was determined that a minimum of approximately 2ha was necessary to allow for creation of a productive ‘a‘o colony and management of native vegetation for seabird habitat. Since the fence site needs to include sloped terrain to facilitate seabird takeoff, a 2ha site or larger minimizes the potential for fence collision during takeoffs and landings of seabirds and fledglings. A smaller unit would also not support enough suitable area for the installation of artificial burrows and habitat restoration for breeding birds to naturally create burrows and nest within the enclosure.

Another conservation measure alternative that was considered was translocation of Covered Seabird chicks to “jump start” the Preserve population within the social attraction site. This was considered not feasible for the following reasons. Considering the rarity of the ‘a‘o, the number of active and accessible source burrows is the primary limiting factor for translocation in any given year. Despite ongoing efforts to identify other breeding areas and locate active burrows, there are currently only five stable breeding colonies (Upper Limahuli Preserve, Pohakea, Hanakāpī‘ai, Hanakoa, Kīlauea Point National Wildlife Refuge) considered appropriate as a source for chicks for translocation (due to existing predator control and colony monitoring). All available chicks from these colonies are already being considered for another existing long-term translocation effort (the Nihoku site within Kīlauea Point NWR).

In addition, translocation of chicks requires extensive monitoring of remote colonies to locate nest sites that may be available for chick removal, predator control in these remote locations to offset human traffic during monitoring, and an extended period of care for translocated chicks. All of the above are costly, time intensive, and not likely necessary given the proximity of source seabird colonies to the Kahuama‘a Seabird Preserve. Finally, unlike the Nihoku site, the selected fence enclosure site is located adjacent to the highest concentration of ‘a‘o nesting colonies on the island of Kaua‘i, thus providing high confidence that social attraction alone will attract birds to nest within the fence site. It is anticipated that social attraction at the Preserve will provide beneficial seabird production earlier than translocation would, because it attracts juvenile and breeding birds to the site immediately, instead of waiting five to seven years for the translocated chicks to return to begin prospecting and breeding.

Other conservation measures that were considered but not selected include rodent and feral pig control in colonies; predator proof fencing an existing seabird breeding colony; and contributing

to a large scale watershed protection project with the Kaua'i Watershed Alliance (KWA) that is planning to construct ungulate fencing in areas with active seabird nesting. Each of these options was not selected for multiple reasons. Rodent and feral pig control alone, without a fence, requires constant removal of predators to maintain benefit to breeding seabirds, has a lower nesting productivity than a fenced site and creates long lasting human trails within breeding colonies that may facilitate ongoing and enhanced predator presence. Building a predator proof fence directly around existing seabird colonies would provide immediate benefits, however most of the seabird nesting colonies that remain on Kaua'i are in areas that are difficult to access, are in terrain where fencing is not feasible, or are already targeted for other fencing projects. Contributing to the KWA fencing program was considered infeasible because it (1) targets only removal of ungulates, and does not address feral cats and rats, and (2) logistically, ungulate removal, would be carried out predominantly in areas with low endangered seabird numbers, and would have been very hard to quantify and monitor.