

Environmental Assessment for Pilot Release of ‘Alalā (*Corvus hawaiiensis*) on East Maui, Hawai‘i



10/16/2023

Prepared jointly by:

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

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawai‘i

Executive Summary

The ‘ālalā or Hawaiian crow (*Corvus hawaiiensis*) is the only native Hawaiian corvid (Corvidae: family of crows, ravens, magpies, and jays) still extant in Hawai‘i and is listed as endangered under the U.S. Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531-1544, 87 Stat. 884) and the Hawai‘i Revised Statutes (Chapter 195D). The ‘ālalā is known historically from the island of Hawai‘i and currently survives only in captivity at two conservation breeding centers, one on Hawai‘i Island and one on east Maui. This environmental assessment (EA) analyzes the impacts of the proposed action to release ‘ālalā on the island of Maui, Hawai‘i. There have been two attempts to release ‘ālalā on Hawai‘i Island. Both failed largely due to predation on released ‘ālalā by ‘io or Hawaiian hawk (*Buteo solitarius*). Montane native forest on east Maui is similar to native forest on Hawai‘i island, except east Maui forest, generally, is wetter, and ‘io are not present on Maui. The proposed action will allow managers to evaluate whether ‘ālalā will breed in wet forest on east Maui and have better survival in habitat absent of ‘io, which fulfills the Hawai‘i Department of Land and Natural Resources (DLNR) and U.S. Fish and Wildlife Service (USFWS) mandates for promoting long term conservation and recovery of the endangered ‘ālalā.

The draft EA analyzes three Action Alternatives, each involving pilot short-term release to east Maui, and a No Action alternative involving continued conservation breeding for release to Hawai‘i island. Two release sites are evaluated for the Action Alternatives: 1) a middle elevation site within the Ko‘olau Gap in Ko‘olau Forest Reserve (Ko‘olau FR) on the north slope of Haleakalā volcano on east Maui, and 2) a middle to high elevation site in Kīpahulu Forest Reserve (Kīpahulu FR) on the southeast slope of east Maui. The two sites, owned and managed by the State of Hawai‘i, are native wet forest and contain many of the same species of native fruiting plants, on which ‘ālalā foraged on Hawai‘i Island. It is expected ‘ālalā would use a maximum area of 2 miles from their release site but spend most of their time within approximately 0.8 miles of their release site. For the Ko‘olau FR site, it is expected ‘ālalā would overlap private lands leased to The Nature Conservancy that are upslope of the proposed release site, and lands to the west owned by East Maui Irrigation Company that are managed for watershed protection. For the Kīpahulu FR site, it is expected ‘ālalā would overlap lands that are owned and managed by Haleakalā National Park to the north and east; Kaupō Ranch, recently sold to Kamehameha Schools, and Nu‘u Mauka Ranch to the west; and Kaupō Homestead lands to the south. Because of ‘ālalā habitat preferences, it is expected ‘ālalā at the Kīpahulu FR proposed release site would not use ranch lands to the west nor fragmented non-native forest to the south of the release site, as observations of ‘ālalā habitat preference on Hawai‘i Island show they are found to use closed canopy native forest primarily.

The EA evaluates direct, indirect, and cumulative impacts to plants and animals; farming and ranching; forestry; geology, soil, water quality and climate; cultural and historic resources; designated wilderness; recreation, hunting and public safety and access, and visitor use and experience; and air quality, scenic resources, and noise. The Preferred Alternative (i.e. proposed action) is to release ‘ālalā only at the Kīpahulu FR proposed release site. This alternative meets the need of assessing if ‘ālalā can survive and breed in wet native forest habitat of east Maui in absence of the threat of ‘io predating ‘ālalā. Based on the analysis in the EA the Preferred Alternative will have no significant environmental impacts.

Table of Contents

● Chapter 1: Purpose and Need	1
1.1 Introduction	1
1.2 Purpose and Need	2
1.3 Scoping/Public Involvement	3
● Chapter 2: Alternatives	3
2.1 Identification of the Alternatives	3
2.2 Alternative 1: No Action Alternative	4
2.3 Alternative 2: Release of ‘Alalā to Ko‘olau Forest Reserve and Kīpahulu Forest Reserve on Maui	4
2.4 Alternative 3: Release of ‘Alalā to only Kīpahulu Forest Reserve on Maui	5
2.5 Alternative 4: Release of ‘Alalā to only Ko‘olau Forest Reserve on Maui	5
2.6 Factors in Common to All Action Alternatives (Alternatives 2, 3, and 4)	5
● Chapter 3: Affected Environment and Environmental Consequences	15
3.1 Plants	16
3.1.1 Environmental Setting	16
3.1.2 Impacts of Proposed Action on Plants	18
3.1.3 Avoidance, Minimization, and Conservation Measures	19
3.1.4 Conclusion	20
3.2 Animals	21
3.2.1 ‘Alalā	21
3.2.1.1 Environmental Setting	21
3.2.1.2 Impacts of Proposed Action on ‘Alalā	22
3.2.1.3 Avoidance, Minimization, and Conservation Measures	26
3.2.1.4 Conclusion	27
3.2.2 Other Listed Animals Species	27
3.2.2.1 Environmental Setting	27
3.2.2.2 Impacts of Proposed Action on Other Listed Animal Species	29
3.2.2.3 Avoidance, Minimization, and Conservation Measures	32
3.2.2.4 Conclusion	34
3.2.3 Other Animal Species	34
3.2.3.1 Forest Birds	34
3.2.3.2 <i>Partulina</i> Tree Snails	34
3.2.3.3 Avoidance, Minimization, and Conservation Measures	36
3.2.3.4 Cumulative effects Plants and Animals	37
3.2.3.5 Conclusion	38
3.3 Farming and Ranching	38
3.3.1 Environmental Setting	38
3.3.2 Impacts of Proposed Action on Farming and Ranching	39
3.3.3 Avoidance, Minimization, and Conservation Measures	40
3.3.4 Conclusion	40
3.4 Forestry	40
3.4.1 Environmental Setting	41
3.4.2 Impacts of Proposed Action on Forestry	41
3.4.3 Avoidance, Minimization, and Conservation Measures	41
3.4.4 Conclusion	41
3.5 Geology, Soil, Water Quality and Climate	42
3.5.1 Environmental Setting	42
3.5.2 Impacts of Proposed Action on Geology, Soil, Water Quality and Climate	42
3.5.3 Avoidance, Minimization, and Conservation Measures	43
3.5.4 Conclusion	44
3.6 Cultural Resources	44
3.6.1 Cultural Resources and Practices	45

3.6.2 Consultation	45
3.6.3 Impacts of Proposed Action on Cultural Resources	46
3.6.4 Avoidance, Minimization, and Conservation Measures	46
3.6.5 Conclusion	47
3.7 Designated Wilderness	48
3.7.1 Environmental Setting	48
3.7.2 Impacts of Proposed Project on Designation Wilderness	50
3.7.3 Avoidance, Minimization, and Conservation Measures	52
3.7.4 Cumulative effects Designated Wilderness	52
3.7.5 Conclusion	52
3.8 Recreation, Hunting, Public Access, and Visitor Use and Experience	53
3.8.1 Environmental Setting	53
3.8.2 Impacts of Proposed Project on Recreation, Hunting, Public Access, and Visitor Use and Experience	53
3.8.3 Avoidance, Minimization, and Conservation Measures	54
3.8.4 Conclusion	54
3.9 Air Quality, and Scenic Resources and Noise	54
3.9.1 Environmental Setting	54
3.9.2 Impacts of Proposed Action on Air Quality, and Scenic Resources and Noise	56
3.9.3 Avoidance, Minimization, and Conservation Measures	57
3.9.4 Conclusion	57
3.10 Cumulative Effects	58
3.11 Required Permits and Approvals and Consistency with Government Plans and Policies	60
3.11.1 List of Required Permits and Approvals	60
3.11.2 Consistency with Government Plans and Policies	60
3.11.2.1 Hawai'i State Plan and Conservation Lands Functional Plan	60
3.11.2.2 Hawai'i State Wildlife Action Plan and 'Alalā Recovery Plan	62
3.11.2.3 County of Maui General Plan	62
● Chapter 4: HRS 343 Anticipated Determination and Findings	64
4.1 Anticipated Determination	64
4.2 Findings and Supporting Reasons	65
● Chapter 5: USFWS, NEPA Anticipated Determination and Findings	67
5.1 Anticipated Determination	67
5.2 Preferred Alternative	67
5.3 Cumulative and Secondary Impacts	73
5.4 Irreversible and Irretrievable commitments of Resources	74
5.5 Unavoidable Adverse Effects	74
Appendix A: References	75
Appendix B: 'Alalā Biology, Life-History Needs, and Background Information	80
Appendix C: Scoping Consultations and Comments Received	86
Appendix D: List of Preparers	91
Appendix E: 'Alalā Release Site Recommendation Letter	93
Appendix F: Maui Nui Planning Group Team Members	95
Appendix G: Tables	96
Appendix H: USFWS Invasive Species Biosecurity Protocols	105
Appendix I: USFWS Avoidance, Minimization, and Conservation Measures for Federally Listed Plants in the Pacific Islands	110
Appendix J: Migratory Bird Treaty Act Nationwide Standard Conservation Measures	114
Appendix K: 'Alalā Conservation Measures	120
Appendix L: NPS Issues and Impact Topics Dismissed from Detailed Analysis	121
Appendix M: Cultural Impacts Analysis	127

List of Figures

Fig. 1: Two proposed release sites on east Maui, major land managers, and helicopter staging and land landing areas.	8
Fig. 2: Two proposed release sites on east Maui and traditional ahupua'a and moku boundaries.	9
Fig. 3: Example of a release aviary.	12
Fig. 4: Conceptual design of 'ālalā release area.	14
Fig. 5: Conceptual design of 'ālalā support camp.	15
Fig. 6: Haleakalā Wilderness map.	49

● Chapter 1: Purpose and Need

1.1 Introduction

The ‘alalā is the only native Hawaiian corvid still in existence in Hawai‘i and is listed as endangered under the U.S. Endangered Species Act of 1973 (ESA; 16 U.S.C. §§ 1531-1544, 87 Stat. 884) and the Hawai‘i Revised Statutes (Chapter 195D). The ‘alalā is endemic to Hawai‘i Island and is currently extinct in the wild. Two conservation breeding facilities in the Hawaiian Islands host a population of approximately 120 birds, as of September 2023. Three conservation translocation attempts were conducted on Hawai‘i Island. However, these were unsuccessful due in part to high predation on ‘alalā by ‘io or Hawaiian hawk (*Buteo solitarius*). During the Hawai‘i Island releases some ‘alalā paired and attempted to breed, but no pairings resulted in young. ‘Io depredated at least one pair-member of a confirmed pair before the pair was able to breed successfully and depredated other breeding age ‘alalā that were in process of pair formation.

Because there are no ‘io on Maui, the island would allow the opportunity to test if released ‘alalā are able to breed successfully in absence of predation on ‘alalā by ‘io. Subfossil remains indicate that corvids were once present on islands of O‘ahu, Maui, and Moloka‘i; Maui had the ‘alalā or a similar species as late as the period of human occupation based on radiocarbon dating of crow subfossil remains from east Maui (James *et al.* 1987, p. 2354; all references are in **Appendix A**). Most remaining forest habitat on east Maui receives substantially greater annual rainfall than habitat ‘alalā used historically on Hawai‘i Island and available area of suitable habitat on Maui is smaller than on Hawai‘i Island. High annual rainfall and smaller area of suitable habitat may be limiting factors for ‘alalā survival and breeding on east Maui.

This environmental assessment (EA) analyzes the impacts of the proposed pilot project to release ‘alalā to determine if habitat is suitable and a breeding population is possible on the island of Maui. The draft EA analyzes Three Action Alternatives, each involving pilot short-term release to east Maui, and a No Action alternative involving continued conservation breeding for release to Hawai‘i Island. Two release sites are evaluated in the Action Alternatives and are described below under *Proposed Release Sites*.

The proposed action is being coordinated between the U.S. Fish and Wildlife Service (USFWS) Pacific Islands Fish and Wildlife Office (PIFWO), the State of Hawai‘i Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW), Haleakalā National Park (HNP) unit of the National Park Service (NPS), the University of Hawai‘i Pacific Cooperative Studies Unit Maui Forest Bird Recovery Project (MFBRP), ‘Alalā Project, and the San Diego Zoo Wildlife Alliance (SDZWA). This EA has been prepared consistent with the National Environmental Policy Act, of 1969, as amended (NEPA), the Hawai‘i Environmental Policy Act (HEPA), and National Historic Preservation Act of 1966, and provides compliance for project implementation on both federal and state lands.

To comply with their respective obligations under NEPA, the Council on Environmental Quality (CEQ) NEPA Regulations (40 CFR 1500-1508), Department of the Interior NEPA Regulations (43 CFR 46), and the Hawai‘i Revised Statutes (HRS) Chapter 343, the USFWS and DLNR are preparing this joint EA to analyze the impacts from releasing the ‘alalā on east Maui. The NEPA and HRS Chapter 343 regulations state that an agency shall prepare an EA for a proposed action that is not likely to have significant effects or when the significance of the effects is unknown. The DLNR and USFWS are joint lead agencies for this EA, and the NPS is a Cooperating Agency.

1.2 Purpose and Need

The purpose of the proposed action is to assess if ‘ālalā can survive and breed in wet native forest habitat of east Maui in absence of the threat of ‘io depredating ‘ālalā. The species needs opportunities to support recovery and conservation by improved understanding of release methods and habitat conditions for ‘ālalā reintroduction and breeding. There have been two attempts to release ‘ālalā on Hawai‘i Island. Both failed largely due to predation on released ‘ālalā by ‘io. Montane native forest on east Maui is similar to montane native forest on Hawai‘i, except east Maui forest generally is wetter. There are no ‘io on Maui. The action proposed is to evaluate whether ‘ālalā will breed on east Maui through a short duration pilot project and evaluate suitability of east Maui as ‘ālalā habitat. Please refer to **Appendix B: ‘Alalā Biology and Historical Background** for comprehensive description of species biology, life history needs, release history, and other pertinent background information.

Conservation planning guidance and documents

The proposed action is consistent with the USFWS mandate for promoting long-term conservation and recovery of the nation’s endangered and threatened species under the Endangered Species Act (ESA) as well as DLNR’s mandate to promote long term conservation and recovery of Hawaii’s endangered and threatened species (Hawai‘i Revised Statutes, Chapter 195D). The proposed action would be completed in compliance with Federal and State policies and the following laws and regulations: NEPA; Executive Order 12372 (Intergovernmental Review of Federal Programs); ESA; HRS 195D; HRS 343; The Wilderness Act (1964, 16 U.S. Code § 1131); and NPS policy.

The Revised USFWS Recovery Plan for the ‘Alalā (*Corvus hawaiiensis*) (USFWS 2009) guides urgent and essential steps in preventing the extinction of the ‘ālalā, while at the same time providing an overarching plan for the species’ eventual recovery. Action 3 in the ‘Alalā Recovery Plan is to “Establish New Populations in Managed Suitable Habitat” including to conduct pilot releases as soon as genetically and demographically redundant birds are available, determine the potential efficacy of behavioral management of juvenile ‘ālalā, optimize aviaries and rearing/socialization techniques to maximize behavioral fitness of selected birds for release, and determine the potential efficacy of different reintroduction approaches. The proposed project is highly consistent with recovery actions in the Revised Recovery Plan for the ‘Alalā.

Hawai‘i’s State Wildlife Action Plan (SWAP) (DLNR 2015) comprehensively reviews the status of the state’s native terrestrial and aquatic species, over 10,000 of which are found nowhere else on earth, and the SWAP presents strategies for long-term conservation of these species and their habitats. ‘Alalā is listed as a Species of Greatest Conservation Need (DLNR 2015) and the former presence and ecological role of ‘ālalā in various areas of Hawai‘i Island is noted throughout the SWAP. Ongoing and future potential conservation actions are discussed, including maintaining and increasing the captive flock without further loss of genetic diversity. Also listed are planned re-introduction sites through coordinated management activities designed to conserve other endangered forest birds on the island of Hawai‘i, including fencing, ungulate and small mammal control, forest restoration, habitat monitoring, and studies of disease and disease vectors. Determining potential reintroduction sites on other islands is listed as a research priority. The proposed project is highly consistent with Hawai‘i’s State Wildlife Action Plan.

1.3 Scoping/Public Involvement

Public involvement is a key component of the NEPA process. In the interest of maintaining strong community engagement while developing this proposal, the 'Alalā Project staff held community meetings in Hāna, Ke'ānae, Kaupō, and Makawao from July to November 2022 for public input on potential release sites and the pilot project. Additional presentations and requests for feedback were given to the following groups throughout 2022: Hawai'i Cattleman's Association, Maui County Farm Bureau, East Maui Watershed Partnership, Mauna Kahālāwai Watershed Partnership, The Nature Conservancy, and Haleakalā National Park. Early in the development of the proposal, leaders of the respective ahupua'a (traditional Hawaiian land subdivisions) were asked to help identify issues and concerns, and a cultural advisory committee was created for that same purpose. Finally, an early consultation letter was distributed to a large group of stakeholders from other agencies, private landowners, special interest groups, and conservation groups in February 2023, and comments received in response to scoping and the early consultation letter are in **Appendix C**. The issues analyzed in Chapter 3 include all concerns regarding potential effects of 'alalā releases voiced during those interactions. A complete list of persons and agencies consulted, and List of Preparers of this document are in **Appendix D**. The agencies will include copies of all written comments received in response to the Draft EA during the 30-day comment period as well as the agencies' responses to substantive comments.

● Chapter 2: Alternatives

2.1 Identification of the Alternatives

This section of the EA describes the activities that would be implemented under each of the four alternatives being considered. Alternative 1 is the No Action Alternative. Alternatives 2 through 4 are the Action Alternatives and identical in methodology, differing only in location. Also discussed are other alternatives that were identified but dismissed from further consideration. During initial scoping, a total of eight sites, two on Moloka'i, one on west Maui, and five on east Maui were identified as potential release sites. These sites were narrowed down to two feasible sites on east Maui for more detailed evaluation based on habitat quality, area of suitable habitat, and other factors. **Appendix E**: 'Alalā Release Site Recommendation Letter, describes the scoping process undertaken by the 'Alalā Maui Nui Planning Group (membership is listed in **Appendix F**) to identify the most favorable sites to recommend to agency leadership for more detailed evaluation.

Alternatives Considered but Dismissed from Further Consideration

Alternatives were developed based on the best available scientific data and applicable conservation principles. Early in the alternatives' development process, the following possible release sites were considered but were ultimately eliminated for the reasons provided. The locations of potential release sites were evaluated, but were dismissed from further consideration due to technical, environmental or economic infeasibility or because they did not meet the purpose and need of the proposed action.

Other Islands. Previous 'alalā recovery efforts focused on Hawai'i Island; however, high predation by 'io identified a need for further investigations into 'io life history prior to additional releases on Hawai'i Island. Better understanding of 'io habitat preferences, seasonal movements, and habitat use and territorial behavior during breeding will help identify locations on Hawai'i Island where potential conflict between 'io and 'alalā are reduced or can be minimized. Release on Kaua'i was not considered because there are no known corvid species to have inhabited Kaua'i. Release on O'ahu was not considered although there are two corvid species known from the paleontological record to have lived

on O‘ahu (*Corvus impluviatus* and *C. viriosus*) (James and Olson 1991, pp. 11-22) they are different species than the ‘ālalā, and O‘ahu today lacks sufficient suitable habitat for ‘ālalā. Two sites on Moloka‘i were initially considered (Pu‘u Ali‘i Natural Area Reserve and Kamakou Preserve); however, the expense and logistics of supporting and monitoring released birds on an island with no contracting helicopter company, limited stores for supplies, and no captive care facility were greater than the project was able to support at this time. Furthermore, the only remains of a corvid found on Moloka‘i are from a different species than ‘ālalā (James and Olson 1991, pp. 11-22; Fleisher 2003, entire). The species of corvid on Maui, from subfossils on the southwest slope of Haleakalā Volcano, is either ‘ālalā or a very closely related species (James *et al.* 1987, p. 2354; James and Olson 1991, pp. 11-22; Fleischer *et al.* 2003).

Other Sites on Maui. Five other sites on Maui were initially considered for ‘ālalā release [Olowalu section of West Maui Forest Reserve (Olowalu FR), The Nature Conservancy's (TNC) Waikamoi Preserve, northwestern Ko‘olau Forest Reserve, Nakula Natural Area Reserve (Nakula NAR), and lower Hanawī Natural Area Reserve (Hanawī NAR)]. These sites were not considered further for several reasons. The Olowalu FR was not considered because the small area of suitable forest and the very steep topography would make releasing and tracking ‘ālalā extremely difficult. The TNC's Waikamoi Preserve was dismissed from consideration due to the further complexities of performing releases on private lands as compared to state lands. Nakula NAR and West Maui FR are significantly farther from the largest patch of contiguous native forest on Maui than the proposed action sites. Nakula NAR is smaller than the proposed action sites, and likely lacks sufficient year-round food resources (Price *et al.* 2022). Average annual rainfall at Hanawī NAR was considered to be too high and greatly outside precipitation amounts for the historic range of ‘ālalā. Northwestern Ko‘olau FR lacked sufficient tree canopy to provide key nesting trees. We may consider these sites again for potential future releases after we gain more information about how ‘ālalā use forests on Maui absent the threat from ‘io.

2.2 Alternative 1: No Action Alternative

‘Ālalā would not be released on Maui under the No Action alternative. Current management would continue, including conservation breeding at the two conservation breeding facilities operated by the SDZWA and continued research for ‘ālalā release on Hawai‘i Island. Under the No Action alternative, captive ‘ālalā are expected to continue to lose their wild traits and ability to persist in the wild, and conservation breeding centers would continue to face problems of limited aviary space for ‘ālalā.

‘Ālalā are important seed dispersers for native fruiting plants, carrying fruits and transporting seeds in the gut, and can consume larger native fruits, including from the genus *Pittosporum*. Seed germination for some native plants in the genera *Clermontia* and *Pittosporum* is improved when fruits are eaten by ‘ālalā (Culliney *et al.* 2012, p. 1729). ‘Ālalā or a crow species very similar existed on Maui into the era of human occupation providing these ecosystem services (James *et al.* 1987, p. 2354). If no action is taken ‘ālalā will not contribute to the potential for enhanced dispersal of larger seeds and improved seed germination of native plants on east Maui.

Under this alternative, the agencies will be limited in being able to improve their understanding of release methods and habitat conditions for ‘ālalā reintroduction and breeding in the wild.

2.3 Alternative 2: Release of ‘Ālalā to Ko‘olau Forest Reserve and Kīpahulu Forest Reserve on Maui

Alternative 2 would release ‘ālalā within both the middle elevation area of Ko‘olau Gap in Ko‘olau

Forest Reserve, “Ko’olau FR,” and the Healani section of Kīpahulu Forest Reserve, “Kīpahulu FR” (Figs. 1 and 2). The analysis area for Alternatives 2, 3, and 4 is defined by the number of ‘alalā that would be released at a given site and the total area that ‘alalā are expected to utilize on a regular basis during the entirety of the proposed pilot project. Activities would occur as described below in section 2.6. Factors in Common To All Action Alternatives.

Descriptions of the individual Kīpahulu and Ko’olau proposed release sites are under Alternative 3 and Alternative 4, below.

2.4 Alternative 3: Release of ‘Alalā to only Kīpahulu Forest Reserve on Maui (Preferred Alternative)

The Kīpahulu proposed release site is located on the southeast slope of Haleakalā volcano on east Maui at approximately 5,000 ft elevation in Kīpahulu Forest Reserve (Kīpahulu FR) and is managed by DLNR DOFAW (Fig. 1). This site is immediately adjacent to Haleakalā National Park. The site is protected from ungulate intrusion by an upslope ungulate exclusion fence however ungulates can access the area from downslope. The proposed release site has several possible helicopter landing zones (LZs) but no permanent camp sites and it is likely a permanent camp would need to be established to better meet project goals. The site has adequate cellular connectivity to be able to monitor released ‘alalā via radio and satellite telemetry transmitters affixed to each released bird. Ongoing management actions at the Kīpahulu proposed release site include ungulate control, control of invasive introduced plants, forest bird surveys, and planting and monitoring of listed plants. Alternative 3 would implement a pilot ‘alalā release to Kīpahulu Forest Reserve only (Kīpahulu release site, Figs. 1 and 2). Activities would occur as described below in section 2.6, Factors In Common To All Action Alternatives

2.5 Alternative 4: Release of ‘alalā to only Ko’olau Forest Reserve on Maui

The Ko’olau proposed release site is located on the north slope of Haleakalā volcano on east Maui at approximately 3,000 ft elevation in Ko’olau Forest Reserve (Ko’olau FR) and is managed by DLNR DOFAW (Fig. 1). The site is protected from ungulate intrusion by two ungulate exclusion fences, one at approximately 2,700 ft elevation and the other at approximately 6,000 ft elevation and is protected on the east and west by steep cliffs that prevent ungulate ingress to the site from these directions. The site has an existing trail network used primarily for management and research. There are two helicopter landing sites near the lower elevation fence at the proposed Ko’olau release site and two remote camping sites used for conservation resource management. Each camping site has a small cabin and cleared areas to pitch tents and other structures needed to support management activities including a composting latrine. The site has adequate cellular connectivity to interface via radio and satellite telemetry transmitters affixed to each released bird. Ongoing management actions at the Ko’olau site include ungulate control, control of invasive non-native plants, forest bird surveys, and outplanting and monitoring listed plants. Alternative 4 would implement the proposed pilot ‘alalā release to Ko’olau Forest Reserve only (Ko’olau release site, Figs. 1 and 2). Activities would occur as described below in section 2.6, Factors in Common To All Action Alternatives.

2.6 Factors in Common to All Action Alternatives (Alternatives 2, 3, and 4)

Release to the wild of paired adult ‘alalā that have bred and fledged young in captivity has not been attempted and is considered as a release strategy under Alternatives 2, 3, and 4. Release of breeding pairs is a method that has the potential to accelerate establishment of breeding populations of ‘alalā in the wild by bypassing the roughly 2-3 year time period for juveniles (3-9 month old birds) to grow to maturity, pair, and breed. During the breeding season adult pairs will not tolerate the presence of other pairs, and unpaired birds in their breeding territory. Alternative 2, which proposes two release

sites, would enable the release of juvenile ‘ālalā at one proposed release site (a known successful release strategy) and between 2 and 3 breeding pairs at the other proposed release site, which would be pilot but could lead to quicker breeding success and the locations would not overlap.

Analysis area

The agencies identified the analysis area by incorporating ‘ālalā behavior data from past releases on Hawai‘i island. Past cohorts (groups of released birds) have quickly established at release sites, and it is expected that future cohorts are likely to remain at release sites as long as supplemental food is available. During releases from 1997-1999 at Pu‘u Maka‘ala Natural Area Reserve (Pu‘u Maka‘ala NAR), on the east slope of Mauna Loa Volcano, Hawai‘i Island, all of which included supplemental feeding, the mean core home ranges of established territorial pairs were estimated to be 150 acres, while non-territorial birds had mean ranges of 212 acres. However, ‘ālalā overall space use was larger, with data suggesting a mean cumulative area of 1,350 acres used by non-territorial birds in 2017/2018 (Smetzer *et al.* 2021, entire). We anticipate birds released on Maui would use the area within a 0.8-mile radius from their release aviary and spend approximately 95% of their time in this area. Occasionally ‘ālalā flew up to 1.7 - 2.5 miles from release sites (mean = 2.04 miles) (Smetzer *et al.* 2021, p. 4). The duration of these long-distance exploratory trips generally was one to a few days and the birds returned to the area near their release site. We expect ‘ālalā to spend approximately 5% of their time within this larger radius from the release site. Should supplemental feeding end, some expansion of their core home range is expected. In comparison, estimates of wild ‘ālalā home ranges varied from 250–3,600 acres, depending on the decade, study effort, and status of the population (DLNR/USFWS 1999, p. 4; Banko *et al.* 2002, p. 10). Space use within these areas is not likely to be homogeneous over space and time, since ‘ālalā have previously been documented avoiding crossing large open fragments of habitat (DLNR/USFWS 1999, p. 5) and have shown preference for closed canopy habitat (Greggor *et al.* in review). These preferences may have been driven by predation pressure, and whether ‘ālalā will retain them in the absence of ‘io is unknown. In addition to the continuation of conservation breeding activities and planning for future Hawai‘i Island releases, Action Alternatives 2, 3, and 4, include releasing ‘ālalā in one or both release sites in State Forest Reserves within east Maui. Specific release location maps are retained by the agencies in the decision file but are not included in the EA to protect sensitive ‘ālalā habitat.

The spatial area of analysis for this project considers two generalized types of impacts. *Human impacts* are anticipated to be those from humans that could result from supporting and monitoring released birds and impacts from helicopter support. *‘Ālalā impacts* are anticipated to be those from ‘ālalā that could result from the birds’ interactions with the environment. The spatial area considered in analysis of human impacts is directly within the release area, containing infrastructure, supplemental feeders, and traps for predator control. This human impact area is within the estimated range of released ‘ālalā and is approximately 250 acres in size, with the release aviary as the center. The spatial area considered in analysis of the primary ‘ālalā impacts is 1,350 acres (area within a 0.8-mile radius from the release aviary) and is the area it is expected ‘ālalā to spend most of their time. Lower frequency of ‘ālalā impacts is expected for the area from 0.8 miles to 2.04 miles of the release aviary, an area of 7,017 acres. Therefore, the area of human impact for Alternatives 3 and 4, each would be 250 acres, and areas for primary and low frequency ‘ālalā impacts would be approximately 1,350 acres and 7,017 acres, respectively. Considering the two proposed release sites together, the total human impact area for Alternative 2 would be roughly 500 acres and the primary and low frequency ‘ālalā impact areas would be approximately 2,700 acres and 14,034 acres, respectively. Impacts of the proposed project to helibases outside the above described analysis area are also considered as possible helicopter staging areas (Fig. 1).

Regardless of whether adults or juveniles are released, the spatial extent of ‘ālalā movement will likely differ across the phases of the release. In the first couple of weeks post-release, it is not unusual for individual birds to disperse beyond 0.8 miles, become lost, and disappear. These early dispersal events can be unpredictable but have involved a small percentage of released juvenile birds in past releases (6.7%, Smetzer *et. al.* 2021). All birds that dispersed widely right after release during previous releases and did not return to the release area within a matter of days were searched for intensively over an area approximately 3 miles radius from their release site. If the living bird was not found and a carcass was not recovered the bird was presumed to have died. This is because released birds that dispersed widely shortly after release had not yet learned to forage sufficiently on wild foods to avoid starvation. During proposed releases, if released birds disperse widely immediately after release, these birds would be searched for and recaptured over a wide area. However, if they disappear and cannot be recovered using the search methods described, see Section 2.6A at page 10, the reasonable conclusion is the bird(s) would be presumed to have died.

Because of the homogenous forest habitat at the Ko‘olau proposed release site, it is expected ‘ālalā will use the entire area within 0.8 miles of the release aviary on a frequent basis. The area ‘ālalā are expected to use is mostly within Ko‘olau FR and a small area of Waikamoi Preserve upslope from Ko‘olau FR. For the Kīpahulu proposed release site it is not expected released birds will use habitat areas to the west and south greater than 0.8 miles from the release aviary that are grassland, but it is expected that they will enter wet forest to the north owned and managed by Haleakalā National Park. Kaupō Ranch and Nu‘u Mauka Ranch, to the west, is grassland and shrubland with few trees. It is not expected ‘ālalā will use this area as virtually all observations of ‘ālalā on Hawai‘i Island have been in forest habitat. It also is not expected ‘ālalā will use fragmented habitat and Homestead lands to the south, based on observations of ‘ālalā on Hawai‘i Island choosing not to cross open areas and their preference for closed canopy forest habitat.

To access the release sites, field teams would need to use one of several temporary helibases to stage for each helicopter operation. The temporary helibases likely to be used for the release sites are shown in Figure 1. Temporary helibases are accessible by ground vehicles and are used to stage personnel and gear to reduce the flight time for a helicopter operation requiring multiple legs, as is typical. These helibases are located on private ranchland (Haleakala Ranch and Kaupō Ranch), State of Hawai‘i, and Haleakalā National Park property. These helibases are regularly used for conservation and management flights and permission would be sought and is regularly granted for the use of these areas for each operation.

Proposed activities for all Action Alternatives (Alternatives 2, 3, and 4) include:

- A. Each release area would receive two to three pairs of adults already demonstrating breeding behavior in captivity or approximately five to seven juvenile birds. Although all efforts would be made to anticipate and address mortality factors, because there is the potential for some released birds to die during the first weeks and months after release, the project may need to release small numbers of birds during years two and three of the proposed release. Numbers of ‘ālalā at a given release site, however, at any time during the proposed release would not exceed 15 birds, although group size of any single release cohort would be approximately six birds. The maximum number of birds potentially

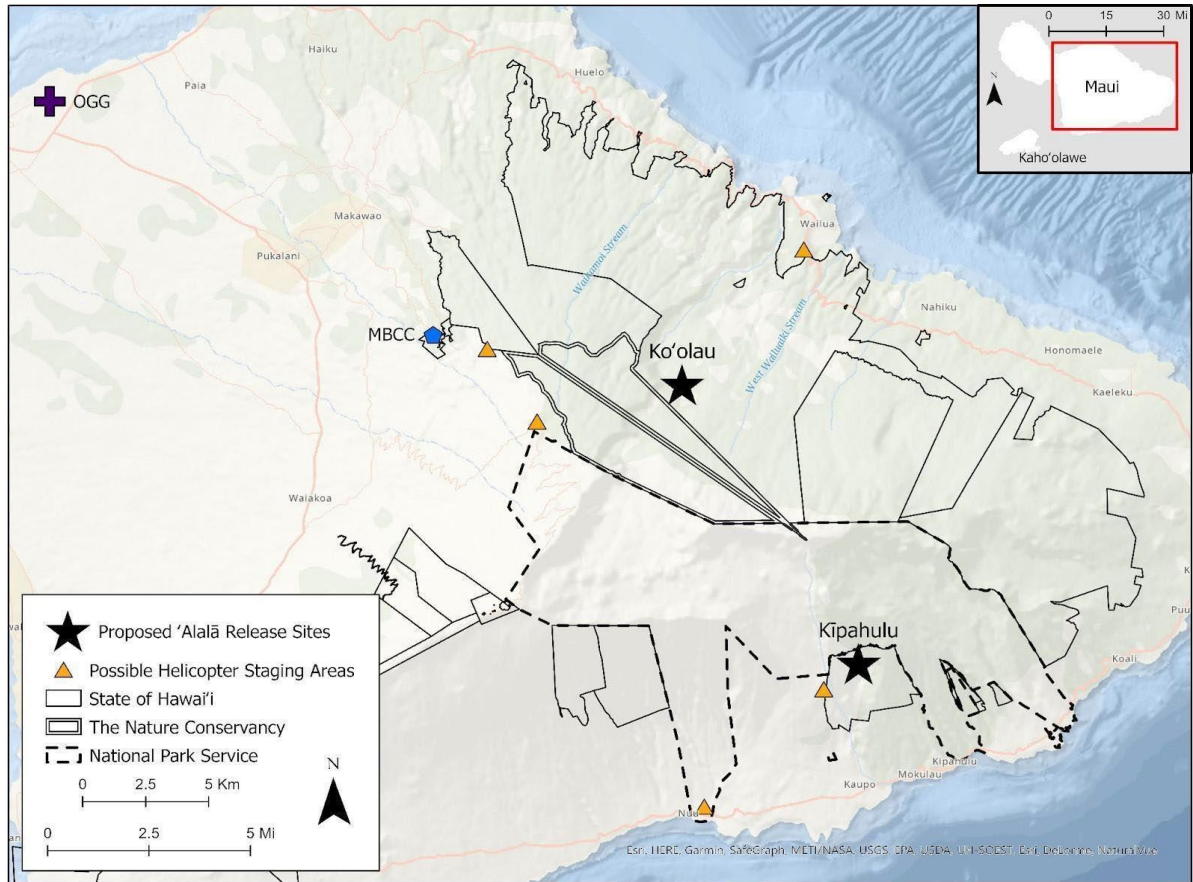


Figure 1. Two proposed release sites on east Maui. Also shown are the main heliport at Kahului airport (OGG) and possible staging areas for crew and cargo helicopter operations into the proposed release sites. Maui Bird Conservation Center (MBCC) managed by San Diego Zoo Global is where release cohorts would be housed prior to release.

released over the course the project is 15 birds at a given release site. These additional birds would be released only to replace birds that had died. Young produced by birds in the wild would increase the number of birds above the approximately six birds at a given release site. The age of young released birds could range anywhere from 3-20 months old, and cohorts would be composed of similarly aged birds within three to six months of one another in age. If the number of surviving birds in the juvenile cohorts drops below four, or if the gender ratio of the surviving birds in either scenario is not conducive to mating pairs, more birds may be released. 'Alalā release cohorts would be composed only of individuals that are already well represented genetically by related individuals in the captive flock. The project would strive to not release birds during December, January, and February, the coldest and wettest months on Maui, to minimize exposure to harsh conditions as they adapt to their new environment immediately post release. Adult pairs would not be released during the breeding season (April-July) unless the pair had a failed nesting attempt that year or was otherwise not caring for young or in the process of nesting.

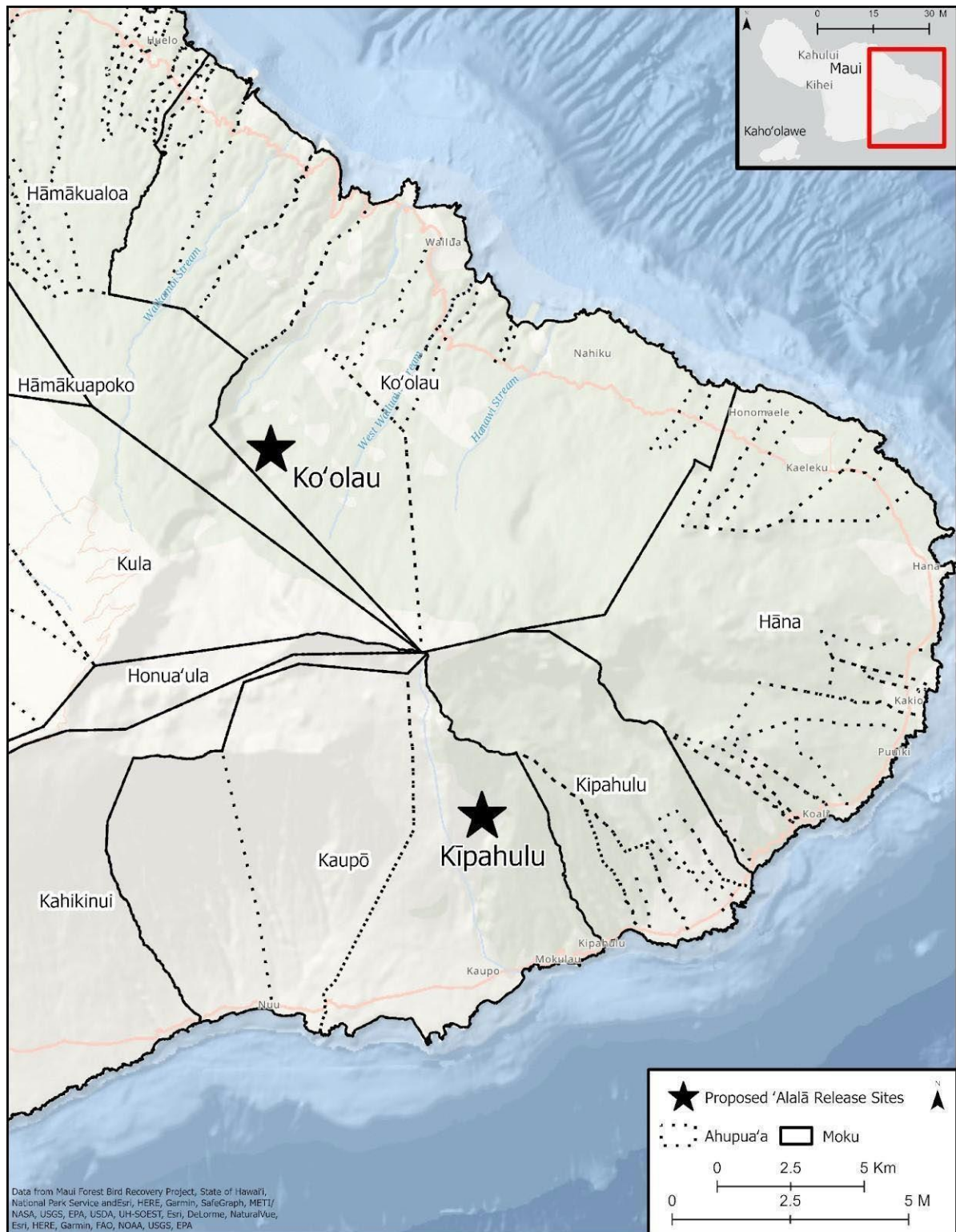


Figure 2. Two proposed release sites on east Maui and traditional ahupua'a and moku (land division) boundaries. Ahupua'a labeled.

All 'ālalā to be released would be fitted with satellite locators and/or VHF radio trackers that transmit the birds' locations. These tracking devices would be used throughout the entire time of the proposed project to monitor birds' locations and locate birds that are potentially breeding, in need of assistance, or that may need to be removed (recaptured) if they are found to be negatively affecting other resources. The preferred tracker type that would be used is a solar powered satellite tag with a built-in rechargeable battery. The advantage of satellite trackers is that birds can be monitored remotely (without personnel having to be in the field) and satellite locators have greater range than VHF radio trackers. This type of unit has been used on other species of birds where it has lasted up to several years, however the longevity of the tag on 'ālalā is unknown. Longevity would depend on whether feathers may cover a portion of the solar panels, or whether tags sustain any damage (from beaks, the environment, etc.), and therefore VHF radio trackers are also planned to be used. Personnel were able to track birds throughout the entirety of previous releases using VHF radio trackers alone, even after some trackers failed, in part because released 'ālalā had either established territories or exhibited predictable patterns of movements over the landscape. Birds would also receive "recall" training, a type of training where they would be taught to associate a specific sound with presentation of food. This training can be used to draw the birds into recapture set ups, a mist net, for example. The project would be able to attach a new transmitter, should a bird's transmitter fail, by recapturing birds with a mist net, in a release aviary, using foot-catch noose-carpets, or other recapture methods. Because 'ālalā are social and are often near one another, should a tracker on one bird fail, that bird would likely be able to be located and targeted for recapture to replace the failed tracker by following the tracker signals of another 'ālalā.

If 'ālalā successfully breed, offspring would be captured and given trackers to monitor their movements and habitat use. If successful parents are receiving supplemental food at the time young are fledged, and the young are also using supplemental feeders, the project would provide recall training to fledged young at this time to facilitate their recapture at the end of the project. Satellite and VHF trackers would allow personnel to track birds' movements and locations and target birds for recapture at the end of the 5-year project. Recall training would be used to facilitate recapture of released birds by attracting them to recapture setups. Recapturing birds at the end of the study could take up to 4 weeks based on experiences recapturing the remaining 5 'ālalā at the end of the Pu'u Maka'ala release, and the 6 remaining 'ālalā at the end of the Hawai'i Island Kona release. In both instances recapture took 4 weeks. However, if 'ālalā are at both proposed release sites at the end of the pilot project, recapture may need to be sequential, thereby requiring approximately 8 weeks to retrieve all 'ālalā from the two proposed release sites. There were a few instances during the Pu'u Maka'ala release when birds dispersed widely immediately or very shortly after their release, and the tracker signal was lost. In these instances, because birds had not yet learned to forage on their own and could not yet survive on their own, and carcasses were not recovered, the birds were presumed to have died.

A temporary release aviary would be constructed within reasonable walking distance from the support camp (<0.65 miles) within each release area. A suitable site would be a forest clearing a minimum of 20 X 40 feet on level ground. Sites not requiring tree removal would be prioritized. Materials would be flown in by helicopter sling loads by trained personnel and removed after project completion. Construction would be similar to those used at Pu'u Maka'ala (Fig. 3) and would maximize portability. Aviaries would be constructed of material that excludes predators from access and would enclose native plants as feasible. There have been no documented reports of entrapment of non-target animals in a release aviary. Some 'ālalā released in Kona in

the 1990's were thought to have contracted avian malaria while in the release aviary, but all birds recovered (USFWS 2009, p. I-21). No mosquito netting was used on release aviaries in the 1990's and it is thought if 'ālalā had contracted avian disease that their chance of survival increased with access to a supportive environment. For proposed releases on Maui, no mosquito netting would be placed over release aviaries. All materials for construction of release aviaries would be removed at the end of the pilot project.

- B. Lethal predator control for rats (*Rattus* spp.), feral cats (*Felis catus*), and mongooses (*Herpestes auropunctatus*) would be performed in the immediate vicinity of the release aviary, supplemental feeders, and nests where feasible to reduce direct depredation of 'ālalā and 'ālalā eggs as well as minimize exposure to diseases spread by these non-native mammals. Predator control would begin 3-4 months prior to the release of each cohort in their release site with the intention of reducing the predator population prior to release when birds are likely most vulnerable. Reduction in predator abundance would be assessed using tracking tunnels for rodents and analysis of change in capture rates, and possibly other methods. Predator control would use no motorized equipment other than helicopter transport of personnel and equipment to already established landing zones within proposed release areas. The release aviary and feeding stations would be approximately 0.3-0.5 miles from NPS lands. Predator control would be conducted near the release aviary and feeding stations and would not be prioritized on NPS lands for release but could be necessary on NPS lands in the event of 'ālalā nesting within the HNP.

Traps used could be automatic self-resetting traps such as the GoodNature A24 or other mechanical traps requiring manual reset such as DOC250s or body-grip traps. All traps used would have excluder devices to prevent accidental trapping of 'ālalā or other non-target animals. Traps would primarily be placed along existing trails and frequency of checks would be balanced between the need for effective trapping with the goal of reducing unnecessary human impacts on the ground (trampling of plants, clearing trails, erosion from foot traffic). Traps around feeders and nests would be checked during each visit to supply food or monitor. Traps on trails and fence lines would be checked between one and four times every 1-2 months. Carcasses would be removed and dispersed by discarding in tall vegetation away from traps to reduce the probability of 'ālalā scavenging carcasses and associating traps with a food reward.

- C. Each release cohort would be supplementally fed for a period from 6 months to 2 years following release at each site to ease the transition to life in the wild. During the early stages of the release, feeders would be supplemented with food daily and during later phases of the release, feeders would be supplemented weekly. There may be several weeks when the feeders are not supplemented during weaning or certain foods are limited to encourage foraging on wild foods. Feeders may be relocated within the analysis area to facilitate bird dispersal over time. Adult pairs actively breeding may also be fed within their territory to increase survival of offspring to fledgling stage through the duration of the project, pending project resources, access, and perceived need. Feeders would be composed either of a tripod structure supporting a pole to which the feeder is attached, or a pole driven into the ground, to which the feeder is attached. If a pair is found nesting on NPS, private or other management lands, the 'Alalā Project would ask permission for temporary placement of a supplemental feeder in the vicinity of the nest for a period of 3-6 months, depending upon project resources and perceived need.



Figure 3. Example of a release aviary. A temporary release aviary would be constructed in a forest opening similar to the one depicted here from a previous release in Pu'u Maka'ala NAR. All material would be removed after the release.

Supplemental food would be prepared at the field camp and provided in small moveable hoppers within the clearing containing the release aviary. Supplemental food would transition from fresh fruit and protein rich items resembling their diet in captivity to dry, inert pellets over time. This dietary change would allow automated delivery by custom food hoppers and, in being less desirable to 'ālalā, encourage foraging for wild foods. All food provided to 'ālalā would be subject to strict bio-control measures to limit the likelihood of non-native plant establishment due to project activities. Food would only be provided in a container that minimizes the ability for rats or other non-target species (feral cats and mongoose) to access food, and traps would also be located near feeders as an additional control.

- D. 'Alalā would be monitored using a combination of remote technology and in-person observations with the goal of providing information to improve management of this population and inform future releases on both Maui and Hawai'i Islands. Movements and survival would be monitored via radio and/or satellite tags affixed to each released bird. A monitoring plan is being created by the 'Alalā Maui Nui Planning Group and will be reviewed by global experts in conservation translocation and corvid ecology. Daily monitoring of birds by field personnel would occur from the time birds enter a release aviary until 30 days post-release or for the duration of time birds are being fed fresh food daily. After supplemental feeding switches to automated feeders and up to 6 months post-release, birds would be monitored in the field for two weeks each month. For 6 months to 1-year post-release, birds would be monitored in the

field for one week per month. From 1 year to up to three years, attempts would be made to observe birds in person once every 2-3 months. The above are guidelines based on previous experience releasing 'ālalā but may need to be modified to adapt to specific conditions at proposed release sites. Remote monitoring via satellite telemetry and VHF radio transmitters would occur for the duration of the pilot project. Tracker signals become weaker towards the end of the battery life and sometimes a tracker will fail suddenly. Birds would be recaptured and refitted with satellite telemetry monitoring devices and/or VHF radio transmitters prior to battery or device failure and in the event of sudden tracker failure to ensure all released birds are monitored continuously for the duration of the proposed project. Because 'ālalā are social birds and often congregate together, a bird with a failed tracker very likely would be located by tracking other 'ālalā whose transmitters are still functioning. Additionally, monitoring of supplemental feeders and area searches performed by trained personnel would be employed to locate a bird with a failed tracker.

If remote monitoring indicated adult pair(s) localize during the breeding season (March – July), attempts would be made to identify possible nests, install predator control, and monitor the outcome of nesting attempts through regular visits. Predator control or other deterrents would only be installed in a manner that does not disturb nesting, and only if approved by the land manager. Trackers would be equipped with a mortality signal indicator. If project personnel detected a mortality signal on a tracking unit, carcass recovery actions would be initiated, and necropsies would be conducted on any recovered carcasses in a professional laboratory to determine the likely cause of death. A request for permission to enter onto lands not owned by the State to install predator control around nests or search for missing birds would be made to the appropriate landowner. The 'Alalā Project would not enter onto public or private lands without permission.

- E. Foot traffic would primarily be restricted to an established path between the release aviary, supplemental feeders, and field camps (Fig. 4). Clearing of overhead trees for new trail establishment would be avoided, but understory growth would be cleared to facilitate ease of travel. Vegetation maps with locations of listed plants and rare tree snails would be used to avoid areas with listed plants and rare tree snails during trail creation and all staff would be trained in identification of listed plants and rare tree snails. Staff would be encouraged to focus 'ālalā observations from established trails, with infrequent off-trail movements in the case of carcass recovery, pinpointing the exact location of a new nest and monitoring its outcome, or if an 'ālalā is suspected to need recapture for health or other reasons.
- F. Camp infrastructure would include areas for sleeping, storage for supplies, preparation of human and 'ālalā food, field office work, personal waste, water collection, capture of solar energy, and a helicopter landing zone (Fig. 5). Ko'olau Forest Reserve already has multiple established camps and landing zones within the Ko'olau Gap and this existing infrastructure would be utilized by field staff. Where necessary, improvements would be made to existing camps to facilitate project needs. Kīpahulu Forest Reserve also has one existing camp, but it is likely a new camp would need to be established in an area that can better meet project goals. At the Kīpahulu proposed release site there are several open grassy areas within the reserve where a new camp could be established with few impacts to the surrounding environment. At the end of the pilot project all 'ālalā release infrastructure would be removed including release aviaries, feeding stations, and predator control. It is possible DLNR would want to retain the camp infrastructure (Quonset hut and composting toilet) at the Kīpahulu FR proposed release site.

Although removable, camp infrastructure might stay in place beyond the 5 years of the proposed project if DLNR wishes the camp at the Kīpahulu FR proposed release site to remain. No new camp infrastructure would be built within the NPS boundary.

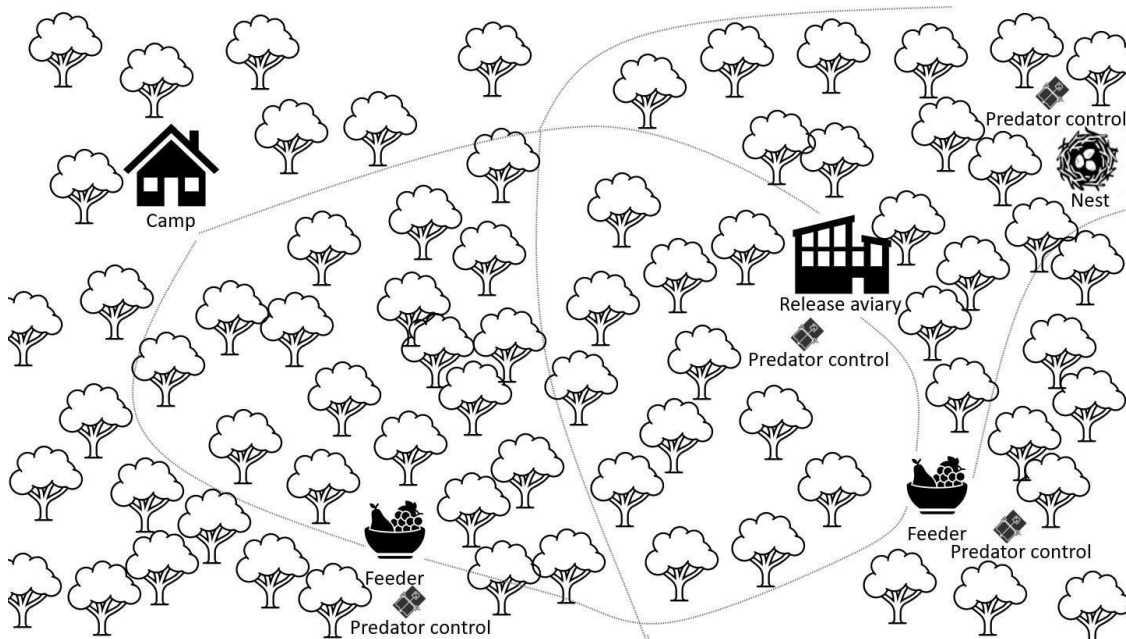


Figure 4. Conceptual design of 'alalā release area. Low-impact trails would be created or improved to facilitate access for monitoring and care with understory vegetation removed but all overhead trees left standing. Invasive mammal predator control would occur around feeders, aviary, and established nests where possible. Diagram does not depict actual location and scale of infrastructure or trail routes. Actual area would be surveyed for sensitive features and avoidance and minimization protocols would be observed.

- G. As these sites are not reasonably reached by ground transport (no roads, more than 8 hours of hiking), all staff, materials for project activities, and personal gear would need to be delivered via helicopters. The estimate of average helicopter flight hours to the two proposed release sites for the proposed pilot project is from 2-24 hours/month, depending upon stage of the release. During the first few months of a release, personnel would be at the release site continuously, requiring a greater number of helicopter flight hours, yet access to the sites may only require biweekly flights. As birds become more independent during later stages of the release and able to forage on wild foods, personnel would not need to be in the field as often. All staff participating in operations would receive proper aviation and safety training. Length of flights and frequency would be reduced by having staff camp multiple nights at the release site and by operating out of a nearby front country staging area (a site accessible by roads with a clear and minimal distance to the landing zone and approved for use by landowners/managers).
- H. Because 'alalā would be monitored closely, the project personnel would be able to determine after 3 years whether released 'alalā are surviving and breeding and if there are any impacts to other conservation resources. At year 3 of the pilot release, the agencies would initiate a reintroduction EA or EIS to evaluate whether to leave 'alalā in the wild on east Maui or to recapture all individuals as evaluated in this EA.

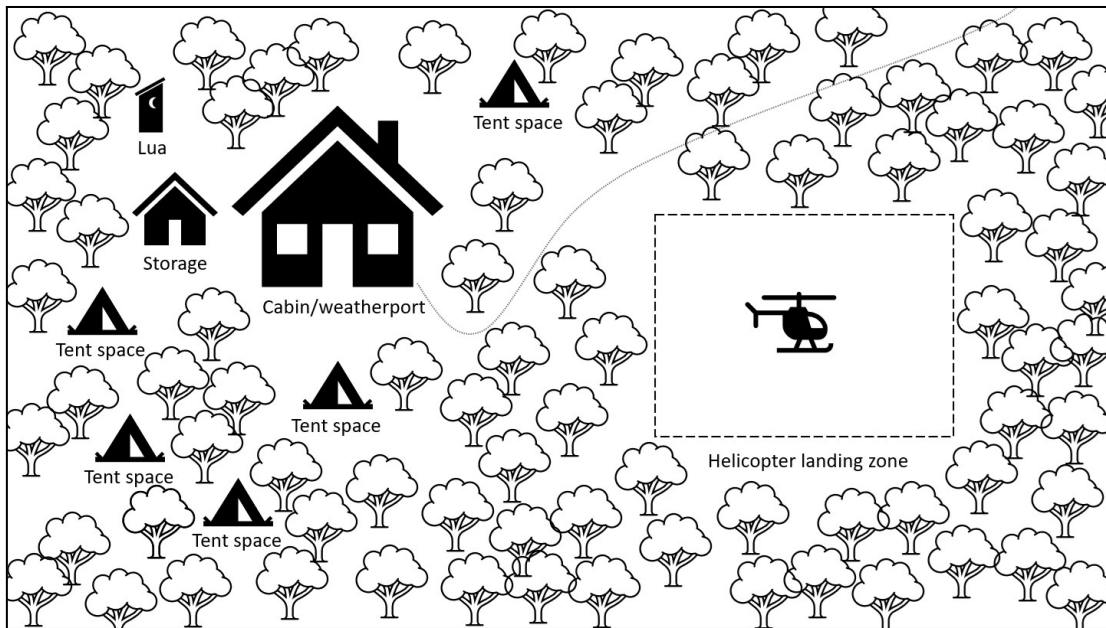


Figure 5. Conceptual design of ‘ālalā support camp. Camp components include a cabin or weatherport for food preparation, field office, and sleeping quarters. An additional storage shed and outhouse would be located nearby. Additional sleeping space would be available in the form of small openings for backcountry-style tents. A solar array and water collection system would be mounted to the storage shed and cabin. All trees would be removed for a helicopter landing zone a minimum of 75 feet x 75 feet in size. Understory vegetation would be cleared for low-impact walking trails between camp and release site. Diagram does not depict actual location and scale of infrastructure. Actual areas would be surveyed for sensitive features and avoidance and minimization protocols would be observed.

- I. At the end of five years, all ‘ālalā on east Maui would be removed from the wild, under the terms of this project. It is expected it would take approximately 8 weeks to recapture all ‘ālalā released on east Maui, and any young, at the end of the proposed project if ‘ālalā are released at both proposed release sites, and approximately 4 weeks to recapture all released ‘ālalā and any young if released at only one proposed release site. These calculations are based on the time required to recapture the 5 ‘ālalā at the end of the Pu‘u Maka‘ala Hawai‘i Island release, and the 6 ‘ālalā at the end of the Kona, Hawai‘i Island release,

● Chapter 3: Affected Environment and Environmental Consequences

This chapter describes those aspects of the biological, physical, and cultural environment that could be affected by the No Action (Alternative 1) and Action Alternatives (Alternatives 2, 3, and 4). The analysis evaluates direct, indirect, and cumulative impacts that would result from the implementation of the alternatives. Analysis of impacts (environmental consequences) assumes a five-year period as all proposed actions would be completed within that time frame. Analysis also assumes the existing conditions of resources, including trends and ongoing and planning actions. The key resources considered are plants; animals; farming and ranching; forestry; geology, soil, water quality and climate; cultural and historic resources; designated wilderness; recreation, hunting and public safety and access, and visitor use and experience; air quality, scenic resources and noise; and cumulative impacts. Impact and resource analysis is followed by a list of required permits and approvals and a discussion of consistency with government plans and policies. Under the no-action alternative, each key resource would remain the same as existing conditions,

including trends and impacts from past, present, and foreseeable planned actions.

When evaluating impacts of the proposed action and alternatives for resources, we consider three areas of impact: 1) a smaller area of 250 acres at each proposed release site where most human activity is planned to occur, 2) and a larger area of 1,350 acres at each proposed release site that 'ālalā are likely to use on a regular basis. Together these are the "core analysis area" of each release site. During the Pu'u Maka'ala release a few 'ālalā occasionally spent a few hours to a few days in habitat greater than 0.8 miles from their release site. The average maximum distance released 'ālalā traveled during the Pu'u Maka'ala release was 2 miles from the release site (Smetzer *et al.* 2021). Therefore, we consider also, 3) impacts by 'ālalā to the area outside the core analysis area, the area within 2 miles of the aviary but outside the 1,350-acre core analysis area. For some impact topics, areas farther than 2 miles from the release aviary are included for specific resources, including helicopter flight corridors to and from proposed release sites and sound impacts from helicopter flights, and forestry and agriculture.

3.1 Plants

3.1.1 Environmental Setting

The vegetation of the northern and eastern slopes of Haleakalā is characterized by mixed native and introduced wet forest at lower elevations, native 'ōhi'a (*Metrosideros polymorpha*) and mixed native 'ōhi'a- and koa (*Acacia koa*) wet forest at middle elevations, and dry pūkiawe (*Leptecophylla tameiameia*) and 'a'ali'i (*Dodonea viscosa*) shrubland at upper elevations. These habitats are home to a wide diversity of animal, plant, and invertebrate species native to the Hawaiian Islands, many of which are found only in east Maui. The forests provide valuable watershed services, helping prevent soil erosion and protect reef areas from soil siltation, supply water for agriculture and other human uses, and afford recreational opportunities. Agencies, organizations, and landowners within the analysis area actively manage conservation resources by fencing and removing feral ungulates, controlling introduced invasive plants, and supporting the survival of native plants, Hawaiian forest birds, and invertebrate species. The annual rainfall at the proposed Ko'olau release site is from 160-200 in/year and at the proposed Kīpahulu release site from 100-180 in/year (Giambelluca *et al.* 2013). The general risk of wildfire at both proposed release sites is very low.

Plant species listed as threatened or endangered receive federal and state protection under the ESA and Chapter 195D, Hawai'i Revised Statutes, respectively, and are characterized as those that are in danger of or area threatened with extinction throughout all or a significant portion of their range. State plant species at risk include species that are not federally, or state listed but are recognized as imperiled or vulnerable by the state. Biologists or land managers have identified these species as important to protect and manage as there are fewer than 50 individuals remaining in the wild. Some plant species at risk may be considered vulnerable to population declines, or extinction, by state or global metrics (e.g., NatureServe Global Conservation Rank), others are lacking enough information to make a status determination.

The proposed release site at Ko'olau (Alternatives 2 and 4) is within a montane wet forest comprised of closed canopy 'ōhi'a forest with native shrub and fern understory and some areas with introduced strawberry guava (*Psidium cattleianum*), Koster's curse (*Miconia hirta*), and Himalayan ginger (*Hedychium gardnerianum*). Native fruiting plants at the proposed release site with fruits eaten by 'ālalā include pūkiawe, 'ōlapa (*Cheirodendron trigynum*), pilo (*Coprosma* spp.), 'ōhelo (*Vaccinium* spp.), kōlea (*Myrsine* spp.), kanawao (*Hydrangea arguta*), 'oha wai (*Clermontia* spp.), hō'awa (*Pittosporum* spp.), and māmakī (*Pipturus albidus*). As shown in Table 1 (**Appendix G**) listed plants

within the analysis area for the proposed Ko'olau release site include *Asplenium peruvianum* var. *insulare*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Cyanea kunthiana*, *Cyanea mceldowneyi*, *Joinvillea ascendens* ssp. *ascendens*, *Melicope ovalis*, *Phyllostegia brevidens*, and *Wikstroemia villosa*.

The proposed release site at Kīpahulu (Alternatives 2 and 3) is located in montane wet forest comprised of mostly closed canopy 'ōhi'a forest with native fern and shrub understory and some areas primarily at lower elevations with introduced strawberry guava, Koster's curse, and Himalayan ginger. Australian tree fern (*Sphaeropteris cooperi*), and non-native grasses are notable in some portions of the Kīpahulu site. Native fruiting plants at the proposed release site with fruits eaten by 'ālalā include pūkiawe, 'ōlapa, pilo, 'ōhelo, kōlea, kanawao, 'oha wai, pa'iniu (*Astelia* spp.), and 'ākala (*Rubus hawaiensis*). Māmaki and hō'awa are also present at the Kīpahulu proposed release site but are less abundant than other native fruiting plants at this site. As shown in Table 1 (**Appendix G**), listed plants in the area of the proposed release site include: *Bidens micrantha* ssp. *kalealaha*, *Calamagrostis expansa*, *Clermontia samuelii* ssp. *samuelii*, *Ctenitis squamigera*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Cyanea horrida*, *Cyanea kunthiana*, *Cyanea maritae*, *Cyrtanda ferripolosa*, *Joinvillea ascendens* ssp. *ascendens*, *Huperzia mannii*, *Microlepia strigosa* var. *mauiensis*, *Nothocestrum latifolium*, *Phyllostegia bracteata*, *Phyllostegia brevidens*, *Phyllostegia haliakalae*, *Plantago princeps*, *Schiedea diffusa* subsp. *diffusa*, and *Wikstroemia villosa*. Seventeen of the listed plants (Alternatives 2, 3, and 4) have designated critical habitat, and areas of designated critical habitat for some plant species overlap portions of the analysis area (**Appendix G**, Table 1). Baseline surveys are planned of introduced and native fruiting plants and other vegetation at both proposed release sites following similar protocols previously used for vegetation surveys at 'ālalā proposed release sites on Hawai'i Island (Price and Jacobi 2007).

The habitat in the vicinity of the temporary helibases to be used for helicopter operations into the release sites are generally heavily impacted by human activities and characterized by non-native vegetation communities. All but one site are within active rangeland for cattle and few to no native plant or animal species occur in the area. No active cattle grazing occurs at the Wailua temporary helibase in lower Ko'olau FR, but the area is also an open grassy field with few native plants or animals in the vicinity.

Current management of listed plants and other native vegetation in the analysis area (2 mile radius of the Ko'olau and Kīpahulu proposed releases sites, release aviaries) and neighboring lands includes protection of individual plants and sensitive habitats by ungulate fencing and ungulate removal. The Plant Extinction Prevention Program (PEPP) and State of Hawai'i Native Ecosystems Protection and Management Program (NEPM) support conservation of listed plants by securing seeds or cuttings (with permission from the State, Federal, or private landowners) for propagation and translocation, survey and monitoring wild populations, outplanting for survival and reproduction, manual and chemical weed control, removing over growing vegetation from translocated plants, rodent and slug control, and establishing new reintroduction sites. To protect native vegetation, DOFAW, East Maui Watershed Partnership, The Nature Conservancy, and Haleakalā National Park control introduced invasive plants, including strawberry guava, kahili ginger, and Australian tree fern by manual removal, biocontrol, and use of herbicides within the analysis and adjacent areas. The Ko'olau proposed release site (Alternatives 2 and 3) is protected by ungulate exclusion fencing and natural barriers from ungulate intrusion. Invasive plant control is conducted within most of this area. The Kīpahulu proposed release site (Alternatives 2 and 4), though fenced in some portions, has presence of feral ungulates throughout the area. Lower elevations of the site have substantial presence of

introduced non-native plants, while upper elevations within Haleakalā National Park are native forest with few introduced plants.

3.1.2 Impacts of Proposed Action on Plants

Effects to plant resources would be considered significant if there is a high likelihood of adversely affecting a listed threatened or endangered plant species or adversely modifying plant critical habitat; causing irreversible damage to a non-negligible expanse of a native ecosystem through wildfire or other area-wide impacts; causing widespread damage or death to native plants; or inducing spread of non-native species within an area of largely or exclusively native habitat.

Human activities associated with the project have the potential to directly harm native vegetation within the smaller 250-acre area at each proposed release site (Alternatives 2, 3, and 4) due to vegetation clearing, construction, use of trails, trampling, and introduction of invasive plants or pathogens by pedestrian or helicopter teams during materials transport and monitoring activities (an impact that could eventually extend beyond the 250 acres). No project activities involve changes to the vegetative community or water resources that could lead to greater wildfire risk, but human activities can sometimes lead to accidental fires. There is an elevated risk of wildfire at the site of the temporary helibases during helicopter operations especially those in the dry environments. There is also a risk of spreading weeds from the temporary helibase areas. The above impacts are potentially substantial enough to require minimization measures, as summarized in the avoidance, minimization, and conservation measures section below.

Another source of effects – both adverse and beneficial – to native vegetation are the ‘ālalā themselves. It is expected that ‘ālalā would most likely only interact with threatened or endangered native plant species that offer fleshy fruits (e.g., *Clermontia*, *Cyanea*), fleshy native plant species and fruit-bearing non-native plants as these provide forage for the birds. ‘Ālalā are important seed dispersers for native fruiting plants by carrying fruits and transporting seeds in the gut. Seed germination for some native plants in the genera *Clermontia* and *Pittosporum* is improved when fruits are eaten by ‘ālalā (Culliney *et al.* 2012, p. 1729). The large body size and mouth size of ‘ālalā potentially allow for this species to disperse the seeds of several native plant species that currently lack a seed disperser on Maui (e.g., *Pittosporum* and *Alyxia*). Thus, a beneficial impact of the pilot project is the potential for enhanced seed dispersal and improved seed germination of native plants and the ability to monitor the areas where ‘ālalā are proposed to be released and record evidence of this ecosystem service.

However, ‘ālalā may also spread seeds of introduced invasive plants including strawberry guava, Koster’s curse, kahili ginger, and *Rubus* spp. (Medeiros 2004; Foster and Robinson 2007). The larger mouth size of ‘ālalā allows this species to consume larger fruits that are unavailable to smaller introduced birds (Culliney *et al.* 2012). This may allow ‘ālalā to be more efficient at spreading seeds of certain plants, such as strawberry guava, because they are able to consume large amounts of the fruit in a single bite along with many seeds. Strawberry guava occurs throughout most of the Ko‘olau proposed release site and the downslope area of the Kīpahulu proposed release site (Medeiros 2004, Fig. 15). Given this, ‘ālalā have the potential to contribute to dispersal of seeds of invasive plants at both proposed release sites. However, while capable of dispersing seeds of invasive plant species, like strawberry guava, there is no indication that ‘ālalā will preferentially seek out invasive plant species. These invasive plants will be novel to the released ‘ālalā, while native fruits will be familiar to them from their captive diet. It is expected that this conditioning would lead to a preference for native fruiting plants, at least initially. ‘Ālalā

visiting downslope vegetation at the Kīpahulu proposed release site where invasive plants are more abundant is not expected due to preference displayed for native canopy forest available upslope of the release site. The potential for spread of introduced plants by ‘ālalā (Alternatives 2, 3, and 4) would have less potential for areas that have fewer introduced invasive plants with fruits ‘ālalā could feed on. Because ‘ālalā can fly long distances, potential impacts from ‘ālalā dispersing seeds of introduced plants may be greater in areas where the distance is short between areas with substantial numbers of introduced plants and native forest with few introduced invasive plants. There are no means to prevent ‘ālalā from transporting seeds of introduced plants within release sites or from release sites to other areas, but there are measures that can be used to better understand if dispersal of seeds of introduced (and native) plants is occurring. These measures are listed below in 3.1.3 Avoidance, Minimization, and Conservation Measures.

Warbling white-eye (*Zosterops japonicus*) and red-billed leiothrix (*Leiothrix lutea*) are two common introduced birds in the analysis area that are known seed dispersers of at least nine species of native plants but also have been found to spread seeds of introduced plants and known to contribute to the spread of introduced invasive plants in native forests. Hwamei or melodious laughing-thrush (*Garullax canorus*) is an introduced bird that also feeds on fruits within the analysis area, but the species is uncommon in the affected areas (0.8-mile radius of the proposed release aviaries) (Judge *et al.* 2019, p. F-13). Warbling white-eye population density in wet forest areas of east Maui is approximately 3.54 birds/acre and the population density of the red-billed leiothrix is approximately 0.90 birds/acre (Judge *et al.* 2019, p. 25). Based on these densities, we estimate roughly 6,000 warbling white-eye and red-billed leiothrix (collectively) would be in the same area as 4–6 ‘ālalā (one 1,350-acre analysis area). Five ‘ālalā would account for roughly 3% of the total mass of the frugivorous birds at a single release site. Thus, accounting for the size and relative abundance, the released ‘ālalā (n = 5) would potentially distribute a ratio roughly 1:30 the number of seeds of introduced plants that warbling white-eye and red-billed leiothrix are already distributing.

3.1.3 Avoidance, Minimization, and Conservation Measures

The project incorporates several measures to minimize impacts on listed plant species and native vegetation and monitoring protocols to measure potential effects of presence of ‘ālalā on vegetation communities. There are no appreciable differences between the effects of necessary avoidance, minimization, and conservation measures among Alternatives 2, 3, and 4.

- Existing infrastructure such as trails, helicopter LZs, and clearings would be utilized to the greatest degree possible, minimizing additional disturbance to vegetation.
- All construction of new infrastructure would be preceded by a botanical survey. The project would avoid construction in areas with listed plants and sensitive habitats and follow avoidance and minimization protocols when clearing trails.
- Personnel conducting ‘ālalā monitoring, predator control, and infrastructure maintenance would be trained to identify listed plants.
- Personnel conducting ‘ālalā monitoring would walk only on established trails to the degree feasible.
- Strict protocols would be observed to prevent introduction of non-native plants and insects to the proposed release sites in materials transported to the release sites and by personnel working at the release sites (Appendices G and H).
- Wildfire generation would be avoided by cooking in cook stoves only (no fire pits or barbecues) and keeping fire extinguishers available in and adjacent to cooking areas.
- Helicopter operations utilizing temporary helibases will follow standard protocols to avoid starting wildfires including careful observance of weather conditions (e.g., “Red Flag

Warnings”) and avoiding parking vehicles in high grass.

- If satellite telemetry monitoring or monitoring using VHF indicates that an ‘ālalā is possibly nesting or has died on TNC or HNP, the ‘Ālalā Project managers would request permission to enter onto neighbor’s lands to attempt to find the nest or missing bird. Entry onto lands neighboring proposed release sites would only be with permission and all measures required by landowners would be followed to minimize effects to ongoing conservation management and sensitive resources.
- If ‘ālalā are found nesting on TNC or HNP lands; the ‘Ālalā Project managers may request regular weekly access to install and manage predator control traps targeting mammalian predators around the nest tree. Such predator control would likely consist of few to several lethal traps located at a distance between 50 and 200 feet from the nest tree. All measures required by landowners would be followed to minimize effects to ongoing conservation management and sensitive resources.
- ‘Ālalā would be provided “recall” training, a type of training that teaches them to associate specific cues, making it easier to recapture them in the event they move into an area where their presence poses unacceptable risk to other conservation resources.
- ‘Ālalā would not be fed fruits of introduced plants while in captivity to avoid released birds developing a search image for fruits of introduced plants as food.
- ‘Ālalā fecal samples would be collected around feeding stations and samples examined to identify seeds. A subset of fecal samples would be spread in germination trays every three months, to determine what fruits of native and non-native plants ‘ālalā are eating (based on seeds that sprout). This would be used to gauge the effects ‘ālalā may cause to vegetation communities through dispersing seeds of native and non-native plants. Location of germination trays would be at the Olinda forest bird conservation breeding facility or Olinda rare plant facility.
- Vegetation baseline surveys would be conducted prior to introduction of ‘ālalā to proposed release sites using protocols previously used for vegetation surveys for ‘ālalā proposed release sites on Hawai‘i Island (Price and Jacobi 2007). Follow-up surveys would be repeated at approximately two-year intervals within areas we expect ‘ālalā to use frequently to gather information whether ‘ālalā may be dispersing seeds of native and non-native plants and possible changes to vegetation communities in these areas.
- Collection of fecal samples and vegetation surveys would be conducted for the 5 years of the proposed pilot project.

3.1.4 Conclusion

For native and introduced plants, under the No Action Alternative, conditions would remain the same or similar to existing conditions, including trends and impacts from past, present, and foreseeable future actions. This includes the continued loss to ‘ālalā of their wild traits and ability to persist in the wild, including their important role as seed dispersers and involvement in successful seed germination processes, which would continue to adversely impact native vegetation diversity. Based on the impact analysis described in 3.1.2, and on incorporating avoidance, minimization, and conservation measures discussed above, proposed release of ‘ālalā for any of the Action Alternatives is unlikely to result in significant effects to federally listed plants or their designated critical habitat, as applicable.

Furthermore, project activities are not likely to cause irreversible damage to a non-negligible expanse of a native ecosystem through wildfire or other area-wide impacts; cause widespread damage or death to native plants; or induce spread of non-native species within an area of largely or exclusively native vegetation. Although some temporary adverse impacts are expected under the proposed action, with the implementation of avoidance, minimization, and conservation measures, and the limited duration

of the pilot project, no significant effects to listed plants and other plant species are likely to occur.

3.2 Animals

The discussion on animals has been divided into discussions of ‘ālalā recovery in Section 3.2.1 and to other listed animal species in Section 3.2.2.

3.2.1 ‘Ālalā

Although the proposed action is intended to provide critical information to help recover this critically endangered species, it comes with certain risks to the individual ‘ālalā involved in the pilot project, and to some extent, to the limited population from which these individuals are drawn (discussed in 3.2.1.2 below).

3.2.1.1 Environmental Setting

Significant changes in the forest ecosystems of Hawai‘i, beginning with Polynesian arrival and increasing after European contact, have contributed to the decline and disappearance of many species of endemic birds (Banko 2009, entire). ‘Ālalā experienced a severe decline in numbers and range during the latter part of the 19th and throughout the 20th century (Berger 1972, p. 91). Decline in ‘ālalā populations have been caused by historical shooting by farmers (Berger 1981, p. 91), avian disease (Duckworth et al. 1992, pp. 24-26), reduced habitat quality and food availability (Cuddihy and Stone 1990, pp. 17, 37 and 41), and suspected predation on nests and young by introduced mammals, including mongooses (*Urva auropunctatus*) and feral cats (*Felis catus*) (Duckworth et al. 1992, p. 24). Feral cats are also suspected predators of adults (USFWS, unpubl. data). Unlike Hawaiian honeycreepers, which are susceptible to avian diseases spread by mosquito vectors, mosquito-borne disease appears not to have played a significant role in the population decline of ‘ālalā (USFWS 2009, p. I-21).

During the 1970s and 1980s, ‘ālalā disappeared from several districts on Hawai‘i Island, with the wild population in central Kona reduced from 11 to three birds between 1992 and 1999. The last observation of wild ‘ālalā was in 2002 (USFWS 2009, p. I-6). Subfossil remains indicate that corvids were once present on islands of O‘ahu, Maui, and Moloka‘i; Maui had the ‘ālalā or a similar species as late as the period of human occupation based on radiocarbon dating of crow subfossil remains from east Maui (James et al. 1987, p. 2354).

As of mid-2023, ‘ālalā are only held in conservation facilities and none currently exist in the wild. The entire world population of ‘ālalā is approximately 120 individuals, which exist only at two conservation breeding centers, one at Olinda, Maui, and the other at Volcano, on Hawai‘i Island, with two additional birds at the Pana‘ewa Rainforest Zoo, in Hilo, Hawai‘i. Because the ‘ālalā survives only at three captive locations, it is extremely vulnerable to catastrophic population loss from disease outbreaks or stochastic events (i.e., fire, volcanic eruption, or hurricanes). In addition, animals held in captivity over long periods of time begin to lose wild behaviors (USFWS 2009, p. I-17 and II-4). To recover ‘ālalā, it is necessary to understand the best methods to release captive birds to the wild and establish wild breeding populations (USFWS 2009, p. II-4).

Broad-scale mosquito control to protect endangered honeycreepers is being considered to begin in 2023/2024 in areas in and near the Ko‘olau and Kīpahulu proposed release sites. The entire area of the Kīpahulu release site overlaps the core area for proposed mosquito control, while the majority of the area of the Ko‘olau release site overlaps the area for proposed mosquito control (HALE 2022, p. 11). Mosquito control may involve use of helicopters and/or uncrewed aerial vehicles (UAVs) flown

along transect lines as often as twice weekly over forest areas where mosquitoes are to be controlled. UAVs and or helicopters would release male southern house mosquitoes (*Culex quinquefasciatus*) infected with a strain of *Wolbachia* bacteria that renders resident female mosquitoes infertile, thereby suppressing mosquito reproduction (HALE 2022, entire).

Haleakalā National Park is developing an Air Tour Management Plan (ATMP) with the Federal Aviation Administration to mitigate or prevent substantial adverse impacts of commercial air tour operations on the park's natural and cultural landscapes and resources, areas of historic and spiritual significance to Native Hawaiians, wilderness character, and visitor experience. A final plan is expected in the beginning of 2024. Commercial air tours currently occur in HNP seven days a week year-round, excluding commercial-free days and operator reported routes currently fly over the project area.

3.2.1.2 Impacts of Proposed Action on 'Alalā

'Alalā recovery efforts would potentially benefit if released 'alalā are able to breed and raise young to fledging in the wild on east Maui, and this project's methods could inform future 'alalā recovery. 'Alalā raised in captivity and released into the wild have not yet been able to reach this reproductive milestone. There are several challenges that released 'alalā would need to overcome on east Maui. These include surviving in wetter environments present in proposed release sites on Maui; released juveniles forming breeding pairs; and for a pair release, the pair maintaining its pair bond and breeding successfully. Conditions in the wild would be less supportive of successful breeding than in captivity, including weather and rain events, and the time needed by released birds to learn to forage efficiently on wild food. Supplemental food would be provided prior to and potentially during breeding to ease the transition to independent foraging. Given these considerations, we estimate the potential for successful breeding (a pair fledging young) is moderate for the 5 years of the pilot release program. Although there is potential for injury or death to released 'alalā, the project has incorporated extensive avoidance, minimization, and conservation measures based primarily on experiences with reintroduction of 'alalā on Hawai'i Island to minimize potential for injury or mortality of released birds on east Maui.

Previous 'alalā releases in central Kona and Pu'u Maka'ala NAR have revealed interactions and mortality factors that must be addressed during a release program for 'alalā to survive and reproduce in the wild. Risk factors, and thus the potential for successful reintroduction, appeared to vary across the island of Hawai'i and may be different between Hawai'i and Maui. One risk factor of 'io predation on 'alalā, is absent on Maui. The high rainfall in most native forests on east Maui, however, may increase risk of death from exposure (birds dying from cold). There are ample food resources available to 'alalā at the proposed Ko'olau release site but annual precipitation is greater than all areas that 'alalā are documented to have lived and nested historically on Hawai'i Island. It is possible that the high rainfall at the Ko'olau site may preclude 'alalā nesting and/or increase mortality. However, the Ko'olau site is at lower elevation and thus temperatures are warmer than Pu'u Maka'ala NAR on Hawai'i Island, and higher rainfall may be less of a concern. The annual precipitation in part of the proposed Kīpahulu release site, specifically drier areas to the west, is near the precipitation range for areas 'alalā nested on Hawai'i Island. The diversity of habitats (i.e., closed canopy 'ōhi'a forest, open canopy 'ōhi'a forest, 'ōhi'a forest with grass understory, and shrubland areas) at the Kīpahulu site is similar to the range of habitats 'alalā are known to have used on Hawai'i

Island. However, similar to the Ko'olau release site, there is the potential that 'alalā would not nest at

the Kīpahulu site because of generally higher rainfall than areas they nested on Hawai‘i Island.

Facilities that rear ‘alalā are reaching capacity. Building additional facilities to house large numbers of ‘alalā is unlikely due to lack of available funding and would not increase the chance of successful introduction to the wild. The pilot project on Maui would not affect the stability of the captive population and the proposed releases would not reduce the total population abundance anywhere near levels that would jeopardize the existence of the captive population. However, in August 2023, devastating wildfires on Maui came close to impacting the Olinda breeding facility. Wildfire is already a risk in Hawai‘i, and we expect major fire events to happen again. The August 2023 fire is an example of a stochastic event that could eliminate many ‘alalā if one of the conservation breeding centers is destroyed. At the Olinda facility as many as 40 ‘alalā could have died or been injured had the fire not been extinguished; so the birds' success depends on them being able to occupy many separate areas, rather than the current situation where the vast majority of birds are confined to only two conservation breeding centers. The Panewea Zoo holds only two non-breeding ‘alalā. Actions from the project itself as well as from unrelated conservation management actions and other human activities at or near the proposed release sites and the risks and benefits these activities pose to ‘alalā are summarized in **Appendix G**, Table 2.

The risk to ‘alalā released on Maui from predators and disease is likely similar to ‘alalā released on Hawai‘i Island, with the exception that there is no risk to ‘alalā of predation by ‘io. For Hawai‘i Island releases, the suspected causes of mortality (followed by the number of birds that died in parentheses) were: predation by ‘io (14), toxoplasmosis disease (3), exposure (3), other disease (2), and mammal predation (2). On east Maui, there is virtually no risk to ‘alalā from predation by ‘io. This is because although there have been rare sightings of ‘io on Maui, ‘io do not nest on Maui (Clarkson and Laniawe 2000, p. 2). Introduced barn owls (*Tyto alba*) and native Hawaiian short-eared owl (*Asio flammeus sandwichensis*) are both on Maui and Hawai‘i Island and could possibly predate ‘alalā. However, there are no reports from the island of Hawai‘i of ‘alalā being attacked or killed by these species. Three ‘alalā died from toxoplasmosis infection during the Kona releases in the 1990s on Hawai‘i Island. Cats are the primary host for toxoplasmosis, and ‘alalā during the Kona releases in the 1990s were observed manipulating cat feces and potentially could have contracted toxoplasmosis by this means. ‘Alalā may also contract toxoplasmosis from consumption of pig carcasses (Dubey 2009). Feral cats, mongooses and rats are present on Maui and Hawai‘i Island. Cats pose threats both from disease and predation. At least two released ‘alalā were killed by mammalian predators during ‘alalā releases on Hawai‘i Island (it is uncertain however whether these deaths were caused by cats or mongooses or one death each by one of these predators). Rats may depredate ‘alalā nests and are also a potential carrier of toxoplasmosis. Three ‘alalā died from exposure during cold/rainy conditions during the Pu‘u Maka‘ala release, during a winter storm when there was reduced availability of supplemental food. The failure of released ‘alalā to maintain body condition may increase the risk of mortality from exposure, disease, and predation. Despite its rapid spread across the continental US in the early 2000s, West Nile virus (WNV) has not arrived in Hawai‘i as of 2023 (https://health.hawaii.gov/docd/disease_listing/west-nile-virus). American crows (*Corvus brachyrhynchos*) are extremely vulnerable to the disease and experience high mortality (Yaremych *et al.* 2004); however, surviving American crows can be a vector for WNV for a period of up to 90 days (Hopf *et al.* 2022). Although WNV is not known in Hawai‘i, it is a potential threat, and ‘alalā would be vaccinated for WNV prior to their release.

As a State and Federally listed species, it is illegal to hunt or shoot ‘alalā. Public hunting is allowed within Ko‘olau and Kīpahulu Forest Reserves of game species; however, the two proposed release sites are extremely remote and are rarely visited by hunters. Aerial shooting of feral ungulates is

conducted by DOFAW staff at the Kīpahulu proposed release site. Shooters are highly trained in this task and extremely unlikely to accidentally shoot ‘ālalā. Therefore, risk is very low to ‘ālalā of intentional or accidental shooting at the Ko‘olau and Kīpahulu proposed release sites (**Appendix G, Table 2**). Gathering of native plant materials for cultural purposes by permit is allowed at the two sites, however the proposed release areas are distant from public access points and rarely visited by the public. Effects of harassment of ‘ālalā by humans could range from disruption of loafing and foraging behavior to nest abandonment. Because the proposed release sites are very difficult to access by foot, the risk of harassment by humans as chance visitors to the release sites is very low. There is the potential for the public to interact with ‘ālalā along Kaupō Trail within and south of HNP, should ‘ālalā travel west from the Kīpahulu proposed release site. However, it would be unlikely for ‘ālalā to be near Kaupō Trail because the area is mostly open grassland. Currently there are no rodenticide poisons being used in the areas proposed for ‘ālalā releases, and rodenticides are not planned to be used at the proposed release sites.

The risk to ‘ālalā from chemical invasive plant control is very low. DOFAW conducts approximately 5 to 6 trips per year at the Kīpahulu site for weed control and monitoring biocontrol for strawberry guava and approximately 5 to 6 trips a year for aerial control of weeds.

Invasive feral pigs (*Sus scrofa*), whose foraging habits are extensive and damaging to native Hawaiian ecology, are controlled by multiple conservation agencies on East Maui. Despite these efforts, there are still populations of feral pigs in both the Kīpahulu and Ko‘olau proposed release sites. Lethal control measures have been in place at the Ko‘olau proposed release site in fenced areas for over 10 years and pig numbers have been reduced to virtually zero in fenced units. In Haleakalā National Park, immediately to the north of the Kīpahulu proposed release site, pigs are actively being controlled, however, pigs are present both on Kīpahulu FR and NPS lands. Pigs are a known secondary host for toxoplasmosis (HMAR 2022, p. 3) and there is some risk to ‘ālalā of contracting toxoplasmosis by ingesting meat from carcasses of pigs. This risk is very low at the Ko‘olau release site as pig numbers in this area are virtually zero, and the area is protected by ungulate exclusion fencing. Risk is higher at the Kīpahulu release site, where moderate numbers of pigs are reported on State and NPS lands. Pig baits are not used so there is no potential for ‘ālalā to be attracted by baits to traps used for catching pigs. There are no reports of ‘ālalā or other large birds being captured or otherwise harmed as a result of pig control activities.

Ungulate exclusion fences require maintenance and repair on a quarterly or twice-yearly basis. Repairs may require hand tools and chain saws to remove fallen trees over fence lines, and other repairs. It is of critical importance to maintain ungulate fences to prevent ungulate ingress through fence breaches. Fence-line inspections by pedestrians, repair activities and fence construction would likely cause non-breeding ‘ālalā to move away from the immediate area of disturbance and only briefly interrupt ‘ālalā foraging or other behaviors. For breeding birds, however, disturbance of an active nest could interfere with nest building, incubation, feeding nestlings, and could potentially result in nest failure (failure of young to fledge from the nest). The distance to maintain from an active ‘ālalā nest to avoid disturbance is unknown. If power equipment (generators or chain saws) is not required, the ‘Ālalā Project would request that no ungulate fence inspection or repairs occur within 164 feet of an active nest. This is based on nest observation protocols for Mariana crow (*Corvus kubaryi*) (S. Faegre, pers. comm., 2023), another island species of crow that has similar behaviors to ‘ālalā and assuming ‘ālalā response to disturbance near a nest would be similar to Mariana crows. If power equipment is required, the ‘Ālalā Project would request that no ungulate fence repairs or new fence construction occur within 660 feet of an active nest. This is based on

National Bald Eagle Management Guidelines (USFWS 2007) and is used because although the bald eagle (*Haliaeetus leucocephalus*) is not a corvid, it is a large-bodied bird that builds similar platform-type nest as ‘ālalā, and we have information for bald eagle response to loud noises from power equipment when nesting. The time an ‘ālalā pair could be actively nesting is approximately 3 months from the time of nest building, egg-laying, incubation, chick-rearing, and chicks fledged from the nest. To minimize potential harm to conservation resources if a fence breach is found near an active nest, minimization measures for the proposed project could include placement of pig traps near the fence-line breach and conducting temporary fence repairs using hand tools. ‘Ālalā Project personnel who understand tolerances of nesting ‘ālalā to disturbance would be available to monitor ‘ālalā behaviors during fence repairs or new fence construction and to help evaluate whether power equipment might be used nearer than 660 feet from an active nest.

There are two areas being considered for the first application of *Wolbachia* incompatible mosquitoes near the Ko‘olau and Kīpahulu proposed release sites to protect critically endangered Hawaiian honeycreepers. The first is in TNC’s Waikamoi Preserve, upslope and to the west, approximately 2 miles from the Ko‘olau proposed release site. The second is in Haleakalā National Park, to the north approximately 2 miles of the Kīpahulu proposed release site. Incompatible mosquitoes may be dispersed via helicopter or UAV. During UAV flyovers of ‘ālalā at Pu‘u Maka‘ala NAR, ‘ālalā were not observed to approach UAVs and there was no change to ‘ālalā behavior (A. Greggor, pers. comm., 2022). This suggests that there is low potential for impacts of UAVs on non-breeding ‘ālalā. However, an Australian corvid species (*Corvus orru*), when nesting, attacked overflying UAVs (Tazrout 2021). We estimate the risk of harassment or harm to ‘ālalā released at the Ko‘olau and/or Kīpahulu proposed release sites from UAV flyovers is low and risk of disruption to mosquito control activities by ‘ālalā attacking UAVs is also low. The ‘Ālala Project would not request any modification to scheduling or use of helicopters or UAVs for mosquito control if ‘ālalā are released at either or both the proposed release sites. In the unlikely event ‘ālalā significantly interfere with UAVs during application of *Wolbachia* treated mosquitoes, ‘ālalā likely would be able to be recaptured by locating individual(s) using transmitters and capturing them aided by recall training using mist-nets or other capture means.

The East Maui Watershed Partnership in the Ko‘olau proposed release site schedules a maximum of 32-36 helicopter flights/year for personnel to monitor pig snares, ungulate fences, and conduct invasive plant control. Helicopter flights for conservation purposes to the Kīpahulu proposed release site are fewer, averaging approximately 12 flights/year. Tourist helicopters at Pu‘u Maka‘ala would sometimes fly at a few hundred feet or lower above the forest canopy. Observers reported ‘ālalā responded to low flying tourist helicopter flights but did not respond to high flying aircraft (A. Greggor, pers. comm., 2022). Low helicopter flights elicited alarm calling by ‘ālalā, or ‘ālalā becoming quiet and vigilant. Helicopter disturbance was documented as part of a dataset on ‘ālalā anti-predator behavior, and ‘ālalā responses were generally consistent with the types of anti-predator responses seen with overhead flying ‘io. ‘Ālalā did not appear to habituate to these low passes by aircraft. This suggests low altitude helicopter flyovers (less than 500 feet above the forest canopy) at the proposed release sites are likely to affect ‘ālalā. However, because conservation helicopter flights for transport of personnel and materials are conducted at altitudes greater than 500 feet above forest canopy and lower altitudes only when approaching and leaving helicopter landing zones, it is likely disturbance to ‘ālalā caused by conservation helicopter flights will only be if ‘ālalā are near helicopter landing zones. During planned broad-scale mosquito control there is the potential for a period (up to two months) that helicopters could be used to disperse *Wolbachia* treated mosquitoes. Under this scenario, helicopters would fly 150-200 feet above ground level and up to 80 hours flight

time (HALE 2022, pp. 12-13). If mosquito release flights were to occur over the analysis area there is the potential for ‘*‘ala‘ala* to alarm call or exhibit other anti-predator behavior such as becoming quiet and vigilant. Disturbance to ‘*‘ala‘ala* caused by potential helicopter overflight would be transitory (< 1 minute each overflight) as helicopters would be moving through the airspace and would not be hovering in place.

Planning is in place to request permission for limited entry onto neighbors’ lands to search for missing birds and implement predator control around ‘*‘ala‘ala* nest(s) if nest(s) are found on neighbors’ lands. Plans to control predators on neighbors’ lands would be developed in collaboration with the landowner and would only be implemented with landowner support. NPS lands are closely adjacent to the Kīpahulu proposed release site and there is strong likelihood that ‘*‘ala‘ala* would venture onto NPS lands. In discussion with NPS, a maintained remote landing zone and camp on HNP near the Kīpahulu FR proposed release site would be available periodically for ‘*‘ala‘ala* Project to use through permitting and existing trails on NPS lands for monitoring ‘*‘ala‘ala* nesting in HNP. Existing LZs on Kīpahulu FR would be sufficient and prioritized for all project needs at the Kīpahulu proposed release site.

The Ko‘olau release site has adequate infrastructure to support implementation of all management actions to reduce risk factors limiting successful release of ‘*‘ala‘ala*, including camp site, helicopter landing zones, suitable locations for construction of release aviaries, control of introduced predators, supplemental feeding, and monitoring released ‘*‘ala‘ala*. The Kīpahulu release site currently lacks adequate infrastructure to support implementation of all management actions needed to reduce risk factors limiting successful release of ‘*‘ala‘ala*. Camp infrastructure including new access trails, a canvas roof Quonset hut built on an elevated plywood foundation and a composting toilet would need to be constructed. Any new infrastructure would be on State lands in Kīpahulu FR. A new helicopter landing zone would be established near the camp or an existing landing zone on State lands used. Although the Kīpahulu proposed release site would require placement of new infrastructure, this would be in non-sensitive areas such as open grassy areas (LZs and camp) and natural openings in forest canopy (release aviary).

3.2.1.3 Avoidance, Minimization, and Conservation Measures

Any project that seeks to experiment with reintroducing a critically endangered bird species into the wild poses unavoidable risks to the individual birds involved. Analysis of both project and non-project related activities that could potentially pose a risk to ‘*‘ala‘ala* indicates that there is very low risk to ‘*‘ala‘ala* from most general conservation management activities. These include ungulate control; fence work; aerial shooting; herbicide application; conservation and tour helicopter flights; small mammal control; and construction and use of the field camp, release aviary, trails, and other infrastructure. Even when endangered species are concerned, the existence of risk itself should not preclude engaging in the action, as the risks must be balanced against the potential benefits. However, mitigation to reduce these risks should be developed and implemented to the degree feasible. The project has developed extensive built-in mitigation founded primarily on experiences with reintroduction of ‘*‘ala‘ala* on Hawai‘i Island. These measures are described below.

- *West Nile Virus*. As a precaution against West Nile, all ‘*‘ala‘ala* would be vaccinated against the disease prior to release. To reduce the risk of possible spread of other avian disease by captive ‘*‘ala‘ala* to forest birds on east Maui, all ‘*‘ala‘ala* would be screened for symptoms of avian malaria and avian pox by veterinarians before their release, and any bird showing signs of illness would not be released.
- *Toxoplasmosis and predation*. These related threats to released ‘*‘ala‘ala* from non-native

mammals would be reduced by a program of trapping around release aviaries and feeding stations and along fence lines and trails, and limited predator control near ‘alalā nests (where feasible) and in cooperation with neighboring landowners if nests are found outside of state lands. This level of threat control is considered sufficient to minimize risks to ‘alalā from mammalian predators and disease and can be adapted as information is gained.

- Released ‘alala would be provided supplemental foods 6 months to 2 years after their release to provide nutritional support as they learn to forage on wild foods.
- Release aviaries would be roofed to provide ‘alalā shelter from the elements and the doors to aviaries would remain open after birds are released in case released ‘alalā choose to roost or seek shelter in aviaries.
- Release aviaries would be constructed of material that excludes predators.
- ‘Alalā would be released during warmer months with less rainfall to minimize risk from exposure at a time when they are most naïve to the wild environment.
- ‘Alalā would receive recall training, enabling them to be recalled (recaptured) if they become sick or injured, pose an unacceptable risk to other conservation resources, or interfere unacceptably with other conservation management activities.
- Camp garbage, which could be ingested by wildlife, would be flown out, and human waste would be disposed of in composting toilets to prevent ecosystem impacts.
- Coordination with adjacent landowners to perform ‘alalā protection measures if individuals nest outside of State lands.

3.2.1.4 Conclusion

Under the No Action Alternative, conditions would remain the same or similar to existing conditions, including trends and impacts from past, present and foreseeable future actions, including the continued loss to ‘alalā of their wild traits and ability to persist in the wild. Without actions to release ‘alalā and the potential to learn more about wild habitats and potential habitat on east Maui with the absence of the threat of ‘io depredating ‘alalā there would be a loss of opportunities to take action towards ‘alalā recovery and conservation. Based on the impact analysis described in 3.2.1.1., proposed Action Alternatives would potentially result in impacts that would adversely impact ‘alalā. However, with avoidance, minimization, and conservation measures listed in 3.2.1.3 above, these adverse impacts are negligible. As discussed in Chapter 2, one or both release sites already have some infrastructure in the form of trail networks, camp sites, ungulate exclusion fences, helicopter landing zones, and adequate cellular connectivity for monitoring released ‘alalā via satellite telemetry transmitters affixed to each released bird and/or monitoring using VHF radio transmitters. In addition, the proposed action would likely support recovery of ‘alalā and allow agencies to gain understanding of methods and conditions for successful long-term release of the species. Based on the analysis, the proposed project activities, incorporating these proposed avoidance, minimization, and conservation measures, would effectively minimize danger to released ‘alalā.

3.2.2 Other Listed Animal Species

There are eleven listed animal species occurring or potentially occurring within the analysis area.

3.2.2.1 Environmental Setting

The montane wet forest comprised primarily of closed canopy ‘ōhi’a forest with native shrub and fern understory is habitat for a wide variety of native birds, invertebrates, and a bat. As shown in

Table 3 (**Appendix G**), listed vertebrates that may occur at or nearby both sites include ‘ōpe‘ape‘a or Hawaiian hoary bat (*Lasiurus cinereus semotus*), ‘i‘iwi (*Drepanis coccinea*), ‘ākohekohe (*Palmeria dolei*), and kiwīkiu (*Pseudonestor xanthophrys*). Nēnē or Hawaiian goose (*Branta sandvicensis*); and ‘ua‘u or Hawaiian petrel (*Pterodroma sandwichensis*), ‘akē‘akē or band-rumped storm-petrel (*Pterodroma sandwichensis*), and ‘a‘o or Newell’s shearwater (*Puffinus newelli*) [the last three species collectively known as Hawaiian seabirds] have the potential to overfly the proposed release areas. There are three species of federally listed Hawaiian damselfly (*Megalagrion* spp.) that may potentially be at the proposed release sites. The presence of native birds, particularly listed species, is highly relevant because alalā are known to prey upon eggs and nestlings of other forest birds, particularly during the ‘alalā breeding season (DLNR/USFWS 1999, p. 4).

Following is a brief description of listed animal species, primary habitat, life history and vulnerability characteristics.

- ‘Ōpe‘ape‘a or Hawaiian Hoary Bat, is the only fully terrestrial native mammal in the Hawaiian Islands and is state and federally listed as endangered. ‘Ōpe‘ape‘a are found from sea level to 11,800 feet, with most observations occurring in native rain forests up to at least 6,000 feet (Bonaccorso et al. 2015). Hawaiian hoary bat roosts in woody vegetation across all main Hawaiian Islands and will leave their young unattended in trees and shrubs when they forage. If trees or shrubs 15 feet or taller are cleared during the pupping season, June 1 through September 15, there is a risk that young bats could inadvertently be harmed or killed, since they are too young to fly or move away from disturbance. Ōpe‘ape‘a can be injured and killed from collisions with man-made structures including barbed wire fences, wind turbines, and communication towers.
- Listed Hawaiian forest birds’ (Hawaiian honeycreepers) ranges on Maui are predominantly restricted to montane forests above 4,500 feet in elevation due to habitat loss and threat of disease at lower elevations. Breeding season can be protracted but generally is from February 1 through July 1. Hawaiian forest birds generally nest in the middle and upper forest canopy. Existing threats to honeycreepers are avian disease, loss of habitat, and climate warming, which contributes to range expansion of the mosquitoes that vector avian disease. Broad-scale mosquito control has the potential to create improved future conditions for Hawaiian honeycreepers by reducing numbers of disease carrying mosquitoes in areas where honeycreepers persist.
- Nēnē or Hawaiian goose, which are federally threatened and state listed as endangered are found on the islands of Hawai‘i, Maui, Moloka‘i, and Kaua‘i. The Maui nēnē population is relatively small, fluctuating around approximately 250 breeding pairs (USFWS 2019). They are observed in a variety of habitats, but prefer open areas, such as pastures, golf courses, wetlands, natural grasslands and shrublands, and lava flows. Breeding season on east Maui in Haleakalā National Park is October to May. Nests consist of a shallow scrape on the ground lined with plant material and down. Nēnē on Maui are susceptible to vehicle collisions, wind turbine collisions and human or vehicle-related injuries and trauma, toxoplasmosis (a pathogen carried by feral cats), predation by mongoose and cats, and mosquito-borne avian pox virus (Work et al. 2015). Breeding failures occur often during drought conditions (Black et al. 1997), and increasing drought or other extremes in climate variability, expanding invasive species, and associated climate change scenarios are likely to negatively affect nēnē. Climate change may disrupt seasonal movements and some habitats used by nēnē for molting, breeding, and foraging.
- Hawaiian seabirds nest in high elevation lava fields and may traverse the project area at night during the breeding, nesting, and fledging seasons (February 5 to December 15).

Seabirds fly into and out of their nests at night, and during their breeding season, listed seabirds commute between the ocean for foraging and their cryptic underground burrows to feed their young (Ainley et al. 2019, Slotterback 2020). Feral cats, other invasive predators, and light pollution are primary threats to Hawai'i's nocturnal ground-nesting seabirds (Raine et al. 2020). Outdoor lighting could result in seabird disorientation, fallout, and injury or mortality. Downed and nesting seabirds are subject to increased mortality due to collision with automobiles and infrastructure, starvation, and predation by dogs, cats, and other predators.

- Hawaiian damselflies are found in aquatic habitats across the islands. Breeding habitat includes anchialine pools, perennial streams, marshes, ponds, and artificial pools and seeps. Major threats include introduced fish, amphibians, and invertebrates in streams, reduced stream flow from drought and water diversion, and reduced habitat quality from ungulates and nonnative plants.

Ongoing conservation management within the project area includes predator, ungulate and invasive plant control, fence construction and repair, and forest bird recovery action implemented by NPS, DLNR, TNC, and other surrounding land managers.

3.2.2.2 Impacts of Proposed Action to Other Listed Animal Species

Effects to fauna would be considered significant if there is a high likelihood of adversely affecting a listed threatened or endangered animal species or adversely modifying animal critical habitat; causing irreversible damage to a non-negligible expanse of native habitat that supports listed species; inflicting widespread injury or death to native but not listed animals; or inducing spread of non-native species that adversely affected the behavior or health of native animals.

Federally listed wildlife species are characterized as those that are in danger of extinction throughout all or a significant portion of their range. They receive protection under the ESA and Chapter 195D, Hawai'i Revised Statutes, respectively. State protected wildlife species include all indigenous wildlife, which are protected under state law (Section 13-124-3, HAR). Although all threatened and endangered wildlife species in the project area were considered, only those species that have the potential to be impacted by the proposed action are described in this EA.

There should be no impact to listed invertebrates including listed picture-wing flies and damselflies, because the project involves minimal habitat modification, careful infrastructure maintenance to avoid introduction of predators or competing invertebrates, and avoidance of any impact to the host species on which some of the listed species depend. Furthermore, damselfly species are unlikely in the analysis area and proposed activities do not impact watershed or water resources. As discussed below in Avoidance, Minimization, and Conservation Measures (3.2.2.3), standard practices to avoid impact to these listed invertebrates have been incorporated into the project.

Impacts to seabirds are not expected under the proposed action. The largest breeding colony of the endangered seabird, 'ua'u, is largely outside of the project analysis area. In higher elevation and drier areas, the project will avoid any nesting habitat for Hawaiian seabirds and lighting will be confined to minimal lighting at campsites. Seabirds do not use the analysis area and only transit the Ko'olau and Kīpahulu proposed release sites in flight. Proposed project work would be confined to daylight hours to not impact seabirds transiting at night. As discussed below under 3.2.2.3, standard practices to avoid impact to Hawaiian seabirds have been incorporated into the project.

Impacts to nēnē or Hawaiian goose are not expected under the proposed action, as the areas affected are not normal habitat for this species, however, there is a low risk of collision with helicopters as commercial air tours and management helicopters travel between staging areas and LZs at the proposed release sites. As discussed below under 3.2.2.3, standard practices to avoid impact to nēnē have been incorporated into the project.

Ongoing and planned actions that could impact ‘ōpe‘ape‘a include maintenance and infrastructure projects, like fencing, especially if they require trimming or cutting of larger trees where they are roosting. Hawaiian hoary bat impacts can be avoided by standard measures, as discussed below (3.2.2.3).

Potential impacts to listed Hawaiian honeycreepers have required a detailed analysis. There are two distinct sources of impacts to these species, the first from human activities associated with the project, and the second associated with ‘alalā behavior. The development and modification of project infrastructure (camps, trails, aviaries, etc.) and project implementation (walking on trails, occupying camps, etc.) have at least some potential to result in disturbance to listed Hawaiian honeycreepers, nēnē, Hawaiian seabirds, and the Hawaiian hoary bat. Precipitous population declines have been observed for kiwikiu and ‘ākohekohe across their small ranges (Judge *et al.* 2013, 2019, 2021). Kiwikiu and ‘ākohekohe population estimates from surveys in 2017 are 157 individuals (44–312 individuals [95 percent confidence interval]) and 1,768 individuals (1193–2411), respectively (Judge *et al.* 2021). Kiwikiu and ‘ākohekohe abundance has declined by more than 70 percent since 2001 (Judge *et al.* 2021), and a predicted range loss of more than 90 percent may occur by the end of this century under moderate climate change scenarios (Fortini *et al.* 2015). Mitigation in the form of avoidance measures for each of these species in addition to minimal project area overlap with listed honeycreepers’ habitat, discussed below, can reduce any such impacts to negligible levels.

‘Alalā are omnivorous and depend on a diversity of food resources from native understory fruit trees and shrubs. They also utilize other forest resources, including forest bird eggs and nestlings, primarily during the ‘alalā breeding season (Sakai *et al.* 1986, entire; USFWS/DLNR 1999, p. 4). Between 2017–2020 during the Pu‘u Maka‘ala release the release team observed 6,662 wild foraging observations by ‘alalā, of which 14 observations (0.2%) were ‘alalā either inspecting or manipulating forest bird nests, with a total of nine nests where this behavior was observed. Of these 14 observations, five involved confirmed predation by ‘alalā on the contents of the nest. Of these predation events, one was on an ‘apapane nest, and another was likely the nest of introduced warbling white-eye or red-billed leiothrix; the other three nests were of unknown identity. The remainder of ‘alalā foraging observations were on fruits and insects. From this information, nest predation by captive released ‘alalā is very rare. It should be noted, however, that supplemental food was available during the entire time of the Pu‘u Maka‘ala release. The frequency of predation by ‘alalā on nests of other forest birds might be higher in conditions where ‘alalā are completely reliant on wild foods. For example, forest bird body parts and eggs were frequently found in wild ‘alalā nestling fecal droppings (Sakai 1990), but it is unclear what proportion of these body parts and eggs were from native versus non-native birds. It is clear nonetheless that ‘alalā may depredate native Hawaiian honeycreeper nests in the analysis area, including listed species. Analysis of potential impacts on nesting forest birds at each proposed release site is for the 1,350-acre primary use area (analysis area). Measures to address potential impacts by ‘alalā to listed Hawaiian forest birds beyond the 1,350-acre primary use area are discussed under 3.2.2.3, Avoidance, Minimization, and Conservation Measures.

The 1,350-acre analysis area for the Ko‘olau proposed release site overlaps the ranges of two common Hawaiian honeycreepers: ‘apapane and Hawai‘i ‘amakihi, and the lower elevation extent of the ranges of the non-threatened (but declining) Maui ‘alauahio and threatened ‘i‘iwi (Judge *et al.*

2019). The Ko'olau analysis area also overlaps the ranges of three introduced birds, warbling white-eye, red-billed leiothrix, and Japanese bush-warbler. 'Apapane, Hawai'i 'amakihi, warbling white-eye, red-billed leiothrix, and Japanese bush-warbler are common to abundant throughout the Ko'olau analysis area based on survey results. By contrast, the threatened 'i'iwi is uncommon within the Ko'olau analysis area.

The Kīpahulu analysis area of 'alalā release impacts overlaps the ranges of 'apapane and Hawai'i 'amakihi and portions of the ranges of Maui 'alauahio, 'i'iwi, 'ākohekohe, and kiwīkiu. The Kīpahulu analysis area also overlaps the ranges of the introduced warbling white-eye, red-billed leiothrix, and Japanese bush-warbler. The non-threatened 'apapane and Hawai'i 'amakihi as well as the introduced warbling white-eye, red-billed leiothrix, and Japanese bush-warbler are common to abundant throughout the Kīpahulu analysis area. Maui 'alauahio are uncommon within the analysis area (Judge *et al.* 2019). 'Ākohekohe and kiwīkiu are rare within the Kīpahulu analysis area. 'i'iwi are moderately common at in the Kīpahulu analysis area.

Given this context, the proposed action would potentially result in some level of impact to federally listed Hawaiian forest birds from 'alalā depredating their nests. The Ko'olau site sits at the low-elevation limit of the 'i'iwi range, and the species is relatively uncommon at the site. Based on the most recent survey data available, 'i'iwi likely make up approximately 6% of the total bird abundance in Ko'olau analysis area and the area includes <3% of the species' range on east Maui (Judge *et al.* 2019). Therefore the likelihood of predation by 'alalā on an 'i'iwi nest at the Ko'olau proposed release site is low, and if such an event were to occur, effects to the 'i'iwi population on Maui would be very small. The Kīpahulu analysis area overlaps a similarly small percentage of the overall east Maui 'i'iwi range (<2%), however 'i'iwi density (and therefore abundance) is greater within this portion of their range (Judge *et al.* 2019). Nonetheless, survey data indicate that this area likely contains <4% of the overall abundance of the species on Maui.

The Kīpahulu analysis area overlaps <2% of 'ākohekohe and kiwīkiu ranges. Based on published densities for HNP, this area likely holds fewer than 20 pairs of 'ākohekohe, roughly 2% of the total species' abundance. This analysis area overlaps an even smaller portion of the kiwīkiu range, and this area is unlikely to contain more than one pair of kiwīkiu. It should be noted, however, that both 'ākohekohe and kiwīkiu are regularly detected just upslope of the analysis area and, should 'alalā disperse farther up into Manawainui, the risk of 'alalā depredation on these species' nests would increase. In total, the three listed species found within the Kīpahulu analysis area likely make up <10% of the overall bird abundance in the area. Although there is a greater potential for 'alalā depredating listed species' nests at the Kīpahulu proposed release site compared to the Ko'olau site, the overall likelihood of this occurring remains low.

Should 'alalā be released at both sites, the two areas collectively overlap <4% of the 'i'iwi range on east Maui including <6% of the overall estimated abundance of the species in the region. As only the Kīpahulu analysis area overlaps the 'ākohekohe and kiwīkiu ranges, the collective impact of releases at both sites for these species is the same as that for the Kīpahulu site only. Should 'alalā disperse farther than expected (e.g., up to 2 miles), the released 'alalā could potentially impact 'ākohekohe and kiwīkiu at both release sites. As the total population of 'ākohekohe is estimated to be approximately 1,768 individuals and the species is known to renest within a given year, the impact of the loss of a nest to 'alalā predation on the species' overall abundance is low. With a total abundance of approximately 157 kiwīkiu individuals and slow life history traits (e.g., single-egg clutches, extended parental investment), the loss of a kiwīkiu nest to any cause is potentially quite harmful to

the species as a whole. However, the rarity of the species in the vicinity of the Kīpahulu release site coupled with the relative abundance of other nesting species, makes the likelihood that ‘ālalā would encounter a kiwīkiu nest extremely low. Mitigation measures in the event ‘ālalā move into core kiwīkiu areas or are observed to be having a higher-than-expected interaction with kiwīkiu and ‘ākohekohe are presented below. If released ‘ālalā travel farther than expected, e.g., up to 2 miles from the two proposed release sites, ‘ālalā would potentially range over an area that encompasses approximately 29%, 20%, and 29% of the ‘ākohekohe, ‘ī‘īwi, and kiwīkiu ranges, respectively. However, the vast majority of released ‘ālalā at Pu‘u Maka‘ala stayed within 1,350 acres (0.8 miles) of their release site, and thus the impacts of ‘ālalā on the threatened and endangered forest bird species outside the 1,350 acres area at each release site is expected to be low.

Although it is likely released ‘ālalā will depredate forest bird nests, the very low incidence of this at Pu‘u Maka‘ala NAR (total 5 nest predation events over 4 years) suggests that the number of predation events by ‘ālalā on forest bird nests on east Maui is likely to be few (< 10) over the 5-years of the pilot release. Although eggs and nestlings of forest bird nests may be depredated by ‘ālalā, adult forest birds, whose nests are depredated, have the potential to renest during the same breeding season, and nest in future years. Furthermore, the number of listed Hawaiian forest birds at the Ko‘olau proposed release site are very few compared to the number of non-listed Hawaiian honeycreepers and introduced forest birds. The only listed forest bird at the Ko‘olau proposed release site is the ‘ī‘īwi and the species is relatively uncommon in this analysis area. With these factors considered, the likelihood of ‘ālalā depredating nests of listed Hawaiian forest birds at the Ko‘olau proposed release site is very low.

The Kīpahulu analysis area includes portions of the ranges of ‘ākohekohe, ‘ī‘īwi, and kiwīkiu. Considering the presumed low incidence of nest predation events by ‘ālalā and the predominance of non-listed Hawaiian honeycreepers and introduced forest birds, the likelihood of predation by ‘ālalā on nests of listed Hawaiian honeycreepers at the Kīpahulu proposed release site is low. If such an event were to occur, the estimated east Maui populations of ‘ī‘īwi (50,250 birds) and ‘ākohekohe (1,768 birds) are sufficiently large and the number of ‘ālalā released is so small that nest predation by ‘ālalā is unlikely to influence population trends of these two species. The overall rarity of kiwīkiu and the small overlap in this species’ range with the analysis area suggest that the likelihood for incidence of predation by ‘ālalā on a kiwīkiu nest at the Kīpahulu proposed release site is very low. The likelihood of potential impacts to kiwīkiu will be reduced further by the following avoidance and minimization measures.

3.2.2.3 Avoidance, Minimization, and Conservation Measures

All ‘ālalā to be released would receive recall training, a type of training where they will be taught to associate a specific sound with presentation of food. This training can be used to facilitate recapture of released ‘ālalā if a bird is sick or injured, at risk of harm, presents a risk to conservation resources or is interfering with other conservation management actions. During 2019, at Pu‘u Maka‘ala NAR, foot-catch noose-carpets were used to recapture the last five ‘ālalā in the wild, and this process took four weeks of intensive effort. Other methods that have been successfully used to recapture ‘ālalā are also available, such as mist nets or luring birds back into their release aviary with food and closing the aviary door. The ‘Alalā Project would have the capability to target released birds for recapture throughout the release if it is found that, for example, ‘ālalā were to move into areas with kiwīkiu populations, and their presence is determined to pose an unacceptable risk to nesting kiwīkiu. It is not completely certain that ‘ālalā targeted can be captured; for instance, if a bird drops its transmitter, then recapture efforts would be more challenging. However, for previous releases birds that lost their transmitters were able to be monitored because they remained near ‘ālalā with

transmitters that were still working. Throughout the entirety of the project if a transmitter fails, the bird carrying the failed transmitter will be targeted for recapture and a new transmitter placed on that individual. There is a high likelihood that locations of all released 'ālalā would be always known throughout the pilot project. Therefore, if an 'ālalā is deemed to pose an unacceptable risk to kiwīkiu it is likely it can be recaptured.

An extensive set of mitigation measures derived from USFWS animal avoidance measures adapted to account for project activities has been incorporated into the project. In addition to these avoidance measures, the project incorporates other measures to minimize impacts to listed Hawaiian honeycreepers and other listed animals. The suite of measures is listed below.

To avoid and minimize impacts to the endangered and threatened Maui forest birds on Maui: kiwīkiu or Maui parrotbill (*Pseudonestor xanthophrys*), 'ākohekohe (*Palmeria dolei*) and 'i'iwi (*Drepanis coccinea*), the following measures from the USFWS animal avoidance measures would be implemented:

- Avoid conducting activities within forest bird habitat that:
 - Promote the spread or survival of invasive species.
 - Increase mosquito populations or stagnant water habitat.
 - Increase wildfire threat to montane forest habitats.
 - Remove tree cover during the peak breeding season between January 1 and June 30.
- Project would provide 'ālalā with "recall" training so released birds can be recaptured if they move into areas where they are determined to pose a significant threat to listed forest birds, particularly kiwīkiu. Project staff would use various methods that can confidently recapture 'ālalā if an 'ālalā presents a threat to listed forest birds.

To avoid and minimize impacts to the endangered Hawaiian hoary bat or 'ōpe'ape'a (*Lasiurus cinereus semotus*), the following measures would be implemented:

- Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15).
- Do not use barbed wire for fencing.

To avoid and minimize potential project impacts to the threatened and endangered Hawaiian seabirds Hawaiian petrel (*Pterodroma sandwichensis*), Newell's shearwater (*Puffinus auricularis newelli*), and Hawai'i-distinct population segment of the band-rumped storm-petrel (*Oceanodroma castro*), the following measures would be implemented:

- Do not use outdoor lighting at field camps and when using flashlights keep these pointed to the ground.
- No camp construction or other construction activities will be conducted at night.

To avoid and minimize potential project impacts to the threatened Hawaiian goose or nēnē (*Branta [Nesochen] sandvicensis*), the following measures would be implemented:

- Do not approach, feed, or disturb nēnē.
- If nēnē are observed loafing or foraging within the project area during the breeding season (October through May), have a biologist familiar with nēnē nesting behavior survey for nests in and around the project area prior to the resumption of any work. Repeat surveys after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest).

- Cease all work immediately and contact the Service for further guidance if a nest is discovered within a radius of 150 feet of the project, or a previously undiscovered nest is found within the 150-foot radius after work begins.

The following additional mitigation measure would assist in avoidance of impact to listed species and/or benefits to listed species.

- For small mammal trapping to conduct lethal control of rats, cats, and mongoose, traps would be fitted with excluder devices to prevent non-target animals from entering.

3.2.2.4 Conclusion

Under the No Action Alternative, conditions would remain the same or similar to existing conditions, for listed animals including trends and impacts from past, present, and foreseeable future actions. There are some differences between the Action Alternatives in the potential to adversely affect listed animals related to the greater proportion of listed honeycreepers at the Kīpahulu proposed release site. Therefore, Alternative 4 (Koʻolau) has the least potential for impact to listed animal species other than ʻalalā, and Alternative 2 (both sites) has the greatest potential. Impacts to other listed animals are not expected to be significant at either site. For all Action Alternatives, with avoidance, minimization, and conservation measures, impacts are expected to be negligible and non-significant. USFWS ESA Section 7 consultation for effects to listed species would be conducted for the final EA.

3.2.3 Other Animal Species

The discussion on other animals has been divided into discussions of forest birds (Section 3.2.3.1) and *Partulina* tree snails (Section 3.2.3.2).

3.2.3.1 Forest Birds

Non-listed native forest birds at the proposed release site are Hawaiʻi ʻamakihi (*Chlorodrepanis virens*), ʻapapane (*Himatione sanguinea*), pueo or Hawaiian short-eared owl (*Asio flammeus sandwichensis*), and Maui ʻalauahio (*Paroreomyza montana*), which are protected under the Migratory Bird Treaty Act (MBTA, 16 U.S.C. § 703 *et. seq.*). Nonnative bird species that occur in the project area and are listed under the MBTA include barn owl (*Tyto alba*) and house finch (*Haemorrhous mexicanus*). Nonnative species that occur within the project area and are not protected by the MBTA include Chinese hwamei (*Garrulax canorus*), Japanese bush warbler (*Cettia diphone*), warbling white-eye (*Zosterops japonicus*), red-billed leiothrix (*Leiothrix lutea*), and white-rumped shama (*Copsychus malabaricus*). A list of birds protected under MBTA regulations is provided in 50 CFR § 10.13. Unless permitted by regulations, it is unlawful under the MBTA to pursue, hunt, take, capture, or kill; attempt to take, capture, or kill; possess, offer to or sell, barter, purchase, deliver, or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product. The proposed project would follow conservation measures provided under the MBTA (as applicable) to minimize impacts to MBTA species as described in **Appendix I**.

3.2.3.2 *Partulina* Tree Snails

Though not federally or state listed on Maui, there are 23 species of rare *Partulina* tree snails recognized on east Maui. Only a handful have been detected in recent years. There are two subspecies of *Partulina porcellana* tree snail, *Partulina porcellana* ssp. *porcellana* and *Partulina porcellana* ssp. *wailuaensis*, which occur only at the Koʻolau proposed release site. Three observation locations (defined as a tree or shrub where snail(s) were observed) for *Partulina porcellana* are within the area at the Koʻolau proposed release site ʻalalā would be expected to use on a frequent

basis; e.g., within 0.8 miles of the location of the proposed release aviary. Although captive propagation of *Partulina porcellana* has been attempted, there are no *P. porcellana* of either subspecies in captivity. Numbers of *Partulina porcellana* in the wild are likely less than 100 individuals. *Partulina marmorata* is known from three observation locations at the Kīpahulu proposed release site. This population is within the area of the proposed release site 'ālalā are expected to use less frequently; e.g., area greater than 0.8 miles from the proposed release aviary. Experts estimate the total number of *Partulina marmorata* may be in the low hundreds and the population is declining in the wild. Captive propagation of *Partulina marmorata* has been more successful than *Partulina porcellana*, and approximately 60 individuals of this species are currently in captivity. However, approximately 200 individuals of a tree snail species, distributed among at least two separate breeding facilities, are needed to insure against possible catastrophic loss of the captive population from disease outbreak or other mishap. There is an observation of a species of *Partulina* tree snail (unidentified species) at the same population site as *Partulina marmorata* that may be either *Partulina marmorata* or another species of *Partulina* tree snail.

Distribution of *Partulina* tree snails on east Maui is generally from 2,400 to 4,000 feet elevation. *Partulina* tree snails are small, approximately 0.1 inches long, and are found on surfaces of vegetation from near the forest floor to the upper canopy where they glean algae and other material from vegetation surfaces. Tree snails are vulnerable to predation by rodents (*Rattus* spp.), introduced carnivorous snails (*Euglandina rosea* and *Oxychilus alliarius*), and introduced Jackson's chameleon (*Trioceros jacksonii*) (DLNR 2015, pp. A-5 and A-6). Wild 'ālalā on Hawai'i Island were observed eating "land-snails," and snail shell fragments were found in 'ālalā feces (Sakai *et al.* 1986, p. 213), but the study did not identify whether these fragments were of native or introduced snail species. Although *Partulina* tree snails may go into torpor and remain motionless during daylight hours when 'ālalā are active and searching for food, they nonetheless remain visible on vegetation surfaces during the day and would be vulnerable to predation by 'ālalā. Manipulating vegetation, gleaning leaves, and bark flaking were common 'ālalā foraging behaviors observed at Pu'u Maka'ala NAR. However, although wild 'ālalā in the 1980s was documented to have eaten snails, captive reared 'ālalā will not have encountered *Partiluna* snails pre-release so they will not be seeking them initially. How likely 'ālalā are to encounter tree snails depends on the density of tree snails in the area and how often 'ālalā are in an area. If released 'ālalā do encounter tree snails, it is predicted that adult 'ālalā are less likely to try new foods than groups of juveniles. This is a pattern in many corvid species (Greggor *et al.* 2020, p. 61), but based only on anecdotal evidence in 'ālalā. If 'ālalā do try eating tree snails, it is expected they would only continue to do so if they are palatable. Since 'ālalā were documented eating snails in the past, it is presumed 'ālalā find tree snails palatable. If tree snails are palatable, then 'ālalā will only actively seek them out if they are better to eat or easier to find than other invertebrate prey. Given this, there is nonetheless the potential, should an 'ālalā discover a tree snail population and find the tree snails palatable, to develop a search image for them and rapidly decimate the population.

An important method that has been developed to protect native tree snails in the wild in Hawai'i is the construction of fenced predator exclosures from which snail predators are removed and tree snails are then introduced to the exclosure (Rohrer *et al.* 2016). These predator exclosures however would not protect tree snails from an aerial predator such as 'ālalā as they are not netted from the top. The recently completed Olinda Tree Snail Exclosure (OTSE) on east Maui is approximately 5 miles west of the Ko'olau proposed release site and 15 miles west of the Kīpahulu proposed release site. Because of the anticipated maximum dispersal for 'ālalā of approximately 2 miles from their release aviary, it is not expected that 'ālalā released at either the Ko'olau or Kīpahulu proposed

release sites would discover or interact with the OTSE. In the coming year it is anticipated predators will be removed from the OTSE and initially a small number of *Partulina marmorata* tree snails will be introduced to the enclosure.

The likelihood of ‘*alalā* to impact *Partulina* tree snail species is a function of the number of ‘*alalā* on the landscape; how long they are on the landscape; the numbers of tree snail populations and tree snail point locations; and the amount of time ‘*alalā* spend in an area where there are *Partulina* tree snails. Observations of *Partulina porcellana* ssp. *wailuaensis* are from seven locations at the Ko‘olau proposed release site within the area ‘*alalā* are expected to use rarely (spend approximately 5% of their time) and three locations of *Partulina porcellana* spp. *porcellana* within the area ‘*alalā* are expected to use frequently. Given the number of ‘*alalā* proposed to be released (approximately 6 birds); the time they will be on the landscape (maximum five years); and although captive raised ‘*alalā* are unfamiliar with tree snails as food; we expect it is *somewhat likely* ‘*alalā* would encounter and prey upon *Partulina* tree snails at the Ko‘olau proposed release site. Based on this, and despite avoidance and minimization measures (described below under 3.2.3.3) we think there is a risk to releasing ‘*alalā* at the Ko‘olau proposed release site since there is moderate likelihood ‘*alalā* would encounter tree snails, we know wild ‘*alalā* have eaten snails (unknown species) in the past, and there would potentially be significant effects to *Partulina porcellana* tree snails if ‘*alalā* were to predate this species.

There are three observations of *Porcellana marmorata* from the area at the Kīpahulu proposed release site ‘*alalā* are expected to use less frequently, e.g., area greater than 0.8 miles from the proposed release aviary. Because ‘*alalā* are expected to use the area where the population of *Porcellana marmorata* is located only rarely, few numbers of ‘*alalā* would be released, and the time ‘*alalā* would be on the landscape is limited to 5 years, we expect it is *unlikely* for ‘*alalā* released at the Kīpahulu proposed release site to encounter and prey upon *Partulina marmorata* tree snails. However, releasing ‘*alalā* at the Kīpahulu proposed release site would require implementation of avoidance, minimization, and conservation measures.

3.2.3.3 Avoidance, Minimization, and Conservation Measures for *Partulina* Tree Snails

Satellite and VHF transmitters for the proposed project will provide point locations for all released ‘*alalā* from twice daily to ten times a day based on transmitter type and environmental conditions. ‘*Alalā* point location errors will likely range between 330 and 660 feet from an ‘*alalā*’s true location.

To avoid and minimize potential project impacts to rare *Partulina* tree snails the following measures would be implemented:

- ‘*Alalā* would be monitored using a combination of remote technology (satellite and/or radio transmitters) and in-person observations for the entire time they are on the landscape.
- Trail cameras would be set at tree snail observation locations to record if ‘*alalā* were to visit locations where tree snails have been seen in the past.
- ‘*Alalā* that enter within 660 feet of a known *Partulina* tree snail location would be monitored for how often they enter this area and time spent, and observers would be deployed to observe foraging behavior of ‘*alalā* in these areas.
- ‘*Alalā* fecal samples would be collected at feeding stations and examined for snail shells. Particular effort would be made to collect fecal samples from ‘*alalā* that have visited areas with tree snails. Fecal samples would also be collected from ‘*alalā* in the field away from feeders if birds are seen in areas where there are known tree snail populations. All fecal samples collected would be immediately examined for snail shell fragments.

- 'Alalā that visit the immediate area of a known tree snail population repeatedly and spend time foraging in this area may need to be recalled (captured) and returned to captivity to protect *Partulina* tree snails.
- If snail shell fragments of *Partulina* tree snails are discovered in the feces of an 'alalā, that individual would be captured and returned to captivity.

Conservation measures include tree snail surveys, tree snail live collection and captive propagation, and introduction of tree snails to the OSTE snail enclosure. Tree snail surveys would be conducted at the Kīpahulu proposed release site before the proposed release, and information obtained from these surveys incorporated into the final EA. There is a population of approximately 60 *Partulina marmorata* in captivity, and it is anticipated a small number of *P. marmorata* tree snails will be introduced to the OSTE in 2024. The conservation measure to introduce captive raised *Partulina marmorata* to the OSTE snail enclosure is its own recovery action independent of the proposed 'alalā release, but when accomplished, will result in a second (protected) wild population of *Partulina marmorata* tree snails. There is virtually no risk of 'alalā flying over 15 miles from the Kīpahulu proposed release site to the OSTE, and if this did occur, these 'alalā would be captured and returned to captivity.

3.2.3.4. Cumulative effects on Plants and Animals

Cumulative effects on plants and animals are discussed here, and other cumulative effects under Section 3.10. Cumulative effects may occur when the adverse effects of a proposed action are added to other past, present, and reasonably foreseeable future actions of any government or private entity. In some cases, the direct effects of a project may be minor but the cumulative effects significant. The proposed project has the potential to have impacts that interact with those of other ongoing wildlife projects and activities, including U.S. Fish and Wildlife Service Support of Plant Extinction Prevention Program (PEPP) Activities, DOFAW Support of Mosquito Control Activities, Haleakalā National Park Conservation Activities, The Nature Conservancy Waikamoi Preserve Conservation Activities, and East Maui Watershed Partnership Conservation Activities. The adverse impacts of the proposed project are centered on minor and almost entirely avoidable disturbance of vegetation and listed plant species. Potential for adverse impacts by 'alalā predation on nests of listed birds are low because there are many more non-native birds than listed forest birds and mitigation measures including recall (capture) of 'alalā if they pose an unacceptable risk to vulnerable populations of listed birds.

The temporary helibases likely to be used to access release sites are used by multiple agency partners, including those listed above, for other management helicopter operations. The use of these areas for 'alalā release actions will contribute to the cumulative use of these areas and the impacts on these sites from helicopter operations. Increasing the use of these sites would marginally increase the risk of wildfire at the helibase site and the risk of introducing weed plants and pathogens from the helibase site to the release site. The Na Kula temporary helibase in Haleakalā National Park is typically used several times per month for management helicopter operations. Monthly use may increase temporarily while certain projects are underway, e.g. fencing operations.

Risk of impacts to rare *Partulina* tree snails are expected to be low given the snails do not move during the day when 'alalā forage for food, are very small, and are generally rare. Tree snails can have a clumped distribution however within a habitat that may put them at risk should an 'alalā find an occupied habitat, eat a tree snail(s) and stay in the area to search for other snails, increasing the risk of predation and extirpation of a population. Not releasing 'alalā at the Ko'olau proposed release site and implementation of avoidance, minimization, and conservation measures for the Kīpahulu proposed

release site we believe reduces potential risk to *Partulina* tree snails of the proposed pilot project to low and acceptable levels.

‘Alalā may spread seeds of introduced invasive plants including strawberry guava, Koster’s curse, kahili ginger, and *Rubus* spp. (Medeiros 2004; Foster and Robinson 2007). If we cumulatively look at the potential for ‘alalā to be more efficient at spreading seeds of certain plants with the existing spread of invasive species trends on east Maui dispersed by non-native birds and wind, the impacts could be adverse. Any addition of non-native and invasive plant dispersal by ‘alalā would be mitigated by collection of fecal samples around feeding stations, examining and germinating collected seeds to determine what fruits of native and non-native plants ‘alalā are eating, and vegetation surveys of the project area completed every two years to ensure ‘alalā are not adding to the spread of invasive species. With the added project minimizations and mitigations evaluated in this EA, the project would not add to the spread of invasive plant species on east Maui.

Adverse impacts to conservation management that includes fencing and ungulate removal, broad-scale mosquito control, surveys and monitoring listed plants, predator control, and scientific research are low because the standard project operating procedures and implementation of the projects’ avoidance, minimization, and conservation measures. Cumulative effects are either non-existent, or minor and largely temporary or mitigable through standard project operating procedures. Further, releasing ‘alalā may provide beneficial effects including dispersal of native plants seeds and benefits of the project’s small-scale rodent control around release aviaries and feeding stations that may help decrease native bird mortality. Please see Section 3.10 for complete discussion of cumulative effects.

3.2.3.5 Conclusion

Under the No Action Alternative, there would be no impacts to other animal species. Under the Action Alternatives, potential risk to native non-listed forest birds and introduced forest birds is negligible. Potential risk to *Partulina* tree snails of the proposed release of ‘alalā is higher at the Ko‘olau proposed release site than the Kīpahulu proposed site because some observations of *Partulina porcellana* tree snails at the Ko‘olau proposed release site are in an area at the proposed release site ‘alalā are likely to use frequently. Because the greater potential for ‘alalā to prey on *Partulina porcellana* tree snails at the Ko‘olau proposed release site, and *Partulina porcellana* tree snails are not in captivity, we do not recommend ‘alalā be released at the Ko‘olau proposed release site. Potential risk to *Partulina* tree snails from the proposed release of ‘alalā is lower at the Kīpahulu proposed release site because the population of *Partulina marmorata* tree snails at the Kīpahulu proposed release site is entirely in an area ‘alalā are expected use only rarely, approximately 60 individuals of *P. marmorata* are currently in captivity, and the species is planned to be introduced to the OTSE in 2024. Based on an analysis of risks, and implementation of avoidance, minimization, and conservation measures, it is expected it is reasonably certain ‘alalā released at the Kīpahulu proposed release site would not have a significant adverse impact on rare *Partulina marmorata* tree snails.

3.3 Farming and Ranching

This section analyzes potential impacts from the pilot project to farming and ranching. As discussed in Section 2.1.2, based on detailed analysis of ‘alalā behavior after releases on Hawai‘i Island, ‘alalā are expected to range within a maximum circular 2-mile radius from their release location during the

five years of the proposed project. Any effects to farming and ranching would occur within this area

of effect.

3.3.1 Environmental Setting

The proposed release sites considered in Alternatives 2, 3, and 4 are located primarily in State-managed Forest Reserves that do not support farming or ranching. The proposed site within Ko'olau FR (Alternatives 2 and 4) is located approximately one mile from private lands owned by Haleakala Ranch, and East Maui Irrigation, Inc., that are leased by The Nature Conservancy and managed under a permanent conservation easement as the Waikamoi Preserve, and lands owned by East Maui Irrigation, Inc., to the west that are managed for watershed protection. Portions of Haleakala Ranch that are more than 3 miles west from the Ko'olau proposed release site are managed as a working cattle ranch and for koa silviculture. The Ko'olau site is approximately 3 miles upslope from private lands along Hāna highway, but none are currently in agricultural production.

The proposed release site within Kīpahulu Forest Reserve (Alternatives 2 and 3) is located 0.3 miles downslope of the HNP boundary. Private lands west of the site are owned by Kamehameha Schools (recently acquired from Kaupō Ranch) and Nu'u Mauka Ranch. Kaupō Ranch is a working cattle ranch. Kaupō Homesteads lands, downslope of the Kīpahulu proposed release site within the analysis area, are undeveloped.

3.3.2 Impacts of Proposed Action on Farming and Ranching

Farming and ranching effects would be evaluated as significant if they involved a measurable decrease in agricultural production or necessitated substantial and burdensome actions by farmers or ranchers to maintain their production levels.

Although east Maui has active agriculture such as cattle grazing for meat production and harvestable fruit crops, the areas of effects for Alternatives 2, 3, and 4 do not contain agricultural areas. The area nearest to the Ko'olau site where ranching could potentially be affected is on Haleakala Ranch, more than 3 miles west of the proposed Ko'olau release site and outside the analysis area. The area nearest to the Kīpahulu release site where ranching could potentially be affected is Kaupō Ranch, approximately 1 mile west of the Kīpahulu site. It is expected that released 'ālalā would prefer habitat to the north and east of the Kīpahulu release site since 'ālalā have previously been documented avoiding crossing large open fragments of habitat (DLNR/USFWS 1999, p. 5) and have shown preference for closed canopy habitat (Greggor *et al.* in review). Open pasture lands lack trees 'ālalā use for perching and fruiting plants 'ālalā use to forage. Based on the distance 'ālalā dispersed during previous releases, it is very unlikely that 'ālalā will venture onto private lands used for ranching near the Ko'olau proposed release site. Furthermore, it is very unlikely for 'ālalā to move into areas with open grassland or pasture based on observations of past habitat use on Hawai'i Island. It is very unlikely that 'ālalā would enter onto private lands that are actively used for cattle ranching during the maximum 5-year term of this analysis period because these lands lack forest cover and food resources that 'ālalā require. Any impact to cattle ranchers would be unlikely and negligible under Alternatives 2, 3, and 4.

Since fruit is a considerable component of the 'ālalā diet, and 'ālalā were fed domestic fruits during captive rearing, it is possible that released 'ālalā may consume products from fruit farms. However, there are no fruit farms within or near the areas of effect under Alternatives 2, 3, and 4, and any impact to farmers would be unlikely.

Farming and ranching activities in the area often involve rainwater collection. The only water utilized

under the action alternatives of this project would be rain collection for camp use, which would be minimal in scope and have no impact on other users. Proposed activities under Alternatives 2, 3, and 4 would not disturb existing water collection systems, so there would be no impact under any alternative. Although it is unlikely, there is some potential that ‘alalā could use forested areas (not in use for farming and ranching) on private lands to nest. This would not affect any agricultural activity.

3.3.3. Avoidance, Minimization, and Conservation Measures

Although effects to farming or ranching are not anticipated under all action alternatives, adverse impacts are not entirely discountable, and the project has developed avoidance, minimization and conservation measures for implementation in the highly unlikely event that released ‘alalā travel far beyond the expected range and appear on farms and ranches during the 5-year maximum term of analysis for the pilot project.

- Landowners may adopt one or more voluntary conservation measures for ‘alalā developed by the ‘Alalā Project (see Appendix J for full list) in the unlikely event ‘alalā enter their private forested lands. These measures are designed to protect ‘alalā while minimally impacting landowners’ management of their lands. One measure to protect nesting ‘alalā involves managing ungulates so that native understory plants and trees can regenerate. Another is refraining from activities creating disturbance within 660 ft of nests while ‘alalā are actively nesting (e.g., nest building, incubating eggs, and caring for young in the nest).
- MFBRP would actively coordinate with farmers and ranchers during the pilot project to assist in explaining voluntary conservation measures and collect data on ‘alalā behavior and issues, if any.
- In the unlikely event that the ‘alalā disperse beyond the expected two-mile radius of the release sites and begin to utilize fruit farms or other private lands, DLNR may choose to capture and move individual ‘alalā to prevent impacts to farm crops, and for their safety, should ‘alalā presence in these areas put them at risk of harm from human activities.

3.3.4 Conclusion

Under the No Action Alternative, there would be no impacts to farming and ranching. Based on the analysis, project activities under Action Alternatives, incorporating above proposed avoidance, minimization, and conservation measures and described in **Appendix J**, would not be expected to result in a decrease in agricultural production or requirement for substantial and burdensome actions by farmers or ranchers to maintain their production levels. No significant adverse impacts to farming or ranching activities would be likely to occur. With avoidance, minimization, and conservation measures, impacts would be negligible. There are no substantial differences in impacts between Alternatives 2, 3, and 4, although Alternative 2 would necessarily involve impacts in both Kīpahulu and Ko‘olau.

3.4 Forestry

This section analyzes potential impacts from the project to forestry activities. As discussed in Section 2.1.2, based on detailed analysis of ‘alalā behavior after releases on Hawai‘i Island, the birds would regularly range within a roughly circular 0.8-mile radius and range occasionally up to 2-miles from their release site during the maximum five years of the pilot project. Any substantial effects to forestry operations would occur within this area of effect.

3.4.1 Environmental Setting

Lands immediately adjacent to the analysis area are managed for native species and habitat conservation by The Nature Conservancy (Waikamoi Preserve) and Haleakalā National Park (Fig. 1). The DOFAW Forestry Program does not conduct forestry activities within the areas of effect. The nearest lands managed for silviculture under the Forestry Program are approximately 3 miles from the proposed Ko'olau release site. Haleakala Ranch manages portions of its lands approximately 5 miles west of the proposed Ko'olau release site for koa forestry. No current or planned forestry operations are known from the area within 5 miles of the Kīpahulu proposed release site.

3.4.2 Impacts of Proposed Action on Forestry

Effects to forestry would be evaluated as significant if they involved a measurable decrease in the potential harvest levels of forest products or necessitated substantial and burdensome actions by foresters to maintain their production levels. The most commonly chosen nesting tree by 'ālalā is 'ōhi'a. Given this, even in the highly unlikely event that one or more 'ālalā range into areas on private lands with koa silviculture during the pilot project, it is unlikely that 'ālalā would attempt to nest. If 'ālalā do nest in an area that is managed for silviculture, impacts on forestry activities would be limited to the March through July season when 'ālalā are actively nesting (nest building, incubation, and care of young while in the nest), and involve only not producing loud noise and disturbing vegetation within 660 feet of the active nest. It is highly unlikely that 'ālalā would expand beyond the analysis area in the pilot project maximum 5-year period, and even if they did the impacts to forestry under Alternatives 2, 3, and 4 would be negligible.

3.4.3 Avoidance, Minimization, and Conservation Measures

As discussed in Section 3.2.3, above, in the unlikely event 'ālalā were to nest within lands being actively utilized for forestry, landowners may adopt one or more voluntary conservation measures for 'ālalā developed by the 'Alalā Project and described in **Appendix J**. Restrictions on activities would include avoiding loud noises and disturbance of vegetation within 660 feet of an active nest. The 'Alalā Project, DOFAW, and USFWS would actively coordinate with any forestry operators during the pilot project to assist in explaining voluntary conservation measures, request to collect data on 'ālalā behavior, and provide assistance regarding any issues or concerns.

Based on the analysis, project activities, incorporating these proposed avoidance, minimization, and conservation measures, would not result in a decrease in forest products or a requirement for substantial and burdensome actions by foresters to maintain their production levels. No significant adverse impacts to forestry are likely to occur. There are no substantial differences in impacts or mitigation measures between Alternatives 2, 3, and 4, although Alternative 3, which involves release only in the Kīpahulu area, would be the least likely to have any chance of impacts to forestry.

3.4.4. Conclusion

Under the No Action Alternative, there would be no impacts to forestry. Based on the analysis, project activities under Action Alternatives, incorporating above proposed avoidance, minimization, and conservation measures and as described in **Appendix J**, would not be expected to result in a decrease in forestry production or requirement for substantial and burdensome actions by foresters to maintain their production levels. No significant adverse impacts to forestry activities are likely to occur. With these measures, impacts are expected to be negligible. There are no substantial differences in impacts between Alternatives 2, 3, and 4.

3.5 Geology, Soil, Water Quality and Climate

This section discusses the existing geology, soils, climate and streams and then analyzes potential impacts from the project to soil erosion, sedimentation and pollution in streams, and greenhouse gas emissions.

3.5.1 Environmental Setting

The island of Maui comprises two volcanoes – Mauna Kahālāwai to the west, and Haleakalā to the east – separated by a low, flat plain. Both proposed release sites are located fully on Haleakalā (Fig. 1). This active volcano dates from approximately 1.1 million years ago and last erupted in 1790 (Juvik and Juvik 1998, p. 43). The surface geology at the Koʻolau release site consists of lava flows of the Hana Volcanic Series dated at less than 1,500 years in age. At the Kīpahulu release site, the surface geology is Pleistocene lava flows exceeding 10,000 years in age (Sherrod *et al.* 2007).

The general slope at both sites exceeds 5% and is rugged and incised with gulches. According to the U.S. Geological Survey, there is a moderate risk of lava flow inundation on Haleakalā Volcano (<https://www.usgs.gov/volcanoes/haleakal%C4%81/geology-and-history>). Lava flows and cinder cones younger than 500 years are found along Haleakalā's southwest and east coasts and along the corresponding major rift zones of the volcano. The youngest lava flow, Kalua o Lapa, erupted from East Maui's lower southwest rift zone sometime between A.D. 1420 and 1620. Although scientists are not able to predict the next episode of volcanic activity at Haleakalā, there is certainly at least some risk of lava inundation over human time scales in the proposed project area.

There are two broad classes of soil substrates formed from basalt lava which support wet forests: undeveloped or geomorphologically recent soil substrates found on Hawaiʻi and Maui, and well-developed soils in humid climates. Soils on east Maui in rainforest areas are andisols that have formed in volcanic ash or other volcanic ejecta. These soils contain minerals which bind strongly with organic matter and have high water holding capacity. Like organic soils, they are well-aggregated, resist erosion and have good drainage. Soils at both proposed sites are dominated by the Hydrandepts (7-30% slope) characteristic of northeast Haleakalā (HSA 2023). This soil type has a very high water-holding capacity, fast permeability, and little chance for runoff and erosion when forested, but the potential for flash flood increases with higher slopes.

Climate on windward east Maui is dominated by trade wind conditions. Temperatures are mild, with low annual variation, averaging close to 60 degrees F over the year, with annual average highs in August about 6 to 7 degrees warmer, and average annual lows in February equally cooler (Giambelluca *et al.* 2013). The temperature inversion that forms from 6,000 and 8,000 feet tends to suppress vertical movement of air and so concentrates cloud development to the zone just below the inversion, resulting in high annual rainfall on northeast and east slopes of east Maui. The Koʻolau proposed release site gets approximately 160-200 inches of average annual rainfall, while the Kīpahulu proposed release site gets about 100-180 inches (Giambelluca *et al.* 2013).

The geologic and climatic setting at the sites have helped produce water resources that are important to the ecology and economy of Maui, including streams and groundwater aquifers. The stream network on Haleakalā consists of deeply incised gulches that have more permanent waterflow on the windward side and more ephemeral waterflow on the leeward side. Because of the steep profile of the landscape, small streams are characterized by numerous waterfalls. Stream flow tracks rainfall patterns. Although year-round rainfall is the primary source of stream water, localized heavy rainfall and storms passing through the islands cause flow spikes lasting often only a few days. The Koʻolau release site is in the headwaters of Piʻinaʻau Stream, which discharges to the ocean at Keʻanae. The Kīpahulu release site is near the headwaters of Nuanulua Gulch. The Koʻolau

and Hāna aquifers underlie the northeast and east slope of Haleakalā in the area of the proposed release sites, respectively.

3.5.2 Impacts of Proposed Action on Geology, Soil, Water Quality and Climate

A significant effect in terms of geologic hazard would be one that substantially places lives and property at risk. Effects to soil, erosion, and streams would be evaluated as significant if they involved a change to soil quality, non-negligible increases in soil erosion, alterations in stream flow, or adverse changes to water quality. Climate impacts would be significant if there were substantial greenhouse gas emissions that could contribute to climate change.

In general, impacts to soil erosion and sedimentation would be extremely minor because of the negligible action on the ground. As discussed in Chapter 2, existing camps would be used to the degree feasible for project field activities such as sleeping areas, storage supply, field office work, cooking, helicopter LZs, etc. Some new camp areas would likely be required. Areas would be hand cleared, with no grading or other significant ground disturbance, and any soil disturbance would be negligible and unlikely to lead to erosion. Workers walking on trails can sometimes increase soil erosion, but these can be limited to inconsequential levels by employing mitigation measures to avoid creation of bare areas vulnerable to erosion. With project activities that do not tend to create bare surfaces, erosion that then leads to sedimentation in nearby streams would not occur. The amount of vegetation clearing would not affect soil water holding capacity. Other activities potentially affecting water quality that can be a part of conservation actions include escape of wastewater and any long-lasting and harmful chemicals present in materials involved in cooking, cleaning, fueling machinery, or weed and pest control. Very little in the way of toxic material would be involved in the proposed project. Composting toilets would be used, and all camp garbage would be flown out. Equipment would be mostly battery powered and storage and use of fuels would be minimal and controlled. Currently, no chemical weed or pest control is planned. Rodent control and control of mammalian predators would be using traps fitted with excluders to preclude bird access. If it becomes necessary to utilize a rodenticide bait, the active ingredient in rodenticide baits that would be used (diphacinone) has low water solubility and exposure of surface and ground water would be negligible (EPA 2015, p. 12).

The only aspect of the project with the potential to produce significant quantities of greenhouse gasses such as carbon dioxide or methane and thus affect climate is the increase of vehicle and helicopter trips from the proposed project. Vehicle trips would be to helicopter staging areas for flights to remote landing zones at proposed release areas. As discussed in Section 3.9 concerning noise impact, the number of helicopter hours to support the project is estimated to be between 2 and 24 hours/month. The percent change (between 6 and 48 percent) from current conditions for the number of helicopter flight hours within the analysis area for conservation purposes is minimal and there will be negligible impact to climate from increase in vehicle use. Carbon emissions because of operating the project would be considered negligible and are not expected to contribute significantly to global climate change.

3.5.3 Avoidance, Minimization, and Conservation Measures

Avoidance, minimization, and conservation measures employed to minimize the risk of soil erosion and resulting sedimentation include minimizing creation of new trails, restricting ground disturbance, not removing vegetation except under certain conditions, and restricting staff to forest trails except under certain conditions, for example to search for a bird that is suspected to be injured or to have died. Camp garbage would be flown out and composting toilets would be used to mitigate

impacts to water quality. All fuel and any other substances with the potential to pollute water would be strictly controlled within the camp and any waste would be monitored and taken off-site for proper disposal.

3.5.4 Conclusion

Under the No Action Alternative, there would be no impacts to geology, soil, water quality and climate. Based on the analysis, project activities under Action Alternatives, incorporating above proposed avoidance, minimization, and conservation measures, would not be expected to result in a significant change to soil, soil erosion, alterations in stream flow, adverse changes to water quality, or effects on climate. With these measures, all impacts to soil erosion, water quality in streams or aquifers, or climate would be negligible and non-significant. There are no substantial differences in impacts between Alternatives 2, 3, and 4, although Alternative 2 would necessarily involve impacts in both the Kīpahulu and Koʻolau proposed release sites.

3.6 Cultural Resources

This section of the EA discusses existing cultural resources and practices and potential impacts to these posed by the proposed project and summarizes the ‘Alalā Cultural Impact Assessment (CIA) prepared by Kau’i Lopes and Lokelani Brandt of ASM Affiliates, to which the reader is referred for details (**Appendix M**; Brandt and Lopes 2023, entire). Additional resources that fall within Haleakalā National Park are summarized in this section with information provided by NPS archeologists.

Cultural resources include prehistoric and historic archaeological sites; historic buildings, structures, and districts; and physical entities and manmade or natural features important to a culture, a subculture, or a community for traditional, religious, or other reasons. Cultural resources are designated in three major categories: Archaeological resources (prehistoric and historic) are locations where human activity has measurably altered the earth or left deposits of physical remains. Architectural resources include standing buildings, structures, landscapes, and other built-environment resources of historic or aesthetic significance. Traditional cultural properties may include archaeological resources, structures, districts, prominent topographic features, habitat, plants, animals, and minerals that Native Americans, Native Hawaiian Organizations, or other groups consider essential for the preservation of traditional culture.

Cultural resources are governed by federal laws and regulations, including the National Historic Preservation Act (NHPA), Archeological and Historic Preservation Act, American Indian Religious Freedom Act, Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990. Federal agencies’ responsibility for protecting historic properties is defined primarily by Sections 106 and 110 of the NHPA. Section 106 requires federal agencies to consider the effects of their undertakings on historic properties. Section 110 of the NHPA requires federal agencies to establish—in conjunction with the Secretary of the Interior—historic preservation programs for the identification, evaluation, and protection of historic properties. Cultural resources also may be covered by state, local, and territorial laws. Chapter 6E of the Constitution of the State of Hawai‘i recognizes the value of conserving and developing the historic and cultural property within the State of Hawai‘i for the public good, and the State Historic Protection Division (SHPD) reviews projects for impacts to historic properties under Chapter 6E.

Section 106 and Chapter 6E review and compliance for the proposed project would be completed before the Final EA.

3.6.1 Cultural Resources and Practice

For the CIA the ahupua'a of Ke'anae and Nāholokū is considered the 'study area', while the location of the proposed release areas is referred to as the 'project area' (Brandt and Lopes 2023, p. 9; p. 2 shows map of project areas). The CIA examines cultural resources and customary practices that might be encountered within the project area and the connection of these to the 'ālalā to establish a context within which to assess the significance of such resources and potential impacts of the proposed release on east Maui. Discussed are relevant prior archaeological and cultural studies that have been conducted within and in the immediate vicinity of the project area and their culture-historical context. The only archaeological resources on east Maui described in the CIA are The Nā Ala Hele, which refers to trails and byways in Hawaiian, and which serve as vital connections between communities and the cultural and natural resources on the island, and petroglyphs. In ancient times, people primarily traveled on foot along these trails for various reasons that include but are not limited to, travel between ahupua'a, travel within the ahupua'a to exchange goods, access to mauka (upper) and makai (lower) regions for resources, and travel to significant burial grounds or heiau. In his Archaeology of Maui study, Winslow M. Walker mentions the location of petroglyphs that "are known to occur on the cliffs near the Keanae trail in the crater of Haleakala" (Brandt and Lopes 2023, p. 81). There is no known historical map that depicts a trail by this name, and it is presumed by the authors that the Kaupō Trail, which crosses through the western part of the Kīpahulu proposed release site, is the trail Walker identified. The use of this trail, which connects to both the Ko'olau and Kaupō regions, would most likely have been utilized by various practitioners to seek resources in the upper regions of Haleakalā. The CIA notes, Pu'u 'Ahulili, at the head of Mana Wainui Valley, within the analysis area of the Kīpahulu proposed release site, is a known burial site for the chief Heleipawa (Brandt and Lopes 2023, p. 99). Ample historical records (Brandt and Lopes 2023, entire) documents 'ālalā as a family 'aumakua (ancestral deity) and an important part of Hawaiian religious and cultural practices.

The NPS, within the analysis area for the Kīpahulu proposed release site, identifies the following archaeological sites: 50-50-16-3694 (cairn); 3622; 50-50-16-3655 (wall); 50-50-16-3656 (rockshelter); and 50-50-16-3657 (rockshelter) in Kaupō Gap, and the historic Kaupō Gap Trail, which is a contributing feature to the Civilian Conservation Corps Crater Trails Historic District. Building structures are identified within the analysis area on Kaupō Homestead lands at the trailhead for the Kaupō Gap Trail in the extreme southern portion of the Kīpahulu proposed release site. A temporary helibase, or helicopter staging area, is approximately 1 mile southeast of the Kīpahulu proposed release site on Kaupō Ranch and a second helicopter staging area, Na Kula, is on NPS lands in the Nu'u section of HNP near the coast-line (yellow triangles, Fig. 1). There would be one helicopter landing zone (to be established) in an open area on Kīpahulu FR, approximately 0.5 miles south of the NPS boundary. Impacts of helicopters at landing zones and effects on designated wilderness within HNP are discussed under 3.7.

3.6.2 Consultation

Gathering input from community members with genealogical ties and long-standing residency or relationships to the study area is vital to the process of assessing potential cultural impacts to resources, practices, and beliefs. As described in the CIA, the comments of interviewees with genealogical ties and relationship to 'ālalā regarding the proposed release were positive, encompassing the need to do something to help recover the 'ālalā and maintain the species on the landscape as an important part of native ecosystems and the cultural importance of the 'ālalā as a family 'aumakua (a Hawaiian personal and family god). One interviewee stated the desire to see the project maintained on Hawai'i Island, but nonetheless expressed support for the project on east

Maui. This interviewee also stated the importance to maintain information flow between the project proponent and the community and maintain community support for the project, noting that there may be some people who are indifferent or outright oppose the project and the importance to do more education and outreach and involve the community in the process. The agencies also plan to initiate consultation through Section 106 of the NHPA.

3.6.3 Impacts of Proposed Action on Cultural Resources

It is evident from the information presented in the CIA that the forested upland areas of Nāholokū, Kaupō and Ke‘anae, Ko‘olau have been utilized since the Precontact and Historic periods for a variety of practices. Furthermore, the CIA has shown that the endangered ‘ālalā is a valued bio-cultural resource. The conclusions in the CIA are the action alternatives, which involve the creation of low-impact foot trails in the release areas, construction of temporary release aviaries, and improving field camp infrastructure, would likely result in some level of direct impact on the physical landscape at the proposed release sites, while the action alternatives also have the potential to restore wild populations of the ecologically and culturally important ‘ālalā. As described in the CIA, the no-action alternative would not have any direct impact on the physical landscape at the proposed release sites but would likely adversely impact efforts to restore wild populations of ‘ālalā. Those that participated in the CIA’s consultation process did not express any major concerns or cultural issues with the project. Minimal impacts of project helicopter noise and views would overlap areas within the NPS boundary. ‘Ālalā may access areas within the HNP, but most impacts would have a beneficial impact to Cultural Resources, therefore impacts in the HNP are negligible. Prehistoric/Historic Structures and Cultural Landscape Resources were considered but dismissed from further evaluation by NPS since resources would either see no impacts or impacts would be negligible due to the small geographical area of HNP included in the project area (see **Appendix L**).

3.6.4 Avoidance, Minimization, and Conservation Measures

With the action and no action alternatives in mind, the CIA concludes if done thoughtfully and considering the action alternatives’ recommendations provided in the CIA, the proposed project would not likely adversely impact any specific valued cultural resources or traditional customary practices. The CIA recommends the project proponents remain mindful and work to prevent or limit the potential for impacts on valued cultural resources and customary practices by implementing the following:

- Continued Educational Outreach: Those consulted as part of the CIA study were generally supportive of the proposed project especially as it relates to re-establishing wild populations of ‘ālalā. Some of the consulted parties shared their first-hand experiences with the ‘ālalā, both wild and captive-bred populations, while some only knew of the bird by name. It was clear that bringing more awareness about the ecological and cultural significance of the ‘ālalā is crucial to garnering public support for restoring wild populations. Additionally, and as described by some of the consulted parties, it is important to hear and thoughtfully consider any concerns that the public at large may have about the proposed action.
- Archaeological Survey: The trails identified in the CIA are believed to be in the vicinity of the proposed project area, however, except for the Kaupō Trail, there is not enough existing information to make a clear determination on the location of such trails. Furthermore, as there has been no prior archaeological study of those areas that would be directly impacted by the proposed project, it is recommended that an archaeological survey be conducted to determine the presence or absence of any archaeological or historic resources. If such resources are present, efforts should be made to preserve them in place through avoidance. Project proponents should consult with DLNR’s State Historic Preservation Division and other

necessary stakeholders to determine and agree upon an acceptable scope of work.

- Avoid Activities on Pu‘u ‘Ahulili: Being that Pu‘u ‘Ahulili is a known burial site for the chief Heleipawa, it is recommended that there be no activities on this pu‘u including but not limited to the creation of low-impact foot trails or constructing temporary release aviaries. This pu‘u should be treated as a culturally sensitive place and avoidance is the best way to limit any potential cultural impacts.
- Fencing, Predator Control, and Monitoring: As described by some of the consulted parties, fencing the release areas to prevent or limit impacts to ‘alalā from wild ungulates and predators is recommended. Some of the consulted parties spoke about the importance of ongoing monitoring and predator control to ensure those released populations of ‘alalā are adequately protected.

3.6.5 Conclusion

The proposed project does not impact known archaeological sites or interfere with the performance of cultural practices including traditional gathering and historic trails systems. The ‘Alalā Project would continue to conduct education and outreach to involve the east Maui and wider Hawai‘i communities in the release process. Although no cultural sites were identified near or in the vicinity where camps, release aviaries, LZs, and other infrastructure would be built, the ‘Alalā Project would look for evidence of historic artifacts at sites before installing any project infrastructure. The project would avoid building camp or any other infrastructure in areas where historic artifacts are discovered. Pu‘u ‘Ahulili would be avoided. As identified in the CIA, the ‘Alalā Project would provide updates to the community members with genealogical ties and long-standing residency relationships to the study area throughout the entirety of the proposed pilot project.

Under the No Action Alternative, there would be no impacts to archaeological resources, however, cultural resources would be impacted by not pursuing efforts to understand how to release ‘alalā into the wild and ecosystem benefits this species would provide. Based on the analysis, project activities under Action Alternatives, incorporating above avoidance, minimization, and conservation measures, would not be expected to result in a significant impact to cultural and archaeological resources. With these measures, all impacts to cultural and archaeological resources would be minimal and non-significant. There are no substantial differences for these measures between Alternatives 2, 3, and 4, although Alternative 2 would necessarily involve impacts in both the Kīpahulu and Ko‘olau proposed release sites.

3.7 Designated Wilderness

The Wilderness Act of 1964 (Act) established the National Wilderness Preservation System, which currently comprises over 800 congressionally designated wilderness areas and over 111 million acres. Congress passed the Act to preserve and protect certain lands “in their natural condition” and “to secure for the present and future generations the benefits of wilderness.” The Wilderness Act and NPS policy mandate preservation of wilderness character, which includes five tangible qualities (untrammeled, natural, undeveloped, outstanding opportunities for solitude or primitive and unconfined recreation, and other features of value). The Haleakalā Wilderness is designated by federal statute and there is no wilderness on state or private lands. All actions taken that involve a

prohibited use pursuant to Section 4(c) of the Act would be subject to a Minimum Requirements Analysis and would strive to minimize the impacts to wilderness character.

3.7.1 Environmental Setting

Approximately 24,719 acres of HNP is congressionally designated wilderness (Fig. 6). Distinct areas comprise the Haleakalā Wilderness: the Haleakalā Crater and Kīpahulu Valley above 2,000 feet in elevation, the adjacent Manawainui and Hāna Rainforest areas. Upper Kīpahulu Valley and adjacent areas are a designated Biological Reserve and are closed to visitors. Approximately 24% of the Kīpahulu 'alalā release site analysis area is in wilderness, which accounts for approximately 1% of the total Haleakalā Wilderness area.

Untrammeled

An untrammeled wilderness is one that is unhindered and free from the intentional actions of modern human control or manipulation. The untrammeled quality is preserved or sustained when actions to intentionally control or manipulate the components or processes of ecological systems inside wilderness (e.g., suppressing fire, stocking lakes with fish, installing water catchments, or removing predators) are not taken.

The ongoing extreme degradation of Haleakalā Wilderness ecosystems caused by invasion of non-native species has led HNP to take management actions (trammeling) to address these threats. These include non-native wildlife removal, activities to restore and protect native wildlife, and re-establishment of unique native plant communities. Because of the severe threats to native species, Haleakalā's Wilderness is a setting where manipulation of the biophysical environment is required to maintain, protect, and revive the native environment. HNP is currently implementing predator and ungulate control and ground and aerial herbicide spray operations for invasive plant control. Additional ongoing or planned activities include fencing to exclude ungulates, manual removal of invasive plants, and native plant outplantings all of which adversely affect the untrammeled quality of wilderness. HNP would continue current management actions and respond to future needs and conditions to improve the natural quality of the wilderness, while designing these activities to minimize adverse impacts on the untrammeled quality.

Natural

A natural wilderness is one where ecological systems are substantially free from the effects of modern civilization. When indigenous species and ecological conditions are protected and managed to preserve natural conditions, the natural quality is preserved. The natural quality may be improved by controlling or removing non-native species or by restoring ecological conditions. The natural quality is degraded by human-caused changes to the natural environment (i.e. human-caused effects on plants, animals, air, water, ecological processes, etc.).

Manawainui and upper Kīpahulu Valley areas of HNP provide refuge for some of Hawai'i's most unique native plant and wildlife communities. The diverse plant communities of the Haleakalā Wilderness support several endemic animal species, many of which are now threatened or endangered. The natural quality of the Haleakalā Wilderness has been severely impacted by non-native species introductions, which have led to the extinction or severe decline of many native species. Invasive plants grow quickly and outcompete native vegetation. Prior to rigorous management, feral ungulates overgrazed, trampled, and severely disturbed the crater and wet forest landscapes, damaging and altering vegetative communities, and significantly impacting ground-nesting birds. Invasive mammalian predators and disease negatively impact the natural quality of wilderness, particularly populations of native bird species that have not evolved with this type of pressure. HNP is currently implementing predator and ungulate control, forest bird monitoring, and ground and aerial herbicide spray operations for invasive plant control which benefit the natural

quality of wilderness. Additional ongoing or planned activities include fencing to exclude ungulates, manual removal of invasive plants, and native plant outplantings which also improve the natural quality of wilderness.

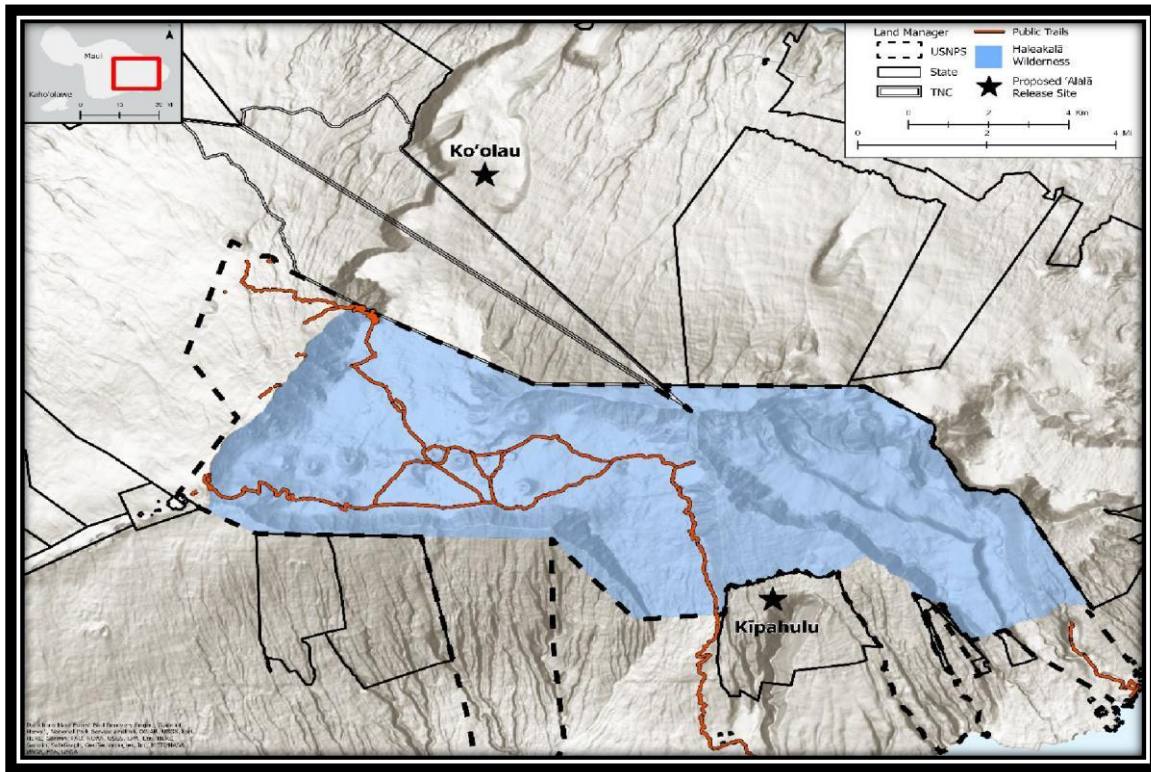


Fig. 6. Haleakalā Wilderness and public trails.

Undeveloped

An undeveloped wilderness retains its primeval character and influence and is essentially without permanent improvements or modern human occupation. The undeveloped quality is preserved or sustained when it remains free from modern structures, installations, human habitation, motor vehicles, motorized equipment, mechanical transport, and landing of aircraft. It is improved when these prohibited uses are removed or reduced.

Due to the remote location and difficult access of Manawainui and adjacent areas, protection and restoration of this vulnerable environment may sometimes require non-recreational wilderness developments and installations. The developments present within Haleakalā Wilderness include fencing and fence supply caches, snares, monitoring transects, research plots, stream and weather monitoring stations, research shelters, traps and bait stations, trail and tool caches, and administrative trails (NPS 2015a). Research shelters exist near adjacent LZs and monitoring transects or administrative trails may be used to strategically travel to both a management site (i.e. invasive plant removal site) and another shelter within an 8-hour hike. These developments would remain in the wilderness in the future and continue to detract from the undeveloped quality of wilderness.

Solitude or Primitive and Unconfined Recreation

Wilderness provides outstanding opportunities for recreation in an environment that is relatively

free from the hindrance of modern society. The ability to experience solitude is an integral component of wilderness, while opportunities for primitive and unconfined recreation make the wilderness experience unique. In preserving this wilderness quality, it is important to consider the value of maintaining these places where present and future generations have the opportunity to feel free, at peace, and self-reliant.

Solitude in Haleakalā Wilderness is impacted by administrative flights, commercial helicopter air tours, hikers, campers, and day-use visitors, and administrative use of motorized equipment which audibly and visibly affect the primitive wilderness experience. Administrative flights are more frequent in the Kīpahulu District but are intermittent and do not occur on weekends or after dark. Alternatively, commercial air tours occur constantly throughout the day and flights that occur just outside of HNP can have impacts within Haleakalā Wilderness. Broad-scale mosquito control is being considered to begin in 2023/2024 within Haleakalā Wilderness and may involve use of helicopters and/or uncrewed aerial vehicles (UAVs) flown along transect lines as often as twice weekly over forest areas where mosquitoes are to be controlled. HNP is also developing an Air Tour Management Plan (ATMP) with the Federal Aviation Administration to mitigate or prevent substantial adverse impacts of commercial air tour operations on the park's natural and cultural landscapes and resources, areas of historic and spiritual significance to Native Hawaiians, wilderness character, and visitor experience.

3.7.2 Impacts of the Proposed Action on Designated Wilderness

Potential impacts on designated wilderness were evaluated based on three of the five qualities of wilderness character as described earlier in this section. Impacts on the untrammeled, natural, undeveloped, and solitude or primitive and unconfined recreation qualities are analyzed for the no-action alternative and the proposed action alternatives. The analyses only apply to the actions taken within or near the designated Haleakalā Wilderness within HNP under each alternative as there is no designated wilderness outside of federal lands on Maui.

Although there is no designated wilderness on state or private lands, actions taken at the Kīpahulu FR proposed release site could potentially have impacts on adjacent Haleakalā Wilderness. No impacts to wilderness are expected at the Ko'olau proposed release site because the analysis area for this site does not overlap designated wilderness (Fig. 6). Impacts to HNP designated wilderness will be evaluated within the 0.8-mile estimated 'ālalā analysis area at the Kīpahulu proposed release site, which is focused within Manawainui, and portions of Kīpahulu Valley may only receive impacts in the unexpected instance where 'ālalā took a long-distance exploratory trip for a few days. Additionally, the area of analysis for wilderness includes locations outside of the 'ālalā proposed release area where helicopters would travel from staging helibases outside of wilderness including areas within Nakula and portions of the designated Haleakalā Wilderness in the park's Summit District. Minimal clearing of vegetation at LZs, trails, and fence lines would be required intermittently if access was needed within Haleakalā Wilderness to accommodate 'ālalā monitoring, but impacts would be limited to areas that have already been cleared for administrative use and clearing for off-trail access would be minimal.

The introduction of 'ālalā under the proposed action would result in substantial beneficial impacts to the Natural quality of wilderness character because of the resultant stabilization or increase in bird populations over time, including the beneficial roles the 'ālalā plays in the ecosystem. Negative ecological interactions are possible if 'ālalā are found to disperse non-native invasive plant seeds and would be monitored and mitigated to prevent the spread of invasive weeds. The planned 'ālalā pilot

study would inform future efforts of restoring natural ecosystem processes that have been degraded over time by human-related impacts. Over the long term, the proposed action would substantially benefit the natural quality of wilderness compared to the existing conditions if long-term 'ālalā releases into the environment were approved.

Noise from helicopters would only occur for minutes at a time during take-off and landing mostly outside of wilderness, but some LZs within wilderness may be used if bird monitoring or capture needs to happen on NPS land. The presence of and noise from these motorized and mechanized uses would result in temporary adverse impacts on the natural and solitude qualities of wilderness during any monitoring activities. Landing of aircraft may occur within designated wilderness in the Manawainui area, but only if it is the minimum requirement necessary for recapture or monitoring. Helicopters would land briefly near wilderness during 'ālalā infrastructure installation, feeding, and monitoring, to pick up and drop off teams and supplies. All infrastructure and project work is focused outside of Haleakalā Wilderness on Kīpahulu Forest Reserve State land, but noise impacts may travel into designated wilderness. If 'ālalā decide to nest on NPS lands within Haleakalā Wilderness, the nests would need to be monitored, surrounding predator control implemented, and potential temporary installation of feeding stations may occur. Installations that are a prohibited use pursuant to Section 4(c) of the Act would be subject to a Minimum Requirements Analysis and would strive to minimize the impacts to wilderness character. Any temporary installation of feeders or predator control within Haleakalā Wilderness would degrade the undeveloped quality of wilderness, although all equipment would be installed with little impact to the environment, then removed once a nest is unoccupied or at the completion of the project.

Only a portion of the 'ālalā core analysis area (within 0.8 miles of the proposed release aviary) is located within designated Haleakalā Wilderness, while the outer analysis area (between 0.8 and 2 miles from the release aviary), where impacts are unlikely or uncommon, covers a larger portion of wilderness. Most of the project area is closed to public access, but the Kaupō Trail is included to the west and within the outer analysis area. However, helicopter flights to and from the project area over portions of designated wilderness would occur on an intermittent basis (approximately once or twice per week), very briefly (perhaps 15 seconds to a few minutes) audibly and visibly impacting the primitive wilderness experience. Hikers may hear helicopter impacts along the trail, which is one of the more remote and less visited open trails within HNP. Helicopters would land briefly near wilderness during each 'ālalā implementation or monitoring effort (see description of fecal samples and vegetation monitoring on p. 20), to pick up and drop off teams and supplies. Direct adverse impacts on the primitive wilderness experience would result, though these would be rarely and intermittently perceptible to visitors in accessible wilderness areas. Project noise created within the Kīpahulu Valley Biological Reserve, and Manawainui portion of designated wilderness, that does not travel beyond that boundary would not affect opportunities for solitude and primitive experiences in wilderness areas open to public access.

Releasing 'ālalā at the Kīpahulu proposed release site would degrade the untrammeled quality of wilderness since proposed actions would be an intentional manipulation of an ecological system. Any installations or predator control work would adversely impact the undeveloped and natural qualities. However, impacts to wilderness would only occur if 'ālalā individuals travel into designated wilderness and nest or frequent habitat. In past releases, 'ālalā mostly remained near their release site and feeders, so although 'ālalā could enter Haleakalā Wilderness it is expected they will stay close to the release site and aviary off NPS land. Impacts to Haleakalā Wilderness are expected to be minimal and temporary, since the proposed action is a pilot and temporary release where all birds

would be collected at the termination.

3.7.3 Avoidance, Minimization, and Conservation Measures

The project incorporates the following measures to minimize impacts to Wilderness.

- All actions taken that involve a prohibited use pursuant to Section 4(c) of the Wilderness Act would be subject to a Minimum Requirements Analysis and would strive to minimize the impacts to wilderness character.
- Noise impacts and infrastructure resulting from the project would be prioritized off of NPS land Haleakalā Wilderness and all would be temporary and removed at the end of the pilot project.

3.7.4 Cumulative effects Designated Wilderness

When the impacts of the proposed action are added to impacts from past, present, and reasonably foreseeable future projects within the park described under Cumulative Effects (see 3.10), the overall cumulative impact on wilderness character would be beneficial. Ongoing work within and near the project area include release of sterile male mosquitoes in areas of HNP potentially overlapping the Kīpahulu proposed release site and plans to replace an ungulate fence directly adjacent to the Kīpahulu FR site within the next five years. Although the proposed action would adversely impact some wilderness character qualities due to the increase of noise and presence of helicopters and installations, in addition to current helicopter use and developments in the area, these impacts would be temporary and removable at the end of 5 years (i.e. installation of feeders). Additionally, project helicopter flights would be prioritized off of NPS lands and would only occur in wilderness if it is the minimum requirement necessary to support ‘ālalā nesting in HNP. A draft Air Tour Management Plan proposes a designated flight path for commercial air tours further from Haleakalā Wilderness with current air tour flights traveling closer to the proposed project area (HALE 2023). The overall result of ‘ālalā research would be a long-term beneficial impact to the Natural quality of wilderness due to the ability to learn more about ‘ālalā in the natural environment and beneficial dispersing roles of native seeds. Considering the mitigations discussed in the EA, the proposed action would contribute negligible impacts to the existing conditions of Haleakalā Wilderness.

3.7.5 Conclusion

The No Action Alternative is likely to result in fewer impacts to the untrammelled, undeveloped, opportunity for solitude and other features of value in wilderness compared to the proposed action. However, under the No Action Alternative, the natural quality of wilderness would continue to degrade with the loss of the only extant native Hawaiian corvid bird species. The proposed action impacts additional wilderness character qualities including the untrammelled quality, undeveloped quality, and opportunity for solitude from the use of mechanized equipment for ‘ālalā releases and monitoring. However, the proposed action would likely support a considerable recovery to natural conditions previously present on the island, thus benefiting the natural and other features of value qualities of wilderness. Areas we expect most use by ‘ālalā are near the release aviaries at the Kīpahulu and Ko‘olau proposed release site, that is outside designated wilderness, and areas of wilderness that are within 0.8 miles of the proposed release aviary at the Kīpahulu proposed release site (Fig. 6). Although the proposed action detracts from wilderness character qualities, under the Action Alternatives the small adverse impacts to the undeveloped quality, untrammelled quality, and opportunity for solitude are offset by substantial benefit to the natural and other features of value through protection of native ‘ālalā. With avoidance, minimization, and conservation measures, impacts to wilderness would be brief and minimal.

3.8 Recreation, Hunting, Public Access, and Visitor Use and Experience

This section discusses existing public uses of the area including hiking, birding, gathering and subsistence and recreational hunting along with the impacts that the project would have on these resources. Tourism is an important component of the east Maui economy, and access to public land is important for recreation as well as subsistence hunting, foraging, and gathering materials. Each agency has different guidance for public access and recreation. There is an intersection of these activities with cultural practices, as noted in Section 3.6, to which the reader is also referred.

3.8.1 Environmental Setting

Visitor use in the Koʻolau and Kīpahulu Forest Reserves is restricted by State regulations [DLNR 2003] to officially permitted access and hunter access on state holidays and weekends only. Visitor use and hunting within Kīpahulu Forest Reserve is very limited due to lack of road access. The Koʻolau proposed release site is within a fenced area and all feral ungulates have been removed. Both reserves are open to hunting year-round with a valid hunting license and in accordance with DLNR rules for feral pig (*Sus scrofa*), axis deer (*Axis axis*), and feral goat (*Capra aegagrus hircus*; DLNR 2003). Gathering, hiking, and birding may also be practiced in these forest reserves, but because of the remoteness of the sections of the reserves for the proposed release sites, DLNR reports virtually no public presence in these areas. . The character and quality of the visitor experience influences perception of natural areas, providing a unique encounter with a place that differentiates it from other regions. Public enjoyment of resources is a fundamental purpose of all national parks (NPS 2006). Access to Haleakalā National Park within the Kīpahulu analysis area is restricted to on-trail use and only includes a portion of Kaupō Trail (1 mile west of release site) in areas ‘ālalā are expected to spend 5% of their time. There is no visitor access to designated wilderness north of the Kīpahulu proposed release site on HNP in Manawainui and east in Kīpahulu Valley and most of the project area within the park is closed to the public.

3.8.2 Impacts of Proposed Action on Recreation, Hunting, Public Access, and Visitor Use and Experience

Effects to recreation, hunting and public access, and visitor use and experience would be considered significant if they involved a substantially adverse change to access or degraded or limited the resources for which the public accessed the area. There would be no changes to public access under any of the action alternatives, which all propose to release ‘ālalā in sections of State-managed land that is publicly accessible. However, these mauka (upslope) regions cannot be reached by cars or trucks and the public could only reach the release sites by foot after 8 or more hours of hiking. Field crews would access sites by helicopter; helicopter landings for purposes other than conservation activities, i.e., recreation, hunting or gathering, are very unlikely to occur. There is little chance for interaction between the public utilizing the forest reserves and the proposed project, and no adverse impacts if there were any interaction. Exact locations of endangered species are not shared publicly to protect these species from harm. As discussed in Section 3.1, ‘ālalā are unlikely to disperse within the 5 years maximum of the pilot project to sites that are readily accessible by the public. Very little visitor use and recreation occurs within the NPS portion of the project area and public hunting is not allowed, so impacts to park visitors would be minimal. Any impacts to HNP visitor experience would be indirect from project helicopter noise outside of the park boundary and the minimal flights within HNP that would not travel over visitor cabins and trails. Adverse impacts

to public access or use of the proposed release sites for hiking, birding, hunting, or gathering are not anticipated.

3.8.3 Avoidance, Minimization, and Conservation Measures

No avoidance, minimization, and conservation measures are proposed because we anticipate no impacts to recreation, hunting and public access, and visitor use and experience would occur under Alternatives 2, 3, and 4.

3.8.4 Conclusion

Under the No Action Alternative, there would be no impacts to recreation, hunting, public access, and visitor use and experience. Minimal impacts of project helicopter noise and views would overlap visitor use trails within HNP and the birds may but are unlikely to spend 5% of their time in areas where visitors are present, therefore impacts to visitor use and experience in the park are negligible. Based on the analysis, project activities under Action Alternatives, incorporating above proposed avoidance, minimization, and conservation measures, would not be expected to result in a significant change to recreation, hunting, public access, and visitor use and experience. With these measures, all impacts to recreation, hunting, public access, and visitor use and experience would be minimal and non-significant. There are no substantial differences in impacts between Alternatives 2, 3, and 4, although Alternative 2 would necessarily involve impacts in both the Kīpahulu and Koʻolau proposed release sites.

3.9 Air Quality, and Scenic Resources and Noise

This section of the EA describes the existing sound levels and noise sources, air quality and scenic resources and vantages within the subject areas and then discusses impacts the project may have upon these resources.

3.9.1 Environmental Setting

The trade winds of east Maui contribute to excellent air quality, with pollution from human sources posing little or no health risk. However, when Kīlauea and/or Mauna Loa volcanoes on the island of Hawaiʻi are erupting, VOG (volcanic smog or haze containing volcanic dust and gasses) can be blown from Hawaiʻi towards Maui when the winds are from the southeast, briefly reducing air quality on Maui. National Ambient Air Quality Standards (NAAQS) and their State equivalents have been established for various criteria pollutants linked to potential health concerns, most notably: carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM), which is broken down for regulatory purposes into particles of 10 micrometers or smaller (PM₁₀) and particles of 2.5 micrometers and smaller (PM_{2.5}), and sulfur dioxide (SO₂). The State has also set a standard for hydrogen sulfide. The NAAQS, as well as the State standards that are defined in HAR 11-59, Air Quality, are set at levels that protect public health with a margin of safety. Maui Island, like the rest of the state, meets all these and is within what for federal regulatory purposes is called an attainment area. The scenic resources of east Maui are notable on a global scale, evidenced by a thriving commercial air tour business providing helicopter rides for tourists from around the world to enjoy the scenic mountains, waterfalls, volcanic crater, and sea cliffs. Air tours currently travel over the analysis area itself, however, described in the Draft Haleakalā Air Tour Management Plan (HALE 2023), commercial air tours would not fly over the Kīpahulu proposed release site. The landscape is also enjoyed from below as tourists drive the Hana Highway for the primary purpose of enjoying the scenery. The Maui Island Plan (Maui County Department of Planning 2012) notes:

Scenic views are closely tied to residents' quality of life and the island's sense of place. Maui possesses unique, rare, and significant views, many of which have no equal. Many views and landscapes are

closely tied to Hawaiian culture, folklore, and history (Maui County Department of Planning 2012: 2-44).

The objectives, policies and actions of the Maui Island Plan related to scenic resources focus on road corridors, coastal areas, and trails, but also contain the following: 2.5.1-Action 7: Develop and adopt standards to protect ridgelines, slopes, and view planes from development (Maui County Department of Planning 2012:2-48).

Acoustic resources are the individual types of sounds, including both natural sounds (for example, wind, water, wildlife, weather) and cultural sounds (for example, Native Hawaiian ceremonies). Noise generally refers to sounds which are unwanted or intrusive, either because of its effects on humans and wildlife, or its interference with the perception or detection of other sounds (Section 4.9 in NPS 2006; Lee et al. 2016). Ambient noise within the analysis area is derived from both human-made and natural sources. The analysis area for consideration of effects of ambient noise is the two proposed release sites within 2 miles of the locations of the proposed release aviaries. Natural sound is created by wind through leaves, rain on forest canopy, rushing water in streams and waterfalls, and bird song. Sound levels are usually quite low in both proposed release areas. Evaluation of noise requires a consideration of loudness at various pitches. Loudness is measured in units called decibels (dB) or the A-weighted decibel (dBA) scale, which is commonly used to describe sound levels because it reflects the frequency range to which the human ear is most sensitive.

To help protect the public health and welfare, both State and Federal agencies utilize noise abatement criteria for various categories of land use. On the State level, the standards most relevant for the proposed project are those for Class A (e.g., conservation) lands imposed by HAR 11-46, Community Noise Control. According to HAR 11-46-4, maximum noise levels at the property boundary as measured over a specified period of time should not exceed 55 dB during the day and 45 dB at nighttime. This is roughly the equivalent of moderate traffic on a highway and an urban street at night, respectively. The most important federal concern is the presence of nearby Haleakalā National Park. NPS Management Policies 2006 and Director's Order 47 require the agency to manage, preserve, and restore park acoustical environments and soundscapes. In addition, HNP's Foundation Document (NPS 2015) identifies natural soundscapes as a vital component of healthy, intact biological communities that play an important role in wildlife communication and behavior and are critical to effective wilderness management. These policies require the NPS to protect and restore the natural soundscapes of parks, including those that have been affected by unnatural and unacceptable noise. HNP has invested in over three decades of extensive acoustic monitoring due to the acknowledgement of the importance of the natural acoustic environment. The findings of these studies revealed that across HNP, the acoustic environment is generally in good condition, while aircraft are documented as the most prevalent noise source affecting the soundscape (Wood 2015, Lee et al. 2016). Helicopters are most common during the daytime and high-altitude jets are most common at night (Wood 2015). Further, the crater of HNP boasts intensely quiet sound pressure levels, around 10 dBA (Wood 2015).

Most of the project area within HNP is in the Kīpahulu District where common natural sounds include rain, water flowing, bird calls and insects buzzing (Lee et al. 2016). Commercial air tours, commercial flights, private aviation, and other administrative flights contribute noise to this area.

3.9.2 Impacts of Proposed Project to Air Quality, and Scenic Resources and Noise

Effects to air quality would be considered significant if the action involved a substantial new emissions source or if State standards would be violated. Impacts to scenic resources would be

evaluated as significant if the project degraded a noted scenic resource or interfered with a scenic view plane. Effects to noise would be considered significant if State standards of the Department of Health would be violated, or if the natural quiet of the area was substantially disturbed, or if there was noticeable disturbance to the soundscape of Haleakalā National Park. Most conservation activities would be conducted by staff working with no vehicles and minimal machinery in small camps in remote areas with no potential for air pollution, noise audible to humans, or interference with scenic views. Virtually the only source of impacts for the resources of air quality, scenic value and natural sound levels would be helicopters.

It bears emphasis that helicopters are essential for natural resource management on east Maui because these sites are not accessible by ground transport; as there are no roads, access requires more than 8 hours of hiking through steep topography and dense vegetation. Therefore, all staff and materials for project activities, and personal gear would be delivered via helicopters. Regular helicopter flights would be necessary to support field operations under Alternatives 2, 3, and 4, but the total proportion of increase would slightly vary depending on which, if any, alternative is selected. Helicopter flights to the proposed release sites would be from helibase staging areas accessible by ground transport, indicated by the yellow triangles (Fig. 1.) All possible/potential staging areas are on State, NPS, or private lands and would only be used with landowner/manager permission.

Assessment of the impacts of the project's helicopter operations requires an understanding of the current volume of helicopter operations in east Maui for other conservation projects and air tourism. Currently, there are four helicopter operators offering both air tours and flights for conservation management projects. The minimum estimate of average monthly flight hours combined from the four companies is 60-80 hours/month for conservation management flights. For context, commercial air tour helicopter flights over the eastern part of Haleakalā National Park are roughly 10-13 flights/day or roughly 60 flight hours/month (HALE 2022, p. 26). Table 4 (**Appendix G**) estimates the number of additional flight hours under each alternative and the proportional increase from existing conditions for conservation helicopter flights. Alternative 2 has two sites, so more trips would be needed, however they would not be purely additive since the activities would be staggered with releases occurring in different years. The most intense field activities would occur for the first few months post-release, represented by the maximum value, and taper off after 6 months to 2 years, represented by the minimum value. A subsequent release at the other site under Alternative 2 would increase again to intense field activities in the first few months after the second release, but infrequent field visits would continue at the first release site. The estimated additional monthly helicopter hours for conservation flights are only a small to moderate increase (6 to 20 percent) during the majority of months, and moderate to considerable (20 to 68 percent) during the first few months of each release over already existing east Maui conservation flights. Flights would be prioritized off of NPS lands and flights would only enter the park if a remote LZ was needed to monitor and support nesting 'āla'ā within HNP. Reduction in air quality for proposed flights is negligible and minor increase in noise and impact on scenic resources compared to current commercial helicopter traffic over east Maui.

All staff participating in helicopter operations would receive proper training. Length of flights and frequency would be reduced by operating out of a nearby helibase staging area (a site accessible by roads with a clear and minimal distance to the landing zone and approved for use by landowners/managers) (yellow triangles, Fig. 1) and efficient flight planning. Flight paths would be designed so that there are no flights over residential homes under 500 feet above ground elevation (AGL) and no external loads would be carried over homes and other buildings. During a typical operation, it is

expected that the helicopter would fly at a speed of 69 miles per hour and approximately 500–2000 feet AGL from the main heliport (Kahului Airport, OGG) to a designated temporary helibase (staging area) then to the selected field sites (20–90 miles; 10–25 minutes). Helicopter airtime for each of the 3 action alternatives would be between 2–24 hours/month depending on stage of the release. Most helicopter flight noise would be highly variable depending upon the flight height and lateral distance to a person or wildlife but could reach a maximum of 82–93 dBA during pick ups and drop offs at LZs. Occasional resource management trips to the analysis area for current management would result in other human-caused noises such as speaking and running generators or chain or brush saws and comprise approximately 20 site visits/year to the proposed Ko‘olau release site and 12 site visits/year for the Kīpahulu release site.

Conservation helicopter flights will avoid flying low near forest bird breeding habitats to avoid rotor wash and excessive noise disturbance to nesting forest birds. There would be no work done at night, so noise impacts would only occur during daylight hours (between civil sunrise and civil sunset). During helicopter operations, impacts to the acoustic environment would primarily occur along flight paths, at helibases, and when hovering over remote landing zones, which are very isolated. Because the helicopters would be flying well above the canopy at speeds as high as 69 mph, noise levels on a given point on the ground would be temporary (15 seconds or less) and would not exceed 82 dBA for a person or wildlife on the ground. While noise levels immediately beneath flight paths may disrupt human communication and potentially cause annoyance to wildlife, these noise levels would be temporary, and impacts are insignificant.

A special concern is the impact to Haleakalā National Park. The Kīpahulu proposed release site is within 0.5 miles of Haleakalā Wilderness, a congressionally designated wilderness area, to the north (HALE 2022, p. 40) (Fig. 6). The *National Park Service Management Policies 2006* and *Director’s Order 47* require the National Park Service to manage, preserve, and restore park designated wilderness and acoustical environments, including those that have been affected by unnatural and unacceptable noise (HALE 2022, p. 23). To avoid contributing to noise levels and scenic impacts within the park, all helicopter flights to the Kīpahulu proposed release site in support of the ‘Alalā Project would avoid overflights of HNP and only minimal noise, if any, would impact the park’s soundscape. Due to the proposed project flights mostly avoiding HNP and possible, but not targeted use of remote LZs and camps within the park boundary, noise impacts to HNP’s natural soundscapes are expected to be very infrequent and negligible.

3.9.3 Avoidance, Minimization, and Conservation Measures

Avoidance, minimization, and conservation measures are built-in to project design to minimize the impacts of helicopters on the air quality, scenic quality, and especially the soundscape of the region. These include efficient flight planning that reduces the length and frequency of flights, as well as avoiding low overflights of breeding bird habitat and homes and avoiding overflight of Haleakalā National Park.

3.9.4 Conclusion

Under the No Action Alternative, there would be no impacts to air quality, scenic resources, or additional noise. Based on the analysis, project activities under Action Alternatives, incorporating above proposed avoidance, minimization, and conservation measures, would not be expected to result in substantial new emissions, degradation of a noted scenic resources or interference with a scenic view plane, or substantially effect the general quiet or noticeably disturb the soundscape of State FRs and HNP in the analysis area for the proposed release sites. There are no substantial differences in impacts between Alternatives 2, 3, and 4, although Alternative 2 would necessarily

involve impacts in both the Kīpahulu and Koʻolau proposed release site, including potentially longer helicopter flightpaths to the Kīpahulu proposed release site.

3.10 Cumulative Effects

Cumulative effects may occur when the adverse effects of a proposed action are added to other past, present, and reasonably foreseeable future actions of any government or private entity. In some cases, the direct effects of a project may be minor but the cumulative effects significant. Cumulative impacts would be evaluated as significant if the severity of an impact to a particular resource increased to be substantially adverse because of the interaction of two or more distinct actions and the proposed project was not capable of mitigating this impact to insubstantial levels. Cumulative effects are also addressed under 3.2.3.4 Cumulative effects Plants and Animals and 3.7.4 Cumulative effects Designated Wilderness.

In analyzing cumulative effects, it is important to first identify future or ongoing actions in nearby areas with the potential to have impacts that interact with those of the proposed project. Review of HRS 343 and National Environmental Policy Act documents in the editions during the previous year of *The Environmental Notice* indicates no known new major planned or ongoing projects in the east Maui area in the 2023 to 2025 timeframe that could interact with the proposed project. Because the proposed release sites are on State Forest Reserves that are managed for conservation it is not expected that any new major planning or ongoing projects in east Maui for these areas in the 2026 to 2027 timeframe that could interact with the project. Most development involves construction or renovation of individual homes, commercial structures and government infrastructure, and no major infrastructure or development projects were noted. No construction or land-altering projects are proposed for the analysis area within 2 miles of the proposed release sites. However, the proposed project does have the potential to have impacts that interact with those of ongoing wildlife projects and activities, as listed below.

- *U.S. Fish and Wildlife Service Support of PEPP Activities.* The Service provides funding support to the Plant Extinction Prevention Program (PEPP), which conducts conservation management including fencing and weeding for two listed plants at the Kīpahulu proposed release site. PEPP also monitors rare and listed plants at the Koʻolau and Kīpahulu proposed release sites and collects seeds and fruits of listed plants for propagation. These activities would not be hindered by the ʻAlalā Project as all listed plants and sensitive habitats would be avoided when monitoring ʻalalā and when installing any needed infrastructure (trails, camp, release aviary, supplemental feeding stations).
- *DOFAW Support of Mosquito Control Activities and Conservation Activities.* Broad-scale control of invasive mosquitoes is currently in the initial trial and calibration stages on east Maui, including additional human presence, mosquito traps, and mosquito releases (HALE 2022, entire). DOFAW may be conducting mosquito releases in forest areas near and possibly overlapping the Koʻolau proposed release site. DOFAW is also conducting ongoing fencing and feral ungulate control, controlling invasive introduced plants, conducting plant and animal surveys, and is an active partner in the PEPP program at both proposed release sites.
- *Haleakalā National Park (HNP) Conservation Activities.* HNP is a partner with DOFAW in planning broad-scale control of invasive mosquitoes. Sterile male mosquitoes likely would be dispersed in areas of Haleakalā National Park potentially overlapping the Kīpahulu proposed release site. HNP has plans to reconstruct an ungulate fence directly adjacent to the Kīpahulu FR site within the next five years. The fence project, which would require about one year to complete, would include increased helicopter traffic to bring supplies

and staff, increased noise generated by fence building crews while working and camping, and vegetation clearing as needed to access fence line where plants have encroached the line. Noise-generating equipment anticipated to be used include chainsaws and post-pounders. HNP also has plans to continue to control invasive introduced plants and conduct plant and animal surveys.

- *The Nature Conservancy Waikamoi Preserve Conservation Activities.* The Conservancy has plans to maintain ungulate exclusion fencing, remove feral ungulates, control invasive introduced plants, and conduct small mammal predator control. The Conservancy is a partner with DOFAW and HNP in planning broad-scale control of invasive mosquitoes. Sterile male mosquitoes likely would be dispersed in areas of Waikamoi Preserve.
- *East Maui Watershed Partnership (EMWP) Conservation Activities.* The EMWP has plans to maintain ungulate exclusion fencing, remove feral ungulates, and control invasive introduced plants.

The adverse impacts of the proposed project by human presence on the ground are centered on minor and almost entirely mitigable disturbance of vegetation and listed plant species. There is the potential for 'ālalā to increase the rate of spread of introduced plants, however because of the high densities of introduced forest birds in the proposed release areas that already contribute to the spread of introduced plants the likelihood is low of the spread of introduced plants by 'ālalā causing widespread damage or death to native plants. There is the potential for 'ālalā to predate nests of introduced and non-listed Hawaiian forest birds. However, numbers of these species are so numerous and frequency of predation events by 'ālalā based on observations of foraging behavior of 'ālalā on Hawai'i Island is so few that impacts to introduced and non-listed forest birds would be negligible and non-significant. The likelihood of 'ālalā depredating nests of listed Hawaiian forest birds is low and impacts to listed Hawaiian forest birds with mitigation measures would be non-significant. Release at the Ko'olau proposed release site is not recommended because of potential impacts to *Partulina* tree snails. The likelihood of 'ālalā depredating *Partulina* tree snails is low at the Kīpahulu proposed release site and impacts with mitigation measures would be non-significant. With mitigation, impacts to all resources at the Kīpahulu proposed release site would be negligible or non-significant.

More unlikely, but not entirely discountable, are minor impacts to operations on nearby farms and ranches in the unlikely event 'ālalā disperse to much greater distances than expected. These impacts would also be mitigated through voluntary conservation actions by the operations and/or retrieval of 'ālalā by the 'Alaāl Project.

The only category of impacts that has any realistic potential to accumulate with those of other ongoing or future projects is helicopter noise, which is discussed from a cumulative perspective in Section 3.9, which concluded that even with releases at both sites, the overall increase in conservation helicopter flights would be modest. Adding in air tour hours, the additional helicopter noise would be minimal. The additive impact is further diluted by the fact that most other helicopter activity will not be concentrated in the same area. Highest priority areas for mosquito release are outside the areas of the proposed 'ālalā release sites. Helicopters that might be used for a period of a few to several weeks for broad-scale mosquito control would likely be outside the proposed release areas. However, if helicopter flights over the proposed release areas were needed, helicopters would fly quickly over areas where 'ālalā could potentially be, causing only minor disturbance to 'ālalā. Helicopters would not hover in place. 'Alalā in areas where broad-scale mosquito control is conducted would be unlikely to approach UAVs or helicopters (see 3.2.1.2). Planned ungulate fence construction by NPS near the Kīpahulu proposed release site has the potential to impact nesting

‘ālalā. However, the likelihood an ‘ālalā nest would be near a fence line during construction is small, and the time the ‘Ālalā Project would request fence construction activities be modified or limited would be no more than 3 months (see 3.2.1.2).

In sum, cumulative effects are either non-existent, or minor and highly temporary or mitigable through standard project operating procedures. There does not appear to be any need for additional mitigation for cumulative impacts. It should also be noted that there are some beneficial impacts of the project that may also accumulate with those of other conservation projects. These include dispersal of native plants seeds and control of rats leading to increased reproduction of some forest plants, as well as control of feral cats, mongoose and rats that help decrease native bird mortality. The cumulative benefits would cease after the termination of the maximum five-year pilot project.

Secondary impacts occur when projects induce physical and social impacts that are only indirectly related to the project – e.g., effects on housing scarcity when a major resort is constructed in a rural area. The project will not create a large number of new jobs that could lead to in-migration on Maui, and it will not cause stresses on government infrastructure or induce any other type of adverse secondary effects.

3.11 Required Permits and Approvals and Consistency with Government Plans and Policies

3.11.1 List of Required Permits and Approvals

Hawai‘i State Department of Land and Natural Resources Conservation District Use Permit

U.S. Fish and Wildlife Service

U.S. Fish and Wildlife Service Recovery Permit

3.11.2 Consistency with Government Plans and Policies

Listed below are applicable government plans and policies and a discussion of the project’s consistency with each.

3.11.2.1 Hawai‘i State Plan and Conservation Lands Functional Plan

The Hawai‘i State Plan (HSP) was adopted in 1978. It was revised in 1986 and again in 1991 (Hawai‘i Revised Statutes, Chapter 226, as amended). The HSP establishes a set of goals, objectives and policies that are meant to guide the State’s long-term growth and development activities. The aspects of the plan most pertinent to the proposed project are the following:

Chapter 226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources. Planning for the State’s physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of prudent use of Hawaii’s land-based, shoreline, and marine resources and effective protection of Hawaii’s unique and fragile environmental resources. To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of the State to:

- (1) Exercise an overall conservation ethic in the use of Hawaii’s natural resources.
- (2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.
- (3) Take into account the physical attributes of areas when planning and designing activities and

facilities.

- (4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.
- (5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.
- (6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawai'i.
- (7) Pursue compatible relationships among activities, facilities, and natural resources.
- (8) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.

Discussion. The proposed action is consistent with the goals, objectives and policies of the *Hawai'i State Plan*. Specifically, it is an appropriate use of an isolated land area that will encourage the survival of a critically endangered animal species, while protecting other important species in the area and enabling the continued existence of rare plants that will benefit from the unique ecosystem services the 'alalā provides.

Hawai'i State Functional Plan for Conservation Lands

The Hawai'i State Plan, Conservation Lands (DLNR 1991) addresses the impacts of population growth and economic development on our natural environment and provides a framework for the protection and preservation of our pristine lands and shorelines. Functional Plans are intended primarily to address priority actions that should be taken within a two- to six-year period, which coincides with the Biennial Budget and Capital Improvement Program budgetary cycles. Functional Plans primarily affect State operations; however, recommendations for coordinated actions at the Federal, County and private sector levels are also included. Although after more than three decades it is clearly beyond what was considered the primary time frame for the HSP, no new HSP has been adopted, and many of the basic goals remain relevant.

The HSP for Conservation Lands has several priority guidelines, but the one most relevant to the proposed project is:

3. Utilize Hawaii's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline, conservation lands, and other limited resources for future generations.

In furtherance of this are several policies and implementing actions:

Policy IIB(I): Develop protection and preservation of habitats of rare and endangered wildlife and native ecosystems in Hawaii.

Implementing Action IIB(I)a: Establish sanctuaries for populations of endangered plant and animal species when necessary to protect critical habitats.

Implementing Action IIB(I)b: Develop coordination with federal and county agencies and interest groups in efforts to protect and assist recovery of threatened and endangered species and habitats.

Discussion: The proposed project would be highly consistent with all actions related to endangered species and native ecosystems, would involve key coordination with federal agencies, and is not inconsistent with any aspect of the Conservation Lands Functional Plan.

3.11.2.2 Hawai'i State Wildlife Action Plan and 'Alalā Recovery Plan

Hawai'i's State Wildlife Action Plan (SWAP) (DLNR 2015) is a continuation of an initiative begun in 2005 with the first edition of this plan, then called the Comprehensive Wildlife Conservation Strategy (CWCS). The plan comprehensively reviewed the status of the full range of the state's native terrestrial and aquatic species, over 10,000 of which are found nowhere else on earth and builds on the foundation developed in 2005. Hawai'i's SWAP presents strategies for long-term conservation of these species and their habitats (DLNR 2015). 'Alalā is listed as a Species of Greatest Conservation Need (DLNR 2015, pp. 7-10 – 7-12). The former presence and ecological role of 'alalā in various areas of Hawai'i Island is noted in many areas of the State Wildlife Action Plan. Historical and contemporary threats to 'alalā are outlined in a special species information sheet that lists predation, shooting, disease, habitat degradation, population size, and genetic effects. Ongoing and future potential conservation actions are also discussed, including maintaining and increasing the captive flock without further loss of genetic diversity. Also listed are planned re-introduction sites through coordinated management activities designed to conserve other endangered forest birds on the island of Hawai'i, including fencing, ungulate and small mammal control, forest restoration, habitat monitoring, and studies of disease and disease vectors. Determining potential re-introduction sites on other islands is listed as a research priority. The proposed project is highly consistent with Hawai'i's State Wildlife Action Plan (DLNR 2015).

The Revised Recovery Plan for the 'Alalā (*Corvus hawaiiensis*) (USFWS 2009) guides urgent and essential steps in preventing the extinction of the 'alalā, while at the same time providing an overarching plan for the species' eventual recovery. Action 3 in the Plan is to "Establish New Populations in Managed Suitable Habitat." Sub-actions are to conduct pilot releases as soon as genetically and demographically redundant birds are available, determine the potential efficacy of behavioral management of juvenile 'alalā, optimize aviaries and rearing/socialization techniques to maximize behavioral fitness of selected birds for release, and determine the potential efficacy of different reintroduction approaches. The proposed project is highly consistent with recovery actions in the Revised Recovery Plan for the 'Alalā.

3.11.2.3 County of Maui General Plan

The *Maui Island Plan, General Plan 2030* (Maui County Department of Planning 2012) and the *County of Maui 2030 General Plan, Countywide Policy Plan* comprise a long-term, comprehensive blueprint for the physical, economic, environmental development and cultural identity of the County of Maui. The Countywide Policy Plan, adopted on March 24, 2010, provides broad goals, objectives, policies, and implementing actions that portray the desired direction of the County's future. Furthermore, this Countywide Policy Plan provides the policy framework for the development of the Maui Island Plan and the nine Community Plans. The Countywide Policy Plan is the outgrowth of and includes the elements of the earlier General Plans of 1980 and 1990. The Maui Island Plan, General Plan 2030 was adopted on December 28, 2012, and establishes urban and rural growth areas that indicate where development is intended and will be supported. Growth areas will provide for less costly services, reduced commuting, protection of community character and the preservation of agriculture, open space, and cultural and natural resources. This section is organized to list all areas of concerns in the Maui Island Plan, General Plan 2030 (General Plan 2030) (Maui County Department of Planning 2012), and where directly relevant to the proposed action, the individual Goals, Objectives, Policies and Implementing Actions, contained in the General Plan 2030 by subject area. Discussions of consistency are provided after each subject area.

Cultural, Historic, and Archaeological Resources

Goal: 2.1 Our community respects and protects archaeological and cultural resources while

perpetuating diverse cultural identities and traditions.

Objective 2.1.1 To promote “an island culture and lifestyle that is healthy and vibrant as measured by the ability of residents to live on Maui, access and enjoy the natural environment, and promote Hawaiian customs and conditions” (Maui County Department of Planning 2012, p. 2-10).

Shoreline, Reefs, and Nearshore Waters and Watersheds, Streams, and Wetlands

Goal 2.3 Healthy watersheds, streams, and riparian environments.

Objective 2.3.1 Greater protection and enhancement of watersheds, streams, and riparian environments.

Objective 2.3.2 Decreased non–point source and point source pollution.

Objective 2.3.4 Greater preservation of native flora and fauna biodiversity to protect native species.

Objective 2.3.5 Limited development in critical watershed areas (Maui County Department of Planning 2012, p. 2-30 – 2-33).

Discussion: The proposed project involves very little on-ground disturbance and the location of the few on-ground facilities within the large project areas is highly flexible. Archaeological reconnaissance surveys would be conducted to ensure that no archaeological or cultural resources are present or would be affected in the small sites that require surface disturbance. All such sites

would completely avoid watercourses and employ Best Management Practices to prevent erosion and sedimentation impacts.

Wildlife and Natural Areas

Goal 2.4 Maui’s natural areas and indigenous flora and fauna will be protected.

Objective 2.4.1 A comprehensive management strategy that includes further identification, protection, and restoration of indigenous wildlife habitats.

Policy 2.4.1.b Require flora and fauna assessment and protection plans for development in areas with concentrations of indigenous flora and fauna; development shall comply with the assessment and protection plan and shall use the avoidance, minimization, and mitigation approach respectively, with an emphasis on avoidance.

2.4.1.c Support the implementation of Hawai’i’s Comprehensive Wildlife Conservation Strategy (October 2005).

Objective 2.4.3 Greater protection of sensitive lands, indigenous habitat, and native flora and fauna.

Policy 2.4.3.g Encourage reforestation efforts that increase native species’ habitat (Maui County Department of Planning 2012, p. 2-39 – 2-42).

Discussion: The project is focused on efforts to ensure the survival of an endangered species and involves assessment and protection of associated habitat. It is highly consistent with all goals, objectives and policies related to Wildlife and Natural Areas. Prior to ground disturbance, sites will be surveyed for rare plants and employ appropriate avoidance and minimization measures.

Economic Development

Goal 4.1 Maui will have a balanced economy composed of a variety of industries that offer employment opportunities and well-paying jobs and a business environment that is sensitive to resident needs and the island’s unique natural and cultural resources (Maui County Department of Planning 2012, p. 4-5).

Discussion: The project will have a minor and temporary beneficial economic impact through purchase of labor, equipment, helicopter services, and supplies.

Tourism

Goal 4.2 A healthy visitor industry that provides economic well-being with stable and diverse employment opportunities (Maui County Department of Planning 2012, p. 4-12).

Discussion: No aspect of the proposed action is inconsistent with goals, objectives or policies related to tourism. The perpetuation of endangered species is a small but tangible attraction to visitors interested in the conservation of resources in Hawai'i, however the small scope and remote location of release sites suggests there will be no impact to tourism from this project.

Agriculture

Goal 4.3 Maui will have a diversified agricultural industry contributing to greater economic, food, and energy security and prosperity (Maui County Department of Planning 2012, p. 4-19).

Discussion: No aspect of the proposed action is inconsistent with goals, objectives or policies related to agriculture. The release areas are distant from any farming activities. Crow species in the continental U.S. are sometimes considered agricultural pests that can spread disease and damage

crops. The behavior of the released 'ālalā however is to remain near its release site and the small number of 'ālalā planned to be released indicate that there will be little or no effect on agriculture.

Employment

Goal 4.4 A diverse array of emerging economic sectors (Maui County Department of Planning 2012, p. 4-25).

Discussion: The project would involve labor focused on Maui's unique natural resources and would not be inconsistent with goals, objectives or policies related to employment.

Each of the nine community plans is meant to provide recommendations concerning land use, density and design, transportation, community facilities, infrastructure, visitor accommodations, commercial and residential areas and other matters related to development that are specific to the region of the plan.

Maps of the community plan areas indicate that the release sites are outside the mapped areas that are within scope of consideration for the Hana and Makawao-Pukalani-Kula Community Plans. All existing community plans call for enhancement and protection of resources, including endangered species, and no aspect of the project would appear to be inconsistent with any community plan.

● **Chapter 4: HRS 343 Anticipated Determination and Findings**

4.1 Anticipated Determination

Based on the findings below, the State of Hawai'i, Department of Land and Natural Resources expects to determine the Preferred Alternative for the proposed action will not significantly alter the environment in the context of HRS 343 and HAR 11-200.1 (see Chapter 5 for selection of the Preferred Alternative).

4.2 Findings and Supporting Reasons

Chapter 11-200.1-13, Hawai'i Administrative Rules, outlines those factors agencies must consider when determining whether an Action has significant effects: In considering the significance of potential environmental effects, agencies shall consider and evaluate the sum of effects of the proposed action on the quality of the environment.

(a) In determining whether an action may have a significant effect on the environment, the agency shall consider every phase of a proposed action, the expected impacts, and the proposed mitigation measures. In most instances, an action shall be determined to have a significant effect on the environment if it may:

1. *Involve an irrevocable commitment or loss or destruction of any natural or cultural resources.* With built-in project mitigation in place to ensure protection of listed threatened or endangered plants and birds, no valuable natural resources would be committed or lost. Cultural resources would be safeguarded through protection of forest resources, which are important for gathering. No historic sites are known to be present in areas where ground disturbance is planned to occur, but in areas where ground disturbance would occur, such as temporary aviaries, camps and LZs that do not already exist, archaeological surveys would be conducted to verify the lack of historic sites. If historic sites are found where ground disturbance is planned, the site for proposed facilities would be moved to another location where no historic sites are present. It is expected it is *somewhat likely* 'alalā would encounter and prey upon *Partulina porcellana* tree snails at the Ko'olau proposed release site. Based on this, and despite avoidance and minimization measures (described in 3.2.3.3) it is not preferred to release 'alalā at the Ko'olau proposed release site to avoid potential loss or destruction of *Partulina porcellana* tree snails.

2. *Curtail the range of beneficial uses of the environment.* The proposed project would enhance and sustain beneficial uses of Hawaii's environment through gaining information about the potential to re-establish a critical species on the landscape.

3. *Conflict with the State's environmental policies or long-term environmental goals established by law. The broad goals of this policy are to conserve natural resources and enhance the quality of life.* The project is environmentally beneficial, and it is thus consistent with all elements of the State's long-term environmental policies, particularly those that focus on preservation of native species and ecosystems.

4. *Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State.* The project would not have any substantial adverse effect on the economic or social welfare of the Maui community or the State of Hawai'i. No valuable natural resources or cultural or recreational practices such as forest access, gathering, hunting, or access to ceremonial sites would be substantially affected. The social welfare of the State would be advanced through gaining knowledge to help protect an iconic endangered bird.

5. *Have a substantial adverse effect on public health.* The project would not affect public health and safety in any adverse way.

6. *Involve adverse secondary impacts, such as population changes or effects on public facilities.* The project would not produce any substantial secondary impacts, such as population changes or effects on public facilities.

7. *Involve a substantial degradation of environmental quality.* The project is minor in scope and environmentally benign, and thus it would not contribute to environmental degradation. *Be individually limited but cumulatively have substantial adverse effects upon the environment or involve a commitment for larger actions.* No development projects with the potential to have adverse impacts that could accumulate with those of the proposed project are known to be in planning. Nearby ongoing activities in the area include U.S. Fish and Wildlife Service Support of Plant Extinction Prevention Program activities to translocate and monitor listed plants, DOFAW and NPS Support of mosquito control activities, and a plan by Haleakalā National Park to reconstruct an ungulate fence directly adjacent to the proposed Kīpahulu FR site. The adverse impacts of the proposed project are centered on minor and almost entirely mitigable disturbance of vegetation and listed plant species, spread of weed species by ‘ālalā, potential ‘ālalā nest predation of listed bird species and *Partulina* tree-snails mitigable by recapture of released ‘ālalā if needed, and a very minor addition to helicopter noise. More unlikely, but not entirely discountable, are minor impacts to operations on nearby farms and ranches in the unlikely event ‘ālalā disperse to much greater distances than expected. Cumulative effects are either non-existent or minor and highly temporary or mitigable through standard project operating procedures. There does not appear to be any need for additional mitigation for cumulative impacts. There are some beneficial impacts of the project that may also accumulate with those of other conservation projects. These include dispersal of native plants seeds and control of rats leading to increased reproduction of some forest plants, as well as control of feral cats, mongoose and rats that help decrease native bird mortality. The cumulative benefits would cease after the termination of the maximum five-year pilot project.

8. *Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat.* Effects to listed plants will be readily avoided by surveying the limited areas planned for disturbance such as camps, aviaries, trails and helicopter landing zones, prior to disturbance. Off-trail activities would be conducted by biologists trained in detecting and avoiding listed plants. ‘Ālalā are known to occasionally depredate a variety of bird eggs and nestlings, including those listed as threatened or endangered. Well-documented experience with released ‘ālalā at the Pu‘u Maka‘ala NAR indicated only 5 predation events on forest bird nests for over 20 ‘ālalā released at the Pu‘u Maka‘ala site over a 4-year period. Considering the very small likelihood of nest predation events by ‘ālalā and the predominance of non-listed Hawaiian honeycreepers and introduced forest birds at the release sites, the likelihood of predation by ‘ālalā on nests of listed Hawaiian honeycreepers is low at the Kīpahulu site and very low at the Ko‘olau proposed release site. Incorporating mitigation measures that are built into the project, biologists assess that the action may affect, but is unlikely to result in significant impacts, to federally listed animal species and their designated critical habitat. It is somewhat likely ‘ālalā released at the Ko‘olau proposed release site, and unlikely ‘ālalā released at the Kīpahulu proposed release site, would prey upon rare *Partulina* tree snails. Based on this, it is preferred to release ‘ālalā at only the Kīpahulu proposed release site and not at the Ko‘olau proposed release site (see Chapter 5).

9. *Have a substantial adverse effect on air or water quality or ambient noise levels.* No effect to air or water quality would occur because of the project. The occasional helicopter flight would

produce extremely brief periods of noise that would not substantially adversely affect humans or animals.

10. *Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area,*

beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters. Although the project would be located in an area with minor volcanic seismic risk, the entirety of east Maui shares this risk, and the action is not imprudent to implement. The project site is located near sensitive waters but would not adversely affect water quality or flooding in any way. The project site is more than 3,000 feet above sea level and will not be affected directly by sea level rise.

11. *Have a substantial adverse effect on scenic vistas and views planes, during day or night, identified in county or state plans or studies.* The proposed action is not anticipated to adversely affect any vistas or view planes identified in County or State plans or studies. No lighting is involved.

12. *Require substantial energy consumption or emit substantial greenhouse gasses.* Negligible amounts of energy input and greenhouse gas emission would be required for implementation, but not on a scale that would stress energy use or measurably contribute to climate change.

● Chapter 5: USFWS, NEPA Anticipated Determination and Findings

5.1 Anticipated Determination

Based on the findings below, the U.S. Fish and Wildlife Service expects to determine the Preferred Alternative for the proposed action will not significantly alter the environment in the context of NEPA.

5.2 Preferred Alternative

The Preferred Alternative chosen is Alternative 3: Release of ‘Alalā to only Kīpahulu Forest Reserve on Maui. Although two release sites would allow comparison of juvenile release and release of paired adults, the Preferred Alternative meets the important need to learn whether ‘alalā can breed in wet native forest habitat of east Maui where predation by ‘io on ‘alalā is not a mortality factor. There is no significant impact of the Preferred Alternative to the physical and biological environment and to cultural and socio-economic resources. ‘Alalā are known to depredate nests of small forest birds. Although the Preferred Alternative, proposed release at Kīpahulu Forest Reserve only, overlaps portions of the ranges of three listed Hawaiian honeycreeper species, the likelihood of ‘alalā depredating nests of listed Hawaiian honeycreepers is low because of the far greater numbers of introduced and non-listed Hawaiian forest birds, the very few ‘alalā (approximately six) at the Kīpahulu proposed release site at any given time, and the expected small number of foraging events on nests of forest birds by ‘alalā. If ‘alalā disperse into areas with listed forest bird populations that have very low population numbers, kiwīkiu in particular, ‘alalā would be able to be recaptured (captured). As many as 12-15 ‘alalā might be released throughout the entire project at the Kīpahulu proposed release site, but birds released after the initial approximately six birds would be only to replace birds that had died or recaptured. Because the preferred alternative is to release at the Kīpahulu proposed release site only, it is probable the project would release juvenile birds (not adult pairs), as this method of introduction has been used successfully in the past, while release of adult pairs of ‘alalā has not yet been attempted. The number of ‘alalā at the Kīpahulu proposed release site could go up by approximately 1-3 wild fledged young each year beginning year 3 of the proposed release, once the released juvenile birds start to breed. However, the numbers of ‘alalā on the landscape during years 3-5 of the project, under the most optimistic scenario, is likely to be no more than 10-15 birds. It is unlikely ‘alalā would prey upon rare *Partulina* tree snails at the Kīpahulu

proposed release site and avoidance, minimization, and conservation measures would be observed to further reduce potential for ‘*alalā* to depredate tree snails at the Kīpahulu proposed release site.

Alternatives not Selected:

- Alternative 1: No Action.
The No Action Alternative was not selected because no action (not releasing ‘*alalā* on east Maui) would result in not learning whether ‘*alalā* can breed on east Maui in wet native forest habitat in conditions where predation by ‘*io* is not a mortality factor. This knowledge is important for planning ‘*alalā* reintroduction and developing methods for future ‘*alalā* releases.
- Alternative 2: Release of ‘*Alalā* to Ko‘olau Forest Reserve and Kīpahulu Forest Reserve on Maui. Alternative 2 was not chosen because it is expected to be *somewhat likely* ‘*alalā* would encounter and prey upon rare *Partulina* tree snails at the Ko‘olau proposed release site.
- Alternative 4: Release of ‘*alalā* to only Ko‘olau Forest Reserve on Maui. Alternative 4 was not chosen for reasons described under Alternative 2 (above).

Findings and Supporting Reasons:

The remainder of this chapter assesses the potential effects to the physical and biological environment and to cultural and socio-economic resources because of implementing each alternative and are the facts on which the anticipated determination and Preferred Alternative are based. For the following discussion:

- Effects to plants and animals and designated wilderness would be considered significant if there is a high likelihood of adversely affecting rare and listed threatened or endangered plant and animal species, or adversely modifying plant critical habitat; causing irreversible damage to a non-negligible expanse of a native ecosystem through wildfire or other area-wide impacts; causing widespread damage or death to native plants; or inducing the spread of non-native species within an area of largely or exclusively native habitat; or significantly eroding the value of designated wilderness.
- Effects to cultural and historic resources would be considered significant if there is a high likelihood of damage to historical structures or exclusion of cultural practitioners accessing cultural resources.
- Effects to recreation, hunting and public access, and Visitor Use and Experience on NPS lands would be considered significant if there is a high likelihood of excluding the public from areas the public currently uses to conduct recreation, hunting, and other public access.

In no instance for any of the factors evaluated is there likelihood of a significant impact except on rare *Partulina* tree snails at the Ko‘olau proposed release site.

Impacts on Threatened and Endangered Species

Species listed as threatened or endangered by the State or Federal government require additional consideration whenever an activity permitted by USFWS or DLNR may have an effect on these species or their habitats. This section addresses effects to listed species. Listed animals found on east Maui that may occur at or near the proposed release sites include the ‘ōpe‘ape‘a or Hawaiian hoary bat (*Lasiurus cinereus semotus*), ‘i‘iwi (*Drepanis coccinea*), ‘ākohekohe (*Palmeria dolei*), and kiwīkiu (*Pseudonestor xanthophrys*). Nēnē or Hawaiian goose (*Branta sandvicensis*), an open country bird, could potentially be present in some areas of the Kīpahulu proposed release site. ‘Ua‘u or Hawaiian petrel (*Pterodroma sandwichensis*), ‘ake‘ake or band-rumped storm-petrel (*Pterodroma sandwichensis*), and ‘a‘o or Newell’s shearwater (*Puffinus newelli*) (Hawaiian seabirds) potentially could overfly the proposed release sites. There are three species of federally listed Hawaiian damselfly (*Megalagrion* spp.) that may potentially occur in the proposed release areas. Listed plants

at the proposed release sites or in nearby areas include: *Asplenium peruvianum* var. *insulare*, *Bidens micrantha* ssp. *kalealaha*, *Calamagrostis expansa*, *Clermontia samuelii* ssp. *samuelii*, *Ctenitis squamigera*, *Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea hamatiflora* ssp. *hamatiflora*, *Cyanea horrida*, *Cyanea kunthiana*, *Cyanea maritae*, *Cyanea mceldowneyi*, *Cyrtanda ferripolosa*, *Joinvillea ascendens* ssp. *ascendens*, *Huperzia mannii*, *Melicope ovalis*, *Microlepia strigosa* var. *mauiensis*, *Nothocestrum latifolium*, *Phyllostegia bracteata*, *Phyllostegia brevidens*, *Phyllostegia haliakalae*, *Plantago princeps*, *Schiedea diffusa* subsp. *diffusa*, and *Wikstroemia villosa*. For each alternative with mitigation described in Chapter 3 and summarized in Table 2, all impacts to threatened and endangered species would be non-significant.

- Alternative 1: No Action.
No pilot project involving translocation of ‘ālalā to Maui would occur under the No Action alternative and there would be no effects on threatened and endangered species on east Maui other than the potential benefit of ‘ālalā spreading seeds of listed plants not occurring and potential benefit to some listed plants and forest birds by rodent control.
- Alternative 2: Release of ‘Ālalā to Ko‘olau Forest Reserve and Kīpahulu Forest Reserve on Maui.
In no instance for any of the factors evaluated is there likelihood of a significant impact to listed plants, listed insects, listed seabirds and open country birds, and ‘ōpe‘ape‘a. ‘Ālalā are known to depredate nests of small forest birds. The likelihood of ‘ālalā depredating nests of listed Hawaiian forest birds is low to very low because the far greater numbers of introduced and non-listed Hawaiian forest birds, the few numbers of ‘ālalā that would be released, and the expected very small proportion of foraging events by released ‘ālalā on forest birds from observations of ‘ālalā foraging behavior on Hawai‘i Island. Additionally, if ‘ālalā disperse into areas with listed forest bird populations with very low population numbers, particularly kiwīkiu, ‘ālalā can be recalled (captured) to remove all potential of nest predation by ‘ālalā on listed forest birds in these areas.
- Alternative 3: Release of ‘ālalā to only Kīpahulu Forest Reserve on Maui (Preferred Alternative)
Impacts to threatened and endangered animals would be non-significant for reasons described under Alternative 2 (above).
- Alternative 4: Release of ‘ālalā to only Ko‘olau Forest Reserve on Maui.
Impacts to threatened and endangered animals would be non-significant for reasons described under Alternative 2 (above).

Impacts on Native Plants

Effects to native plants would be considered significant if there is a high likelihood of adversely affecting native plants over a non-negligible expanse of native ecosystem; causing widespread damage or death to native plants; or inducing spread of non-native species within an area of largely or exclusively native habitat. Human activities associated with the project have the potential to directly harm native vegetation within the smaller 250-acre area at each proposed release site by vegetation clearing, construction, use of trails, trampling, and introduction of invasive plants or pathogens by pedestrian or helicopter teams during materials transport and monitoring activities. No project activities involve changes to the vegetative community or water regime that could lead to greater wildfire risk, but human activities can sometimes lead to accidental fires. Under all the proposed alternatives, there would be no prolonged or intensive negative impact to the native flora. For each alternative, with mitigation described in Chapter 3 and summarized in Table 2 (**Appendix F**), all impacts to plants would be non-significant.

- Alternative 1: No Action.
No pilot project involving translocation of ‘ālalā to Maui would occur under the No Action alternative and there would be no effects on native plants present on east Maui, other than the

potential benefit of ‘alalā spreading seeds of native plants would not occur.

- Alternative 2: Release of ‘Alalā to Ko‘olau Forest Reserve and Kīpahulu Forest Reserve. Because of project mitigations the likelihood of adversely affecting native plants is low to very low from human activities such as trail creation, wildfire, aviary and camp construction and other effects of human presence. ‘Alalā may spread seeds of non-native plants and could potentially increase the rate of spread of non-native plants. However, because of the high densities of introduced forest birds in the proposed release areas that already contribute to the spread of introduced plants the likelihood is low of ‘alalā causing widespread damage or death to native plants because of invasion of areas with native plants by non-native plants. The project plans to collect ‘alalā fecal samples at supplemental feeding stations, identify seeds of fruits of native and non-native plants in ‘alalā feces, plant seeds from ‘alalā feces in seed germination trays, and conduct vegetation surveys to better understand potential impacts on native forest of seed dispersal by ‘alalā of native and non-native plants.
- Alternative 3: Release of ‘Alalā to only Kīpahulu Forest Reserve on Maui (Preferred Alternative). Impacts to native plants would be evaluated as described under Alternative 2 (above).
- Alternative 4: Release of ‘Alalā to only Ko‘olau Forest Reserve on Maui. Impacts to native plants would be evaluated as described under Alternative 2 (above).

Impacts on Animals not listed as threatened or endangered

Effects on animals would be considered significant if there is a high likelihood of adversely affecting non-listed vertebrate and invertebrate species or causing irreversible damage to a non-negligible expanse of a native ecosystem animals are dependent through wildfire or other area-wide impacts. Under all the proposed alternatives, there would be no prolonged or intensive negative impact to native and non-native animals, including migratory birds and insects (except Alternatives 2 and 4 for the Ko‘olau proposed release site).

- Alternative 1: No Action
No pilot project involving translocation of ‘alalā to Maui would occur under the No Action alternative and there would be no effects on non-listed vertebrate and invertebrate species on east Maui.
- Alternative 2: Release of ‘Alalā to Ko‘olau Forest Reserve and Kīpahulu Forest Reserve.
There is the potential for ‘alalā to depredate nests of introduced and non-listed Hawaiian forest birds and prey upon rare native tree snails (*Partulina* spp.). Numbers of introduced and non-listed Hawaiian forest birds are so numerous and number of predation events by ‘alalā on forest bird nests based on observations of foraging behavior of ‘alalā on Hawai‘i Island are expected to be so few, and very few ‘alalā would be released, that impacts to introduced and non-listed Hawaiian forest birds would be negligible and non-significant. Alternative 2 was not chosen however because it is expected it is *somewhat likely* ‘alalā would encounter and prey upon rare *Partulina* tree snails at the Ko‘olau proposed release site.
- Alternative 3: Release of ‘Alalā to only Kīpahulu Forest Reserve on Maui (Preferred Alternative).
Impacts to animals would be non-significant for reasons described under Alternative 2 (above). It is expected it is *unlikely* ‘alalā would prey upon rare *Partulina* tree snails at the Kīpahulu proposed release site. With avoidance, minimization, and conservation measures it is expected the proposed action will not significantly affect rare *Partulina* tree snails at the Kīpahulu proposed release site.
- Alternative 4: Release of ‘alalā to only Ko‘olau Forest Reserve on Maui.
As described in Alternative 2 above, it is expected it is *somewhat likely* ‘alalā would encounter

and prey upon rare *Partulina* tree snails at the Ko'olau proposed release site. Impacts to other non-listed animals would be non-significant for reasons described under Alternative 2 (above).

Impacts on Geology, Soil, Water Quality and Climate

A significant effect in terms of geologic hazard would be one that substantially places lives and property at risk. Effects to soil, soil erosion, and streams would be evaluated as significant if they involved a change to soil quality, non-negligible increases in soil erosion, alterations in stream flow, or adverse changes to water quality. Climate impacts would be significant if there were substantial greenhouse gas emissions that could contribute to climate change.

In general, impacts to soil erosion and sedimentation would be extremely minor because of the negligible action on the ground as discussed in section 3.5.2. The amount of vegetation clearing would not affect soil water holding capacity. Currently, no chemical weed or pest control is planned. Rodent control would be conducted using traps fitted with excluders to preclude bird access. If it becomes necessary to utilize a rodenticide bait, the active ingredient in rodenticide baits that would be used (diphacinone) has low water solubility and exposure of surface and ground water would be negligible (EPA 2015, p. 12). Mitigation measures employed to minimize the risk of soil erosion and resulting sedimentation including minimizing creation of new trails, restricting ground disturbance, not removing vegetation except under certain conditions, and restricting staff to forest trails except under certain conditions, for example to search for a bird that is suspected to be injured or to have died. Camp garbage would be flown out and composting toilets would be used to mitigate impacts to water quality. All fuel and any other substances with the potential to pollute water would be strictly controlled within the camp and any waste would be monitored and taken off-site for proper disposal.

The only aspect of the project with the potential to produce significant quantities of greenhouse gasses such as carbon dioxide or methane and thus affect climate is the increase of vehicle and helicopter trips from this project. Vehicle trips would be to helicopter staging areas for flights to remote landing zones at proposed release areas. As discussed in Section 3.6 concerning noise impact, the number of helicopter hours to support the project is estimated to be between 2 and 24 hours/month. The percent change (between 6 and 48 percent) from current conditions for number of helicopters flight hours within the analysis area is moderate and there would be negligible impact to climate from increase in helicopter and vehicle use. Carbon emissions because of operating the project would be considered negligible and are not expected to contribute significantly to global climate change.

- Alternative 1: No Action. No pilot project involving translocation of 'alalā to Maui would occur under the No Action alternative and there would be no impacts on geology, soil, water quality and climate on east Maui.
- Alternatives 2, 3, and 4, although Alternative 2 would necessarily involve impacts in both Kīpahulu and Ko'olau proposed release sites, with mitigation, all impacts to soil erosion, water quality in streams or aquifers or climate would be negligible and non-significant.

Impacts on Cultural and Historic Resources

The conclusions of the Cultural Impact Assessment (CIA 2023, pp. 99) and National Park Service evaluation of archaeological resources (Section 3.7) are that there are no major concerns or cultural issues with the project or unmitigable cultural impacts of the Preferred Alternative.

Impacts on Designated Wilderness

Although all action alternatives detract from wilderness character qualities, under the Preferred Alternative, these are small adverse impacts to the undeveloped quality, untrammelled quality, and opportunity for experiencing nature, while the Preferred Alternative provides a substantial benefit to the natural and other features of value qualities through the protection of native ‘āla‘ā and ecosystem services ‘āla‘ā provides.

Impacts on Recreation, Hunting and Public Access, and Visitor Use and Experience

Effects to recreation, hunting and public access would be evaluated as significant if they involved a substantially adverse change to access or degraded or limited the resources for which the public accesses the area. There would be no changes to public access under any of the action alternatives, which all propose to release ‘āla‘ā in sections of State-managed land that is publicly accessible. There is little chance for interaction between the public utilizing the Kīpahulu FR and HNP and ‘āla‘ā for the action alternatives, and little if any adverse consequences if there were any interaction. As discussed in Section 3.1, ‘āla‘ā are unlikely to disperse within the 5 years maximum of the pilot project to sites that are readily accessible by the public. There appears to be no potential to adversely affect access or use of the area for any of the action alternatives for hiking, birding, hunting, or gathering. No mitigation measures are required, as no impacts to recreation, hunting and public access would occur under Alternatives 2, 3, and 4.

Impacts on Air Quality, and Scenic Resources and Noise

Effects to air quality would be evaluated as significant if the action involved a substantial new emissions source or if State standards would be violated. Impacts to scenic resources would be evaluated as significant if the project degraded a noted scenic resource or interfered with a scenic view plane. Effects to noise would be considered significant if State standards of the Department of Health would be violated, or if the natural quiet of the area was substantially disturbed, or if there was noticeable disturbance to the soundscape of HNP. Most conservation activities would be conducted by staff working with no vehicles and minimal machinery in small camps in remote areas with no potential for air pollution, noise audible to humans, or interference with scenic views. Virtually the only source of impacts for the resources of air quality, scenic value and natural sound levels would be helicopters.

- There would be an increase of approximately 20 percent annually for the Ko‘olau and Kīpahulu proposed release sites in helicopter use for conservation purposes as discussed in section 3.9.2. Mitigation measures are built-in to project design to minimize the impacts of helicopters on the air quality, scenic quality, and especially the soundscape of the region. These include efficient flight planning that reduces the length and frequency of flights, as well as avoiding low overflights of breeding bird habitat and homes and any overflight of HNP. With mitigation, all impacts to air quality, scenic quality, and the soundscape would be negligible and non-significant.
- Alternative 1: No Action. No pilot project involving translocation of ‘āla‘ā to Maui would occur under the No Action alternative and there would be no impacts on air quality, scenic resources, or soundscape.
- Action Alternatives. There are no substantial differences in impacts or mitigation measures between Alternatives 2, 3, and 4, although Alternative 2 would necessarily involve impacts in both Kīpahulu and Ko‘olau proposed release sites, including potentially longer helicopter flight paths because the greater distance from Kahului Airport to the Kīpahulu proposed release site.

5.3 Cumulative and Secondary Impacts

Cumulative effects may occur when the adverse effects of a proposed action are added to other past,

present, and reasonably foreseeable future actions of any government or private entity. In some cases, the direct effects of a project may be minor but the cumulative effects significant. Cumulative impacts would be evaluated as significant if the severity of an impact to a particular resource increased to be substantially adverse because of the interaction of two or more distinct actions and the proposed project was not capable of mitigating this impact to insubstantial levels.

In analyzing cumulative effects, it is important to first identify future or ongoing actions in nearby areas with the potential to have impacts that interact with those of the proposed project. Review of HRS 343 and National Environmental Policy Act documents in the editions during the previous year of *The Environmental Notice* indicates no known new major planned or ongoing projects in the east Maui area in the 2023 to 2025 timeframe that could interact with the proposed project. Most development involves construction or renovation of individual homes, commercial structures and government infrastructure, and no major infrastructure or development projects were noted. No construction or land-altering projects are proposed for the analysis area within 2 miles of the proposed release sites. However, the proposed project does have the potential to have impacts that interact with those of other ongoing wildlife projects and activities, as listed in section 3.9: including, U.S. Fish and Wildlife Service Support of PEPP Activities, DOFAW and NPS Support of Mosquito Control Activities, Haleakalā National Park Conservation Activities, The Nature Conservancy Waikamoi Preserve Conservation Activities, and East Maui Watershed Partnership Conservation Activities. The adverse impacts of the proposed project however are centered on minor and almost entirely mitigable disturbance of vegetation and listed plant species. Potential for adverse impacts by ‘ālalā predation on nests of listed birds are low because there are far higher numbers of introduced and non-listed birds compared to listed forest birds and because of mitigation measures including recall (recapture) of ‘ālalā, if ‘ālalā pose an unacceptable risk to vulnerable populations of listed Hawaiian honeycreepers. Similarly potential impacts to rare *Partulina* tree-snails are low and mitigation measures including recall of ‘ālalā if ‘ālalā pose an unacceptable risk to vulnerable populations of *Partulina* tree snails. Adverse impacts to conservation management including fencing and ungulate removal, broad-scale mosquito control, surveys and monitoring listed plants, predator control, and scientific research are low because the standard project operating procedures, project mitigation measures, and established communication structures between the ‘Alalā Project and landowners/land managers conducting conservation activities in areas where ‘ālalā are proposed to be released.

More unlikely, but not entirely discountable, are minor impacts to operations on nearby farms and ranches in the unlikely event ‘ālalā disperse to much greater distances than expected. These impacts can also be mitigated through voluntary conservation actions by the operations and/or retrieval of ‘ālalā by the ‘Alalā Project. As discussed under Section 3.3.3, MFBRP would actively coordinate with farmers and ranchers during the pilot project to assist in explaining voluntary conservation measures (voluntary conservation measures are described in **Appendix K**). The only category of impacts that has any realistic potential to accumulate with those of other ongoing or future projects is helicopter noise, which is discussed from a cumulative perspective in Section 3.9, which concluded that even with releases at both sites, the overall increase in noise from conservation helicopter flights would be modest.

In sum, cumulative effects are either non-existent, or minor and highly temporary or mitigable through standard project operating procedures. There does not appear to be any need for additional mitigation for cumulative impacts. Beneficial impacts of the project may also accumulate with those of other conservation projects. These include dispersal of native plants seeds and control of rats,

leading to increased reproduction of some forest plants, as well as control of feral cats, mongooses, and rats that help decrease native bird mortality.

Secondary impacts occur when projects induce physical and social impacts that are only indirectly related to the project – e.g., effects on housing scarcity when a major resort is constructed in a rural area. The project will not create many new jobs that could lead to in-migration on Maui, and it will not cause stresses on government infrastructure or induce any other type of adverse secondary effects.

5.4 Irreversible and Irretrievable Commitments of Resources

With built-in project mitigation in place to ensure protection of listed threatened or endangered plants and birds, and rare species, no valuable resources would be committed or lost. Cultural resources would be safeguarded through protection of forest resources, which are important for gathering. Nā Ala Hele Trails and archaeological sites along Kaupō Trail are known to be present. These are outside human impact areas, but in areas where ground disturbance would occur, such as temporary aviaries, camps and helicopter landing zones that do not already exist, archaeological surveys will be conducted to verify the lack of historic sites and move the location of proposed facilities if any archaeological sites are found. The public would be notified during the entire project of events pertaining to the proposed release. If by year 2-3 of the pilot study it is found that ‘ālalā are surviving long-term and are breeding successfully, an EA or EIS would be conducted to evaluate the potential impacts of ‘ālalā to all east Maui, since successful breeding of ‘ālalā for the pilot project indicates the potential for the ‘ālalā population to grow and expand beyond the analysis area. If the EA or EIS find the potential impacts of an expanding ‘ālalā population are significant, cannot be mitigated, and harm outweigh benefits of ‘ālalā on east Maui, the pilot project would continue until its designated conclusion (year 5); when released ‘ālalā and young produced in the wild would be captured and brought to captive facilities.

5.5 Unavoidable Adverse Effects

The project would not involve any unavoidable adverse effects. As described in Chapter 4, section 4.2, the project would not:

- Involve an irrevocable commitment or loss or destruction of any natural or cultural resources;
- Curtail the range of beneficial uses of the environment;
- Conflict with the State’s environmental policies or long-term environmental goals established by law; Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State;
- Have a substantial adverse effect on public health;
- Involve adverse secondary impacts, such as population changes or effects on public facilities;
- Be individually limited but cumulatively have substantial adverse effects upon the environment or involve a commitment for larger actions;
- Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat;
- Have a substantial adverse effect on air or water quality or ambient noise levels;
- Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;
- Have a substantial adverse effect on scenic vistas and views planes, during day or night, identified in county or state plans or studies; or
- Require substantial energy consumption or emit substantial greenhouse gases.

Appendix A: References

- Ainley, D.G, T.C. Telfer, M.H. Reynolds, and A.F. Raine. 2019. Newell's Shearwater (*Puffinus newelli*). Birds of North America. Birdsna.org. Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bna.towshe2.02>.
- Banko, P.C., D.L. Ball, and W. E. Banko. 2002. Hawaiian Crow (*Corvus hawaiiensis*). The Birds of North America, No. 648 (A. Poole and F. Gill, editors). The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C.
- Banko, W.E., and P.C. Banko. 1980. Part 1. POPULATION HISTORIES—SPECIES ACCOUNTS Forest Birds: Hawaiian Raven/Crow ('Alalā) (NATIONAL PARK SERVICE Contract No. CX 8000 8 0012 No. Contribution Number CPSU/UH 026/12), pp. 1–126. University of Hawaii at Manoa.
- Banko, P.C. 2009. Chapter Twenty, 'Alalā. Pages 473-486 in T. K. Pratt, C. T. Atkinson, P. C. Banko, J. D. Jacobi and B. L. Woodworth (editors). Conservation biology of Hawaiian forest birds: implications for island avifauna. Yale University Press, New Haven and London.
- Berger, A.J. 1981. Hawaiian Birdlife, 2nd Edition. Honolulu, University of Hawai'i Press.
- Black J.M., A.P. Marshall, A. Gilburn, N. Santos, H. Hoshide, J. Medeiros, J. Mello, C. Natividad Hodges, and L. Katahira. 1997. Survival, Movements, and Breeding of Released Hawaiian Geese: An Assessment of the Reintroduction Program. Journal of Wildlife Management 61:1161-1173.
- Bonaccorso, F.J., C.M. Todd, A.C. Miles, and P.M. Gorresen. 2015. Foraging range movements of the endangered Hawaiian hoary bat, *Lasiurus cinereus semotus* (Chiroptera: Vespertilionidae). *Journal of Mammalogy* 96:64-71.
- Bouyer, B.L., and S.K. Lopes. 2023. Cultural Impact Assessment for the Release of Endangered Captive-bred 'Alalā in the Ko'olau and Kīpahulu Forest Reserves. Prepared for Department of Land and Natural Resources, Division of Forestry and Wildlife, 1151 Punchbowl Street, Room 325, Honolulu, HI 96813. 111 pp.
- Brandt, L., and S.K. Lopes. 2023. Cultural Impact Assessment for the Release of Endangered Captive-bred 'Alalā in the Ko'olau and Kīpahulu Forest Reserves. 111 pp.
- Clarkson, K., and L. Laniawe. 2000. Hawaiian hawk (*Buteo solitarius*). In The birds of North America, no. 523 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.
- Cuddihy, L.W., and C.P. Stone. 1990. Alteration of Native Hawaiian Vegetation. Cooperative National Park Resources Study Unit, University of Hawai'i Mānoa, Honolulu, Hawai'i.
- Culliney, S., L. Pejchar, R. Switzer, and V. Ruiz-Gutierrez. 2012. Seed dispersal by a captive corvid: the role of the 'Alalā (*Corvus hawaiiensis*) in shaping Hawaii's plant communities. *Ecological Applications* 22:1718-1732.

Department of Business, Economic Development & Tourism. 2018. The State of Hawaii Data Book, a Statistical Abstract.

[DLNR] Hawai'i Department of Land and Natural Resources. 1991. The Hawaii State Plan, Conservation Lands. 43 pp.

[DLNR] Hawai'i Department of Land and Natural Resources. 2003. State of Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife, Title 13, Chapter 123, Rules Regulating Game Mammal Hunting. 56 pp.

[DLNR] Hawai'i Department of Land and Natural Resources. 2015. State Wildlife Action Plan. 893 pp.

[DLNR/USFWS] Hawai'i Department of Land and Natural Resources and U.S. Fish and Wildlife Service. 1999. Draft Environmental Assessment for Population Reestablishment of the 'Alalā. 128 pp.

Dubey, J.P. 2009. Toxoplasmosis in pigs—The last 20 years. *Veterinary Parasitology* 164:89-103.

Duckworth, W.D., T.J. Cade, H.L. Carson, S. Derrickson, J. Fitzpatrick, F.C. James, C. Kuehler, and S. Pimm. 1992. Scientific Bases for the Preservation of the Hawaiian crow. Board on Biology, Commission on Life Sciences. National Academy Press. Washington, D.C. Flegg, J.J.M. and C.J. Cox. 1975. Mortality in the Black-Headed Gull. *British Birds* 68:437-449.

Fleischer, R.C., H.F. James, and J. Kirchman. 2003. Identification of *Corvus* subfossil bones on Maui with mitochondrial DNA sequences. Report to USFWS for Order 1448-12200-IM057. 5 pp.

Fortini, L.B, A.E. Vorsino, F.A. Amidon, E.H. Paxton, and J.D. Jacobi. 2015. Large-Scale Range Collapse of Hawaiian Forest Birds under Climate Change and the Need 21st Century Conservation Options. *PLOS ONE* | DOI:10.1371/journal.pone.0140389 October 28, 2015. 22 pp.

Foster, J.T, and S.K. Robinson. 2007. Introduced Birds and the Fate of Hawaiian Rainforests. *Conservation Biology* 21:1248-1257.

Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte, 2013: Online Rainfall Atlas of Hawai'i. *Bull. Amer. Meteor. Soc.*, doi: 10.1175/BAMS-D-11-00228.1.

Gorresen, P M., R.J. Camp, J.L. Klavitter, and T.K. Pratt. 2008. Abundance, distribution and population trend of the Hawaiian Hawk: 1998-2007. Hawai'i Cooperative Studies Unit Technical Report HCSU-009. University of Hawai'i at Hilo. 53 pp., incl. 8 figures, 3 tables & 1 appendix.

Greggor, A.L, B. Masuda, A.M. Flanagan, and R.R. Swaisgood. 2020. Age-related patterns of neophobia in an endangered island crow; implications for conservation and natural history. *Animal Behavior* 160:61-68.

Greggor, A.L., B. Masuda, J.M. Gaudioso-Levita, J.T. Nelson, T.H. White, D.M. Shier, S.M. Farabaugh, and R.R. Swaisgood. 2021. Pre-release training, predator interactions and evidence for

persistence of anti-predator behavior in reintroduced `ālalā, Hawaiian crow. *Global Ecology and Conservation*: (2021) e01658.

Greggor, A.L., J. Sheppard, B. Masuda, J. Gaudioso-Levita, and R.R. Swaisgood (in review). The influence of feeding station location on the space use and behavior of reintroduced `ālalā: causes and consequences. *Conservation Science and Practice*.

[HALE] Haleakalā National Park. 2015. Foundation Document.

[HALE] Haleakalā National Park. 2022. Environmental Assessment. Suppression of Invasive Mosquito Populations to Reduce Transmission of Avian Malaria to Threatened and Endangered Birds on East Maui. 90 pp. + appendices.

[HALE] Haleakalā National Park. 2023. Draft Air Tour Management Plan, Haleakalā National Park. 22 pp.

Hawai'i Tourism Authority. 2019. Hawai'i Visitor Statistics Released for 2019. 8 pp.

[HMAR] Hawaii Marine Animal Response. 2022. Invasive Species and Toxoplasmosis: A Case for Hawaii's Native Wildlife. 6 pp.

[HSA] Hawai'i Soil Atlas. 2023. <https://gis.ctahr.hawaii.edu/SoilAtlas>. Accessed 2/1/2023.

Hopf, C., E. Bunting, A. Clark, and S. Childs-Sadord. 2022. Survival and release of 5 American crows (*Corvus brachyrhynchos*) naturally infected With West Nile Virus. *Journal of Avian Medical Surgery* 36:85-91.

James, H.F. and S.L. Olson. 1991. Descriptions of thirty-two new species of birds from the Hawaiian Islands: Part II. Passeriformes. *Ornithol. Monogr.* 46:1-88.

James, H.F., T.W. Stafford, Jr., D.W. Steadman, S.L. Olson, P.S. Martin, A.J.T. Jull, and P.C. McCoy. 1987. Radiocarbon dates on bones of extinct birds from Hawaii. *Proceedings National Academy of Science* 84:2350-2354.

Judge, S.W., R.J. Camp, and P.J. Hart. 2013. Pacific Island landbird monitoring annual report, Haleakalā National Park, 2012. Natural Resource Technical Report NPS/PACN/NRTR—2013/740. National Park Service, Fort Collins, Colorado. <https://pubs.usgs.gov/publication/70048595>.

Judge, S.W., R.J. Camp, C.C. Warren, L.K. Berthold, H.L. Mounce, P.J. Hart, and R.J. Monello. 2019. Pacific Island Landbird Monitoring Annual Report, Haleakalā National Park and East Maui Island, 2017. Natural Resource Report NPS/PACN/NRR—2019/1949. 72 pp. + appendices.

Judge, S.W., C.C. Warren, R.J. Camp, L.K. Berthold, H.L. Mounce, P.J. Hart, and R.J. Menello. 2021. Population estimates and trends of three Maui Island-endemic Hawaiian Honeycreepers. *Journal of Field Ornithology* 92:115-126.

Juvik, S.P., and J.O. Juvik, eds. 1998. Atlas of Hawai'i. 3rd ed. University of Hawai'i Press, Honolulu. Maui County Department of Planning. 2012. Maui Island Plan, Island of Maui, General Plan 2030. Wailuku, Maui.

- Lee, C.S.Y., Fleming, G.G., Roof, C.J., MacDonald, J.M., Scarpone, C.J., Malwitz, A.R., & Baker, G. (2016). Haleakalā National Park: Baseline Ambient Sound Levels 2003. <https://irma.nps.gov/DataStore/Reference/Profile/2233849>.
- Meideros, A.C. 2004. Phenology, reproduction potential, seed dispersal and predation and seedling establishment of three invasive plant species in a Hawaiian Rainforest. 277 pp.
- National Park Service (NPS). 2006. U.S. Department of the Interior. Management Policies 2006. Available at https://www.nps.gov/subjects/policy/upload/MP_2006.pdf.
- National Park Service (NPS). 2023. 2022 National Park Visitor Spending Effects. Economic Contributions to Local Communities, States, and the Nation. 74 pp/
- Price, J. and J.D. Jacobi. 2007. Rapid assessment of vegetation at six potential 'Alalā release sites on the island of Hawai'i. Hawai'i Cooperative Studies Unit Technical Report HCSU-006. University of Hawai'i at Hilo. 37 pp., incl. 3 figures, 8 tables, & 3 appendices.
- Price, J., A. Wang, J. Brito, Z. Pezillo, and L. Rhode. 2022. Vegetation Structure and Fruit Availability at Nakula and Nearby Areas. 5 pp.
- Raine, A. F., S. Driskill, M. Vynne, D. Harvey, and K. Pias. 2020. Managing the effects of introduced predators on Hawaiian endangered seabirds. *Journal of Wildlife Management* 84:425-435.
- Rohrer, J, V. Costello, J. Tanino, L. Bialic-Murphy, M. Akamine, J. Sprague, S. Joe and C. Smith. 2016. Development of tree snail protection enclosures: From design to implementation. Pacific Cooperative Studies Unit Technical Report 193. University of Hawai'i at Mānoa, Department of Botany. Honolulu, HI. 58 pages.
- Sakai, H.F. and J.R. Carpenter. 1990. The variety and nutritional value of foods consumed by Hawaiian crow nestlings, an endangered species. *Condor* 92:220-228.
- Sakai, H.F., C.J. Ralph, and C.D. Jenkins. 1986. Foraging ecology of the Hawaiian crow, an endangered generalist. *Condor* 88:211-219.
- Scott, J.M., S. Mountainspring, F.L. Ramsey, and C.B. Kepler. 1986. Forest Bird Communities of the Hawaiian Islands: Their Dynamics, Ecology, and Conservation. Studies in Avian Biology No. 9. Cooper Ornithological Society. Allen Press, Inc., Lawrence, Kansas.
- Sherrod, D.R, Sinton, J.M., Watkins, S.E., and K.M. Brunt. 2007. *Geologic Map of the State of Hawai'i, Sheet 7—Island of Maui*. U.S. Geological Survey. <https://pubs.usgs.gov/of/2007/1089/> Accessed 8/5/2023.
- Slotterback, J.W. 2021. Band-rumped Storm-Petrel (*Hydrobates castro*), version 1.1. In *Birds of the World* (A.F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.barpet.01.1>.

- Smetzer, J.R., A.L. Greggor, K.L. Paxton, B. Masuda, B., and E.H. Paxton. 2021. Automated telemetry reveals post-reintroduction exploratory behavior and movement patterns of an endangered corvid, 'Alalā (*Corvus hawaiiensis*) in Hawai'i, USA. *Global Ecology and Conservation* 26, e01522.
- Tazrout, Z. 2021. Google forced to stop its drone delivery service due to attacks by crows protecting their nests. *Actua*. <https://www.actua.com/english/google-forced-to-stop-its-drone-delivery-service-due-to-attacks-by-crows-protecting-their-nests>. Accessed 3/20/2023.
- [USFWS] U.S. Fish and Wildlife Service. 2007. National Bald Eagle Management Guidelines. 25 pp.
- [USFWS] U.S. Fish and Wildlife Service. 2009. Revised 'Alalā Recovery Plan. U.S. Fish and Wildlife Service, Portland, Oregon.
- van Dooren, T. 2006. Authentic Crows: Identity, Captivity and Emergent Forms of Life. *Theory Culture & Society* 33:29–52.
- VanderWerf, E.A., R.A. Switzer, A.A. Lieberman, and R.R. Swaisgood. 2013. 'Alalā Restoration Plan. 121 pp.
- White, T.H., Collar, N.J., Moorhouse, R.J., Sanz, V., Stolen, E.D., and D.J. Brightsmith. 2012. Psittacine reintroductions: Common denominators of success. *Biological Conservation* 148:106–115.
- Wood, L. 2015. Acoustic Environment and Soundscape Resource Summary, Haleakala National Park. Natural Sounds & Night Skies Division. <https://irma.nps.gov/DataStore/DownloadFile/534087>.
- Work, T.M., Ball, D., and M. Wolcott. 1999. Erysipelas in a free-ranging Hawaiian crow (*Corvus hawaiiensis*). *Avian Diseases* 43:338–341.
- Work, T.M., Massey, J.G., and others. 2000. Fatal toxoplasmosis in free-ranging endangered 'alalā (*Corvus hawaiiensis*).
- Work, T., J. Dagenais, R. Rameyer, and R. Breeden. 2015 Mortality patterns in endangered Hawaiian geese (Nene; *Branta sandvicensis*) *Journal of Wildlife Diseases* 51:688–695.
- Yaremych, S.A., R.E. Warner, P.C. Mankin, J.D. Brawn, A. Raim, and R. Novak. 2004. West Nile Virus and High Death Rate in American Crows. *Emerging Infectious Diseases* 10:709–711. <https://doi.org/10.3201/eid1004.030499>.
- Yom-Tov, Y. 1974. The effect of food and predation on breeding density and success, clutch size and laying date of the crow (*Corvus corone* L.). *J. Anim. Ecol.* 43:479–498.

PERSONAL COMMUNICATIONS

- Faegre, S. 8-31-2023. Pers. Comm. to J. Nelson through L. Nietmann, email communication. Subject: Distance to maintain from wild alala nest.
- Greggor, A. 12-14-2022. Pers. Comm. to J. Nelson, email communication. Subject: food resources at Kīpahulu release site.

Appendix B: ‘Alalā Biology, Life-History Needs, and Background Information

‘Alalā Biology

‘Alalā habitat requirements and behavior

The ‘alalā is the only extant native Hawaiian corvid. At least two other species, once found on O‘ahu and Moloka‘i, became extinct sometime after Polynesian settlement (James and Olsen 1991, pp. 11-22). The ‘alalā is historically known from the island of Hawai‘i, where it was known from dry, mesic, and wet ‘ōhi‘a (*Metrosideros polymorpha*) forests and mesic koa (*Acacia koa*) forests at elevations from 1100 and 6000 feet (ft) on the southeast and west slopes of Mauna Loa Volcano and the north and west slopes of Hualālai Volcano. ‘Alalā, or a closely related subspecies, also inhabited Maui prior to Polynesian settlement but was absent by the time of European contact and is not found in traditional mo‘olelo (stories) from Maui (James *et al.* 1987, entire; Fleischer *et al.* 2003, entire).

‘Alalā are associated with native forests with a closed to semi-open canopy (Scott *et al.* 1986, pp. 82-85). ‘Alalā are omnivorous and depend on diverse food resources from native understory fruit trees and shrubs and perform an essential ecological role as a seed disperser (Culliney 2012, entire). They also utilize other forest resources, including forest bird eggs and nestlings during the breeding season and arthropods found year-round in decaying and healthy overstory and mid-canopy trees (Banko *et al.* 2002, pp. 4-6). During the breeding season a substantial portion of food delivered to ‘alalā nestlings by paired wild adult ‘alalā is small forest birds and eggs of forest birds, based on analysis of nestlings’ fecal samples containing from 52 and 91 percent of fragments of passerine bird bones and eggshells (Sakai and Carpenter 1990, p. 221). ‘Alalā occupied both native koa-‘ōhi‘a and mixed native/introduced forest in the Kona area but did not use forest with only scattered trees, suggesting that some feature of reduction in tree density makes forest unsuitable for ‘alalā (Giffin *et al.* 1987, entire). ‘Alalā often moved from wet ‘ōhi‘a forest into mesic koa-‘ōhi‘a forest and the dry ‘ōhi‘a forest on a seasonal basis in south Kona (Giffin *et al.* 1987, entire). Similarly, on Hualālai, ‘alalā were historically seen moving from the montane dry forests on the north side to the wet west side of Hualālai in response to seasonal food resources (Giffin 1983, pp. 21-22; Banko *et al.* 2002, p. 4). ‘Alalā appear to prefer staying within forested habitat wherever possible. They will traverse small pasture areas surrounded by native forest but rarely cross large areas that provide them with little in the way of food resources or cover that provides protection from ‘io, the natural predator of ‘alalā (DLNR/USFWS 1999, p. 4).

Although collectors in the 1890s noted ‘alalā as low as 1100 ft, all recorded nests have been between 3400 and 5800 ft (DLNR/USFWS 1999, p. 4). Rainfall within ‘alalā historic range on leeward Mauna Loa and Hualālai is from 24 to 98 inches per year. Rainfall in Ka‘ū District in montane wet forest within ‘alalā historic range is greater than 100 inches per year in some areas. In central Kona (leeward Mauna Loa), ‘alalā historically nested in mature mesic koa-‘ōhi‘a forest and appear to have preferred mature ‘ōhi‘a for nest sites in mesic and dry forests. The habitat with the highest breeding densities of ‘alalā from 1970-1982 was a relatively undisturbed koa-‘ōhi‘a forest (Giffin *et al.* 1987). In the central Kona forests, home ranges of established pairs of ‘alalā were approximately (500 acres [ac]) (USFWS, unpubl. data), and pairs were typically permanent residents of their territory. These home ranges contracted slightly during the breeding season (March-July) as the pair stayed closer to the nest. Movements within these home ranges appeared to be influenced heavily by the quality of habitat (food resource availability and protective cover), proximity and distribution of other ‘alalā,

and proximity of territorial 'io. Limited studies with other crow species (Yom-Tov 1974, entire) suggest that sizes of breeding territories are not influenced by food supply, at least in the short term, but are more likely set by social interactions among pairs. Losses of established pairs from a population can lead to several-fold increases in the home ranges of the remaining 'alalā (USFWS, unpubl. data).

'Alalā population history

Significant changes in the forest ecosystems of Hawai'i, beginning with Polynesian arrival and increasing after European contact, have contributed to the decline and disappearance of many species of endemic birds (Banko 2009, entire). Direct mortality factors of 'alalā reported historically are shooting by farmers (Berger 1981, p. 91), avian disease (Duckworth *et al.* 1992, pp. 24-26), and suspected predation on nests and young by introduced mammals, including mongooses (*Urva auropunctatus*) and feral cats (*Felis catus*) (Duckworth *et al.* 1992, p. 24). Feral cats are also suspected predators of adults (USFWS, unpubl. data). Because 'alalā feed extensively on fruits of native understory plants, it is reasonable to assume that the gradual but massive loss of those plants within native forest (Cuddihy and Stone 1990, pp. 17, 37 and 41) has strongly reduced habitat quality. This could have reduced adult survival during lean years, the ability of pairs to raise chicks, and the total number of 'alalā that could subsist in a given area. In common with many Hawaiian birds, the 'alalā experienced a severe decline in numbers and range during the latter part of the 19th and throughout the 20th century (Berger 1972, p. 91). One key reason for population decline of Hawaiian honeycreepers is avian disease spread by mosquito vectors; however, mosquito-borne disease appears not to have played a significant role in the population decline of 'alalā (USFWS 2009, p. I-21). During the 1970s and 1980s 'alalā disappeared from Ka'ū district, Hualālai volcano, and south Kona (USFWS 2009, p. I-5). The wild population in central Kona, numbering 11 birds in 1992, fell to three birds in October 1999, including one known breeding pair. The last observation of wild 'alalā was in 2002 (USFWS 2009, p. I-6).

Recovery actions to date

Conservation Breeding

The 'alalā was protected by Territorial and later State of Hawai'i law beginning in 1931 and was added to the Federal and State lists of endangered species in 1967. Recognizing the importance of healthy native forests to provide habitat for 'alalā and other native forest birds, beginning in the 1980s, Federal, State, and private landowners working in cooperation built ungulate exclusion fencing protecting large areas of native forest on Hawai'i in areas once occupied by 'alalā, as well as extensive areas of native forest on Maui and the other main Hawaiian Islands. A captive propagation program for the 'alalā was initiated in 1970 by DOFAW in partnership with the USFWS. This program was initially based on birds collected as fledglings from the wild in 1970. Between 1970 and 1981, a total of 12 'alalā were brought into captivity. However, the program suffered due to inadequate facilities and a low rate of successful reproduction. In 1986 the program, with nine captive 'alalā, was transferred from Pohakuloa, Hawai'i, to Olinda, Maui. The Peregrine Fund was contracted to manage the 'alalā conservation breeding effort in 1993. Management of the 'alalā conservation breeding program was transferred to San Diego Zoo in 1999. Currently, the San Diego Zoo Wildlife Alliance (SDZWA) operates two conservation breeding centers for 'alalā, one at Olinda and the other at Volcano, Hawai'i. As of 2023, there are 112 birds in these two centers and two birds at the Pana'ewa Zoo in Hilo, Hawai'i.

Reintroduction Efforts

Releases of juvenile 'ālalā (birds < 1 year-old), originating from eggs collected from both captive and wild parents, were conducted in the northern portion of South Kona district at the McCandless Ranch between 1993 and 1998. The location for the Kona release was chosen to allow maximal integration with the remaining wild population. The 27 released birds were fitted with radio transmitters and relocated at frequent intervals, allowing detailed observations of behavior. Juveniles were weaned from supplemental foods within 3–5 months of their release. Foraging behavior of juveniles was less efficient than that of wild adults but was sufficient for survival (Klavitter *et al.* 1995, entire). Juvenile released birds did not integrate with the existing wild population. Twenty-one of the released birds died over the program's duration, and the remaining six were recaptured in 1998 and 1999 for reintegration into the captive flock. Many of the released birds died before reaching the age of sexual maturity (approximately two years), and the rate of mortality (approximately 40 percent per year) declined only slightly as the released birds matured (USFWS 2009, p. I-19).

The cause of death was determined for 13 of 21 released birds (USFWS 2009, p. I-19). Seven were killed by 'io, three died from toxoplasmosis (Work *et al.* 2000, entire), two died of other infections (Work *et al.* 1999, entire), and one died from mammal predation. The bodies of eight birds were not recovered, so the cause of death for these individuals remains unknown. Necropsies of the remains that were found showed poor nutritional condition in some birds but not others. Several released birds were observed manipulating cat feces (USFWS 2009, p. I-21), which is a known reservoir of the protozoan *Toxoplasma gondii*, and these birds may have contracted toxoplasmosis from that source. Habitat conditions (drought and poor fruit production) during the several years during which the reintroductions were completed may have influenced mortality rates. Although positive determination is not possible, it is conceivable that poor body condition may have predisposed some birds to death by infection or predation. Contrary to predictions (Duckworth *et al.* 1992, p. 26), avian malaria and pox were found not to be sources of mortality for released 'ālalā, since all the released birds survived exposure to these pathogens. However, several birds were provided with veterinary care prior to release when weakened by apparent malarial infections.

Releases of subadult (one- to two-year old 'ālalā), originating from eggs collected from captive parents, were conducted on east Mauna Loa at Pu'u Maka'ala Natural Area Reserve (Pu'u Maka'ala NAR or NAR) between 2016 and 2019. Releases were conducted in two different release areas within Pu'u Maka'ala NAR, one in the southern portion of the NAR in 2016, and the other in the northern portion from 2017–2019. All released 'ālalā were fitted with radio transmitters and relocated at frequent intervals allowing detailed observations of behavior. All released birds after their release were provided supplemental foods. They were not successfully weaned from supplemental foods after their release although some reduction in the amount and variety of supplemental foods occurred at different times during the reintroduction. Because supplemental foods continued to be provided, it was not possible to determine if foraging behavior of released birds on wild foods was sufficient for survival.

Five birds were released in 2016 in the southern portion of Pu'u Maka'ala NAR in wet native forest habitat with fruiting trees and shrubs and understory composed predominantly of tree ferns (VanderWerf *et al.* 2013, entire). The 2016 release site was chosen because it provided a variety of fruiting trees and shrubs for food and a tree fern understory to provide 'ālalā cover from 'io. Cat trapping was conducted throughout the release area and rat trapping was conducted in local areas around holding and release aviaries. 'Ālalā released in 2016 were provided some training prior to release to identify and avoid 'io as a potential predator. Within one week of the release, two of the released 'ālalā were killed by 'io, and a third dispersed and died from exposure. The remaining two

‘ālalā were recaptured and reintegrated into the captive flock. USFWS and DOFAW decided for future releases to develop improved methods to teach predator recognition and appropriate behavioral response for ‘ālalā to ‘io predation attempts.

Twenty-seven ‘ālalā (including two surviving birds from 2016) were released in the northern portion of Pu‘u Maka‘ala NAR between 2017 and 2019 in mixed type wet native forest habitat comprised of tall-stature ‘ōhi‘a-koa closed-canopy forest and semi-open canopy short stature ‘ōhi‘a forest (USFWS 2017, entire). Native forest in some areas was interrupted by areas of open pasture and transitioned to shrubland areas at higher elevations. The 2017–2019 release sites were chosen because they provided a diversity of fruiting trees and shrubs for food, understory to provide cover for ‘ālalā from ‘io, and adjacent shrubland areas with seasonal fruiting shrubs. In addition, ‘io surveys indicated few ‘io in the release area, and there was good road access providing improved ability to monitor released birds. Birds were given access to wild foods in captivity to familiarize them with wild foods encountered in the wild and needed to demonstrate competency eating wild foods to be considered for release. Birds received ‘io anti-predatory training and needed to show appropriate behavioral responses to threat stimuli to qualify for release (Greggor *et al.* 2021, entire). Cat trapping was conducted throughout the release area and rat trapping in local areas around hacking aviaries. Birds were released in cohorts of from 7 to 11 birds from release aviaries located at three different release locations. Each hacking aviary was no more than 1,000 m (3,300 ft) from its nearest neighbor.

Three breeding pairs formed in 2019, each occupying a distinct territorial area of the reserve. Two built nest platforms, and one built a full nest, where the female sat for 3–4 weeks. The contents of the nest could not be confirmed; however, the female’s incubation behavior was highly suggestive that eggs were present in the nest. Unfortunately, one member of each of the three pairs died prior to the next breeding season and none of the three survivors formed a pair. In 2020 two additional pairs formed, one of which made a nest platform and defended a territory, but the other never formed firm territorial boundaries.

Twenty-two of the released birds died over the program’s duration, and the remaining five were recaptured in 2020 for reintegration into the captive flock. All birds from the 2017 and 2018 cohorts survived for >1 year, with some surviving close to or over 3 years since their release. By contrast, the 2019 release birds survived for a much shorter period. Five of seven of the 2019 cohort died within 5 months of their release. A primary cause of death was assigned for 13 of the released birds, although some deaths were likely due to multiple factors (e.g., bacterial infection followed by predation). The primary cause of death for three recovered carcasses could not be determined (A. Gregor, pers. comm., 2022). The bodies of seven birds were not recovered, and the cause of death for these individuals remains unknown, although one of them disappeared in a dispersal event soon after release. Seven released ‘ālalā were suspected to be killed by ‘io, and two showed evidence of conspecific aggression. There was one possible death as result of mammal predation. Necropsies of the remains for some birds showed poor nutritional condition, particularly three birds that died in a winter storm during 2019–2020 at a time when supplemental food was being reduced to wean birds to wild foods. One bird was observed with pox infection, which was treated and resolved in the wild. No released ‘ālalā tested positive for active toxoplasmosis infections, however, blood samples pre-release and post-mortem revealed evidence suggesting that several birds had prior infections. Mortalities accelerated rapidly during summer of 2020, and USFWS and DOFAW determined it was necessary to recapture the remaining five ‘ālalā and return them to captivity.

The types of mortalities for the Pu‘u Maka‘ala release show some of the same risk factors observed during the Kona release, including ‘io predation, confirmed or suspected mammal predation, disease, and limited capacity of some released birds to maintain body condition. However, during the Pu‘u

Maka‘ala release, two new risk factors were observed. These were mortalities due to exposure to wet, cold, and windy conditions, and death as result of conspecific aggression. ‘Alalā released at Pu‘u Maka‘ala did not experience infection by toxoplasmosis. Whether this is because cat trapping reduced numbers of cats, the wet environment degraded cat feces quickly, or something about the habitat/vegetation matrix made it less likely for ‘alalā to find cat feces is unclear. During the Pu‘u Maka‘ala release the field team observed release cohorts mixing around supplemental feeding stations near hacking aviaries built for later releases and intra-specific conflicts at and near the feeding stations, as well as in the surrounding forest (A. Greggor, pers. comm., 2022). The field team also observed that aggression increased when birds became sexually mature and formed pairs and that the social cohesion of younger birds, which provided benefits to avoiding ‘io predation, waned as birds matured. These observations are consistent with what is known about the species’ social system historically, with juvenile flocks transitioning to territorial pairs (Banko *et al.* 2002, pp. 10-11). Preliminary analyses of the circumstances surrounding ‘alalā mortalities suggest that birds were at higher risk during periods of weaning and as the number of territorial birds on the landscape increased (A. Greggor, pers. comm., 2022).

‘Alalā historically used mesic to wet forests dominated by ‘ōhi‘a and koa canopy from 1,000-8,200 feet elevation, with seasonal movement along elevation gradients to track food availability. Their nests occupied restricted ranges of 1,700–5,700 ft (Banko and Banko 1980, p. 25), although nest platforms were recorded up to 6,080 ft in recent releases. Future released populations may show different spatial patterns than historic populations, at least initially, since it may take multiple generations for them to regain seasonal movement, which was presumably learned socially between parents and offspring or refined during juvenile flocking (van Dooren 2006, entire). Additionally, there is some uncertainty about how their movement and habitat preferences will translate to different conditions on Maui, when prior records are from Hawai‘i Island. Nonetheless, information from the Hawai‘i Island releases can give some indication of what we might expect in newly released populations.

Releases of juvenile ‘alalā groups were anchored to the release sites using supplemental food stations for previous releases. These sites were dominated by ‘ōhi‘a and koa canopy, although there was considerable forest fragmentation nearby. Similar strategies have anchored other bird species of varying ages (White *et al.* 2012, entire), so it is likely that adult ‘alalā will settle as reliably as juveniles, but uncertainty in how much their spatial behavior will mirror juvenile releases remains. The home ranges of juvenile released birds gradually expanded over time from release (Smetzer *et al.* 2021, entire), but their movements were biased by the location of feeders (Greggor *et al.* in review). It is uncertain what dispersal behavior of released birds will be once weaned from supplemental foods. There is the potential that birds may range more widely, or, if they have already established territories and wild foods are plentiful, dispersal may be similar to observed during the Pu‘u Maka‘ala NAR release.

Factors limiting ‘alalā recovery

Establishment and persistence of reintroduced populations of ‘alalā will require control of the most significant mortality factors over long time periods and extensive areas. In order for a population of ‘alalā to maintain itself in the wild, mortality rates of juveniles and adults must be much lower than those observed in the wild (and reintroduced) populations over the last 50 years (DLNR/USFWS 1999, pp. 7-8). Information gleaned from the Kona and Pu‘u Maka‘ala releases reveal important causes of direct mortality, including ‘io predation, toxoplasmosis infection, exposure, conspecific aggression, and mammal predation, but the effect of other, more indirect, limiting factors, (e.g.,

reduced elevational range and fragmentation of native forest) remain less certain. 'Alalā historically had extensive home ranges, and so a self-sustaining population would occupy a substantial area of forest over considerable range in elevation and different forest habitats. Movements of wild 'alalā between different habitats and precipitation regimes suggest the importance of large forest areas needed for 'alalā to complete its life history (Giffin 1987, p. 490). In addition, smaller populations are more likely to disappear over time due to severe environmental events or other random factors than are larger, more spatially extensive populations. For this reason, areas with more potential habitat for 'alalā are preferable as reintroduction sites.

Most of the factors suggested to be responsible for the decline and extinction of 'alalā in the wild still exist in most of the historic range for the species on the island of Hawai'i, and proposed release locations for 'alalā on Maui. However, the relative effect of each risk factor varies considerably for number of 'alalā that may succumb to a given factor. Selection of release areas that lack or have reduced presence of certain risk factors and reduction of risk factors that have greatest potential to limit survival of 'alalā may contribute to improved likelihood of success of future 'alalā releases. Predation by 'io was the cause for the highest number of 'alalā deaths of all risk factors during the Kona and Pu'u Maka'ala releases. 'Io populations appear to be robust in most areas of native forest on Hawai'i Island (Gorresen *et al.* 2008, entire). While individual 'io have been reported extremely rarely on Maui (Banko and Banko 1980, p. 18), no breeding population is present. Populations of mammalian predators (rats, feral cats, mongoose) are largely uncontrolled in many areas, although control methods exist and can be effective over relatively large areas where infrastructure and resources allow as, for example, broad-scale cat trapping and more localized rodent trapping during 'alalā releases conducted at Pu'u Maka'ala NAR. Mortalities due to confirmed or suspected mammal predation were few during both the Kona and Pu'u Maka'ala releases. Toxoplasmosis can be expected to be present wherever there are feral cats, which apparently includes most areas below 3000 m (10,000 ft) elevation on all the main Hawaiian Islands (DOFAW/USFWS 1999, p. 7) and most of Maui. However, risk to 'alalā being exposed to toxoplasmosis may be lower in wet forest habitats where cat feces are less likely to persist for long periods of time. Avian pox and avian malaria exist throughout all the main Hawaiian Islands, although some areas have lower prevalence of malaria, primarily forest areas at higher elevation (Fortini *et al.* 2015, entire). There were no mortalities for 'alalā from avian malaria or pox during the Kona and Pu'u Maka'ala releases.

Appendix C: Scoping Consultations and Comments Received

A letter describing the proposed project was sent to the following Agencies and individuals. The letter described the two proposed release sites and reasons for considering releasing ‘alalā on east Maui.

County Agencies and Officials

- Jade Butay, Department of Transportation
- Paul Higashino, Kaho‘olawe Island Reserve Commission
- Helen Kau, Maui County Department of Water Supply
- Michael Paul Victorino, Office of the Mayor, Maui County
- Alan M. Arakawa, Past Maui Mayor
- Alice Lee, Maui County Council
- Keani Rawlins-Fernandez, Maui County Council
- Tasha Kama, Maui County Council
- Gabe Johnson, Maui County Council
- Kelly Takaya King, Maui County Council
- Mike Molina, Maui County Council
- Tamara Paltin, Maui County Council
- Shane Sinenci, Maui County Council
- Yuki Lei Sugimura, Maui County Council

State Agencies and Officials

- David Ige, Governor
- Andrew Choy, Department of Hawaiian Homelands
- Katie Ersbak, Hawai‘i State Watershed Partnership Coordinator
- Lee Ohigashi, Land Use Commission, Hawai‘i DBEDT
- Office of Planning and Sustainability, State of Hawai‘i
- Phyllis Shimabukuro-Geiser, Office of the Chairperson, Hawai‘i Department of Agriculture
- Les Welsh, Office of the Executive Director, Conservation Council for Hawai‘i
- Angus McKelvey, Office of the Representative, Hawai‘i State Capital
- Justin Woodson, Office of the Representative, Hawai‘i State Capital
- Kyle Yamashita, Office of the Representative, Hawai‘i State Capital
- Lynn DeCoite, Office of the Senator, Hawai‘i State Capital
- Gilbert Keith-Agaran, Office of the Senator, Hawai‘i State Capital
- Carmen Hulu Lindsey, Office of Hawaiian Affairs

Federal Agencies and Officials

- Kai Kahele, Office of the U.S. Representative
- Ed Case, Office of the U.S. Representative
- Mazie Hirono, Office of the U.S. Senator
- Brian Schatz, Office of the U.S. Senator
- Lisa C. Oshiro-Suganuma, Department of Interior, Office of Native Hawaiian Relations

- Nancy Holman, Kalaupapa National Historical Park
- Melia Lane-Kamahele, National Park Service, Pacific Island Support Office
- Susan Cordell, Office of the Director, US Forest Service, IPF, Pacific Southwest Research Station
- Ricardo Lopez, Pacific Islands Refuges and Monuments Office, US Fish and Wildlife Service
- Natalie Gates, Superintendent, Haleakalā National Park
- John Stephenson, U.S. Fish and Wildlife Service
- Jennifer Roth, U.S. Fish and Wildlife Service Office of Law Enforcement
- Jennifer Higashino, USDA - Natural Resources Conservation Service
- Michael Constantinides, USDA Natural Resources Conservation Service
- Eben Paxton, USGS-PIERC
- Paul Banko, USGS-PIERC
- Lucas Fortini, USGS-PIERC
- Rick Camp, USGS-PIERC

Individuals and Organizations

- Sean O Keefe, Alexander & Baldwin Properties, Inc.
- Steve Holmer, American Bird Conservancy
- Molly Haggeman, Bishop Museum ornithology collections manager
- Amy Atwood, Center for Biological Diversity
- Patricia Tummons, Environment Hawaii
- Jordan Jokiel, Haleakala Ranch
- Scott Meidell, Haleakala Ranch
- Laura Zoller, Hawai'i Audubon Society
- Nicole Galase, Hawai'i Cattleman's Association
- Emma Anders, Hawai'i Conservation Alliance
- Una Greenway, Hawai'i Organic Farming Association
- Linda Elliott, Hawai'i Wildlife Center
- Laura Debnar, Honolulu Zoo
- Miwa Tamanaha, KAHEA The Hawaiian-Environmental Alliance
- Namaka Whitehead, Kamehameha Schools
- Henry Rice, Kaonoulu Ranch
- Wendy Baldwin, Kaupo Ranch
- Sarah Moore, Kealia Ranch
- Keith Unger, McCandless Ranch
- Nina Rønsted, National Tropical Botanical Gardens
- Harold Graham, Nu'u Mauka Ranch
- Jennifer Morris, Office of the CEO, The Nature Conservancy
- Dan Eisenberg, Office of the Coordinator, East Maui Watershed Partnership
- Andrea Buckman, Uhiwai O Haleakalā
- Office of the Coordinator, Three Mountain Alliance
- Christopher Brosius, Office of the Coordinator, Mauna Kahālāwai Watershed Partnership
- Pamela Tumpap, Office of the Director, Maui Chamber of Commerce
- Amanda Bassow, Office of the Director, National Fish and Wildlife Foundation
- Mindy Runnels, Office of the Director, The Panaewa Rainforest Zoo and Gardens
- Eric VanderWerf, Pacific Rim Conservation
- Lindsay Young, Pacific Rim Conservation
- Johnathan Sprague, Pūlama Lāna'i

- Rachel Sprague, Pūlama Lānaʻi
- Ron Swaisgood, San Diego Zoo, Conservation Program
- Wayne Tanaka, Sierra Club, Hawaiʻi Chapter
- Kerri Fay, The Nature Conservancy
- Shalan Crysdale, The Nature Conservancy
- Ulalia Woodside, The Nature Conservancy of Hawaii
- Cara Thow, The Wildlife Society, Hawaiʻi Chapter
- Sumner Erdman, President, Ulupalakua Ranch
- Willam Evanson
- Peter Baldwin
- Auwahi Wind - AEP Renewables
- Lisa M. Toma Yoshida, Kaupō Ranch
- Reza Moazezi
- Roland P. Kanuha, Kanuha, Robert & Doris Family Land Trust
- Hillary Atai
- Jeffrey N. Piimauna
- Mathias & Niehaus Kaupo II LLC
- H. Andy Graham, Nuʻu Mauka LLC
- East Maui Irrigation
- Mahi Pono
- MP East B LLC
- Kauiki Lind, Kīpahulu ʻŌhana (Kīpahulu Moku Poʻo)
- Lyons Cabacungan, Kaupō Moku Poʻo
- Kyle Nakanelua, Koʻolau Moku Poʻo
- Joyclynn Costa, Hamakualoa Moku Poʻo
- Sam Akoj, Hana Moku Poʻo
- Tara Apo, Kaupō Community Association
- Pomaikai Kaniaupio-Crozier, Puʻu Kuʻkui Watershed Preserve
- Mike Opgenorth, Kahanu Garden and Preserve
- Amanda Martin, Na Moku Aupuni o Koʻolau Hui
- Lu'ukia Nakanelua, Koʻolau lineal descendant
- Colleen Heyer, Conservation Council for Hawaii
- Trevor Taylor, The Nature Conservancy
- Alison Cohan, The Nature Conservancy
- Charles Young, Aha Moku Advisory Committee- Hawaii

We received the following comments in Response to the Scoping/Early consultation letter.

General Issue/Comment	Expanded description of issue/comment from contact	Organization or person with issue
Exciting news keep us posted!		Panaewa Zoo
Would like more details about "establishing or updating camp infrastructure" means	The Office of Planning and Sustainable Development has reviewed the material and recommend that the Draft Environmental Assessment should explain in details what "Establishing or updating field camp infrastructure ..." means. Specifically, what kind of infrastructure will be used, where, how it will be used, by whom, etc. Additionally, regarding the proposal to increase the number of helicopter flights for access to the site, it should specify how many flights (current and proposed) and where are they/will they be landing.	State of Hawai'i Office of Planning & Sustainable Development
Integrity of the Ko'olau Gap fence, which is crucial to excluding pigs from Waikamoi Preserve.	How will management activities, like checking that fence and fence maintenance and repair work (e.g., chain saw work), by the East Maui Watershed Partnership (EMWP) be affected by 'alalā release activities?	The Nature Conservancy
Integrity of the Ko'olau Gap fence, which is crucial to excluding pigs from Waikamoi Preserve.	EMWP checks the Ko'olau Gap fence quarterly, remote traps twice per year and does ginger control utilizing Pig Camp (the assumed nearest infrastructure), often camping there. Two helicopter operations per trip, one to insert and one to pull personnel out, would add up to about 12 heli-ops per year. How would those activities affect 'alalā, and in reverse, would EMWP still be able to carry out these management actions?	The Nature Conservancy

General Issue/Comment	Expanded description of issue/comment from contact	Organization or person with issue
Non-native seed dispersal	How would the 'Alalā Project team mitigate risks of spreading weed seeds? If a released bird flies south and personnel are obligated to track it, how do you plan to mitigate for spreading Clidemia uphill? How would the project keep 'alalā from eating and spreading the fruits from those weedy plants?	The Nature Conservancy
Impact on native bird species	We would like to see discussion in the draft EA of the possible impacts of 'alalā on native forest birds, particularly kiwīkiu, ākohekohe, Maui 'alauahio, and 'i'iwi, including possible nestling predation and territorial behaviors displayed by 'alalā.	The Nature Conservancy
Disease questions	what is the risk of 'alalā serving as an 'amplification' host for West Nile Virus (WNV) should it arrive in Hawaii? Recent research indicates American crows can be a vector for WNV and shed the virus for more than 90 days. Similarly, how are you mitigating for avian malaria? Can you expand on the disease testing that will be done before release in the draft EA?	The Nature Conservancy
Drone impact from IIT deployment	Finally, TNC and partners are undertaking a mosquito control project on Maui. The release area is also the release area for the planned IIT mosquitoes, which means there is the possibility that drones could be flying overhead to release male mosquitoes, possibly every week. How would this affect the 'alalā? Would the drones have to avoid that area?	The Nature Conservancy

Appendix D: List of Preparers

Oversight

DOFAW POC: Lindsey Nietmann

- Reviews and facilitates DOFAW specialists

PIFWO POC: John Vetter

- Reviews and facilitates PIFWO specialists

PIFWO Advisors: Lindsay Asman

- Reviews and directs PIFWO staff priorities

MFBRP Advisor: Hanna Mounce

- Reviews and directs MFBRP staff priorities

Implementation

Co-writer: Sarah Malick-Wahls

- Drafts major content and edits specialist sections of EA

Co-writer: Jay Nelson

- Drafts major content and edits specialist sections of EA

Co-writer: Lindsay Moore

- Drafts NPS wilderness area section and edits specialist sections of EA

Scoping and Public Outreach: Rachel Kingsley

- Coordinates scoping and public outreach for EA

Project Facilitator: Ron Terry

- Coordinates meetings, reviews documents to ensure compliance

Specialists

Rare plants: Lauren Weisenberger

- Reviews project proposal, develops list of affected plants

Rare plants: Hank Oppenheimer

- Reviews project proposal and mitigations and effects analysis

Rare invertebrates: Keahi Bustamente (or O'ahu staff)

- Reviews project proposal and mitigations and effects analysis

Invasive plants: Chuck Chimera

- Reviews project proposal and mitigations and effects analysis

Hawaiian forest birds: Christopher Warren

- Reviews project proposal and mitigations and affects analysis

Section 106: USFWS Alton Exzabe

- Completes Section 106 for USFWS

GIS: Hillary Foster

- Creates maps and summarizes project acres

ʻAlalā: Alison Greggor

- Drafts ʻalalā background section

Appendix E: ‘Alalā Release Site Recommendation Letter

This letter details the results of a process undertaken by the ‘Alalā Maui Nui Planning Group to identify two sites to recommend to agency leadership. These proposed sites are analyzed as Alternatives 2, 3, and 4 of this EA, and the determination of the EA will be the final decision whether to implement a release in either or both of the recommended sites.

2465 Olinda Road
Makawao, HI 96768



MEMORANDUM

To:

Earl Campbell, Field Supervisor, USFWS Pacific Islands Fish and Wildlife Office

David Smith, Administrator, DLNR Division of Forestry and Wildlife

Through:

Lindsay Asman, Geographic Island Team Manager, Maui Nui and Hawai‘i Island, USFWS Pacific Islands Fish and Wildlife Office

Lainie Berry, Wildlife Program Manager, DLNR Division of Forestry and Wildlife

From:

Sarah Malick-Wahls, ‘Alalā Research and Recovery Coordinator, Maui Forest Bird Recovery Project

Date: October 25, 2022

Subject: Selection of Maui Nui ‘alalā release locations

The sites for release of initial translocation of ‘alalā into Maui County have been selected through a rigorous decision-making process by the Maui Nui ‘Alalā Planning Group; composed of the US Fish and Wildlife Service Pacific Islands Fish and Wildlife Office (PIFWO), Hawai‘i Department of Land and Natural Resources Division of Forestry and Wildlife (DOFAW), San Diego Zoo Wildlife Alliance (SDZWA), National Park Service (Haleakalā National Park; NPS), The Nature Conservancy (TNC) and a representative from the Maui Nui ‘Alalā Cultural Advisor Group. The process was initiated in November 2021 and monthly meetings occurred through July 2022 (12 to 15 active and regular participants).

The final sites selected for initial release of captive birds are the Ko‘olau Forest Reserve in the Ko‘olau Gap and the Healani Section of Kīpahulu Forest Reserve (Figure 1). These two sites are located on the windward and the leeward side of the contiguous native forest of east Maui. Both release sites present a continuum of habitat and resource features (e.g., intact native forest and precipitation) which allows a hypothesis-based release strategy for the factors that are most important to success of ‘alalā. Much remains unknown about specific ‘alalā life history requirements and necessary release strategies; therefore, we are adopting an adaptive management approach as a key component of this release.

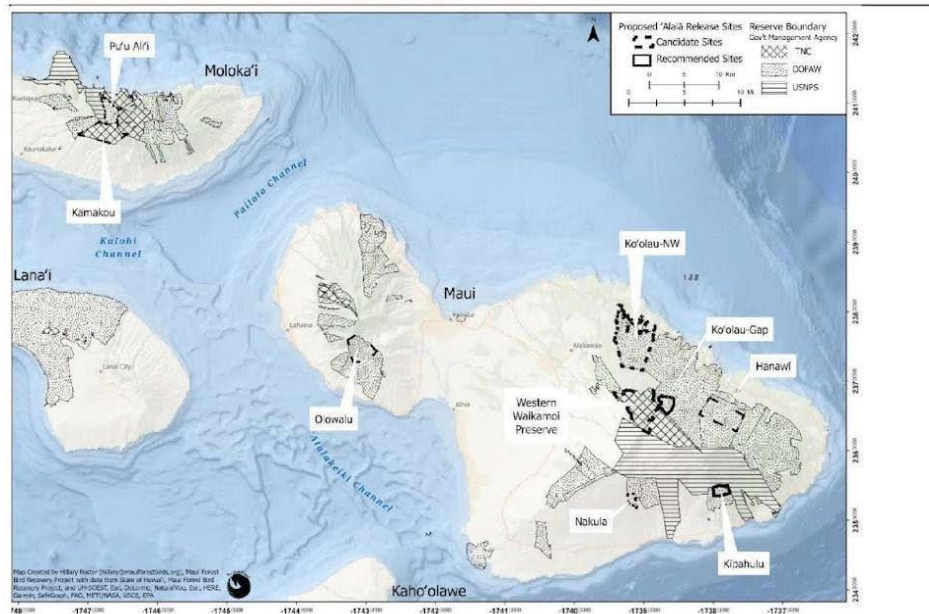


Figure 1. Candidate and recommended release sites.

The decision-making process evaluated several candidate sites that contain the highest quality remaining mature upland native forest habitat on Maui and Moloka'i Islands (Table 1). In-person visits by the entire Maui Nui Planning Group were made unrealistic by COVID-19 restrictions and travel cost and logistics to helicopter access-only field sites. Thus, a diverse subset of the Maui Nui Planning Group led release site field visits based on discussions that were informed both by TNC and DOFAW land manager presentations. In selecting release sites, the group considered many factors including year-round food availability, total area of connected habitat, forest structure, habitat protection status, support from land managers, suitable nest trees, ability for staff to navigate, potential release aviary sites, cell phone coverage (relevant to communication and ability to use remote tracking technology), and more. Although the two TNC sites were advantageous for a number of those indicators, the group recognized releasing birds to lands with ownership other than the State would present additional complexity and decided to carry forth only State-owned properties for this phase.

Planning and implementing an 'alalā release at these sites will require sustained commitment of PIFWO and DOFAW effort for the next several years. Thank you for your support during this exciting time in Hawai'i conservation.

Sincerely,



Oct 25, 2022

Sarah Malick-Wahls
CC: Scott Fretz, Suzanne Case

Table 1. Summary of Maui Nui candidate 'alalā release sites.

Candidate Site	Primary advantages	Primary disadvantages
Lower Hanawā Natural Area Reserve	Quality native and diverse forest, connected to large contiguous native forest, great existing infrastructure	Most divergent from historical 'alalā climatic conditions (very wet)
Pu'u Ali'i Natural Area Reserve (Moloka'i)	Quality native and diverse forest, some existing infrastructure, cell phone coverage	No on-island captive facility, helicopter company, or MFBRP office, extreme terrain makes monitoring difficult, few stores for materials on-island, limited suitable aviary locations
TNC Western Waikomoi Preserve	Quality native and diverse forest, connected to large contiguous native forest, good existing infrastructure, resembles historical climatic conditions	State is not landowner
TNC Kamakou Preserve (Moloka'i)	Native forest in moderate condition, some existing infrastructure, drive-up access available	No on-island captive facility, helicopter company, or MFBRP office, extreme terrain makes monitoring difficult, few stores for materials on-island, State is not landowner
Olowalu Forest Reserve	Native forest in moderate condition, approaching historical climatic conditions	Extreme terrain makes monitoring difficult, smaller area of contiguous native forest, no existing infrastructure, limited suitable aviary locations
Kīpahulu Forest Reserve RECOMMENDED SITE	Native forest in moderate condition, connected to large contiguous native forest, approaching historical climatic conditions, cell phone coverage, many suitable aviary locations, easy to navigate off-trail for monitoring	Invasive plant species prevalent in some areas, limited existing infrastructure
Ko'olau Forest Reserve RECOMMENDED SITE	Native forest in moderate condition, connected to large contiguous native forest, management flexible to clearing for aviaries, quality existing infrastructure	Invasive plant species prevalent in some areas (NW section not carried forward as lacks suitable nesting trees)
Nakula Natural Area Reserve	Existing infrastructure, easy to navigate off-trail for monitoring, within historical climatic conditions, cell phone coverage	Invasive plant species prevalent throughout, low canopy cover of preferred nest tree species, low forest structure, site is smaller than one 'alalā breeding territory, isolated from other forest habitat

Appendix F: Maui Nui Planning Group Team Members

Name	Affiliation
Lindsay Asman	USFWS – Island Team Manager, Hawai‘i Maui Nui, Pacific Islands Fish and Wildlife Office
Lainie Berry	DOFAW-HI Wildlife Program Manager
Jon Brito	DOFAW-Watershed Program Manager [former Maui EPM]
Keahi Bustamente	DOFAW (Maui) – Rare Invertebrates
Christopher Chow	DOFAW-Maui Forester
Lance Desilva	DOFAW-Maui Forestry Program Manager
Scott Fretz	DOFAW-Maui Branch Manager
Alison Greggor	San Diego Zoo Wildlife Alliance
Rachel Kingsley	PCSU-The ‘Alalā Project
Peter Landon	DOFAW-Maui NEPM Program Manager
Ka‘onohipi Lee	Cultural Advisory Committee
Sarah Malick-Wahls	PCSU-The ‘Alalā Project
Bryce Masuda	San Diego Zoo Wildlife Alliance
John Medeiros	DOFAW-Maui Wildlife Program Manager
Hanna Mounce	PCSU-Maui Forest Birds Recovery Project
Jay Nelson	USFWS – Endangered Species Biologist, Pacific Islands Fish and Wildlife Office
Lindsey Nietmann	DOFAW-HI Forest Birds Biologist
Ronald Swaisgood	San Diego Zoo Wildlife Alliance
John Vetter	USFWS – Endangered Species Biologist, Pacific Islands Fish and Wildlife Office
Chris Warren	NPS-Haleakalā National Park
Jamie Yrigoyen	USFWS – Endangered Species Biologist, Pacific Islands Fish and Wildlife Office (Maui)

Appendix G: Tables

Table 1. Federally listed plants occurring within the analysis areas.

Scientific Name	Common Name	Status ¹	Critical Habitat ²	Habitat	Within 0.8 miles of the center of the release area ³	Within 2 miles of the center of the release area ³
<i>Asplenium peruvianum</i> var. <i>insulare</i>	no common name	E	X	Wet forest and swampy areas		Ko
<i>Bidens micrantha</i> ssp. <i>kalealaha</i>	ko'oko'o lau	E	X	Subalpine and dry cliff ecosystems		Kī
<i>Calamagrostis expansa</i>	Maui reedgrass	E		Mesic and wet forest; mesic and wet grassland and shrublands; and montane and riparian wetlands		Kī
<i>Clermontia samuelii</i> ssp. <i>samuelii</i>	'oha wai	E	X	Montane wet forest		Kī
<i>Ctenitis squamigera</i>	pauoa	E	X	Montane wet forest	Kī	Kī
<i>Cyanea copelandii</i> ssp. <i>haleakalaensis</i>	hāhā	E	X	Montane wet forest	Ko	Ko, Kī
<i>Cyanea hamatiflora</i> ssp. <i>hamatiflora</i>	hāhā	E	X	Montane wet forest	Ko, Kī	Ko, Kī

Scientific Name	Common Name	Status ¹	Critical Habitat ²	Habitat	Within 0.8 miles of the center of the release area ³	Within 2 miles of the center of the release area ³
<i>Cyanea horrida</i>	hāhā nui	E	X	Montane wet forest		Kī
<i>Cyanea kunthiana</i>	hāhā	E	X	Montane wet forest	Kī	Ko, Kī
<i>Cyanea maritae</i>	hāhā	E	X	Montane wet forest		Kī
<i>Cyanea mceldowneyi</i>	hāhā	E	X	Montane wet forest	Ko	Ko
<i>Cyrtandra ferripilosa</i>	ha‘iwale	E	X	Montane mesic and wet forest		Kī
<i>Huperzia mannii</i>	wāwae‘iole	E	X	Montane wet forest	Kī	Kī
<i>Joinvillea ascendens</i> ssp. <i>ascendens</i>	‘ohe	E		Montane wet forest	Ko	Ko, Kī
<i>Melicope ovalis</i>	‘alani	E	X	Montane wet forest, wet cliff	Ko	Ko
<i>Microlepia strigosa</i> var. <i>mauiensis</i>	no common name	E		Montane wet forest	Kī	Kī
<i>Nothocestrum latifolium</i>	‘aiea	E		Montane dry and mesic forest	Kī	Kī

Scientific Name	Common Name	Status ¹	Critical Habitat ²	Habitat	Within 0.8 miles of the center of the release area ³	Within 2 miles of the center of the release area ³
<i>Phyllostegia bracteata</i>	no common name	E	X	Wet Cliff	Kī	Ko, Kī
<i>Phyllostegia brevidens</i>	no common name	E		Montane forest		Kī
<i>Phyllostegia haliakalae</i>	no common name	E	X	Montane forest	Kī	Kī
<i>Plantago princeps</i>	kuahiwi laukahi	E	X	Dry and wet cliff ecosystems		Kī
<i>Schiedea diffusa</i> subsp. <i>diffusa</i>	no common name	E		Wet to very wet forest		Kī
<i>Wikstroemia villosa</i>	no common name	E	X	Montane wet forest	Kī	Ko, Kī

¹E = Federally listed as endangered

²X = Species has designated critical habitat

³Ko = Ko'olau analysis area; Kī = Kīpahulu analysis area

Table 2. Project actions and non-project activities at the proposed release sites and the risks and benefits to ‘alalā.

Action	Risk to ‘alalā and mitigating factors	Benefit to ‘alalā
Conservation Actions - Related to the EA		
Release ‘alalā on east Maui	Moderate risk of mortality for released birds	Substantial potential benefit to species recovery if conditions found which allow birds to breed in the wild
Small mammal control using kill traps; rodents, cats and mongooses will be controlled in vicinity of release aviaries, feeding stations, and along trails and fence lines	Very low risk; all traps will have exclusion guards to keep ‘alalā and other non-target animals from entering traps. Guards have been trialed on captive ‘alalā to confirm safety.	Reduces risk of predation and disease
Field camp, release aviary, and other infrastructure construction	Very low risk	Construction of any needed additional infrastructure would occur before ‘alalā are introduced to release aviaries
New trails construction	Very low risk	Cutting of new trails would occur before ‘alalā are introduced to release aviaries
Ongoing Conservation Management in the Proposed Release Areas-Unrelated to EA		
Ungulate control including fence maintenance, aerial shooting, and other control measures	Very low risk of harm by harassment or shooting	Substantial benefit by maintaining the condition of native vegetation in the proposed release areas
‘Alalā exposure to pig carcasses that may contain toxoplasmosis	Very low risk at Ko‘olau as area is pig free; moderate risk at Kīpahulu as there is moderate pig population in this area	Removal of pigs provides substantial benefit by maintaining the condition of native vegetation in the proposed release areas; however, pig carcasses pose moderate risk to ‘alalā as carcasses may contain toxoplasmosis

Ungulate fence repairs and new fence construction requiring use of hand tools, chain saws and power generators	For non-breeding ‘alala these activities may cause ‘alalā to move away from immediate area where activities are being conducted; for breeding ‘alalā, may cause disturbance potentially resulting in failure of nesting attempt (see p. 25 for description of avoidance and minimization measures)	Substantial benefit by maintaining the condition of native vegetation in the proposed release areas
Conservation management activities and potential human-caused disturbance	Low risk; humans performing activities will know how to avoid and minimize interactions with ‘alalā	Substantial benefit by maintaining suitable habitat conditions of native vegetation in release areas
Herbicide application	Very low risk of direct poisoning to ‘alalā; potential minor negative effect by removing introduced plants ‘alalā may feed on	Substantial benefit by maintaining the condition of native vegetation in release areas
Ongoing Conservation Management in the Proposed Release Areas-Unrelated to EA		
Planting native plants grown in greenhouses in the wild	Low risk of human harassment; potential transitory disturbance to ‘alalā from human presence during out planting and monitoring	Substantial benefit by encouraging expansion of listed native plants populations that ‘alalā use for food
Conservation helicopter flights	Low risk; risk to ‘alalā can be minimized by locating release aviaries and feeding stations away from helicopter landing zones	Risk of temporary interruption of behaviors primarily near landing zones, potential disturbance to ‘alalā is transitory

Mosquito control using unmanned aerial vehicles (UAVs)	Very low risk of disturbance to non-breeding 'alalā by UAVs when flying over 'alalā; risk of temporary disturbance when flying over breeding 'alalā	Potential substantial benefit by reducing occurrence of avian disease
Mosquito control using helicopter long-line	Risk of temporary disturbance when flying over 'alalā; disturbance transitory	Potential substantial benefit by reducing occurrence of avian disease
Other Activities at the Release Area – Unrelated to the EA		
Illegal shooting	Very low risk; if occurred would cause substantial harm to individual(s) shot and the Maui release population as a whole	No benefit
Human harassment: unauthorized entry	Low risk because proposed release sites are very remote and difficult to access	No benefit
Tourist helicopter flights	Low risk; tourist helicopters must maintain flight altitudes a minimum of 500 ft above forest canopy, disturbance to 'alalā from low flights is transitory	No benefit

Table 3. Listed fauna either occurring or potentially occurring within the analysis area.

	Scientific Name	Common Name	Listing Status ¹	Critical Habitat ²	Habitat	Within 0.8 miles of the center of the release area ³	Within 2 miles of the center of the release area ³
Bat	<i>Lasiurus cinereus semotus</i>	‘Ōpe‘ape‘a or Hawaiian hoary bat	E		Most observations	Likely present Ko, Kī	Likely present Ko, Kī
Forest bird	<i>Drepanis coccinea</i>	‘I‘iwi	T		Montane wet and mesic forest	Ko, Kī	Ko, Kī
Forest bird	<i>Palmeria dolei</i>	‘Ākohekohe	E	X	Montane wet forest	Kī	Ko, Kī
Forest bird	<i>Pseudonestor xanthophrys</i>	Kiwikiu	E	X	Montane wet forest	Kī	Ko, Kī
Open country bird	<i>Branta sandvicensis</i>	Nēnē or Hawaiian goose	T		Sub-alpine grassland, open native shrubland, mid- and low-elevation pasture and managed grassland	Kī	Ko, Kī
Seabird	<i>Pterodroma sandwichensis</i>	‘Ua‘u or Hawaiian petrel	E		Nests in burrows in high elevation lava fields and open grassland/shrubland areas	Transits area only	Ko: Transits area only, Kī: Transits and nests
Seabird	<i>Oceanodroma castro</i>	‘Ake‘ake or band-rumped storm-petrel	E		May nest in burrows in high elevation lava fields and open grassland/shrubland areas	Transits area only: Ko, Kī	Transits area only: Ko, Kī

	Scientific Name	Common Name	Listing Status ¹	Critical Habitat ²	Habitat	Within 0.8 miles of the center of the release area ³	Within 2 miles of the center of the release area ³
Seabird	<i>Puffinus newelli</i>	‘A‘o or Newell’s shearwater	T		May nest in burrows in high elevation lava fields and open grassland/shrub land areas	Transits area only: Ko, Kī	Transits area only: Ko, Kī
Insect	<i>Megalagrion nesiotes</i>	Flying earwig damselfly	E		Streams and riparian areas; seeps and leaf litter	Potential presence : Ko, Kī	Potential presence: Ko, Kī
Insect	<i>Megalagrion pacificum</i>	Pacific damselfly	E		Streams and riparian areas; seeps and leaf litter	Potential presence : Ko, Kī	Potential presence: Ko, Kī
Insect	<i>Megalagrion xanthomelas</i>	Orange-black damselfly	E		Streams and riparian areas; seeps and leaf litter	Potential presence : Ko, Kī	Potential presence: Ko, Kī

¹E = Federally listed as threatened; T = Federally listed as endangered

²X = Species has designated critical habitat within analysis area; an empty box indicates there is no designated critical habitat for the species

³Ko = Ko‘olau analysis area; Kī = Kīpahulu analysis area

Table 4. Estimated additional helicopter flights for conservation purposes under all alternatives.

Flight Hours	Estimated Additional Monthly Helicopter Hours (Min. – Max.)	Estimated Proportional Increase to Existing East Maui Helicopter Traffic for Agency Conservation Management (Min. – Max.)
Alt. 1 (No Action)	0	0
Alt. 2 (Both Ko‘olau and Kīpahulu FR)	2-24	Roughly 6 to 48 percent
Alt. 3 (Kīpahulu FR only)	2-20	Roughly 6 to 29 percent
Alt. 4 (Ko‘olau FR only)	2-20	Roughly 6 to 29 percent
Commercial flights east Haleakalā National Park in vicinity Kīpahulu proposed release site	Roughly 60 hrs/month	N/A

Appendix H: USFWS Invasive Species Biosecurity Protocols

(Updated February 2022)

Project activities may introduce or spread invasive species, causing negative ecological consequences to new areas or islands, resulting in potential impacts to fish, wildlife, and their habitat. For example, seeds of invasive plant species (e.g., *Chromolaena odorata*, *Senecio madagascariensis*, *Cyathea cooperi*, or *Miconia calvescens*) can be inadvertently transported on equipment from a previous work site to a new site where the species are not present. Likewise, equipment used in an area infected with a pathogen or insect pest that can have ecological consequences (e.g., rapid ‘ōhi‘a death (*Ceratocystis spp.*), black twig borer (*Xylosandrus compactus*), or naio thrips (*Klambothrips myopori*), if not properly decontaminated, can act as a vector to introduce the pathogen into a new area. Additionally, vehicles must be properly inspected and cleaned to ensure vertebrate or invertebrate pests do not stowaway and spread to other areas. These are just a few examples of how even well-intended project activities may inadvertently introduce or spread invasive species.

To avoid and minimize invasive species potential impacts to fish, wildlife, and their habitat we recommend incorporating the applicable general biosecurity protocols (below) into your project planning. Additional consultation is recommended if project activities involve transportation of materials, equipment, vehicles, etc. between islands or transpacific movement of materials or equipment.

Invasive Species Biosecurity Protocol

The following biosecurity protocol is recommended to be incorporated into planning for your project to avoid or minimize transportation of invasive species with potential to impact to fish, wildlife, and their habitat. Cleaning, treatment, and inspection activities are the responsibility of the equipment or vehicle owner and operator. However, it is ultimately the responsibility of the action agency to ensure that all project materials, vehicles, machinery, equipment, and personnel are free of invasive species before entry into a project site. Please refer to the resources listed below for current removal/treatment recommendations that may be relevant to your project.

1. Cleaning and treatment:

Project applicants should assume that all project materials (i.e., construction materials, or aggregate such as dirt, sand, gravel, etc.), vehicles, machinery, and equipment contain dirt and mud, debris, plant seeds, and other invasive species, and therefore require thorough cleaning. Treatment for specific pests, for example, trapping and poison baiting for rodents, or baiting and fumigation for insects, should be considered when applicable. For effective cleaning we offer the following recommendations prior to entry into a project site:

1. Project materials, vehicles, machinery, and equipment must be pressure washed thoroughly (preferably with hot water) in a designated cleaning area. Project

materials, vehicles, machinery, and equipment should be visibly free of mud/dirt (excluding aggregate), seeds, plant debris, insects, spiders, frogs (including frog eggs), other vertebrate species (e.g., rodents, mongoose, feral cats, reptiles, etc.), and rubbish. Areas of particular concern include bumpers, grills, hood compartments, wheel wells, undercarriage, cabs, and truck beds. Truck beds with accumulated material are prime sites for hitchhiking invasive species.

2. The interior and exterior of vehicles, machinery, and equipment must be free of rubbish and food, which can attract pests (i.e., rodents and insects). The interiors of vehicles and the cabs of machinery should be vacuumed clean particularly for any plant material or seeds.

2. Inspection:

1. Following cleaning and/or treatment, project materials, vehicles, machinery, and equipment, must be visually inspected by its user, and be free of mud/dirt (excluding aggregate), debris, and invasive species prior to entry into a project site. For example, careful visual inspection of a vehicle's tires and undercarriage is recommended for any remaining mud that could contain invasive plant seeds.

2. Any project materials, vehicles, machinery, or equipment found to contain invasive species (e.g., plant seeds, invertebrates, rodents, mongoose, cats, reptiles, etc.) must not enter the project site until those invasive species are properly removed/treated.

3. For all project site personnel:

1. Prior to entry into the project site, visually inspect and clean your clothes, boots or other footwear, backpack, radio harness, tools and other personal gear and equipment for insects, seeds, soil, plant parts, or other debris. We recommend the use of a cleaning brush with sturdy bristles. Seeds found on clothing, footwear, backpacks, etc., should be placed in a secure bag or similar container and discarded in the trash rather than being dropped to ground at the project site or elsewhere.

4. Additional considerations (if applicable):

1. Consider implementing a Hazard Analysis and Critical Control Point (HACCP) plan (<https://www.fws.gov/policy-library/750fw1>) to improve project planning around reducing the risk of introducing or spreading invasive species.

2. When applicable, use pest-free or low-risk sources of plants, mulch, wood, animal feed or other materials to be transported to a project site.

3. For projects involving plants from nurseries (e.g., outplanting activities, etc.), all plants should be inspected, and if necessary, appropriately cleaned or treated for invasive species prior to being transported to the project site.

4. Avoid unnecessary exposure to invasive species at a particular site (to the extent practical) to reduce contamination and spread. For example, if your project involves people or equipment moving between multiple locations, plan and organize timelines so that work is completed in native habitat prior to working in a disturbed location to reduce the likelihood of introducing a pest into the native habitat.

5. Maintain good communication about invasive species risks between project

managers and personnel working on the project site (e.g., conduct briefings and training about invasive species). Ensure prevention measures are communicated to the entire project team. Also consider adding language on biosecurity into contracts or permitting mechanisms to provide clarity to all involved in the project. Report any species of concern or possible introduction of invasive species to appropriate land managers.

For current removal/treatment recommendations please refer to the following:

- Hawai‘i Island – <https://www.biisc.org/>
- Maui – <https://mauiinvasive.org/>
- Kaua‘i – <https://www.kauaiisc.org/>

Species-Specific Biosecurity Protocols

NOTE: The following section contains specific protocols for a few select invasive species of concern in the Pacific Islands highlighted because of their potential to easily spread and cause great harm to native species and habitats. Other invasive species may not have existing specific protocols or may already be minimized by implementing the general invasive species protocols above (e.g., invasive plants, invertebrates, larger vertebrates). As new threats emerge that require development of species-specific protocols, those may be added to this list. We have included below the Biosecurity Protocols for invasive species known to occur on Maui.

Table 1. Current island distribution of invasive species with specific biosecurity protocols in the Pacific Islands (PIFWO jurisdiction).

Island	Rapid ‘Ōhi‘a Death	Little Fire Ant	Coconut Rhinoceros Beetle	Brown Treesnake
Island of Hawai‘i	widespread	widespread	not present	not present
Maui	not present	incipient	not present	not present
O‘ahu	incipient	incipient	widespread	not present
Kaua‘i	widespread	not present	not present	not present

Guam	NA	widespread	widespread	widespread
CNMI	NA	not present	Rota only	not present
American Samoa	NA	incipient	widespread	not present

Little Fire Ant (LFA)

NOTE: Include the following information for projects that occur in native habitat on islands where LFA is currently recorded and in areas known to be infested with LFA (check <http://stoptheant.org/lfa-in-hawaii/> for status on each island). If other ant species (i.e., yellow crazy ants) may be a concern for your project, please contact the invasive species team.

Current Distribution of LFA: Island-wide on Guam and island of Hawai‘i; incipient infestation sites on Maui, O‘ahu, and American Samoa; CNMI is also vulnerable and projects there should require that project-related materials, equipment, and vehicles be checked before shipping to the CNMI from Guam and prior to use.

The little fire ant (*Wasmannia auropunctata*), or LFA, is an invasive species with a painful sting that can inhabit many different environments. In Hawai‘i, it often infests agricultural fields and farms, damaging crops and stinging unsuspecting workers. Little fire ants are also highly disruptive to native tropical ecosystems and harmful to wildlife. Slow moving, but tiny and capable of foraging 24 hours a day with multiple queens per colony, LFA is a formidable threat to biodiversity, agriculture, and quality of life on tropical islands in the Pacific. For more information about LFA including helpful guides and workshops for treating or detecting LFA, please visit www.littlefireants.com.

Appendix I: USFWS Avoidance, Minimization, and Conservation Measures for Federally Listed Plants in the Pacific Islands

Appendix I provides general recommendations for avoidance, minimization, and conservation measures for federally listed plants in the Pacific Islands. The USFWS encourages interested parties to contact the Pacific Islands Fish and Wildlife Office (Phone: 808 792-9400) for advice on measures for specific locations.

Project activities may affect listed plant species by causing physical damage to plant parts (roots, stems, flowers, fruits, seeds, etc.) as well as impacts to other life requisite features of their habitat which may result in reduction of germination, growth and/or reproduction. Cutting and removal of vegetation surrounding listed plants has the potential to alter microsite conditions (e.g., light, moisture, temperature), damaging or destroying the listed plants and also increasing the risk of invasion by nonnative plants which can result in higher incidence or intensity of fire. Activities such as grazing, use of construction equipment and vehicles, and increased human traffic (i.e. trails, visitation, monitoring), can cause ground disturbance, erosion, and/or soil compaction which decrease absorption of water and nutrients and damage plant root systems and may result in reduced growth and/or mortality of listed plants. Soil disturbance or removal has the potential to negatively impact the soil seed bank of listed plant species if such species are present or historically occurred in the project area.

In order to avoid or minimize potential adverse effects to listed plants that may occur on the proposed project site, we recommend minimizing disturbance outside of existing developed or otherwise modified areas. When disturbance outside existing developed or modified sites is proposed, conduct a botanical survey for listed plant species within the project action area, defined as the area where direct and indirect effects are likely to occur. Surveys should be conducted by a knowledgeable botanist with documented experience in identifying native Hawaiian and Pacific Islands plants, including listed plant species. Botanical surveys should optimally be conducted during the wettest part of the year (typically October to April) when plants and identifying features are more likely to be visible, especially in drier areas. If surveys are conducted outside of the wet season, the Service may assume plant presence.

The boundary of the area occupied by listed plants should be marked with flagging by the surveyor. To avoid or minimize potential adverse effects to listed plants, we recommend adherence to buffer distances for the activities in the **Table below**. Where disturbed areas do not need to be maintained as an open area, restore disturbed areas using native plants as appropriate for the location. Whenever possible we recommend using native plants for landscaping purposes. The following websites are good resources to use when choosing landscaping plants: Native Hawaiian Plants for Landscaping, Conservation, and Reforestation (<https://www.ctahr.hawaii.edu/oc/freepubs/pdf/of-30.pdf>), and Best Native Plants for Landscapes (<https://www.ctahr.hawaii.edu/oc/freepubs/pdf/OF-40.pdf>).

If listed plants occur in a project area, the avoidance buffers are recommended to reduce direct and indirect impacts to listed plants from project activities. However, where project activities will occur within the recommended buffer distances, additional consultation is required. The above guidelines apply to areas outside of designated critical habitat. If project activities occur within designated critical habitat unit boundaries, additional consultation is required. All activities, including site surveys, risk introducing nonnative species into project areas. Specific attention needs to be made to ensure that all equipment, personnel, and supplies are properly checked and are free of contamination (weed seeds, organic matter, or other contaminants) before entering project areas. Quarantines and or management activities occurring on specific priority invasive species proximal to project areas need to be considered or adequately addressed. This information can be acquired by contacting local experts such as those on local invasive species committees (Kauai: <https://www.kauaiisc.org/>; Oahu: <https://www.oahuisc.org/>; Maui Nui: <https://mauiinvasive.org/>; and Hawaii: <https://www.biisc.org/>

Table 1. Recommended buffer distances to minimize and avoid potential adverse impacts to listed plants from activities listed below.

	Buffer Distance (feet (meters)) - Keep Project Activity This Far Away from Listed Plant	
	Grasses, Herbs, Shrubs and Terrestrial Orchids	Trees and Arboreal Orchids
Walking, hiking, surveys	3 ft (1 m)	3 ft (1 m)
Cutting and Removing Vegetation By Hand or Hand Tools (e.g., weeding)	3 ft (1 m)	3 ft (1 m)
Mechanical Removal of Individual Plants or Woody Vegetation (e.g., chainsaw, weed eater)	3 ft up to height of removed vegetation (whichever greater)	3 ft up to height of removed vegetation (whichever greater)
Removal of Vegetation with Heavy Equipment (e.g., bulldozer, tractor, "bush hog")	2x width body of equipment + height of removed vegetation	820 ft (250 m)

Use of Approved Herbicides (following label)	Ground-based Spray Application; hand application (no wand applicator; spot treatment)	10 ft (3 m)	Crown diameter
	Ground-based Spray Application; manual pump with wand, backpack	50 ft (15 m)	Crown diameter
	Ground-based Spray Application; vehicle-mounted tank sprayer	50 ft (15 m)	Crown diameter
	Aerial Spray (ball applicator)	250 ft (76 m)	250 ft (76 m)
	Aerial Application – herbicide ballistic technology (individual plant treatment)	100 ft (30 m)	Crown diameter
	Aerial Spray (boom)	Further consultation required	Further consultation required
Use of Insecticides (pollinators, seed dispersers)		Further consultation required	Further consultation required
Ground/Soil Disturbance/Outplanting/Fencing (Hand tools, e.g. shovel, `ō`ō; Small mechanized tools, e.g., auger)		20 ft (6 m)	2x crown diameter
Ground/Soil Disturbance (Heavy Equipment)		328 ft (100 m)	820 ft (250 m)

Surface Hardening/Soil compaction	Trails (e.g., human, ungulates)	20 ft (6 m)	2x crown diameter
	Roads/Utility Corridors, Buildings/ Structures	328 ft (100 m)	820 ft (250 m)
Prescribed Burns		Further consultation required	Further consultation required
Farming/Ranching/Silviculture		820 ft (250 m)	820 ft (250 m)

Definitions (Wagner *et al.* 1999)

Crown: The leafy top of a tree.

Herb: A plant, either annual, biennial, or perennial, with the non-woody stems dying back to the ground at the end of the growing season.

Shrub: A perennial woody plant with usually several to numerous primary stems arising from or relatively near the ground.

Tree: A woody perennial that usually has a single trunk

References Cited

- USFWS. 2010. Endangered and threatened wildlife and plants; determination of endangered status for 48 species on Kauai and designation of critical habitat. Federal Register 75:18960–19165.
- . 2012. Endangered and threatened wildlife and plants; endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Federal Register 77: 57648–57862.
- . 2013a Endangered and threatened wildlife and plants; determination of endangered status for 38 species from Molokai, Lanai, and Maui. Federal Register 78: 32014–32065.
- . 2013b. Endangered and threatened wildlife and plants; determination of endangered species status for 15 species on Hawaii Island. Federal Register 78: 64638–64690.

- . 2016. Endangered and threatened wildlife and plants; determination of endangered status for 49 species from the Hawaiian Islands. Federal Register 81: 67786–67860.
- . 2016. USFWS Rare plant database. Unpublished.
- Wagner, W.L., Sohmer, S., and D.R. Herbst. 1999. Manual of the flowering plants of Hawaii, revised edition. Honolulu, Hawaii. University of Hawaii and Bishop Museum Press. 1,919 pp.

Appendix J: Migratory Bird Treaty Act Nationwide Standard Conservation Measures

Listed below are effective measures that should be employed at all project development sites nationwide with the goal of reducing impacts to birds and their habitats. These measures are grouped into three categories: General, Habitat Protection, and Stressor Management. These measures may be updated through time. We recommend checking the USFWS, Avoiding and Minimizing Incidental Take of Migratory Birds website regularly for the most up-to-date list (<https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds>).

1. General Measures

- a. Educate all employees, contractors, and/or site visitors of relevant rules and regulations that protect wildlife. See the Service Policy and Regulations webpage for more information on regulations that protect migratory birds (<https://fws.gov/program/policy-regulations>).
- b. Prior to removal of an inactive nest, ensure that the nest is not protected under the Endangered Species Act (ESA) or the Bald and Golden Eagle Protection Act (BGEPA). Nests protected under ESA or BGEPA cannot be removed without a valid permit.
- c. See the Service Birds Nests webpage for more information (<https://www.fws.gov/story/bird-nests>).
- d. Do not collect birds (live or dead) or their parts (e.g., feathers) or nests without a valid permit. Please visit the Service Migratory Bird Permit webpage for more information on permits and permit applications (<https://www.fws.gov/program/migratory-bird-permit>).
- e. Provide enclosed solid waste receptacles at all project areas. Non-hazardous solid waste (trash) would be collected and deposited in the on-site receptacles. Solid waste would be collected and disposed of by a local waste disposal contractor. For more information about solid waste and how to properly dispose of it, see the EPA Non-Hazardous Waste website (<https://www.epa.gov/rcra/resource-conservation-and-recovery-act-rcra-regulations#nonhaz>).
- f. Report any incidental take of a migratory bird, to the local Service Office of Law Enforcement (<https://www.fws.gov/law-enforcement/wildlife-inspector-honolulu-pacific-islands#>).
- g. Consult and follow applicable Service industry guidance.

2. Habitat Protection

- a. Minimize project creep by clearly delineating and maintaining project boundaries (including staging areas).
- b. Consult all local, State, and Federal regulations for the development of an appropriate buffer distance between development site and any wetland or waterway. For more information on wetland protection regulations see the Clean Water Act sections 401 and 404.
- c. Maximize use of disturbed land for all project activities (i.e., siting, lay-down areas, and construction).
- d. Implement standard soil erosion and dust control measures. For example:
 - i. Establish vegetation cover to stabilize soil
 - ii. Use erosion blankets to prevent soil loss
 - iii. Water bare soil to prevent wind erosion and dust issues

3. Stressor Management

Stressor: Vegetation Removal

Conservation Goal: Avoid direct take of adults, chicks, or eggs.

Conservation Measure 1: Schedule all vegetation removal, trimming, and grading of vegetated areas outside of the peak bird breeding season to the maximum extent practicable. Use available resources, such as internet-based tools (e.g., the FWS's Information, Planning and Conservation system and Avian Knowledge Network) to identify peak breeding months for local bird species; or contact local Service Migratory Bird Program Office for breeding bird information.

Conservation Measure 2: When project activities cannot occur outside the bird nesting season, conduct surveys prior to scheduled activity to determine if active nests are present within the area of impact and buffer any nesting locations found during surveys.

- 1) Generally, the surveys should be conducted no more than five days prior to scheduled activity.
- 2) Timing and dimensions of the area to be surveyed vary and will depend on the nature of the project, location, and expected level of vegetation disturbance.
- 3) If active nests or breeding behavior (e.g., courtship, nest building, territorial defense, etc.) are detected during these surveys, no vegetation removal activities should be conducted until nestlings have fledged or the nest fails or breeding behaviors are no longer observed. If the activity must occur, establish a buffer zone around the nest and no activities will occur within that zone until nestlings have fledged and left the nest area. The dimension of the buffer zone will depend on the proposed activity, habitat type, and species present and

should be coordinated with the local or regional Service office. When establishing a buffer zone, construct a barrier (e.g., plastic fencing) to protect the area. If the fence is knocked down or destroyed, work will suspend wholly, or in part, until the fence is satisfactorily repaired.

4) When establishing a buffer zone, a qualified biologist will be present onsite to serve as a biological monitor during vegetation clearing and grading activities to ensure no take of migratory birds occurs. Prior to vegetation clearing, the monitor will ensure that the limits of construction have been properly staked and are readily identifiable. Any associated project activities that are inconsistent with the applicable conservation measures, and activities that may result in the take of migratory birds will be immediately halted and reported to the appropriate Service office within 24 hours.

5) If establishing a buffer zone is not feasible, contact the Service for guidance to minimize impacts to migratory birds associated with the proposed project or removal of an active nest. Active nests may only be removed if you receive a permit from your local Migratory Bird Permit Office. A permit may authorize active nest removal by a qualified biologist with bird handling experience or by a permitted bird rehabilitator.

Conservation Measure 3: Prepare a vegetation maintenance plan that outlines vegetation maintenance activities and schedules so that direct bird impacts do not occur.

Stressor: Invasive Species Introduction

Conservation Goal: Prevent the introduction of invasive plants.

Conservation Measure 1: Prepare a weed abatement plan that outlines the areas where weed abatement is required and the schedule and method of activities to ensure bird impacts are avoided.

Conservation Measure 2: For temporary and permanent habitat restoration/enhancement, use only native and local (when possible) seed and plant stock.

Conservation Measure 3: Consider creating vehicle wash stations prior to entering sensitive habitat areas to prevent accidental introduction of non-native plants.

Conservation Measure 4: Remove invasive/exotic species that pose an attractive nuisance to migratory birds.

Stressor: Artificial Lighting

Conservation Goal: Prevent increase in lighting of native habitats during the bird breeding season.

Conservation Measure 1: To the maximum extent practicable, limit construction activities to the time between dawn and dusk to avoid the illumination of adjacent habitat areas.

Conservation Measure 2: If construction activity time restrictions are not possible, use down shielding or directional lighting to avoid light trespass into bird habitat (i.e., use a 'Cobra' style light rather than an omnidirectional light system to direct light down to the roadbed). To the maximum extent practicable, while allowing for public safety, low intensity energy saving lighting (e.g. low pressure sodium lamps) will be used.

Conservation Measure 3: Minimize illumination of lighting on associated construction or operation structures by using motion sensors or heat sensors. **Conservation Measure 5:** Bright white light, such as metal halide, halogen, fluorescent, mercury vapor and incandescent lamps should *not* be used.

Stressor: Human Disturbance

Conservation Goal: Minimize prolonged human presence near nesting birds during construction and maintenance actions.

Conservation Measure 1: Restrict unauthorized access to natural areas adjacent to the project site by erecting a barrier and/or avoidance buffers (e.g., gate, fence, wall) to minimize foot traffic and off-road vehicle uses.

Stressor: Collision

Conservation Goal: Minimize collision risk with project infrastructure and vehicles.

Conservation Measure 1: Minimize collision risk with project infrastructure (e.g., temporary and permanent) by increasing visibility through appropriate marking and design features (e.g., lighting, wire marking, etc.).

Conservation Measure 2: On bridge crossing areas with adjacent riparian, beach, estuary, or other bird habitat, use fencing or metal bridge poles (Sebastian Poles) that extend to the height of the tallest vehicles that will use the structure.

Conservation Measure 3: Install wildlife friendly culverts so rodents and small mammals can travel under any new roadways instead of over them. This may help reduce raptor deaths associated with being struck while tracking prey or scavenging road kill on the roadway.

Conservation Measure 4: Remove road-kill carcasses regularly to prevent scavenging and bird congregations along roadways.

Conservation Measure 5: Avoid planting “desirable” fruited or preferred nesting vegetation in medians or Rights of Way.

Conservation Measure 6: Eliminate use of steady burning lights on tall structures (e.g., >200 ft).

Stressor: Entrapment

Conservation Goal: Prevent birds from becoming trapped in project structures or perching and nesting in project areas that may endanger them.

Conservation Measure 1: Minimize entrapment and entanglement hazards through project design measures that may include:

1. Installing anti-perching devices on facilities/equipment where birds may commonly nest or perch.
2. Covering or enclosing all potential nesting surfaces on the structure with mesh netting, chicken wire fencing, or other suitable exclusion material prior to the nesting season to prevent birds from establishing new nests. The netting, fencing, or other material must have no opening or mesh size greater than 19 mm and must be maintained until the structure is removed.
3. Cap pipes and cover/seal all small dark spaces where birds may enter and become trapped.

Conservation Measure 2: Use the appropriate deterrents to prevent birds from nesting on structures where they cause conflicts, may endanger themselves, or create a human health and safety hazard.

1. During the time that the birds are trying to build or occupy their nests (generally, between April and August, depending on the geographic location), potential nesting surfaces should be monitored at least once every three days for any nesting activity, especially where bird use of structures is likely to cause take. It is permissible to remove non-active nests (without birds or eggs), partially completed nests, or new nests as they are built (prior to occupation). If birds have started to build any nests, the nests shall be removed before they are completed. Water shall not be used to remove the nests if nests are located within 50 feet of any surface waters.
2. If an active nest becomes established (i.e., there are eggs or young in the nest), all work that could result in abandonment or destruction of the nest shall be avoided until the young have fledged or the nest is unoccupied. Construction activities that may displace birds after they have laid their eggs and before the young have fledged should not be permitted. If the project continues into the following spring, this cycle shall be repeated. When work on the structure is complete, all netting shall be removed and properly disposed of.

Stressor: Noise

Conservation Goal: Prevent the increase in noise above ambient levels during the nesting bird breeding season.

Conservation Measure 1: Minimize an increase in noise above ambient levels during project construction by installing temporary structural barriers such as sand bags

Conservation Measure 2: Avoid permanent additions to ambient noise levels from the proposed project by using baffle boxes or sound walls.

Stressor: Chemical Contamination

Conservation Goal: Prevent the introduction of chemicals contaminants into the environment.

Conservation Measure 1: Avoid chemical contamination of the project area by implementing a Hazardous Materials Plan. For more information on hazardous waste and how to properly manage hazardous waste, see the EPA Hazardous Waste website (<https://www.epa.gov/hw>).

Conservation Measure 2: Avoid soil contamination by using drip pans underneath equipment and containment zones at construction sites and when refueling vehicles or equipment.

Conservation Measure 3: Avoid contaminating natural aquatic and wetland systems with runoff by limiting all equipment maintenance, staging laydown, and dispensing of fuel, oil, etc., to designated upland areas.

Conservation Measure 4: Any use of pesticides or rodenticides shall comply with the applicable Federal and State laws.

1. Choose non-chemical alternatives when appropriate
2. Pesticides shall be used only in accordance with their registered uses and in accordance with the manufacturer's instructions to limit access to non-target species.
3. For general measures to reducing wildlife exposure to pesticides, see EPA's Factsheet on Ecological Risk Assessment for Pesticides (<https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/factsheet-ecological-risk-assessment-pesticides>).

Stressor: Fire

Conservation Goal: Minimize fire potential from project-related activities.

Conservation Measure 1: Reduce fire hazards from vehicles and human activities (e.g., use spark arrestors on power equipment, avoid driving vehicles off road).

Conservation Measure 2: Consider fire potential when developing vegetation management plans by planting temporary impact areas with a palette of low-growing, sparse, fire resistant native species that meet with the approval of the County Fire Department and local FWS Office.

Appendix K: ‘Alalā Conservation Measures

The Hawaiian Crow or ‘alalā (*Corvus hawaiiensis*) is a federally listed endangered species and as of 2022 only survives in captivity. Historically, ‘alalā were broadly distributed across a range of forest habitats on Hawai‘i Island and either the ‘alalā or a closely related species also existed on Maui when humans first arrived in the Hawaiian Islands. The U.S. Fish and Wildlife Service (USFWS), State of Hawai‘i Department of Land and Natural Resources (DLNR), and many other Conservation Partners are collaborating to recover the species and release captive birds on Hawai‘i and Maui Islands.

Habitat for ‘alalā has been lost or degraded from development, agriculture, grazing, wildfire, and invasive habitat-altering vegetation. Other threats to ‘alalā include activities that increase human access to habitat (e.g., road building) and diseases spread by non-native species such as cats and mosquitoes (*Toxoplasmosis gondii*, avian malaria, avian pox).

Recommended Conservation Measures to protect ‘alalā and their habitat:

- Follow Invasive Species Prevention Protocols to prevent degradation of native habitat (at attachment H).
- In forest habitats where ‘alalā are present, manage ungulates to allow native understory plants and trees to regenerate.
- Manage wildfire threats to native forest habitats (i.e., manage or remove nonnative vegetation, especially fire prone nonnative grasses, and maintain firebreaks around native vegetation).
- During the ‘alalā breeding season (March 1 to July 31), avoid activities that prevent or discourage nesting adult ‘alalā from attending active nests (i.e., construction, heavy machinery use, or other activities with elevated sound levels or human presence near nests), which may cause nest failure.
- If work must be conducted during the ‘alalā breeding season where ‘alalā may be nesting, we recommend that the landowner have a biologist familiar with the species conduct a nest search in the area of the project footprint one to five days prior to the start of work activities. If an active nest is found it is recommended there be no clearing of vegetation or construction activities within 660 feet of the ‘alalā nest until it is confirmed young have fledged or the nest is no longer active.

‘Alalā are protected under the Migratory Bird Treaty Act (MBTA), the Endangered Species Act (ESA), and Hawai‘i Revised Statute 195-D2 (HRS 195-D2). For your awareness, it is prohibited to remove an ‘alalā nest without permit(s) under these authorities.

Appendix L: NPS Issues and Impact Topics Dismissed from Detailed Analysis

ISSUES AND IMPACT TOPICS DISMISSED FROM DETAILED ANALYSIS

Section 4.2 E of the National Park Service (NPS) NEPA Handbook (NPS 2015) states that, generally, issues should be discussed in detail in an Environmental Assessment (EA) if any of the following apply:

- the environmental impacts associated with the issue are central to the proposal or of critical importance
- a detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives
- the environmental impacts associated with the issue are a big point of contention among the public or other agencies
- there are potentially significant impacts to resources associated with the issue

The NPS NEPA Handbook further states that if the considerations above do not apply, issues should be dismissed from detailed analysis. The following issues and impact topics were not fully addressed in the EA because the listed resources are not in the project area; the environmental impacts associated with the issue are not central to the proposal, pivotal, or of critical importance; a detailed analysis of environmental impacts related to the issue is not necessary to make a reasoned choice between alternatives; or the resource would not be or only negligibly impacted and there is no potential for significant impacts. The impact topics discussed within Appendix L are specific to the NPS and are evaluated only on NPS lands within the project area. More details about the dismissal for these issues and impact topics are provided in the sections below.

Air Quality, Greenhouse Gas Emissions, and Climate Change

Haleakalā National Park regularly monitors air quality in the frontcountry (headquarters area) and baseline data is available. Air quality in the project area is typically very good, and Maui is in attainment for National Ambient Air Quality Standards (EPA 2021). Under the proposed action, there are several factors involved in release methods, including relatively limited helicopter flight times and primarily focused off NPS lands.

Although some management actions would result in emissions of criteria pollutants pursuant to the Clean Air Act and greenhouse gases due to the use of helicopters and other motorized vehicles, contributions would be extremely low and would result in impacts on air quality and greenhouse gas emissions that would be below de minimis levels. Overall, any effects resulting from the proposed alternatives would be negligible. The regional effects of climate change are evident in the Hawaiian archipelago, and after a minor lull in the rate of climatic change in the early 2000s, a rapid warming trend appears to have resumed in 2014 (McKenzie et al. 2019). As suggested by some climate change models, the mean temperatures in Hawai'i may increase by 2°– 3°C by 2100 (IPCC 2007). The effects of climate change can result in increased stress to natural systems through altered temperatures and rainfall patterns (Alexander et al. 2016). Frazier and Giambelluca (2017) examined trends by elevation and showed that the highest rates of drying during dry season months were found in high-elevation areas where populations of threatened or endangered populations of forest birds are still able to persist. Though climate change and associated adverse impacts have and will continue to affect specific resources on Maui and within the project area (Alexander et al. 2016, Pauchard et al. 2016), greenhouse gases from helicopters are not expected to have a measurable effect on local climatic conditions. For example, the management activities proposed with 'ālalā release would result in fossil fuel consumption from helicopters, but the greenhouse gas emissions associated with these activities would be negligible because of the comparatively limited number of flights

anticipated, compared to ongoing commercial and administrative flights on Maui.

Based on the considerations discussed above, air quality, greenhouse gas emissions, and climate change were dismissed from detailed analysis as an impact topic. However, climate change was addressed in terms of impacts on the existing conditions of resources, and their long-term trends, as applicable.

Native Vegetation (Non-threatened/Endangered)

Manawainui and other NPS portions of the project area are within higher elevation and include important rainforest habitat. The native 'ōhi'a (*Metrosideros polymorpha*) dominates the forest canopy above 4,000 feet. Tree ferns (*Cibotium* spp.) are important in the understory. Lobelioids (*Cyanea* spp., *Clermontia* spp., *Lobelia* spp., and *Trematolobelia macrostachys*) are among the rare and spectacular endemic plant species within Manawainui. If successful pilot releases allow 'alalā to disperse larger seeded rare native plants, project activities could indirectly benefit East Maui's native vegetation. 'Alalā play a critical role in ecosystem function by dispersing larger seeds and their role in successful seed germination. Maintaining populations of these species benefits the native plant community and preserves ecosystem function. There is potential under the proposed action for minimal adverse impacts to vegetation from localized plant removal or disturbance along trails, fencelines, and at landing zones and camps by ground crews. These impacts would be temporary in nature and largely occur in previously disturbed locations. In addition, activities for regular maintenance of existing landing zones and regular maintenance and clearing along fence corridors have been cleared through previous environmental compliance conducted by the park. To help mitigate any vegetation/ground disturbance and monitoring efforts, the project work would be conducted on existing resource management trails and fence lines to avoid disturbance of soils and plant communities. Additionally, best management practices (BMPs) would be implemented to reduce or remove the threat of introducing invasive plants within the project area; however, a risk of introduction still exists. Crews would be trained to follow BMPs to minimize this risk. Given previous environmental compliance of proposed activities and anticipated negligible impacts, this issue was considered and dismissed from further analysis.

Museum Collections

No impacts to museum collections would result from the proposed action as none are present within the project area. This issue was considered and dismissed from further analysis.

Prehistoric/Historic Structures

No impacts to prehistoric or historic structures are anticipated to result from the proposed action. Much of the project area has not been surveyed, but only negligible ground disturbance would occur, if any. To help mitigate potential effects of ground-based activities on previously undiscovered prehistoric or historic structures, monitoring would only be conducted via existing, previously disturbed resource management trails and fence lines, as well as camping at established remote camps or helicopter landing zones for overnight stays, to avoid new ground disturbance. Helicopter operations would utilize existing, previously disturbed landing zones. These existing areas (trails, fence lines, and landing zones or camps) have been cleared through previous environmental compliance conducted by the park. Therefore, this issue was considered and dismissed from further analysis.

Cultural Landscapes

The NPS defines cultural landscapes as geographic areas associated with historic events, activities, or people that reflect the history of the park unit, development patterns, and the relationship between people and the park. The historic Kaupō Gap Trail, which is a contributing feature to the Civilian

Conservation Corps (CCC) Haleakalā Crater Trails Historic District, is within the project area. The CCC Haleakalā Crater Trails Historic District is located in Haleakalā Crater in the center of Haleakalā National Park. The trail system was designed by National Park Service landscape architects and constructed and improved by CCC enrollees between 1930 and 1941 to encourage visitor access into the crater by foot, instead of vehicle. The boundary of the proposed district includes a 20-foot wide corridor that follows the length of the trail system. The corridor is measured ten feet from the centerline of the trails, which widens as necessary to include built features such as retaining walls and developed areas. No impacts to cultural landscapes are anticipated to result from the proposed action. To help mitigate potential effects of ground-based activities on cultural landscapes within HNP, bird monitoring would only be conducted via existing, previously disturbed resource management trails and fence lines, as well as camping at established remote camps or helicopter landing zones for overnight stays, to avoid new ground disturbance. Helicopter operations would utilize existing, previously disturbed landing zones. These existing areas (trails, fence lines, and landing zones or camps) have been cleared through previous environmental compliance conducted by the park. The proposed action will result in limited visual and noise impacts to the feeling and setting of the CCC Haleakalā Crater Trails Historic District, which includes views and vistas as a landscape characteristic that contributes to the setting, feeling and association of the district. However, these noise and visual impacts have been minimized in order to limit negative impacts to the cultural landscape. The proposed action has minimized the use of helicopters, especially by prioritizing landing on state lands and limiting landing on NPS lands. Therefore, this issue was considered but dismissed from further analysis.

Geological Features and Soils

No impacts to geological features are anticipated to result from the proposed action. Any disturbances to bedrock geology or soils from bird monitoring would be minimal, and therefore have negligible effects on soils in NPS lands. To help mitigate any effects of ground disturbance, ground-based monitoring efforts would be conducted on existing resource management trails and fence lines to avoid disturbance. Helicopter operations would utilize existing, previously disturbed landing zones. For these reasons, impacts to geology and soils were considered and dismissed from further analysis.

Lightscares

No impacts to lightscares are anticipated to result from the proposed action. All work would be conducted during daylight hours. This issue was considered and dismissed from further analysis.

Land Use

No impacts to land use are anticipated to result from the proposed action. All current land uses would continue as is under the proposed action. This issue was considered and dismissed from further analysis.

Environmental Justice

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, provides that “each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.” A minority population exists within an affected area when either the minority population exceeds 50%, or the minority population is meaningfully greater than the minority population of the general population (CEQ 1997).

According to EJScreen, EPA's Environmental Justice Screening and Mapping Tool, census block groups within and around the project area on East Maui are comprised of populations where at least 50 percent of the population is considered a minority. Therefore, environmental justice communities exist in the study area. The proposed action involves helicopters to monitor birds and assist with release efforts. Potential impacts would mostly be due to the noise or visual disturbance from aircraft, as the released birds are unlikely to have impacts on environmental justice communities. Similar aerial operations are already ongoing on state and federal lands on East Maui. There would be minimal or no adverse effects on the public outside of the project area since the project would not result in disproportionately high and adverse noise, air quality, or visual impacts to surrounding environmental justice communities. Because noise and visual impacts could primarily affect only those members of the public that are actively recreating within HNP in the project area during implementation and most of the project area is closed to public access, there would be no low income or minority populations that would be disproportionately affected by project activities. Therefore, this issue was considered and dismissed from further analysis.

Socioeconomics

The CEQ regulations for implementing NEPA, 40 CFR 1500, direct economic analyses of federal actions that will affect local or regional economies. The policies and rationale associated with including an evaluation of socioeconomic impacts in the NEPA process are found in Section 1.4.7.1 of NPS Management Policies (2006). The factors of socioeconomics discussed in this draft EA include the tourism industry.

The economy of Maui County has a high reliance on the visitor industry, with 34,400 jobs or approximately 41 percent of all jobs in the county being visitor-related in the categories of food services, accommodation, retail trade, and arts, entertainment, and recreation (Department of Business, Economic Development & Tourism 2018). The tourism industry is Maui County's leading sector. HNP plays a major role in the tourism industry of Maui County and Hawai'i. In 2021, visitors spent a total of approximately \$61 million at HNP and added a value of approximately \$50.3 million to the local economy. The total labor income generated by this spending equaled approximately \$27.3 million (NPS 2023). The majority of visitors travel to Kīpahulu by way of the state- and county-maintained Hāna Highway through the community of Hāna. The Kīpahulu District can receive over 500 cars per day and as many as 1,500 to 1,800 people per day during peak times (NPS 2022). The Crater District of HNP has the highest visitation for the park and is a considerable distance from the project area. The only area a park visitor may encounter any impacts of the proposed action would be along the Kaupō Trail exiting HNP from within the Crater or from Palikū Cabin. These areas are not highly visited areas of the park and are within Haleakalā Wilderness. Impacts are not expected to be experienced in these areas.

Tourism is the largest single source of private capital for Hawai'i's economy. Tourism in Maui contributed \$14.0 million per day to the local economy in 2019. The Hawai'i Tourism Authority anticipates continued growth in tourism from "upgrades" to natural resources and increased distribution of visitors to the "neighbor" islands. In 2007 \$35 million in tourism spending in the State of Hawai'i supported 172,000 jobs; in 2017 these figures had grown to \$46 million in spending and 203,000 jobs supported (Hawai'i Tourism Authority 2019). Birding can drive visitation to HNP within Hosmer Grove and Palikū Cabin areas of the park. It is possible that visitors may travel within HNP to attempt glimpses of 'alalā in the wild from Palikū and along the Kaupō Trail. The project area is not accessible to the public and will not experience visitation within the release area.

Tourism related to birding only comprises a small portion of local tourism, and there would be a beneficial impact to birding from release of 'alalā populations. Both action alternatives would not induce substantial economic growth or impact employment related to tourism due to the limited amounts of tours for

birding in the project area. No measurable impact to the local economy would occur as a result of the proposed action. Therefore, this issue was considered and dismissed from further analysis.

Viewsheds

Under the proposed action, helicopters would be visible for very limited periods of time during flights to release and monitor birds, but the visual intrusion would be temporary, perhaps a few minutes at a time in each location, and impacts would be considered de minimis. There would be no permanent impacts to viewsheds. Therefore, this issue was considered and dismissed from further analysis.

Floodplains

No impacts to floodplains are anticipated to result from the proposed action because the project would not result in disturbance to designated floodplains which are primarily located downstream of the project area. According to the State of Hawai'i, DLNR, Flood Hazard Assessment Tool, the project area overlaps with many streams originating on the slopes of HNP that have designated floodways. However, only monitoring via existing trails and fence lines and helicopter landing zones or camps would be used. Therefore, this issue was considered and dismissed from further analysis.

Marine or Estuarine Resources

No impacts to marine or estuarine resources are anticipated to result from the proposed action as the project area is in terrestrial areas only. Therefore, this issue was considered and dismissed from further analysis.

Water Quality or Quantity

The proposed action would not affect water quality in any measurable manner because care would be taken to avoid water sources during bird monitoring. This project would involve no change to water quantity in East Maui as water is not required for implementation of this project. Therefore, this issue was considered and dismissed from further analysis.

Wetlands

No impacts to wetlands are anticipated to result from the proposed action because monitoring trails and helicopter landing sites would avoid wetland areas. Ground-based monitoring efforts would be conducted on existing resource management trails and fence lines. Helicopter operations would utilize existing, previously disturbed landing zones. These existing areas (trails, fence lines, and landing zones or camps) have been cleared through previous environmental compliance conducted by the park. No protected wetland areas would be disturbed during implementation of the proposed action. Therefore, this issue was considered and dismissed from further analysis.

Human Health and Safety

Under the proposed action, bird monitoring and helicopter operations would present some risk of accidents or injuries to employees, partners, and contractors during ground crew transportation or bird monitoring. In addition, ground crews would be subject to some risk of injury from hiking in remote areas and through difficult terrain. The NPS has strict guidelines and safety/training standards that are followed on all management projects and would be followed under the proposed action. Safety is paramount to all missions.

Helicopter operations would be carried out on NPS lands by trained personnel and contractors approved by the U.S. Department of Interior Office of Aviation Services and would be required to observe proper safety protocols and use proper personal protective equipment. Equipment would be well-maintained and

helicopter flights would only occur during favorable weather conditions. In addition, an aviation safety plan specific to this project would be developed and implemented. A safety briefing would be performed for each flight. Agencies would seek to minimize the risk of accident or injury during helicopter-based activities and temporarily cease operations if unsafe conditions exist. Given the proposed action includes activities that are routinely carried out already and there would be only minimal risk to visitors, if any, this issue was considered and dismissed from further analysis.

Appendix M: Cultural Impact Assessment

Cultural Impact Assessment for the Release of Endangered Captive-bred ‘Alalā in the Ko‘olau and Kīpahulu Forest Reserves

(2) -1-002:002 por. and (2) 1-7-004:006 por.

Ke‘anae and Nāholokū

Ahupua‘a Ko‘olau and Kaupō

District Island of Maui

FINAL
VERSION



Prepared By:

Lokelani Brandt, M.A. and
S. Kau‘i Lopes, B.A.

Prepared For:

Department of Land and
Natural Resources,
Division of Forestry and
Wildlife
1151 Punchbown St., Rm.
325 Honolulu, HI 96813

August 2023



Hilo Office: (808) 969-6066 Fax: (808) 443-0065
507-A E. Lanikaula Street, Hilo, HI 96720

Honolulu Office: (808) 439-8089 Fax: (808) 439-8087
820 Milliani Street, Suite 700, Honolulu, HI 96813

ASM Project Number
43130.00

**Cultural Impact Assessment
for the Release of Endangered Captive-bred
‘Alalā in the Ko‘olau and Kīpahulu Forest
Reserves**

(2) 1-1-002:002 por. and (2) 1-7-004:006 por.

Ke‘anae and Nāholokū Ahupua‘a
Ko‘olau and Kaupō District
Island of Maui

CHAPTERS

	Page
1. INTRODUCTION	1
PROJECT BACKGROUND AND PURPOSE	6
DESCRIPTION OF RELEASE SITES	6
Geology and Soil within the Project Areas.....	6
2. BACKGROUND	9
RESEARCH METHODS	9
CULTURE-HISTORICAL CONTEXT	9
Overview of Traditional Hawaiian Land Management Strategies	10
Intensification and Development of Hawaiian Land Stewardship Practices	11
‘ALALĀ: A GENERAL DESCRIPTION.....	12
Historical Range	14
Diet and Foraging Habits.....	15
The Decline of ‘Alalā In the Wild	16
Conservation Efforts.....	18
‘ALALĀ: HAWAIIAN CULTURAL PERSPECTIVES	19
‘Alalā in the Kumulipo	19
Ho‘okumu-ka-Lani Ho‘okumu-ka-Honua and the Akua Alalahe	20
‘Alalā In Hawaiian Spirituality and Canoe Practices	23
Role of the ‘Alalā In <i>Oli</i> (Chant) Practices	25
‘Alalā in the Practice of <i>Kia Manu</i> (Bird Catching), Feather Work, and as Food	26
Traditional Mo‘olelo Associated with the ‘Alalā	27
Accounts of ‘Alalā in the Hawaiian Language Newspapers	31
DESCRIPTIONS OF ‘ALALĀ BY EARLY EXPLORERS AND NATURALISTS.....	33
Lieutenant James King, 1779	33
Peale and Cassin, U.S. Exploring Expedition, ca. 1858	34
S. B. Wilson, 1877-1888	36
A CULTURE HISTORY OF KE‘ANAE AND NĀHOLOKŪ AHUPUA‘A.....	38
The Island Setting.....	38
Geographic Setting: Ke‘anae in Ko‘olau and Nāholokū in Kaupō	38
Cultivation Practices in Ko‘olau and Kaupō	41
‘ <i>Ōlelo No ‘eau</i> of the Broader Ko‘olau and Kaupō Moku	43
Selection of <i>Mo ‘olelo</i> for Ke‘anae, Ko‘olau and Nāholokū, Kaupō	44
Noted Upland Burial Places	54
Maui’s Ruling Chiefs	54
The Legacy of the <i>Māhele ‘Āina</i> of 1848.....	60
Kuleana Act of 1850.....	61
Government Land Grant Program	65
Land Boundary Commission Testimony.....	73
Economic Industries During the Late 19 th and Early 20 th Centuries	74
<i>Huaka ‘i Māka ‘ika ‘i a Kaupō, Maui</i> (A Visit to Kaupō Maui).....	76
Brief History of the Ko‘olau and Kīpahulu Forest Reserve in 1907 and 1914	81
SUMMARY OF PRIOR ARCHAEOLOGICAL WORK.....	83
3. CONSULTATION	87

OUTREACH EFFORTS	88
Interview Methodology.....	90
NOAH GOMES.....	90
J. ALOHALANI SMITH.....	92
KU‘ULEI VICKERY	92
JIM “JIMMY” MEDEIROS	94
ALDEI KAWIKA GREGOIRE	95
4. IDENTIFICATION AND MITIGATION OF POTENTIAL CULTURAL IMPACTS.....	95
IDENTIFICATION OF TRADITIONAL AND CUSTOMARY PRACTICES, VALUED CULTURAL RESOURCES.....	96
‘ <i>Alalā</i> as a Valued Cultural Resource.....	96
Forest Resources and Gathering Practices.....	97
Water Resources	97
Caves and Burial Sites	98
Upland Agriculture Practices.....	98
Trails.....	98
Ranching and Hunting.....	98
FINDINGS AND RECOMMENDATIONS.....	98
Continued Educational Outreach.....	98
Archaeological Survey.....	99
Avoid Activities on Pu‘u ‘Ahulili.....	99
Fencing, Predator Control, and Monitoring.....	99
CONCLUSION	99
REFERENCES CITED	100
APPENDIX A. <i>KA WAI OLA</i> PUBLIC NOTICE	111

FIGURES

	Page
1. Project area locations	2
2. Tax Map (2) 1-1-002 showing project area located within a portion of Parcel 002	3
3. Tax Map (2) 1-7 showing the Kīpahulu Forest Reserve project area on a portion of Parcel 002.....	4
4. Google Earth™ satellite image showing project area locations	5
5. Geology of the project area within the Ko‘olau Forest Reserve, <i>mauka</i> Ke‘anae.....	7
6. Geology of the Kīpahulu Forest Reserve project area, <i>mauka</i> Nāholokū, Kaupō.....	7
7. Soils in the project area within the Ko‘olau Forest Reserve, <i>mauka</i> Ke‘anae.....	8
8. Soils of the Kīpahulu Forest Reserve project area, <i>mauka</i> Nāholokū, Kaupō.....	8
9. Bones of the <i>Corvus viriosus</i> recovered from Mo‘omomi, Moloka‘i. Photos taken at the Bishop Museum’s Vertebrate Zoology Collection.	13
10. Bones of the <i>Corvus impulviatus</i> recovered from a sinkhole at Barber’s Point on O‘ahu. Picture taken at the Bishop Museum’s Vertebrate Zoology Collections	14
11. Two adult ‘ <i>alalā</i> foraging in ‘ <i>ōhi‘a</i> treetops during nesting season. Photo courtesy of San Diego Zoo Wildlife Alliance	15
12. Adult ‘ <i>alalā</i> . Photo courtesy of San Diego Zoo Wildlife Alliance.....	16
13. Juvenile ‘ <i>alalā</i> with its blue iris. Photo courtesy of San Diego Zoo Wildlife Alliance.....	16

FIGURES

	Page
14. Map of Hawai‘i Island showing the decline in the historical range of ‘ <i>alalā</i> (National Research Council 1992:13)	17
15. ‘ <i>Alalā</i> (Photo by Lainie Berry, DLNR-DOFAW website)	20
16. ‘ <i>Alawī</i> (Photo by Bret Mossman, DLNR-DOFAW website)	20
17. Sketch of an ‘ <i>alala</i> published by Kahiolo (1863b:1).....	32
18. Camera lucida sketch of the <i>Corvus hawaiiensis</i> superimposed on a background of Kealakekua Bay by T. Peale (Cassin 1858a).....	35
19. Sketch of <i>Corvus tropicus</i> prepared by F. W. Frohawk (Wilson and Evans 1890-99).....	37
20. Hawai‘i Registered Map 1408 by F. S. Dodge from 1886 showing the project areas within Ke‘anae and Nāholokū Ahupua‘a	39
21. Aerial photo taken from the east showing the Kaupō Gap (left) and Ko‘olau Gap (right) (Macdonald and Hubbard 1951)	39
22. Map showing waterways and cultivated areas in lower Ke‘anae and the adjacent areas of Wailua (Handy et al. 1991) (project area not shown)	40
23. Hawai‘i Registered Map No. 2238 from 1903 showing <i>kuleana</i> awards within the Ke‘anae Peninsula (project areas not shown on map)	64
24. Portion of Hawai‘i Registered Map No. 1782 from 1894 showing <i>kuleana</i> awards in Kaupō	65
25. Hawai‘i Registered Map No. 2235 from 1903 showing Land Grants within Ke‘anae along Palauhulu stream (project areas not shown on map)	66
26. Portion of Hawai‘i Registered Map No. 1115 from 1895 showing land grants sold to A.V. Marciel and W. Mutch and the Kaupō Trail to the west of the Kaupō (Kīpahulu Forest Reserve) project area.....	67
27. Copy of William Mutch’s land grant document showing surveyor notes (Office of Hawaiian Affairs 2018).....	68
28. Copy of William Mutch’s land grant document showing the surveyor map (project area not shown) (Office of Hawaiian Affairs 2018)	69
29. Copy of Antone Vierra Marciel’s land grant document showing surveyor notes (Office of Hawaiian Affairs 2018).....	70
30. Copy of Antone Vierra Marciel’s land grant document showing the surveyor map of Lot 1 (project area not shown) (Office of Hawaiian Affairs 2018)	71
31. Copy of Antone Vierra Marciel’s land grant document showing the surveyor map of Lot 6 and 7 (project area not shown) (Office of Hawaiian Affairs 2018)	72
32. 1957 USGS map showing the Ko‘olau Ditch meandering through Ke‘anae between the 1,000 and 2,000 foot elevation.....	75
33. Hawai‘i Registered Map No. 1185 prepared by W. A. Wall in 1884 shows the upper portion of Kaupō Trail and multiple place names some of which are mentioned in Maunupau and Emory’s visit to the uplands (project area not shown on map).....	80
34. Hawai‘i Registered Map No. 2891 from 1934 showing the Ke‘anae (Ko‘olau Forest Reserve) project area.....	82
35. Walker (1931 in Sterling 1998:13) site map overlaid with project area locations.....	86

TABLES

	Page
1. <i>Kuleana</i> awards in Ke‘anae Ahupua‘a	62
2. <i>Kuleana</i> awards in Kaupō. (* location not shown in Figure 24)	63

3. <i>Heiau</i> identified by Walker (1931). (* = location not shown in Figure 35)	85
4. Persons/organizations contacted for consultation	88

1. INTRODUCTION

At the request of the Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW; the proposing Agency) in collaboration with seven other state and private agencies, ASM Affiliates (ASM) has prepared this Cultural Impact Assessment (CIA) to inform a Hawai'i Revised Statutes (HRS), Chapter 343 Environmental Assessment (EA) being prepared (by DLNR-DOFAW) for the proposed release of captive-bred 'alalā (*Corvus hawaiiensis*), the endangered Hawaiian crow on state-owned conservation lands in the upper elevations of the Kīpahulu and Ko'olau Forest Reserves on the island of Maui. The Agency is considering three action alternatives: 1) release only at the Kīpahulu Forest Reserve; 2) release only at the Ko'olau Forest Reserve or; 3) release at both the Kīpahulu and Ko'olau Forest Reserve. The proposed release sites (referred to hereafter as 'project areas') are within the Ko'olau Forest Reserve in Ke'ānae Ahupua'a (on a portion of TMK: (2) 1-1-002:002) and in the Kīpahulu Forest Reserve in Nāholoku Ahupua'a (on a portion of TMK: (2) 1-7-004:006), both of which are located respectively in Ko'olau and Kaupō Districts, Island of Maui (Figures 1, 2, 3, and 4). A description of the proposed project is provided in the ensuing section along with a description of the project areas. The use of state-owned lands for the proposed release sites necessitates compliance with HRS Chapter 343.

This CIA is being prepared pursuant to Act 50 and in accordance with the Environmental Review Program (formerly the Office of Environmental Quality Control [OEQC]) *Guidelines for Assessing Cultural Impacts*, adopted by the Environmental Council, State of Hawai'i, on November 19, 1997 (OEQC 1997). Act 50, which was proposed and passed as Hawai'i State House of Representatives Bill No. 2895 and signed into law by the Governor on April 26, 2000, specifically acknowledges the State's responsibility to protect native Hawaiian cultural practices. Act 50 further states that environmental studies "... should identify and address effects on Hawaii's culture, and traditional and customary rights" and that "native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the 'aloha spirit' in Hawai'i. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on governmental agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups."

The current report is divided into four main sections. Section 1, the introduction, includes an overview of the proposed project as well as a physical description of the project area. Section 2 includes culture-historical information for the 'alalā as well as the proposed project areas in Ke'ānae and Nāholokū and at times the broader Ko'olau and Kaupō region. This chapter also includes a summary of prior archaeological and cultural studies that have been conducted within or near the project areas. The methods and results of the consultation process are then presented in Section 3. Lastly, Section 4 includes a discussion of potential cultural impacts as well as actions and strategies that may help to mitigate any identified impacts.

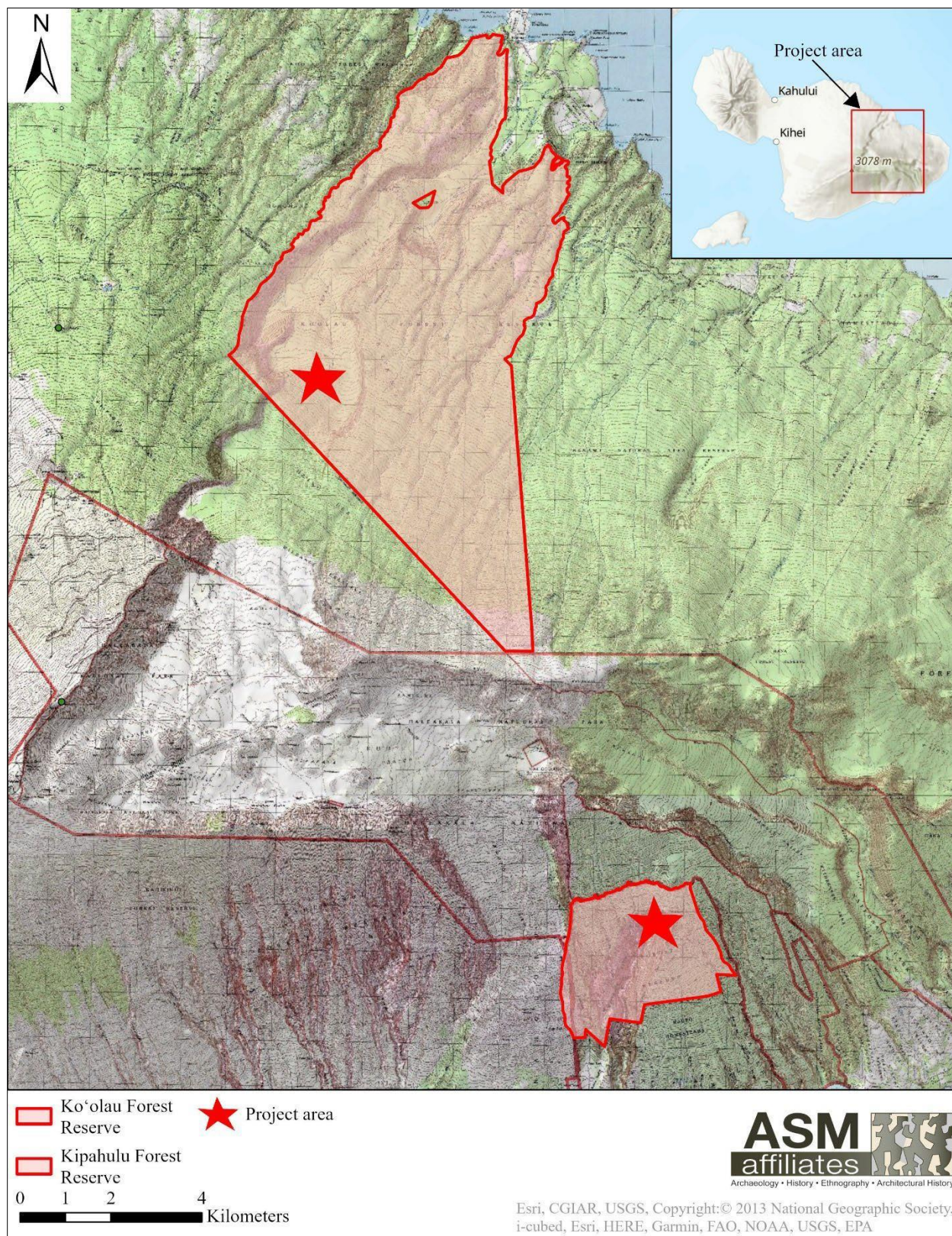


Figure 1. Project area locations.

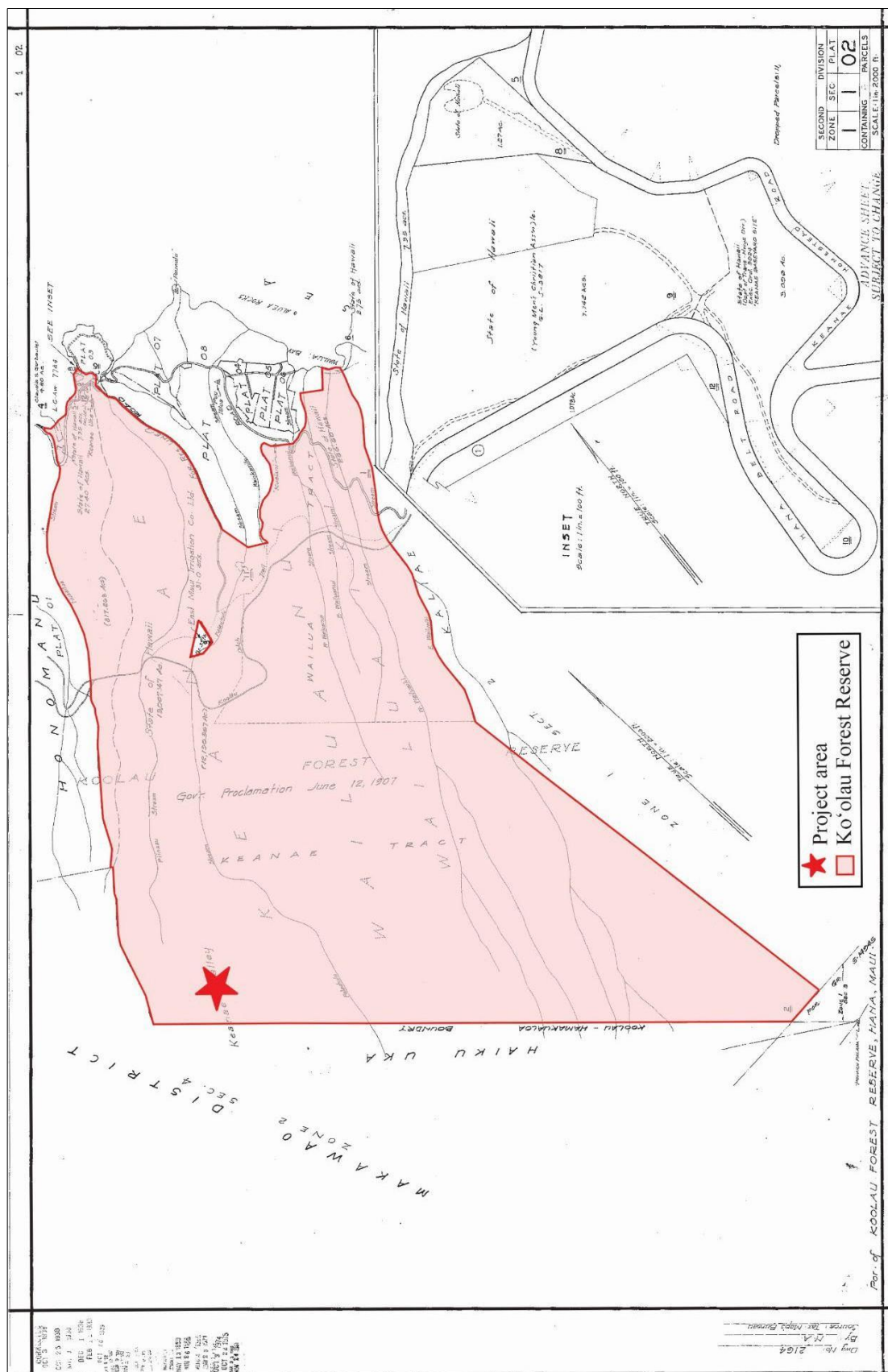


Figure 2. Tax Map (2) 1-1-002 showing project area located within a portion of Parcel 002.

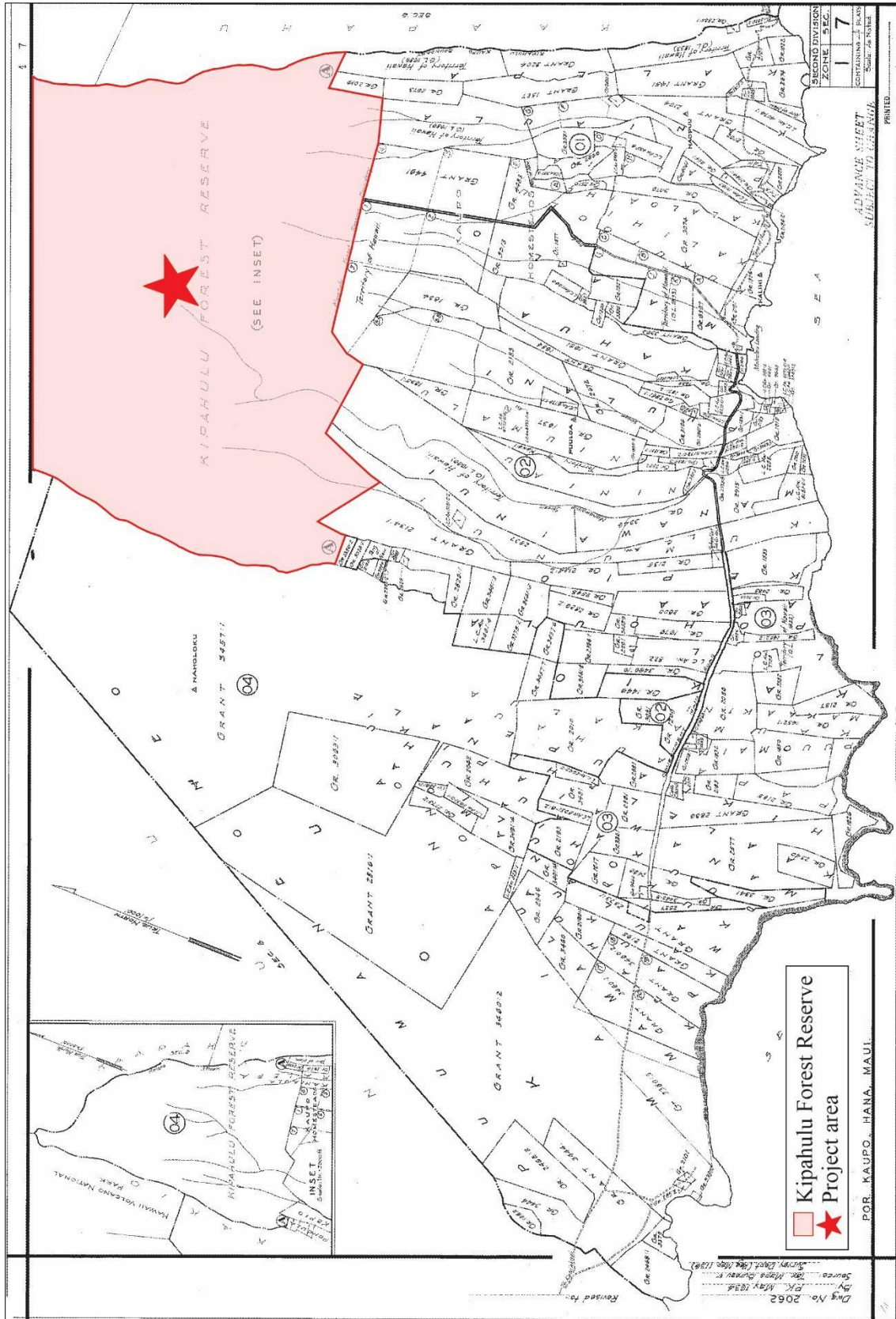


Figure 3. Tax Map (2) 1-7 showing the Kīpahulu Forest Reserve project area on a portion of Parcel 002.

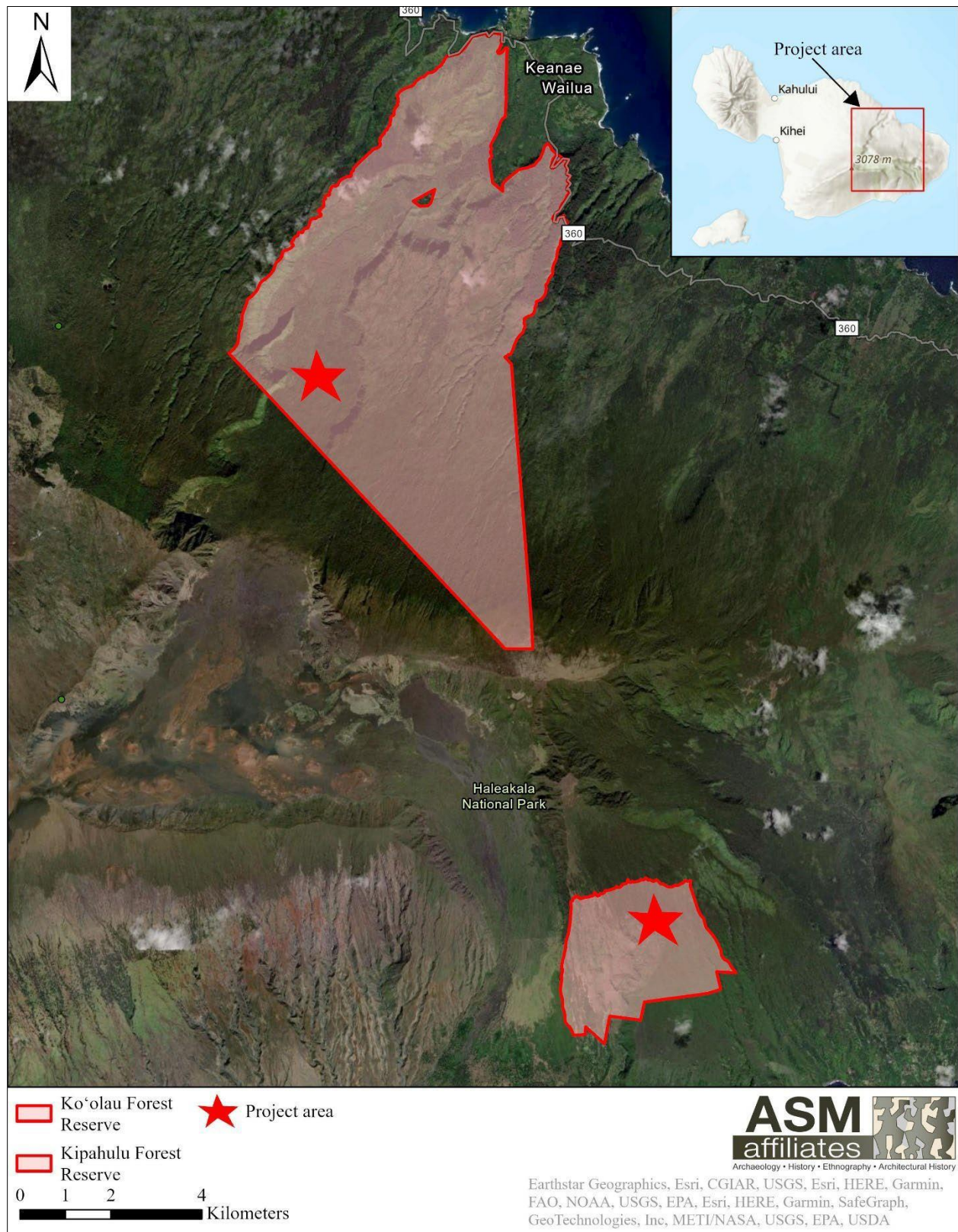


Figure 4. Google Earth™ satellite image showing project area locations.

PROJECT BACKGROUND AND PURPOSE

The ‘*alalā* is an endangered corvid endemic to Hawai‘i and currently extinct in the wild. Two conservation breeding facilities on Maui and Hawai‘i Island host a population of 112 birds held in captivity, as of March 2023. Two conservation translocation attempts were conducted on Hawai‘i Island, where the ‘*alalā* was known historically. However, both were unsuccessful due in part to high predation on ‘*alalā* by ‘*io* or Hawaiian hawk (*Buteo solitarius*). During the Hawai‘i Island releases some ‘*alalā* paired and attempted to breed, but no pairings resulted in young since ‘*io* depredated at least one pair member before the pair was able to gain the experience needed to breed successfully. Since there are no ‘*io* on Maui, the island would allow the opportunity for wild establishment without major predators. Subfossil remains indicate that corvids were once present on all Hawaiian Islands and that Maui had ‘*alalā* or a similar species. However, most remaining forest habitat in east Maui receives substantially greater annual rainfall than habitat ‘*alalā* used historically on Hawai‘i Island and the available area of suitable habitat on Maui is smaller than that of Hawai‘i Island. High annual rainfall and a smaller area of suitable habitat may be a limiting factor for ‘*alalā* survival and breeding in east Maui.

In addition to the release of captive-bred populations of ‘*alalā* on conservation lands, other associated activities include performing invasive predator control in the immediate release areas; monitoring individual bird survival and breeding activities to support adaptive management action that would help improve the efficacy of future releases on Maui and Hawai‘i Island; creation of low-impact foot trails in the release areas to aid with the associated project activities; the construction of temporary bird cages; and improving field camp infrastructure.

The proposed release of endangered ‘*alalā* as a pilot project is to determine if a breeding population is feasible on the island of Maui. The action is being coordinated between the U.S. Fish and Wildlife Service (USFWS) Pacific Islands Fish and Wildlife Office (PIFWO), the State of Hawai‘i Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW), the National Park Service (NPS), the Pacific Cooperative Studies Unit of the University of Hawaii at Manoa’s Maui Forest Bird Recovery Project (MFBRP), ‘Alalā Project, and the San Diego Zoo Wildlife Alliance (SDZWA).

DESCRIPTION OF RELEASE SITES

The two release areas consist of a middle elevation site within the Ko‘olau Gap in the Ko‘olau Forest Reserve on the north slope of east Maui, and a middle to high elevation site in the Kīpahulu Forest Reserve on the southeast slope of east Maui. The two sites, owned and managed by the State of Hawai‘i, are native wet forests and contain many of the same species of native fruiting plants on which ‘*alalā* foraged on Hawai‘i Island. Based on the dispersal behavior of previously released ‘*alalā* on Hawai‘i Island, it is expected that the ‘*alalā* will stay within approximately 0.8 miles of their release location during the early phases of the release. There is the potential that ‘*alalā* may range occasionally as far as 2 miles from their release location during later phases of the release. For the Ko‘olau Forest Reserve site, it is expected that the ‘*alalā* will overlap private lands leased to The Nature Conservancy to the south and lands owned by East Maui Irrigation Company to the west. For the Kīpahulu Forest Reserve site, it is expected that the ‘*alalā* will overlap lands owned and managed by Haleakalā National Park to the north and east, lands owned by Kaupō Ranch to the west, and Kaupō Homesteads to the south.

Geology and Soil within the Project Areas

The geology underlying the project area in the Ko‘olau Forest Reserve has been mapped by Sherrod et al. (2007) as Qhn6 described as being between 750-1,500 years old and is a part of the Hana Volcanics. Other geological types identified near this project area include Honomanu Basalt dating between 0.95-1.3 million years old and fringes much of the Hana Volcanics. A map showing the geological development within and near the Ko‘olau Forest Reserve project area is provided in Figure 5.

The geology underlying the Kīpahulu Forest Reserve project area has been mapped by Sherrod et al. (2007) as Qkul and has been dated between 140,000-950,000 years old and is a part of the Kula Volcanics. To the northeast of this release site is another younger geological type identified as Qkuv that is also part of the Kula Volcanics but has been dated between 140,000-780,000 years old (Figure 6).

The substrate in the Ko‘olau Forest Reserve project area has been identified as a hydrandepths-tropaquods complex that occurs on Maui in areas of high rainfall. No specific soil type has been identified for the Kīpahulu Forest Reserve project area rather it has been simply identified as “rough mountainous land” (Figures 7 and 8).

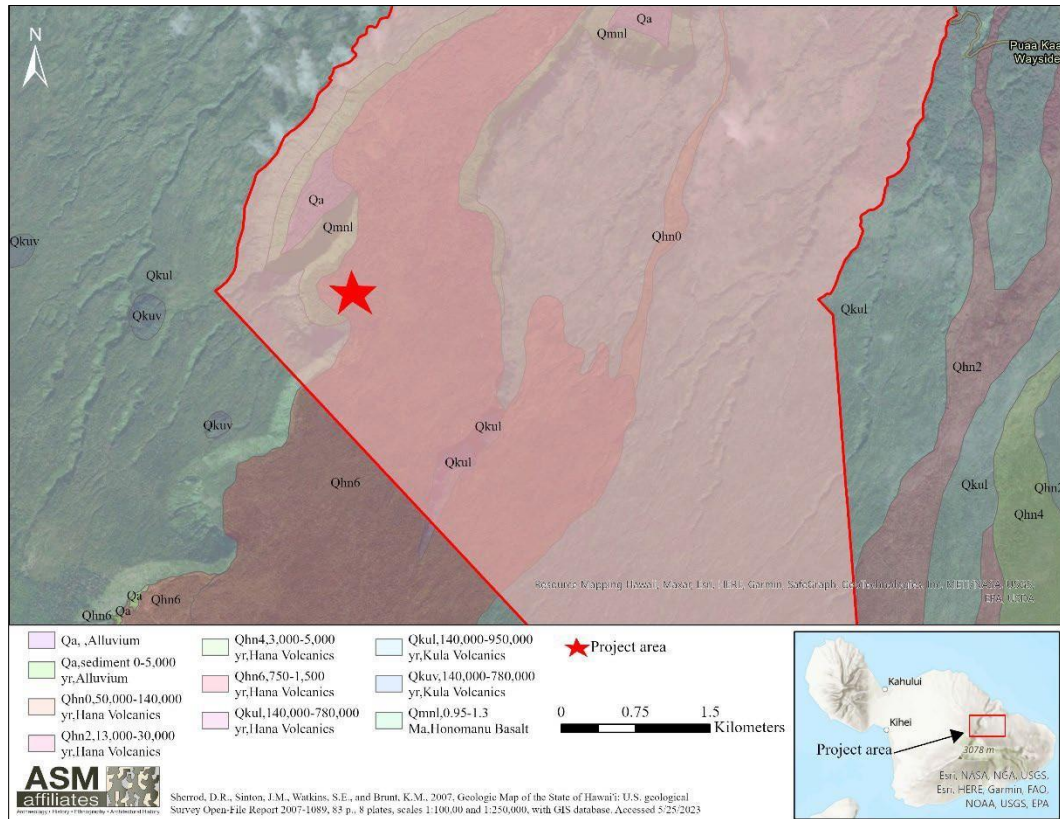


Figure 5. Geology of the project area within the Ko'olau Forest Reserve, mauka Ke'anae.

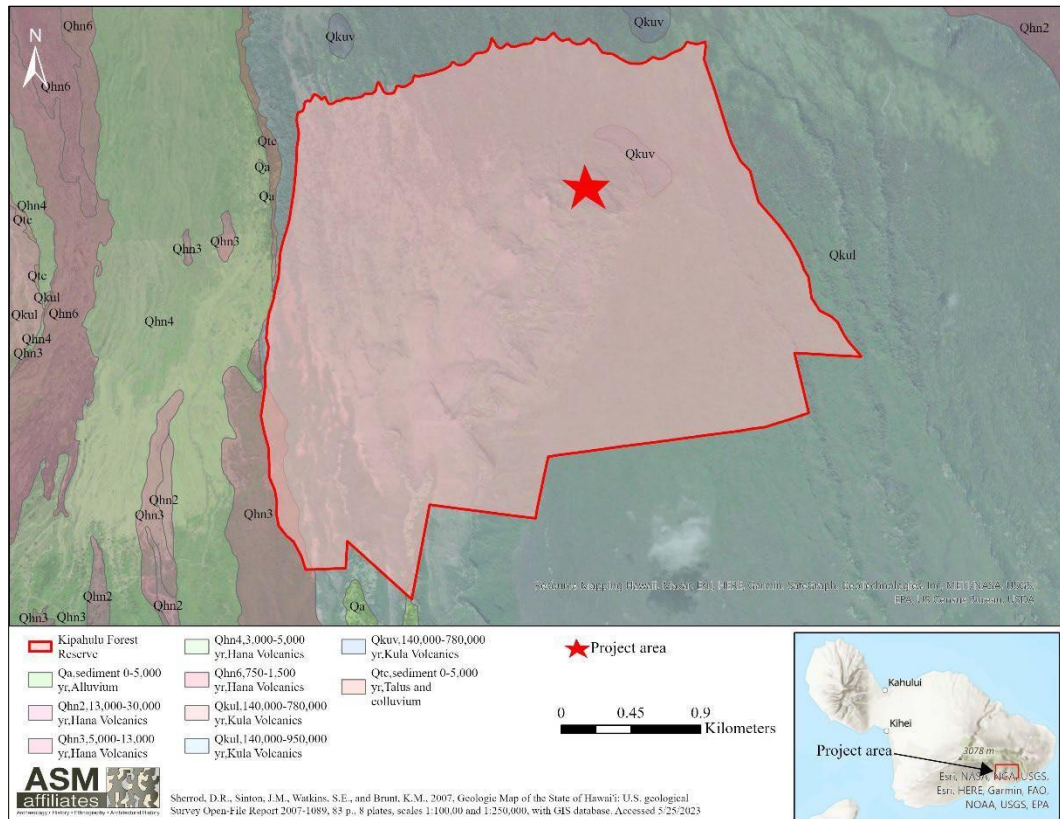


Figure 6. Geology of the Kīpahulu Forest Reserve project area, mauka Nāholokū, Kaupō.

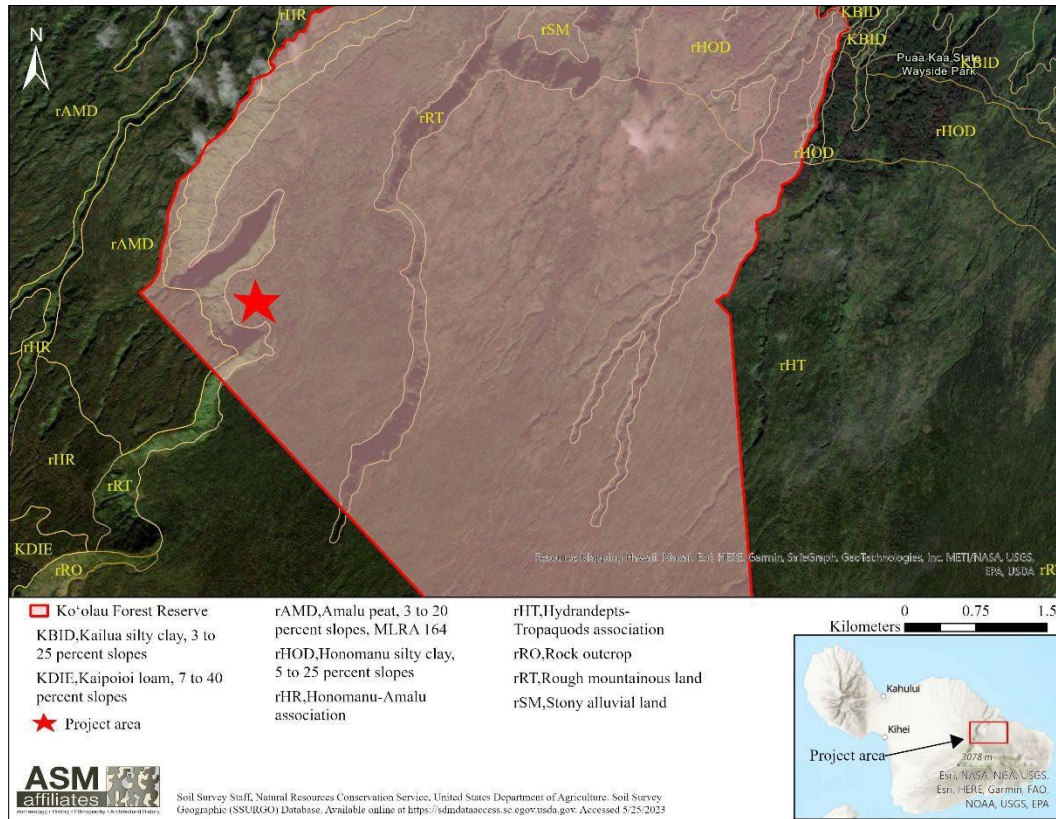


Figure 7. Soils in the project area within the Ko'olau Forest Reserve, *mauka* Ke'anae.

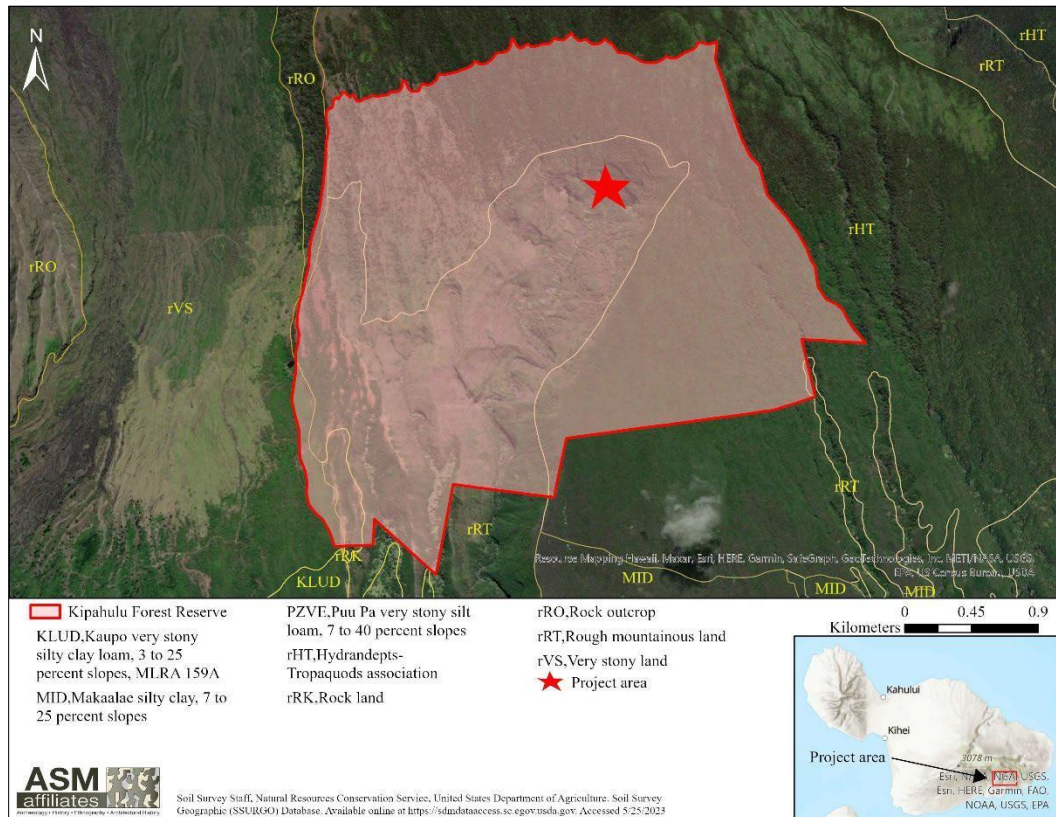


Figure 8. Soils of the Kīpahulu Forest Reserve project area, *mauka* Nāholokū, Kaupō.

2. BACKGROUND

As specified in the OEQC *Guidelines for Assessing Cultural Impacts* (1997:1), “...the geographical extent of the inquiry should, in most instances, be greater than the area over which the proposed action will take place. This is to ensure that cultural practices which may not occur within the boundaries of the project area, but which may nonetheless be affected, are included in the assessment.” For this CIA, the *ahupua‘a* of Ke‘anae and Nāholokū is considered the ‘study area’, while the location of the proposed release areas is referred to as the ‘project area.’

To generate a set of expectations regarding the nature of cultural resources and customary practices that might be encountered within the current project area and to establish a context within which to assess the significance of such resources, the background section begins with a general culture-historical context. This is followed by culture-historical background information concerning the history of Ke‘anae and Nāholokū. Limited background information for Ko‘olau and Kaupō, the broader regional designation in which the proposed release sites are situated, also falls within the parameters of the OEQC guidelines and ensures that a broader set of cultural practices and histories are considered. Following this background section is a discussion of relevant prior archaeological and cultural studies that have been conducted within and in the immediate vicinity of the project area.

RESEARCH METHODS

The culture-historical context and summary of previously conducted archaeological and cultural research presented below are based on research conducted by ASM Affiliates at various physical and digital repositories. Primary English language and Hawaiian language resources were found at multiple state agencies and local museums, including the State Historic Preservation Division, Hawai‘i State Archives, and the Department of Accounting and General Services Land Survey Division, and the Bishop Museum. Digital collections provided through the Office of Hawaiian Affairs Papakilo and Kīpuka databases, Waihona ‘Āina, the Ulukau Hawaiian Electronic Library, and Newspapers.com were also reviewed as a part of this study. Lastly, secondary resources curated at ASM Affiliates’ Hilo office offer general information regarding the history of land use, politics, and culture change in Hawai‘i, enhancing the broad sampling of source materials cited throughout this CIA.

CULTURE-HISTORICAL CONTEXT

While the question of when Hawai‘i was first settled by Polynesians remains contested, scholars working in the fields of archaeology, folklore, Hawaiian studies, and linguistics have offered several theories. With advances in palynology and radiocarbon dating techniques, Kirch (2011), Athens et al. (2014), and Wilmshurst et al. (2011) have argued that Polynesians arrived in the Hawaiian Islands sometime between A.D. 1000 and A.D. 1200. This initial migration on intricately crafted *wa‘a kaulua* (double-hulled canoes) to Hawai‘i from Kahiki, the ancestral homelands of Hawaiian deities and peoples from southern Pacific islands, occurred at least from initial settlement to the 13th century. According to Fornander (1969), Hawaiians brought from their homeland certain Polynesian customs and beliefs: the major gods Kāne, Kū, Lono, and Kanaloa (who have cognates in other Pacific cultures); the *kapu* system of political and religious governance; and the concepts of *pu‘uhonua* (places of refuge), *‘aumakua* (ancestral deity), and *mana* (divine power). Archaeologist Kenneth Emory who worked in the early to mid-20th century reported that the sources of early Hawaiian populations originated from the southern Marquesas Islands (Emory in Tatar 1982). However, Emory’s theory is not universally accepted, as Hawaiian scholars in the past and present have argued for a pluralistic outlook on ancestral Hawaiian origins from Kahiki (Case 2015; Fornander 1916-1917; Kamakau 1866; Kikiloi 2010; Nakaa 1893; Poepoe 1906).

While stories of episodic migrations were widely published in the Hawaiian language by knowledgeable and skilled *kū‘auhau* (individuals trained in the discipline of remembering genealogies and associated ancestral stories), the cultural belief that living organisms were *hānau ‘ia* (born) out of a time of eternal darkness (*pō*) and chaos (*kahuli*) were brought and adapted by ancestral Hawaiian populations to reflect their deep connection to their environment. As an example, the *Kumulipo*, Hawai‘i’s most famed *ko‘ihonua* (a cosmogonic genealogical chant), establishes a birth-rank genealogical order for all living beings (Beckwith 1951; Liliuokalani 1978). One such genealogical relationship that remains widely accepted in Hawai‘i is the belief that *kalo* (taro) plants (in addition to all other plants, land animals, and sea creatures), are elder siblings to humans (Beckwith 1951). This concept of hierarchical creation enforces the belief that all life forms are intimately connected, evidencing the cultural transformations that occurred in the islands through intensive interaction with their local environment to form a uniquely Hawaiian culture.

In Hawai'i's ancient past, inhabitants were primarily engaged in subsistence-level agriculture and fishing (Handy et al. 1991). Following the initial settlement period, communities clustered in the *ko'olau* (windward) shores of the Hawaiian Islands where freshwater was abundant. Sheltered bays allowed for nearshore fisheries (enriched by numerous estuaries) and deep-sea fisheries to be easily accessed (McEldowney 1979). Widespread environmental modification of the land also occurred as early Hawaiian *kanaka mahi'ai* (farmers) developed new subsistence strategies, adapting their familiar patterns and traditional tools to work efficiently in their new home (Kirch 1985; Pogue 1978). Areas with the richest natural resources became heavily populated over time, resulting in the population's expansion to the *kona* (leeward) side of the islands and more remote areas (Cordy 2000).

Overview of Traditional Hawaiian Land Management Strategies

Adding to an already complex society was the development of traditional land stewardship systems, including the *ahupua'a*. The *ahupua'a* was the principal land division that functioned for taxation purposes and furnished its residents with nearly all subsistence and household necessities. *Ahupua'a* are land divisions that typically include multiple ecozones from *mauka* (upland mountainous regions) to *makai* (shore and near-shore regions), assuring a diverse subsistence resource base (Hommon 1986). Although the *ahupua'a* land division typically incorporated all of the eco-zones, their size and shape varied greatly (Cannelora 1974). Noted Hawaiian historian and scholar Samuel Kamakau summarized the ecozones that could be found in a given *ahupua'a*:

Here are some names for [the zones of] the mountains—the *mauna* or *kuahiwi*. A mountain is called a *kuahiwi*, but *mauna* is the overall term for the whole mountain, and there are many names applied to one, according to its delineations ('*ano*). The part directly in back and in front of the summit proper is called the *kuamauna*, mountaintop; below the *kuamauna* is the *kuahea*, and makai of the *kuahea* is the *kuahiwi* proper. This is where small trees begin to grow; it is the *wao nahele*. Makai of this region the trees are tall, and this is the *wao lipo*. Makai of the *wao lipo* is the *wao 'eiwa*, and makai of that the *wao ma'ukele*. Makai of the *wao ma'ukele* is the *wao akua*, and makai of there is the *wao kanaka*, the area that people cultivate. Makai of the *wao kanaka* is the '*ama'u*, fern belt, and makai of the '*ama'u* the '*apa'a*, grasslands.

A solitary group of trees is a *moku la'au* (a "stand" of trees) or an *ulu la'au*, grove. Thickets that extend to the *kuahiwi* are *ulunahale*, wild growth. An area where *koa* trees suitable for canoes (*koa wa'a*) grow is a *wao koa* and mauka of there is a *wao la'au*, timber land. These are dry forest growths from the '*apa'a* up to the *kuahiwi*. The places that are "spongy" (*naele*) are found in the *wao ma'ukele*, the wet forest.

Makai of the '*apa'a* are the *pahe'e* [*pili* grass] and '*ilima* growths and makai of them the *kula*, open country, and the '*apoho* hollows near to the habitations of men. Then comes the *kahakai*, coast, the *kahaone*, sandy beach, and the *kalawa*, the curve of the seashore—right down to the '*ae kai*, the water's edge.

That is the way *ka po'e kahiko* [the ancient people] named the land from mountain peak to sea. (Kamakau 1976:8-9)

The *maka'ainana* (commoners, literally the "people that attend the land") who lived on the land had rights to gather resources for subsistence and tribute within their *ahupua'a* (Jokiel et al. 2011). As part of these rights, residents were required to supply resources and labor to *ali'i* (chiefs) of local, regional, and island chiefdoms. The *ahupua'a* became the equivalent of a local community with its own social, economic, and political significance and served as the taxable land division during the annual *Makahiki* procession (Kelly 1956). During the time of *Makahiki*, the paramount *ali'i* sent select members of his/her retinue to collect *ho'okupu* (tribute and offerings) in the form of goods from each *ahupua'a*. The *maka'ainana* brought their share of *ho'okupu* to an *ahu* (altar) that was marked with the image of a *pua'a* (pig), serving as a physical visual marker of *ahupua'a* boundaries. In most instances, these boundaries followed mountain ridges, hills, rivers, or ravines (Alexander 1890). However, Chinen (1958:1) reports that "oftentimes only a line of growth of a certain type of tree or grass marked a boundary; and sometimes only a stone determined the corner of a division." These ephemeral markers, as well as their more permanent counterparts, were oftentimes named as evidenced in the thousands of boundary marker names that are listed in Soehren (2010).

Ahupua'a were ruled by *ali'i 'ai ahupua'a* or chiefs who controlled the *ahupua'a* resources. Generally speaking, *ali'i 'ai ahupua'a* had complete autonomy over the *ahupua'a* they oversaw (Malo 1951). *Ahupua'a* residents were not bound to the land nor were they considered property of the *ali'i*. If the living conditions under a particular *ahupua'a* chief were deemed unsuitable, the residents could move freely in pursuit of more favorable

conditions (Lam 1985). This structure safeguarded the well-being of the people and the overall productivity of the land, lest the chief loses the principal support and loyalty of his or her supporters. In turn, *ahupua'a* lands were managed by an appointed *konohiki*, oftentimes a chief of lower rank, who oversaw and coordinated stewardship of an area's natural resources (Lam 1985). In some places, the *po'o lawai'a* (head fisherman) held the same responsibilities as the *konohiki* (Jokiel et al. 2011). When necessary, the *konohiki* took the liberty of implementing *kapu* (restrictions and prohibitions) to protect the *mana* of an area's resources from environmental and spiritual depletion.

Many *ahupua'a* were divided into smaller land units termed '*ili* and '*ili kūpono* (often shortened to '*ili kū*). '*Ili* were created for the convenience of the *ahupua'a* chief and served as the basic land unit which *hoa'āina* (caretakers of particular lands) often retained for multiple generations (Jokiel et al. 2011; MacKenzie 2015). As '*ili* were typically passed down in families, so too were the *kuleana* (responsibilities, privileges) that were associated with it. The right to use and cultivate '*ili* was maintained within the '*ohana*, regardless of the succession of *ali'i 'ai ahupua'a* (Handy et al. 1991). Malo (1951) recorded several types of '*ili*, including the '*ili pa'a* (a single intact parcel) and '*ili lele* (a discontinuous parcel dispersed across an area). Whether dispersed or wholly intact, '*ili* required a cross-section of available resources, and for the *hoa'āina*, this generally included access to agriculturally fertile lands and coastal fisheries. '*Ili kūpono* differed from other '*ili* lands because they did not fall under the jurisdiction of the *ahupua'a* chief. Rather, they were specific areas containing resources that were highly valued by the ruling paramount chiefs, such as fishponds (Handy et al. 1991).

Ali'i 'ai ahupua'a, in turn, answered to an *ali'i 'ai moku* (chief who claimed the abundance of the entire *moku* or district) (Malo 1951). Maui is comprised of twelve *moku* (districts) that include Lahaina, Ka'anapali, Wailuku, Hāmākualoa, Ko'olau, Hāna, Kīpahulu, Kaupō, Kahikinui, Honua'ula, and Kula. Although a *moku* comprises multiple *ahupua'a*, *moku* were considered geographical subdivisions with no explicit reference to rights in the land (Cannelora 1974). While the *ahupua'a* was the most common and fundamental land division unit within the traditional Hawaiian land management structure, variances occurred, such as the existence of the *kalana*. By definition, a *kalana* is a division of land that is smaller than a *moku*. *Kalana* was sometimes used interchangeably with the term '*okana* (Lucas 1995; Pukui and Elbert 1986), but Kamakau (Kamakau 1976) equates a *kalana* to a *moku* and states that '*okana* is merely a subdistrict. Despite these contending and sometimes conflicting definitions, what is clear is that *kalana* consisted of several *ahupua'a* and '*ili 'āina*. This form of district subdividing was integral to Hawaiian life and the product of advanced natural resource management systems. As populations resided in an area over centuries, direct teaching and extensive observations of an area's natural cycles and resources were retained, well-understood, and passed down orally over the generations. This knowledge informed management decisions that aimed to sustainably adapt subsistence practices to meet the needs of growing populations. The *ahupua'a* system and the highly complex land management system that developed in the islands are but one example of the unique Hawaiian culture that developed in these islands.

Intensification and Development of Hawaiian Land Stewardship Practices

Hawaiian philosophies of life in relation to the environment helped to maintain both natural, spiritual, and social order. In describing the intimate relationship that exists between Hawaiians and '*āina* (land), Kepā Maly writes:

In the Hawaiian context, these values—the “sense of place”—have developed over hundreds of generations of evolving “cultural attachment” to the natural, physical, and spiritual environments. In any culturally sensitive discussion on land use in Hawai'i, one must understand that Hawaiian culture evolved in close partnership with its' natural environment. Thus, Hawaiian culture does not have a clear dividing line of where culture and nature begins.

In a traditional Hawaiian context, nature and culture are one in the same, there is no division between the two. The wealth and limitations of the land and ocean resources gave birth to, and shaped the Hawaiian world view. The '*āina* (land), *wai* (water), *kai* (ocean), and *Iewa* (sky) were the foundation of life and the source of the spiritual relationship between people and their environs. (Maly 2001)

The '*ōlelo no'eau* (proverbial saying) “*hānau ka 'āina, hānau ke ali'i, hānau ke kanaka*” (born was the land, born were the chiefs, born were the commoners), conveys the belief that all things of the land, including *kanaka* (humans), are connected through kinship links that extend beyond the immediate family (Pukui 1983:57). '*Āina* or land, was perhaps most revered, as noted in the '*ōlelo no'eau* “*he ali'i ka 'āina; he kauwā ke kanaka*,” which Pukui (Pukui 1983:62) translated as “[t]he land is a chief; man is its servant.” The lifeways of early Hawaiians, which were dependent entirely on the finite natural resources of these islands, necessitated the development of sustainable

resource management practices. Over time, what developed was an ecologically responsive management system that integrated the care of watersheds, natural freshwater systems, and nearshore fisheries (Jokieli et al. 2011).

Disciplined and astute observation of the natural world became one of the most fundamental stewardship tools used by the ancient Hawaiians. The vast knowledge acquired through direct observation enabled them to detect and record the subtlest of changes, distinctions, and correlations in the natural world. Examples of their keen observations are evident in the development of Hawaiian nomenclature to describe various rains, clouds, winds, stones, environments, flora, and fauna. Many of these names are geographically unique or island-specific, and have been recorded in *oli* (chants), *mele* (songs), *pule* (prayers), *inoa* 'āina (place names), and 'ōlelo no 'eau (proverbial sayings). Other Hawaiian arts and practices such as *hula* (traditional dance), *lapa 'au* (traditional healing), *lawai 'a* (fishing), *mahi 'ai* (farming) further aided in the practice of knowing the rhythms and cycles of the natural world.

Comprehensive systems of observing and stewarding the land were coupled by the strict adherence to practices that maintained and enhanced the *kapu* and *mana* of all things in the Hawaiian world. In Hawaiian belief, all things natural, places, and even people, especially those of high rank, possessed *mana* or “divine power” (Pukui and Elbert 1986:235; Pukui et al. 1972). *Mana* was believed to be derived from the plethora of Hawaiian gods (*kini akua*) who were embodied in elemental forces, land, natural resources, and certain material objects and persons (Crabbe et al. 2017). Buck (1993) expanded on this concept noting that *mana* was associated with “the well-being of a community, in human knowledge and skills (canoe building, harvesting) and in nature (crop fertility, weather etc.)” (c.f. Else 2004:244).

To ensure the *mana* of certain resources, places, and people, *kapu* of various kinds were implemented and strictly enforced to limit over-exploitation and defilement. Elbert and Pukui (1986:132) defined *kapu* as “taboo, prohibitions; special privilege or exemption.” Kepelino noted that *kapu* associated with *akua* (deities) applied to all social classes, while *kapu* associated with *ali 'i* were applied to the people (in Beckwith 1971). As *kapu* dictated social relationships, they also provided “environmental rules and controls that were essential for a subsistence economy” (Else 2004:246). The companion to *kapu* was *noa*, translated as “freed of taboo, released from restrictions, profane, freedom” (Pukui and Elbert 1986:268). Some *kapu*, particularly those associated with maintaining social hierarchy and gender differentiation were unremitting, while those *kapu* placed on natural resources were applied and enforced according to seasonal changes. The application of *kapu* to natural resources ensured that such resources remained available for future use. When the *ali 'i* or the lesser chiefs (including *konohiki* and *po 'o lawai 'a*) determined that a particular resource was to be made available to the people, a decree was proclaimed indicating that *kapu* had been lifted, thereby making it *noa*. Although transitioning a resource from a state of *kapu* to *noa* allowed for its use, people were expected to practice sustainable harvesting methods and pay tribute to the paramount chief and the *akua* associated with that resource. *Kapu* were strictly enforced and violators faced serious consequences including death (Jokieli et al. 2011). Violators who escaped execution sought refuge at a *pu 'uhonua*, a designated place of refuge or an individual who could pardon the accused (Kamakau 1992). After completing the proper rituals, the violator was absolved of his or her crime and allowed to reintegrate back into society. In summary, the layering and interweaving of beliefs, land stewardship practices, and the socio-political system forms the basis of the relationship shared between the Hawaiian people and the land. It is through the analysis of these dynamic elements that we develop an understanding of the complexity of place.

‘ALALĀ: A GENERAL DESCRIPTION

The population of captive-bred ‘*alalā* (*Corvis hawaiiensis*), the species that is at the crux of the proposed project, is the last surviving species of endemic crows (Corvidae) that colonized and evolved in the Hawaiian Islands (Banko et al. 2002). Known in the Hawaiian language as ‘*alalā*, the name of this endemic bird is derived from the sound of its loud caw (Pukui and Elbert 1986:18). Through the discovery of fossilized remains, scientists have determined that there were historically at least five distinct species of corvids in the Hawaiian Islands (Banko et al. 2002). The fossils of several species of corvids have been found on four of the six largest Hawaiian Islands including O‘ahu, Moloka‘i, Maui, and Hawai‘i Island. In 1974, the bones of the *Corvus viriosus* (Figure 9) were recovered from Mo‘omomi Beach on Moloka‘i and three years later, the bones of the *Corvus impulviatus* (Figure 10) were found in a flooded sinkhole at Barber’s Point on O‘ahu. Corvid bones have also been found in lava tubes on Maui in the 1980s, however, the exact species have yet to be determined. By the time European naturalist began exploring Hawai‘i’s forest (post-1778), populations of wild ‘*alalā* were only observed on Hawai‘i Island and by 2002, only two wild individuals (a single pair) were observed along the leeward slopes of Mauna Loa in the Kona District. Today, Hawai‘i Island is the home of the last remaining populations of captive-bred ‘*alalā*, specifically the highly threatened species known as *Corvid hawaiiensis* (Olson and James 1991).



Figure 9. Bones of the *Corvus viriosus* recovered from Mo'omomi, Moloka'i. Photos taken at the Bishop Museum's Vertebrate Zoology Collection.



Figure 10. Bones of the *Corvus impulviatus* recovered from a sinkhole at Barber's Point on O'ahu. Picture taken at the Bishop Museum's Vertebrate Zoology Collections.

Historical Range

While the exact reason for the decline of the earlier species remains unknown, as for the *Corvus hawaiiensis* scientists have identified three main categories of factors that are believed to have significantly reduced 'alalā populations: reduction in habitat and food resources, introduction of new predators, and disease (Munro 1944; National Research Council 1992; Olson and James 1991). As of European arrival in 1778, the only Hawaiian Island where the wild population of 'alalā had not gone extinct was Hawai'i Island. Consequently, the descriptions and information about the 'alalā's characteristics and distribution in historical records are based primarily on those remaining wild populations on Hawai'i Island. In describing the historical distribution changes, Banko et al. (2002:3) wrote:

Distribution on Hawai'i I. formerly included low-to-high-elevation forest surrounding Hualālai (as far north as Pu'uānāhulu, N. Kona District), western slopes of Mauna Loa (as far north as Kīpuka 'Alalā), southeastern slopes of Mauna Loa (as far north as Kīpuka Puāula, Hawai'i Volcanoes National Park, and southern portion of Keauhou), and upper slopes of Kīlauea Volcano... 'Alalā last reported in Pu'uānāhulu area in early 1960s... and last individual disappeared from Hualālai in early 1990s. Sightings in Ka'ū District infrequent after 1930s. Western Ka'ū population essentially disappeared by 1960s, but last sightings reported in 1981 and 1982 from 600 m elevation in Manukā... Eastern Ka'ū population vanished by 1970s, although scattered sightings, probably vagrants, occurred through 1970s in Hawai'i Volcanoes National Park and Keauhou areas... Reports of 'Alalā from outside the normal range, including N. Kohala District and Maui I., suggest 'Alalā sometimes wandered far, especially when relict populations were in steep decline within Kona and Ka'ū Districts...

Although 'alalā are considered nonmigratory birds, observations of relic populations confirmed moderate shifts in elevation and habitat during breeding (spring and summer) and non-breeding seasons (fall and winter). Such

movements have also been correlated with the seasonal availability of food resources, rainfall, and volcanic changes. As they mature into breeding adults, *'alalā* are known to be monogamous, however, other types of non-monogamous copulations have been observed. These birds are also site-faithful and will therefore return to the same area every season to nest primarily in *'ōhi'a* (*Metrosideros polymorpha*) and *koa* (*Acacia koa*) wet-forest (Figure 11). *'Alalā* are generally known for their territorial nature with males exhibiting even stronger dominating behavior during the nesting season (Banko et al. 2002).



Figure 11. Two adult *'alalā* foraging in *'ōhi'a* treetops during nesting season. Photo courtesy of San Diego Zoo Wildlife Alliance.

Diet and Foraging Habits

Owing to its diverse foraging, arboreal tendencies, and opportunistic disposition, the *'alalā* is a disperser of many wet and dry forest plant species. Banko et al. (2002:5) noted that because of their diverse foraging, they influence “the composition and function of dry-and wet-forest ecosystems.” While the *'alalā* is an omnivorous bird, about 33-66% of the adult diet consists of a diversity of fruits and seeds of native trees, shrubs, and vines. The specific type of plants consumed is influenced by the forest type (wet and dry forests) and is sometimes related to the sex, age, and seasonal activities (mating, nesting, etc.) of the bird. The predominant food source of those *'alalā* occupying wet forests is *'ie'ie* (*Freycinetia arborea*) whereas those occupying dry forests frequently eat the seeds of *hō'awa* (*Pittosporum hosmeri*). However, they are known to eat a variety of other plants including *'ōlapa* (*Cheirodendron trigynum*), *'ōhā kepau* (*Clermontia* spp.), *māmaki* (*Pipturus* spp.), *'ākala* (*Rubus hawaiiensis*), *pilo* (*Coprosma* spp.), *manono* (*Hedyotis* spp.), *pūkiawe* (*Styphelia tameiameia*), *'alani* (*Melicope* spp.), *'aiea* (*Nothocestrum* spp.), *'ōhelo* (*Vaccinium* spp.), and others. In addition to native plants, the introduced banana poka (*Passiflora mollissima*) has also become a source of nutrition for the *'alalā* (Banko et al. 2002). *'Alalā* were also known to exploit traditional crops including bananas and gourds (Teauotalani 1859-1860 and Baldwin 1969 in Banko et al. 2002). Aside from these plants, isopods, caterpillars, beetles, flies, small wasps, arachnids, and land snails gathered from the forest floor or trees, make up the remainder of the *'alalā*'s diet. The diet of nestlings consists of the aforementioned resources in addition to passerine eggs, nestlings, and mice (Banko et al. 2002).

The *Corvus hawaiiensis* is the largest surviving endemic forest bird with adults typically measuring 1.5 feet from bill to tail and for the most part, features a sturdy black bill, black legs and feet, and dark black/brown feathers (Figure 12). Adult male 'alalā are typically 3%-9% larger in overall measurements in comparison to females. Juveniles are discernable by their spectrum blue iris (Figure 13), dark bluish gray to blackish neutral gray feathers which may appear fluffy in comparison to adults, and pinkish-red mouths. The features of the juveniles typically darken, including their iris, mouth, and tongue as they mature which occurs at about two years old.



Figure 12. Adult 'alalā. Photo courtesy of San Diego Zoo Wildlife Alliance.



Figure 13. Juvenile 'alalā with its blue iris. Photo courtesy of San Diego Zoo Wildlife Alliance.

The Decline of 'Alalā In the Wild

In the late 19th century, wild populations of 'alalā were reported to be “abundant locally” and “extremely numerous” in certain areas of Hawai'i Island mainly the Kona and Ka'u Districts (National Research Council 1992:16). Up until the 1940s, although their numbers were declining, sighting 'alalā was still a common occurrence in a narrow forest belt of the Kona District. However, throughout the early 20th century, its population steadily declined due to factors such as commercial logging, deforestation for agriculture and ranching, and the shooting of 'alalā as agricultural pests. These activities led to a steady decrease in the number of 'alalā throughout its range. In 1976, three 'alalā were observed in the Ka'u Forest Reserve, and in 1977, a single bird was observed within the Hawai'i Volcanoes National Park (National Research Council 1992). A map showing the historical distribution along with the decline in the 'alalā's native range is shown in Figure 14. In 1967, in accordance with the Endangered Species Act of 1966, the 'alalā along with several other native birds, were listed as on the federal endangered species register (Secretary of the Interior 1967). This status made additional support available for studying the remaining populations of 'alalā and for the development of the Federal 'Alalā Recovery Plan which was published in 1982 (Burr et al. 1982).

Despite the precipitous decline of 'alalā in Ka'u, scattered throughout the Kona District, a more sizeable population remained. To document this rapidly declining species, U.S. Fish and Wildlife Service (USFWS) in a joint effort with the State of Hawai'i, undertook a series of surveys throughout the 1970s and 1990s. Along the northern slopes of Hualālai, where 'alalā were once common, the population was reduced from twenty-six birds in 1974 to a single female in 1991 with the last nest observed in 1983. Reports from Kamehameha Schools Bishop Estate's Hōnaunau (South Kona) lands paralleled the findings from North Kona. The only exception was within the privately-owned McCandless Ranch where in the 1980s, the ranch reported on the presence of an estimated 10-25 birds. Restricted access made observing the birds on the ranch difficult, however, in 1989-1990, cameras installed by USFWS biologist on the ranch recorded a single group of nine along with four individually observed birds. By 1992, the 'alalā population on McCandless Ranch was determined to be 11 birds. Despite joint state and federal efforts, the 'alalā continued to dwindle, with the exception of those on the McCandless Ranch property (National Research Council 1992).

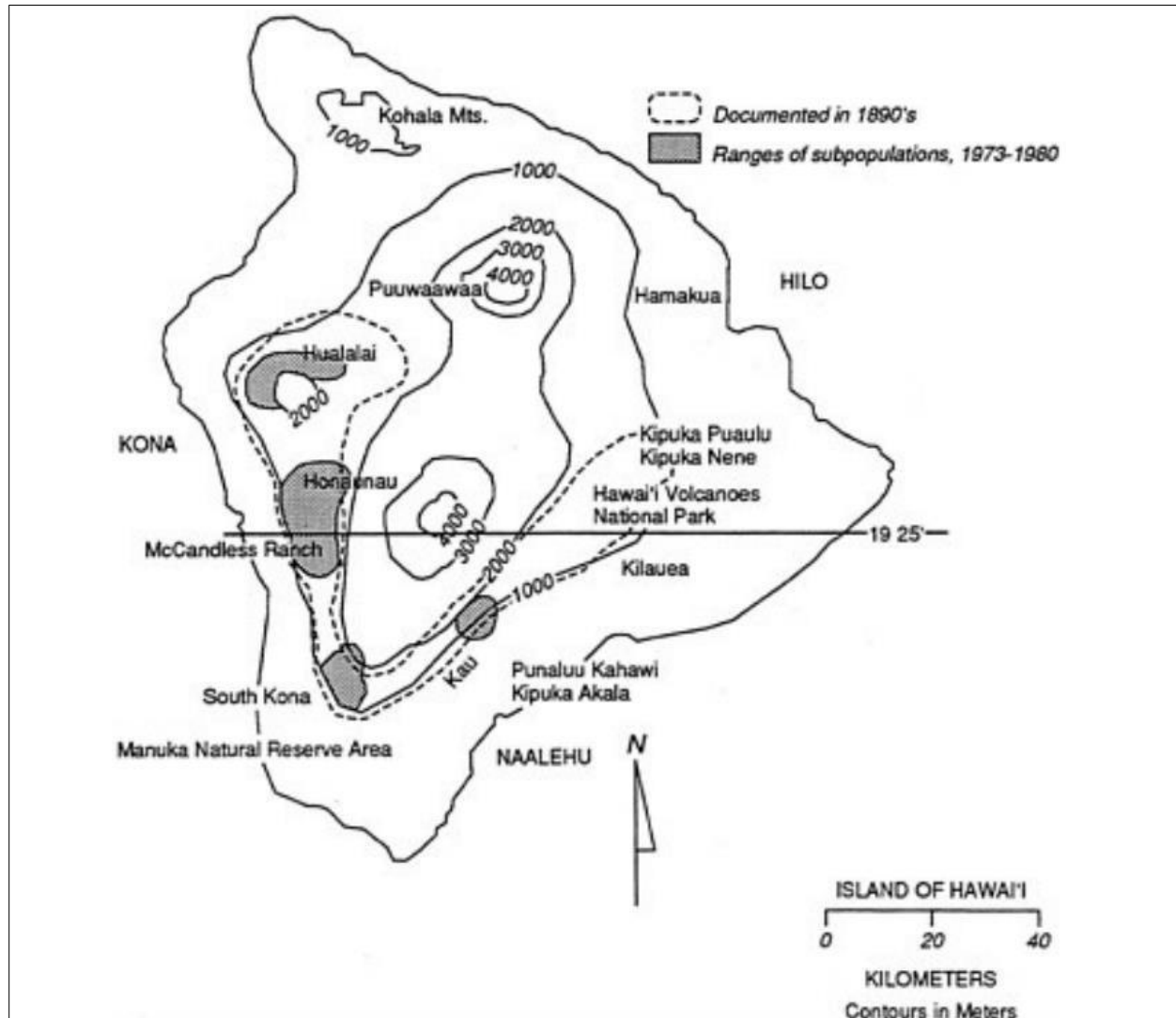


Figure 14. Map of Hawai'i Island showing the decline in the historical range of 'alalā (National Research Council 1992:13).

As previously noted, reduction in habitat and food resources coupled with the introduction of new predators and diseases have been identified as some of the primary factors that have contributed to the 'alalā's low reproduction and survival rates. Commercial logging and forest conversion for pastureland have reduced the 'alalā's natural habitat and depleted its food resources. Through forest clearing, the 'alalā are deprived of the tall 'ōhi'a and koa canopy which are essential for nesting, as well as the understory and ground cover where much of their diet is obtained and where they seek refuge from the 'io (Hawaiian hawk; *Buteo solitarius*), one of their only known natural predators. Along with forest clearing, the introduction and foraging of feral ungulates has further reduced or eliminated the native understory and ground cover and in many instances replaced it with introduced grasses and weeds.

Disease-carrying predators, such as feral cats, mongooses, rats, and mosquitos are another factor that has contributed to the birds' demise. Cats, mongooses, and rats are known to attack and eat 'alalā both the adults and fledglings. The fledglings are particularly vulnerable to mongooses and feral cats because they leave the nest before they have acquired strong flying abilities and instead spend their time on the ground or climbing the understory all while still being fed by their parents. The introduced rat, a known arboreal nocturnal predator, take and eat 'alalā eggs and nestlings. Mosquitos infect native birds with diseases such as malaria and pox and cats are known spreaders of toxoplasmosis. In addition, to introduced predators and diseases, European settlers hunted 'alalā for

sport. When the birds were more abundant they were known to enter poultry yards and many were shot by farmers as agricultural pests (National Research Council 1992).

Conservation Efforts

In response to the rapid decline of wild ‘*alalā* populations during the late 1960s, state and federal biologists supported the implementation of a captive-breeding program for the species. This involved removing injured or sick birds from the wild. The primary goals of the program, which aligned with similar initiatives for other endangered species at that time, were to prevent extinction in case wild populations vanished, conduct research on behavioral and reproductive needs, and generate offspring for potential reintroduction into the wild to bolster existing populations. The significance of this last objective was emphasized in the subsequent ‘*Alala Recovery Plan* developed by the Alala Recovery Team (Burr et al. 1982). Prior to 1976, any injured or sick birds retrieved from the wild were held and or treated at an aviary facility at the Hawai‘i Volcanoes National Park and birds needing additional care were transferred to the Patuxent Wildlife Research Center in Maryland (National Research Council 1992).

Between 1976 and 1985, when the State of Hawai‘i assumed responsibility for the ‘Alalā Breeding Program, a facility at Pōhakuloa—which was constructed in 1949 for the propagation of the *nēnē* (Hawaiian Goose; *Branta sandvicensis*) and later the Hawaiian and Laysan duck (*Anas wyvilliana* and *Anas laysanensis*)—was used for the ‘Alalā Breeding Program. Although the facility at Pōhakuloa was successful in repropagating the *nēnē* and endemic ducks, it proved unsuitable for the ‘*alalā*. “Substandard facilities, personnel and predator problems, prevailing climatic conditions, and periodic disturbance caused by military training activities at the nearby U.S. Army Pōhakuloa Training Facility” led the state to seek out a more suitable location (National Research Council 1992:51). The existing Olinda Honor Prison Camp near Makawao, Maui was the selected site for the new breeding facility. The prison camp was renovated and the nine ‘*alalā* at Pōhakuloa were transferred in November of 1986. By the 1990s, the staff at both the Pōhakuloa and Olinda facilities developed close ties with the staff at the San Diego Zoo one of which included Zoologist, Cynthia Kuehler. Kuehler reviewed the ‘Alalā Breeding Program, provided several husbandry and management recommendations, and summarized the existing records for the captive-bred population in a studbook. (National Research Council 1992).

In 1993, a new partnership was forged between the San Diego Zoo Global’s Institute for Conservation Research, the USFWS, and the State’s Department of Land and Natural Resources-Division of Forestry and Wildlife (DLNR-DOFAW) which resulted in the creation of the Hawai‘i Endangered Bird Conservation Program. This program was designed to use captive propagation and release techniques as a means to reestablish populations of critically endangered Hawaiian birds on Maui and Hawai‘i Island. As part of this program, in 1996, the 150-acre Keauhou Bird Conservation Center (KBCC) located on lands owned by Kamehameha Schools in Keauhou, Ka‘ū opened its doors (National Research Council 1992). Today, the KBCC houses four critically endangered Hawaiian forest birds one of which includes the ‘*alalā* (Hawai‘i Forest Institute 2023). As described in the 2009 Revised ‘Alalā Recovery Plan (U.S. Fish & Wildlife Service 2009:vii):

Between 1993 and 1998, twenty-seven juvenile ‘Alalā, originating from both captive and wild parents, were raised in captivity and released in South Kona at the McCandless Ranch, near where wild ‘Alalā were still known to exist. Twenty-one of the 27 released birds died from disease, were depredated, or disappeared. The remaining six were returned to captivity in 1998 and 1999.

The anticipated integration of released birds into the wild population, as predicted, did not materialize. There was a lack of reproductive success, with only minimal observed reproductive behavior among the released birds. Unfortunately, the wild population, which consisted of twelve birds in 1992, declined to extinction by 2002. As of January 2008, the entire population of the ‘*alalā* species, totaling fifty-six individuals, was held in captivity at the Keauhou and Maui Bird Conservation Centers on Hawaii and Maui Islands, respectively (U.S. Fish & Wildlife Service 2009). The breeding program proceeded with success as by 2019, there were a reported 110 birds in the two breeding facilities on Hawai‘i and Maui Islands.

With the success of the breeding program, the ‘Alalā Project—a joint partnership between the DLNR-DOFAW, USFWS, San Diego Zoo, the Maui Forest Bird Recovery Project, Three Mountain Alliance, National Park Service, Kamehameha Schools, the University of Hawai‘i, and the U.S. Geological Survey—was launched (Department of Land and Natural Resources 2023). Between 2016-2019 several efforts were made by the ‘Alalā Project to introduce small populations of ‘*alalā* back into the forest of Hawai‘i Island. In December 2016, the first five male juvenile

‘alalā were released at the Pu‘u Maka‘ala Natural Area Reserve on Hawai‘i Island, however, within a week three were found dead. Necropsies carried out on the dead birds found that two had been killed by its natural predator, the *‘io* and one had died of starvation (Ashe 2017). Despite subsequent efforts to release additional populations of *‘alalā*, the high mortality rate prompted scientists to pause the program and develop new release strategies. By October 2020, the remaining five captive-bred birds that had managed to survive in the wild for up to three years were recaptured and returned to the KBCC where they remain until new release sites are identified (Department of Land and Natural Resources 2023).

‘ALALĀ: HAWAIIAN CULTURAL PERSPECTIVES

To develop an understanding of the Hawaiian cultural significance of *‘alalā*, the following is a presentation of accounts that reflect traditional customary uses and affiliations that appear in a variety of published Hawaiian and English language materials. While historical accounts of the *‘alalā*’s existence are primarily based on accounts originating from the Kona and Ka‘ū Districts of Hawai‘i Island, there is limited documentation that references the bird’s connection to Maui and O‘ahu, particularly in the context of canoe building traditions. The following section begins with the several origin stories and chants that refer to the *‘alalā*. This includes the cosmogonic chant, *Kumulipo* as well as the story of Ho‘okumu-ka-Lani and Ho‘okumu-ka-Honua written by S. L. Peleiholani, a renowned antiquarian, and genealogist. It is important to note that the ancient Hawaiians did not agree on a single creation story. Rather, their pluralistic outlook on their origins reveals a profound connection to all things of the land, the ocean, and the greater cosmos. As ancient as some of these stories may be, they remain integral to understanding the deep reverence and connection Hawaiians had and continue to have with their environment.

‘Alalā in the Kumulipo

To establish a cultural context for the *‘alalā*, we look to its cultural origins. The *mele ko‘i honua*, or cosmogonic chant known as the *Kumulipo* explains the origins of the Hawaiian universe through the birthing of various aquatic and terrestrial organisms found in the Hawaiian Islands. Containing over 2,000 lines, this chant was uttered by the high priest Puou in Kealahou, Kona upon the birth of the 18th-century high chief Ka‘i‘imāmao, as a way to recognize and fortify the depth of his royal family’s divine origin (Liliuokalani 1978). Various scholars and Hawaiian royalty including Queen Lili‘uokalani and her brother King David Kalākaua have attempted to translate this epic chant, with each translator offering their interpretation. The *Kumulipo* anchors the Hawaiian world and its people to the ocean by way of the primal substance known to the Hawaiian people as *walewale* (slime). According to the *Kumulipo*, all animate and inanimate objects were *hānau ‘ia* (born) with some emerging from the depths of the ocean while others emerging from a parent stock.

This lengthy chant is divided into sixteen *wā* (eras) that categorize the organisms by their predominant characteristics. The first *wā* describes a time of eternal darkness (*pō*) that passes progressively, through the union of male and female energies, ultimately giving birth to light (*ao*). It is in this first *wā* that organisms of the benthic zone are born. The second *wā* of the *Kumulipo* describes the birth of the fishes and their forest counterparts. In these two *wā* along with the fourth *wā* there is a reoccurring theme of duality in which the aquatic lifeform is paired with a terrestrial counterpart. The third *wā* describes the emergence of the winged creatures of both land and sea, however, rather than an aquatic and terrestrial pairing, this *wā* describes the birth of a “*keiki*” (child, offspring) from a “*mākuā*” (parent) (Beckwith 1951). It is not until the eighth *wā* of the *Kumulipo* that *kānaka* (humans) are born. The birth order presented in the *Kumulipo* informs us of the Hawaiian belief that Kanaka Maoli derives from the same source as all other living creatures and that there is a natural hierarchy that is to be honored and respected. The *Kumulipo* also serves as a reminder that the well-being of Kanaka Maoli is dependent upon maintaining the delicate balance between all life forms and that a symbiotic relationship exists between the land and the ocean. Although this chant is set in Hawai‘i’s distant past, the messages and nuanced meanings remain deeply embedded in the spirits and minds of Kanaka Maoli today. In her explanation of the pairs of aquatic and terrestrial counterparts, Martha Beckwith writes:

The names are not invented for mere rhyme value...The punning of names have in some cases a practical magical function. For example, in plant medicine the first food to be taken after dosing with a special medicinal herb is the sea-growing thing whose name matches with it...Such is the nature of the language that these lists may be extended indefinitely. (Beckwith 1951:50-51)

The Hawaiian language version of this chant comes from the text written by King David Kalākaua that was published by Beckwith (1951). The English translation is derived from a version of the *Kumulipo* published by King

2. Background

Kalākaua's sister, Queen Lili'uokalani (1978). That portion of the *Kumulipo* that refers to the birth of the 'alalā and its offspring is cited below:

305. *Hanau ka Alala ka makua*
306. *Puka kana keiki he Alawi, lele*
(Beckwith 1951:195)

The Alala was born and became parent (crow);
Its offspring was an Alawi, and flew
(Liliuokalani 1978:13)

As demonstrated in the lines above, the 'alalā is paired with its child, the 'alawī (*Loxops mana*), both of which are pictured below in Figures 15 and 16. Although these birds differ in appearance, their pairing in the *Kumulipo* suggests there is some association. As noted by Beckwith (1951), the pairing of names in the *Kumulipo* represents a practical function and in the context of the 'alalā and the 'alawī, their names appear to be most closely associated with their respective calls. In the article *Ka Mo'olelo o Nā Manu o Hawai'i Nei* (The Story of the Birds of Hawai'i) authored by G. W. Kahiolo (1863a:4) and published in the May 9th, 1863 edition of the Hawaiian language newspaper, *Ka Nūpepa Kū'oko'a*, Kahiolo stated "*o kona inoa, ua kapaia mamuli o kana kani*" which translates to "regarding its name, it is so called because of its sound." Pukui and Elbert (1986) translated 'alalā as "to bawl, bleat, squeal, cry, caw, yelp, wail, scream; such noises" and 'alawī as "to shriek; shrill, to squeal." The pairing as presented in the *Kumulipo* is likely based on the call of each bird, which to the native ear was considered a near opposite with the 'alawī having a softer high pitch call and the 'alalā having a lower toned but resounding and bombastic call. This particular trait of the 'alalā is also reflected in the following 'ōlelo no'eau (proverbial saying) which states, "*He 'alalā, he manu leo nui*" translated as "It is the crow, a loud-voiced bird" which was "said of a person who talks too loud" (Pukui 1983:62).



Figure 15. 'Alalā (Photo by Lainie Berry, DLNR-DOFAW website).



Figure 16. 'Alawī (Photo by Bret Mossman, DLNR-DOFAW website).

Ho'okumu-ka-Lani Ho'okumu-ka-Honua and the Akua Alalahe

The creation chant, *Ho'okumu-ka-Lani Ho'okumu-ka-Honua*, which refers an *akua* by the name of Alalahe, was first recorded by renowned antiquarian and genealogist, Solomon L. Peleiholani (b. 1844 d. 1916) and subsequently translated by Joseph M. Poepoe (b. 1852 d. 1913). Poepoe's undated translated manuscript, found at the Bishop Museum, tells of the creation of the heavens (*lani*) and earth (*honua*). Although the exact date of publication is unknown, it is believed that Poepoe completed this work sometime during the late 19th century. As a preface to the story of *Ho'okumu-ka-Lani Ho'okumu-ka-Honua*, Poepoe offered the following:

Learned men who have studied [*sic*] the history of the Hawaiian People from very ancient times, have many opinions relating to the primitive people of Hawaii nei. Some supposed that the ancestors of the Hawaiian people immigrated from the islands of the South Pacific, like Savaii in the Samoan Group.

And in the history of Hookumu-ka-Lani Hookumu-ka-Honua the ancestors of the Hawaiian race came, not from the islands of the South Pacific—for the immigrants from that direction were late arrivals here—but from the northern direction (*welau lani*), that is, from the land of Kalonakikeke, now known as Alaska.

The first man and woman who came from Kalonakikeke to the island continent of Ka-Houpo-o-Kane (the Bosom of Kane) were Kalonakikeke and his wife Hoomoe-a-pule. They were said to be high chiefs of the countries of Kanaka-Hikina (East Kanaka) and Kanaka-Komohana (West Kanaka). (Poepoe n.d.:35)

Poepoe continues noting that Kalonakikeke and his wife, Hoomoe-a-pule arrived at Ka-Houpo-a-Kane prior to it being disrupted by a great flood, which is said to have occurred during the reign of the chief Kahiko Luamea. The legend telling of this great flood was recorded in an old prayer, which according to Poepoe, was the same prayer uttered to the *akua* Kāne by Nu‘u. Poepoe goes on to explain that Nu‘u, his wife, and their three sons were saved from the deluge when their canoe called *Ka Wa ‘a Hālau Ali‘i O Ka Moku* ran aground atop Mauna Kea, on Hawai‘i Island. The chant, cited below, addresses the *akua* Alalalahe, who was known by other names including Alihi, Alohilohi (The Shinning One), Aloha (Love), and Alalahe. Peleiholani’s Hawaiian language version of the chant is provided below along with Poepoe’s translation:

1. Eia ka ai, ka mohai, alana, e Alalala-He—a
2. Na kulauka, na kulakai
3. Na kanikanihia, e kani aku ana i ke Aloha—Aloha
4. I ke aloha o kana wahine, e Alalalohi—Aloha
5. Ua lilo oa Nalau-mahikihi—e-
6. Mahiki wale mai ana no kona aloha,
7. Na Makili-kili, na Makala-kala—Aloha
8. Na ka wahine a Hilihililaukamaile.
9. Hilihili wale mai ana no kona aloha
10. Na ka wahine hou oe ka ai—e—a—a-
11. Eia ka ai e ke ‘kua e Alahe-Alohi-Aloha.
12. Na kahuli, na Kahela, na Haalewawahilani-e
13. Na ka wahine e moe ana iluna ke alo,
14. O ka moe a Hanauna, o Milikaamea
15. O ka lepo ahulu; o Pahukini; o Pahukai
16. Pahuluna; o Pahulalo; o Pahuiuka; o Pahukai
17. O Kulana-a-pahu; o Piiia-ohela ia,
18. O Paki, o o‘e ae; o Palaau, o Olekahua
19. O Papaialaka; o Manuu kecu
20. E Kapaepaenui alaimoku, e moe nei la -e-
21. E ala! E ala! E kala kala e keia kala !!
22. E ala e ka papa me ka pohaku
23. E ala e nu‘a moena wahine me ke kapa
24. E ala e ka uluna
25. E ala e ipu-kai me ka umeke
26. E ala ke po‘i wai holoi me ke kanoa
27. E ala e ka uku-wai me ke kapuahi
28. E ala e ka pae-kua me ka pae-alo
29. E ala e ka pou-kua me ka pou-alo
30. E ala e ka hiikua me ka hii alo
31. E ala e na kukuna
32. E ala e ka aho me ka aho kele
33. E ala e ka lohe-lau
34. E ala e ka ilio me ka nakinaki
35. E ala e kua-iole me kauhuhu
36. E ala e ka loha-kua me ka loha-alo

1. Here is the food, the sacrifice, the offering O Alala-la-he.
2. To ye gods of the mountains (na kulauka) and of the ocean (na kulakai)
3. To Kanikanihia (goddess of love) the love is declared unto thee the affection
4. The love of his lay, o Alalalohi-yea his love
5. That love has turned over to Nalau-mahikihi
6. Her affection never danced so dearly
7. But such love ever so frivolous and unending
8. As declared by the woman of Hilihililaukamaile
9. Her love dances before me
10. Although you are some one else’s love
11. Here is the food, O God, Alahe, Alohi, Aloha
12. For Kahuli, for Kahela, for Haalewawahilani
13. For the lady that sleeps her face turned to the sky
14. The reposing of Hanuna, of Milikaamea
15. The ancient earth of Pahukini of Pahulau
16. Pahuluna of Pahulalo; of Pahuuka; of Pahukai
17. Of Kulana-a-pahu; of Piiia (going up) o heleia (going forward)
18. Of Paki (casting down); of o‘e ae (praying upward), of Palaau (fence) of Olekahua
19. Of Papa-ia-Laka; of Manuu, the mischievous
20. Of Ka-paepae-nui-alai-moku (the threshold which props the island), which is lying here.
21. Arise! Arise! O that side and this side,
22. Arise the board and stone,
23. Awake the lady of the mat and kapa
24. Awake, o pillow
25. Awake the fish container and the calabash
26. Awake the finger-bowl and the awa dish
27. Awake the threshold and the fireplace,
28. Awake the rear and front rows of stones
29. Awake the rear and front posts
30. Awake the rear and front thatchings
31. Awake o rays of the house (kukuna)
32. Awake o ye short poles and long poles,
33. Awake plates of the house (lohelau)
34. Awake the crossbeams of the house (ilios)
35. Awake the upper and lower ridge poles

37. E ala e ka pili me ka ha -ko
38. E ala e kaupoku-
39. E ka ua; e ka la e ka pohu e ka malino
40. E ka makani e ka waikahe wai punawai
41. Wai-ola a Ka-ne -e—A—la-
42. E ala e ka ohu kolo mai i uka
43. Ohu kolo mai i kai-
44. Kai kane, kai wahine
45. Kai pupule, kai hehena, kai ulala, kai aumakua
46. Kai nuu, kai ea, kai po'i
47. Kai ma-u, a kai pili-aiku -e
48. Ua pu-ni—ua ou-ni—ho—i
49. Ua puni hoi na moku i ke kai
50. O hu'ahu'akai wale, o aleale ka wai
51. O nape-nape ka wai, o pi-ina e ka wai
52. O Amoa e ka wai, o ka waieliakekoena
53. O Keaumiki, o Keauka, au ka iho
54. Au-a a'e, au ka iuka, au-ka i kai
55. I ka ale-i, i ka ale-moe
56. I ka ale hako'iko'i—e—i—Kahiki
57. O Kalana-a-Kahiki, e hiki ai
58. A hiki a ola nei make ia oe—Lono
59. E Lono -e! E Lono hoi !!
60. E Lono mauka, e Lono makai
61. E Lono i ka uila, I ka hekili,
62. I ka ua loku, i ka ua paka,
63. I ka ua hea, i ka ua oiliili,
64. Makakai nei la, e Lono,
65. E Lono i ka po; e Lono i ke ao,
66. E Lono maka ahialele-
67. A lele oe i kai Kona, i kai Koolau,
68. I one-huli; i one-hele, i ke one i Mahinauli
69. E Uli-i-nana-pono! E Uli-i-nana-hewa-
70. I ke one i Niihau, i Halalii—e-
71. O pipipi, o unauna, o alealea,
72. O naka, o hee, o leho, o loli, o haukeuke
73. O pakii moe one;ulae niho wakawaka
74. O ka ina i ke aluka
75. O wana noho i ke ale
76. O ka ula noho i ka naele
77. Paiwan oho wawae;aama pii pali
78. O kama au, o opihi kau pali
79. O Aku lele po—e, o helelei
80. O Halau alii, o kahi i waiho ai-
81. Ka huaolelo a Piikalani
82. Ma laua o Lono
83. O kama i ka ipu poepoe la -e
84. Haele mai -E ku i ke kala,
85. E Lono i ka ueke -e
86. E Kane-i-ka-pohakaa
87. Hookaalia mai kea lo o ka moku ia'u nei
88. Hookaalia mai kea lo ia'u nei
36. Awake the rear and front corner trimmings
37. Awake the grass and sugar-cane thatchings
38. Awake the upper ridge of the house
39. Arise o rain; the daylight the calm, the gentleness
40. Arise o wind; the rushing waters; the well water
41. Kane's water of life, O awake!
42. Awake o mists driving inland
43. The mists driving seaward
44. The rough sea, the tame sea
45. The wild sea, the violent sea, the angry sea, the foreboding sea (kai aumakua)
46. The swelling sea, the rising sea, the swamping sea
47. The standing sea, and the boisterous sea of iku
48. It has surrounded, yea, it has surrounded
49. The sea has surrounded the islands
50. O the foaming sea, the rippling water
51. The water is bubbling the water is flying
52. The water bearer the water digger
53. O the tides Keaumiki and Keauka, still flow on
54. Let it flow crossways, let it flow inward, let it flow ocean ward.
55. O the rising billows, o the falling billows
56. O The surging billows in Kahiki
57. O continent of Kahiki hear us
58. Salvation from this death comes from you o Lono
59. O Lono! Alas, Lono!
60. O Lono of the mountains, o Lono on the ocean,
61. O Lono of the lightning, of thunder
62. Of the heavy rain, the dripping rain,
63. Of the cold rain, of the spattering rain
64. Which moves along the coast, O Lono
65. O Lono of the night, O Lono of the sunlight
66. O Lono with the restless eyes,
67. Ah, fly thee to the southern sea
68. A, fly thee to the northern sea
69. To the upturned sand, to moving sand, to the sane of Mahinauli
70. To the sand at Niihau, at Halalii
71. The nerite (pipipi), the barnacle (unauna), the white shell-fish
72. The naka (a species of fish) the squid, the kauri shell- fish (leho), the beche-de-mer, the sea urchin
73. The flat fish which burrows the sand; the sharp tooth lobster,
74. The small sea-egg in the rock crevices,
75. The large sea-egg in the deep
76. The lobster in the sea caverns
77. The soft shell crab (paiea) in the rocky crevices; the black crab which climbs the sea cliff
78. The young shell-fish, the shell-fish sticking to the rocks
79. The bonito that flies in the night and drops,
80. O Halaulii (Royal house) where were deposited
81. The words of Piikalani

- | | |
|--|---|
| 89. E Kane-ka-wai-ola—e: Eia ka ai, | 82. And of Lono |
| 90. Eia ka awa, e Kane, he awa-lani wale no, | 83. The child of the round gourd- |
| 91. He ai nak e Kama-iki | 84. Come ye forth, o Ku the forgiver |
| 92. Inu aku i ka awa lau-lena- | 85. O Lono the absolving one |
| 93. I ka awa o Keahi-a-Laka | 86. O Kane the thundering one |
| 94. Halawai aku la Pele | 87. Let the front of the land be turned toward me |
| 95. E ako ana i ka pua-lehua | 88. Yea, let the face be turned toward me |
| 96. Kui aku i kai o Hopoe | 89. O Kane of the water of life, here is the food |
| 97. He awa no na wahine o ka lani, | 90. Here is the awa, o Kane, the heavenly food |
| 98. A pale aku, a palepale mai | 91. Food for a child |
| 99. Mu ka waha, holoi ka lima | 92. Drink the yellow leaf awa |
| 100. E aliali kapu- E aliali noa | 93. The awa of Keahi-a-Laka |
| 101. Ua- no-a-ka awa—a | 94. Pele is met |
| 102. Amama, u anoa, lele wale | 95. Plucking the lehua blossoms |
| 103. Ka pule —a— | 96. To be strung down by the beach of Hopoe |
| 104. Noa —Honua—no—a- | 97. Here is the awa for the celestial ladies |
| 105. Ua—no—a—a- (Peleiholani in Poepoe n.d.:37-40) | 98. Shift it one way, then shift it this way |
| | 99. Roll the water in the mouth, wash the hands |
| | 100. Finished is the kapu:-Finished! It is free |
| | 101. The awa is free |
| | 102. Amen. It is free |
| | 103. The prayer is lifted |
| | 104. The Earth is free-O! It is free! |
| | 105. It is free (Poepoe n.d.:40-45) |

‘Alalā In Hawaiian Spirituality and Canoe Practices

Hawaiians recognized several classes of gods, one of which included those known as ‘*aumakua* (plural form ‘*aumākua*). Pukui and Elbert (1986:32) define ‘*aumakua* as “family or personal gods.” (Pukui et al. 1972) explained that the spirit of the deceased ancestor passed into Pō (the realm of the gods) by leaping from a *leina* (a place where spirits leap into the nether world). Through deification and ritualistic feedings by family members, the spirit transfigured into certain animals, plants, flowers, rocks, sea creatures, or clouds (Pukui and Elbert 1986; Pukui et al. 1972). The ‘*aumakua* rendered aid to its keeper and helped guide their deceased family members into the afterlife (Beckwith 1971; Kamakau 1964). Knowledge of one’s ‘*aumakua* was kept carefully hidden, and the sharing of such information with individuals outside the family circle (and occasionally even within) was and continues to be done cautiously and discreetly.

For some Hawaiian families, especially those of the Kona and Ka‘ū Districts of Hawai‘i Island, the ‘*alalā* was recognized as an ‘*aumakua*. In his book *Seeking The Sacred Raven Politics and Extinction on a Hawaiian Island*, Mark J. Walters (2006:24) explored the relationship between ‘*alalā* and those families that recognized it as an ‘*aumakua* and noted that “‘aumākua were actual members of one’s family.” Walters’ also included excerpts of statements made by several *kama‘āina* which have been cited below. Walters’ spoke with Joanna Gaspar whose family was from the South Kona area. In relating the information shared by Gaspar, Walters’ wrote:

“My grandmother lived in Ka‘awaloa before the town was abandoned,” she told me, speaking of the town that had stood at the bay’s northern end before it was abandoned at the beginning of World War II. “I’ve heard of the ‘alalā being ‘aumākua for some people, but I don’t know any still alive.” Then she added, with a hint of defensiveness, “Besides, Christianity has replaced the old beliefs.”

Gaspar directed me to Elsie Thompson, a woman in her eighties, who sat at one of the long lunch tables. Her maiden name was Ackerman and she had grown up at Keakalekua Bay, although she now lived in Keālia, several miles south, she said. “The ‘alalā was ‘aumakua for my father-in-law,” she said. “He’s passed away. He talked about the ‘alalā, but not a whole lot. I never asked him about it. It was a personal thing.” (Walters 2006:39-40)

Walters also spent time with brothers Clarence A. Medeiros Jr. and Jimmy Medeiros Sr. of South Kona. The brothers related detailed information about how the ‘*alalā*, which they recognize as their ‘*aumakua*, would guide

2. Background

their ancestors through the forest while in search of a suitable *koa* log from which a canoe could be built. The Medeiros' story begins with their great-great grandfather, John Mokuohai Puhalahua who was born in 1850 and took up the family's practice of canoe building. Puhalahua built fishing canoes and:

...was affectionately known as Kahuna 'Alalā because the birds were once common in the highland forests where he sought *koa* trees for his canoes. Kahuna 'Alalā spent many of his working days in the *koa* forests among 'alalā and within the ahupua'a of Honokua, Waiea, Keālia, and Kalāhiki and elsewhere—tracts that would one day be encompassed in the sprawling McCandless Ranch. (Walters 2006:215)

The practice of canoe building was subsequently passed to Puhalahua's grandson, Charles Mokuohai Parker, who like his grandfather became a well-known master canoe builder. Parker built fishing canoes but later adapted his craft and built racing canoes. Parker's descendants, brothers Clarence and Jimmy Medeiros related that "the 'alalā would follow him down the mountain and, as they had with his grandfather join him for lunch" (Walters 2006:216). In sharing more about the significance and the role of the 'alalā in their family practice of canoe building, Jimmy shared:

"The 'alalā is one of our family's 'aumākua, or protective spirits, through my mother's side," Jimmy Sr. told me one afternoon. We were standing under a corrugated tin roof on which he and his wife dried coffee beans harvested from bushes his father had planted years before. He explained that the family also had other 'aumākua, including the 'io and the owl. "What I know of Kahuna 'Alalā comes through the stories my father told me. He spent much of his time in the *koa* forests among the 'alalā as he looked for trees suitable for canoes. It could take a long time to select the right tree. One way to determine a good tree was to watch the 'alalā. If the 'alalā pecked at it or peeled off the bark, it was looking for insects, and the tree had rotten spots. When a tree was finally selected and cut, it had to be snaked by horse all the way down the mountain. The 'alalā would caw and cackle and make conversation as they followed my father and his helpers all the way back to his house, where they would gather for a while before returning to the forests. My great-great-grandfather was so closely associated with the birds, that's how he got the name Kahuna 'Alalā.

"It made sense that the 'alalā would be our 'aumakua, and it passed down through the generations to my own family," Jimmy Sr. continued. "But there are many other ways to come by an 'aumakua. An 'aumakua may present itself as an unexpected helping voice or physical presence, especially when you're in trouble, maybe lost in a forests or in personal trouble. Or you can discover a guardian spirit in a dream. In our case, it goes way back because our family built canoes further back than anyone can remember, before history." (Walters 2006:216-217)

In recalling memories of seeing 'alalā in the upland forests of South Kona, Clarence shared that:

For over 6 generations, my family have seen 'alalā in Honokua, and in the ahupua'a to the north—Waiea, Kalāiki, Ho'okena, and in the ahupua'a to the south...I have seen the 'alalā as far back as the 1950s and 1960s when their numbers were plentiful. The mountain was our store where we would go to hunt for wild game to eat, to gather maile for special occasions, pick watercress, ho'io, kakuma to eat, gather plants for medicine purposes, [and] cut wood to make utensils to clean taro and fish. On our way down from the mountain, the 'alalā would follow us, flitting from tree to tree, making loud, crowing calls. The 'alalā would follow us down to about the 2000 foot elevation and then they would disappear. The never came any lower than that. But in the 1990s, one 'alalā would frequent one of my kuleana in Honokua which was at the 1500 foot elevation. It would be crowing in the mango tree at about 6:30-7:30 in the morning. This lasted for only an hour's time. The 'alalā did this for about 9 months, then I never heard it again. (Walters 2006:220-221)

Concerning other recollections of 'alalā in Kona, Kepā Maly in citing an interview he had conducted in 2001 with Mr. Alfred Medeiros Jr., a native of South Kona (Kealakekua-Ka'awaloa) related that:

In those early years, the forests were thick with 'ōhi'a, maile, 'ie'ie. And through the 1960s he also recalled seeing 'alalā in the mauka lands of the ranch [McCandless Ranch]. (Medeiros in Maly and Maly 2001:A-185-186)

In addition to sharing this intimate family story, Walters also asked Jimmy Medeiros about his thoughts if the 'alalā were to go extinct, to which Jimmy replied:

“That is an issue,” he replied, stopping to think about it. “When the ‘*alalā* goes, we will no longer have its protection. Luckily, through my other grandfather’s side we inherited the pueo, or owl, as ‘*aumākua* too. Families have several ‘*aumākua*. But how long will the pueo be safe?” he asked, wondering aloud whether it would be around for his great-grandchildren.

“There is a planned housing development not far from here that would destroy an ancient nesting area of the pueo. What happens when we have no more ‘*alalā*, no more pueo, no more ‘*aumākua*? The loss of land took away our traditional diet of taro and sweet potatoes, and it’s taking away the animals. That is how the destruction of land destroys culture, health, and self-identity. In the end, it’s about land. The land is about who we are—or once were. It’s really the same with the ‘*alalā*. Its land was taken away too.” (Walters 2006:217)

In a subsequent conversation, Clarence Jr. told Walters about how during the 1960s, while hunting wild cattle he and his father would stop at the old wooden water tanks located on the leeward slopes of Mauna Loa. On some occasions, Clarence Jr. recalled seeing dead ‘*alalā* floating in the tanks. Recognizing this as a source of danger for the ‘*alalā*, Clarence Jr. and his father cut two-foot sections of the buoyant *hau* (*Hibiscus tilaceus*) wood and placed the logs in the tank with the hopes that “when the ‘*alalā* fell in they’d have something to grab and maybe not drown” (Walters 2006:221). Clarence Jr. added that “I think a lot of them [‘*alalā*] drowned in water tanks, which were built right in some of the areas where the birds were most common back then” (Walters 2006:221-222).

As demonstrated by Walters’ conversations with the Medeiros brothers, the ‘*alalā* provided canoe carvers (*kālaiwa‘a* or *kahuna kālaiwa‘a*) with important cues as to the internal integrity of the *koa* tree and whether or not that tree was suitable for a canoe. Similarly, the ‘*elepaio* (*Chasiempis sandwichensis*) is also recognized as serving this same purpose to canoe carvers (Fornander 1918-1919; Pukui and Elbert 1971). In Tommy Holmes (1981) book, *The Hawaiian Canoe*, he also credits the ‘*alalā* as functioning in this same capacity for the canoe carvers of Maui and Moloka‘i since the ‘*elepaio* is not found on either island. According to Kauwenaolu, an informant of Abraham Fornander, hearing the ‘*alalā* while seeking a log in the forest signaled to the practitioner that:

...the idea of building the canoe [from that particular log] should be abandoned, because it is evident to them that the tree is rotten inside. If they do not hear any noise from the birds until they come to the canoe tree, those priests would feel very glad. (Fornander 1918-1919:614)

Not only did the ‘*alalā* signify whether a tree was sound for canoe carving, but the ‘*alalā*, in general, was considered the heralds of the forests. Screaming flocks of ‘*alalā* seen flying towards the lowlands near settlements were understood as a warning of an impending lava flow from Mauna Loa or if the caw of an ‘*alalā* is heard after an *oli noi komo* (chant asking permission to enter) to enter the forests was offered, it was understood to be a sign to not enter the forest (Walters 2006).

Role of the ‘*Alalā* In *Oli* (Chant) Practices

Infamous for its loud and resounding calls that reverberate through the forest, the ‘*alalā* which is referred to by Pukui (1983:62) as “*He ‘alalā, he manu leo nui*” (It is the crow, a loud-voiced bird) is the source of inspiration for a distinct style of *oli* (chant) known by the same name. Walters (2006), in detailing information he obtained from several native informants, including Pualani Kanaka‘ole Kanahele, Mel Kalāhiki Sr., Ma‘uhili Dickson, and John Lake described the ‘*alalā* style of chanting in which the mouth of the chanter is opened wide and the vocal cords are deliberately quivered to deliver resounding chant. When Walters (2006:54) inquired with Mrs. Kanahele about “what does the name ‘*alalā* mean?” she responded:

“As with many Hawaiian words, it has many meanings,” she explained. “One meaning is the Hawaiian word for the cry of a child--‘*alalā*. That’s how it is said the ‘*alalā* got its name. But the word also refers to a specialized style of chanting, a style I sometimes use myself. You open your mouth very wide and create a sound by vibrating the vocal cords. The ‘*alalā* style projects your voice farther than other chanting style. It makes a different sound because you use a different space in your head to create the resonance. Maybe the Hawaiians learned this style of chanting by mimicking the bird. I don’t know. Hawaiian words invite many meanings, not all of them explicit.”

In his conversations with Mr. Kalāhiki (who along with Mr. Dickson are practitioners of Pu‘ukoholā Heiau), Walters (2006:55) learned that the ‘*alalā* was not only a distinct chant style but was also used in reference to a particular band of warrior chanters. Mr. Kalāhiki explained:

“The ‘*alalā* belonged to the class known as *ali‘i koa*, or warrior chief,” he said. “Their task was to chant in a style that used a quivering of the vocal chords [*sic*] to produce a stylized, haunting, melodious chant.”

Mr. Dickson added that “The ‘*alalā* inherited his role as a specialized chanter along bloodlines, assuming he could perform well enough...” (Walters 2006:56) The ‘*alalā* chanter was called upon during certain ceremonies and selected occasions one of which included when a chief wanted to deliver a message:

He might call on the ‘*alalā* to put the message into a chant and deliver it. The ‘*alalā* also needed oratory and poetic stills, something which most all Hawaiians were born with but which the ‘*alalā* was especially good at. (Dickson in Walters 2006:56)

The skills of the ‘*alalā* might also be employed during war, as:

“...another job of the ‘*alalā* was to shout the chief’s commands to large groups of warriors. The ‘*alalā* had to have a strong and loud voice, a gift reserved for a special few. No bird in the forest can shout like the ‘*alalā*. (Dickson in Walters 2006:56)

Dickson also informed Walters (2006:56) that “the wail that women once expressed at the death of a loved [one] was also known as ‘*alalā*.” In his closing comments to Walter (2006:57) Dickson added “We were an oral cultural and we still area, although most of us now read and write. The ‘*alalā* is that oral cultura in us that still lives.”

In a subsequent conversation with Kahuna Nui (head priest) of Pu‘ukoholā Heiau, John Keolamaka‘āinana Lake, he shared with Walters (2006:58) how the various band of warriors—each with their own specialized skills—were organized with the ‘*alalā* stationed “off to the sides of these frontline forces” which included the sling bearers and spear carriers. During the battle, the ‘*alalā* would shout strategic commands to the various bands to signal a shift in war strategy. Lake noted that “to communicate the commander in chief’s orders amidst the melee must have been a considerable challenge...That’s why the ‘*alalā* were crucial to winning the battle” (in Walters 2006:59). Lake further added:

“The bird may have been ‘*aumakua* to the ‘*alalā* warriors of Ka‘ū and Kona. What we can be sure of is that the ‘*alalā* warrior class took their name from the bird ‘*Alalā* the bird is a herald in the forest, and the warriors were the heralds in battle and chanters in Kamehameha’s court.

“It would have also been natural for the warriors and chanters to have called upon the bird for strength and ability, to rely on the bird to provide the gift of heraldry and chant. It was not in the Hawaiian way of thinking to take a namesake from an animal and for the connection to end there. There is almost always a connection in spirit and a sharing of soul, so to speak. In this case, there was probably a sharing of voice, a strong and gifted voice.” (Lake in Walters 2006:59)

As evidenced in the information shared above, the ‘*alalā* chanters, whether chanting for *hula* or heralding commands in the heat of battle, emulate the power and reverberance of ‘*alalā*’s call. Whereas the bodily gestures observed in *hula* reflect environmental phenomena, *oli* audibly mimics the diverse soundscape of Hawai‘i’s environments. In this way, the melodies and calls of the forest birds serve as an indispensable source of inspiration for *oli* practitioners.

‘*Alalā* in the Practice of *Kia Manu* (Bird Catching), Feather Work, and as Food

The art and mastery of *kia manu* (bird catching) was widely practiced throughout Hawai‘i prior to contact with the western world in 1778 and well into the the 19th century (Gomes 2016). Bird catchers, also called *kia manu*, traveled into the interior forest in search of varying species of native birds which they used for both artisinal and to a lesser degree, subsistence purposes. The birds which the *kia manu* typically captured and released provided the plumage from which ornate regalia worn exclusively by Hawaiian royalty were intricately crafted. Examples of such regalia include the *mahi‘ole* (feathered helmet), *ahu‘ula* (feathered cape), *lei hulu* (feathered lei), *kāhili* (feather standard), amongst others. In his book *Hawaiian Antiquities*, David Malo (1951:38) noted that the ‘*alalā* was “captured by means of the pole [*kia*] or of the snare [*ahele*]” and that “its feathers are useful in *kāhili* making.” Although the feathers of the ‘*alalā* were utilized in feather work, they were certainly not the choice feathers as Nathaniel B. (Emerson 1894:110) commented that “...a higher valuation was set upon bird feathers (those of the *mamo* and *o-o*) than upon any other species...”

Kia manu, who often conducted their work in solitude (or sometimes in the company of their wife) remained in the quiet of the forest for extended periods residing in a small makeshift hut called *pāpa‘i* (Emerson 1894). Remaining in the forest for an untold period meant that food had to either be hauled up or procured from the forest itself. Although the available historical information describing the diet of the *kia manu* is scant, there is some evidence that certain native birds, namely the ‘*ua‘u* (*Pterodroma sandwichensis*), *nēnē* (*Branta sandvicensis*), ‘*a‘o* (*Puffinus newelli*), and *koloa* (*Anas sp.*), were actively sought out for subsistence purposes (Gomes 2016). There is

evidence to suggest that the ‘*alalā*’ was consumed as a source of protein, however, the extent to which it was actively sought out as a food source is debatable. Malo (1951:38) simply states that the “body [of the ‘*alalā*’] is used for food,” however other historical accounts including one published in the Hawaiian language newspaper *Ka Lei Momi* (1893:3) included a less than favorable description of the taste of the ‘*alalā*’s meat, which was told to be incredibly tough with an unpleasant and putrid odor (“*He manu uwauwau loa ka Alala me he loli la, aole no hoi he ono loa ka ai i kona io. He hauna a hohono no hoi*”).

Traditional Mo‘olelo Associated with the ‘Alalā

Traditional Hawaiian *mo‘olelo* are key entry points to understanding the history and ideologies that have been attached to a specific place or in this case the ‘*alalā*. The term *mo‘olelo*, which means “succession of talk,” has many meanings, including story, tale, myth, history, literature, tradition, and legend (Pukui and Elbert 1986:254). For this study, the term *mo‘olelo* is used to reference Hawaiian narratives that are mythological or legendary in nature. A review of *mo‘olelo* that feature the ‘*alalā* is important because it sheds light on the cultural role and significance of the ‘*alalā* in Hawaiian culture. In some cases, *mo‘olelo* can be expansive, and detailed, and are sometimes interconnected to other *mo‘olelo* through certain characters or events. Furthermore, a review of *mo‘olelo* sheds light on aspects of Hawaiian culture including historical figures, beliefs, traditions, wahi pana (legendary places), and place names, all of which contribute to an in-depth understanding of the people, their culture, and their connection to a place and its resources.

Despite an exhaustive search through primary and secondary source material, *mo‘olelo* that make explicit reference to ‘*alalā* are few and have been summarized below. There is, however, at least one other *mo‘olelo* that includes subtle references to the ‘*alalā* but only in the context of the name of a character. An example of this is found in the legend of the infamous rat-shooter Pīkoiaka‘*alalā*.

‘Alalā, Father of the Infamous Rat-Shooter Pīkoi-a-ka-‘Alalā

Published in the Hawaiian language newspaper *Ka Nūpepa Kū‘ōko‘a* in the mid-1860s, S.M. Kauī, of O‘ahu tells the legend of Pīkoi-a-ka-‘Alalā. Although the ‘*alalā* is not, per se, the focus of this story, the first edition of this legend provides a genealogical introduction to Pīkoi and his family who hailed from Wai‘oli, Kaua‘i. This section of the story introduces ‘Alalā as the father and Koukou as the mother, to whom were born six divine daughters (*kaikamahine Akua*) who took the form of rats, a human daughter named Kau‘iomānoa, and their son Pīkoi-a-ka-‘Alalā (Pikoi, son of ‘Alalā) who was known for his excellence in rat shooting. That portion of the *mo‘olelo* explaining their genealogy along with a translation completed by ASM staff is provided below:

O Alala ka makuakane, o Koukou ka makuahine. O ko laua aina i noho ai, o Waioli i Kauai. Ua ao no laua i ka laua hana o ka Pana Iole i ko laua wa. A hanau mai na laua eono kaikamahine Akua, a hookahi kaikamahine kanaka. A o ka muli loa o Pikoikaalala, ke keiki kaulana hoi no ke akamai i ka Pana Iole, ka mea hoi nona keia Kaao.

Eia hoi na inoa o na kaikamahine a laua,

“O Kikoookalani ka mua,

O Kikoookahonua ka lua,

O Kikoookamauna ke kolu,

O Kikoooka moana ka ha,

O Kikoookapo ka lima,

O Kikookeao ke ono,

Pau na keiki Akua; o Kauiomanoa ke kaikamahine kanaka; a o ka hiku hoi ia, o Pikoikaalala ka walū. O na kino o ua poe kaikamahine Akua nei he Iole. A

Alala is the father, Koukou is the mother. Their place of residence was Wai‘oli, Kaua‘i. They both learned their craft of rat shooting during their time. They have birth to six divine daughters (*kaikamahine Akua*) and one human daughter. The youngest was Pīkoiaka‘*alalā*, the boy famous for his skill in rat shooting, for whom this legend is written.

These are the names of their daughters

Kīko‘ookalani, the eldest,

Kīko‘ookahonua, the second,

Kīko‘ookamauna, the third,

Kīko‘ookapā, the fifth,

Kīko‘okeao, the sixth.

After their divine children; was Kau‘iomānoa, the human daughter; who was the seventh; and Pīkoiaka‘*alalā* was the eighth. The bodies of their divine daughters are rats. And it is also the reason for Pīkoiaka‘*alalā*’s great skill in rat

*o ke kumu no hoi ia o ke akamai nui o
Pikoiakaalala i ka Pana Iole. A nui ae
la o Kauiomānoa, a ui, a wahine
maikai; makemake oia e holo i Oahu
nei, e imi i kane nana. (Kauī 1865:1)*

shooting. Kau'iomānoa grew to be a
beautiful woman; she desired to travel
here to O'ahu in search of a husband.

Although this *mo'olelo* does not tell us more about Pīkoi's father 'Alalā, it does offer areas of research that should be explored in future research efforts.

Māui and His Association with Hawai'i's Birds

Of the *mo'olelo* associated with the ancient *kupua* (demigod; supernatural being capable of possessing human and non-human body forms) of Hawai'i, those associated with the legendary hero, Māui tells of his many adventures with the different birds of Hawai'i and across Oceania. Many of the *mo'olelo* connecting Māui to the birds of Oceania were recorded by William D. Westervelt (1910) in his book *Legends of Maui-A Demi-God of Polynesia and of His Mother Hina*. Some of the stories recorded by Westervelt were compiled and retold respectively by Mary Kawena Pukui and Caroline Curtis in their book *Tales of the Menhune* (Pukui and Curtis 1960). Some of Māui's most renowned interactions with Hawai'i's birds include learning the secret of fire from the 'alae (mud hen) in Hilo but after being deceived one too many times, Māui branded the bird with the firestick thereby leaving the infamous red ('ula) mark on its head, thus its name 'alae 'ula. According to Westervelt (1910:144), Māui possessed an array of supernatural powers that allowed him to "assumed the form of birds and insects."

Although the following *mo'olelo*, does not explicitly name the 'alalā, it tells of how Māui kept hidden the vibrant colors of Hawai'i's birds until he was visited by a god from another island. Although the delightful songs and humming of the wings could be heard, their colors and physical features remained invisible to everyone except Māui. After boasting of the beauty of their respected lands, Māui in his effort to showcase the beauty of his land to the visiting god decided at once, to lift this mysterious veil thus revealing the great hues of colors of Hawai'i's birds. The story reads thusly:

One of the old native Hawaiians say that in the long, long ago the birds were flying around the homes of the ancient people. The flutter of their wings could be heard and the leaves and branches moved when the motion of the wings ceased and the wanderers through the air found resting places. Then came sweet music from the trees and the people marvelled. Only one of all mankind could see the winged warblers. Maui, the demi-god, had clear vision. The swift-flying wings covered with red or gold he saw. The throats tinted many colors and reflecting the sunlight with diamond sparks of varied hues he watched while they trembled with the melody of sweet bird songs. All others heard but did not see. They were blind and yet had open vision.

Sometimes the iiwi (a small red bird) fluttered in the air and uttered its shrill, happy song, and Maui saw and heard. But the bird at that time was without color in the eyes of the ancient people and only the clear voice was heard, while no speck of bird life flecked the clear sky overhead.

At one time a god from one of the other islands came to visit Maui. Each boasted of and described the beauties and merits of his island. While they were conversing, Maui called for his friends the birds. They gathered around the house and fluttered among the leaves of the surrounding trees. Soon their sweet voices filled the air on all sides. All the people wondered and worshipped, thinking they heard the fairy or menhune people. It was said that Maui had painted the bodies of his invincible songsters and for a long time had kept the delight of their flashing colors to himself. But when the visitor had rejoiced in the mysterious harmonies, Maui decided to take away whatever veil shut out the sight of these things beautiful, that his bird friends might be known and honoured ever after.

So he made the birds reveal themselves perched in the trees or flying in the air. The clear eyes of the god first recognized the new revelation, then all the people became dumb before the sweet singers adorned in all their brilliant tropical plumage.

The beautiful red birds, iiwi and akakani, and the birds of glorious yellow feathers, the oo and the mamo, were a joy to both eye and ear and found high places in Hawaiian legend and story, and all gave their most beautiful feathers for the cloaks and helmets of the chiefs. (Westervelt 1910:112-114)

Although the above *mo'olelo* does not explicitly name the *'alalā*, the following account titled *Lepe-a-moa* also recorded by Westervelt provides an interesting narrative about the ancient *kupua* Lepe-a-moa who—during a battle with the Keauhelemoa, the *kupua* rooster belonging to Maui, the king of Maui—shape-shifted into an *'alalā*.

The Story of Lepe-a-moa

Taken from W. D. Westervelt's book *Legends of Old Honolulu*, the chapter titled *Lepe-a-moa* includes four separate *mo'olelo* that tells of the life of the *kupua* Lepeamoa, who possessed the power to assume various bird forms and her younger brother, Kau'ilani. The *mo'olelo* of Lepeamoa can also be found in the Hawaiian language newspaper, *Ka Nūpepa Kū'oko'a* in the fourteen part publication titled *He Ka'ao No Kauilani* published by Samuela Kapohu between September 18th, 1869 through February 12th, 1870 (Kapohu 1869-1870). Although the summary below is based on Westervelt's (1915) version, Kapohu's version was also carefully reviewed.

As a preamble to this lengthy story, Lepeamoa's parents were Ke'āhua a chief of Kaua'i, and Kauha'o of Kapālama, O'ahu. At one point in Ke'āhua's life, he traveled to O'ahu and sought Kauha'o as his wife. The couple returned to Kaua'i and resided for a short time at Wailua but Ke'āhua soon found himself in a battle with another *kupua* named Akua-pehu-'ale. His defeat by Akua-pehu-'ale forced Ke'āhua and his wife into the uplands of Kawaikini, Wailua where the couple lived with their followers. After some time Kauha'o became pregnant and soon gave birth. After Kauha'o gave birth it was soon realized that the child was, however, born as a *huamoa* (chicken egg). At the sight of the egg, Ke'āhua thought to discard the egg child but instead, the egg child was entrusted to the care of the grandmother, Luakaikapu.

The day Kauha'o delivered the egg child, her parents, Kapālama and Honouliuli thought it prudent for them to travel to Kawaikini to accompany their daughter and grandchild. Kapālama, however, already knew the child would be born as an egg so they readied their canoe *Pōhakuokaua'i* and traveled to Kaua'i and met with their grieving daughter and son-in-law. Kapālama proposed that she take and care for the egg child, to which the parents agreed. Kapālama and Honouliuli wrapped the egg in soft tapas and returned home to Kapālama and set up a house where the egg child was safely kept and nurtured. The house was furnished with the finest tapa cloths and scented with various fragrant plants. Soon, Kapālama heard noises coming from within the egg child's house. Upon their inspection, the egg had hatched into a very beautiful chicken adorned in a colorful plumage. The grandparents continued to care for the chicken until one day, they heard a muffled voice coming from within the house. Upon their inspection, the grandparents saw that the chicken had transformed into a beautiful girl which they named Lepeamoa. Lepeamoa's beauty was so divine that she radiated colors and was accompanied by a brightly colored rainbow wherever she went.

As the grandparents raised Lepeamoa at Kapālama, Ke'āhua and Kauha'o became pregnant and gave birth to their second child, a son named Kau'ilani who was raised by his paternal grandparents. His paternal grandparents frequently took him to a special pool called Waiu'i, which possessed mystical powers that incited rapid growth. After a few short years and frequent visits to Waiu'i, Kau'ilani returned to his parents who were amazed to see their son had matured so quickly. Ke'āhua spoke to Kau'ilani and asked for his help in defeating Akua-pehu-'ale and restoring him as king of Wailua. Kau'ilani proposed a plan to his father and they carried out all part of the plan that ultimately led to a fierce battle between Kau'ilani, Akua-pehu-'ale and their gods. Akua-pehu-'ale was killed and Kau'ilani and Ke'āhua reclaimed the lands of Wailua with all of its fishponds and taro and sweet potato lands. After residing at Wailua with his parents, Kau'ilani asked if he was an only child to which his mother informed him of his sister, Lepeamoa who lived on O'ahu. Longing for a new adventure, Kau'ilani traveled to O'ahu in search of his sister.

The Battle Between Lepeamoa and Keauhelemoa

In this portion of the *mo'olelo*, Kau'ilani is on O'ahu visiting his sister, Lepe-a-moa. Together, they reside in Kapālama with their grandparents. One day Kau'ilani desired to meet Kākuhihewa, the king of O'ahu who was hosting his sister, Wailuku, and brother-in-law, Maui, the king of Maui. In Maui's possession was a *kupua* rooster named Keauhelemoa who was an ancestor of Kau'ilani's family. Keauhelemoa could:

...assume a different bird form for each magic power he possessed. This, with his miraculous human powers, made him superior to all the roosters which had ever been his antagonists in cock-fighting. (Westervelt 1963:229)

While on O'ahu, Maui challenged and defeated many of O'ahu's chiefs in cock-fighting and made his last bet with Kākuhihewa for his entire kingdom. Realizing the magical powers of Keauhelemoa, Kākuhihewa feared

losing his kingdom to Mauinui. Kākuhihewa had heard about Kau'ilani and sent messengers to Kaua'i to on a futile search for the young chief. Kau'ilani, however, arrived before Kākuhihewa and was recognized as a chief of Kapālama. Not realizing that the young chief before him was indeed Kau'ilani, Kākuhihewa proceeded to speak with Kau'ilani about how he might acquire more power that would enable his roosters to defeat Keauhelemaoa. Kau'ilani inspected the king's roosters but none possessed the power needed to beat Keauhelemaoa. Kau'ilani said to Kākuhihewa that perhaps he could find a powerful bird that would help him retain his kingdom. In exchange, Kākuhihewa offered his daughter as a wife to Kau'ilani.

Kau'ilani returned to Kapālama to seek the help of his sister, Lepeamoa. The duo went down to a pool to swim at which point they heard the sweet voice of an '*elepaio* bird. The little '*elepaio* bird was none other than Lea, the goddess of canoe carving. Lea instructed the brother to conceal Lepeamoa's identity in battle by hiding her in a *lei* which he would wear around his neck. Lea warned that if Keauhelemaoa saw Lepeamoa before hand, he would destroy her entirely. Lastly, Lea instructed Lepeamoa on which body forms she should assume while in battle with Keauhelemaoa that would lead to her victory. The brother and sister returned home and spoke with their grandmother, Kapālama about Kākuhihewa's troubles. Like Lea, Kapālama advised them in a similar manner that would lead to their victory.

The day came for Kau'ilani to conceal Lepeamoa and deliver her as an egg to King Kākuhihewa's residence at Waikīkī and soon the cock-fighting battle was to begin. It was here that Kākuhihewa's daughter was betrothed to Kau'ilani. Mauinui delivered his proposition to Kākuhihewa which was "death to the defeated" but Kākuhihewa refused and instead offered his wager "we will try one rooster, and then another. If both of my roosters are killed, we will rest until time has been give to get another bird for me" (Westervelt 1915:237). One by one, each king set out their roosters and both of Kākuhihewa's roosters were quickly killed. As the kings rested, Kau'ilani took out his egg and uttered a chant which caused the egg to hatch into a full grown hen. Kau'ilani instructed his sister on the various manners in which to defeat Keauhelemaoa to which she heeded. One by one, Lepeamoa destroyed the various bird forms of Keauhelemaoa. When Keauhelemaoa transformed into a red bird, she turned white and struck him down. He then turned into a *nēnē* (*nēnē* goose) and she became a small mud-hen and dealt a terrific blow to Keauhelemaoa's face until all that was seen was a great billow of feathers. Using his last bits of energy Keauhelemaoa called upon the snow and ice to sweep over O'ahu:

Then Kauilani called to his sister: "Behold Ke-au-hele-moa comes to his last strength. He follows the ice-cloud. Can you make a way of escape?" This call was in a spirit voice and none of the people heard.

Lepe-a-moa called upon Ke-ao-lewa (The morning cloud) for help, and a cloud was let down as a shield, turning off the cold mist and letting it pass on over the sea. So Kakuhihewa and his people were left in peace.

Lepe-a-moa flew up into a tall coconut-tree and saw her enemy in the form of a *manu-alala* (**great black bird**) coming behind the mist to the battlefield. She flew down and put on the color of the *pua-niu* (the cream color of a coconut blossom) and again flew like a whirlwind around her enemy. Then the ancestor-bird took his last body, that of a *moa-a-uha*. (Westervelt 1915:240)

As Keauhelemaoa shapeshifted he was met with the various forms of Lepeamoa, which vastly outnumbered her enemy. Following the instruction of her brother, Lepeamoa fought fearlessly against her opponent thereby destroying different parts of him until at once, she "dashed against him, and he fell over" (Westervelt 1915:242). After Keauhelemaoa was dashed to his death, Lepeamoa flew back into the arms of her brother and they made a swift escape back to Kapālama. It had come to Kākuhihewa's realization that the young chief who had aided him in defeating Mauinui and Keauhelemaoa, was none other than Kau'ilani. Despite efforts to send a search party to locate the whereabouts of Kau'ilani, he could not be found. Kākuhihewa did not heed death as victory and therefore, Mauinui returned home to the island of Maui and his wife, Wailuku remained on O'ahu with her brother. After aimlessly searching for Kau'ilani, Kākuhihewa's men finally found Kau'ilani at Kapālama. They requested his return to the king and with the urging of Lepeamoa, Kau'ilani agreed. Upon his return to the king's compound, he learned that his wife, Kākuhihewa's daughter, was preparing to give birth to their child, a baby girl. When the child was born, she was entrusted to the care of Lepeamoa who adopted the baby as her own and give it the name Kamamo. Kau'ilani lived out the rest of his life with his wife in the court of his father-in-law, Kākuhihewa.

Accounts of ‘Alalā in the Hawaiian Language Newspapers

Several articles making explicit reference to the ‘alalā were published in 19th-century Hawaiian language newspapers. Both of these articles, which were written by G. W. Kahiolo describe the characteristics, and mannerisms, as well as an anecdotal account of a mischievous ‘alalā on O‘ahu. In 1863, Kahiolo, authored a series of articles which he published in *Ka Nūpepa Kū‘oko‘a* under the title, *Ka Moolelo O Na Manu O Hawaii Nei* (The Story of the Birds of Hawai‘i). In part two of Kahiolo’s series, which appeared in the May 9th edition, he included a sketch (Figure 17) along with describing the bird’s characteristics, sound, diet, and how the ‘alalā were attuned to finding water sources. Kahiolo’s article is reproduced below along with a translation by ASM staff. The article reads:

He manu eleele ka Alala e like me ka Moa kinana, a pela no hoi kona nui, he kikiwi kona nuku. O ka maia pala o kae-a ka-na ai, a me ka maia kanu no hoi, a pili ana ma ka waonahale. He manu akamai loa ka Alala i ka noii ana, aole koe ka maia pala ke loa iaia, a he manu imi wai no hoi, nolaila oia i kapaia‘i, he manu pao huiwai.

O kona inoa, ua kapaia mamuli o kana kani, oau-a ke kani a Alala, a o Alala ka mea nana oau-a. He manu pioloke ka Alala, he paia kuli ka pepeiao ia a ke hele ma kanahale, ma na wahi i nohoia e ia.

Ina e loa kekahi Alala i ke kanaka, a hoalala aku, alaila, he mea e ka huhu a me kona hae mai, e kiki mai no oia me ka maka‘u ole, me he kinana Moa la, e kai pu ana me kana poe keiki. (Kahiolo 1863b)

The Alalā is a black bird similar to a hen, and its size is similar, its beak is curved. The ripe ‘e‘a banana (mountain banana) is its food as well as the cultivated bananas found in the upland forest. The Alalā is an intelligent bird when it is searching [for food], nothing remains of the ripe banana when it is in its possession, and it is a bird that searches for water, that is why it is called the bird that pecks the water gourd.

Its name was given because of its sound, *oau-a* is the sound of the Alalā and it is the Alalā that *oau-a*. The Alalā is a noisy bird, its sound is deafening when it moves about the forest, the place where it lives.

When a person encounters an Alalā and mimic its sound (*hōalalā*), it is a thing that angers it and causes it to squawk, it will fly fearlessly, like a hen guarding its babies.

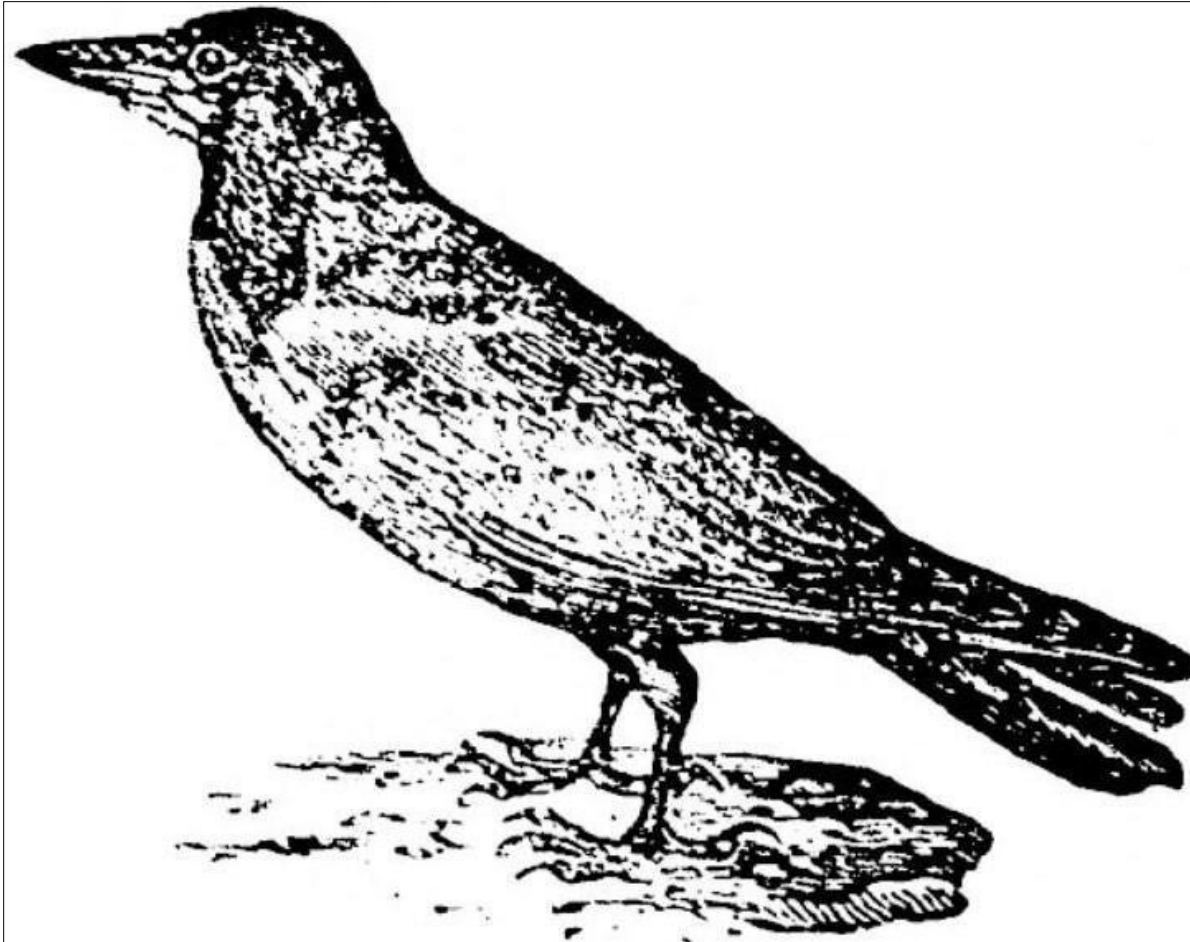


Figure 17. Sketch of an 'alala published by Kahiolo (1863b:1).

Published in the September 24th, 1864 edition of *Ka Nūpepa Kū'ōko'a*, G. W. Kahiolo told the story of a Honolulu resident, Daniel Kauaua and his wife Hainau, who reportedly shared their home with an 'alalā. As the story is told, Kauaua left his 'eke dala (wallet) on a bed and left the house. The 'alalā, which was left in the care of Hainau, wandered over to the bed and without Hainau's knowledge, the bird grabbed the wallet and placed it in an *ipukuha* (spittoon). When Kauaua returned home, he and Hainau searched aimlessly for the missing wallet. A nearby neighbor, Kekela informed the couple that she had seen the 'alalā take the wallet and place it in the *ipukuha*. The couple proceeded to the *ipukuha*, and at once, found the missing wallet. This particular 'alalā was known for its mischevious and cunning ways as it was also reported this 'alalā had pecked at someones water gourd (*nana i pao i ka huewai a ke kanaka*) and temporarily conceal coins and tobacco pipes only to bring them out again for show. The author concluded the article by describing the 'alala as "*he keu ka hana maalea a keia manu*" (this bird is very cunning) (Kahiolo 1864:1).

Appearing the July 31st, 1893 edition of *Ka Lei Momi*, the following article titled *Kau Wahi Hoomanao no na Manu o-ka Lewa* (My Recollections of the Birds of the Sky) provided even more cultural insight into the 'alalā. Although the author is not listed, based on the similarity of the text published in the May 9th 1863 (see above) edition of *Ka Nūpepa Kū'oko'a*, this article appears to have also been written by G. W. Kahiolo. The article is cited in its entirety below along with a translation provided by ASM staff:

Ka Alala

He manu eleele ka Alala e like me ke Kinana, a pela no hei ka nui. He nui kona nuku a ua kikiwi. O ka maia ka ea kana ai, a me na maia kanu no hoi ke pala. He manu inuwai ka Alala; no laila i kapaia ai

The 'Alalā

The 'Alalā is a black bird similar to a hen, and its size is similar. Its beak is large and curved. The ripe 'e'a banana is its food as well as cultivated bananas when they are ripe. The 'Alalā is a water-loving bird;

he manu pao hūewai, mamuli o kona lolohe i na hūewai o ka ulueki. He uhekeheke kona kino e like me ke kinana, aole loihi kona a-i, aohe poo nui, aohe kioea, he nui kupono no kona mau ano a pau. Ua kapaia oia mamuli o ke ano o kana kani ana. O “awa” kana kani ana, a o Alala ka lawe’na inoa. He manu pioloke ka Alala, he paiakuli ke hele i ka nahele. A no kona akamai ole i ka lawaia, a no kona noho mau i ka nahele, nolaila ua hookomoia ka Alala iloko o na manu o ka aina, e like me ka Io a me ka Pueo.

Ina e loa ka Alala i ke kanaka a hoalala aku, he mea o ka hae o na Alala i ke kanaka. E kiki mai no i ke kanaka me ka me he kinana kai keiki la a me he pueo la no hoi. He manu uwauwau loa ka Alala me he loli la, aole no hoi he ono loa ka ai i kona io. He hauna a hohono no hoi. (Ka Lei Momi 1893:3)

therefore it is known as the bird that pecks the water gourd, because it can hear, very well, the water gourds in the forests’ understory. It’s body is plump like a hen, it’s neck is not long, its head is not big, its legs are not long, its size is perfectly scaled all around. It is so called because of its sound. The “āwā” is its sound, and ‘Alalā is the name it received. The ‘Alalā is a noisy bird, its sound is deafening when traveling about the forest. Due to its lack of fishing skill and permanently dwelling in the forest, it is considered a land bird, similar to the ‘Io (hawk) and the Pueo (owl).

When a person encounters an ‘Alalā and mimics its sound (*hōalalā*), the ‘Alalās will squack to the human. It will fly directly to the human like a hen guarding its babies or like a *pueo*. The [flesh] of the ‘Alalā is incredibly tough like that of a seacucumber, its flesh is not good eating. The odor of the flesh is unpleasant (like rotting meat) and offensively putrid.

DESCRIPTIONS OF ‘ALALĀ BY EARLY EXPLORERS AND NATURALISTS

The observations and surveys undertaken by early European explorers and naturalist during the late 19th and early 20th century forms much of the scientific basis for understanding the physical characteristics, diet, and distribution of historic populations of ‘*alalā*. These early studies, which begin with the observations made by Captain James King in 1779, are presented below.

Lieutenant James King, 1779

Lieutenant James King, the Naval Officer accompanying Captain James Cook on his third Pacific voyage, documented the earliest European account strongly believed to be describing the ‘*alalā*. In the early part of 1779, upon their arrival in Kealakekua Bay, King recorded his observations of a bird he referred to as a “raven;” In describing the birds of the Hawaiian Islands, King stated “Ravens are found here, but they are very scarce; their colour is dark brown, inclining to black; and their note is different from the European” (Cook and King 1784:119). In the excerpt cited below, King tells of a visit to a “house” south of Kealakekua Bay containing what are likely *ki’i* (wooden idols, images), as well as a custom surrounding the adoration of certain birds—the “raven”—and his unsuccessful efforts to obtain specimens of these avian creatures:

In a bay to the Southward of Karakakooa [Kealakekua], a part of our gentlemen were conducted to a large house, in which they found the black figure of a man, resting on his fingers and toes, with his head inclined backward; the limbs well formed and exactly proportioned, and the whole beautifully polished. This figure the natives called *Maee*; and round it were placed thirteen others of rude and distorted shapes, which they said were the *Eatooas* [Akua] of several deceased Chiefs, whose names they recounted. The place was full of *whattas* [haka], on which lay the remains of their offerings. They likewise give a place in their house to many ludicrous and some obscene idols, like the Priapus of the ancients.

It hath been remarked, by former voyagers, that both among the Society and Friendly Islanders, an adoration is paid to particular birds; and I am led to believe, that the same custom prevails here; and that, probably, the raven is the object of it, from seeing two of these birds tame at the village of Kakooa, which they told me were *Eatooas*; and, refusing everything I offered for them, cautioned me, at the same time, not to hurt or offend them. (Cook and King 1784:160-161)

Peale and Cassin, U.S. Exploring Expedition, ca. 1858

Between 1838 and 1842, Lieutenant Charles Wilkes of the U.S. Exploring Expedition led the first government-sponsored expedition into the Pacific. Abroad Wilkes' crew was Titian Peale, the expedition's naturalist/artist. Peale's description of what he identified as *Corvus hawaiiensis* was published by American Ornithologist, John Cassin as part of the Expedition's mammal and ornithology findings. Based on Cassin's remarks, it appears that the Exploring Expedition collection specimens of the *Corvus hawaiiensis*, however, these along with notes were lost when the ship transporting these items, the U.S.S. Peacock, ran aground in 1841 off the Washington-Oregon coast.

FORM.—About the size of or slightly larger than *Corvus americanus* or *Corvus corone*. Bill large, thick, rather short; wings rather long, fourth quill longest; tail moderate, rounded.

DIMENSIONS.—Total length. Male? (of skin), eighteen and three quarter inches; wing, twelve inches; tail, eight inches; bill, two and one-fourth inches; tarsus, two and a half inches. Female ? Total length, seventeen and a half inches.

COLORS.—Entire plumage, fuliginous brown, with a slight tinge of cinereous. Quills, light reddish-brown, with their shafts white on their under surfaces; all the plumage dark cinereous at the bases of the feathers. Bill and legs black, the former lighter at tip.

HAB.—Hawaii, Sandwich Islands. Specimen in Mus. Acad. Philadelphia.

Of this remarkable *Corvus*, there are no specimens in the collection of the Expedition, but the description by Mr. Peale was drawn from two specimens now in the collection of the Academy of Natural Sciences of Philadelphia, to which they were presented by the late John K. Townsend, M.D., a distinguished naturalist and traveller [*sic*], who received them from the Rev. Mr. Forbes, then attached to a missionary station at Karakakua Bay [Kealahukua Bay].

This species appears to have been hitherto unknown as an inhabitant of the Sandwich Islands, and in all probability, had not been noticed by naturalists previous to its being described by Mr. Peale. We consider it possible, however, that this bird may be the *Corvus australis*, Gmelin, in young plumage, both the specimens above described being evidently immature. This point cannot, in our opinion, be determined either from the specimens before us, or from the heretofore published statements of naturalists or voyagers, and must await future more extended observation and information.

In a short but important article on the Natural History of the Sandwich Islands, by Mr. A. Bloxham, in an Appendix to the "Voyage of H.M.S. Blonde, to the Sandwich Islands," p. 250...the only species of crow given in the catalogue of birds, is "*Corvus tropicus*"... The description of that species, by Dr. Latham (in his General Synopsis of Birds, p. 384), "from a bird in the possession of Sir Joseph Banks," is not applicable to the present, in several particulars. Its total length is given as "twelve inches and a half," and we have doubts as to its having been a true *Corvus* at all. We may say the same of another Pacific island species, *Corvus pacificus*...which is also represented as a small species, "length, ten inches and a half."

In its present plumage, the color of this species is peculiar, and is very remarkable. We regard it as a highly interesting addition to the fauna of the Sandwich Islands, and as very probably a species hitherto not described, thought the adult plumage may prove to be essentially different from that of the specimens now before us, from the Museum of the Philadelphia Academy. It is the only crow that we have ever seen with the plumage uniformly tinged with a cinereous shade of color, like that of some species of Jays.

According to Mr. Peale, the bird now before us is known to the people of the Sandwich Islands by the name of *Alala*, and was observed in small societies, in the island of Hawaii. "Specimens," he says, "were obtained a few miles inland from the village of Kaawaloa, celebrated as being the spot where the renowned Captain Cook was killed, a camera lucida sketch of which is introduced in our plate, as a background to the bird. Our specimens, collected by the Expedition, of the *Alala*, with many important notes attached, were lost in the wreck of the U.S. Ship Peacock, but we are happy to acknowledge our obligations to Dr. J. K. Townsend, who had kindly loaned us others, collected at the same place." (Cassin 1858b:119-120)

This bird is represented in our plate about two-thirds of the size of life.

A camera lucida sketch of the '*alalā*' observed by Peale at Kealahukua Bay is provided below in Figure 18.



Figure 18. Camera lucida sketch of the *Corvus hawaiiensis* superimposed on a background of Kealahou Bay by T. Peale (Cassin 1858a).

S. B. Wilson, 1877-1888

In 1887-1888, British Naturalist S. B. Wilson surveyed Hawai'i Island and documented various bird species previously unknown to the Western world, including a *Corvus* species. Wilson's records of this particular species include the following description and a sketch of the bird, which was prepared by F. W. Frohawk (Figure 19).

There can be no doubt that the "Ravens" mentioned by King in his account of Cook's last voyage as having been met with a Kakooa in Hawaii are to be referred to this bird, specimens of which must have reached England about that period, for Latham described his Tropic Crow in 1781 from an example brought from Hawaii in the collection of Sir Joseph Banks, which from the details appears to have been a pied specimen. Peale's *Corvus hawaiiensis* is of course identical, since this is the only species in the island.

Bloxam noticed this species in his account of the voyage of the 'Blonde,' and Peale procured several examples during the United States Exploring Expedition; but as these were lost in the wreck of the 'Peacock,' the latter must be considered fortunate to have so readily obtained the loan of two others from Dr. J. K. Townsend, which were sent from Kaawaloa by Mr. Forbes, a missionary at Karakakoa Bay, and were afterwards deposited in the collection of the Philadelphia Academy. Cassin, however, while remarking upon the uniform cinerous tinge visible in Peale's examples, and upon their small dimensions, did not consider them to belong to the *Corvus tropicus* of Gmelin, which is founded on Latham's Tropic Crow, but surmised that they might be the *C. australis* of the former author.

This interesting bird, well known to the natives by the name of Alala—the strict signification of which is the cry made by any young animal—is fairly common in the district of Kona on Hawaii, where it ranges from 1100 to 6000 feet and probably higher. As Peale observes, in his excellent account, "They frequent the woody district of the interior, seldom, if ever, visiting the coast."

In the ohia forests, a few miles above Kaawaloa (celebrated as being the spot where Captain Cook fell), I found this bird numerous in the month of June, by which time the brood had already left the nest. A friend, extremely clever at imitating sounds, was able, by carefully concealing himself and then mimicking the cry of the young Alala, to collect round him in a short time many of the old birds; he had found a nest at the end of April, which he informed me was a large loosely-fashioned structure of dead sticks, resembling that of a Pigeon, placed in a *Pandanus*. The Alala seems to feed principally on the fruit of the Iéié (*Freycinetia arborea*), but no doubt, when occasion serves, takes the young of the various forest birds. Peale remarked in this connection:—"We noticed that the smaller species of birds were kept in great terror by the presence of the Alala; from this we infer that, like other crows, they will rob nests of their eggs, and when an opportunity offers ear the old birds: such was their character given to us by the natives."

I was assured by the islanders that they collect in large numbers and feed on the sheep occasionally found dead from natural causes or killed by wild dogs, which animals are said only to suck the blood, leaving the carcass otherwise intact.

The Alala is a noisy species, and Peale remarks that "its voice closely resembles that of the North-American Fish-Crow, *C. ossifragus*." It is far from wild; and I secured a specimen by a shot from my 28-bore when on the back of a steady-going mule, as we were riding through the forests. It seems to be restricted to two districts of Hawaii—Kona and Kau; personally I only observed it in the former, but was assured, on authority of a friend who resided in Kau, of its presence there as well. At Puuanahulu—a veritable oasis surrounded by lava-flows—I shot several examples; but this spot, though many miles distant from Kaawaloa, is still in the district of Kona.

Description.—*Adult male.* Entire plumage dusky brown, almost black on the head and neck, somewhat lighter on the tail and wings, the quills of the latter being of a rusty brown, with the shafts of the feathers white. Irides dark hazel; bill bluish black, lighter at the tip; nostrils covered with glossy black bristle-like feathers; feet black, yellowish underneath.

Dimensions.—*Adult male.* Total length 19 inches, wing from carpal joint 13·15, culmen 2·50, tarsus 2·50, tail 8·50.

The total length of an adult female in 17·25 inches, while the other parts are proportionately smaller than in the male. In plumage the sexes do not differ.

Immature specimens have the whole plumage of a more rusty shade, and the primaries light ochereous. (Wilson and Evans 1890-99:1-2)



Figure 19. Sketch of *Corvus tropicus* prepared by F. W. Frohawk (Wilson and Evans 1890-99).

A CULTURE HISTORY OF KE‘ANAE AND NĀHOLOKŪ AHUPUA‘A

This section presents a cultural history of two distinct areas: Ke‘anae Ahupua‘a in the Ko‘olau District and Nāholokū Ahupua‘a in the Kaupō District (Figure 20). The following sections in this background are organized topically wherein one will find specific information for the respective ahupua‘a and or district as it relates to the topic at hand. It is important to note that the information presented in this section represents a curated selection of cultural history rather than a comprehensive and exhaustive search. Due to time constraints and the geographical vastness of the project areas, the authors of this study gathered as much information as possible within their allotted timeframe. Therefore, the included content provides a valuable glimpse into the cultural heritage of the Ke‘anae and Kaupō districts, but it may not encompass the entirety of their rich histories.

The Island Setting

Maui, an island located in the Hawaiian Archipelago known as *Ka Pae ‘Āina o Hawai‘i*, is one of the eight major islands. Although known today as Maui, oral traditions have identified other names for this island including ‘Ihikapalaumaewa, ‘Ihikapulaumaewa, Kūlua, Mauiola, and Hīhīmanu (Oliveira 2014:47). Formed by two major volcanoes that have shaped Maui’s geography, the island has historically been divided into two distinct areas, Maui Komohana (West Maui) and Maui Hikina (East Maui)—although other traditional designations exist for different land areas of the island (i.e. Nā Poko, Pū‘ali Komohana, Nā Wai ‘Ehā). Maui is divided into twelve *moku* (districts), with Maui Komohana consisting of Kā‘anapali, Lāhainā, and Wailuku, and Maui Hikina consisting of Hāmākua Poko, Hāmākua Loa, Ko‘olau, Hāna, Kula, Honua‘ula, Kahikinui Kīpahulu, and Kaupō (King 1935). The district formalization of Maui has been attributed to the chief Kakaalaneo and his *kahuna* Kalaihaohia (Oliveira 2014). By some accounts, the districts of Ko‘olau, Hāna, Kīpahulu, and Kaupō were collectively known as Hāna as described in the poetic expression recorded by Pukui (1983:55), *Hāna, mai Ko‘olau a Kaupō* (Hāna, from Ko‘olau to Kaupō). Such reference demonstrating the connectedness of these districts is particularly evident in this region’s Precontact and early Historic Periods.

Both project areas are within Maui Hikina, where eight of its nine *moku* meet at a single rock atop Haleakalā known by two names; Pōhaku ‘Okī ‘Āina (rock that divides the land) and Pālaha (flat). The junction of the Kaupō and Ko‘olau District at Pālaha are shown in Hawai‘i Registered Map No. 1408 prepared in 1886 (see Figure 20). The land divisions in Maui Hikina have been metaphorically likened to a *he‘e* (octopus), where at Pālaha lies the *po‘o* (head) of the octopus, and its *‘awe‘awe* (tentacles) radiate outwards thereby defining the district boundaries (Oliveira 2014).

Two major geologic features are present in the uplands of Maui Hikina and are near the project areas, the Kaupō Gap and Ko‘olau Gap. An aerial view of this geological feature is shown below in Figure 21. This impressive feature is a prolonged canyon formed along the slopes of Haleakalā and was shaped by the powerful flow of two significant streams, which carved their paths over time. As a result, a distinct connection was established between the Ko‘olau and Kaupō, enhancing the geographic link between these areas (Handy et al. 1991; Macdonald and Hubbard 1951). While there is a geological explanation for the creation of the significant landform, traditional legendary accounts attribute its creation to the gods Kū and Hina while in other versions, the gods Kū and Kanaloa are named (Maunupau 1998).

Geographic Setting: Ke‘anae in Ko‘olau and Nāholokū in Kaupō

The first of the two project areas is situated within the *mauka* (upland) region of the Ko‘olau District in Ke‘anae Ahupua‘a. Ko‘olau, which is the name given to the windward sides of the Hawaiian Islands are often the wettest areas that are frequented by the cool, rain-bearing trade winds (Pukui and Elbert 1986). Handy et al. (1991) credit the steep flank of Haleakalā and the trade winds that blow up towards the forested areas as the source of this region’s moist and cooled climate. The boundaries of Ko‘olau begin at the ‘O‘opuola Gulch, which separates it from the Hāmākua Loa District and extends eastward towards the *ahupua‘a* of Makapu‘u. The *ahupua‘a* of Ke‘anae and its neighbor, Wailuanui, is considered by Handy et al. (1991:499) as the “Type Area” for the windward side of Maui, with ample freshwater resources. Ke‘anae which means “the mullet” according to Handy et al. (1991:501), was named after a *lo‘i* that shared the same name; the traditional *mo‘olelo* regarding the name will be discussed in the *mo‘olelo* section presented later in this study. Ke‘anae Ahupua‘a is bound to the west by Honomanū Ahupua‘a and to the east by Wailuanui. Writing in the 1930s, Handy et al. (1991:500) provided the following description of the formation, settlement, and cultivation practices of Ke‘anae Ahupua‘a:

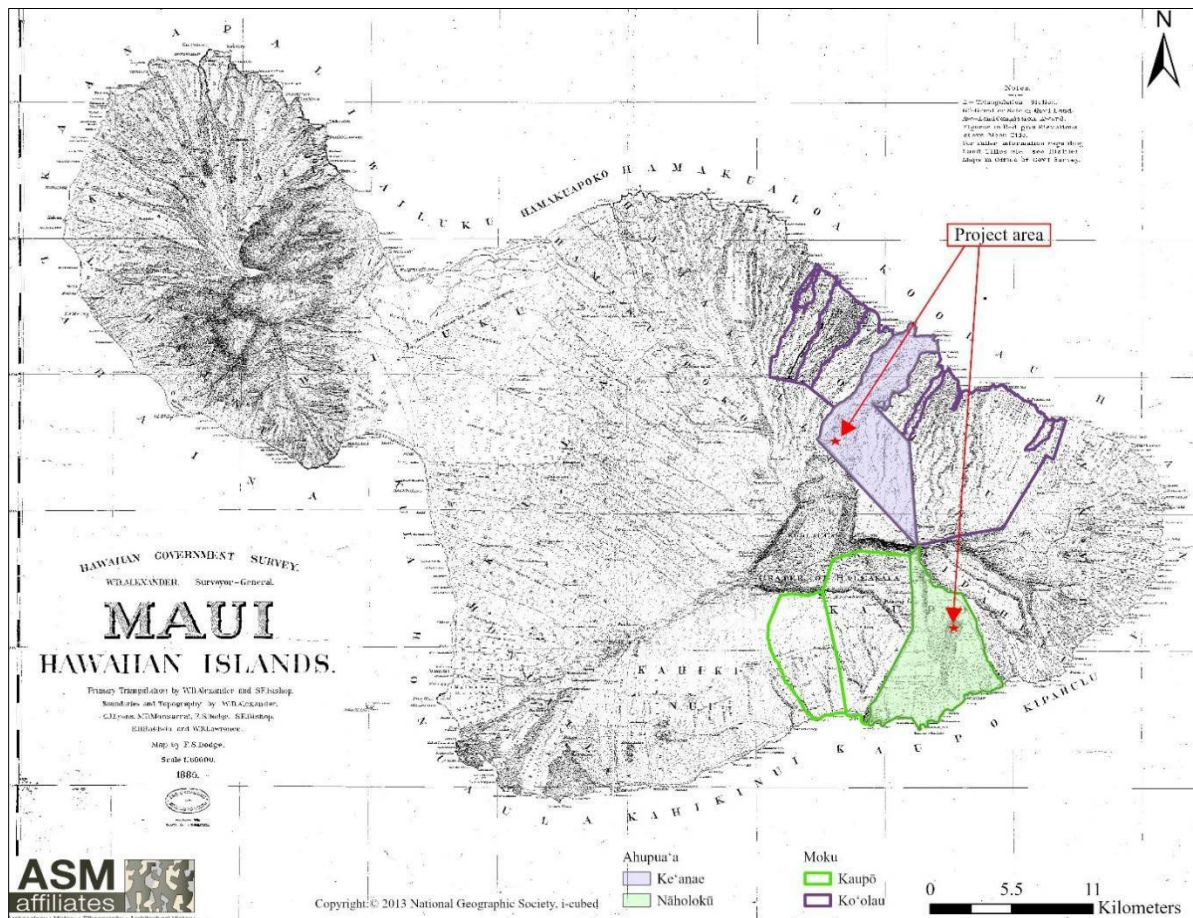


Figure 20. Hawai'i Registered Map 1408 by F. S. Dodge from 1886 showing the project areas within Ke'anae and Nāholokū Ahupua'a.



Figure 21. Aerial photo taken from the east showing the Kaupō Gap (left) and Ko'olau Gap (right) (Macdonald and Hubbard 1951).

This is a unique wet-taro growing *ahupua'a*. In the Pleistocene times Ke'anae was a long, broad, sloping valley reaching right back into the caldera of Haleakala, deeply eroded, with a floor of sediment and detritus washed down by the great rains during the era when a glacier covered the top of Mauna Kea on nearby Hawaii. Then came late eruptions in Haleakala's caldera, and much lava flowed down into Ke'anae Valley partially filling it then moving on down to the coast and cooling to form a broad, flat peninsula as it spread over the delta of sediment and detritus where the valley with its stream (then a river) met the sea. The fresh lava in the lower valley above this peninsula was continually wet; a great stream flowed through it; it soon became forested, with verdant sloping bogs and swales. It was here that the early inhabitants settled, planting upland rain-watered taro far up into the forested area. In the lower part of the valley, which is covered mostly by grass now, an area of irrigated taro was developed on the east side. A much larger area in the remainder of the valley could have been so developed. However, we could find no evidence of terracing here. This probably was due to the fact that the energies of the people were diverted to create the *lo'i* complex which now covers the peninsula.

It is on the broad flat peninsula of lava extending for about half a mile into the sea from the western line of the valley that Ke'anae's famed taro patches are spread out—striking evidence of old Hawaii's ingenuity. Polaukulu Stream, which breaks through the gap at the northwestern corner of the valley, gives an abundant supply of water to the many wet patches (about half those once cultivated) which are still used for raising wet taro. A flume (*ha wai*) carried the water across the narrow channel below the *pali*. When well tended, the taro growing there was as healthy as any we have seen, indicating that there is ample water. But we are told that there has been taro disease in some of the patches and that some of the lower terraces were abandoned because the earth bottoms, which rest on rough lava, break through in spots and allow the water to drain out. Above the peninsula, but below the highway, there are a few cultivated patches watered by the small stream midway between Ke'anae and Wailua.

Figure 22 shows the various waterways and cultivated areas in lower Ke'anae as well as the extensively cultivated Ke'anae Peninsula.

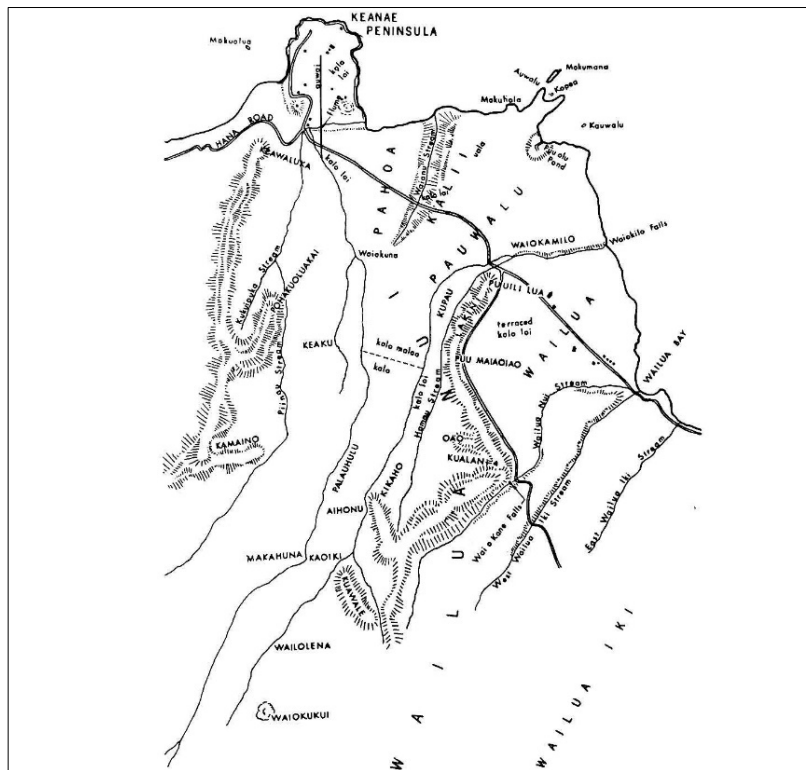


Figure 22. Map showing waterways and cultivated areas in lower Ke'anae and the adjacent areas of Wailua (Handy et al. 1991) (project area not shown).

Pukui et al. (1974:96) have offered the following translation of Kaupō meaning, “landing [of canoes] at night.” Furthermore, Pukui and Elbert (1986:139) identify *kaupō* as a type of native *mai‘a* (banana) which was also known as *waimūhea* and “perhaps named for the place on Maui.” Whereas the Ko‘olau region of Maui is renowned for its steep slopes descending from Haleakalā, the *moku* of Kaupō is characterized by its gentle slopes covered with more recent lava and mud flows. While the coastal areas of Kaupō tend to be moderately arid, the higher elevations, reaching approximately 2,000 feet, are known for their fertile volcanic soil and abundant water supply. Despite its isolation, Kaupō has a rich historical record of being densely populated. The topography of East Maui features two significant breaks in the Haleakalā crater wall. One of these breaks known as the Kaupō Gap is located to the west of the Kīpahulu (Kaupō) Forest Reserve project area Handy et al. (1991). The Kīpahulu (Kaupō) Forest Reserve project area is also situated within the *mauka* (northern) most end of the well-watered Manawainui Gulch the head of which is formed by Pu‘u ‘Ahulili. The boundaries of Kaupō extend from Waiopai Ahupua‘a in the west to Kalepa Gulch in the east. Nāholokū, according to Lloyd Soehren’s *Compilation of Hawaiian Place Names*, is either an ‘*ili āina* (land division within an *ahupua‘a*) of Kou Ahupua‘a or Pu‘u Mane‘one‘o Ahupua‘a, and that its size as depicted on U.S. Geological Survey maps are believed to be greatly exaggerated (Soehren 2010). Despite its conflicting land division-type status, for this study, Nāholokū will be considered an *ahupua‘a*. Based on historical evidence of mudflows in the area, the name Nāholokū can be deconstructed into three components: “*nā*,” a pluralizer, “*holo*,” indicating a flow or landslide, and “*kū*,” signifying a halt or stop. By combining these terms, this name can be interpreted as referring to the region where the landslides or flows have come to a halt (Pukui and Elbert 1986).

Cultivation Practices in Ko‘olau and Kaupō

In the Ko‘olau Moku where water resources are plentiful, the conditions are favorable for cultivating *kalo* (taro) in *lo‘i* (irrigated fields). Handy et al. (1991:501) note that throughout the wet Ko‘olau region, *kalo* was grown “along the streams and in the pockets high on the canyonlike walls of the gulches” as well in the forest above the road and in protected spots that were formerly forest but were converted to pasture. Handy et al. (1991:695) add that the lower valley situated just above the Ke‘anae peninsula was recognized as an early settlement where “the early inhabitants settled, planting upland rain watered taro far up into the forested areas.” Handy et al. (1991) also mentioned the existence of irrigated *lo‘i kalo* (irrigated taro patches) in the lower parts of the valley. However, the most renowned agricultural endeavors in Ke‘anae were centered around an extensive complex of *lo‘i kalo* established across the broad peninsula which was fed by several streams. The development of *lo‘i* on the broad peninsula was said to have been carried out by an area chief who in a desire to increase food production of his lands, ordered the people to the mountains to carry soil from the uplands and fill the lava-covered peninsula. One of the most interesting irrigation methods employed by the Ke‘anae natives involved the construction of a *hā wai* (flume) that carried water across the channel below the *pali*. An indicator of the ample water sources in the area is seen through the abundance and production of hearty *kalo* (Handy et al. 1991). In addition to *kalo* cultivation, evidence of ‘*uala* (sweet potato) patches were also identified in 1934 by Handy (1940:160) “above Keanae and at Wailua and Nahiku.”

In addition to *kalo*, during times of scarcity, sizable *imu kī* (ti pit) were frequently constructed for steaming *kī* root, which was then grated, mashed, and blended with water for consumption. The *imu kī* of Ke‘anae used to be located west of the peninsula, along the road that passed the old boat landing, however, it has since been filled (Sterling 1998). Despite other types of agricultural practices occurring in this area one of which included growing rice in *lo‘i* during the late 19th and early 20th centuries, the cultivation of *kalo* whether for market or home consumption, has for generations, remained an integral part of the lifeways and practices of the area’s native families (McGregor 2007).

The Kaupō planting practices were well-suited to its distinct dry environment. Although the coastal environmental conditions were not well-suited for cultivating *kalo* Handy et al. (1991:128) noted that the presence of “gravelly semi-decomposed lava” in Kaupō provided an ideal environment for the successful cultivation of ‘*uala* (sweet potato), making it the primary starch crop in the region. According to Handy et al. (1991:276), “all the country below the west and south slopes of Haleakala, specifically Kula, Honua‘ula, Kahikinui, and Kaupo, in old Hawaiian times depended on the sweet potato.” Handy et al. (1991:192) presented one method of preparation in the following excerpt:

In preparation for planting, the patch (*mala*) must be cleared by burning off grass and shrubs, then dug over thoroughly (after a good shower softens the ground in dry localities) and all the stubble thrown out. The patch is then ready for planting, if the soil is regularly moist or if dry soil has had a good soaking from showers. The patch with fresh turned soil is termed *wela*, while an old patch

replanted is *pahulu*. Slow-growing varieties should be planted in new rich soil, but vigorous quick growers may be planted in an old patch which has lost some of its richness. The patch that is to be replanted should be dug and weeded between plantings.

Abraham Fornander also noted a specific planting method done in the rockier places such as Kaupō:

Planting in rocky places was called *makaili*. There was very little soil proper, the greater portion [of the field] being gravel, with rocks all around. There were also large holes resembling banana holes. Upon the sprouting of the potato vines gravel and stones are piled up around them, and by the time the hole was covered thick with leaves, the potatoes were large and grooved; they were reidge-formed but not very sweet; they were somewhat tasteless and insipid; not very palatable. (Fornander 1919-1920:164)

The planting practices of Kaupō were further described by Thomas K. Maunupau (1998) in his book *Huakai Makaikai a Kaupō, Maui* who traveled throughout Kaupō with Kenneth Emory of the Bishop Museum (a comprehensive overview of Maunupau's expedition is provided later in this report). Citing his local informants, Poouwahi, J. W. Kawaakoa, and Joseph Marciel, Maunupau (1998:152) reported that:

Poouwahi said that the ancients had only small patches for their sweet potatoes. That was sufficient to supply the family and there never was a lack of food. This kind of farming was done with prayers. Here Joseph Marciel told what he knew of the things J. W. Kawaakoa told him about potato cultivation.

In the beginning, everyone would clear a patch with the one who knew the prayers. After the weeding was done and the patch was clean, then the holes were made. The person who knew the prayers went ahead and everyone followed after, when making the holes. In planting, the one who knew the prayers planted the slips in two holes and prayed thus:

E Kamapuaa-kane, e Kamapuaa-wahine, e	O Kamapua'a-kane and Kamapua'a-wahine,
Kū, e Hina,	O Kū and Hina,
E Kamapuaa-kane, e Kamapuaa-wahine,	O Kamapua'a-kane and Kamapua'a-wahine,
Eia ko kua waena,	Here is our patch,
Mai hele oe i ko ha'i waena,	Do not go into someone else's,
I ko kua waena wale no oe e eku ai,	But root into our own patch,
I ko kua waena wale no oe e ki'o ai,	Excrete only in our own patch
Mai hele oe i ko ha'i waena e kio ai,	But do not excrete in someone else's patch,
O pa auanei oe i ka pohaku a eha,	Lest you be stoned and hurt,
A i ko kua waena wale no oe e aku ai, a e	Root and excrete only in our patch,
ki'o ai,	And no one shall stone you.
Aole e pa i ka pohaku,	This whole enclosed patch of ours, is yours,
O na palena apau o keia waena o kua nou	Amen. (translation by Pukui and Chun in
wale no ia,	Maunupau 1998:152)
Amama. (Maunupau 1998:86)	

After praying he planted in two holes and when he had finished planting everyone planted. It was kau to turn and look behind but must only look ahead. When the work was done, the patch was left along and not weeded until the sweet potatoes matured. The one who prayed began the weeding and he weeded the first two which he had planted. (Maunupau 1998:152-153)

After the weeds were pulled, they were left in place and the farmer proceeded to dig up a few tubers to determine their readiness for harvesting. If the farmer found that the tubers were of sufficient size, a prayer was uttered to Kamapua'a-kāne and Kamapua'a-wahine to free the *kapu* that had been placed over the patch. The sweet potatoes were carefully removed and any "rough looking ones" were considered the excrement of the pig and left in place for it was "kapu to throw them away and must be left beside the mounds" (Maunupau 1998:153). 'Uala was also utilized in traditional husbandry practices of Kaupō, as Handy et al. (1991:201) described how:

The sweet potato vines and foliage make excellent hog feed and have always been used for this purpose by the Hawaiians. Certain rapid-growing varieties are planted in upper Kaupō especially for this purpose, and the foliage is regularly cut about once a month. The potatoes themselves are also fed to the hogs for fattening.

Although *kalo*, a staple of the Hawaiian diet was not widely cultivated in Kaupō, McGregor (2007) in citing an interview conducted by Mary Kawena Pukui with Josephine Marciel stated that most of the families of Kaupō and

Kīpahulu, where *kalo* cultivation was extensive practiced, were related and exchanging of food and other necessities were common. Other crops that were planted in Kaupō included *mai'a* (banana) which in Kaupō was planted in August, during the beginning of the rainy season. Introduced during the Historic Period, pineapple, also known by the Kaupō residents as *hala kahiki* (foreign pineapple) or *hala 'ai* (edible pandanus) was also cultivated (Handy et al. 1991). The origins of *wauke* (paper mulberry), the plant from which *kapa* (tapa; bark cloth) was made, has been associated with Kaupō (Handy 1940). Handy (1940) explained that “near Kaupo in the district of Hana, is the cave in which the chiefess Luukia...is said to have first put designs on tapa.”

‘Ōlelo No‘eau of the Broader Ko‘olau and Kaupō Moku

Prior to the arrival of missionaries in 1820, Hawaiian traditional knowledge was transmitted primarily through various oral expressions one of which included *‘ōlelo no‘eau* (proverbial sayings). *‘Ōlelo no‘eau* are finely crafted expressions that help to convey, among other things, historic information, traditional Hawaiian morals, values, and beliefs, as well as nuanced knowledge about the landscape and the demeanor or characteristics of certain communities. Much of the *‘ōlelo no‘eau* that has been recorded for both the Ko‘olau and Kaupō Districts speaks of the natural phenomena that are specific to each *moku* as well as the characteristics of its inhabitants. The following *‘ōlelo no‘eau*, which were documented and translated between 1910 and 1960 illustrate these traits in greater detail, and appear below as they were interpreted and published in *‘Ōlelo No‘eau, Hawaiian Proverbs & Poetical Sayings* by Mary Kawena Pukui (1983):

‘Ōlelo No‘eau Specific to Ko‘olau and Ke‘anae and Kaupō

Hāna, mai Ko‘olau a Kaupō

Hāna, from Ko‘olau to Kaupō

The extent of the district of Hāna, Maui. (Pukui 1983:55)

Ko‘olau hauwala‘au.

Ko‘olau of the loud voices

The inhabitants of Ko‘olau Maui, were said to be loud of voice. (Pukui 1983:199)

Ko‘olau kai malo‘o.

Ko‘olau of the very low tide.

An expression of contempt for the people of Ko‘olau, Maui who were said to lack generosity and hospitality. (Pukui 1983:199)

O ka wai kau no ia o Ke‘anae; o ka ‘ūlei ho‘owali ‘uwala ia o Kula.

It is the pool on the height of Ke‘anae; it is the ‘ūlei digging stick for the potato [patch] of Kula.

A handsome young man of Kula and a beautiful young woman of Ke‘anae, on Maui, were attracted to each other. She boasted of her own womanly perfection by referring to her body as a pool on the heights of Ke‘anae. Not to be outdone, he looked down at himself and boasted of his manhood of the digging stick of Kula. (Pukui 1983:267)

Ipu pa‘u lena i ka uahi

Soot containers yellowed by smoke

A term of contempt applied to the *kauwā* of Kaupō, Maui. (Pukui 1983:137)

Ka ua pe‘e pōhaku o Kaupō

The rain of Kaupō that makes one hide behind a rock.

It falls so suddenly that one flees behind rocks for shelter. (Pukui 1983:172)

Kaupō ‘ai loli.

Kaupō. Land of *loli* eaters.

Kauakahiakua, a chief of Kaupō, Maui, is said to have been fond of *loli* and to have once built a large *imu* for roasting them. Since that time the people of Kaupō have had a reputation for being especially fond of this sea creature. (Pukui 1983:176)

Ku ke ‘ā i ka hale o Kaupō

The lava is heaped at the house of Kaupō.

A saying from the legend of Pāmano. Pāmano shouted this as his uncle Waipū was trying to make him drunk with *‘awa* before killing him. The saying denotes great distress. (Pukui 1983:204)

‘Ōnea Kaupō, ua kā ka ‘ai i ka lua.

Barren is Kaupō; the eating in the cavern has begun.

Fatal shark attacks were common at Kaupō at one time. As a result the people moved elsewhere, after which a man-eating shark peered at Kaupō and said these words. The spot from which he watched was named Ki‘ei (peer). Later used to mean destitution. (Pukui 1983:275)

Selection of *Mo‘olelo* for Ke‘anae, Ko‘olau and Nāholokū, Kaupō

In the context of Hawaiian culture, *mo‘olelo* encompasses stories, myths, legends, and historical accounts passed down through the generations. These narratives serve as a vital means of understanding, preserving, and transmitting cultural knowledge, offering insight into genealogy, significant events, resources, customary practices, and spiritual beliefs. In the years following the arrival of the first missionaries in 1820 and the subsequent formalization of Hawaiian orthography, Hawaiians took up reading and writing in great numbers and began inscribing generations’ worth of orally held traditions onto paper which they published primarily in Hawaiian language newspapers of the 19th and 20th centuries (Nogelmeier 2010). Reviewing the *mo‘olelo* associated with particular lands helps foster a deeper understanding of Hawai‘i indigenous heritage all while uncovering and revitalizing place-specific knowledge. Extensive research of *mo‘olelo* was done via published sources and historical Hawaiian language newspapers that resulted in a number of *mo‘olelo* that feature Ke‘anae and the Ko‘olau District as well as Nāholokū and the Kaupō District. Summaries of these *mo‘olelo* are curated below.

Kāne and Kanaloa Open Up Springs In Southeast Maui and Create the Kaupō Gap

In his book *Tales and Traditions of the People of Old, Nā Mo‘olelo A Ka Po‘e Kahiko*, Kamakau (1991) related a short *mo‘olelo* about the arrival of the *akua* Kāne and Kanaloa on Maui and their opening of fishponds and water sources along Maui’s southern coast. Kamakau (1991:112) wrote:

According to the *mo‘olelo* of Kāne and Kanaloa, they were perhaps the first who kept gods (‘*o laua paha nā kahu akua mua*) to come to *Hawai‘i nei*, and because of their *mana* they were called gods. Kaho‘olawe was first named Kanaloa for his having first come there by way of Ke-ala-i-kahiki. From Kaho‘olawe the two went to Kahikinui, Maui, where they opened up the fishpond of Kanaloa at Lua-la‘i-lua, and from them came the water of Kou at Kaupō. They caused the deaths of the unholy priests (*kāhuna‘aiā*) at Ko‘ina at Kīko‘o in Kīpahulu and of the grandchild of Waianu for defiling drinking water. They broke open rocks so that water would gush forth—sweet, flowing water—at Wai-he‘e and at Kahakuloa on Maui, on Lāna‘i, at Waiakāne in Punakou on Moloka‘i, and at Kawaihoa on O‘ahu.

Additionally, Beckwith (1970) in relating information told to her by a local informant, shared that two holes “just below the road across Ohia gulch beyond Keanae on Maui” was where Kāne dug his spear into one hole and then another thereby creating two springs. Handy et al. (1991) further add that it was from these springs in ‘Ohi‘a Valley that the *lo‘i* in the neighboring lands of Wailua was irrigated.

Kāne and Kanaloa are again mentioned in Maunupau’s (1998) account in which he tells of how these gods created Waiū spring in Kaupō as well as the infamous Kaupō Gap. This version was told to Maunupau by Joseph Marciel and Albert Kapaeko in which they noted that in some tellings of this story, the gods responsible for this act were Kū and Hina instead of Kāne and Kanaloa. The narrative begins with Kāne and Kanaloa arriving at Kanemalaho, a fishpond in Kahikinui. After stopping at the house of an area native, they asked the woman living there for some fish to which she replied that her husband had gone fishing and if they waited for his return they would have some fish. The woman’s reply angered Kāne and Kanaloa and in an act of retaliation, they used their supernatural powers to destroy her husband’s fishpond and proceeded on the road to Nu‘u and Kaupō. Upon the husband’s return home, he found that his fishpond had been destroyed, so he asked his wife “Who broke up the fishpond? (Maunupau 1998:124)” The wife informed her husband of the inquiry of the two strangers and that they were responsible for breaking up his fishpond. She told her husband that if he takes the road to Nu‘u and Kaupō, he would most definitely encounter the two strangers. The husband left the house and just as the wife had indicated, he saw two men walking on the road. He pursued the two men but did not approach them. At the beach near Nu‘u, the man observed the two strangers thrusting their stick into the earth, and from it emerged water. In another version of the story, the two strangers went further inland and met a man named Waiū. Again the two strangers thrust their stick into the earth thereby creating another spring that is still known today by the name Waiū.

After this, still being pursued by the fisherman from Kahikinui, the two gods ascended the slopes of Haleakalā in upper Kaupō and proceeded to feverishly break up the hillside thereby creating the infamous break in the crater wall of Haleakalā known as the Kaupō Gap. As described by Maunupau (1998:124)

When the solid hill was broken through separating one side from the other, these two gods pressed against the base of the hills one on each side and waited for the man who was pursuing them. The man still pursued the gods until he reached the hill facing the gap called the Kaupō Gap.

As the man approached the uplands, he met a female relative who asked him why he had come to the area with such haste. The man informed the woman of the two mischief-making men he was pursuing. The woman told him that the two men he was pursuing were gods and that it would be wise for him to end his trip and return home lest he be killed. The man heeded the woman's warning and ended his chase and returned home.

Winds of Southeast Maui Noted in The Legend of Kuapāka'a and the Wind-Gourd of La'amaomao

The winds of Maui are enumerated in a traditional *mo'olelo* featuring the famous wind-gourd La'amaomao, which was said to contain all the winds of Hawai'i. Originally published by Moses Kuaea Nakuina (2005), the legend relates the story of Kūapāka'a, and his father Pāka'a, the highly trusted and favored personal attendant of the *ali'i 'ai moku* Keawenui a 'Umi, grandson of celebrated *ali'i nui* 'Umi a Līloa. Pāka'a succeeded his father as *kahu* (personal attendant) of Keawenui a 'Umi, and had charge over many of the chief's belongings. However, Pāka'a's greatest and most cherished responsibility was keeping a highly treasured personal possession: a very special and sacred *ipu* (gourd) passed down to him from his mother. The *ipu*, known as the wind-gourd of La'amaomao, belonged to Pāka'a's grandmother. In the *mo'olelo*, Nakuina (2005:14-15) explains the gifting of the *ipu* to Pāka'a from his mother:

Then La'amaomao lifted the lid of a large calabash and took out a small, long, highly polished gourd in a woven bag. The gourd was covered securely. She [La'amaomao] turned to her keiki and said, "I'm giving you this gourd which belonged to your extraordinary kupunawahine for whom I was named. Her bones are inside the gourd. While she was alive, she controlled all the winds of the islands—she had them under a supernatural power. She gathered all the winds and put them into this gourd, where they're still kept. She memorized one by one the names of all the winds of Hawai'i to Ka'ula. On windless days, she could remove the cover and call out the name of a wind, and the wind in this gourd would blow. This gourd, called 'the wind gourd of La'amaomao,' was famous.

Before she died, she entrusted me to put her bones inside this gourd and care for them until I had a child. Then I was to give the gourd to the child to watch over. You're my only child, so now I'm giving the gourd to you. You must look after it according to the wishes of your extraordinary kupunawahine.

You must care for this gourd because it had been handed down from the kupuna. This gourd has great value—you may not think so now, but when you sail with the *ali'i* and arrive at an area where no wind blows and the canoes are becalmed, say that the winds are at your command; all you have to do is call, and the winds will blow.

"When you're laughed at, remove the lid of the gourd and call for a wind. The wind will blow and bring the canoes to shore. The *ali'i* will be grateful to you, and you'll be loved and valued by him."

Before Pāka'a sailed off, La'amaomao taught him the names of all the winds, along with the prayers, songs and chants concerning them, and when she was done, Pāka'a had memorized everything. Then he took the wind gourd and tied it with a cord he had made, prepared his other things for the voyage, and left home.

Pāka'a settled into his role as *kahu*, and he became the utmost favorite of Keawenui a 'Umi. However, the favoritism of Pāka'a inspired considerable virulence and collusion against him by two men, Ho-okele-i-Hilo and Ho-okele-i-Puna. The pair successfully conspired to entrap Pāka'a in a scandal by spreading lies about him to Keawenui a 'Umi as a way to undermine Pāka'a's prestige in the eyes of his *haku* (lord, overseer). Keawenui a 'Umi, having heard of these rumors, was incensed and relinquished all of Pāka'a's gifted lands and authority, transferring all power to Ho-okele-i-Hilo and Ho-okele-i-Puna, who had usurped Pāka'a's power with their cruel deception. Hurt by Keawenui a 'Umi's naivety to the slander that had befallen his name, Pāka'a gathered some of the belongings of his former *haku*, placed them inside his family's heirloom, departed from Waipi'o, and eventually made a life for himself on Moloka'i. While on Moloka'i, Pāka'a fathered a son, Kūapāka'a, whom he raised to become a *kahu* that could avenge Pāka'a.

Meanwhile, the true character of the two schemers who deposed Pāka'a of his esteemed position began to surface, and Keawenui a 'Umi grew regretful of his decision to scorn his former *kahu* in their favor. The tale

continues with Keawenui a ‘Umi’s frantic and persistent search for Pāka‘a, with whom he had been communicating with in dreams. Pāka‘a and Kūapāka‘a knew that the *ali‘i* would come searching for them. They strategically positioned themselves in their canoe where they fished for *uhu* (parrot fish; *Scarus perspicillatus*) in the early morning off the shore of Moloka‘i. When Keawenui a ‘Umi’s party approached the pair, the men were unsuspecting of Pāka‘a’s and Kūapāka‘a’s true identity, especially since Pāka‘a had disguised himself as a deaf, hunched-over fisherman. The six fleets of men and chiefs from each district on Hawai‘i Island approached Pāka‘a and Kūapāka‘a, led by the *ali‘i* of Kohala, Wailani.

With each passing fleet, Kūapāka‘a hurled insults, incensing each district *ali‘i*, who continued past the father and son, allowing Keawenui a ‘Umi’s bevy to move closer and closer to them. Just before dawn, as Keawenui a ‘Umi’s party approached, Kūapāka‘a chanted to his *haku* at his father’s request. His chant was rivaled by a chant from the *Kuhina Nui*, Kahikuokamoku, who was part of Keawenui a ‘Umi’s party and unaware of the youth’s true identity. Kūapāka‘a, in an effort to lure Keawenui a ‘Umi’s party onshore so he could isolate Ho‘okele-i-Hilo and Ho‘okele-i-Puna, continued his chants implicating impending stormy weather. However, Kahikuokamoku challenged his prophecy, arguing the impossibility of poor weather, and refused to come ashore. Furthermore, Kahikuokamoku challenged Kūapāka‘a’s knowledge of all the islands, for how could a young native boy from Moloka‘i possibly understand and foretell that strong winds would be heading towards them that would force them to land ashore. In response, Kūapāka‘a drew upon his heirloom gourd and his ancestral knowledge and began chanting his warning of destruction. Although no specific wind name for Ke‘anae is recounted in this chant, the wind name for Kaupō and the adjacent lands are and they have been (bolded for emphasis Only those portions of the chant making explicit reference to the lands and winds within east and southeast Maui are cited below:

Hāna’s winds are ‘Ai-maunu,
Kaomi, Kāpae,
Ho‘olua, Lauawaawa,
Paiolopaowa, Halemauu,
Kui, Kona;
Koholā-pehu is of Kīpahulu,
Koholā-lele as well,
‘Ai-loli is of Kaupō,
Moa‘e is of Kahikinui,
(Nakuina 2005:54-56)

After Kūapāka‘a’s recital of the winds of the islands, Keawenui a ‘Umi became unsettled with a suspicion that the boy’s forecast would be realized. Perturbed at the possibility of meeting certain death in the face of violent weather, Keawenui a ‘Umi consulted with his two advisors, and thus the ultimate targets of the trickery, who adamantly insisted that Kūapāka‘a was lying and that they should depart. Keawenui a ‘Umi’s party still retained suspicion and were not sure if they were being duped. Kahikuokamoku demanded the youth’s name, but Kūapāka‘a denied him, arguing that he would reveal his name once the men landed, but they did not comply, and instead, the canoes sailed off to O‘ahu. Soon after their departure, and upon the command of his father, Kūapāka‘a chanted:

Ē winds that I’ve called,
Blow here, those of Ka‘ula and Kaua‘i first,
Those of O‘ahu and Hawai‘i from the sides,
Those of Maui and Moloka‘i last,
Blow true, and overtake the canoe fleet
Of Keawenuia‘umi, the *ali‘i*. (Nakuina 2005:63)

And with this utterance, every wind that had escaped Kūapāka‘a’s lips through chant ravaged the atmosphere, wreaking utter havoc upon Keawenui a ‘Umi’s fleet. Soon, the survivors and their *ali‘i* made their way back to Moloka‘i to escape the mayhem and were led safely to shore by Kūapāka‘a and his father. They continued to play the role of the unassuming fisherman. Keawenui a ‘Umi was cold and wet from the escapade, and Kūapāka‘a was concerned for his wellbeing:

By evening, all the canoes had landed, but Keawenuia‘umi remained on the platform of his double-hulled canoe because he had no dry kapa or malo to wear since all his clothing had been lost at sea. Kūapāka‘a saw his *haku* shivering on the canoe, so he went to speak to his father: “I pity my *haku* because he’s suffering from the cold. He just sits there in a wet malo on the canoe, without any kapa covering.”

Pāka'a took out one of Keawenuia'umi's malo which he had cared for when he was the ali'i's kahu; he gave it to his keiki: "Here's one of your haku's malo. Take it to him. Ask him to remove the wet malo he's wearing and bring it back here. Tell him that this malo you give him is yours." Kūapāka'a took the dry malo and offered it to Keawenuia'umi saying, "Here's my insignificant malo for you. Please remove your wet one."

Keawenuia'umi gave his wet malo to Kūapāka'a, and the keiki gave the ali'i the dry one. Keawenuia'umi noticed the dry malo looked very much like one of his own. He said to Kūapāka'a, "Perhaps this is one of my malo—it looks like one of mine."

The keiki said, "The malo is mine. My mother beat the kapa for it and I was saving it until I could wear it in public as an adult. But now it's yours, my haku."

After the ali'i had taken off his wet malo and put on the dry one, he placed the wet one in the keiki's care.

The keiki returned with it and when he reached the door of Pāka'a's hale, his father asked him, "Where is your haku's malo?"

"Here it is."

"Hang it at the door of my hale, so that the 'ā'ipu'upu'u can no longer come in here."

"I've hung it at the door."

Pāka'a said, "Now only you can enter here because you've been made sacred for your haku by the handling of his kapa. From now on, you'll distribute the food in here to the 'ā'ipu'upu'u who come, because they can longer enter." (Nakuina 2005:66-67)

The scenario repeated with Pāka'a giving Kūapāka'a a beautifully-scented *kapa* (cloth made of *wauke* or *māmaki* bark) that he had cared for over the years for Keawenui a 'Umi. Although suspicious, the *ali'i* presumed the tale told to him by the boy was true, that it was a *kapa* of the same fragrance as his but from Wailau, Moloka'i and not in fact one of his own. Being that Keawenui a 'Umi had lost everything in the storm, Kūapāka'a continued to care for his *haku*, who was still clueless as to the boy's true identity. He dutifully attended to his every need, just as his father, Pāka'a, had in previous years. Meanwhile, Pāka'a continued to craft his revenge plot on Ho'okele-i-Hilo and Ho'okele-i-Puna, and in order to facilitate this, his son let loose the winds of his gourd to keep the weather just unstable enough so Keawenui a 'Umi would not be able to leave the island.

Four months later the weather became agreeable once more, and Keawenui a 'Umi and his men readied their canoes for sailing. That night, Kūapāka'a chanted to each of the six district *ali'i* and their men to ready themselves for sailing. The men were confused, as the voice urging them to depart belonged to Kūapāka'a, who instructed them to set sail to Ka'ula and explained to them that Keawenui a 'Umi would shortly follow. However, Kūapāka'a did not wake his *haku* immediately, and allowed him to sleep in, while the other fleets departed Moloka'i. When day broke, Keawenui a 'Umi and his men (including Ho'okele-i-Hilo and Ho'okele-i-Puna) departed to Ka'ula in search of Pāka'a. Being that the rest of his party had departed, Keawenui a 'Umi requested that Kūapāka'a accompany him to Ka'ula to search for Pāka'a, which he agreed to do as this was part of his father's plan. As part of Pāka'a's conspiracy to exact revenge on his enemies, he had instructed his son to load the double-hulled canoe of the *ali'i* with a hollowed-out tree trunk secretly filled with food, drink, palm fronds, and a large stone to be used as an anchor.

Meanwhile, the rest of Keawenui a 'Umi's party was en route to Ka'ula, but stalled at O'ahu to wait for their *ali'i*, but he never arrived. Exhausted from their journey, the men fell asleep. When they awoke, they unexpectedly found that they had drifted to Hawai'i Island, and found themselves on the shores of Kawaihae. Meanwhile, Keawenui a 'Umi and his party were voyaging to Ka'ula, with Ho'okele-i-Hilo and Ho'okele-i-Puna steering the canoe, oblivious to their imminent, discretely planned demise. To carry out the final segment of the grand scheme, Kūapāka'a allowed the winds out of La'amaomao and the weather became severe. He anchored the canoe with his big rock and encouraged the men to ride out the storm in place, arguing that it would be better than fighting the bad weather. The bitter wind and rain chilled the men to the bone, and they began to get hypothermic. Just before they reached the verge of death, Kūapāka'a then revealed the hidden trove of food. He gave palm fronds for protection and food and drink for strength to everyone on board except his father's enemies, Ho'okele-i-Hilo and Ho'okele-i-Puna, who inevitably succumbed to the cold and perished.

As the weather cleared and became pleasant, Kūapāka'a assumed the now-deceased steersmen's role and set sail for Ka'ula. However, that night when everyone was sleeping, the boy opened his wind-gourd yet again, and the winds wafted them to Hawai'i Island where they landed at Kawaihae. Once there, joy and excitement overcame Keawenui a 'Umi and his party, and they rushed to lovingly greet their families while Kūapāka'a was utterly forgotten, abandoned, and alone. Eventually, word of a canoe race that the boy participated in reached the ears of

Keawenui a 'Umi by a messenger, and it was realized that Kūapāka'a's neglect had been inadvertent, as it was mistakenly presumed that the youth had been taken in and cared for. As part of the wager for the canoe race against Keawenui a 'Umi's favorite fishermen, it was agreed that should Kūapāka'a reign victorious, the losers be baked in an *imu* (underground oven). During their conversation, Kūapāka'a informed his *haku* that he intended to make true on his wager and defeat the men. But he was met with opposition from Keawenui a 'Umi, who did not want to see his men perish. Eventually, a deal was made in which Kūapāka'a would fetch Pāka'a from Moloka'i if Keawenui a 'Umi agreed that the fishermen be put to death.

Though Pāka'a longed to serve his *haku* once more, he refused to travel back to Hawai'i Island without having his land, position as navigator, and other rights restored. When Keawenui a 'Umi was informed of this, he immediately consented, eager to reconnect. Only once Keawenui a 'Umi agreed to restore everything that had been revoked from Pāka'a, did his beloved *kahu* return to him to serve him faithfully for the rest of his days.

The Naming of Ke'anae

In their book *Native Planters in Old Hawai'i*, Handy et al. (1991) offered a short *mo'olelo* regarding the naming of the Ke'anae Ahupua'a. Told to them by their informant, Henry Ikoa, the story focuses on the origin of a small sacred *lo'i* found on the Ke'anae Peninsula and how the people of Ke'anae brought soil from the uplands to the coast to expand their cultivation efforts out of the valley and into the peninsula. Below is the short paragraph that is provided in their section on Ke'anae:

The story of the founding of the Ke'anae *lo'i* area is highly interesting. Anciently, according to Henry Ikoa, the peninsula was barren lava. But a chief, whose name is not remembered was constantly at war with the people of the neighboring Wailua and was determined that he must have more good land under cultivation, more food, and more people. So he set all his people to work (they were then living within the valley and going down to the peninsula only for fishing), carrying soil in baskets from the valley down to the lava point. The soil and the banks enclosing the patches were thus, in the course of many years, all transported and packed into place. Thus did the watered flats of Ke'anae originate. A small *lo'i* near the western side of the land formerly belonged to the chief of Ke'anae and has the name Ke'-anae (the Big Mullet); it is said that entire locality took its name from this small sacred *lo'i*. Here, as at Kahakuloa, the taro that grew in the sacred patch of the *ali'i* was reputed to be of great size. (Handy et al. 1991:500-501)

Kānehekili's Association with Ke'anae

In Samuel Kamakau's publication *Ka Po'e Kahiko*, he recorded god-associated accounts that mention lands of the Hāmākua-Ko'olau regions, specifically Pāpa'a'ea, 'O'opuloa, and Ke'anae. In discussing the *kino lau* (body forms) of Kāne that manifest as thunder and lightning, Kamakau referenced a *heiau* "that stood above Ke'anae." In this same account, Kamakau reported that the chiefs who came from the Hekili line were dedicated at Pāpa'a'ea:

Kanehekili, Kanewawahilani, Kaho'ali'i, Kauilanuimakehaikalani, and the many other gods who belong to the upper and lower strata of the firmament (*ka lewalani, ka lewanuru*), are called "gods of the heavens," *na akua o ka lani*. Kanenuiakea's place was elsewhere. The first *kahu* who observed the kapus of these gods were named Hekili (Thunder). He lived at Papa'aea in Hamakualoa, Maui. The land of Papa'aea where this man was born is a place where thunder claps very loudly, with double claps, and there come flashes of lightning that smash to pieces the forest of 'O'opuloa.

Everyone knew Hekili as a man who had *mana*, so that everything he said was fulfilled. He had but to speak to the thunder and lightning, and they avenged him instantly upon his enemies; those persons who cursed him and abused him were all killed suddenly by thunder and lightning. His enemies therefore plotted in their hearts to kill him and whispered about it in secret. While they whispered thunder struck. His enemies ceased to plot and to think evil thoughts.

People feared Hekili as a man of great *mana*, and they all called him Kanehekili. They believed him to be a man with the *mana* of a god, and they relied on him as man of *mana* and as a *kahu* for the "gods of heavens." His *heiau* for the gods of the heavens stood above **Ke'anae** in the Ko'olau district. There Hekili died, beneath the *kuapala* offering stand. When the brother-in-law of this man of thunder spirit (*kanaka akua hekili*) entered the *heiau* and found him dead, he cut off his head and took it to Lanai, and thus it came into the possession of Lanai. The men of Hamakualoa

missed him, and searched, and found his body in the *heiau* above **Ke'anae**. When they found that this *kahu* of great *mana* was dead, they took the body and divided it into small pieces and distributed the pieces to various places around Maui. These became their *kuleana* to worship thunder. Those persons who had the head worshiped through the head and eyes of Kahekili. They were called “the eyeball of the god” (*ka 'onohi o ke akua*), and “the mouth of the god” (*ka waha o ke akua*). (Kamakau 1968:69)

Martha Beckwith in her book *Hawaiian Mythology* also wrote of Kānehekili and gave name of the *heiau* situated above Ke'anae. Below is a passage from Beckwith's section on Kānehekili:

A kahuna named Kahekili who at one time kept the *heiau* of **Pakana-loa**, erected back of **Keanae** on Maui at a place where violent thunderstorms occur, came to be regarded as possessed by the spirit of Kane-hekili. He was feared as a sorcerer, but any plot against his life seemed invariably to be checked by a violent thunderstorm. When he died his brother-in-law sought his body inside the *heiau* and carried away the head to Lanai and worshiped it as a god. Parts of the body were distributed, and men became known as worshipers of “eyes of Kahekili” or “mouth of Kahekili.” (Beckwith 1976:48-49)

He Mo'olelo no Kamapua'a

He Mo'olelo no Kamapua'a (*A Tradition of Kamapua'a*) was originally published in the Hawaiian Language newspaper *Ka Hae Hawaii* by G.W. Kahiolo in 1861. The following excerpt of the story follows the pig-god, Kamapua'a as he makes his way to Wailua-iki, an *ahupua'a* of the Ko'olau District just east of Ke'anae. In Wailua-iki resided Kapo-ma'ilele, Pele's sister who saved her from Kamapua'a by sending her flying *ma'i* (genital) to Hawai'i Island. The passage cited below is extracted from Kahiolo's original Hawaiian text which was translated by Kepa Maly in his cultural study for Maui Hikina:

...Kamapua'a's advances towards Pele, having been thwarted, he departed from Kilauea, following Kapo-ma'ilele (Pele's sister who had taken her genitals off and thrown them across the land to distract Kamapua'a—thus the name, Kapo-of-the-flying-genitals). It was in this way that Kapo-ma'ilele saved Pele from Kamapua'a's advances.

Traveling across the island of Hawai'i, and eating *mai'a* (bananas), Kamapua'a met with Kapo-ma'ilele at Kahuā in Kohala. Kapo-ma'ilele then flew across the sea and returned to her home on Maui, at Wailua-iki. From the heights of Kapaliuka, Kamapua'a looked across the ocean, and decided to follow her. He crossed the channel and landed at Hāmoa, Hāna...He then traveled to Kawaikau which is near the boundary between Ko'olau and Hāna. From there he traveled to Kaliae, and then arrived at Wailua-iki, where he found the house of Kapo-ma'ilele. Looking shoreward, he saw Pueonui, the husband of Kapo, fishing. He then chanted:

<i>Kanikani hia Hikapoloa—e,</i>	Hīkapōloa cries out loudly.
<i>Ka la o Wailua-iki.</i>	The day is at Wailua-iki.
<i>Ka lai malino a Kapo i noho ai,</i>	Kapo dwells in the calm,
<i>A ka wahine a Pueonui,</i>	The woman of Pueonui,
<i>I noho nanea i ka lai a ke Koolau, aloha.</i>	Dwelling with pleasure, in the peace of Ko'olau— <i>aloha</i> .

Kamapua'a then went to the *kapa* making house (*hale akuku*), and asked Kapo-ma'ilele if they too might sleep together. She agreed, and they did. Now a man saw this and went to tell Pueonui that his wife was sleeping with another man. Pueonui returned to the house in anger, and he struck Kamapua'a on the back with a paddle. Kapo got angry, and he struck Kamapua'a again. Kapo told him “stop, don't do that, for he is not a man, but is Kamapua'a.” Hearing this, he was afraid, for he had heard [that] he was a god and man of power.

Kamapua'a then went to Hāmākua-loa, Hāmākua-poko, and on to Wailuku...(Maly and Maly 2002:22-23)

Māui Snares the Sun by Tethering Its Legs to a Wiliwili Tree in Kaupō, Maui

The swift and strong-willed *kupua* Māui is noted in Hawaiian lore for accomplishing many epic feats. While the accounts of Māui often involve grueling battles and trickery, his brave acts ultimately lead to an improved life for the people of Hawai'i and throughout the Pacific. One such account recorded by W. D. Westervelt (1910) in his book *Legends of Ma-ui—A Demi God of Polynesia and of his Mother Hina*, tells of Māui's heroic adventure to slow

the fast-moving sun that raced across the heavens. This tale begins with Māui's mother Hina, who took to her wooden mallets daily, tirelessly pounding bark and felting them into sheets of *kapa*, which would be fashioned into sleeping mats and clothing. These *kapa* cloths, however, had to be thoroughly dried, but the days were so short that by the time Hina had laid out her *kapa*, the sun would race across the sky and descend into the underworld, leaving Hina in the dark and forcing her to gather up her *kapa*. The recklessly moving sun also created other troubles "[t]he food could not be prepared and cooked in one day. Even an incantation to the gods could not be chanted through ere they were overtaken by darkness" (Westervelt 1910:43).

Māui pitied his mother and set out with determination to alter the pace of the sun. Māui traveled to the northwest of the island to the summit of 'Iao to study the course of the sun. Māui saw that the sun rose on the eastern side of Haleakalā and passed directly over its summit. After studying the sun's path, Māui returned to his mother's home and informed her that he would "...cut off the legs of the sun so that he could not run so fast" (Westervelt 1910:43). After talking with her son, Hina handed Māui "...fifteen strands of well-twisted fiber and told him to go to his grandmother, who lived in the great crater of Haleakala..." (Westervelt 1910:44). Hina continued:

You must climb the mountain to the place where a large wiliwili tree is standing. There you will find the place where the sun stops to eat cooked bananas prepared by your grandmother. Stay there until a rooster crows three times; then watch your grandmother go out to make a fire and put on food. You had better take her bananas. She will look for them and find you and ask who you are. Tell her you belong to Hina.

When she had taught him all these things, he went up the mountain to Kaupo to the place Hina had directed. There was a large wiliwili tree. Here he waited for the rooster to crow. The name of that rooster was Kalauhele-moa. When the rooster had crowed three times, the grandmother came out with a bunch of bananas to cook for the sun. She took off the upper part of the bunch and laid it down. Maui immediately snatched it away. In a moment she turned to pick it up, but could not find it. She was angry and cried out: "Where are the bananas of the sun?" Then she took off another part of the bunch, and Maui stole that. Thus he did until all the bunch had been taken away. She was almost blind and could not detect him by sight, so she sniffed all around her until she detected the smell of a man. She asked: "Who are you? To whom do you belong?" Maui replied: "I belong to Hina." "Why have you come?" Maui told her, "I have come to kill the sun. He goes so fast that he never dries the tapa Hina has beaten out." (Westervelt 1910:45-46)

Māui's grandmother then handed him a magical stone ax and another rope and taught him how to catch the sun. She explained:

"Make a place to hide here by this large wiliwili tree. When the first leg of the sun comes up, catch it with your first rope, and so on until you have used all your ropes. Fasten them to the [*wiliwili*] tree, then take the stone axe to strike the body of the sun." (Westervelt 1910:47)

Māui then dug a hole and concealed himself among the roots of the *wiliwili* and watched closely for the sun. Soon the first leg—the first ray of the sun—came up over the mountain and Māui threw his rope and ensnared the first leg then fastened it to the *wiliwili*. One-by-one, Māui continued to entangle the legs of the sun as they came over the crater of Haleakalā, tethering each rope to the *wiliwili* until all that remained was the longest leg. Using the rope given to him by his grandmother, Māui caught the last leg of the sun.

When the sun saw that his sixteen long legs were held fast in the ropes, he began to go back down the mountain side into the sea. Then Maui tied the ropes fast to the tree and pulled until the body of the sun came up again. Brave Maui caught his magic stone club or axe, and began to strike and wound the sun, until he cried: "Give me my life." Maui said: "If you live, you may be a traitor. Perhaps I had better kill you." But the sun begged for life. After they had conversed a while, they agreed that there should be a regular motion in the journey of the sun. There should be longer days, and yet half the time he might go quickly as in the winter time, but the other half he must move slowly as in summer. Thus men dwelling on the earth should be blessed. (Westervelt 1910:46-47)

The sun assented to Māui's request, and an agreement was made. Māui released the sun back onto its course and from that day the sun agreed to move slower through the heavens.

Legend of Maikoha and an Origin Story of Wauke

In this particular *mo'olelo*, we learn about the origin of *wauke* (paper mulberry) plant, the fibers from which were artfully pounded by Hina to create her *kapa* cloth. There are two versions of the *wauke*'s origins, but for the purpose

of this report, we will focus on the one that associates Kaupō Valley as the birthplace of *kapa*. In this account, documented by Fornander (1918-1919), he tells of a fearless young man named Maikoha. As a result of breaking several *kapu*, he was expelled from his homeland and sent away to the island of Maui. According to Fornander:

This was a very brave and fearless young man, and it was this man that broke the kapu poles, the sacred places of worship, the kapu insignia and all the different sacred things. Because of these doings of Maikoha, the father, Konikonia, became very angry. He was not sure which one had done this unholy thing, so he pondered deeply on how he was to find out the guilty person. After spending several days in study, he decided on a certain course as follows: he procured two long poles and tied one of them on the back of the necks of all his ten children and the other he tied under the chin. He thought within himself that the one who would not cry would be the guilty one, a sure proof he thought, and he must be sent away. In applying this test, Maikoha was the one who did not cry out, all the other children cried more or less. This satisfied the father that Maikoha was the guilty one and so he was sent away, to go wherever he pleased.

Maikoha then started out and landed at Kaupo, Maui, where he made his home. Here he changed into the wauke plant, which is known by this name to this day, and it was at Kaupo that this plant first grew. Because Maikoha's body was very hairy the wauke plant is therefore the same, as we see.

After Maikoha had departed from home, his sisters came in search of him and they traveled as far as Kaupo, where they found he had already changed into the wauke plant. After they had located him they began to make a search for his navel, looking from the top of the plant to the bottom, but they were unable to find it; so a search was made of the roots, and there they found it, for Maikoha had secreted it there. Shortly after this the sisters left Maikoha in Kaupo, Maui, and they continued on their journey until they arrived in Oahu. (Fornander 1918-1919:270)

Pele in Kaupō: A Hawaiian Legend of a Terrible War

Moses Manu Jr. a prolific 19th century Hawaiian writer born in Kīpahulu, Maui in 1837 published a number of *mo'olelo* highlighting the east Maui landscape. In his 30s he became an editor for the Hawaiian Language newspaper *Ke Au Okaa*, where he was able to publish several traditional *mo'olelo* such as the legends of *Keaomelemele* and *Pelekeahiloa*. He was also an informant of Abraham Fornander and Thomas Thrum, both of whom have published his stories in their books (Gregoire 2023c). One such *mo'olelo* published by Manu appeared in the September 9th, 1899 edition of the Hawaiian language newspaper *Ka Loea Kalaiaina* and was summarized in the book *Sites of Maui* by Elspeth Sterling (1998). This story tells of Pele's activities on Maui. Below is the excerpt provided in Sterling's book that mentions "Naholaku", which is believed to be an erroneous spelling or a variation of the name Nāholokū:

After Pele accomplished her wonderous deeds on Maui she left her relatives at Ke-ala-a'e and Nanualele. She returned to Hale-a-ka-la and began to dig a deep pit and made and made sixteen cinder cones that stand to this day. She went visiting below Paukela, Naholaku, and Maua. There were broken bubbles (kipukapuka) in the lava beds from above Maua to Kumunui and all the way to Paukela. Paukela was a chiefess of Kaupo in the legend of the high chiefs of Maui.

Lava beds are seen at Kaki'o, Mai'ai Hill, and Maneoneo Hill all the way down to the sea of Kou. Found there is the most peculiar flow of water Pele made. The name of it is Waiu and it flows to this very day in which we are telling this tale. This water comes out of a hill of red rocks and cinder similar to Ka'uiki hill. At Nu'u on the windward side, the lava had covered it from Pohaku-ula'ula down. Kalou was the place where the line of the ship, Claudine, was attached and where the wharf of Nu'u is now located. The late Queen Kapi'olani owned that land. The lava went on and ended at Hu'akini in Kaupo. (Sterling 1998:167)

The Legend of Pamano

Published in Abraham Fornander *Volume V Collection of Hawaiian Antiquities and Folk-lore* the following *mo'olelo* tells of the life of Pamano and his time in Kaupō. Born in the village of Kaipolohua in the neighboring lands of Kahikinui, to his parents, Lono (father) and Kanaio (mother), Pamano took up the arts of *hula* and *oli*. He was the youngest of three children, however, his two elder sisters died during infancy, thus Pamano was raised as an only child. Soon his reputation as a dancer and chanter spread over the land and reached Ko'olau, a place in the uplands above Mokulau in Kaupō (not to be confused with the Ko'olau District). When Pamano arrived at Ko'olau

2. Background

he was seen by Kaiuli, the king of Maui who adopted him, thus Pamano was virtually made king of Maui. After settling in with his adopted family, Kaiuli called his daughter, Keaka, and his son Pamano together and commanded:

“Where are you my two children? I want you to listen to what I have to say. I want you, Pamano, to be good and not to touch your sister; and I want you, Keaka, to be good and not to touch your brother. If you two wish to go surf riding, each of you can go down and have your surf riding and then return straight home. Pamano must not enter the house of Keaka or you will die; and so with Keaka.”(Fornander 1918-1919:302)

Kaiuli's commands were clear, and life resumed for his two children. It was the custom of Pamano to ride the surf at Mokulau every day. Soon Keaka set up her home at Mokulau and lived there with her guardian, Ko'olau, who was also a close friend of Pamano. One day, after surfing at Mokulau, Pamano and his friend Ko'olau went to a pool to bathe. As the companions were returning to the uplands, they passed near the home of Keaka who called out “Come and get some fish for you two” (Fornander 1918-1919:302). The two men reluctantly called back asking Keaka to bring the fish outside to them, however, she kept her distance and managed to lure Pamano into her house. As Pamano stepped into her house, the deceiving Keaka fastened the door shut and left Ko'olau outside of her house. Keaka had a strong desire to make Pamano her husband and soon she began to make advances, despite the commands of their father. After a short banter, Pamano turned to Keaka and said “I have vowed with Koolau that before I take a wife he must first have her; and this promise also holds good with him; before he takes a wife, I must first be favored; therefore we must call him into fulfill the vow” (Fornander 1918-1918:304). To this, Keaka did not consent and Ko'olau returned to his house and retreated for the night.

As dawn broke the following morning, Pamano left Keaka's home and returned to his home with Ko'olau. When Ko'olau awoke, he turned to Pamano and saw that the sides of Pamano's body were blackened with bite marks. Concerned, Ko'olau inquired as to the source of the bruises to which Pamano said that they were caused by Keaka when they passed the evening together. After hearing Pamano's reply, Ko'olau headed straight for King Kaiuli to inform him about the sinful acts of his children. Upon hearing the words of Ko'olau, the King sought council with Waipu, an uncle of Pamano, and the two men agreed that Pamano be killed using *'awa*. All the preparation to kill Pamano were made and Waipu went out in search of Pamano who was amusing himself in the surf at Mokulau.

Waipu arrived at Mokulau and called out to Pamano to come ashore and enjoy the food and *'awa* that had been prepared. Pamano, however, heard the words of his uncle and was overcome with a premonition forewarning him of death and disaster. Despite the pleas of his uncle, Pamano remained on the ocean and occasionally called out in chant to his uncle asking about his intentions. At last, Pamano decided to come ashore, and in his usual manner, washed himself off in a nearby pool, and girdled his loincloth. When Pamano and Waipu arrived at Mahinui, a high knoll overlooking Mokulau, he chanted out again. As Pamano and Waipu continued to the uplands, Pamano heard the spirit of his two sisters, Nakinowailua and Hokirolele chanting. Their chant, however, pointed blame at Pamano which caused him much anger and he vowed that if he were to return alive, he would kill the both of them.

Finally, Pamano and Waipu arrived at the king's residence, he noticed that the house was completely deserted and everything within the house was drenched in water. Pamano sat down and was fed great quantities of *'awa*. The spirit of his sisters, however, managed to remove the intoxicating properties of the drink, thus allowing Pamano to consume a large amount of *'awa* without intoxication. However, because there was so much *'awa* the sisters could not manage to remove any more and became weary. At last, Pamano was overcome and laid down inside a cloak where he watched to see what was planned for him. Seeing Pamano under the influence of *'awa*, Waipu reached for the stone axe and began fastening the handle to the sharp stone.

Waipu proceeded to hack at Pamano's body with the axe, however, the stone could not cut through his skin because the spirit of Pamano's two sisters worked to dull the axe's edge. The sisters knew that in due time, Waipu's axe would complete its work thereby leaving Pamano's body severely dismembered. As predicted, Pamano's body was brutally cut up and carried off to be buried in a pile of sugarcane trash. That night, Pamano's two sisters conspired to retrieve their brother's body and restore him to life, however, upon arriving at the sugarcane pile, they saw that the area was heavily guarded. One sister, Nakinowailu, decided that she would scare the watchmen away by revealing her form that was visible to the men, while the other sister, Hokirolele would gather up Pamano's body parts. The sisters carried out their plan with success and took Pamano's body to a secluded spot where they brought him back to life. Pamano then carried on with his life and visited other places.

While Pamano was about his travels, Keaka and Ko'olau organized festivities at the royal house in Kaupō. Hearing word about this event, Pamano made his way back to Kaupō and entered the house where the festivities were being held and hid himself in a cloak and observed his actions of his sister Keaka and friend Ko'olau. As the

night progressed, Pamano saw that Keaka chanted every *mele* that he had ever recited. From his hiding place, Pamano responded using the chants that Ko‘olau had shared while they were together that one night. Hearing these chants, Keaka search for the chanter and after some time she found Pamano who said to her “I will never be your husband as long as Kaiuli, Waipu and Koolau are alive. After they are dead I will live with you” (Fornander 1918-1919:312). Keaka then ordered a large *imu* to be prepared. Kaiuli, Waipu, and Ko‘olau were killed and put in the *imu* and Pamano and Keaka lived together as a couple.

He Mo‘olelo Ka‘ao No Lauka‘ie‘ie

Between January 5th, 1894, and September 13th, 1895, Moses Manu (1894-1895) took to the Hawaiian language newspaper, *Nupepa Ka Oiaio*, where he serialized *He Mo‘olelo Ka‘ao Hawai‘i No Lauka‘ie‘ie* (A Legend of Lauka‘ie‘ie). This lengthy and intricate tale narrates the story of Lauka‘ie‘ie who was born an ‘*e‘epa* (mysterious form) and features one of her brothers, Mekanikeoe (one of the main figures in this account), who during his travels throughout the islands sought out caves and tunnels that served as underground passageways. In addition to learning about the area’s water sources, Manu’s narrative highlights places visited by Mekanikeoe along with some references to the practices and resources at some of the localities he visited. In one portion of the legend, Mekanikeoe visits localities within Kahikinui, Kaupō, Kīpahulu, Hāna, Ko‘olau, and Hāmākua. Those segments of Manu’s account featuring the lands specific to this study are summarized below beginning with references to Kaupō and the *mauka* section of the Ko‘olau forest areas.

As published in the November 16th, 1894 article, Mekanikeoe traveled from Kahikinui into Kaupō using *lua* (pits, cave, crater) and *lua wai* (water pits, water caves, water-filled craters). Having arrived at Waipū at the bay near Kalaeoka‘īlio via a *lua*, Mekanikeoe sought to find the source of the water, which led him halfway up the cliff of Helani. The story continues thusly and describes Mekanikeoe finding the source of the water as well as describing the nature of the water sources of Kaupō:

*Aia Mekanikeoe ma keia pali kiekie
launa ole mai, ua alu koke iho la oia a
hiki pono malalo o ke kumu o ka pali a
loaa aku la iaia ke kumu o ka wai
malalo pono o ka puu o Ahulili a na
kahe mai kekahi mana wai uuku ahu
ma Waikaia...*

*A he nui a lehulehu wale na mana wai
liilii ma keia aina o Kaupo... (Manu
1894a:1)*

Mekanikeoe was on this remarkably high cliff and quickly descended to the bottom of the cliff and found the source of the water just below the hill of ‘Ahulili where it flowed from a small water source at Waikaia...

And there are many small water sources in this land of Kaupō...

The story goes on to note that the water from this source bubbles forth at Paala at the shore of Puuahoa. After entering several coastal *lua*, Mekanikeoe then entered the cave of Alewa which led him high above the forested region of Kaupō. Here Manu described:

*A ua komo hou aku oia ma ia lua a
hoea mauka loa o ke kuahiwi, o Alewa
ka inoa o keia lua, ua kanuia e ka poe
hele kuahiwi i ka ke Neneleau a puni, i
ole e haule a poino ka poe kalai waa i
ka wa kahiko, a ke ulu nei ke Neneleau
a hiki i keia manawa... (Manu
1894a:1)*

And he [Mekanikeoe] entered the *lua* and arrived well above the forests, Alewa is the name of this *lua*. The people who frequented the mountains planted the area all around with Neneleau so that the canoe carvers of old would not fall and perish. And the Neneleau grows until today.

In closing out Mekanikeoe’s journey through Kaupō, Manu offered the following remarks which included a poetical expression for Manawainui and Kaupō:

*Nolaila, e waiho kua e ka mea
heluhelu i ke kamailio ana i na
makamaka o ka aina nona
Kaupilipapohaku o Kaupo, a me ka
wai luu poo o Manawainui, na lakou e
ike a hoomaopopo i keia mau
hoakaka. (Manu 1894a:1)*

Therefore, let’s leave it to the reader to talk to the friends of the land Kaupilipāpōhaku of Kaupō, and the head diving water of Manawainui, for they will know and remember these explanations.

In the subsequent article published on November 23rd, 1894, Manu chronicles Makanikeoe's journey through Kīpahulu and his arrival in the uplands from where he gazed towards Ko'olau and saw the famous pond of Wai'ale (Manu 1894b). In the December 21st, 1894 article, Manu makes a brief mention of Makanikeoe's arrival at Leleikeoho, the boundary between Hāna and Ko'olau then his stop at Wai'oni and Kea'ā, north of Ke'anae. No specific information for the Ke'anae area is detailed in Manu's narrative (Manu 1894c).

Noted Upland Burial Places

The following short story tells of the naming of 'Alalākeiki—a burial cave “on a plain not far from the road” in Kaupō—which was recorded by J. Maunupau (1998:113):

In the olden days some of the natives of Kaupō and Nu'u went to Hawai'i to live. Soon after, one of them who was greatly loved by the people of Kaupō and Nu'u passed from this life on earth, his earthly remains were taken back to his birthplace, to Nu'u. In this same way, some people came from the island of Hawai'i. When they arrived at Nu'u the body was carried into this cave. Everyone could go in, sit down and wail in the customary Hawaiian way.

As the people wailed, a man heard the crying, drew near to the cave and closed the entrance with a big rock. He closed it so tightly that those inside could not get out. The people there thought that there was no peril for those within for they took food enough into the cave. A long time afterwards a native went to the cave and found them all dead. Because of their wailing and the manner of their deaths, the cave was named 'Alalā-keiki to this day.

In his book *Ka Po'e Kahiko, The People of Old Kamakau* (1968) described noted burial places throughout the islands including several on Maui. In the following narrative, Kamakau tells of Ka'a'awa a burial pit inside the Haleakalā crater near the eastern edge of the Ko'olau gap above Ke'anae. Kamakau also refers to a burial pit in the Kaupō area mauka of Pu'umane'one'o. In describing this place and its associated practices and beliefs, Kamakau (1968:39-40) noted:

The disposal pit of Ka'a'awa is a deep disposal pit inside the crater of Haleakala. It is on top of a lava mound in a pit (*lua*) on the north side, close to Wai'ale'ale [a swamp just outside the crater wall] and the rock that divides the land [Pohaku Palaha, or Pohaku'oki'aina] on the eastern edge of the Ke'anae gap that opens at Ko'olau. It is a chasm, a *nupa*, or perhaps a deep pit, a *lua meki*, opened up from the foundations of the island by the forces of heaping lava, and may be several miles deep, with fresh or sea water at the bottom. Because of the insipid taste ('*ono 'ole*) of the waters, some people have supposed that the waters of Waiu and Waipu at Kaupo have their source at this pit of Ka'a'awa, or from some disposal pits mauka of Pu'umane'one'o. This pit of Ka'awa was like Waiuli; it was the disposal pit for the people of Makawao, Kula, and Kaupo. These pits could be visited in broad daylight because no evilly disposed people could get at the bones and take them away to work mischief. This is the character of *nupa* and *lua meki*—they are pits that mischievous people cannot get at.

Maui's Ruling Chiefs

The early governance of Maui is characterized by a dynamic political system, as described in Hawaiian oral traditions. This system witnessed a fluctuating pattern of chiefly rule, with periods of independent chiefdoms exerting authority over the entire island and other periods when governance was divided between East Maui (including Ko'olau, Hāna, Kīpahulu, and Kaupō districts) and West Maui (comprising Kā'anapali and Lahaina districts) (Cachola-Abad 2000; Fornander 1880; Kamakau 1992). Fornander traces the Maui chiefly lineage to Paumakua, who was a descendant of the Hema branch of the Ulu line, and whose genealogy spread over Maui and Hawai'i Island. Fornander writes:

...there is little to tell of the Maui Paumakua of the Hema line, the son of Huanuikalalailai... Through his son Haho and grandson Palena he became the great-grandfather and progenitor of the noted Hanalaa, whom both the Maui and Hawaii chiefs contended for as their ancestor under the varying names of Hanalaa-nui and Hanalaa-iki, asserting that Palena was the father of twins who bore those names. (Fornander 1880:26-27)

Cachola-Abad (2000:175) writes that “each of these ali'i nui seemed to have served as the nominal sovereign over the entire of Maui.” However, the political distinction between the East and West Maui chiefs appears to have occurred during the time of Palena or Hanalaa'a (Cachola-Abad 2000). Kamakau (1991) provided insight into the

chief Hanala'a, stating that Hanala'a-nui served as the ancestral chief for individuals on Hawai'i Island, while those on Maui traced their chiefly lineage back to Hanala'a-iki but that this too was not unanimously agreed upon.

Whereas Fornander (1880) identifies Paumakua was the progenitor of Maui's chiefly lineage, Kamakau (1991) identifies Heleipawa as a chief whose reign predates that of Paumakua. Kamakau (1991:136) adds that Heleipawa was the son of Kapawa—a chief of Waialua, O'ahu—and that it was during Kapawa's time that the ancient people (*po'e kahiko*) began memorializing the "place where each chief was born, and so forth." As such Kamakau offered the following details and chant concerning the life of Heleipawa and the path of his funeral procession through Kaupō to his final resting place atop Pu'u 'Ahulili, near the Kīpahulu (Kaupō) Forest Reserve project area. Kamakau's original Hawaiian language text is derived from the October 21st, 1869 article published in the Hawaiian language newspaper *Ke Au Okoa* and the English translation comes from the book *Tales and Traditions of the People of Old (Nā Mo'olelo a ka Po'e Kahiko)*:

*Ua hanau keia alii ma Lelekea no
Kīpahulu i Maui. Ua kaulana kona
kahuahale i kukulu ai, a ua hiki ke
hoomaopopo ia, o Kahaleikalea kona
hale. O Kuai kona punawai he wai ia i
loko o ke kai, he 10 paha kaulahao a
keu mai ka aina aku, a he 20 paha a
keu kapuai ka hohonu o ke kai a loa
iho ka punawai, ua nini ia i ka pohaku
a maikai, e like paha me ka hana ana i
ka wa kahiko, a no ka hui ana o ka
papa pohaku nini i hookahi a puni ka
punawai, nolaila, aole e home i na
nalu huliamaahi, a no ka ikaika loa o
ka mapuna o ka wai, aole e hiki i
kekahi ke luu pono iho maluna o kahi
e mapuna ae ana ka wai, oia paha ka
mea i paa ole ai ka wai mapuna i ka
pohaku a me ke one.*

*Penei ka hoomanao ana a ka poe
kahiko no Heleipawa.*

"O Heleipawa o ka alii o Kīpahulu,

I hanau i Lelekea,

O Pieleku la ke ewe,

Paookahi ka piko,

I Hekeu i kaui ka aa,

I ka Kahaleikalale kahua,

I ka piina i Keahuala i Makaaaoa,

I Kaapahu mauna i ka lani,

I Kaloiki la i Kalonui,

I ke alahaka i Manokiai,

I ke ala hoolewa i Nahunonapuunalu,

I ke alahauiki a Kana,

I ke Anawao i Kalepa,

I Waiahole la i Hualele,

I Puualaea i Nuanualoa,

I Puolokalina i Kalaeoaiho,

I Mikimiki la i Maalo,

I Kahuwai i Popoiwi,

Heleipawa was born at Lelekea in Kīpahulu, Maui. The site of the house that he built is well known and is still clearly discernible; Ka-hale-i-kalalea was its name. His freshwater spring, called Kua'i, is in the sea about 10 chains from land, where the sea is about twenty feet deep. It is well laid, *nini a maika'i*, with rock, as they used to do in the old days, and so well joined are the slabs of rock that surround the spring that strong waves have not loosened them. The water wells up so strongly that no one can dive directly on top of where the water wells up. That is perhaps the reason why the spring has never been covered over by stones or sand.

Here is the memorial chant of Heleipawa by the *po'e kahiko*:

Heleipawa, the chief of Kīpahulu,

Was born at Lelekea;

At Pielekū the placenta,

At Paokahi [heiau] the vnaul cord,

At Hekeu, by Kua'i, the caul,

Ka-hale-i-kalalea the [house] site.

*Along the ascending path to Keahualā
on Maka'aoa*

In Ka'apahu, the mountain in the sky,

To Kaloiki, to Kalonui,

Along the rough road to Manokia'i,

*Along the funeral path to
Nāhunonapu'unalu,*

Along the trail of Hauiki-a-Kana,

By the inland cave in Kālepa,

*Through Waiāhole, through
Hua'alele,*

*Through Pu'ualaea [Pualāia], to
Nu'anua'aloa,*

To Pu'olokālina in Kalae-o-'aihē;

*I Punahoa i Kanemalohemo,
Mokulau la i Muliwai,
I Poukela i Loaloa i Puumakaa,
I Kaakaukawa i Kawahaohinau,
I Nakukuioolu i Paliakoa,
I Kaheka ilalo,
I Iuliuli mauna iluna,
I Helaniku i ke poo o Kauhau,
I Ahulili, waiho no o Heleipawa.”*

*Ua maopopo maloko o keia manwa a
ka poe kahiko, kahi i hanau ai, a me
kahi i make ai o Heleipawa. A he
waiwai nui keia i ka poe hou e
maopopo ai ka moolelo o keia alii.*

*O Hulumanailani ke keiki a
Heleipawa, ua hanau oia ma
Kipahulu, a o Kailoau kekahi inoa
ona. (Kamakau 1869:1)*

*Through Mikimiki, through Ma‘alol;
Through Kahuwai to Pōpōiwi,
To Punahoa, to Kānemalohemo,
At Mokulau; to Muliwai,
To Poukela, to Lo‘aloa‘a [heiau], to
Pu‘umaka‘ā [heiau]
To Ka‘akaukawa, to Kawahaohinau,
To Nākukui‘o‘olu, to Pali-a-koa‘e;
To Kāheka below,
To the dark-hued mountain above;
At Helanikū, on the top of Kauhau
on ‘Ahulili, Heleipawa was laid away.*

Made clear in this chronology (*manawa*) of the *po‘e kahiko* are the place where Heleipawa was born and the place where he died. It is of value to those of today to know the *mo‘olelo* of this chief.

Heleipawa’s son Hulumānailani, also known as Kailoau, was born in Kī-pahulu. (Kamakau 1991:137-138)

Concerning the names of those chiefs that ruled over East Maui, Cachola-Abad (2000) identifies, ‘Ele‘i‘o, Kalā‘eha‘eha, Lei, Kamoho‘alii, Kalaehina, and Hoolae, all of whom succeeded each other and are believed to have ruled out of Ka‘uiki, Hāna. This political division lasted until the time of the 16th-century high chief Kiha-a-Pi‘ilani, who managed to consolidate the island under his rule (Kirch 2010). Prior to Kiha-a-Pi‘ilani’s consolidation, the chiefs ruling the greater part of Maui, also ruled over the island of Lāna‘i, and at times Moloka‘i (Fornander 1880; Kirch 2010).

Paumakua’s son, Haho is remembered in Hawaiian history as the founder of the *‘aha ali‘i*, a council of chiefs and priests that conferred the rank of a chief by tracing their chiefly descent, and ensuring their genealogy remained undisputed. To protect the purity of these royal lineages, *ali‘i* families were also afforded extra protection during times of warfare, as they were sometimes ceremonially sacrificed. Chiefs of the *‘aha ali‘i* were entitled to wear the insignia associated with his or her rank, such as the *lei hulu* (feathered lei), *‘ahu ‘ula* (feathered cloak or cape), *lei niho palaoa* (ivory pendant), and they traveled with painted red sails on their canoes (Fornander 1880). It has been suggested that the creation of the *‘aha ali‘i* came about during what is often referred to as the “migratory period” of Hawaiian history, an era marked by the intensification of social institutions and political and religious organization (Cordy 2000:200; Fornander 1880). Fornander (1880:30) further clarified that the *‘aha ali‘i* “arose, probably, as a necessity of the existing conditions of things during this migratory period, as a protection of the native aristocracy against foreign pretenders, and as a broader line of demarcation between the nobility and the commonality.”

The chiefly succession of West Maui also includes Kakaalaneo’s brother Kakaē, who begat a son, Kahekili I with the chiefess Kapohauola. Concerning Kahekili, Ashdown (1971:44) notes that:

In Ke‘anae stands the temple named Pa-kana-loa where the Kahuna Kahehili was kahu of that place. He was of the Kane-Ku Order of priesthood and, like his descendants, was born with the Mark of Kane Hekili. Two of those descendants were King Kahekili, Maui’s final ruler, and ‘Ulu-ma-hei-hei who was called Governor Hoapili.

Kahekili I’s son, Kawaokaohēle married the chiefess, Kepalaoa who bore the distinguished Pi‘ilani, a 16th-century high chief whose rule was marked by peace and industry among the people (Fornander 1880). Pi‘ilani was a contemporary of Līloa, a powerful Hawai‘i Island chief (Cordy 2000). Pi‘ilani married his first cousin, Lā‘ielohelohe, who was born at Helumoa and raised at Kaluaokau in Waikīkī, O‘ahu. To them were born four children, all of whom are celebrated in Maui’s chiefly lineage (Kamakau 1991).

Building upon the legacy of his chiefly ancestors, Pi'ilani continued to solidify Lahaina as a chiefly center by establishing the islet of Moku'ula and Mokuhinia Pond located in Lahaina as his home. Historical descriptions concerning the life and rule of Pi'ilani often reference his sacred genealogy, peaceful rule, and his initiation of large-scale public work projects. In his book *Moku'ula Maui's Sacred Island*, Klieger (1998) explains the attributes associated with Pi'ilani's rule:

Pi'ilani, Maui's greatest king, is credited with creating a road that encircles the entire island of Maui. Upon this trail the great *mō'i* made frequent tours throughout the land, collecting taxes during the time of the Makahiki and seeing to general order. He ruled from Lahaina and is known to have died there. (Klieger 1998:9)

The Maui royal family descended from Pi'ilani was notable in the archipelago for carefully maintaining and replicating *mana* through the *kapu* system and through brother-sister (*pi'o*) or other closely related matings, in imitation of the creative passions of Papa and Wākea. This marriage pattern was especially frequent in the eighteenth century, resulting in great prestige for the Maui line. The power generated by several generations of *pi'o* mating by the sacred members of the Pi'ilani family and the restrictions associated with their *kapu* made the family's dignity, ascribed authority, and status practically unrivaled among the *ali'i nui* of the Hawaiian Islands. The *pi'o* system served to concentrate the *mana* of the gods within the ruling class. Especially important was the power of the guardian Kihawahine among the Maui royal family, a symbol of the family's *mana*. (Klieger 1998:15)

According to Kamakau (1991), Pi'ilani's union to Lā'ielohelohe resulted in the birth of four children: Lonoapi'ilani, their eldest son, then two daughters Pi'ikeaapi'ilani and Kalā'aiheana, and finally, the youngest son Kihaapi'ilani—who would become his brother's greatest rival. Kihaapi'ilani unlike his siblings was born and raised on O'ahu and later returned to Maui at the time of his father's death. The eldest daughter Pi'ikea married the Hawai'i Island chief, 'Umi A Liloa. According to Mary Kawena Pukui, the youngest daughter Kalā'aiheana (also known as Kihawahine) is said to have been born as an "*e'epa*—a human born with some sort of supernatural difference" (in Klieger 1998:9). Pukui (in Klieger 1998:9) also maintains that upon her death, Kalā'aiheana was deified and made a *mo'o* goddess and was the only *mo'o* with the ability to move from "pond to pond, island to island."

Kamakau (1991) provides a description of Pi'ilani's death and the transfer of rule within his kingdom. In describing Kihaapi'ilani's return to Maui, Kamakau (1991:50) writes, "when he was twenty years of age, Kiha was ordered to go to Maui to become the heir apparent, the *ho'oilina mō'i*; but when he reached Ka-lae-o-ka-lā'au on Moloka'i, his father Pi'ilani died at Lahaina, and the first-born, Lono-a-Pi'ilani became the *mō'i* of Maui." Kamakau (1992) and Fornander (1916-1917) both provide detailed accounts of the brothers' feud following their father's death. Although the brothers lived together in the royal court at Ka'uiki, Hāna, Lonoapi'ilani displayed great hatred towards his younger brother, which resulted in Kihaapi'ilani leaving the royal court. Fornander (1916-1917:236) writes:

One day while Piilani [Lonoapi'ilani] was eating with his companions, all strangers, enjoying the good things placed before them, Kihaapiilani, although present at the table, was not served with any of the good things; but, in front of him was placed a small calabash containing some small fish. This dish belonged to Piilani. Seeing that this was all there was to be had within reach, he reached into the dish and took out two small fish and ate them. While doing this he was seen by Piilani. Piilani then reached for the dish and held it up in his hand, then asked of Kihaapiilani: "Who ate the fish in this dish?" Kihaapiilani replied: "I did, because there was nothing else for me to eat." Piilani then threw the dish with the fish in it, bring and all, at the forehead of his brother, breaking the dish into pieces and spattering the fish and brine into the eyes of Kihaapiilani which blinded him for a while.

No longer willing to endure his brother's ill-treatment, Kihaapi'ilani secretly ran away to a place in Makawao, where he met the chiefess Koleamoku, the daughter of Ho'olaemakua, a Hāna chief (Fornander 1880). Koleamoku was one of two known wives of Kihaapi'ilani; the other being Kumaka who also descended from the Hāna chiefly families. While living with Koleamoku at Makawao, Kihaapi'ilani became a farmer and was able to temporarily conceal his identity as a chief. Kihaapi'ilani stayed in the country for some time, until he was able to garner the support needed to dethrone Lonoapi'ilani his elder brother, and Ho'olaemakua, his father-in-law and the ruling chief of East Maui (Fornander 1916-1917). According to Moses Manu (1884), as part of Kihaapi'ilani's plan to overthrow his brother, he sought counsel from *kahuna* across Maui. This led him and his wife on a journey around the island

including Kaupō where they were led by a large white dog (*‘ilio nui ke ‘oke ‘o*) said to be a spirit form of Kihawahine (Kihaapi‘ilani’s sister). The large white dog guided them to the *imu loli o Kaupō* (sea cucumber oven of Kaupō), said to be located on the *makai* side of the road, then to directly to Kumunui near the house of the *kahuna* who lived near Loaloa Heiau. Here they were greeted by the *kahuna* and a feast was held. Kihaapi‘ilani requested of the people of Kaupō to harvest *māmane* and *kea* wood—hardwoods from which spears were made. Kihaapi‘ilani with the assistance of the *kahuna* is said to have taught the people of Kaupō the arts of spear fighting (*‘ō ‘ō ana o ka ihe a me ka ‘ōniu ana i ka pololū*) and casting stones using a sling (*ma ‘a*). Despite Kihaapi‘ilani’s attempts to build a rebel army, the *kahuna* of Kaupō advised him that Lonoapi‘ilani’s army stationed at Kauiki to whom Ho‘olaemakua was the *pūkua* (general), would not be easily defeated and therefore he must form an alliance with ‘Umi, the chief of Hawai‘i Island who was married to Pi‘ikeaapi‘ilani, Kihaapi‘ilani’s sister (Manu 1884). At the advice of the *kahuna*, Kihaapi‘ilani and his wife were directed to the *kahuna* at Kīpahulu and upon leaving Kaupō, they crossed Manawainui Stream and looked back to observed the plains of Niniao [Niniau] and Makulau [Mokulau] (Manu 1884).

‘Umi summoned his war counselors to prepare for an invasion on Maui. ‘Umi then ordered his district chiefs to ready the canoes and gather the warriors. Kihaapi‘ilani’s forces attacked Ho‘olaemakua and gained control over East Maui. After Ho‘olaemakua’s death, Kihaapi‘ilani turned his attention to slaying his brother. Differences arise regarding who was ruling West Maui at the time of this invasion. Fornander (1916–1917) writes that Lonoapi‘ilani had already died and that his son Kalaninuiakupuapāikalaninui was ruling West Maui. However, Kamakau (1992) contends that Lonoapi‘ilani was still ruling at the time of the invasion and that upon hearing about the death of Ho‘olaemakua he trembled with the fear of death, and died. Kihaapi‘ilani’s rise to power resulted in the dissolution of east and west Maui chiefly kingdoms and the consolidation of the island’s rule under a single chief.

Pi‘ilani and his sons, particularly Kihaapi‘ilani are well known for their completion of many large-scale public work projects around the island of Maui, including the construction of *heiau* (temples), *loko i ‘a* (fishponds), as well as continuing the construction of the *alaloa* trail that circuited the entire island (Ashdown 1971; Kirch 2010; Maly and Maly 2007). The *alaloa* is said to have been paved to a width of four to six feet as it followed the coastline and branched to Haleakalā, and to Pu‘u Kukui in Mauna Kahalawai, the highest peak of the West Maui mountain range (Ashdown 1971). Fornander (1880:206) adds that Kihaapi‘ilani “improved and caused to be paved the difficult and often dangerous roads over the Palis of Kaupo, Hana, and Koolau—a stupendous work for those times, the remains of which may still be seen in many places, and are pointed out as the “Kipapa” of *Kihaapiilani*.” Maunupau (1998:146) adds that Kihaapi‘ilani constructed a road that was “6 to 8 feet wide” which extended “from the Makawao side of the mountain and up to the rise on the Kalapauwili mountain on the Kaupō side and down outside Haleakalā by the pool of Ale.” This pool, Ale was also said to have been built by Kihaapi‘ilani for use by his warriors. In Manu’s (1884) account he added that improving the *alaloa* along with other trails were undertaken by Kihaapi‘ilani after he had secured his rule over Maui and revived (*hō ‘ala*) the *heiau* at Honua‘ula. Manu stated:

...a ma ia hope iho, e hoomaka oe e
Kipapa i ke alanui mai Pihehe aku ma
Hana a hiki i Koolau ma kanahele o
Oopulua, a me na wahi ino e ae o na
alanui o Maui... (Manu 1884:1)

after this you will begin to pave the
road from Pihehe at Hana as far as
Koolau at the forest of Oopulua, as
well as all the other bad places on the
roads of Maui (Sterling 1998:130)

Once Kihaapi‘ilani had secured Maui, he remembered the advice of ‘Umi and began improving the roads on Maui. Concerning the roads in east Maui, Manu related the following:

...ua hoomaka ka hana ana o ke alanui ma
ke kahawai o Kawaipapa a me Pihehe, oia
ka hoomaka ana e komo iloko o ka ulu hala
o Kahalaowaka mai keia wahi aku a
kanahele o Akialaa ma Honomaele, ua
Kipapa lelele ia ka pohaku ala ma ke alanui
aole i nee paha ia ke kipapa ana, a ma
Kipahulu ua hoopaakeia ke Kipapa ana i ka
ala mai Alae-iki a hiki Kukuiula, aia
mawaena o kekahi mau aina o keia wahi, ua
pau kekahi mau Kipapa i ka hao ia e ka ihu
o ka oo palau a T. K. Clarke, a ua kau
[illegible] na pohaku ala a ua kanuia i ke ko
i keia wa. A pela no ma Kaupo ma ke

The construction of the road was begin at
the stream of Kawaipapa and at Pihehe
where it would start to enter the hala grove
of Kahalaowaka. From here to the forest of
Akialaa at Honomaele the ‘alā stone paving
was set at intervals on the road and the
paving has probably not been moved. At
Kipahulu the paving of ‘alā stone was
begin, from Alae-iki to Kukui‘ula.

Between some of the lands in this locality
some of the paving is gone, having been
dug out by the plow of T. K. Clarke. The
‘alā stones were scattered about and sugar

kahawai o Manawainui a hiki ma Kumunui, a pau ka hana ana a ua alii nei me na kanaka malaila, ua hoomakaia ke Kipapa ana i ka nahele o Oopuloa ma Koolau, mai Kawahinepee aku ma Kaloa... (Manu 1884:3)

cane planted at this time. It was thus at Kaupo at the stream of Manawainui as far as Kumunui. When the chief and men had finished the work there, the paving was begun in the forest of Oopuloa in Koolau, from Kawahinepee at Kaloa... (Sterling 1998:130)

Concerning *heiau*, some anthropologists have argued that Pi'ilanihale Heiau in Honoma'ele, Hāna may have functioned as a residential compound for the Pi'ilani-line of chiefs (i.e. his sons Lono-a-pi'ilani and Kiha-a-Pi'ilani and his grandson, Kamalālāwalu), however, this hypothesis along with earlier interpretations of the *heiau* serving as a war temple, remains inconclusive (Kolb 1999).

Chiefly Rule Following the Consolidation of East and West Maui by Kihaapi'ilani

The reign of Kihaapi'ilani was followed by Kamalālāwalu, Kauhi a Kama, Kalanikaumakaowākea, Lonohonuakini, and others lasting until the rule of Ka'uhiaioakamoku. During this period (ca. late 16th through 18th century), Maui was under the rule of a single *ali'i* and their domain also included Lāna'i (Cachola-Abad 2000). Fornander (1880:126) relates a brief account describing the lineage of some of the ruling chiefs of Kaupō during the reign of Kauhi A Kama:

After this narrow escape *Iwikauikaua* went to Oahu, and there became the husband of *Kauakahikuaanauakane*, daughter of *Kakuhihewa's* son *Kaihipapu*. He is next heard of in the legends as having visited Maui, where one of his sisters, *Kapukini*, was the wife of the *Moi Kauhi-a-Kama*, and another sister, *Pueopokii*, was the wife of *Kaaoao*, the son of *Makakukalani*, and head of the Kaupo chief families who descended from *Koo* and *Kaiuli*.

In the subsequent generations of ruling chiefs from the time of Kamehamehanui down to Kamehameha I intra-island and inter-island warfare intensified as the Maui and Hawai'i Island chiefs sought to increase their land base and power. This was done through direct warfare as well as through political alliances that were forged through marriage and the birth of offspring. For example, during the reign of Kamehamehanui, the Hawai'i Island chief, Kalani'ōpu'u managed to capture Hāna and Kīpahulu thereby expanding his territory beyond Hawai'i Island to include East Maui. The Maui chief, Kekaulike, the father of Kamehamehanui, also made attempts to capture Hawai'i Island. As described by Fornander (1880:133):

While these intestine commotions were occurring on Hawai'i [Island], harassing the country people and weakening the power of the chiefs, *Kekaulike*, the *Moi* of Maui, judging the time opportune for a possible conquest of Hawaii, assembled his forces at Mokulau, Kaupo district, Maui, where he had been residing for some time, building the Heiaus Loaloa and Puumakaa at Kumunui, and Kanemalohemo at Popoiwi. When his forces and fleet were ready, *Kekaulike* sailed for the Kona coast of Hawaii, where he harried [*sic*] and burned the coast villages. *Alapainui* was then in Kona, and, assembling a fleet of war canoes, he overtook *Kekaulike* at sea, fought a naval engagement, beat him, and drive him off. Retreating northwards, *Kekaulike* landed in several places, destroying villages in Kekaha, cutting down the cocoa-nut trees at Kawaihae, and plundering and killing along the Kohala coast, and finally returned to Mokulau, Maui, intending to invade Hawaii with a larger force next time.

After Kekaulike's futile attempt to capture Hawai'i Island, Alapa'inui made preparations to invade Maui only to find that his enemy had died just before his invasion. As described by Fornander (1880:136):

...*Alapainui* set sail with his fleet and landed at Mokulau, in the district of Kaupo on Maui. He met no resistance, but learned that *Kekaulike* had died but a short while previous; that his body had been removed to the sepulcher [*sic*] of Iao in Wailuku, and that *Kamehamehanui*, the son of *Kekaulike* and *Kekuiapo'iwa*, had, by orders of the late king, succeeded him as *Moi* of Maui.

Rather than pursue a war against Kamehamehanui, Alapa'inui was "moved by feelings of affection for his sister *Kekuiapo'iwa* and his nephew *Kamehamehanui*, he refrained from acts of hostility, and met the young *Moi* and his mother with the rest of the royal family at Kiheipukoa, where peace was concluded and festive reunions took the place of warlike encounters" (Fornander 1880:136). The records regarding Kamehamehanui's reign describe a time of peace that lasted up until Kalani'ōpu'u of Hawai'i Island initiated an abrupt invasion in ca. 1759 where he thereby secured the fort at Ka'uwiki (also spelled Ka'uiki) as well as Hāna and Kīpahulu. Fornander (1880:214) noted that "it is probable that, although *Kamehamehanui* failed in retaking the fort at Kauwiki, Hana, yet to some

extent he curtailed the possession of Hawaii outside of Kauwīki, more especially on the Koolau side.” Kamehamehanui died in ca. 1765 and his kingdom passed to his brother, Kahekili in the absence of his sister Kalola, who was the wife of Kalani’ōpu’u (Fornander 1880). Kalani’ōpu’u appears to have held the fort at Ka’uwīki along with all of Hāna and Kīpahulu until about 1775 when a war between Hawai’i and Maui broke out again.

Having heard that the people of Kaupō maintained Kekaulike as their rightful ruler, the Hawai’i Island forces stationed at Ka’uwīki led a devastating raid on the Kaupō residents. Referring to the aftermath of this invasion, Fornander (1880:150) explained:

Taken by surprise and unprepared, the Kaupo people suffered great destruction of property, cruelty, and loss of life at the hands of the Hawaii soldiers; and the expedition is called in the legends the war of “Kalaehohoa,” from the fact that the captives were unmercifully beaten on their heads by the war-clubs of the Hawaii troops.

The battle continued to Kalaeoka’īlio, a point in coastal Kaupō, and here, Kalani’ōpu’u’s forces were defeated and according to Desha (2000:31) “the bodies of the Hawai’i warriors were heaped like *kukui* branches before Maui’s exceptional warriors.” Kalani’ōpu’u then returned to Hawai’i Island and for a whole year, readied his forces for another invasion. It was in 1778, during the reign of Kalani’ōpu’u that the first foreign ships called into Hawaiian waters. By 1781, the aging Kalani’ōpu’u was nearing the end of his life. Hearing of the chief’s ill health, Kahekili prepared his forces to recover the East Maui districts, which had been under the rule of the Hawai’i Island chiefs for many years. Mahihelelima was serving as the Governor of Hāna and under him were several Hawai’i Island chiefs. Kahekili divided his forces and marched to Hāna by way of Ko’olau and Kaupō to the fort at Ka’uwīki. The Hawai’i Island forces stationed at Ka’uwīki were well-equipped and managed to stave off Kahekili’s men for some time until Kahekili was advised to “cut off the water supply of the fort by damming and diverting the springs in the neighbourhood [*sic*]” (Fornander 1880:216). Kahekili’s efforts were met with great success and he managed to recapture the fort at Ka’uwīki and Hāna and Kīpahulu in the battle known as Kaumupika’o. Despite regaining Ka’uwīki, the area had been severely plundered and Kahekili moved to the large plain of Makali’ihānau above Muolea, Hāna where he and his soldiers took up planting food (Fornander 1880). Kahekili moved to expand his kingdom and by the latter half of the 18th century, he and his son, Kalanikūpule managed to gain control over all the islands except for Kaua’i and Hawai’i Island (Kamakau 1992).

After several battles—including the famed ca. 1790 Battle of Kepaniwai that took place in ‘Īao valley, where Kalanikūpule barely escaped to O’ahu with his life—Kalanikūpule eventually lost the rule of his island kingdom to Kamehameha. Kalanikūpule fought to recapture Maui, and brought his forces against Kamehameha once again at the battle of Kepūwaha’ula on Hawai’i Island near Waipi’o Valley, but neither side was victorious. Kamehameha and Kalanikūpule’s forces then met one last time in 1795 at the Battle of Nu’uanu, where Kalanikūpule’s warriors were forced off of the *pali* (cliff) located at the back of Nu’uanu Valley on the Island of O’ahu. Although Kalanikūpule escaped into the Ko’olau Mountains, he was eventually caught and offered as a sacrifice to Kamehameha’s war god Kūkā’ilimoku (Kamakau 1992; Kirch 2010). Through these events, Kamehameha became king over all the islands except for Kaua’i. Thrum (1908b) reported that ca. 1802, while Kamehameha was en route to Kaua’i in an attempt to seize control of that island, he stopped at Kaupō and rebuilt the *heiau* of Loaloa, Pumaka’a, and Kānemalohemo and dedicated them to Kūkā’ilimoku. Kamehameha carried out ceremonies empowering his son and heir apparent, Liholiho (Kamehameha II) “with the sacred duties of temple consecration” (Thrum 1908b:47). By 1810, Kamehameha had united all of the islands under his rule and established the Kingdom of Hawai’i, which was governed by his descendants well into the 19th century. After Kamehameha died in 1819, the primary ruling center moved from Kailua on Hawaii Island to Lahaina, Maui.

The Legacy of the *Māhele* ‘Āina of 1848

The mid-19th century brought with it great changes, especially as it relates to the alteration of the traditional Hawaiian land tenure system. During the 1830s and 1840s, the Hawaiian Kingdom was an established center of commerce and trade in the Pacific, recognized internationally as a sovereign nation by the United States and other nations in the Pacific and Europe (Sai 2011). As Hawaiian political elites sought ways to modernize the burgeoning kingdom, and as more Westerns settled in the Hawaiian Islands, major socioeconomic and political changes took place, including the formal adoption of a Hawaiian constitution by 1840, the change in governance from an absolute monarchy to a constitutional monarchy, and the shift towards a Euro-American model of private land ownership. The change in land governance was partially informed by ex-missionaries and Euro-American businessmen in the islands who were generally hesitant to enter business deals on leasehold lands that could be revoked from them at any time. Convinced that the feudal system of land tenure previously practiced was not compatible with a constitutional government, the reigning *Mō‘ī* (King) Kūikeyaouli and his high-ranking chiefs decided to separate and

define the ownership of all lands in the Kingdom (King n.d.). The change in land tenure was further endorsed by missionaries and Western businessmen in the islands who were generally hesitant to enter business deals on leasehold lands that could be revoked from them at any time. After much consideration, it was decided that three classes of people each had one-third vested rights to the lands of Hawai'i: the *Mō'ī*, the *ali'i* (chiefs) and *konohiki* (land agents), and the *maka'āinana* (common people or native tenants) (Chinen 1958). In 1845 the legislature created the Board of Commissioners to Quiet Land Titles (more commonly known as the Land Commission), first to adopt guiding principles and procedures for dividing the lands and granting land titles, and then to act as a court of record to investigate and ultimately award or reject all claims brought before them. All land claims, whether by chiefs for the entire *ahupua'a* or by tenants for their house lots and gardens, had to be filed with the Land Commission within two years of the effective date of the Act (February 14th, 1848) to be considered. This deadline was extended several times for the *ali'i* and *konohiki*, but not for commoners (Alexander 1920; Soehren 2005).

The *Mō'ī* and some 245 *ali'i* (Kuykendall 1938) spent nearly two years trying unsuccessfully to divide all the lands of Hawai'i amongst themselves before the whole matter was referred to the Privy Council on December 18, 1847 (King n.d.). Once the *Mō'ī* and his *ali'i* accepted the principles of the Privy Council, the *Māhele 'Āina* (Land Division) was completed in just forty days (on March 7th, 1848), and the names of all of the *ahupua'a* and *'ili kūpono* (nearly independent *'ili* land division within an *ahupua'a*) of the Hawaiian Islands and the chiefs who claimed them, were recorded in the *Buke Mahele* (also known as the *Māhele* Book) (Buke Māhele 1848; Soehren 2005). As this process unfolded the *Mō'ī*, who received roughly one-third of the lands of Hawai'i, realized the importance of setting aside public lands that could be sold to raise money for the government and also purchased by his subjects to live on. Accordingly, the day after the division when the last chief was recorded in the *Buke Māhele*, the King commuted about two-thirds of the lands awarded to him to the government (King n.d.). Unlike the King, the *ali'i* and *konohiki* were required to present their claims to the Land Commission to receive their Land Commission Award (LCAw). The chiefs who participated in the *Māhele* were also required to provide commutations of a portion of their lands to the government to receive a Royal Patent that gave them title to their remaining lands. The lands surrendered to the government by the *Mō'ī* and *ali'i* became known as "Government Land," while the lands that were personally retained by the *Mō'ī* became known as "Crown Land," and the lands received by the *ali'i* became known as "Konohiki Land" (Chinen 1958:vii; 1961:13). Most importantly, all lands (Crown, Government, and *Konohiki* lands) identified and claimed during the *Māhele* were "subject to the rights of the native tenants" therein (Garovoy 2005:524). Finally, all lands awarded during the *Māhele* were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be formally surveyed. This process expedited the work of the Land Commission.

At the time of the 1848 *Māhele*, Ke'ānae Ahupua'a was claimed by the Sovereign, Kūikeyaouli as his personal lands (Crown Lands) which suggests the importance of this land to the King. In contrast, no specific claim to Nāholokū was made. However, the *ali'i* Ane Keohokālole as part of Parcel 25 of LCA 11216 claimed portions of at least five *ahupua'a* in Kaupō, namely Kahuai, Maalo, Popoiwi 1 and 2, and Pu'ulani and all remaining portions of Kaupō were incorporated into the inventory of government lands (Office of Hawaiian Affairs 2018).

Kuleana Act of 1850

As the King and his *ali'i* and *konohiki* made claims to large tracts of land via the *Māhele*, questions arose regarding the protection of rights for the native tenants. To resolve this matter, on August 6th, 1850, the Kuleana Act (also known as the Enabling Act) was passed, clarifying the process by which native tenants could claim fee simple title to any portion of lands that they physically occupied, actively cultivated, or had improved (Garovoy 2005). The Kuleana Act also clarified access to *kuleana* parcels, which were typically landlocked, and addressed gathering rights within an *ahupua'a*. Lands awarded through the Kuleana Act were and still are, referred to as *kuleana* awards or *kuleana* lands. The Land Commission oversaw the program and administered the *kuleana* as Land Commission Awards (LCA) (Chinen 1958). Native tenants wishing to claim their lands were required to register in writing those lands with the Land Commission, who assigned a number to each claim, and that number (the Native Register) was used to track the claimant through the entire land claims process. The native tenants registering their *kuleana* were then required to have at least two individuals (typically neighbors) provide testimony to confirm their claim to the land. Upon provision of the required information, the Land Commission rendered its decision, and if successful, the tenant was issued the LCA. Finally, to relinquish any government interest in the property, the holder of a LCA obtained a Royal Patent Grant from the Minister of the Interior upon payment of the commutation fee.

Kuleana Awards in Ke‘anae Ahupua‘a and Nāholokū Ahupua‘a

Within Ke‘anae, forty-one *kuleana* parcels were awarded to twenty-one native tenants the details of which are listed below in Table 1. The vast majority of *kuleana* awards are located within the Ke‘anae Peninsula except for two awards (LCA 3472 B to Barenaba and LCA 4848:1 to Kuluhiwa) which are located further east along Waianu Stream (Commissioner of Public Lands 1929; Office of Hawaiian Affairs 2018). None of the awarded *kuleana* are within the *mauka* section of Ke‘anae. The *mauka*-most *kuleana* which was awarded to Kuluhiwa (LCA 4848:1) is roughly 0.40 miles *mauka* of the nearest coastline. The *kuleana* in Ke‘anae, which ranged in size from 0.91 to 7.0 acres were awarded between 1855 and 1857. The location of the *kuleana* awards for Ke‘anae, except those awarded to Barenaba and Kuluhiwa, is shown on Hawai‘i Registered Map No. 2238 from 1903 (Figure 23).

The records for Nāholokū do not show whether any *kuleana* awards were claimed or awarded. This discrepancy may be explained by the incongruity in the status of Nāholokū as an *ahupua‘a* or an *‘ili ‘āina*. *‘Ili ‘āina* like *moku* were geographical subdivisions and had no reference to rights in land (Cannelora 1974). As such, given the lack of *kuleana* claims and awards, it is likely that at the time of the *Māhele* of 1848, Nāholokū was recognized as an *‘ili ‘āina* rather than an *ahupua‘a*. Furthermore, Gregoire (2023a) notes that the status of Nāholokū as a *ahupua‘a*, along with at least ten others in Kaupō “is most questionable.” Despite the lack of information regarding the *kuleana* awards for Nāholokū, at least eighteen *kuleana* were awarded in all of Kaupō, the details of which are listed in Table 2. The location of the *kuleana* in Kaupō is shown in Hawai‘i Registered Map No. 1782 from 1894 (Figure 24).

Table 1. *Kuleana* awards in Ke‘anae Ahupua‘a.

<i>Claimant</i>	<i>LCA No.</i>	<i>Royal Patent No.</i>	<i>Year Awarded</i>	<i>No of Parcels</i>	<i>Acres</i>
Barenaba	3472 B	2810	1856	1	7.0
Ehu	4665-G	3341 & 4062	1856	3 & 1	4.84 & 0.50
Kaea	2442	2017	1855	1	3.25
Kahaukomo	7784	2908	1856	1	4.42
Kaihu	4856	3357	1856	2	2.91
Kailio	4848-H	3271	1856	3	0.98
Kauakahi	4665-I	3106	1856	2	2.11
Kanehaku	2443	3380	1856	1	3.15
Kanuku	4665-K	3352	1856	1	1.56
Kaopa	4853-L	3268	1856	3	1.12
Kealina	2441	2946	1856	3	3.27
Keliiaea	4848-C	3812	1857	1	1.20
Kuluhiwa	4848	3655	1857	2	1.79
Maewaewa 1	4848-F	3332	1856	2	3.01
Maewaewa 2	4848-E	3272	1856	2	1.07
Makea	4874	3656	1857	2	1.83
Malailua	4847	3266	1856	3	1.76
Mamaekawaha	4854	3270	1856	1	0.75
Mu	4848-G	3346	1856	3	0.91
Naeole	4665-F	3274	1856	2	3.56
Ohiki	4857	3267	1856	1	1.50
<i>Total</i>				<i>41 parcels</i>	<i>52.49 acres</i>

Table 2. *Kuleana* awards in Kaupō. (* location not shown in Figure 24)

<i>Claimant</i>	<i>LCA No.</i>	<i>Royal Patent No.</i>	<i>Year Awarded</i>	<i>No of Parcels</i>	<i>Locational Information</i>	<i>Acres</i>
Akaa	4074	2947	1856	3	Ohia, Niu	21.57
Alenuihaha	5178-D	2624	1856	2	Popoiwi	17.82
Baldwin, D.	635-B	8281	1911	1	Kalianu, Pualaea	1.50
Ekikalaka	823	7812	1866	2	Kukoa & Waipouli	8.25
Harbottle, W.	2937	7259	1879	1	Kumunui (1)	145.00
Kahalua	7788	n/a	n/a	1	Opupao, Lole	7.32
Kahoouluwaa	822	726	1852	1	Lole	30.0
Kaili, I.	1000	4065	1858	1	Maalo	8.64
Kaimihaku	5178-E	6220	1868	2	Haleniki, Kunane	3.977
Kau	2288	7023	1877	1	Kihehale	13.50
Kawahakaia	6773-C*	2623	1856	4	Puulani, Niumalu	7.88
Kekahu	10157-B	6680	1875	1	Nuanualoa	6.40
Kekapa	542	5166	1862	5	Kahawai	9.26
Keliilawaia	5051 B	7177	1878	2	Pukeauhulu, Hikiaupea	16.37
Lahaina	8986-B	5540	1865	1	Pualaea	12.05
Mailehuna	2642	n/a	n/a	2	Puulani	7.36
Nawaimakaeha	5181-C	6514	1873	2	Kumunui	20.23
Nuuanu	11290	n/a	n/a	1	Niumalu	2.55
Total				33 parcels		339.67

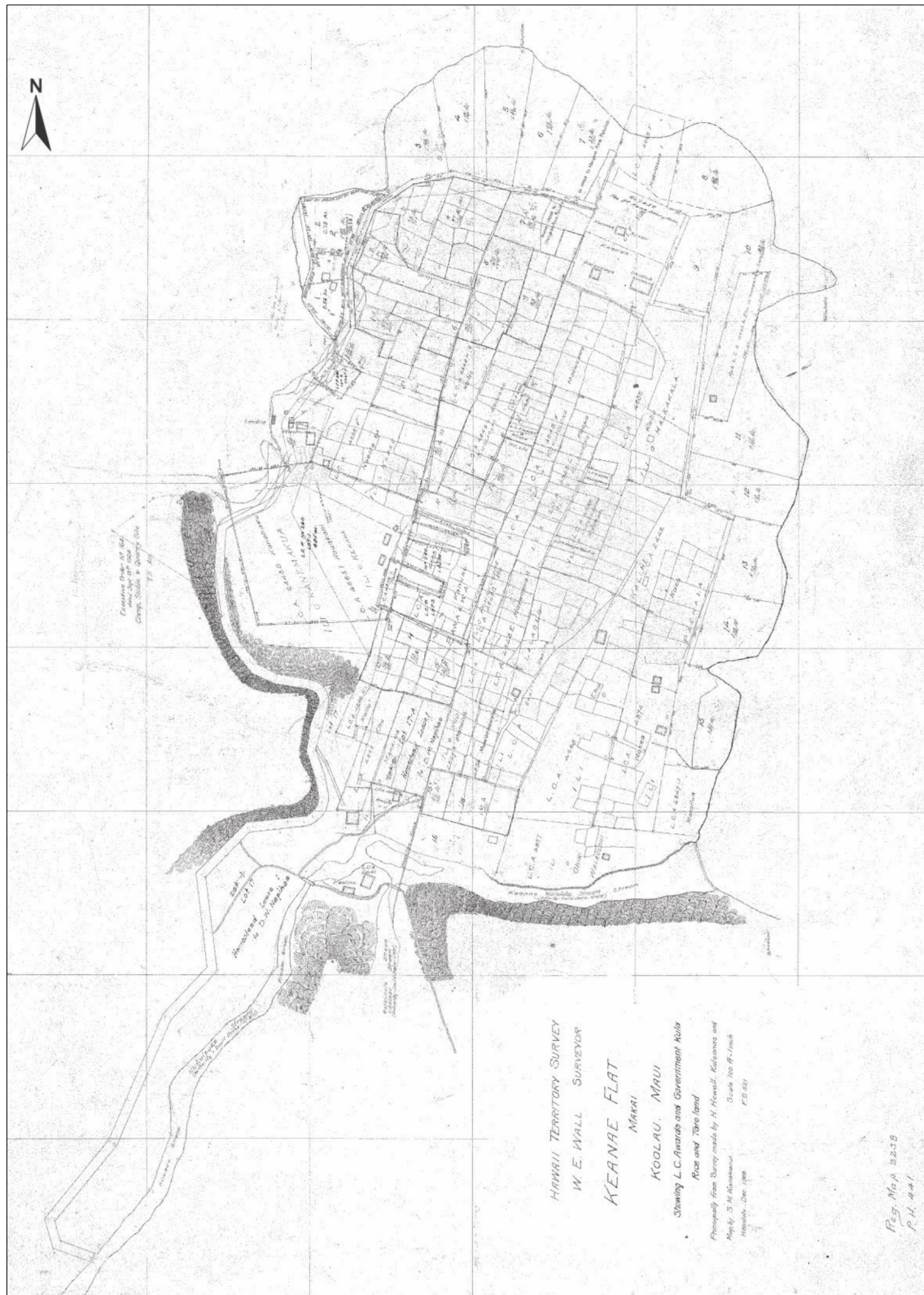


Figure 23. Hawai'i Registered Map No. 2238 from 1903 showing *kuleana* awards within the Ke'anae Peninsula (project areas not shown on map).

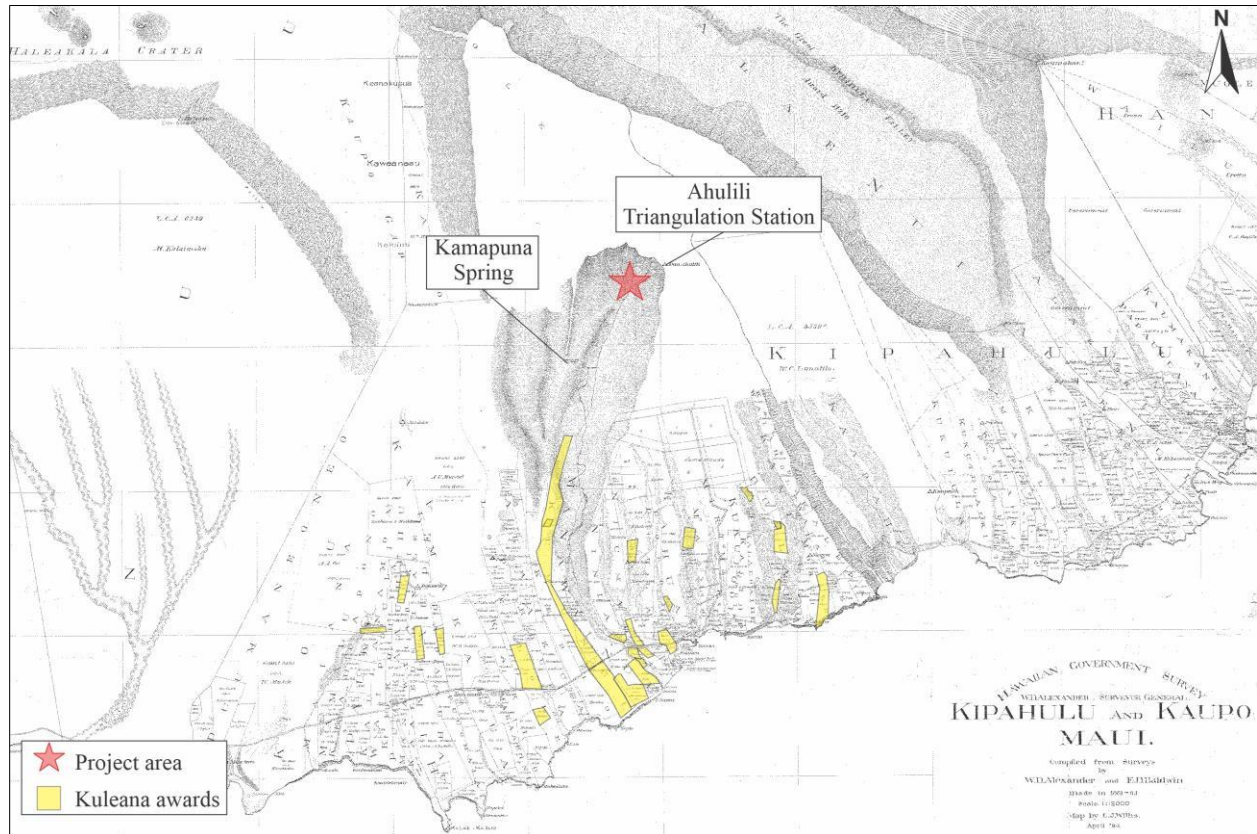


Figure 24. Portion of Hawai'i Registered Map No. 1782 from 1894 showing *kuleana* awards in Kaupō.

In addition to showing the distribution of *kuleana* awards across Kaupō, the 1894 map (see Figure 24) also identifies several place names near the project area including “Ahulili Triangulation Station” and “Kamapuna Spring.” ‘Āhulili, a renowned *pu‘u* of the Kaupō area which sits at the head of Manawainui Gulch, serves as the inspiration for the *mele* titled Ahulili by Scott Ha‘i (Ha‘i n.d; Soehren 2010). While there are several versions of this *mele*, the composer plays on the place name ‘*āhulili*, literally translated as glowing, dazzling and *lili* meaning jealous as well as the manner in which the mountain mist does not settle on this *pu‘u* to allude to deep and passionate love or attachment with hints of jealousy and a desire for lasting connection or presence to a particular person (Pukui and Elbert 1986). Other than it being noted as a spring, no additional information was obtained for Kamapuna.

Government Land Grant Program

In conjunction with the *Māhele*, the reigning monarch, Kamehameha III authorized the issuance of Royal Patent Grants to applicants for tracts of government land. The process for applications was clarified by the “Enabling Act,” which was ratified on August 6, 1850. The Act resolved that portions of Government Lands established during the *Māhele* of 1848 should be set aside and sold as grants. The stated goal of this program was to enable native tenants, many of whom were not awarded or insufficiently awarded *kuleana* parcels during the *Māhele*, to purchase lands of their own. Despite the stated goal of the program, many parcels that were sold also fell into the hands of foreigners.

Within Ke‘ānae about dozen land grants were awarded all of which are located to the southeast of the Ke‘ānae Peninsula along Palauhulu and Waioakamilo streams which are shown in Hawai'i Registered Map No. 2235 from 1903 (Figure 25). Of these, the *mauka*-most grant (No. 3375; see Figure 25), which was sold to Uluhani (also spelled Uluhane in some records) in 1884 and comprised 31.0 acres is within Ke‘ānae Valley roughly 3 miles inland of the nearest coastline. Uluhani’s land grant documents are silent regarding land use, however, the surveyor notes did identify ‘*ōhi‘a* trees; a *pali* (cliff) at a place called Kaulanamoā, as well as a watercourse (Office of Hawaiian Affairs 2018).

2. Background

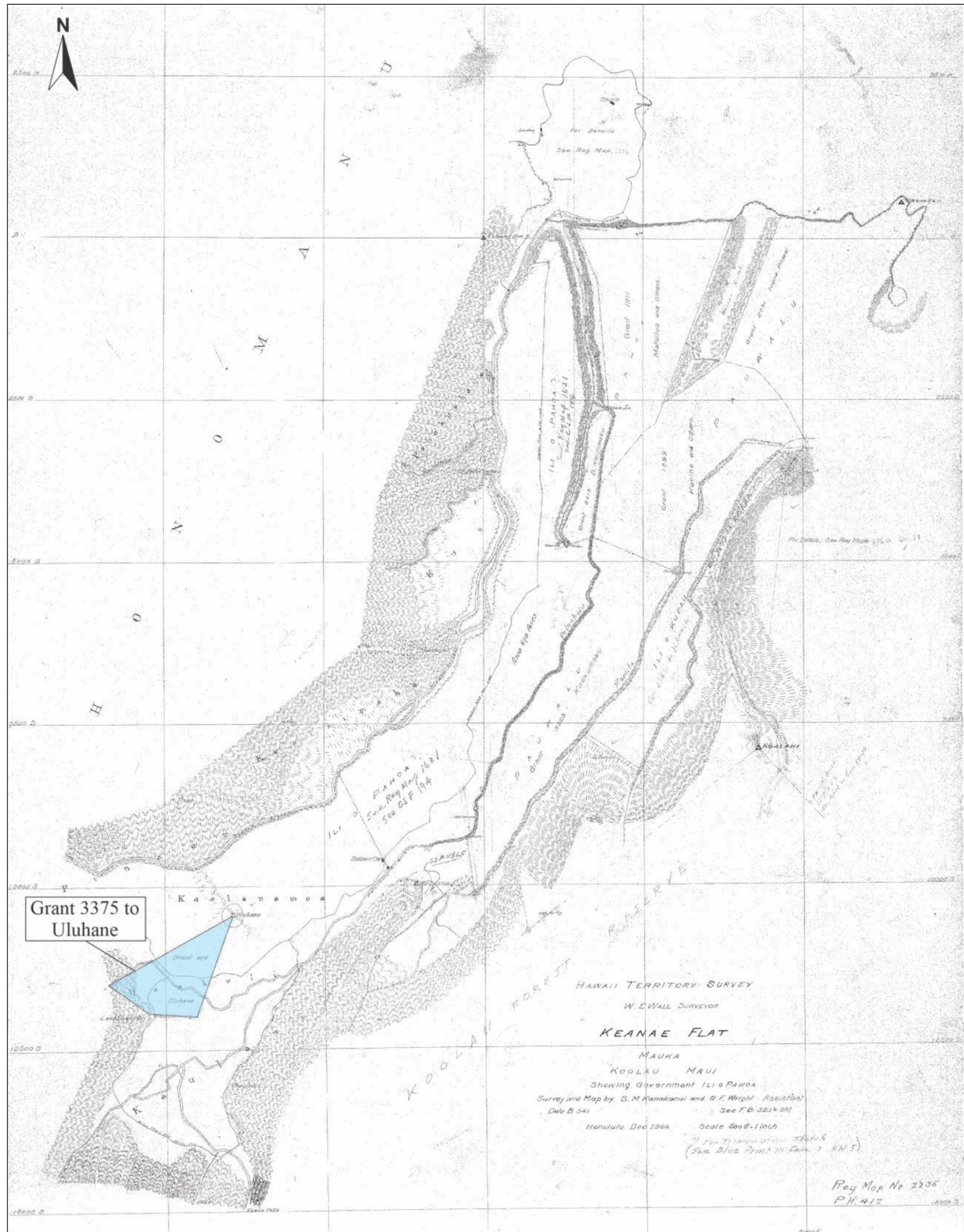


Figure 25. Hawai'i Registered Map No. 2235 from 1903 showing Land Grants within Ke'anae along Palauhulu stream (project areas not shown on map).

Within the greater Kaupō District, a number of land grants were sold, the vast majority of which were located no further than 2.3 miles inland of the coast. Only two land grants extended from the district's interior towards the summit slopes of Haleakalā, including the 1,280-acre grant (No. 3457:1) sold to Antone Vierra Marciel in 1899 and a 1,200-acre grant (No. 3602) sold to William Mutch in 1892 (Office of Hawaiian Affairs 2018). The Kaupō (Kīpahulu Forest Reserve) project area is located to the east of where Mutch's and Marciel's grant boundaries meet as shown in Hawai'i Registered Map No. 1115 from 1894 (Figure 26).

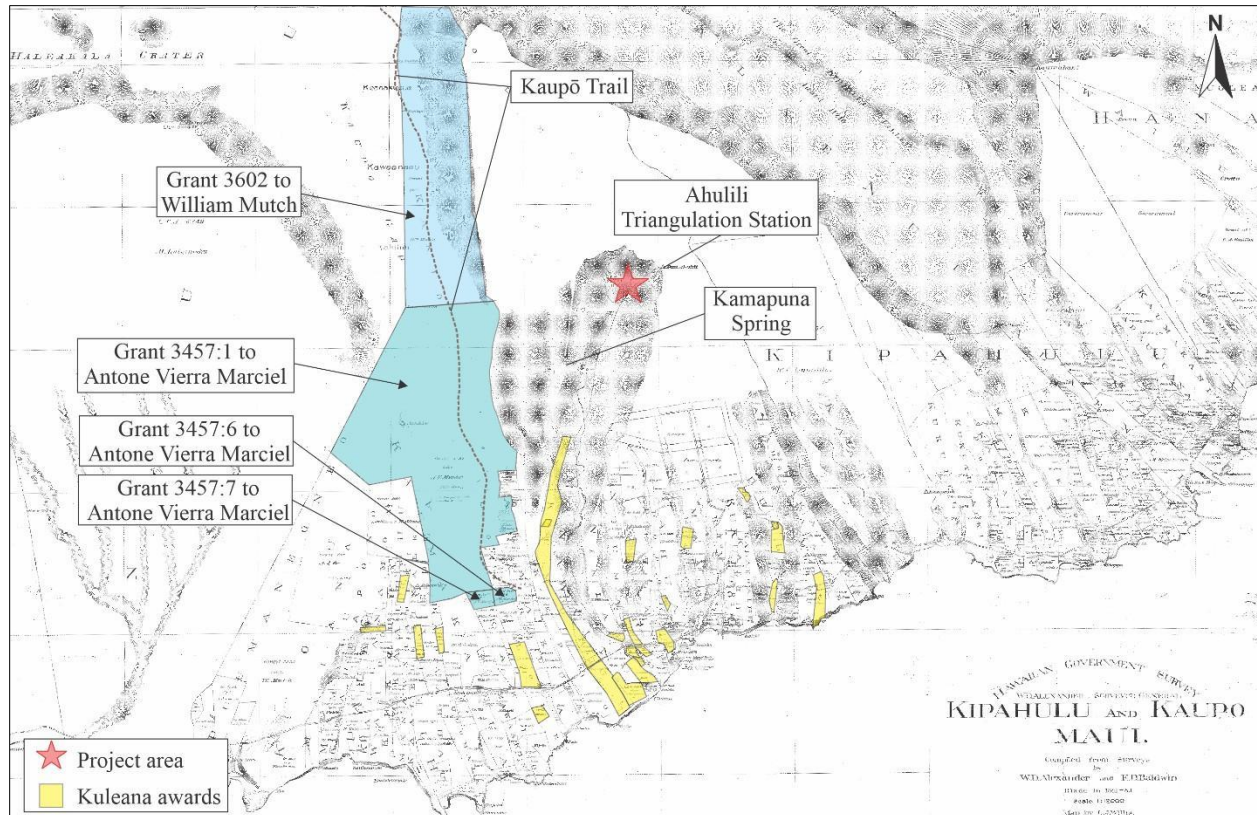
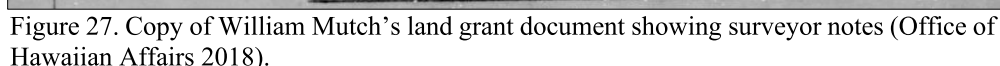


Figure 26. Portion of Hawai'i Registered Map No. 1115 from 1895 showing land grants sold to A.V. Marciel and W. Mutch and the Kaupō Trail to the west of the Kaupō (Kīpahulu Forest Reserve) project area.

Concerning William Mutch, the passenger statement for the *S.S. Australia* listed William Mutch, as arriving in Honolulu on May 25th, 1897. Born around 1850 in Scotland, Mutch arrived in Hawai'i and worked as a contractor in Honolulu where according to his son, he "built the old Moana Hotel, old Kamehameha Schools, Bishop Museum, and the Alexander & Baldwin building, among others" (Hawai'i State Archives 1897; Honolulu Star-Bulletin 1951:24). Born in Azores, Portugal in 1838, Antone Vierra Marciel arrived in Hawai'i around 1865 after the whaling vessel he was on became icebound. He arrived first in Honolulu and worked on Kuli'ou'ou Ranch then moved to Maui and worked on the ranch in Kahikinui. Around 1889, Marciel purchased the ranch at Kaupō and remained there until he died in 1929 at the age of 91 (Honolulu Star-Bulletin 1929).

As part of Marciel's 1,280-acre *mauka* grant (also known as Lot 1), he also purchased two other grants (the roughly 13.5-acre Lot 6 and the 16.5-acre Lot 7) both of which were adjacent to the *makai* boundary of Lot 1. Of the two, the grant sold to Mutch extended *mauka* from about the 4,200-foot elevation to the Haleakalā crater rim at about the 7,700-foot elevation and is located to the west of the Kaupō (Kīpahulu Forest Reserve) project area. Although Mutch's and Marciel's land grant documents are silent regarding land use, the surveyor notes and maps showing Mutch's (Figures 27 and 28) and Marciel's (Figures 29, 30, and 26) grants provide insight into some of the places and vegetation found in the upland during the late 19th century.

A review of the surveyor notes associated with Mutch's grant identified the following plants namely *lehua*; place names including Kauhakamoa, Keolepelepe, Pōhakulua, Pōhaku 'Okī 'Āina, Kaluanui; *ahupua'a* names including Kalialinui, Haiku, Ke'anae; as well the Kaupō Trail which rain *mauka* through the central part of his grant before turning west towards the boundaries identified as Keolepelepe and Pōhakulua (see Figure 26). Similarly, the surveyor notes from Marciel's grant identified the following place names, Kauhakamoa, Keolepelepe, Pōhakulua,



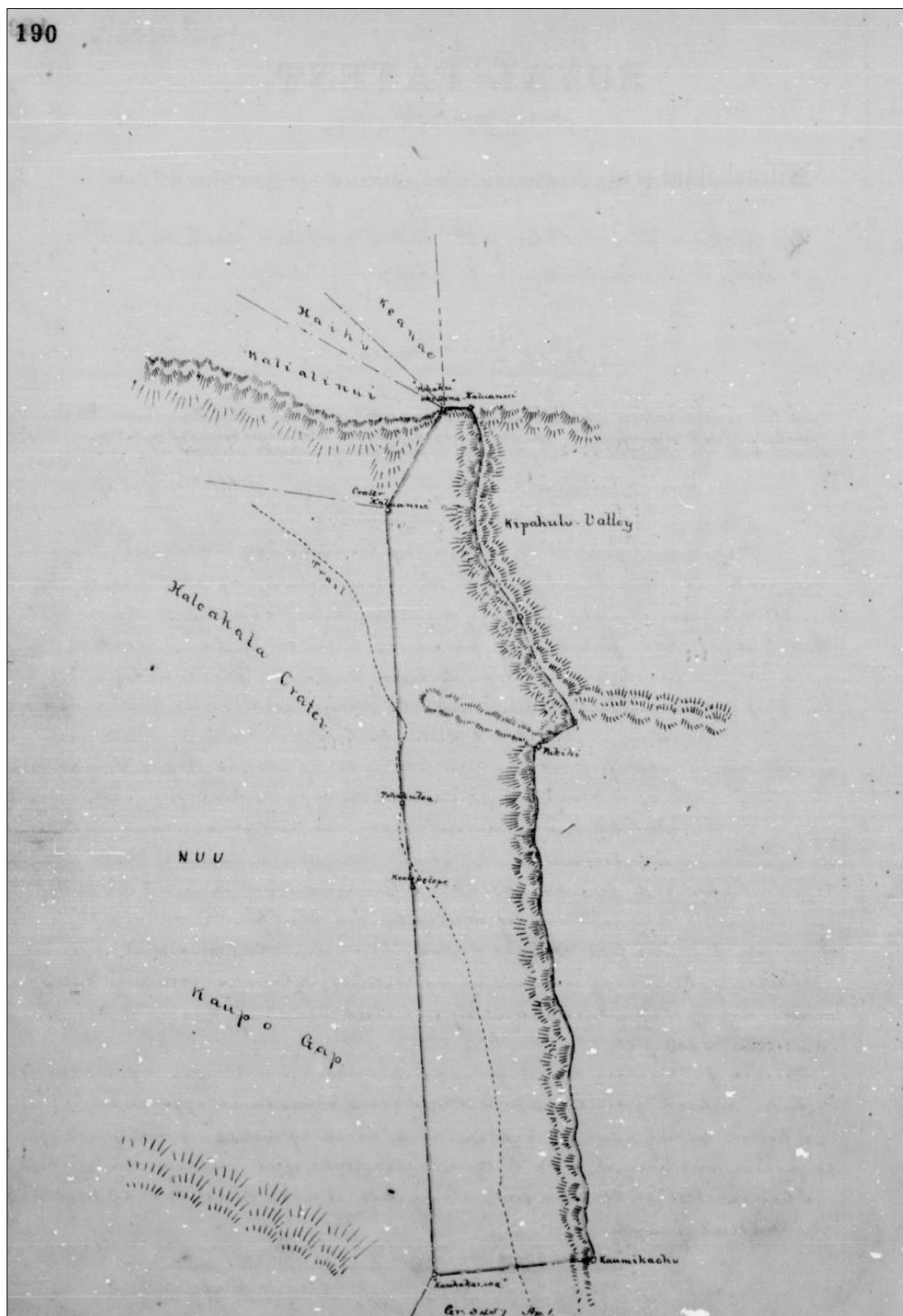


Figure 28. Copy of William Mutch's land grant document showing the surveyor map (project area not shown) (Office of Hawaiian Affairs 2018).

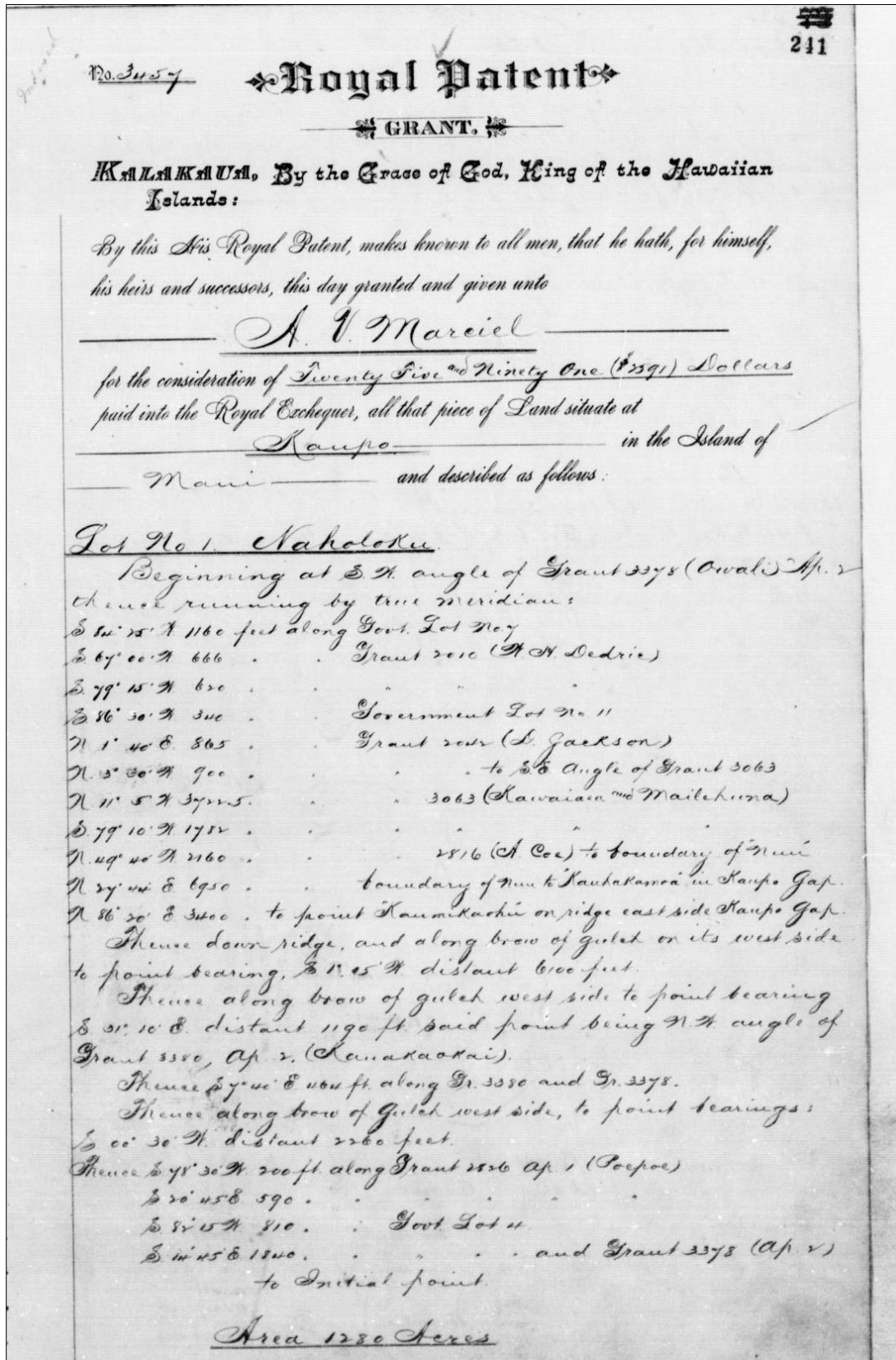


Figure 29. Copy of Antone Vierra Marciel's land grant document showing surveyor notes (Office of Hawaiian Affairs 2018).

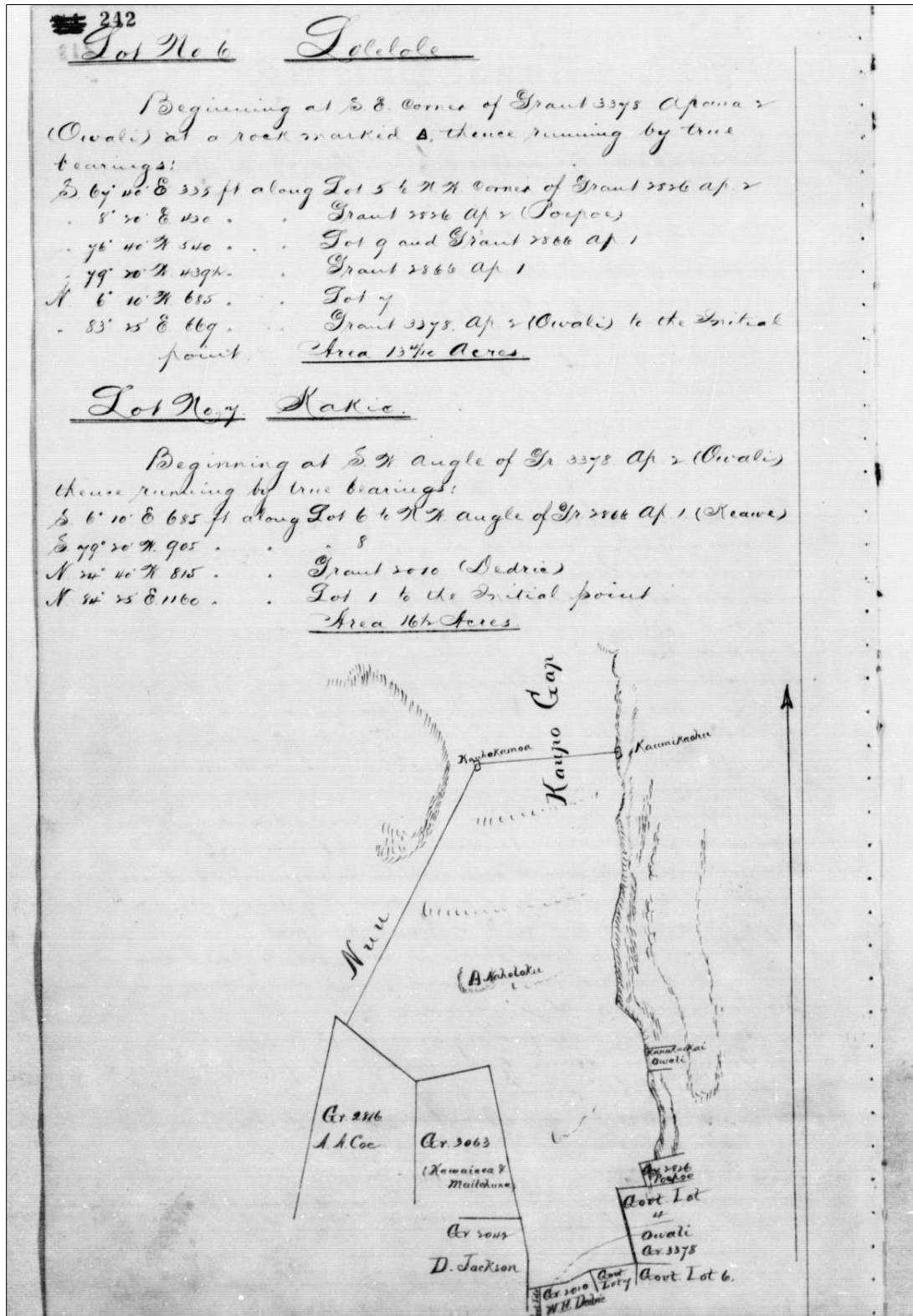


Figure 30. Copy of Antone Vierra Marciel's land grant document showing the surveyor map of Lot 1 (project area not shown) (Office of Hawaiian Affairs 2018).

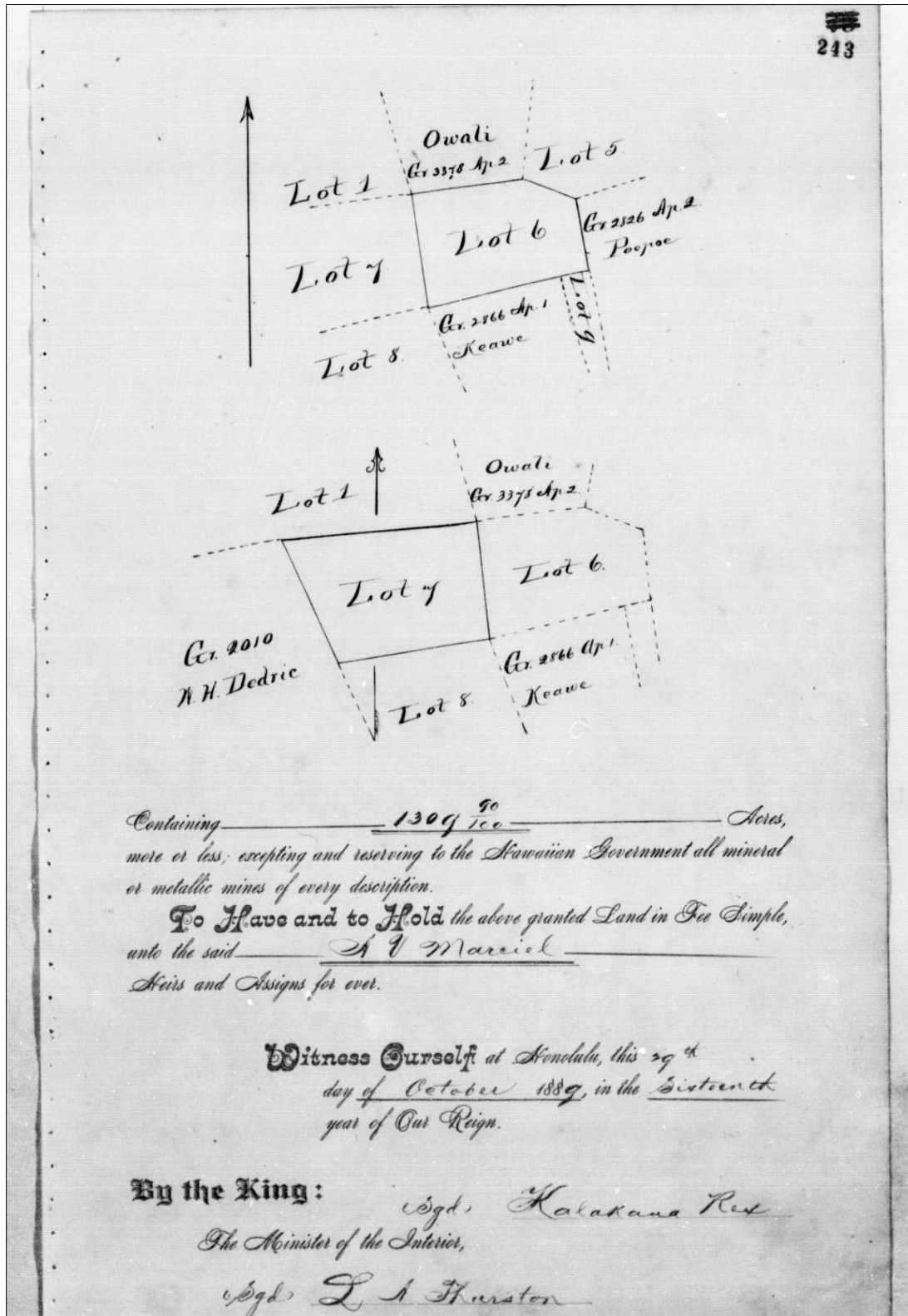


Figure 31. Copy of Antone Vierra Marciel's land grant document showing the surveyor map of Lot 6 and 7 (project area not shown) (Office of Hawaiian Affairs 2018).

Land Boundary Commission Testimony

In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawai'i to legally set the boundaries of all the *ahupua'a* that had been awarded, by name only, as a part of the *Māhele*. Subsequently, in 1874, the Boundary Commission was authorized to certify the boundaries for lands brought before them. As a part of this process, the Boundary Commission gathered testimony from informants, who were typically older native residents who learned of the boundaries from their ancestors, relatives, or neighbors. The boundary information was collected primarily between 1873 and 1885 (and sometimes later) and was usually given in Hawaiian and simultaneously transcribed into English. Although hearings for most *ahupua'a* boundaries were brought before the Boundary Commission and later surveyed by Government employed surveyors, in some instances, the boundaries were established through a combination of other methods. In some cases, *ahupua'a* boundaries were established by conducting surveys on adjacent *ahupua'a*. Or in cases where the entire *ahupua'a* was divided and awarded as Land Commission Award(s) and or Government-issued Land Grants (both of which required formal surveys), the Boundary Commission relied on those surveys to establish the boundaries for that *ahupua'a*. Although these small-scale surveys aided in establishing the boundaries, they lack the detailed knowledge of the land that is found in the Boundary Commission hearings.

A review of the Boundary Commission records indicates that no survey or testimony was gathered for Nāholokū, likely because the entirety of the Kaupō District was awarded as either a LCA or a government Land Grant, both of which required formal surveys. However, with regard to certifying the boundaries of Ke'anae, a hearing was held at Wailuku beginning on March 27th, 1895 at Wailuku. The testimony, which is reproduced below indicates that no testimony was gathered from *kama'āina* rather the boundaries of Ke'anae were determined based on the information provided by government Surveyor, M. D. Monsarrat. The testimony certifying the boundaries of Ke'anae is as follows:

Before G. Hemstrong, Commissioner of Boundaries for the Second Judicial District H.I.

Wailuku, Maui Wednesday, Mar, 27th 1895.

In the matter of the Boundaries of the land of Keanae District of Koolau, Island of Maui.

Application made by C.N. Spencer, Minister of the Interior, and C.P. Iaukea, Esq. Agent for Crown Lands.

Continued to Thursday, March 28th, 1895.

Wailuku, Maui, Thursday March 28th 1895

Due Publication made.

M.D Monsarrat sworn

The survey which I now submit of the land of Keanae, District of Koolau, Island of Maui, H.I. is a survey made by me and is correct. I identify the map filed, and shown me as a correct map of said land.

M.D. Monsarrat having filed his credentials from the Government authorizing him to act in the premises, and after duly notifying all parties holding adjoining land and none appearing:

It is decreed that the Boundaries of the land of Keanae in the District of Koolau, Island of Maui, H.I., is as follows:

Commencing at the mouth of a stream on the East side of the Keanae flat at foot of pali and running true bearing N84° 45' W 1160 feet along Gr. 1911 to Malailua & Co. to point on edge of pali

2 S 19° 22' E 911.5 feet along Gr 1991 along edge of pali.

3 S 5° 23' E 2030 " " 1991 " " " " to water falls of Wai o Kuna.

4 S 42° 38' W 350 feet along the precipice between this land and Gr. 3815 to Kalilimoku, the stream being the Boundary

5 S 6° 26' W 710 feet along same.

6 S 21° 15' W 1203 " " " and across bend in gulch to concrete post near the water fall of Keaku

7 S 30° 48' W 999 feet along Gov't land of Pahoa

2. Background

- 8 S 33° 33' W 455 “ “ “ “ “ “
9 S 35° 21' W 2320 “ “ “ “ “ “ to a place called “Ka pahu ku.”

Land of Keanae continued.

- 10 S 45° 9' W 1100 feet along Pahoa to a place called “Ke Poo o ka Moku.”
11 S 49° 58' W 2908 feet along Pahoa to a place called [document damaged, text illegible]
12 S 61° 58' W 2199 feet along Pahoa to a large ohia tree marked K at a place called Ainakiki on ridge.
13 S 14° 50' W 3180 feet along Pahoa up center of the ridge to a place called Nunumea.
14 S 43° 55' W 12190 feet along Wailua Nui & Iki through woods point in same.
15 S 4° 43' E 18810 feet along the Gov't land to a large rock marked 𐀀 thus on ridge. North of a hill called Puu Alaea.
16 S 3° 2'E 4150 feet along Gov't land passing on the east side of Puu Alaea to a large rock on the brink of Haleakala crater called “Pohaku Oki Aina” at a place called Palaha. Where all the large lands of East Maui meet.
17 N 42° 38' W 32490 feet along Haiku across the Koolau Gap to a point on the west edge of the same.
18 N 12° 15' E 7660 feet along Haiku to a hill called Kikau at the south corner of the land of Honomanu.
19 N 44° 43' E 21375 feet along Honomanu to the sea. Thence along the seashore to initial point.

The [illegible] along the seashore being as follows:

- 20 N 87° 10' E 1360 ft along seashore to mouth of stream.
21 N 61° 42' E 2040 “ “ “
22 N 23° 40' E 1420 “ “ “
23 S 65° 18' E 1280 “ “ “
24 S 1° 52' W 2145 “ “ “ to initial point

Honolulu, July 1883. M.D. Monsarrat Sur.

Area 11148 acres

Economic Industries During the Late 19th and Early 20th Centuries

After the *Māhele* 'Āina of 1848 and the passage of subsequent laws enabling land privatization in Hawai'i, the economy continued to trend towards large-scale commercial agriculture and ranching. In the Hāna region, six distinct sugar plantations were operating by 1883. Chinese contract laborers, some of whom upon completion of their contracts (or broke their contacts altogether), left these plantations and settled in Ke'ānae. At Ke'ānae, the Chinese cultivated rice “wherever taro farmers were interested in earning cash by renting out their traditional taro growing land” (McGregor 2007:103). Although these sugar plantations were not as robust as other operations on Maui, the region's abundant water supply drew the interest of sugar moguls who sought to expand their private economic pursuits by diverting water to Maui's dry central plains.

The proliferation of sugar in Maui's otherwise dry central plains was led by Samuel T. Alexander and Henry P. Baldwin, the son of missionaries who formed Alexander and Baldwin (A&B) in ca. 1869 (Lizzi 2017; Wilcox 1996). By 1876, the duo established the Hamakua Ditch Company and began petitioning the Kingdom government for long-term agreements to access streams in East Maui. Two years later the Hamakua Ditch Company had built the Hamakua Ditch and by the turn of the century, they built Lowrie Ditch situated at a lower elevation. Between 1904-1905, the Hamakua Ditch Company extended its Hamakua Ditch another ten miles east towards Makapipi through the rugged Ko'olau District where it passed through the upper elevations of Ke'ānae (Wilcox 1996). That portion of the Ko'olau Ditch that extended through Ke'ānae meandered between the 1,000 to 2,000-foot elevation, *makai* of the current Ko'olau Forest Reserve project area as shown in a 1957 USGS map (Figure 32).

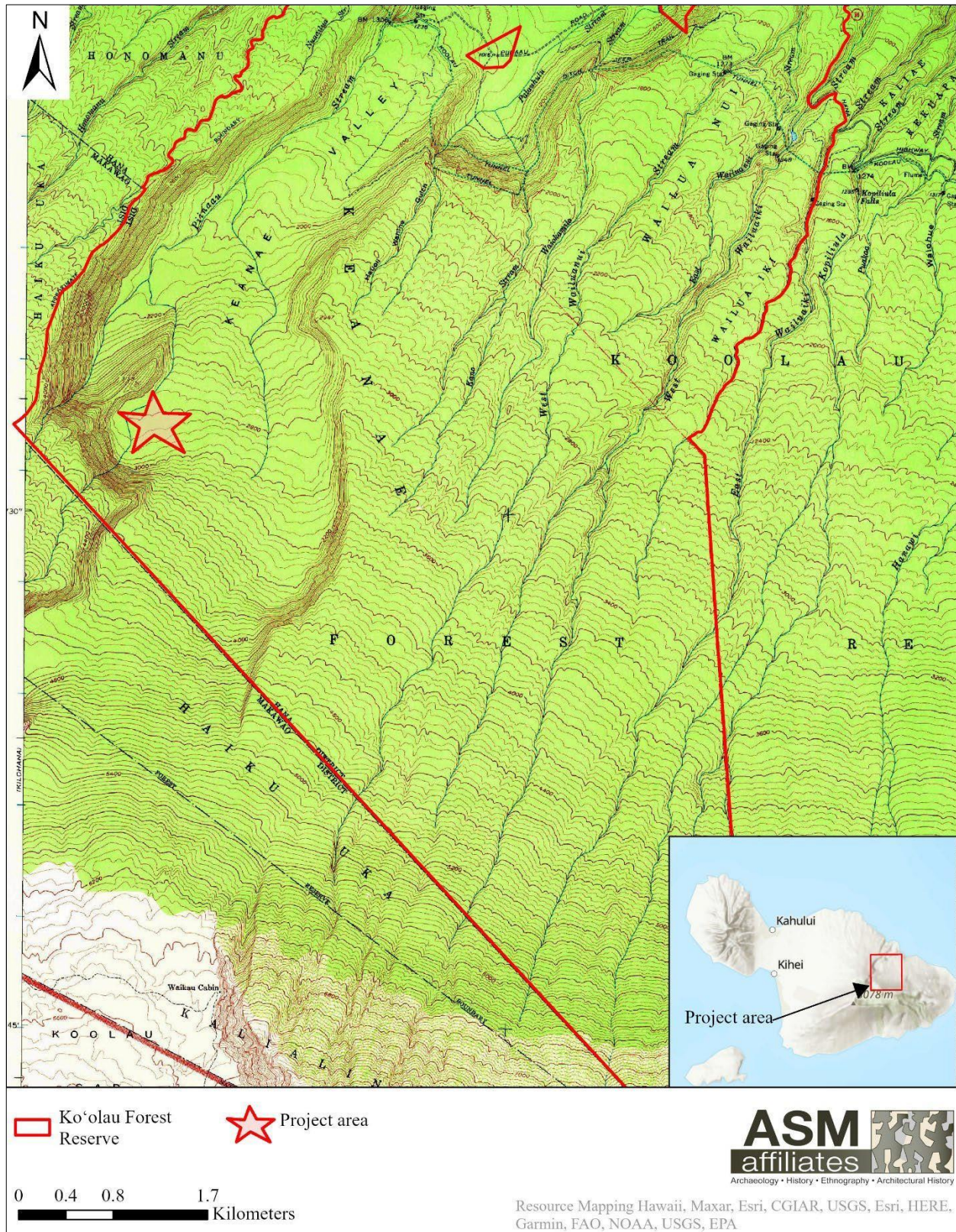


Figure 32. 1957 USGS map showing the Ko'olau Ditch meandering through Ke'anae between the 1,000 and 2,000 foot elevation.

The challenging terrain in the Ko‘olau District posed significant difficulties for the construction of the Ko‘olau Ditch, according to Engineer M. M. O’Shaughnessy:

The country was so steep and precipitous that little ditching could be employed, and it was necessary to make four and one-half miles of wagon road and eighteen miles of stone paved pack trails to facilitate during construction the transportation of supplies. About 4000 barrels of cement and 100,000 pounds of giant powder were used. In all ten mountain streams are intercepted, which are admitted into the main aqueduct through screens of grizzly bars spaced three-quarters of an inch apart. (in Wilcox 1996:117)

Built on the backs of Japanese laborers, the Ko‘olau Ditch, upon its completion, included roughly 7.5 miles of hand-dug tunnels and another 2.5 miles of open ditch and flume with a capacity of 85 million gallons per day. By 1908, A&B formed the East Maui Irrigation Company (EMI), as the successor of the Hamakua Ditch Company, whose purpose was to “develop and administer the surface water for all the plantations owned, controlled, or managed by” A&B (Wilcox 1996:117). Throughout the early 19th century, as A&B continued to expand its planting operations, EMI followed with the construction of additional ditch systems and the acquisition of prime watershed lands in East Maui. However, financially prosperous A&B and EMI were, the diversion of surface water from East Maui has had a lasting and detrimental effect on the region’s taro farmers whose livelihoods and customary practices have been jeopardized by decreased or completely absent stream flow (Lizzi 2017; Wilcox 1996).

Throughout the mid-19th century and with the urging of local farming *hui* (organizations), Kaupō residents began experimenting with a variety of crops such as coffee and cotton. Of the two, cotton emerged as an important industry that was catalyzed by the boycott of cotton from the southern United States during the 1861 U.S. Civil War (Gregoire 2023b). As reported in the February 1894 edition of *The Planters’ Monthly*:

Both natives and foreigners engaged eagerly in the new enterprise, which was started on each of the six principal islands of the group, the finest plants and choicest fiber being produced generally on the leeward sides of each island, as Kona on Hawaii, Kaupo district on Maui... (Planters’ Labor and Supply Company 1894:53)

Despite producing quality cotton for export, poor planting practices resulted in a subpar product and the demise of the industry by the turn of the 20th century. In addition to cotton, ranching emerged as a significant industry in Kaupō, although its exact origins remain somewhat unclear. However, evidence suggests that ranching was already in progress by 1889, marked by Antone Vierra Marciel’s acquisition of a ranch in Kaupō. Furthermore, in 1929, Dwight H. Baldwin solidified the establishment of the present-day Kaupo Ranch (Honolulu Star-Bulletin 1929; Marciel 1977). Over the following decades, Kaupo Ranch grew in size and by 1969 the ranch encompassed a total of 17,000 acres, two-thirds of which the ranch owned in fee-simple with the remaining acreage held by leasehold agreement with the State and private owners. The ranch lands extended from sea level to about the 7,600-foot elevation at the crater rim of Haleakalā with Nāholokū serving as the ranch’s center. (Honolulu Advertiser 1969). Life of Kaupo Ranch as well as the early industries in East Maui during the early 20th century is more intimately recalled in the following account describing the journey taken by Thomas K. Maunupau and Dr. Kenneth Emory.

Huaka‘i Māka‘ika‘i a Kaupō, Maui (A Visit to Kaupō Maui)

In May of 1922, Thomas Kananiokaupunimalamalama Maunupau, a native of Kona was selected by Dr. Kenneth P. Emory of the Bishop Museum to serve as a guide and interpreter for a planned trip throughout Kaupō and Haleakalā. The duo recorded information from area residents about Kaupō’s old *heiau*, house sites, and petroglyphs, and collected artifacts on behalf of the museum. Emory’s chosen guide would prove most valuable as Maunupau “provided Emory with an entrée into the rural communities of Maui” (Maunupau 1998:vii). While on this expedition, Maunupau kept a daily journal where he recorded information shared with him by area residents, his observations, and candid reflections. Upon the completion of the expedition, Maunupau wrote to Solomon Hanohano, the editor of the Hawaiian language newspaper, *Ka Nūpepa Kū‘ōko‘a* requesting that he publish the information he had gathered “*i mea hoi e ike mai ai na kino makamaka o Kaupo, ame Nuu, a pela no hoi ka poe heluhelu e ike mai ai kekahi mau mea ano nui i loa ia maua*” (so that our friends of Kaupō and Nu‘u and other readers will know of the important things we have found) (published June 1, 1922-Maunupau 1998:11). Maunupau’s articles were printed in weekly installments between June 1st, 1922, and March 15th, 1923, with a small break between October 19th, 1922, and February 1st, 1923. Maunupau’s original Hawaiian language articles were eventually compiled, translated by Mary Kawena Pukui and Malcolm Naea Chun, and published by Bishop Museum Press in the book titled *Huakai Makaikai a Kaupo, Maui (A visit to Kaupō, Maui)* (Maunupau 1998).

Maunupau's work is of particular importance because he interfaced with many of the old-time residents of Kaupō, some of whom were born during the early 1850s. Not only did they share information about their places with him but in some instances, they sought to correct inaccurate information that had been published about some of the area's *heiau*. Given the period in which he traveled, Maunupau described industries that had developed in East Maui during the second to late half of the 19th century, including cattle ranching and sugar plantation. As such, his accounts shed light on what life was like for those who lived in Kaupō during the late 19th and early 20th centuries.

Departing Honolulu on May 1st, 1922, aboard the steamer *Kilauea*, Maunupau and Emory landed in Kahului for a quick lunch break before reboarding the *Kilauea* en route to the wharf at Hāna. After arriving, Emory and Maunupau headed by way of a vehicle from Hāna to Kukui'ula in Kīpahulu where the road ended. As Maunupau (1998:95) recalled, "for only a horse trail goes to Kaupō." In describing that stretch of road between Hāna and Kīpahulu, Maunupau related:

In a short time, the village of Hāna was passed and we went through sugar cane fields on both sides of the road. As we went on we came to a hill on the seaward side of the road and a native told us that it was the hill called Iwi-o-Pele (Pele's bones).

The car went up and down, weaving this way and that among the trees and over bridges. The upper side of the land is green with trees and grass. There are many cattle here, but the beaches are of lava stones somewhat like Kona. There are so many streams but many were dry beds. Perhaps there isn't much rain.

Most of the trees are kukui, hala, and ohia. Arrived at Kīpahulu and saw the plantation on the upper side of the road and the homes of the laborers. I saw the laborers cutting cane and the cane cars bearing them to the mill [Kīpahulu Sugar Company]. Now and then we passed a Hawaiian house, some people were farming, some pointing poi and some of the Hawaiian mothers were plaiting mats. Our car continued and came to a place called Kukui'ula. (Maunupau 1998:95)

When they arrived at Kukui'ula, the pair gathered their luggage and observed two mules tied to a tree that had been sent by Joseph Marciel, the son of Antone Vierra Marciel and his wife Rose Kailikea who had received land grant No. 3457 in the uplands of Kaupō near the Kaupō (Kīpahulu Forest Reserve) project area. They were soon met by Keawe Poouwahi who was riding on horseback. The trio then traveled via mule and horse along the coastal cliff trail. As described by Maunupau (1998:95-96):

The animals were heavily loaded and so we went slowly on. On this journey it was mostly a cliff and in some places, it was a thousand feet down, a fearful sight to look down. In other places we went along the edges of the cliffs and if anyone had fallen there would be nothing left of him...

It was an ascent and a descent and that hill was over. If you thought that that was the last of it, that was only the beginning. There are many streams and valleys in these places. Many hala and hau trees growing on the beach.

As we came close to a cliff we met some people from Kaupō, a woman, a man and a small baby. This cliff passed and we encountered another and another and then we reached level land. From this place the village of Kaupō was easily seen, but it was still far off.

The trio then made it to Mokulau, the place where Kalani'ōpu'u of Hawai'i Island beached his war canoes and "slaughtered the people of Kaupō" (Maunupau 1998:100). Of Mokulau, Maunupau (1998:96) noted that "there were many big coral islets here and that may be the reason for the name Moku-lau (Many islands)" and that nearby was "a house and a church," specifically Huialoha Church which was built in 1859. Near Mokulau, Maunupau identified Kapunahoa which he described as resembling a canoe landing and Kane-malo-hemo near the road. On the *mauka* side of Kane-malo-hemo, Maunupau (1998:96) described a "big heiau" and "several more heiaus father up from this place." From this area, Maunupau (1998:96) wrote:

From here one could see the houses on the upper side of the road and beyond. We reached the schoolhouse then turned to go towards the upland. As we went slowly along, I looked here and there at this land. Kaupō is indeed a green land and so is Hāna. They look so open and pleasant to live in because the wind is always blowing.

The coast is good to look at and fine for inshore fishing. The whole of Kaupō faces West Hawai'i. Looking upward one sees the majestic Haleakalā mountain, the Kaupō Gap and many small waterfalls.

After arriving at the home of Joseph Marciel in the late afternoon, the pair retreated for the night and resumed their journey the following day. On May 3, 1922, Maunupau, Emory, and Marciel saddled their horses and departed

for the lowlands to see some *heiau* located roughly 2 miles away from Marciel's home. Maunupau reported on the presence of two nearby *heiau*. The trio then met with Simeona Maihui, an "old-timer of Kaupō" (Maunupau 1998:97). Maihui, who was born in 1852 and made fishing nets from the bark of the *hau* plant, informed Maunupau and Emory that the *heiau* "just upland is Hale O Kāne and the larger of the two is Lonoaea" (Maunupau 1998:97). Following the meeting with Maihui, Maunupau and Emory proceeded to Lo'alo'a Heiau wherein which Maunupau (1998:98) provided the following description:

We walked on top of the heiau to the corner of the front side. A compass was brought out. This heiau was built in a southwest direction. It is a very large heiau, 45 feet from the bottom of the front side to the top. It has terraces similar to stairs. There are three flights of these terraces that are on the front and go around the southern and eastern sides of the heiau. The stones are quite numerous and may weigh several tons. These stones must have been brought from a faraway place, as there are no such stones close to site, and yuo would have to go miles to get them.

Maunupau (1998:99) provided additional details about other features of Lo'alo'a Heiau and as they were scanning the *heiau* for other "things related to this heiau, a heavy downpour came and the wind gushed forth." It was at this time Maunupau (1998:99) offered the following sentiments:

Perhaps our ancestors were angry at us for using these Western ways, but we were examing this heiau for the benefit of the younger generations, resources for their education.

After departing Lo'alo'a, they headed to Popoiwi Heiau, located "seaward at the bay of Mokulau" and was the largest *heiau* in Kaupō with an extent of roughly 300+ feet in length and 200+ feet in width. It was here that Marciel, told Emory and Maunupau about the legend of Pamano. The trio proceeded to Kapunahoa and here they met a Hawaiian woman who directed them to speak with her brother and old-time Kaupō native, Joshua Ahulii. Born around 1862, Ahulii informed the pair that Popoiwi was not the real name of the *heiau* rather its name is Keakalauai, and that Popoiwi was the name of the general area. Ahulii added that "this *heiau* was used for human sacrifices" and that "only the priest lived within the heiau, for it was taboo to commoners" (Maunupau 1998:100). The next three days (May 4-6), Maunupau, Emory, and Marciel spent their days exploring the sites at Kahikinui and Nu'u before making the long trek back to Kaupō.

Maunupau, Emory, and Marciel Ascend Haleakalā Via the Kaupō Trail and other References to Trails in the Uplands of Kaupō and Ko'olau

On May 6th, 1922, the trio prepared to ascend Haleakalā by way of Kaupō taking the road that "led upward" (Maunupau 1998:128). Maunupau's detailed account of their ascent to Lā'ie (also known as Lā'ieikawai) via the Kaupō Trail provides a first-hand perspective of the landscape, plants, and animals he encountered in the uplands near the Kaupō (Kīpahulu Forest Reserve) project area. From Marciel's home, they traveled on the Kaupō Trail to their first stop at a place called Kapiha'a (Full-of-Contradictions) where they had a view of:

...the houses, the taro patches, the green trees, the uninhabited plains, the coast line, the valleys, Kaupō Gap, the innumerable waterfalls, Pamano's house site up on a ridge, the holua sledding course, Kapunahoa stream, Mokulau with its many small coral islands, where Pamano and the chiefs of old enjoyed surfing, Kalaniopuu's (ruling chief of Hawai'i) battle field, where he battled against the people of Kaupō, along with Kamehameha and Kekuhaupi'o the war leaders who were famous for their strength and skill in warfare in this battle and all of the battles during the time of Kalaniopuu and Kamehameha, the conquerer. All these scenes were like a checkerboard, denoting the beauty of Kaupō and Nu'ū.

The triple mountains of Hawai'i, island of Keawe, Mauna Kea, Mauna Loa and Hualālai were plainly visible against the blue sky. The summits of Mauna Kea and Mauna Loa were covered with snow, an unforgettable scene. (Maunupau 1998:128-129)

After leaving Kapiha'a, they ascended to Kōlea-nui (Big plover), a gulch where *kukui* trees grew. From Kōlea Nui the ascended to Kauhīpu'u (A-hill-covered-with-grass), then to Puahuluhulu where grew the *puahuluhulu* and *pamakani* hibiscus. They then proceeded to Keanapuka "a cave containing water with an opening facing seawards; next was Kahuli-lua (Facing-two-ways), the mountain and Kaupō" (Maunupau 1998:129). In describing the plants he encountered while ascending the Kaupō Trail, Maunupau shared:

Many of the forest plants grew on both sides of the road, that is, the ohelo, koa, lehua, kāwa'u, kamani, mamaki, akolea ferns, and many others too numerous to name here. There were no large forest here and so with all of the Kaupō side of Haleakalā. As we ascended slow, through the beauty of the mountain growths interlacing each other, the singing of the iiwi birds, a soft thrilling,

a gentle warbling that made the nights delightful for our departed ancestors that could never here return again.

We not only heard the voices of the iiwi but also of the laehao, and the pheasants that sang cheerily to us, the strangers who visited the mountain.

We reached Pani-lauhulu and Joseph Marciel said that we had come to the crater of Haleakalā. Here we met with a light shower, the misty rain of the mountain, great cold and a lightness of the atmosphere. It was between 7,000 and 8,000 feet from sea level. Kaupō could not be seen from here because this place was in side of the pit. (Maunupau 1998:129)

After arriving in this area, they proceeded to the “ohia grove of Kahilinau” then they reached a cave in the hillside known as Ke-ana-ku-koa (The-cave-of-the-standing-koa-tree) which was recognizable by the big *koa* tree that grew nearby (Maunupau 1998:130). They then proceeded to a steep precipice where “there were many waterfalls” called Kawaanaau where Haleakalā Ranch ran cattle (Maunupau 1998:130). From here, they proceeded through “the bend of Kaolepelepe pass” and “the going was quite good from here till we reached our destination, which was a flat area.” In describing their trek through this area Maunupau (1998:130) observed:

While we were moving slowly along this beautiful, thick forest of the mountainside, the mountains stood in line with their white, majestic cloak of shower clouds, mist, fog, and misty rain. Many waterfalls fell downwards at the dark cliff of the path. These sprays of water did not quite fall upon the ground, rather they became fine mist resembling steam. This was caused by the great height of the cliffs.

This line of mountains went all the way to the Ko‘olau Gap. Over there one can see Ko‘olau, Ke‘anae and all the other areas of that side, and this is also the case with the west side of the ridge. There are many volcanic hills here in Haleakalā crater...

They continued on to Waikē‘ehia, “a ravine in the cliffs” which Maunupau described in the following manner:

It is very cold here, a little colder than other areas, but the features of this place are beautiful; the flat land with shades of dark green. Our natives said that the cold air is made cool with moisture and that the mainland visitors like to say here when they climb the ridge.

At 1:30 in the afternoon, we reached Lā‘ie, the goal of the trip. We were quite happy to reach here. We dismounted and hitched the miles to a mamane tree. Then we brought down the luggage.

I think it would be fitting now to describe the features of this place. Lā‘ie is thought to be the correct name; a shortened form of Lā‘ieikawai. This is a small ravine in the ridge of the cliffs. Joseph Marciel, his family and workers of Kaupō first built two camping sites here, because they always climb up here in the mountains to relax and this is where they stay. These camping sites are really beautiful because they have sandstone and black sand spread out on top. All the area of this place are darkened with grass, aman‘u ferns, ohelo, mamane, mamaki and mountainous vegetation.

The area is about a hundred or more feet above the edge of the cliff and there is a small pool of water here. This is one reason why Lā‘ie wanted to live in the mountains. There is no worry for the lack of water for people and animals (There’s enough water for people and animals).

In the back of Lā‘ie is a high, sharp mountain chain. These mountains are a thousand to two thousand or more feet high, from the surface of the crater. The top of these mountains is always covered with rain clouds. Just below it is covered with the white tapa of fog and mist.

This mountain chain begins at Kaupō Gap and ends at the Ko‘olau Gap about 7 to 8 miles away.

On that side of the mountain, the range creeps along within the clouds and it is lost in the thick mist.

Nearing Lā‘ie, Pu‘u Maile is standing attractively adorned with maile and other vegetation. (Maunupau 1998:131)

After settling in their campsite at Lā‘ie, the crew gathered *ama‘u* ferns which they used “as mattresses or else one would be sore from sleeping on the hard surface” (Maunupau 1998:132). Marciel then took Maunupau to Lā‘ie Spring where they fetched water for themselves and their animals. The animals were then taken to grassy areas to graze and the companions went out to hunt goats to which Maunupau had this to say about the free-roaming ungulates:

2. Background

While we were eating, we heard and saw the goats on the high cliffs. We estimated them to be in the thousands. These animals were devastating the vegetation. (Maunupau 1998:132)

We saw so many goats on the precipices, here and there on the mountain. One could hear their bleating plainly. There are several thousand goats on Haleakalā. The estimation is that there are more than 20,000. It is this animal that is denuding the mountain of its growing plants. Among the plants being destroyed by these animals are the hinahina, or silversword, and if nothing is done to kill of the goats, then it won't be long before this rare plant of ours will become extinct like some of the Hawaiian birds and trees of ancient times. (Maunupau 1998:139)

While hunting, the trio encountered members of the Von Tempsky family as well and Hector Munro, the foreman of Baldwin Ranch on Lāna'i. After their successful hunting expedition, they returned to camp at Lā'ie and managed to sleep through a bitterly cold night. The following morning, May 7, Maunupau recalled waking up to the sound of the *laehao* bird. A footnote states that the *laehao* is not identified in the Hawaiian Dictionary, however, it is "perhaps a variant or misrendering of 'alauwahoo, the Maui and Lāna'i name, the latter sometimes shortened to 'alauwī or lauwi, of a creeper (*Loxos masculata*)" (Maunupau 1998:138). After another day exploring the upland region, the crew bid farewell to Lā'ie along with the Von Tempsky family. They arrived "at beautiful and pleasant Kaupō" not long after which they ventured to a small gulch near Marciel's home to document "pictures carved into the rocks" (Maunupau 1998:151). Maunupau and Emory's expedition through Kaupō ended on May 10 when they boarded the steamer *Kilauea* at Mokulau en route for Honolulu. A map showing some of the localities visited by Maunupau and Emory while in the uplands of Kaupō, along with the route of the Kaupō Trail is shown in the 1884 Hawai'i Registered Map No. 1185 prepared by W. A. Wall (Figure 33).

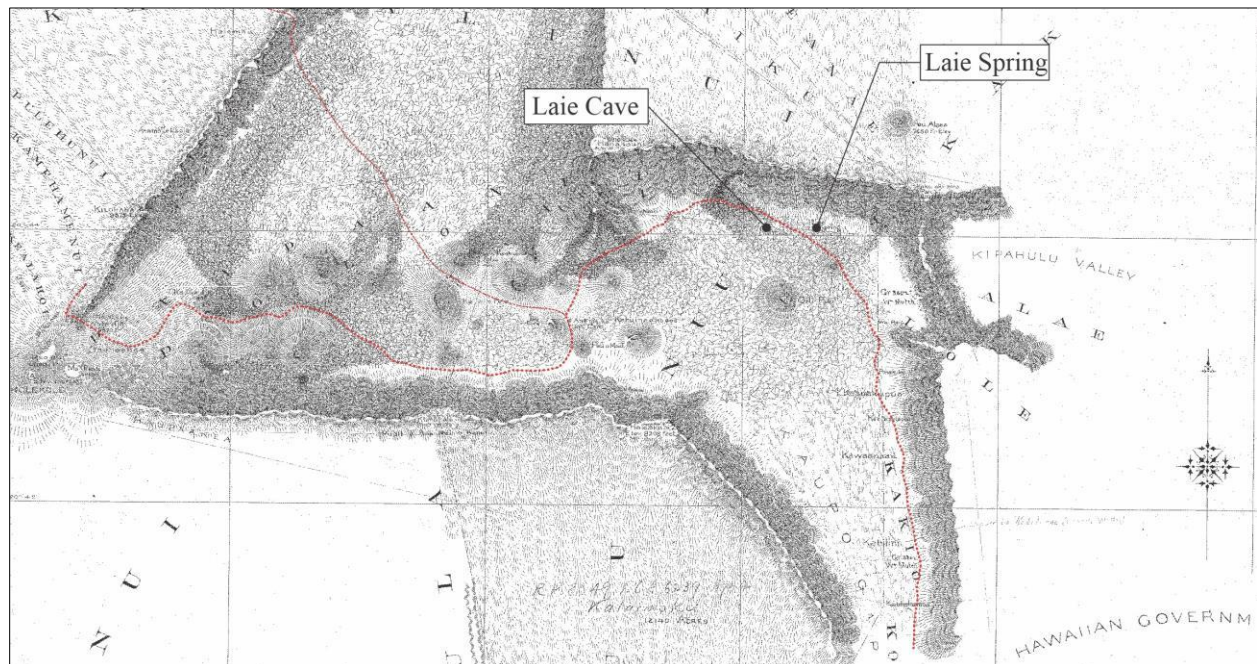


Figure 33. Hawai'i Registered Map No. 1185 prepared by W. A. Wall in 1884 shows the upper portion of Kaupō Trail and multiple place names some of which are mentioned in Maunupau and Emory's visit to the uplands (project area not shown on map).

Additional documentation of the Kaupō Trail was also found within the personal recollection of E. D. Baldwin in which he writes:

On Tuesday Oct. 13, we went up into Haleakala Crater with our small tent and rations for three days...This was a very interesting trip and my first trip into the crater. The path leaves the main road in Kaupo near Manawainui gulch and winds up through Maua village, then to the left heading for the middle of Kaupo Gap, up along side of a small smooth rock bottom dry gulch and reaching mouth of Gap the road crossed over to east side and follows up near the pali. We camped at Wai Palaua near the center of the Crater, under the west pali, found plenty of water; also plenty of ohelos on the way up. (in Sterling 1998:179)

In his *Archaeology of Maui* study, Winslow M. Walker mentioned the location of petroglyphs that “are known to occur on the cliffs near the Keanae trail in the crater of Haleakala” (Sterling 1998:179).

Brief History of the Ko‘olau and Kīpahulu Forest Reserve in 1907 and 1914

By the end of the 19th century, Hawai‘i’s agricultural sectors along with the government began to recognize the importance of Hawai‘i’s forest in providing water for household consumption and ranching but more importantly sugar production—which at that time was Hawai‘i’s largest economic industry. The combined effects of drought, forest clearing for sugar fields, water diversion, wildfire, along with indiscriminate pasturing were adversely impacting water resources across the islands.

In 1892, the government established the Bureau of Agriculture and Forestry to oversee Hawai‘i’s agricultural industries and forests. The Bureau’s primary focus was on livestock but they also implemented programs to work with private landowners to create forest reserves and control wild goats and cattle. By 1903, following the unlawful overthrow of the Hawaiian Kingdom government in 1893 and the establishment of the Territorial Government in 1900, the territorial legislature with the influence of sugar plantation owners established the Board of Agriculture and Forestry with Ralph S. Hosmer hired as the first Superintendent of Forestry.

In 1905, the acting Governor Atkinson issued a proclamation establishing forest reserves on Maui and Kaua‘i, one of which included the roughly 43,000-acre Ko‘olau Forest Reserve. Sugar mogul, Alexander & Baldwin (A&B), however, retained two sections, the 9,000-acre Nahiku Track and the 6,000-acre Hamakualoa Tract, where they held water leases (The Honolulu Advertiser 1905). By 1907, Hosmer reported to the *Honolulu Advertiser* that A&B had turned over the management of the Nahiku and Hamakualoa tracts to the Board of Agriculture and Forestry (The Honolulu Advertiser 1907). During this period other sections of forest in East Maui were incorporated into the Ko‘olau Forest Reserve, one of which included the *mauka* Government-land portions of Ke‘anae along with Honomanu, Wailua 1 & 2, and the Wailua-Ulano Forest which collectively added just under 16,000 acres to the Ko‘olau Forest Reserve (Evening Bulletin 1907).

To understand how Ke‘anae as Crown lands came to be included as part of the inventory of Government lands and thereby incorporated into the forest reserve, the following explanation is provided. At the time of the 1848 *Māhele ‘Aina*, Ke‘anae along with Honomanu and Wailua 1 & 2 were retained as the personal lands of King Kamehameha III and thereby designated establishing them Crown Lands (Iaukea 1894). On January 17th, 1893, a small group of American businessmen and sugar moguls backed by a U.S. consul and marines illegally attacked the Hawaiian Kingdom government and the sovereign, Queen Lili‘uokalani (Beamer 2014). This group, consisting of thirteen men who referred to themselves as the Committee of Safety, and following the overthrow, proclaimed to be the Provisional Government that would manage the affairs of the Hawaiian Kingdom (Beamer 2014; Van Dyke 2008). The overthrow of the Hawaiian Kingdom government had a rippling effect that caused major instability for the Hawaiian nation and altered how Crown lands, such as Ke‘anae, were administered. To provide a context of how Crown lands were administered before 1893, the Commissioner of Crown Lands, Curtis P. Iaukea explained that:

Heretofore, or prior to January 17th, 1893, the Crown Lands were administered more or less in the nature of a private-estate, it being held that the Sovereign, to whom the revenues belonged, had a vested right to the lands. As the question of the validity of the claim was never raised, the Sovereign always exercised a certain amount of control over the management and disposition of the lands.

At the beginning of the year 1892, a new system of leasing was introduced, the main feature of which was to secure to small holders, more particularly native Hawaiians, the opportunity of acquiring under fair conditions suitable sections on the Crown Lands, for homestead and agricultural purposes. (Iaukea 1894:3-4)

Van Dyke (2008:153) stated that “some also believed that abrogation of the Monarchy would open up the Government and Crown Lands for exploitation.” This belief was publicized as early as 1872 by Stanford B. Dole, the acting President of the Provisional Government. In an article published in the *Pacific Commercial Advertiser* (1872:2) newspaper, Dole asserted that preserving Crown lands as inalienable under an 1865 Statute was a “mistaken policy.” Dole believed that maintaining Crown lands as inalienable hampered the economic development of the islands and argued that these lands should be made available to foreigners for homesteading (Van Dyke 2008). Following the overthrow of 1893, sizable portions of the previously inalienable Crown lands were administered in the same manner as Government lands thus making them available for homesteading and other public and private purposes. In his biennial report, Curtis Iaukea, Agent of Crown Lands, provided the following

patches in the valley. In both these gulches there appear to be great possibilities for the development of power. It may be a long cry ahead to that time when the water that goes over these particular falls will be harnessed...

The creation of the Kipahulu forest reserve has been contemplated for a long time. My recommendation that it be established rests on several visits to Kaupo and Kipahulu, but particularly on one made in June 1914, with this especial object in view. The creation of the Kipahulu Forest Reserve will round out the forest reserve system on Maui and practically complete the chain of forest reserves needed throughout the Territory.

"The greater part of the proposed forest reserve is land very much cut up by gulches and ridges. It rises steeply from the strip of agricultural land near the sea. The upper portions of the lands included are on the ridges bounding the crater of Halekala. It is all under a stand of native Hawaiian forest. I suggest that the reserve be called the Kipahulu Forest Reserve." (The Pacific Commercial Advertiser 1914:4)

Since the early 20th century, the project areas have been included as part of the Ko'olau and Kīpahulu Forest Reserves. While there has been no formal development in these areas, the water captured by these forest reserves has been integral to East Maui's traditional cultivation practices, as well as central Maui's sugar plantation history, and Kaupō Ranch.

SUMMARY OF PRIOR ARCHAEOLOGICAL WORK

Although limited, the archaeological studies that have been conducted throughout Kaupō and Ke'ānae have focused largely on the lower elevations, coastal areas, and on *heiau* structures. Perhaps some of the most comprehensive archaeological studies to have been undertaken in the Ke'ānae and Kaupō areas are those of early-20th-century researcher, Thomas G. Thrum and archaeologist, Winslow Walker. Although Thrum was not an "archaeologist" his interest in Hawaiian folklore and history led him to conduct extensive research and documentation of archaeological sites throughout the Hawaiian Islands.

Beginning in ca. 1906, Thomas G. Thrum began compiling a list of *heiau* that were either intact at the time of his visit or were known by the informants he spoke with. Thrum with the assistance of William T. Brigham and John F. Stokes published a list of *heiau* in a series titled "*Heiau and Heiau Sites Throughout the Hawaiian Islands*" and "*Tales from the Temples*" which was published in the *Hawaiian Almanac and Annual*, beginning with the 1907 edition. As part of Thrum's final series which appeared in the *Hawaiian Almanac and Annual for 1909*, Thrum (1908a) identified the names of close to forty *heiau* on Maui, three of which were located in Kaupō and five of which he associated with Ke'ānae. Concerning the *heiau* in Kaupō and Ke'ānae, Thrum (1908a:39) put forth the following names and remarks:

Kanemalohemo.....Popoiwi, Kaupo. Heiau pookanaka, built in terraces by Kekaulike about 1730, covering two acres; still in fair condition.
 Loaloa.....Kumunui, Kaupo. Built by Kekaulike about 1730.
 Puumaka-a.....Kumunui, Kaupo. A noted heiau of pookanaka class, built by Kekaulike. These three Kaupo heiaus were consecrated by Liholiho in his tour for this service about 1801.
 Pakanaloa.....Keanae. A war heiau dedicated to Kanehekili.
 Paliuli
 Kaluanui
 Makehau
 KukuiaupuniNo particulars learned of these Keanae temples.

In Part III of Thrum's second series *Tales from the Temples*, he provided additional remarks and historical information on the *heiau* he had identified. For those *heiau* in the Kaupō District, Thrum noted:

To Kekaulike, King of Maui, is credited the construction of the prominent heiaus in the Kaupo district, just prior to his raid on Hawaii in the early part of the 18th century, for it is recorded that when Alapai-nui made successful war on other chiefs of Hawaii, judging the time opportune for possible conquest on that island, Kekaulike was building the heiaus of Loaloa and Puumaka-a, at Kumunui, and Kanemalohemo, at Popoiwi, after which, gathering his forces together he set sail to harass and burn the Kona coast villages. We find again that these same three temples, with that of

Maulili, at Kīpahulu, received the solicitous care of Kamehameha upon his touching there with the peleleu fleet in 1802, en route for Kauai, for he rebuilt them all and dedicated them to his war god. Connected with the temple services at this time and place was the ceremony of empowering Liholiho with the sacred duties of temple consecration, etc., which public service he first performed at Lahaina, as has been mentioned. (Thrum 1908b:47)

Concerning the *heiau* in Keʻanae, Thrum added:

The temple of Pakanalua, has a tradition claiming origin in the worship of the thunder to the effects that its kahu, Kanehekili, died within its walls, and when his brother-in-law realized the fact he cut off the head and took it to Lanai. The people of Hamakualua, wondering at his disappearance, searched till they found his body in the temple at Keanae, and when it was made known that the guardian of the god was dead, the people came and cut his body into small pieces and distributed it. As each place all over Maui received a portion of his body it became their duty to worship the thunder. Those who had the head, they worshipped it; and also his eyes, or his mouth; they were called the eye of god, or mouth of god, and so on. All the ancient people believed in the god of thunder, and that he came to them personally and conversed with them in visions or dreams. Sometimes he would show his godly body, like the body of a man, his feet touching the earth and his head in the sky with the moving clouds; one side was very black from head to foot, this was the right side, the left side was white. This sometimes changed to a real body and conversed with the people, but not so his black body. It continued that way in order that his descendants would not fail to recognize the body of Kanehekili—the God of Thunder. (Thrum 1908b:48-49)

As part of Thrum's (1916) *Hawaiian Annual and Almanac for 1917*, he published another article titled "*Maui's Heiaus and Heiau Sites Revised*." This time, Thrum focused his efforts on obtaining any additional information from elder *kama'āina* informants about the *heiau* in the districts, of Hāna, Kīpahulu, Kaupō, and Wailuku. Upon arriving in Kaupō, Thrum, unable to secure the help of elder native informants, stopped at the Marciel homestead located "some two miles from the road" with the hopes of them lending him assistance in his venture (Thrum 1916:56). One of the places Thrum managed to visit with the assistance of the Marciels was Haleokane Heiau, which he did not report on during his earlier efforts. Concerning Haleokane, Thrum stated:

Securing the help of an old native we were led to the *heiau* of Haleokane, at Maua, not heretofore listed, the dimensions of which were 133 x 79 feet, its length being practically north and south. Its western wall had a jog inward 13 x 27 feet, some fifteen feet from the south corner. The whole was in a bad state of ruin, with structures in and around it for more modern uses. Haleokane is credited to the marvelous work of the *Menehunes* for its construction in one night, in addition to which they started the same night upon another, named Puukini, a short distance further up the slope, but at completion of the front wall of 200 feet and partial construction of the eastern side wall, daylight came upon them and they had to quit, hence its unfinished state, for tradition says this pigmy race never resumed work on any of their undertakings; everything had to be finished in one night, else it forever remained incomplete. (Thrum 1916:56-57)

In addition to visiting Haleokane Heiau, Thrum also made a stop and provided the following documentation on Loaloa Heiau, a *heiau* "to which the people of other districts all pay deference, both for its size and ancient power" (Thrum 1916:57). Regarding Loaloa Heiau, Thrum noted the following:

It occupies a commanding site on a prominent hill *mauka* of the road, in the land of Kumunui. Climbing to its height we found an interesting pile of ruins, the seaward face of which ran 101 feet. It was a walled structure standing N.N.W.--S.S.E., of two or more sections, the northern division measuring 101 x 264 feet. The rest of the *heiau*, somewhat lower and of irregular lines and more disturbed floor was probably fully as large, westward, though the various inclosures for modern uses thereon, with others adjoining, rendered it difficult to define its original upper boundaries. Running nearly across the *heiau*, some twenty feet from the higher and less disturbed section, was a distinct path of broad, smooth stones, as in the temple of Puukohola, at Kawaihae, the purpose of which could not be learned. The surrounding walls in places have been removed, and on the eastern and seaward front the stone wall has been changed to a row of pyramids, breast high, some four to six feet apart. Its northern section is some twenty feet or more from its base, in height, built up in three and four tiers of rock wall. This *heiau* of Loaloa is credited in history for

its erection to Kekaulike, about 1730, as also those of Popoiwi and Puumaka-a, prior to his raid on the Kona district of Hawaii. (Thrum 1916:57)

Thrum went on to report the discrepancies of his earlier work for several *heiau* in Kaupō. He stated:

Investigations this day showed the former published list for Kaupo to be quite in error. The particulars given to Kanemalohemo, at Popoiwi, belonged to Loaloa. Popoiwi was said to be a *heiau*, not the location of Kanemalohemo. This latter was simply a sacred place at Mokulau, *makai* of the road, famed as the spot where a certain high priest of the Popoiwi temple stood and decried the overthrow of the *kapu* system and abandonment of the gods, which would result in the extinction of the order, and in his distress and despair he disrobed at this spot before all the people, hence the name, and foretold his own death, which occurred musteriously the next day.

Popoiwi is referred to as a *heiau* on a land of same name just above the road, though known to some of the old residents as Hanakalauai. This was found to be so irregular and dilapidated as rendered it difficult to approximate its shape, or size, other than an average one. In places at the base it seemed to have been L-shaped, but its confused surface failed to confirm this.

Puumaka-a at Kumunui, another of Kekaulike's war temples which received the consecration care of Liholiho in Kamehameha's behalf, was not visited, owing to the reported reduction of its ruins. (Thrum 1916:57-58)

Between 1929-1930, Wilslow W. Walker, under the aegis of the Bishop Museum, conducted a more robust archaeological study of sites on Maui. Whereas Thrum focused exclusively on *heiau* sites, Walker, on the other hand, attempted to document various site types including *heiau*, agricultural, petroglyphs, and habitation sites. As part of his fieldwork, informant interviews, and research, Walker (1931) prepared a manuscript *Archaeology of Maui* which is on file at the Bishop Museum but has never been formally published. As part of a 1998 Bishop Museum Press publication, Elspeth P. Sterling in her book *Sites of Maui* included citations from Walker's earlier work. The following paraphrased notes describing the sites documented by Walker (1931) are from Sterling (1998); Walker's original manuscript should be referenced for full accounts. Regarding *heiau* in the Kaupō and Ke'anae areas, Walker reported on a number of *heiau*. Those closest to the project area in Kaupō and Ke'anae are listed below in Table 3 and their locations relative to the project areas are highlighted in Figure 35:

Table 3. *Heiau* identified by Walker (1931). (* = location not shown in Figure 35)

<i>Name</i>	<i>Locational Information</i>	<i>Walker Site No.</i>
Kukuilono	On point of Ke'anae Peninsula.	Site 82
Lalaola	On point of Ke'anae Peninsula.	Site 83*
Pakanalao	Upper slopes of Ke'anae Peninsula.	Site 84*
Kamokukupeu	No specific locational information available.	Site 88
Kawalimukala	At Pauwalu.	Site 90
Kupau	Above road in Ke'anae Valley toward ditch trail.	Site 91
Kualani	Top of ridge on west side of Waiokane Falls.	Site 92
Kamilo	At Kawaloa on north side of stream in dense grove of <i>hau</i> and <i>puhala</i> .	Site 93
Heiau of Ohia	At Ohia in valley $\frac{3}{4}$ mile inland from coast.	Site 94
Kaluanui	At Kaluanui $\frac{1}{3}$ mile inland from coast.	Site 95
Kukuiaupuni	At Pauwalau on top of slope.	Site 96
Makehau	At Makehau near Wailua and Makehau roads.	Site 97
Keakalauae	West bank of Punaho'a valley overlooking Mokulau; above trail leading to Kaupō.	Site 140
Heiau at Paukela	On a hilltop, directly south of Loa-loa Heiau.	Site 141
Lanikaula	Luakauhi just behind Kaupō Post Office.	Site 142
Loa-loa	West side of Manawainui Gulch on a prominent hill.	Site 143
Puumakaa	Polikua; mauka from the school house at the 500 ft. elevation.	Site 144
Haleokane	Kohulau valley; south of the Marciel house at about the 930 ft. elevation.	Site 145

Table 3 continues on next page.

Table 3. continued.

<i>Name</i>	<i>Locational Information</i>	<i>Walker Site No.</i>
Lonoaea	At Lonoaea in Kohulau valley, south of Haleokane Heiau.	Site 146
Heiau at Puhilele	On hill overlooking Waiuha.	Site 147
Unknown name	At Puhilele point about 150 feet from shore.	Site 148
Puuakua	Below the home of A. Marciel Sr. near trail leading down to Nu'u Road. Elevation of 850 feet.	Site 151
Puaakolo	In pasture of A. Marciel Sr. near upper trail leading to Nu'u.	Site 152
Waihi	About 300 yards south of upper Nu'u Trail at above the 1,200 foot elevation.	Site 153

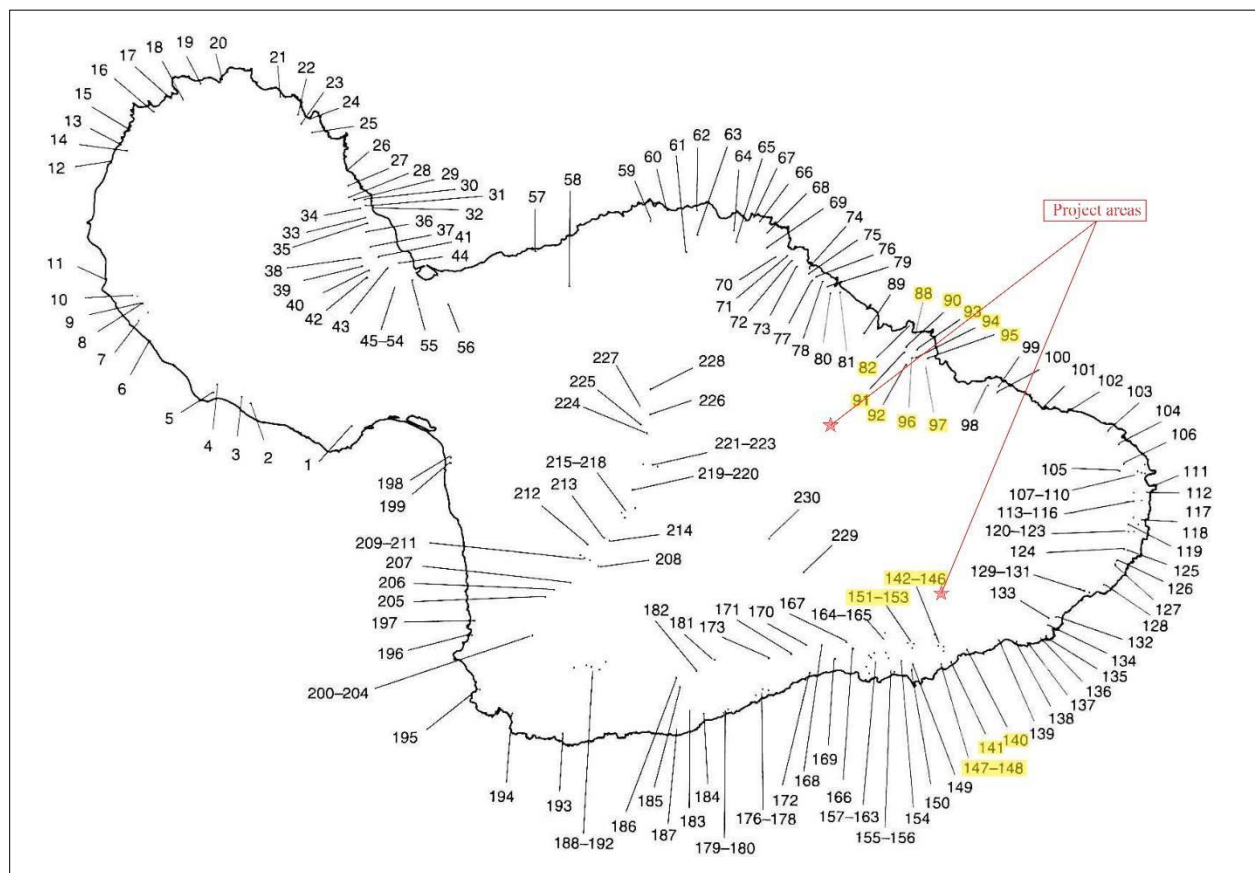
End of Table 3.

Figure 35. Walker (1931 in Sterling 1998:13) site map overlaid with project area locations.

Regarding agricultural sites, Walker (1931:71 in Sterling 1998:168), reported that in Kaupō “many villages were built in the rough lava areas in order to leave every possible bit of good soil for the growing of sweet potatoes and gourds.” He went on to explain that:

These “patches” are indicated by small piles of rock at one side of a cleared space in the lava. Good agricultural land was divided into lanes marked by long lines of stone extending down to the sea cliffs. The region around Kaupo preserves evidence of such lands, 15 to 20 feet apart. It was customary to allot one or more such rows to the members of a single family for their share of cultivation, and in this way all the available land was parcelled out among the villagers.

In discussing the burial feature and the trail built by Kihaapi'ilani, Walker described them thusly:

Burials

Along the trail leading to Keoneoio from Kaupo are several large rocks encircled with low platforms of pebbles and bits of coral. These are the tombs of certain chiefs who fell during one of the numerous fights that occurred between raiding parties from West Maui and the Kaupo region. Less pretentious graves in the vicinity were those of the common fighting men. 57 of these graves were seen at one place in the midst of a rough broken lava flow. Due to insufficient protection from the weather most of the bones have long since mouldered into dust.

Kihaapiilani Trail

Traditions about Kihaapiilani state that among other things he was noted for his road building activities. Part of the trail over the ridges from Kipahulu to Kaupo is attributed to him though it is now kept up by the County of Maui. However, from the way in which smooth flat beach stones have been laid down side by side, it is evident that the trail was not intended for horse travel as it is exceedingly slippery when wet. (Walker 1931 in Sterling 1998:168)

In 1963, Lloyd Soehren (1963), who drew primarily on Walker's work compiled information on *heiau* sites in East Maui. The sites recorded by Soehren (1963), which were located along the coastal region of Ke'anae included Pu'u Olu Fishpond, a house platform, a possible cemetery, as well as the *heiau* of Kukuiaupuni and Makehau. In Kaupō, Soehren (1963) focused primarily on the *heiau* sites that were previously documented by Walker.

Between 1973-1974, the Bishop Museum in collaboration with the State Parks undertook a Statewide survey of archaeological sites. The Maui fieldwork led by Robert Hommon identified "a total of 283 sites, many of which are complexes, including approximately 700 features" (Sinoto 1973:1). The vast majority of the sites recorded in the Nāholokū section of Kaupō and Ke'anae were *heiau* sites that had been previously documented by Thrum and Walker. In Nāholokū on lands owned by Kaupo Ranch, ten sites were recorded and in Ke'anae a dozen sites were recorded, none of which were in *mauka* reaches of the *ahupua'a*.

In the decades following the passage of the 1966 National Historic Preservation Act and Hawai'i Revised Statutes Chapter 6E which established the Hawai'i Historic Preservation Program in 1976, archaeological studies across the Hawaiian Islands have been undertaken largely in response to development activities.

The vast majority of the studies conducted in Ke'anae have occurred in the vicinity of Hāna Highway down towards the coast. In Kaupō, where development has occurred at a radically slower pace, the contemporary archaeological studies, like those of the early 20th century have focused on the region's *heiau* along with other site types and have been research focused rather than for compliance purposes (Baer 2015; Kirch and Ruggles 2019; Kolb 1991).

Concerning the uplands forest reserves in East Maui, at least one archaeological study, a literature review and field inspection for the long-term water lease for four areas (Nāhiku, Ke'anae, Honomanū, and Huelo) was prepared by Cultural Survey Hawai'i (Yucha et al. 2018). Their study concluded that the proposed action would "have no impact to archaeological historic properties" (Yucha et al. 2018:iii). In 2022, Honua Consulting conducted a cultural impact assessment study for the activities associated with the suppression of mosquitos to reduce the transmission of Avian Malaria to native birds forest of East Maui (Watson et al. 2022). Their cultural impact study identified several traditional practices that occurred or associated with the uplands of East Maui including traditional storytelling, habitation, travel and trail usage, hunting, farming, ceremonial practices, bird catching, and harvesting of plant resources for clothing, dyeing, *lei* making, and medicine. In summary, while the archaeological studies that have been conducted in both Ke'anae and Kaupō have not identified any specific archaeological or historic resources the cultural impact assessment study prepared by (Watson et al. 2022) has identified valued cultural resources and customary practices that occurred in the upland forested regions of East Maui.

3. CONSULTATION

Gathering input from community members with genealogical ties and long-standing residency or relationships to the study area is vital to the process of assessing potential cultural impacts to resources, practices, and beliefs. It is precisely these individuals that ascribe meaning and value to traditional resources and practices. Community members often possess traditional knowledge, first-hand experience, and in-depth understanding that are unavailable elsewhere in the historical or cultural record of a place. As stated in the OEQC (1997) *Guidelines for Assessing Cultural Impacts*, the goal of the oral interview process is to identify potential cultural resources, practices, and beliefs associated with the affected project area. It is the present authors' further contention that the oral interviews should also be used to augment the process of assessing the significance of any identified traditional cultural

properties. Thus, it is the researcher's responsibility to use the gathered information to identify and describe potential cultural impacts and propose appropriate mitigation as necessary. This section of the report begins with a description of level of effort undertaken to identify persons believed to have knowledge of the study area, followed by the interview methodology. This section of the report concludes with a presentation of the interview summaries that have been reviewed and approved by the consulted parties.

OUTREACH EFFORTS

In an effort to identify individuals knowledgeable about traditional cultural practices and/or uses associated with the current project and study area and or the 'alalā, a public notice containing (a) locational information about the project area, (b) a description of the proposed project, and (c) contact information was printed in a newspaper with state-wide readership. The public notice was submitted to the Office of Hawaiian Affairs (OHA) on April 11, 2023, for publication in their monthly newspaper, *Ka Wai Ola*. This notice was published in the May 2023 edition of *Ka Wai Ola* and a copy of the public notice is included in Appendix A of this report. From the public notice, zero responses were received.

Additionally, ASM staff contacted twenty-three individuals/organizations via phone and or email whose names are listed, alphabetically (by last name), below in Table 4. These individuals/organizations were identified as persons who were long-time residents of either Ke'anae or Kaupō and were believed to have knowledge of past land use, history, or cultural information specific to the project areas or the 'alalā itself. Efforts were made to identify individuals and organizations from both Hawai'i Island—the island home of the 'alalā—as well as folks from Maui—the potential future home of a population of 'alalā. Each of the persons/organizations contacted was provided with a consultation packet that contained a detailed description of the proposed project along with maps showing the proposed release areas in East Maui. Of the twenty-three persons/organizations contacted, five, Mr. Noah Gomes, Mr. Aldei Kawika Gregoire, Mr. Jimmy Medeiros, Mrs. J. Alohalani Smith, and Ms. Ku'ulei Vickery agreed to be interviewed for this study. Their reviewed and approved interview summaries are presented below. Lastly, ASM staff, Lokelani Brandt met with Mrs. Shirley Keakealani, a *kūpuna* from Pu'uana'hulu, North Kona. Although Mrs. Keakealani declined to a formal interview, she did provide ASM staff with some brief comments and recollections of growing up with the 'alalā which have been noted in the table below (see Table 4)

Table 4. Persons/organizations contacted for consultation.

<i>Name</i>	<i>Organization/Affiliation</i>	<i>Contact Date(s)</i>	<i>Results</i>
Bailey, Cathleen		May 24, 2023	No response.
	East Maui Watershed Partnership	June 14, 2023	No response.
Fukushima, Serena	Hawaii Watershed	May 29, 2023	No response.
Gomes, Noah	n/a	April 11, 2023	See interview summary below.
Gregoire, Aldei Kawika		June 15, 2023	See interview summary below. Also recommended that ASM staff reach out to Makalapua Kanuha, President of the Kaupō Community Association.
	Hāna Community Association	June 14, 2023	No response.
Hanchett, Kauwila	Executive Director, Holani Hana, Inc.	April 11, 2023 May 8, 2023	No response.
Hueu, Napua		May 29, 2023	Email returned as undeliverable.
Inouye-Nohara, Nichole	'Aha Moku Ko'olau Moku	April 11, 2023 May 8, 2023	No response.
Joaquin, Iwikauikaua	Former caretaker at Keauhou, Ka'ū Forest	May 11, 2023	No response.
	Kaupō Community Association	June 14, 2023	Responded via email on June 23, 2023, asking "Can we please get more information." The consultation packet was resent on June 23, 2023.

Table 4 continues on next page.

Table 4. continued

<i>Name</i>	<i>Organization/Affiliation</i>	<i>Contact Date(s)</i>	<i>Results</i>
Kanuha, Makalapua	President of the Kaupō Community Association	June 20, 2023	No response.
Keakealani, Shirley	Resident of Pu‘uanahulu, Kona	May 23, 2023	Declined interview but did share with ASM staff that in Pu‘uanahulu her family would follow the ‘ <i>alalā</i> when they were seeking water sources because the bird would locate even the most remote water sources. Furthermore, the loud caw of the ‘ <i>alalā</i> was a sign of impending rain and when the caw was heard, her mother would direct her and her siblings to gather up the laundry off the clothes line. Lastly, she noted that there were many ‘ <i>alalā</i> roaming the forest of Pu‘uanahulu, Kona when she was a child and that she remembered there being far more <i>wiliwili</i> trees than there are today and felt that the ‘ <i>alalā</i> has an important role in distributing seeds of native plant species.
	Kīpahulu ‘Ohana	June 14, 2023	Email returned as undeliverable.
	Leeward Haleakalā Watershed Restoration Partnership	June 14, 2023	Audrey Tamashiro-Kamii responded on June 14, 2023, via email. Stated that she forwarded the consultation request to Andrea Buckman, the LHWRP Program Manager. No response.
Lind ‘Ohana	‘Aha Moku-Kīpahulu Moku	April 11, 2023 May 8, 2023	No response.
Medeiros, Jimmy	Resident of South Kona	May 24, 2023	See interview summary below.
Miller, Renee	The Nature Conservancy	May 11, 2023	No response.
	Nā Moku Aupuni O Ko‘olau Hui	May 24, 2023	No response.
	Office of Hawaiian Affairs	May 11, 2023	No response.
Santos, Kirie	Former ‘Alala Project, Hawai‘i Island, staff	May 11, 2023 May 8, 2023	Referred ASM staff to Ku‘ulei Vickery and Rachael Kingsley.
Smith, J. Alohalani	Resident of Kaupō, a former employee with Haleakalā National Park and DLNR-Forestry Division	May 11, 2023 May 8, 2023	See interview summary below. Recommended ASM staff reach out to Cathleen Bailey.
Vickery, Ku‘ulei	Former ‘Alala Project, Hawai‘i Island, staff	May 8, 2023	See interview summary below.

End of Table 4.

Interview Methodology

Prior to the interview, ASM staff provided via email a consultation packet that contained detailed information about the nature and location of the proposed project and informed the potential interviewees about the current study. The potential interviewees were informed that the interviews were completely voluntary and that they would be given an opportunity to review their interview summary prior to inclusion in this report. With their consent, ASM staff then asked questions about their background, their knowledge of past land use, and the history of the project area, as well as their knowledge of any past or ongoing cultural practices. The informants were also invited to share their thoughts on the proposed project and offer mitigative solutions and recommendations. All interviews were conducted according to the method specified by the consulted party (i.e. via phone, in-person, or Zoom). Below are the interview summaries that have been reviewed and approved by the consulted parties.

NOAH GOMES

On April 19th, 2023, ASM staff, Lokelani Brandt conducted an in-person interview with Mr. Noah Gomes, M.A. in Hilo, Hawai‘i. Originally from Wahiawā, O‘ahu, Mr. Gomes traces his Hawaiian lineage to the island of Lāna‘i specifically Kama‘o, and the island of Kaua‘i. Mr. Gomes moved to Hilo about eighteen years ago to pursue his degree from the University of Hawai‘i at Hilo. Initially interested in obtaining an art degree, Mr. Gomes quickly changed his focus to Hawaiian studies and went on to receive his bachelor’s and master’s degrees. His master’s thesis focused on traditional Native Hawaiian bird hunting practices on Hawai‘i Island.

When asked how he became interested in native birds, Mr. Gomes related that “I’ve been into *manu* (birds) since I was a kid.” Having grown up in Wahiawā, O‘ahu Mr. Gomes shared stories of his grandfather (as told to him by his father and grand-uncle) who was a pig hunter and was very *ma‘a* (accustomed, familiar) with the Ko‘olau mountains. Mr. Gomes emphasized that hunting was a mainstay of his grandfather’s lifestyle because that is how food was put on the table. Even if they didn’t catch a pig, Mr. Gomes’ grandfather and his siblings would forage for other edible fruits. Because of this heritage, Mr. Gomes’ father thought it was important to teach his children “what O‘ahu was like when he was young...during the 1960s.” He recalled memories of his father taking him and his brother into the pineapple fields near Wahiawā to learn about these places. Mr. Gomes remembered that around the age of eight or nine, they went into one of the gulches and while there Mr. Gomes heard a very distinct bird call. Curious as to the source of this sound, Mr. Gomes’ father came home from the local library with the Hawai‘i Audubon Society field guide. Mr. Gomes recalled thumbing through the pages of the field guide in a futile effort to identify the bird call. Mr. Gomes laughingly shared that as a child, he erroneously assumed he had heard the call of an ‘ō‘ū, but later learned that what he had heard was the call of a Japanese bush warbler. Reflecting on this memory, Mr. Gomes shared that it was this early childhood experience that grew his curiosity about birds. His interest in birds led him to learn more about the plants and ultimately Hawaiian culture.

While developing his thesis topic, Mr. Gomes described talking with Dr. Kale Langlas who encouraged him to review the Land Boundary Commission testimonies because it contained testimony from bird catchers. Understanding that this primary source was rarely utilized in academic research, Dr. Langlas urged Mr. Gomes to leverage this resource. Mr. Gomes related that once he understood how to navigate the archives, he tried to locate any bit of information about native birds.

When asked about any cultural information about the ‘*alalā*, Mr. Gomes noted that much of what he knows originates from previously published sources including the book, *Seeking the Sacred Raven* and Kepelino Teauotalani who wrote about the ‘*alalā* between 1859-1860. According to Mr. Gomes, Kepelino’s writings “have been repeated over and over in various ways but I don’t think there is a good English translation...of Kepelino’s work in general.” Citing the work of David Malo, Mr. Gomes shared that ‘*alalā* were eaten and its feathers were supposedly used for *kāhili* (feather standard used as a symbol of royalty) and that it was called the bird that “*pao hue wai*” (pecks at water gourds). Mr. Gomes noted that the ‘*alalā* was known for their intelligence and curiosity. He added:

I find it interesting--though outside of the few Hawaiian recordings about ‘*alalā*—that in King’s journals from the Cook expedition...there were “pet” ‘*alalā* and *pueo* that were being held by Hawaiians in Kona when they [Captain Cook and Lieutenant King] landed there.

Mr. Gomes noted that “I don’t think they were pets.” Although he has not carefully reviewed the journal entries, Mr. Gomes speculates that these birds may have been held in the temples and were likely being held for a reason. Although he urged for additional research into this topic, Mr. Gomes pointed out that in Kona, the *pueo* was an

important *‘aumakua* (family god) *kino lau* (body form) for some families, one of which included Pueonuikona. He added that similarly, the *‘alalā* was also considered by some Kona families to be *‘aumakua*. He wondered if the *‘alalā* was capable of learning limited human speech and noted that the *‘apapane* (*Himatione sanguinea*) has this capability. He added that an “*‘alalā* is much more intelligent than an *‘apapane*.” He cautioned that although this is purely his speculation, Mr. Gomes wondered if the *‘alalā* served as a sort of *haka* (medium) between the *akua/‘aumakua* and their keepers. He shared that similar stories have been documented in *Seeking the Sacred Raven* in which Kahuna *‘Alalā* [the name given to an old canoe carver from Kona] would “talk” to the *‘alalā*. What this means Mr. Gomes reflected, remains a mystery.

In citing the book *Legends of Honolulu*, Mr. Gomes shared that W. D. Westervelt recorded the story of Lepe-a-Moa (pg. 240). In quickly summarizing the story, he added, in a portion of this legend, while fighting against Lepe-a-Moa (who could transform into other types of birds), the *kupua* (supernatural) rooster named Keauhelemao changed himself into a *manu ‘alalā* to defeat Lepe-a-Moa. Mr. Gomes noted that according to this legend, Keauhelemao belonged to Mauinui who was the ruling chief of the island of Maui. Mr. Gomes reflected on whether this correlation between Keauhelemao shapeshifting into a *manu ‘alalā* and his association with the chief Mauinui has any bearing on Maui being a proposed release site. If there is no true association, at the very least, Mr. Gomes noted it makes for “an interesting piece of heritage.”

In discussing the historical evidence demonstrating *‘alalā* presence on Maui, Mr. Gomes noted that there are only subfossil remains that were found and another report in which a park ranger saw an *‘alalā* at Haleakalā. Mr. Gomes added that the apparent *‘alalā* sighting at Haleakalā is largely believed to have been a bird that wandered over from Hawai‘i Island. From an ornithology perspective, Mr. Gomes pointed out that “Maui is a big gaping hole in our knowledge...as far as bird knowledge is concerned.” Elaborating on this comment, Mr. Gomes shared, firstly, there were intensive studies and inventories of Hawai‘i’s birds until the 1880s which is more than 100 years after Cook’s arrival, and that “huge changes had happened by then.” Secondly, “none of those naturalists were able to do extensive surveys on Maui” which included Perkins, Wilson, and Palmer and his assistants, for a variety of reasons. Mr. Gomes recalled to the best of his knowledge that no one else was able to carry out an extensive ornithology survey/inventory on Maui until the turn of the century when by this time, many places were inaccessible. Mr. Gomes surmised that this is one of the reasons there are “rumors” on Maui about people hearing *‘ō‘ō* (*Moho sp.*) until the 1980s. None of these cases, he noted, were ever confirmed although the people that did make these reports are considered to be “bird experts” and some are still living. In summary, Mr. Gomes shared that “there are a lot of things we don’t know...I wouldn’t throw outside the realm of possibility that there were *‘alalā* on Maui at some point, but there is no historical evidence supporting that.”

Another piece of information that Mr. Gomes shared, although he was not able to point to a source, is that when the *‘alalā* would *‘aoa* (caw) continuously in the mist, it was a sign of impending rain. In sharing his experience with conducting interviews for the American Bird Conservancy project, Mr. Gomes shared that Calvin Louis from Ka‘ū related information shared by his father that when the *‘alalā* was heard while hunting, it was a sign that pigs are nearby. According to Alfred Galimba of Ka‘ū, who saw *‘alalā* in that district as late as the 1960s, this bird was quite common but seemed to have suddenly disappeared. This informant recalled seeing *‘alalā* at Pānēnē (also spelled Paneenee on historical maps) above Kaiholena.

When asked about his thoughts on the proposed project, Mr. Gomes shared that there have been more recent discussions about what to do with other severely imperiled native birds including the *kiwīkiu* (*Pseudonestor xanthophrys*), *‘ākohekohe* (*Palmer dolei*) on Maui, *‘akeke‘e* (*Loxops caeruleirostris*), and especially the *‘akikiki* (*Oreomystis bairdi*) on Kaua‘i. He shared that a few options have been discussed including, (1) taking them into captivity, much like the *‘alalā*, (2) leaving them be, and (3) translocating them from the wild to another place where they are not native. After much deliberation, it was decided that taking these imperiled populations into captivity was the “safest” alternative. Despite this being considered the “safest” option, Mr. Gomes pointed out that when native birds are removed from the wild, as seen with the *‘alalā* which has been in captivity for several generations, they stop passing along their traditional knowledge of surviving in the forest to their offspring because the environmental context has been removed. Regarding the four critical populations noted above, Mr. Gomes shared that he is of the opinion that “it might be better to translocate at least some of the birds into the wild” as they might have a better chance of survival. Concerning the proposed action, Mr. Gomes thinks that “it is worth a shot” and has “no problem with it culturally.” He added that it is unclear if the subfossil remains that were found on Maui are of the same species of *‘alalā* slated for release although osteologically, they appear very similar. Mr. Gomes was steadfast in the idea that:

...you gotta do something and although this is not an ideal situation, the birds and everything else serve a function, to us, to the landscape, and everything else. They are there for a reason and when you remove them from that landscape, their function goes unfulfilled.

If there is any way to maintain ‘*alalā* on the landscape, Mr. Gomes feels the proposed project is the best option for all of us. While this project presents a learning curve, he feels it is worth seeing it through. Furthermore, he noted that there are no frugivores on Maui to help disperse native seeds and that foreign birds do not do as good of a job in seed dispersal. He shared that there are people who feel the best path forward is to let the bird go to extinction and that it’s an opinion and belief that we have to respect. He felt it was important to consider the sentiments and opinions of the public, whether the decision-makers agree or disagree with those opinions.

J. ALOHALANI SMITH

On May 24th, 2023, ASM staff, Lokelani Brandt conducted a telephone interview with Mrs. Jade Alohalani Smith a resident of Kaupō, Maui. Because her father was in the U.S. Army, Mrs. Smith was born in California and raised there until the age of two, at which point her family moved back home to Hāna. From Hāna, her family lived in Kīhei and after high school, Mrs. Smith moved back to Hāna. For the past twenty-three years, she has lived in Kaupō on her husband’s family land where they raise cattle. Prior to this, she worked as an Associate Administrator for the Haleakalā National Park (ca. 1997) and later in the Forestry Division of the Department of Land and Natural Resources. Through her work with the National Park and the Forestry Division, Mrs. Smith has spent quite a bit of time in the upper elevations of the proposed release sites and participated in *nēnē* (*Branta sandvicensis*) and *ua‘u* (*Pterodroma sandwichensis*) surveys.

When asked if she was familiar with any past or ongoing cultural practices as well as cultural resources, Mrs. Smith shared that the forest in the upper elevations of east Maui is “still pristine habitat” however, she noted that they are dealing with an increase in invasive plant species. She believes that this increase in invasive plants is directly related to the increase in invasive ungulates including deer, pig, goat, and in some areas such as Kahikinui and Kīpahulu, wild cattle. She noted that although people do hunt these animals, the rate at which they reproduce outnumbers the amount that is hunted. Mrs. Smith added that people don’t regularly go up into the high elevations of the forests unless they are hunting. In speaking more about other resources found in the upper elevations near the release sites, Mrs. Smith shared that there are bogs as well as populations of *nēnē* and *ua‘u*.

When asked if she thought the proposed project would have a cultural impact, Mrs. Smith stated that “it’s hard to tell the specifics” and that only through carrying out the project and doing monitoring, will we be able to identify the cultural impacts with any certainty. She shared that a similar project was done in the past when *nēnē* populations were in decline. She recalled populations of *nēnē* were relocated from Hawai‘i Island to Kaupō, Maui, and Kaua‘i. From this project, the *nēnē* flourished on Maui and she still sees them flying around the east side of the island. She believes the project as a whole is good and noted that “maybe the ‘*alalā* will thrive on Maui.” Most concerning to Mrs. Smith is the growing population of barn owls. She related that the “barn owls, not the *pueo* (Hawaiian owl) will attack everything.” She explained that there are a lot of barn owls in Kaupō but was not aware of any in the Hāna forest. Because of the barn owls’ behavior, she feels they might be the biggest threat to the ‘*alalā*.

In closing, Mrs. Smith “thinks that they [‘*alalā*] have a good chance on Maui” and that maybe they will be able to be nurtured here. She felt that through active monitoring and forming partnerships with entities like the Haleakalā National Park, there could be enough support to help the ‘*alalā* thrive on Maui. She felt that the east side of Maui is the best spot for the release sites because of the pristine state of its forests. Although she was unsure about how they might react to the area’s native birds, in all she believes the project could net positive impacts.

KU‘ULEI VICKERY

On May 24th, 2023, ASM staff, Lokelani Brandt conducted a telephone interview with Ms. Ku‘ulei Vickery. Although she was born on the continent, Ms. Vickery traces her lineage to Hawai‘i Island and considers Waikōloa her hometown. She currently resides in Mountain View in Puna and has so for the past fourteen years. She earned her degree in Environmental Studies and since college, has been a part of various conservation and research efforts on Hawai‘i Island. Having a deep passion for conservation work which for her is an expression of the practice of Aloha ‘Āina. Ms. Vickery currently serves as a Program Coordinator with KUPU but has worked for the Mauna Kea Forest Restoration Project, Pono Pacific, as well as the ‘*Alalā* Project. Given her first-hand experience in working with ‘*alalā*, much of the interview focused on her time working with the ‘*Alalā* Project which was from 2016-2021.

During her tenure with the ‘Alalā Project, Ms. Vickery was the Predator Control Technician and also served on the project’s Cultural Advisory Board. In reflecting on her time with the ‘Alalā Project, she recalled it being one of the most memorable and amazing times of her life. She shared fond memories of spending every day in the forest of Pu‘u Maka‘ala on Hawai‘i Island alongside the wild ‘*alalā*. She explained that once the captive-bred birds were released, they referred to them as “wild.” Being in the presence of ‘*alalā*, Ms. Vickery shared “I was able to get to know each bird’s personalities” and developed a “*pilina*” (bond, relationship) with each of them. She noted that every bird was named and that names are so important in Hawaiian culture. She remembered that while working with the ‘Alalā Project, she was *hāpai* (pregnant) with her son and that her baby heard the caw of the ‘*alalā* while in the womb. She hopes that someday, her children will be able to hear ‘*alalā* in the forests of Hawai‘i Island.

In speaking more about the ‘Alalā Project, Ms. Vickery noted that the planned releases were determined by the Hawaiian moon phase and that sunrise and ‘*awa* ceremonies were held when structures such as the flight aviary were completed or before a release. She added that even when an ‘*alalā* passed away, which was a period filled with great heaviness, they held ceremonies to honor the life of the bird. In talking about threats to the ‘*alalā*, Ms. Vickery shared that for the releases on Hawai‘i Island, predators mainly, cats, rats, and mongoose were what she focused her work on. She explained that rats and cats, in particular, pose both direct and long-term threats. Both predators will attack the bird and rats in particular will go after their eggs which affects future populations. Furthermore, she added, these invasive predators are known transmitters of toxoplasmosis, which is detrimental to birds. She shared that ‘*io* (Hawaiian hawk; *Buteo solitarius*) and mosquitos are another threat to the ‘*alalā* and noted that ‘*io* eventually honed in to ‘*alalā*, which lead to the removal of ‘*alalā* in the wild. Another threat she identified was ungulates and noted that although they don’t cause direct harm to the ‘*alalā*, their impacts on the forest (i.e. habitat destruction) are very real. She shared that at the release sites in Kona, humans were also a threat because some people didn’t want ‘*alalā* on their property because it could put restrictions on them. Conversely, at the Pu‘u Maka‘ala release site, which is at a higher elevation with limited access, impacts from people were minimal. Although she acknowledged that she is not from Maui nor is she familiar with the release sites, she believes rats, cats, and mongooses will be a problem because they are everywhere. She reflected that the journey of the ‘*alalā* has been filled with so many setbacks that sometimes it’s difficult to maintain hope but it is important to do so because “extinction is so real” And we must continue this fight.

When asked about her thoughts on the proposed project, Ms. Vickery lamented that because the ‘*alalā* are from Hawai‘i Island, she would like to see them stay on Hawai‘i Island. However, what she felt was most important is that wherever the ‘*alalā*’s new home will be, she would like to see them not only survive but thrive. She described a sense of sadness when the decision was made to relocate the project to Maui and recalled the emotions when they had to retrieve the remaining birds from the wild and take them back to the Keauhou Bird Conservation Center. Because of the *pilina* she had developed with the ‘*alalā*, she described this period as being emotionally difficult.

When asked if she thought there were any cultural impacts from the proposed project, Ms. Vickery explained that “maybe not all people care about ‘*alalā*” however when we lose ‘*alalā*, we lose our forest and a part of ourselves.” As such to lose ‘*alalā* to extinction is a cultural impact. She opined that “for those of us who hold the ‘*alalā* dear, we want to see these birds thrive.” She added that impacts are also contingent upon how project managers and decision-makers decide to move forward in the future. Furthermore, she added that the actions of the staff do affect the environment. For example, she pointed out that equipment such as feeding stations or other ancillary structures as well as trails created by the staff leave an imprint on the environment. Although things like trails are unintended impacts, they do affect the environment. She noted that how the staff behaves around the birds also has consequences. Ms. Vickery shared that ‘*alalā* are very smart and curious so ensuring the staff is conscious of their actions is important. For example, she shared that she and her team never ate food around the ‘*alalā* because they didn’t want the birds to associate humans with food, especially if the expectation is for the birds to be fully self-sufficient in the wild. Even with predator control, she shared that when they baited the traps, they needed to do that out of view of the ‘*alalā*. She reflected that the ‘*alalā* “fully understood what we were doing.”

In summary, Ms. Vickery was very glad to see that a Cultural Impact Assessment study was being conducted and that efforts were being made to identify local residents of these areas. She felt it was important for information to flow between the project proponent and the community and stated that there must be community support for such a project. Noting that there may be some people who are indifferent or outright oppose the project, she felt it was important to do more education and outreach and involve the community in the process. Reiterating her sentiment about her desire to see the project maintained on Hawai‘i Island, she shared that of all the islands, “Maui makes sense to me” and reasoned that in the Papa and Wākea genealogy, Hawai‘i and Maui are closely connected and expressed her support for the project.

JIM “JIMMY” MEDEIROS

On June 7, 2023, an in-person interview was conducted by ASM staff, Lokelani Brandt with Mr. Jim “Jimmy” Medeiros at his residence at Hōnaunau, South Kona, Hawai‘i Island. Born in Haleki‘i Ahupua‘a to his father Clarence Medeiros Sr. and his mother, Pansy Hua (Medeiros), Mr. Medeiros (more commonly known as Jimmy) grew up in Honokua Ahupua‘a, a place that was historically known for its populations of ‘*alalā*. Jimmy spent much of his youth working alongside his father where they farmed *kalo* in the forest along the slopes of Mauna Loa at about the 1,500-foot elevation. He recalled seeing and hearing ‘*alalā* while working in the *kalo* patch. In reflecting on his Hawaiian lineage, he shared that on his father’s side, their family names are Mokuohai and Puhalahua and on his mother’s side the names are Hua, Kalalahua, Kahunanui.

In relating more about his paternal family’s traditional practice and heritage, Jimmy related that his paternal great-grandfather, John Mokuohai, as well as his father’s uncle, Charles Mokuohai were canoe builders who would venture into the mountains of South Kona to obtain *koa* logs. He added that as a child, his father, Clarence would go with his grandfather and uncle to obtain logs and conduct all the ceremonies and practices as part of the *koa* harvesting process. He laughingly shared a conversation he had with his father about the equipment they would take into the forest. Jimmy recalled asking his father if grandpa would take a big *ipu* containing water into the forest to which his father explained that grandpa would only take a long narrow type of *olo* (a specific type of gourd) which he would secure to his body. He emphasized that “our *kupuna* were very practical” and that the most important part was the:

...actual prayer moment...how they got there and the instruments were part of it but it was all about that moment when they reached that tree and talked to the birds and checked on all the different aspects before they harvested the tree.

He shared that communicating with the birds as well as the other natural elements was part of their data collection process that informed their practice. He noted that the place where his father, grandfather, and uncle used to harvest trees was about the 7,000-foot elevation or more within ‘*alalā* habitat. He recalled stories told to him by his father about when his grandfather used to hew down a *koa* tree and how the ‘*alalā* would gather around them and be “making noise and being in the area because you stay in their house.” Jimmy noted that his grandfather had a special relationship with the ‘*alalā* stating “they know it’s him somehow because these *kupuna* had a symbiotic relationship with everything over there [referring to the forest].” After harvesting the log, Jimmy described how his family would rough out the canoe in the forest to make it lighter but still durable enough so that it would withstand the trip down the mountainside and be taken near the shore for finishing. He described how a large triangular shape notch was carved into the front and back of the canoe which was where the rope was lashed so that the canoe could be safely guided and dragged down the mountainside. He shared that even at this point, the flock of ‘*alalā* would follow his family down the mountain even when they reached about the 500-600 foot elevation. Only when the canoe was taken down to the shore would the flock of ‘*alalā* disperse back to the uplands.

He shared that his grandfather was a well-known canoe builder and that the “village people called him Kahuna ‘*Alalā*.” Jimmy explained that his grandfather was actually a *kahuna kālaiwa‘a* (expert canoe carver) but at the same time because the ‘*alalā* would follow him and the canoe so intricately down the mountainside, the people in the community associated him with the ‘*alalā*. For this reason, he was given the name Kahuna ‘*Alalā*. Jimmy added, when his grandfather returned to the forest to harvest another log, the ‘*alalā* would be there, back in their home. Although it remains unclear to Jimmy as to why the ‘*alalā* would follow his grandfather down the mountain and at what point the ‘*alalā* felt they were ready to return to the forest, he reflected:

...they [the ‘*alalā*] had a connection to the humans and they had a connection with the log and the forest and whether they came down just to follow the canoe or whether they had a sacred role or *kuleana* that our *kupuna* knew at that time, I don’t know now.

He noted that although he has since passed, Charles Mokuohai was and continued to be a well-known canoe builder even into modern times, and some of the canoes he has made are still in existence.

When asked about his *mana‘o* on the proposed relocation of ‘*alalā* to Maui, Jimmy shared that he had seen similar past efforts done with the ‘*io*, however, they, on their own accord, made the trek back to their home on Hawai‘i Island. He believes determining whether the ‘*alalā* would return home on their own is something that should be seriously studied before the project moves too far along. He noted that if the ‘*alalā* decide on their own accord to return home, he believes it is a sign that their home on Hawai‘i Island needs to be improved. Noting that commercial forest activities such as *koa* harvesting are a major threat to their habitat, Jimmy felt that if there is hope that the ‘*alalā* will return to the forest of Hawai‘i Island, such activities need to cease to continue. For Jimmy,

improving the health of the forest is most important because, without a healthy forest, more of our native birds will be lost and this is exemplified by the dire situation of the *‘alalā*.

Speaking to a more ominous part of forest protection, Jimmy shared that many *koa* harvesters perceive the *‘alalā* and even the *‘io* as a direct threat to their industry because their presence “will stop them [harvesters] from harvesting.” He added that harvesters were known killers of *‘alalā*. In reflecting on what has happened with the *‘io*, Jimmy related that lobbyists have for many years worked to delist the *‘io* from the Federal List of Endangered and Threatened Wildlife so that they can harvest Hawai‘i’s forest resources. For this reason, he felt that it is important to maintain the *‘alalā*’s federal endangered status so that there is perpetual protection and support to protect Hawai‘i’s highland forests. In general, Jimmy supported the colocation of *‘alalā* but felt that improving their habitat and protecting that whether on Hawai‘i Island or Maui is just as important. He also felt that adequate predator control and proper fencing—not simply hog fencing—are essential for making the birds less vulnerable to other predators. In closing, Jimmy shared the following “save the forest, save the bird.”

ALDEI KAWIKA GREGOIRE

On June 22nd, 2023, a telephone interview was conducted by ASM staff, Lokelani Brandt with Mr. Aldei Kawika Gregoire. Raised in Ha‘ikū and descended from the Marciel family, Mr. Gregoire spent many weekends at his grandparent’s house in Kaupō exploring the streambeds, gulches, and ridges. After his return from college in 2008, Mr. Gregoire undertook a photography project about Kaupō and has since compiled a wide range of historical and photographic information about the region which he publishes on his website, kaupomaui.com. Through this passion project, Mr. Gregoire has spent time talking with long-time residents about the history of the area, researching, and exploring the landscape.

In earlier email correspondences, Mr. Gregoire shared that he is familiar with the Kaupō section of the Kīpahulu Forest Reserve being that his family’s property borders the reserve and he has spent some time hiking in the area. He also provided ASM staff with the links to two Hawaiian language newspaper articles that contained information about the cultural traditions associated with Pu‘u ‘Ahulili and Helani Falls. One such article published in the October 21st, 1869 edition of *Ke Au Okoa* identified ‘Ahulili as the burial place of the ancient chief Heleipawa, whereas the other article concerning the legend of *Lauka ‘ie ‘ie* which was printed in the November 16th, 1894 edition of *Nupepa Ka Oiaio* tells of Makanikeoe’s travels throughout Kaupō and Nu‘u in search of sources of water (these articles have been incorporated into the background section of this study; see *mo ‘olelo* section).

In the telephone interview, Mr. Gregoire shared that Ahulili is the *pu‘u* located at the head of Manawainui Valley and that Helani is the name of one of the falls in that valley. He noted that there are deep ravines in Manawainui Valley. When asked about his thoughts on the proposed project, Mr. Gregoire prefaced his statement, stating that he was not very familiar with the *‘alalā* but felt that the project “sounds like a good idea.” He then went on to speak about the feral animals (i.e. cattle, goats, pig, and possibly deer) that are known to roam in the proposed Kīpahulu (Kaupō) release site vicinity and cautioned that these animals may pose a risk to the *‘alalā*. Due to the presence of feral animals in the proposed Kīpahulu (Kaupō) Forest Reserve release area, Mr. Gregoire felt that the area to the west might be more suitable because the boundaries of the adjacent lands have been fenced and therefore have fewer predators than the proposed release site in Kaupō.

4. IDENTIFICATION AND MITIGATION OF POTENTIAL CULTURAL IMPACTS

The OEQC guidelines identify several possible types of cultural practices and beliefs that are subject to assessment. These include “...subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs” (OEQC 1997:1). The guidelines also identify the types of cultural resources, associated with cultural practices and beliefs that are subject to assessment. These include other types of historic properties, both man-made and natural, submerged cultural resources, and traditional cultural properties. The origin of the concept and the expanded definition of traditional cultural property is found in National Register Bulletin 38 published by the U.S. Department of Interior-National Park Service (Parker and King 1998). An abbreviated definition is provided below:

“Traditional cultural property” means any historic property associated with the traditional practices and beliefs of an ethnic community or members of that community for more than fifty years. These traditions shall be founded in an ethnic community’s history and contribute to maintaining the ethnic community’s cultural identity. Traditional associations are those

demonstrating a continuity of practice or belief until present or those documented in historical source materials, or both.

“Traditional” as it is used, implies a time depth of at least 50 years, and a generalized mode of transmission of information from one generation to the next, either orally or by act. “Cultural” refers to the beliefs, practices, lifeways, and social institutions of a given community. The use of the term “Property” defines this category of resource as an identifiable place. Traditional cultural properties are not intangible, they must have some kind of boundary; and are subject to the same kind of evaluation as any other historic resource, with one very important exception. By definition, the significance of traditional cultural properties should be determined by the community that values them.

It is however with the definition of “Property” wherein there lies an inherent contradiction and corresponding difficulty in the process of identification and evaluation of potential Hawaiian traditional cultural properties. The sacredness of a particular landscape feature is often cosmologically tied to the rest of the landscape as well as to other features on it. Limiting a property to a specifically defined area may actually partition it from what makes it significant in the first place. However offensive the concept of boundaries may be, it is nonetheless the regulatory benchmark for defining and assessing traditional cultural properties.

As the OEQC guidelines do not contain criteria for assessing the significance of traditional cultural properties, this study will adopt the state criteria for evaluating the significance of historic properties, of which traditional cultural properties are a subset. To be significant the potential historic property or traditional cultural property must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

- a Be associated with events that have made an important contribution to the broad patterns of our history;
- b Be associated with the lives of persons important in our past;
- c Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;
- d Have yielded, or is likely to yield, information important for research on prehistory or history;
- e Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

While it is the practice of the DLNR-SHPD to consider most historic properties significant under Criterion d at a minimum, it is clear that traditional cultural properties by definition would also be significant under Criterion e. A further analytical framework for addressing the preservation and protection of customary and traditional native practices specific to Hawaiian communities resulted from the *Ka Pa ‘akai O Ka ‘Āina* v Land Use Commission court case. The court decision established a three-part process relative to evaluating such potential impacts: first, to identify whether any valued cultural, historical or natural resources are present and/or past or ongoing traditional customary practices; and identify the extent to which any traditional and customary native Hawaiian rights are exercised; second, to identify the extent to which those resources and rights will be affected or impaired; and third, specify any mitigative actions to be taken to reasonably protect native Hawaiian rights if they are found to exist.

IDENTIFICATION OF TRADITIONAL AND CUSTOMARY PRACTICES, VALUED CULTURAL RESOURCES

The information from the culture-historical background in conjunction with the results of the consultation process revealed the following with respect to traditional and customary practices and valued cultural resources. This section begins with a discussion about the *‘alalā* as a valued cultural resource followed by project area-specific cultural resources and customary practices.

***‘Alalā* as a Valued Cultural Resource**

While there is limited historical documentation of the presence of *‘alalā* on Maui, with only one unconfirmed case of fossilized evidence, the reviewed historical records in this study support the conclusion that the *‘alalā* was and continues to be a culturally valued resources in Hawaiian culture. Its presence at *heiau* sites in South Kona,

utilization of its feathers in *kāhili* making, references in traditional *mo'olelo*, association with a specific chant style, connection to canoe carving and Hawaiian spirituality as an *'aumākua* for certain families, and reference to it as a food source all indicate the Hawaiian cultural significance of the *'alalā*. Furthermore, the *'alalā*'s capability to inhabit both dry and wet forests, and its role, along with other native bird species, in fostering a healthy and diverse forest ecosystem, underscores its bio-cultural significance.

Forest Resources and Gathering Practices

The Ko'olau and Kīpahulu (Kaupō section) Forest Reserves and all of their tangible and intangible elements—like other forested landscapes across the islands—have and continue to be recognized as a valued cultural resource. Although limited, the historical information described use of Kaupō's upland forest by *kālaiwa'a* (canoe carvers). There are, however, a number of traditional *mo'olelo* that speak to various *akua*, chiefs, and *kupua* who made visits to the uplands of Kaupō and Ke'ānae and in some instances shaped the physical landscape seen today.

Despite the limited references to specific cultural uses of Kīpahulu and Ko'olau Forest Reserves, the use of native wet forests in traditional Hawaiian culture is both extensive and well-documented (see Abbott 1992; Buck 1957; Krauss 1993). The flowers, fruits, woods, roots, and bark of many native plants found in the wet forests of the Hawaiian Islands have been and continue to be extensively used in many Hawaiian cultural practices. Although plants were held in high esteem and celebrated in traditional lore, plants were also valued as a collective whole for its ability to attract diverse wildlife, such as birds and insects. Endemic birds were highly valued for their colorful plumages which were traditionally used in creating spectacular feathered garbs, headdresses, *lei*, and other insignia that were worn or displayed by Hawaiian royalty. The task of collecting birds was undertaken by the *po'e kia manu* or *kia manu* (bird catchers), who held a profound understanding of avian behavior and the forest resources, including what plants to use to attract and capture the birds.

The plethora of plants found in Hawai'i's wet forest was and remains an integral component of many traditional Hawaiian cultural practices. Large trees provided a variety of hardwoods from which canoes, houses, *ki'i* (carved images), fishing accessories, and various utilitarian and recreational implements were made. Aerial roots of the climbing *'ie'ie* (*Freycinetia arborea*) were harvested and plaited together to form tightly stitched *'ie* (baskets). Ferns were collected from the forest floor and woven into *lei* or tucked into *kapa* (bark cloth) as a scenting agent. Flowers and fruits were collected for *lei*, natural dyes, and sometimes mixed together with other plants to make medicinal concoctions. Additionally, plots in the wet forests were cleared to cultivate *olonā* (*Touchardia latifolia*), an endemic plant that was purposefully grown and from which cordage of the finest quality was made.

The forest itself also holds profound spiritual implications as various plants found in the wet forest were considered *kinolau* (embodiments) of named deities, many of whom took specific plant forms of the deity Kū. Such examples include but are not limited to Kūka'ōhi'alaka, Kūpūlupulu, Kūmoku'hālī'i, and Kūalanawao (Fornander 1919-1920; Handy et al. 1991; Kamakau 1976). While Kū is considered the activating energy associated with the forest, other deities are also recognized including Kāne, who is embodied in the sun and in freshwater; Lono who is connected to winds, storms, and fertility; and Laka who is associated with transpiration (Edith Kanaka'ole Foundation n.d.). Therefore, the Hawaiian forest, at a minimum, represents the dynamic interplay between Hawaiian deities.

These forested spaces also filled an important spiritual and utilitarian need for *hula* dancers, healing practitioners, and artisans, all of whom rely heavily on Hawai'i's forest resources. *Hula* practitioners have long valued Hawai'i's rich forest, which continues to be extensively used in making adornments, and implements, in furnishing the *hula kuahu* (altars) with specific plants believed to be the embodiments of certain deities. The forests are also the source of inspiration for *hula* practitioners who through dance and chant mimic the various environmental phenomena and soundscapes found in Hawai'i's forest (and other) environments. From a Hawaiian cultural perspective and as articulated by some of the consulted parties, the forest contains both tangible and intangible components and each of these components, whether it is a species of bird, plant, tree, fern, or insect, has a role or a function that contributes to the total wellbeing of everything that is dependant upon that system.

Water Resources

Mo'olelo and historical sources reference the abundance of *wai* (freshwater) in the uplands of Ke'ānae and Kaupō. At least one of the consulted parties spoke about streams, waterfalls, and subsurface water resources in Manawainui Gulch near the Kīpahulu (Kaupō section) Forest Reserve project area. Likewise, in Ke'ānae and across the Ko'olau Forest Reserve are countless streams. These streams and their continuous flow supported a number of agricultural practices that were strewn along its length mainly *lo'i kalo* and fishponds.

Caves and Burial Sites

Traditional *mo'olelo* and historical references mention underground water caves as well as burial sites/pits in the uplands of Kaupō and Ke'anae. Pu'u 'Ahulili, located at the head of Manawainui Gulch—which is located in the vicinity of the Kīpahulu (Kaupō section) Forest Reserve project area—was identified by Kamakau (1991) and one of the consulted parties as the burial place of the ancient chief Heleipawa (*I Ahulili, waiho no o Heleipawa*; On 'Ahulili, Heleipawa was laid away). Kamaku (1991) also mentions burial pits “mauka of Pu'umane'one'o” in Kaupō, but does not specify any other locational information. In the area above Ke'anae, Kamakau (1991) also identified Ka'a'awa as a burial pit inside the Haleakalā crater near the eastern edge of the Ko'olau Gap.

Upland Agriculture Practices

Although limited, some historical references make note of a unique style of *kalo* cultivation that was practiced in the Ko'olau District. As noted by Handy et al. (1991:501) *kalo* was cultivated “along the streams and in the pockets high on the canyonlike walls of the gulches.”

Trails

The background research also identified several upland trails located in the vicinity of the project areas. The first are those associated with the chief Kihaapi'ilani. Although Kihaapi'ilani is perhaps, most remembered for the construction of the *alaloa* which circuted the Island Maui, for the most part following the coastline, there are historical references that describe branches of the *alaloa* that reached Haleakalā and he is known to have improved the pathways over the cliffs of Kaupō, Hāna, and Ko'olau. Another source identified a pathway measuring 6 to 8 feet wide that extended from Makawao up to Kalapauwili on the Kaupō side to the pool of Ale, which was also built by Kihaapi'ilani for use by his warriors. Winslow Walker (in Sterling 1998:179) also referred to a “Keanae” trail in the crater of Haleakala.”

Ranching and Hunting

Since the late 19th century, ranching has been occurring in Kaupō and large areas within the district are still used today for ranching. Ranching as it is practiced today is a historically introduced practice/industry brought on by the efforts of *ali'i* to curb wild populations of foreign ungulates that were introduced during the Postcontact Period. Although ranching is not ongoing within either of the proposed project areas, from the consultation process, it was revealed that there are populations of wild cattle, goat, pigs, and perhaps deer that roam these areas and are hunted for subsistence and recreational purposes.

FINDINGS AND RECOMMENDATIONS

It is evident from the information presented in this study that the forested upland areas of Nāholokū, Kaupō and Ke'anae, Ko'olau have been utilized since the Precontact and Historic periods for a variety of practices. Furthermore, this study has demonstrated that the endangered '*alalā* is a valued bio-cultural resource and is historically associated with certain customary practices. This study concludes the following:

- The action alternatives, which involve the creation of low-impact foot trails in the release areas and the construction of temporary bird cages; and improving field camp infrastructure, will likely result in some level of direct impact on the physical landscape at the proposed release sites. The action alternatives also have the potential to restore wild populations of the ecologically and culturally important '*alalā*.
- The no-action alternative will not have any direct impact on the physical landscape at the proposed release sites but would likely adversely impact efforts to restore wild populations of '*alalā*.

With the action and no-action alternatives in mind, if done thoughtfully and considering the recommendations offered below, the proposed project would not likely adversely impact any specific valued cultural resources or traditional customary practices. The following recommendations, which weave together the thoughts shared by the consulted parties along with those of the authors, are provided below to ensure the proposed activities associated with the project and that the project proponents remain mindful and work to prevent or limit the potential for impacts on valued cultural resources and customary practices.

Continued Educational Outreach

Those consulted as part of this study were generally supportive of the proposed project especially as it relates to re-establishing wild populations of '*alalā*. Some of the consulted parties shared their first-hand experiences with the '*alalā*, both wild and captive-bred populations, while some only knew of the bird by name. It was clear that bringing

more awareness about the ecological and cultural significance of the *‘alalā* is crucial to garnering public support for restoring wild populations. Additionally and as described by some of the consulted parties, it is important to hear and thoughtfully consider any concerns that the public at large may have about the proposed action.

Archaeological Survey

The trails identified above are believed to be in the vicinity of the proposed project area and except for the Kaupō Trail, there is not enough existing information to make a clear determination on the location of such trails. Furthermore, as there has been no prior archaeological study of those areas that would be directly impacted by the proposed project, it is recommended that an archaeological survey be conducted to determine the presence or absence of any archaeological or historic resources. If such resources are present, efforts should be made to preserve them in place through avoidance. Project proponents should consult with DLNR’s State Historic Preservation Division and other necessary stakeholders to determine and agree upon an acceptable scope of work.

Avoid Activities on Pu‘u ‘Ahulili

Being that Pu‘u ‘Ahulili is a known burial site for the chief Heleipawa, it is recommended that there be no activities on this *pu‘u* including but not limited to the creation of low-impact foot trails or constructing temporary bird cages. This *pu‘u* should be treated as a culturally sensitive place and avoidance is perhaps the best way to limit any potential cultural impacts.

Fencing, Predator Control, and Monitoring

As described by some of the consulted parties, fencing the release areas to prevent or limit impacts to *‘alalā* from wild ungulates and predators is recommended. Furthermore, some of the consulted parties spoke about the importance of ongoing monitoring and predator control to ensure those released populations of *‘alalā* are adequately protected.

CONCLUSION

In summary, the culture-historical background, consultation, and recommendations provided above are intended to ensure the activities associated with the proposed project do not adversely impact any of the above-identified valued cultural resources and traditional customary practices. While none of the consulted parties expressed any strong opposition to the proposed project, the concerns, and recommendations offered above are intended to help DLNR-DOFAW and its partner agencies associated with this project to remain mindful of the cultural, social, and environmental uniqueness of the *‘alalā* and the proposed project areas. Conducting background research, consulting with community members who so willingly gave their time and knowledge, and recommending practical actions to mitigate any potential cultural impacts are done so with the utmost *aloha*, for both the land and the people whose heritage is intimately connected to this landscape and to the *‘alalā*. If DLNR-DOFAW and its partners assume their *kuleana* to implement the proposed project, we recommend that it be done so in the same spirit and practice. To reiterate, failure to consider and implement the above-described recommendations has the potential to impact the above-identified valued cultural resources and traditional customary practices. Likewise, the no-action alternative would likely adversely impact efforts to restore wild populations of *‘alalā* which could lead to the bird’s extinction.

REFERENCES CITED

- Abbott, I. A.
1992 *Lā'au Hawai'i, Traditional Hawaiian Uses of Plants*. Bishop Museum Press, Honolulu.
- Alexander, A. C.
1920 Land Titles and Surveys in Hawaii. *The Hawaiian Planters' Record* XXIII:67-78. Electronic document, <https://ags.hawaii.gov/wp-content/uploads/2012/09/Land-Titles-and-Survey.pdf>, accessed 2017/03/07.
- Alexander, W. D.
1890 A Brief History of Land Titles in the Hawaiian Kingdom. In *Hawaiian Almanac and Annual for 1891*. Press Publishing Company, Honolulu.
- Ashdown, I.
1971 *Ke Alaloa O Maui, The Broad Highway of Maui*. Ace Printing Company, Wailuku.
- Ashe, I.
2017 Experts work to improve alala's chances. *West Hawaii Today* [Kailua-Kona]. 19 March: 6A. Electronic document, www.newspapers.com, accessed May 26, 2023.
- Athens, J. S., T. Rieth, and T. S. Dye
2014 A Paleoenvironmental and Archaeological Model-Based Age Estimate for the Colonization of Hawai'i. *American Antiquity* 79 (1):144-155.
- Baer, A. U.
2015 On the cloak of kings: Agriculture, power, and community in Kaupō, Maui. Ph.D. Dissertation, University of California, Berkeley, Berkeley.
- Banko, P. C., D. L. Ball, and W. Banko, E.
2002 Hawaiian Crow (*Corvus hawaiiensis*). In *The Birds of North America*. Edited by A. P. a. F. Gill No. 648. The Birds of North America, Inc., Philadelphia, PA.
- Beamer, K.
2014 *No Mākou Ka Mana: Liberating the Nation*. Kamehameha Publishing, Honolulu.
- Beckwith, M.
1976 *Hawaiian Mythology*. University of Hawaii Press, Honolulu.
- Beckwith, M. W.
1951 *The Kumulipo A Hawaiian Creation Chant*. University of Hawaii Press, Honolulu.
1970 *Hawaiian Mythology*. University of Hawai'i Press, Honolulu.
1971 *Kepelino's Traditions of Hawaii*. Bernice P. Bishop Museum Bulletin 95. Bishop Museum Press, Honolulu.
- Buck, E.
1993 *Paradise remade: The politics of culture and history in Hawai'i*. Temple University Press, Philadelphia.
- Buck, P. H.
1957 *Arts and Crafts of Hawaii*. B. P. Bishop Museum Special Publication 45. Bishop Museum Press, Honolulu.
- Buke Māhele
1848 *Buke Kakau Paa no ka mahele aina i Hooholoia iwaena o Kamehameha III a me Na Lii a me Na Konohiki ana*, Hale Alii, Honolulu.
- Burr, T. A., P. Q. Tomich, E. Kosaka, W. Kramer, J. M. Scott, E. Kridler, J. Giffin, D. Woodside, and R. Bachman
1982 Alala Recovery Plan. Revised 1982. Prepared for U.S. Fish and Wildlife Service, Portland, OR.

- Cachola-Abad, C. K.
2000 The Evolution of Hawaiian Socio-Political Complex: An Analysis of Hawaiian Oral Traditions. Ph.D. Dissertation, University of Hawai'i at Mānoa, Department of Anthropology., Honolulu.
- Cannelora, L.
1974 *The origin of Hawaii land titles and of the rights of native tenants*. Security Title Corp.
- Case, E. M. K.
2015 I Kahiki Ke Ola: In Kahiki There is Life Ancestral Memories and Migrations in the New Pacific. Ph.D. Thesis, Victoria University of Wellington, Wellington.
- Cassin, J.
1858a *United States Exploring Expedition During the Years 1838, 1839, 1849, and 1842 Under The Command of Charles Wilkes, U.S.N. Atlas Mammalogy and Ornithology*. J. B. Lippincott & Co., Philadelphia. Electronic document, <https://www.biodiversitylibrary.org/page/43557830#page/7/mode/1up>, accessed 26 May 2023.
- 1858b *United States Exploring Expedition During the Years 1838, 1839, 1849, and 1842 Under The Command of Charles Wilkes, U.S.N. Mammalogy and Ornithology*. J. B. Lippincott & Co., Philadelphia. Electronic document, <https://www.biodiversitylibrary.org/page/43099740#page/9/mode/1up>, accessed 26 May 2023.
- Chinen, J. J.
1958 *The Great Mahele: Hawaii's Land Division of 1848*. University of Hawaii Press, Honolulu.
- 1961 *Original Land Titles in Hawaii*. Privately published.
- Commissioner of Public Lands (Office of the Commissioner of Public Lands of the Territory of Hawaii)
1929 *Indices of Awards Made by the Board of Commissioners to Quiet Land Titles in the Hawaiian Islands*. Star Bulletin Press, Honolulu.
- Cook, J. and J. King
1784 *A Voyage to the Pacific Ocean Undertaken by Command of His Majesty, for Making Discoveries in the Northern Hemisphere: Performed under the Direction of Captains Cook, Clerke, and Gore, In the Years 1776, 1777, 1778, 1779, and 1780*, vol. III. Order of the Lords Commissioners of the Admiralty, London. Electronic document, <https://www.biodiversitylibrary.org/item/29917#page/5/mode/1up>.
- Cordy, R.
2000 *Exalted Sits the Chief, The Ancient History of Hawai'i Island*. Mutual Publishing, Honolulu.
- Crabbe, K., K. Fox, and H. K. Coleman
2017 *Mana Lāhui Kānaka Mai nā kupuna kahiko mai a hiki i kēia wā*. Office of Hawaiian Affairs, Honolulu, accessed 2019-04-29.
- Department of Land and Natural Resources
2023 'Alalā Project. Department of Land and Natural Resources, Hilo. Electronic document, <https://dlnr.hawaii.gov/alalaproject/>, accessed 26 May 2023.
- Desha, S.
2000 *Kamehameha and his warrior Kekūhaupi'o*. Translated by F. N. Frazier. Kamehameha Schools Press, Honolulu.
- Else, I.
2004 The Breakdown of the Kapu System and Its Effect on Native Hawaiian Health and Diet. *Hūlili: Multidisciplinary Research on Hawaiian Well-Being* 1 (1):241-255.
- Emerson, N. B.
1894 The Bird Hunters of Ancient Hawaii. In *Thrum's Hawaiian Annual for 1895*, pp. 101-111. Edited by T. A. Thrum. Thos. A Thrum, Honolulu.

References Cited

- Evening Bulletin
1907 By Authority. *Evening Bulletin* [Honolulu]. 10 May: 6. Electronic document, <https://www.newspapers.com>.
- Fornander, A.
1880 *An Account of the Polynesian Race: Its Origins and Migrations, and the Ancient History of the Hawaiian People to the Times of Kamehameha I*, vol. II. Trübner & Co., London.
1916-1917 *Fornander Collection of Hawaiian Antiquities and Folk-lore*. Memoirs of the Bernice Pauahi Bishop Museum, vol. IV. Bishop Museum Press, Honolulu.
1918-1919 *Fornander Collection of Hawaiian Antiquities and Folk-lore*. Memoirs of the Bernice Pauahi Bishop Museum Volume V. Bishop Museum Press, Honolulu.
1919-1920 *Fornander Collection of Hawaiian Antiquities and Folk-lore*. Memoirs of the Bernice Pauahi Bishop Museum, vol. VI. Bishop Museum Press, Honolulu.
1969 *An Account of the Polynesian Race: Its Origins and Migrations, and the Ancient History of the Hawaiian People to the Times of Kamehameha I*. Edited by J. F. G. Stokes. Charles Tuttle & Co., Inc., Tokyo.
- Garovoy, J.
2005 "Ua koe ke kuleana o na kanaka" (Reserving the rights of Native Tenants): Integrating Kuleana Rights And Land Trust Priorities in Hawaii. *Harvard Environmental Law* 29:523-571.
- Gomes, N.
2016 Some Traditional Native Hawaiian Bird Hunting Practices *The Hawaiian Journal of History* 50:33-51. Electronic document, https://evols.library.manoa.hawaii.edu/bitstream/10524/59458/1/HJH50_gomes.pdf.
- Gregoire, A. K.
2023a The ahupuaa of Kaupo. *Kaupo, Maui*. Electronic document, <https://kaupomaui.com/research/ahupuaa/>, accessed 29 May 2023.
2023b Kaupo's Cotton Experiment. *Kaupo, Maui*. Electronic document, <https://kaupomaui.com/research/cotton/>, accessed 29 May 2023.
2023c Moses Manu, East Maui Storyteller. *Kaupo, Maui History of the Land*. Electronic document, <https://kaupomaui.com/research/moses-manu/>, accessed 29 May 2023.
- Ha'i, S.
n.d 'Ahulili. Electronic document, <https://www.huapala.org/ah/Ahulili.html>, accessed April 20, 2023.
- Handy, E. S. C.
1940 *The Hawaiian Planter*. Bernice P. Bishop Museum Bulletin No. 126. Published by the Museum, Honolulu.
- Handy, E. S. C., E. G. Handy, and M. K. Pukui
1991 *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Bernice P. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu.
1897 *Collector of Customs, Ship' Passenger Manifest, 1843-1900*, Honolulu.
- Hawai'i Forest Institute
2023 Keauhou Bird Conservation Center Discovery Forest. Hawai'i Forest Institute, 'O'okala. Electronic document, <https://hawaiiforestinstitute.org/our-projects/keauhou-bird-conservation-center-discovery-forest/>, accessed 5 May 2023.
- Holmes, T.
1981 *The Hawaiian Canoe*. Editions Limited, Hanalei.

- Hommon, R.
1986 Social Evolution in Ancient Hawai'i. In *Island Societies: Archaeological Approaches to Evolution and Transformation*, pp. 55-88. Edited by P. Kirch. Cambridge University Press, Cambridge, Massachusetts.
- Honolulu Advertiser
1969 Development Plans for Kaupo Ranch Revealed. *Honolulu Advertiser* [Honolulu]. 16 February: E-49. Electronic document, <https://www.newspapers.com/>.
- Honolulu Star-Bulletin
1929 Maui Pioneer Dies Wednesday--Antone V. Marciel Prominent In Islands Since Days of Monarchy. *Honolulu Star-Bulletin* [Honolulu]. 12 July: 27. Electronic document, <https://www.newspapers.com/>.
1951 Here After Thirty Seven Years. *Honolulu Star-Bulletin* [Honolulu]. 11 August: 24. Electronic document, <https://www.newspapers.com/>.
- Iaukea, C. P.
1894 *Biennial Report of the Commissioner of Crown Lands 1894*. Hawaiian Gazette Company, Honolulu.
- Jokiel, P., K. Rodgers, W. Walsh, D. Polhemus, and T. Wilhelm
2011 Marine Resource Management in the Hawaiian Archipelago: The Traditional Hawaiian System in Relation to the Western Approach. *Journal of Marine Biology* 2011:1-16.
- Ka Lei Momi
1893 He Wahi Hoomanao no na Manu o ka Lewa. *Ka Lei Momi* [Honolulu]. 31 July. Electronic document, www.papakilodatabase.com.
- Kahiolo, G. W.
1863a Ka Moolelo O Na Manu o Hawaii Nei. *Ka Nupepa Kuokoa* [Honolulu]. 09 Mei: 4. Electronic document, www.papakilodatabase.com, accessed 10/14/2020.
1863b Ka Moolelo o na Manu o Hawaii Nei No. 2. *Ka Nupepa Kuokoa*. May 9, 1863: 1. Electronic document, www.papakilodatabase.com.
1864 Manu Kupanaha. *Ka Nupepa Kuokoa*. September 24, 1864: 1. Electronic document, www.papakilodatabase.com.
- Kamakau, S. M.
1866 Ka moolelo o Kamehameha I: Mokuna III. *Ka Nupepa Kuokoa* [Honolulu]. 22 December: 1. Electronic document, <https://www.papakilodatabase.com>, accessed 08/28/2020.
1869 Ka Moolelo Hawaii- Helu 2. *Ke Au Okoa* [Honolulu]. 21 October: 1. Electronic document, <https://www.papakilodatabase.com>, accessed 12/14/2020.
- Kamakau, S. M.
1964 *Ka Po'e Kahiko: The People of Old*. B.P. Bishop Museum Special Publication 51. Bishop Museum Press, Honolulu.
1968 *Ka Po'e Kahiko: The People of Old*. Revised ed. B.P. Bishop Museum Special Publication 51. Bishop Museum Press, Honolulu.
1976 *The Works of the People of Old, Na Hana a ka Po'e Kahiko*. B.P. Bishop Museum Special Publication 61. Bishop Museum Press, Honolulu.
1991 *Tales and Traditions of the People of Old, Nā Mo'olelo a ka Po'e Kahiko*. Bishop Museum Press, Honolulu.
1992 *Ruling Chiefs of Hawaii*. Revised ed. Kamehameha Schools Press, Honolulu.

References Cited

- Kapohu, S.
1869-1870 He Kaa No Kauilani. *Ka Nupepa Kuokoa* [Honolulu]. September 18, 1869 through February 12, 1870. Electronic document, www.papakilodatabase.com.
- Kaui, S. M.
1865 He Ka'ao no Pikoikaalala, Ke Keiki Akamai i ka Pana-Helu 1. *Ka Nupepa Kuokoa* [Honolulu]. 16 December. Electronic document, www.papakilodatabase.com.
- Kelly, M.
1956 Changes in Land Tenure in Hawaii, 1778-1850. Manuscript. Hawaiian-Pacific Collection, Master's thesis. University of Hawaii at Manoa. 1956.
- Kikiloj, S. K.
2010 Rebirth of an Archipelago: Sustaining a Hawaiian Cultural Identity for People and Homeland. *Hūlili: Multidisciplinary Research on Hawaiian Well-Being* 6:73-115.
- King, R.
1935 Districts in the Hawaiian Islands. In *A Gazetteer of the Territory of Hawaii*, pp. 214-230. Edited by J. W. Coulter. University of Hawaii, Honolulu.
- n.d. Hawaiian Land Titles. n.d. Electronic document, <https://ags.hawaii.gov/wp-content/uploads>, accessed May 15, 2020.
- Kirch, P. V.
1985 *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory*. University of Hawaii Press, Honolulu.
- 2010 *How Chiefs Became Kings: Divine Kingship and the Rise of Archaic States in Ancient Hawai'i*. University of California Press, Berkeley.
- 2011 When did the Polynesians Settle Hawai'i? A Review of 150 Years of Scholarly Inquiry and a Tentative Answer. *Hawaiian Archaeology* 12:3-26.
- Kirch, P. V. and C. Ruggles
2019 *Heiau, 'Āina, Lani The Hawaiian Temple System in Ancient Kahikinui and Kaupō, Maui*. University of Hawai'i Press, Honolulu.
- Klieger, P.
1998 *Moku'ula Maui's Sacred Island*. Bishop Museum Press, Honolulu.
- Kolb, M. J.
1991 Social Power, Chiefly Authority, and Ceremonial Architecture in an Island Polity, Maui, Hawaii. Ph.D Dissertation, Department of Anthropology, University of California, Ann Arbor: University Microfilms International.
- 1999 Monumental grandeur and political florescence in pre-contact Hawai'i: Excavations at Pi'ilanihale Heiau, Maui. *Archaeology in Oceania* 34 (No. 2):71-82.
- Krauss, B. H.
1993 *Plants in Hawaiian Culture*. A Kolowalu Book. University of Hawaii Press, Honolulu.
- Kuykendall, R.
1938 *The Hawaiian Kingdom 1778-1854. Foundation and Transformation*, vol. 1. 3 vols. University Press of Hawaii, Honolulu.
- Lam, M.
1985 The Imposition of Anglo-American Land Tenure Law On Hawaiians. *Journal of Legal Pluralism and Unofficial Law* 23:104-128.

- Liliuokalani
1978 *An Account of the Creation of the World According to Hawaiian Tradition, Translated from Original Manuscript Preserved Exclusively in Her Majesty's Family*. Pueo Press, Kentfield.
- Lizzi, C.
2017 *Ola i ka Wai: The Battle over East Maui Waters. Summer 2017*. Ka Huli Ao Center for Excellence in Native Hawaiian Law, Honolulu. Electronic document, <https://manoa.hawaii.edu/kahuliao/ka-moae/summer-2017/ola-i-ka-wai/>, accessed June 27, 2023.
- Lucas, P.
1995 *A Dictionary of Hawaiian Legal Land-Terms*. Native Hawaiian Legal Corporation. University of Hawai'i Committee for the Preservation and Study of Hawaiian Language, Art and Culture, Honolulu.
- Macdonald, G. A. and D. H. Hubbard
1951 *Volcanoes of Hawaii National Park*. In *Nature Notes*, vol. IV. No. 2 ed. Hawaii National Park and Hawaii Natural History Association. Electronic document, https://www.nps.gov/parkhistory/online_books/hawaii-notes/vol4-2.htm, accessed July 30, 2022.
- MacKenzie, M. K.
2015 *Native Hawaiian Law, A Treatise*. Kamehameha Publishing, Honolulu.
- Malo, D.
1951 *Hawaiian Antiquities*. Second ed. Translated by N. B. Emerson. B. P. Bishop Museum Special Publication 2. B. P. Bishop Museum Press, Honolulu.
- Maly, K.
2001 *Mālama Pono I Ka 'Āina—An Overview of the Hawaiian Cultural Landscape*. Kumu Pono Associates. Revised 2001.
- Maly, K. and O. Maly
2001 Appendix A - Oral History Interviews: He Wahi Mo'olelo No Nā 'Āina A Me Nā 'Ohana O Ki'īlāe A Me Kauleolī Ma Kona Hema, Hawai'i, A Collection of Traditions and Historical Accounts of the Lands and Families of Ki'īlāe and Kauleolī, South Kona, Hawai'i (TMK 8-5-05 - various parcels). Kumu Pono Associates Report HiKii56-070101. Revised July 1, 2001. Prepared for Robert Rechtman, Rechtman Consulting, Kea'au, HI.
- 2002 Volume I, Wai O Ke Ola: He Wahi Mo'olelo No Maui Hikina, A Collection of Native Traditions and Historical Accounts of the Lands of Hāmākua Poko, Hāmākua Loa and Ko'olau, Maui Hikina (East Maui), Island of Maui. Kumo Pono Associates, LLC Report MaHikina59-011702b. Prepared for East Maui Irrigation Company, Pā'ia, HI.
- 2007 Volume I (Part 1): He Wahi Mo'olelo No Kaua'ula a me Kekāhi 'Āina o Lahaina i Maui A Collection of Traditions and Historical Accounts of Kaua'ula and Other Lands of Lahaina, Maui. Kumu Pono Associates, LLC Report MaKaua111a (060107). Revised 2007. Prepared for Mākila Land Company, Kahului, HI and Kamehameha Schools, Honolulu.
- Manu, M.
1884 *Ka Moolelo O Kihaapiilani. Ka Nupepa Kuokoa* [Honolulu]. February 16: 1. Electronic document, <https://www.papakilodatabase.com>.
- 1894a *He Moolelo Kaa No Laukaieie- Article No. 43. Nupepa Ka Oiaio* [Honolulu]. November 16: 1. Electronic document, <https://www.papakilodatabase.com>.
- 1894b *He Moolelo Kaa No Laukaieie- Article No. 44. Nupepa Ka Oiaio* [Honolulu]. November 23: 1. Electronic document, <https://www.papakilodatabase.com>.
- 1894c *He Moolelo Kaa No Laukaieie- Article No. 47. Nupepa Ka Oiaio* [Honolulu]. December 21: 4. Electronic document, <https://www.papakilodatabase.com>.

References Cited

- 1894-1895 He Moolelo Kaa No Laukaieie. *Nupepa Ka Oiaio* [Honolulu]. January 5, 1894 through September 13, 1895. Electronic document, <https://www.papakilodatabase.com>.
- Marciel, T.
1977 Notes from a Recorded Interview with Tito Marciel. Interviewed by J. Gutmanis. University of Hawaii, Honolulu.
- Maunupau, T. K.
1998 *Ka Huakai Makaikai A Kaupo, Maui*. Edited by N. N. C. Losch. Translated by Mary Kawena Pukui and M. N. Chun. Bishop Museum Press, Honolulu.
- McEldowney, H.
1979 Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo, Hawai'i. Department of Anthropology, B.P. Bishop Museum. Revised 1979. Prepared for the U.S. Army Engineer Division, Pacific Ocean.
- McGregor, D. P.
2007 *Nā Kua'āina Living Hawaiian Culture*. University of Hawai'i Press, Honolulu.
- Munro, G. C.
1944 *Birds of Hawaii*. Tongg Publ. Co., Honolulu, HI.
- Nakaa, G. W.
1893 He moolelo Hawaii: Mokuna II: Ke kumu mua o ko Hawaii nei kanaka. *Ka Nupepa Kuokoa* [Honolulu]. 4 February: 4. Electronic document, <https://www.papakilodatabase.com>, accessed 08/28/2020.
- Nakuina, M.
2005 *The Wind Gourd of La'amaomao (translated by Esther T. Mookini & Sarah Nākoa)*. University of Hawai'i Press, Honolulu.
- National Research Council
1992 *The Scientific Bases for the Preservation of the Hawaiian Crow*. National Academy Press, Washington D.C. Electronic document, <https://doi.org/10.17226/2023>.
- Nogelmeier, M. P.
2010 *Mai Pa'a I Ka Leo: Historical Voices in Hawaiian Primary Materials, Looking Forward and Listening Back*. Bishop Museum Press, Honolulu.
- OEQC (Office of Environmental Quality Control)
1997 Guidelines for Assessing Cultural Impacts, as Adopted by the State of Hawaii Environmental Council in 1997 and amended in 2000. Electronic document, <http://oeqc2.doh.hawaii.gov/OEQC/Guidance/1997-Cultural-Impacts-Guidance.pdf>.
- Office of Hawaiian Affairs
2018 Kipuka Database. Electronic document, <http://kipukadatabase.com/kipuka>.
- Olivera, K.
2014 *Ancestral places: understanding Kanaka geographies* Oregon State University Press, Corvallis.
- Olson, S. L. and H. F. James
1991 *Descriptions of Thirty-two New Species of Birds from the Hawaiian Islands*. Ornithological Monographs No. 45. American Ornithologists' Union, Winfield, KS.
- Parker, P. and T. King
1998 *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. Revised ed. National Register Bulletin 38. U.S. Department of the Interior, National Park Service, Cultural Resources.
- Planters' Labor and Supply Company
1894 Cotton Cultivation in Hawaii. *Journal XIII*(Issue):52-54. Electronic document.

- Poepoe, J. M.
1906 Moolelo Hawaii Kahiko. *Ka Na'i Aupuni* [Honolulu]. 21 June: 1. Electronic document, <https://www.papakilodatabase.com>, accessed 08/28/2020.
- n.d. The Ancient History of Hookumu-ka-Lani Hookumu-ka-Honua, LG961.H4a M341. Bishop Museum. Honolulu. p. 45.
- Pogue, J. F.
1978 *Moolelo of Ancient Hawaii*. Translated by C. W. Kenn. Topgallant Press, Honolulu.
- Pukui, M. K. (editor)
1983 *‘Ōlelo No ‘eau: Hawaiian proverbs & poetical sayings*. Bishop Museum Press, Honolulu.
- Pukui, M. K. and C. Curtis
1960 *Tales of the Menhune*. Revised Edition ed. Kamehameha Schools Press, Honolulu.
- Pukui, M. K. and S. H. Elbert
1971 *Hawaiian Dictionary: Hawaiian-English, English-Hawaiian*. University of Hawaii Press, Honolulu.
- 1986 *Hawaiian Dictionary: Hawaiian-English, English-Hawaiian*. Revised and english ed. University of Hawaii Press, Honolulu.
- Pukui, M. K., S. H. Elbert, and E. Mo‘okini
1974 *Place Names of Hawaii*. Revised and Expanded ed. University of Hawaii Press, Honolulu.
- Pukui, M. K., E. W. Haertig, and C. A. Lee
1972 *Nānā I Ke Kumu (Look to the Source)*, vol. 1. Hui Hānai, Honolulu.
- Sai, D. K.
2011 *Ua Mau Ke Ea Sovereignty Endures: An Overview of the Political and Legal History of the Hawaiian Islands*. Pū‘ā Foundation, Honolulu.
- Secretary of the Interior
1967 Office of the Secretary Native Fish and Wildlife Endangered Species. *Federal Register* 32 (48).
- Sherrod, D. R., J. M. Sinton, S. E. Watkins, and K. M. Brunt
2007 *Geologic Map of the State of Hawai‘i*. U.S. Department of the Interior, U.S. Geological Survey. Open-File Report 2007-1089. Electronic document, <http://pubs.usgs.gov/of/2007/1089>, accessed Apr 27, 2018.
- Sinoto, Y. H.
1973 Second Quarterly Report on the Inventory of Known Archaeological Sites and Historical Places in the Islands of Hawaii, Maui, Lanai, and Molokai. *Department of Anthropology*. Department of Anthropology, B. P. Bishop Museum, Honolulu. MS 102073. Revised October 20. Prepared for Bernice P. Bishop Museum, Honolulu.
- Soehren, L.
1963 An Archaeological Survey of Portions of East Maui. Bernice P. Bishop Museum, Honolulu.
- 2005 A Catalog of Hawai‘i Place Names Compiled from the Records of the Boundary Commission and the Board of Commissioners to Quiet Land Title of the Kingdom of Hawaii. Part 1: Puna and Hilo. 2005. Electronic document, <http://ulukau.org/cgi-bin/hpn?>, accessed September 14, 2016.
- 2010 A Catalog of Maui Place Names Compiled from the Records of the Boundary Commission and the Board of Commissioners to Quiet Land Tiles of the Kingdom of Hawaii. Honoka‘a. 2010. Electronic document, <http://www.useapencil.org/soehren/pdfs/maui.pdf>, accessed.
- Sterling, E.
1998 *Sites of Maui*. Bishop Museum Press, Honolulu.

References Cited

- Tatar, E.
1982 Nineteenth Century Hawaiian Chant. *Pacific Anthropological Records*. Revised 1982. Prepared for Department of Anthropology, B.P. Bishop Museum.
- The Honolulu Advertiser
1905 Supt. Hosmer's Report. *The Honolulu Advertiser* [Honolulu]. 20 October: 6. Electronic document, www.newspapers.com.
1907 Forestry Reports. *The Honolulu Advertiser* [Honolulu]. 4 April: 3. Electronic document, www.newspapers.com.
- The Pacific Commercial Advertiser
1872 The Problem of Population and Our Land Policy. *The Pacific Commercial Advertiser* [Honolulu]. 26 October.
1914 Forest Reserves Are Recommended. *The Pacific Commercial Advertiser* [Honolulu]. 23 July.
- Thrum, T. G.
1908a Heiaus and Heiau Sites Throughout the Hawaiian Islands. In *Hawaiian Almanac and Annual for 1909*, pp. 38-42. Edited by T. Thrum. Thos. G. Thrum, Honolulu.
1908b Tales from the Temples, Part III. In *Hawaiian Almanac and Annual for 1909*, pp. 44-54. Edited by T. Thrum. Thos. G. Thrum, Honolulu.
1916 Maui's Heiaus and Heiau Sites Revised. In *Hawaiian Almanac and Annual for 1917*, pp. 52-61. Edited by T. Thrum. Thos. G. Thrum, Honolulu.
- U.S. Fish & Wildlife Service
2009 *Revised Recovery Plan for the 'Alalā (Corvus hawaiiensis)*. U.S. Fish and Wildlife Service, Portland, OR.
- Van Dyke, J. M.
2008 *Who Owns the Crown Lands of Hawai'i?* University of Hawaii Press. Electronic document, <https://books.google.com/books?id=IjZPcGb2R08C>.
- Walker, W. M.
1931 Archaeology of Maui. Manuscript. Department of Anthropology, B. P. Bishop Museum, Honolulu.
- Walters, M. J.
2006 *Seeking the Sacred Raven: Politics and Extinction on a Hawaiian Island*. Island Press/Shearwater Books, Washington.
- Watson, T. K., D. Maxwell, E. McKnow, J. Au, M. K. Sproat, C. Thetford, and K. Maly
2022 Cultural Impact Assessment for the Proposed Activities Associated with the Suppression of Non-Native Mosquito Populations to Reduce Transmission of Avian Malaria to Threatened and Endangered Forest Birds on Maui. Honua Consulting. Revised 2022. Prepared for State of Hawai'i Department of Land and Natural Resources, Honolulu.
- Westervelt, W. D.
1910 *Legends of Ma-ui--A Demi God of Polynesia and of His Mother Hina*. The Hawaiian Gazette Co., Ltd., Honolulu.
1915 *Legends of Old Honolulu*. Geo. H. Ellis Co., Boston.
1963 *Hawaiian Legends of Old Honolulu*. Charles E. Tuttle Company, Japan.
- Wilcox, C.
1996 *Sugar Water: Hawaii's Plantation Ditches*. University of Hawai'i Press, Honolulu.

-
- Wilmshurst, J., T. Hunt, C. Lipo, and A. Anderson
2011 High-Precision Radiocarbon Dating Shows Recent and Rapid Colonization of East Polynesia. *Proceedings of the National Academy of Sciences* 108:1815-1820.
- Wilson, S. B. and A. H. Evans
1890-99 *Aves Hawaiienses: The Birds of the Sandwich Islands*. Taylor and Francis, London. Electronic document, www.biodiversitylibrary.org.
- Yucha, T., Z. D. Royalty, and H. H. Hammatt
2018 Archaeological Literature Review and Field Inspection for the Proposed Lease (Water Lease) for the Nāhiku, Ke‘anae, Honomanū, and Huelo License Areas (East Maui Aqueduct System), Multiple Ahupua‘a, Makawao and Hāna District, Maui Island TMKs: [2] 1-1-001:044, 50, 1-1-002:002, 1-2-004:005, 007 (por.), 2-9-014:001, 005, 011, 012, 017. Cultural Surveys Hawai‘i, Inc. Prepared for Wilson Okamoto Corporation, Wailuku, HI.

APPENDIX A. KA WAI OLA PUBLIC NOTICE

Ko'olau Forest Reserve in Ke'anae Ahupua'a (portion of TMK: (2) 1-1-002:002) and in the Kīpahulu Forest Reserve in Naholoku Ahupua'a (portion of TMK: (2) 1-7-004:006), located respectively in Ko'olau and Kaupo Districts, Island of Maui.

In addition to the release of captive-bred populations of 'alala on conservation lands, other associated activities include performing invasive predator control in the immediate release areas; monitoring individuals bird survival and breeding activities to support adaptive management action that would help improve the efficacy of future releases on Maui and Hawai'i Island; creation of low-impact foot trails in the release areas to aid with the associated project activities; the construction of temporary bird cages; and improving field camp infrastructure.

ASM is seeking kama'aina familiar with the area's cultural resources, customs, and practices. We also seek input regarding strategies to prevent or mitigate impacts on culturally valued resources or traditional customary practices. If you know of such information, please contact Lokelani Brandt, lbrandt@asmaffiliates.com, (808) 969-6066.

CULTURAL IMPACT ASSESSMENT: THE KO'OLAU AND KĪPA- HULU FOREST RESERVE, ISLAND OF MAUI

On behalf of the Maui Forest Birds Recovery Project, ASM Affiliates is preparing a Cultural Impact Assessment to inform a HRS, Chapter 343 Environmental Assessment being prepared for the proposed release of captive-bred 'alala (*Corvus hawaiiensis*) on State-owned conservation lands in the upper elevations of the