



## Eradication of Incipient Populations of Invasive Plants

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### FINAL REPORT

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A COOPERATIVE AGREEMENT  
between the  
U.S. FISH AND WILDLIFE SERVICE  
and  
'OHU 'OHU KO'OLAU, Inc.



### PURPOSE

The purpose of this agreement is to provide funding to eradicate incipient invasive plant populations located in the Oahu Forest National Wildlife Refuge (Refuge), located on the island of Oahu in the Hawaiian Islands.

### BACKGROUND

Both established species and site-incipient species threaten native flora and fauna flourishing in the Refuge. Botanical surveys show that known problem species are working their way into the Refuge and can be considered incipient within the Refuge. Observations include incipient individuals of albizia (*Albizia chinensis*), mule's foot fern (*Angiopteris evecta*), octopus tree (*Schefflera actinophylla*), , *Heliocarpus popayanensis*, *Ficus sp.*, African tulip tree (*Spathodea campanulata*) and populations of shoebuttton ardisia (*Ardisia elliptica*), and fiddlewood (*Citharlexylum caudatum*). Large infestations of manuka (*Leptospermum scoparium*) stands and ginger (*Hedychium gardnerium*) have been controlled in the past but there has been new recruitment in both areas.

All of the aforementioned species are established in lowland forests and outcompete native plants. Yet, native forest ecosystems along the summit of the Refuge are presently still intact, despite the encroaching invasive species. Invasive species management recognizes that early detection and rapid response to incipient species—preferably before a large seedbank becomes established—is the most effective method of control.

## PROJECT METHODS AND MATERIALS

### Logistics

Because of the remote location of the Refuge, camping trips were the most cost-effective means to carry out the off-trail work in order to minimize staff time and transportation costs from baseyard to worksite. Each camping trip consisted of two or three nights and three 10-hour days at the worksite. Helicopter time was necessary to ferry crew and equipment to the campsite. Sling loads were conducted by trained and certified staff.



Work locations were determined jointly with Refuge staff using known species points and their proximity to landing zones. Prior to each trip, USFWS ISST Leader and KMWP staff discussed priority actions for each trip including location of work site, priority weed species of concern, and expected results. Managers created a backup plan for each trip to plan around inclement weather at desired work site, which is mostly low cloud cover or strong winds.



### Data Collection Methods:

Crewmembers surveyed the area with spotting scopes for additional locations of site-incipient species and recorded the information using GPS. Crew also used GPS to map track logs of areas where they covered on-the-ground, and points where weeds were removed.



## Control Work/ Weed Removal

During each trip, crew members used the information from prior surveys to remove targeted outlying individual invasive species. Crewmembers removed other invasive individuals they found on the way to these targets as well as seedlings in the immediate vicinity. Priority was given to mature, seeding individuals.

A handful of trips targeted the core stand of manuka in the southern part of the Refuge. Crew spent 10-hour days to clear the manuka infestation at the southern part of the Refuge along Kīpapa trail.

Incipient weeds were treated according to the best known practices for controlling that weed. In order to minimize herbicide use, broadcast sprays were not applied. Species that do not require herbicide were pulled or cut down. Species that required herbicide were cut down or girdled and herbicide was applied to the stump or the cut area.



Due to the extremely wet environment and the persistence of the invasive species controlled, a chemical application of Garlon 4 mixed at 20-50% (50% preferred) with metholated seed oil was applied using basal bark, cut stump, or frill/girdle cut to all species, except kahili ginger where Escort at 1% concentration was used.

For the treatment of juvenile weeds and manuka, mechanical techniques such as hand pull, chainsaw, and cut stump were employed. When large weedy tree species are controlled, field crew applied a frill or girdle cut as the treatment method, leaving the tree to die standing. This application reduces the amount of potential damage from tree fall to the surrounding native forest and reduces the area of available light and disturbance, which may provide opportunity for weed colonization.



To further understand the desired management effort needed to reduce weed populations in an area, control work completed at a small sample site was evaluated. A discrete 10-acre area was identified just off of the Kipapa Trail, southern extent of OFNWR, where 2 control treatments were conducted within the same treatment area. This site spans from the summit to the trail and contains low densities of weeds in a native dominated area.

## RESULTS AND DISCUSSION

### Logistics

From August 2008 – December 2010, KMWP staff participated in a total of 19 multi-day trips, typically 3-4 work days each, to the OFNWR. During these trips, KMWP assisted the USFWS and the Bishop Museum in conducting 2 multi-day work trips in 2010 to conduct rare plant surveys within the project site.

KMWP also facilitated 2 work trips with the Hawaii Youth Conservation Corps during the summers of 2009 and 2010 to conduct weed control, trail maintenance on the Kipapa Trail, and educational enrichment of local youth. KMWP and the Oahu Invasive Species Committee (OISC) partnered with USFWS on 5 trips during the beginning of the project from Fall 2008- Spring 2009, before OISC withdrew their participation due to a shortage of staff for this project. More detailed trip information is available (Table1) but a summary is provided below.

Priority Activity	# of Trips	Worker hours
Weed Control/ Survey	15	820
Rare Plant Survey	2	170
Educational Enrichment (HYCC)	2	230
<b>TOTAL</b>	<b>19</b>	<b>1220</b>



HYCC

A total of 1220 people hours contributed to field work including staff and volunteers from the USFWS, KMWP, OISC, Bishop Museum, and the Hawaii Youth Conservation Corps. Crew covered approximately 553 acres performing weed control, botanical inventories, and trail maintenance.

While working in the Ko'olau mountains is difficult due to steep terrain coupled with wet weather, staff covered an average of 0.5 acres per person hour over the first 25 months of the project. During 10 trips in 2010, an average of 0.75 acres per person hours was estimated using GIS and logistical data. Although an inconsistency among the amount of work done per acre exists, this number provides an estimate for future planning and decision making.

The majority of the 17 total weed control trips occurred in the southern region (9), while 6 weed control trips occurred in the central and 2 control trips in the northern region. Maps of detailed trip coverage are provided in Appendix B.

