Kaheawa II Habitat Conservation Plan
Annual Report: FY 2015

Kaheawa Wind Power, LLC
3000 Honoapiilani Highway
Wailuku, Hawaii 96768

August, 2015

ITL-15 and ITP E27260A-0

I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate and complete.

Mitchell Craig

Hawaii HCP Manager
SunEdison, LLC

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Executive Summary

Kaheawa Wind Power II, LLC (KWPII) has been implementing a Habitat Conservation Plan (HCP) since approval December 2011. The HCP supports a Federal Incidental Take Permit TE-2760A- 0 (ITP) and State of Hawaii Incidental Take License ITL-15 (ITL), both issued in January 2012. KWPII was commissioned to begin operating on July 2, 2012. Species covered under the HCP include the Hawaiian petrel (HAPE), Newell's shearwater (NESH), Hawaiian goose (Nēnē), and the Hawaiian hoary bat (bat). This report is for State of Hawaii Fiscal Year (FY) 2015, July 1, 2014 through June 30, 2015. KWPII has previously submitted annual HCP progress reports for FY 2013 and 2014 to USFWS and DOFAW. SunEdison, LLC (SunEdison) acquired First Wind Energy, LLC officially on January 29, 2015. The HCP, ITL and ITP remain unchanged and in the project owner's name, Kaheawa Wind Power II, LLC. First Wind's HCP program employees have not changed and are now SunEdison employees.

In FY 2015 the plots searched were a circle centered on each wind turbine generator (WTG) with a radius of 75 meters. Plots are scheduled to be searched weekly. During FY 2015, the search interval mean and standard deviation (SD) in days for KWPII was 7.11 (SD = 1.17).

Two Nēnē fatalities were observed during FY 2015. The total estimated take at the 80% credibility level for KWPII HCP species is 7 and 18 adults for Nēnē and bat, respectively (Huso et al 2015). Indirect take (IDT) for bats is one and IDT including lost future productivity for Nēnē would be one.

Independent contractor WEST, Inc. was chosen to conduct searcher efficiency (SEEF) and carcass retention (CARE) trials for one year at both KWPI and KWPII. Trials began March 2014 and ended March 2015. CARE trials conducted by WEST used five Canada geese (CAGO), two chickens, two ducks, one ring-necked pheasant, 20 wedge-tailed shearwaters (WTSH), and 20 rats. Considering the first 14 days of the trials as the trial length the CARE mean and SD for each surrogate in days were 14.0 for CAGO (SD = 0), 14.0 for duck (SD = 0), 14.0 for chicken (SD = 0), 14.0 for ring-necked pheasant (SD = 0), 12.65 for WTSH (SD = 4.16) and 4.2 for rats (SD = 4.27).

The mean of all SEEF trials in in the WEST, Inc. study for large, medium, and small carcasses was 78.1 % (N = 32), 66.7% (N = 81), and 34.7% (N = 75), respectively. A six-month canine efficiency trial was contracted to handler Teresa Gajate and her dog, Makalani. Results show an overall searcher efficiency of 93.9% using 264 small, medium and large size carcasses throughout the KWP I and II sites. Notable is that other than a nearly buried skylark found only by Makalani there were not any additional fatalities found during this trial by canines that had not already been found by human searchers.

Wildlife Acoustics SM2BAT+™ bat detectors with one SM3BAT™ microphone each recorded detections at all eight WTG associated locations at KWPII during 204 of 2864 detector nights (7.1%). Wildlife Acoustics SM3BAT™ bat detectors recorded detections at all seven nacelle WTG locations at KWPI during 35 of 1036 detector nights (3.4%).

A total of 22 site personnel received Wildlife Education and Observation Program (WEOP) trainings through June 30, 2015. Vegetation management for FY 2015 treated 225,008 square meters of total plot area treated using hand-held weed whackers and herbicide.

A mitigation obligation for KWPII was to re-introduce native plant species at discrete locations on-site in the first three years. To date 5,263 plants have been planted at a designated site north of KWPI WTG-17, exceeding our goal of 5,000. Survival counts will continue into FY 2016 to ensure a minimum average of 75% survival. Currently survival rates average 80%.

Seabird mitigation for both KWPI and KWPII is carried out at the Makamaka'ole Seabird Enclosures and currently focuses on trapping and monitoring for potential predators, maintenance of enclosure fences, erosion control and monitoring seabird activity within the Makamaka'ole stream drainage area and near artificial burrows within the seabird enclosures. Alternative seabird mitigation site surveys began in East Maui in FY 2015 and will be completed in FY 2016. An application to amend the HCP and state and federal take license and permit to increase bat and Nēnē take was sent to the USFWS and DLNR-DOFAW on May 8, 2015. The amendment and mitigation proposals for bats and Nēnē are in review.

Regular agency meetings occurred in FY 2015. SunEdison provided quarterly reports for FY 2015 Q1, Q2 and Q3.

Introduction

In July 2012 Kaheawa Wind Power Phase II, LLC (KWPII) began commercial operation to meet the growing need for renewable energy across the island of Maui. The State Board of Land and Natural Resources approved a Conservation District Use Permit (CDUP) for the facility, which is situated on State conservation lands, in August 2010.

In fulfillment of the Endangered Species Act and Chapter 195-D, Hawai`i Revised Statutes, KWPII developed a project-specific HCP in cooperation with the U.S Fish and Wildlife Service (USFWS), the Department of Land and Natural Resources- Division of Forestry and Wildlife (DLNR-DOFAW) and the Hawai`i Endangered Species Recovery Committee (ESRC). Upon final approval of the HCP, the ITP and ITL were issued in January 2012, each with a duration of twenty years. The ITP and ITL cover four federally-listed and endangered species: the Hawaiian petrel or 'Ua'u (*Pterodroma sandwichensis*), Newell's shearwater or 'a'o (*Puffinus auricularis newelli*), Hawaiian goose or Nēnē (*Branta sandvicensis*), and the Hawaiian hoary bat or 'ope'ape'a (*Lasiurus cinereus semotus*).

On November 26, 2014 The DLNR-DOFAW and USFWS approved a minor amendment to the KWP II HCP to clarify language regarding incidental take of adult and juvenile bats. Adult and juvenile bat permitted take is now combined into a single number for clarity and consistency between the HCP and the ITL/ITP.

SunEdison acquired First Wind Energy, LLC officially on January 29, 2015. The HCP, ITL and ITP remain unchanged and in the project owner's name, Kaheawa Wind Power II, LLC. First Wind's HCP program employees have not changed and are now SunEdison employees.

This report summarizes HCP related activities for KWP II during the second year of project operations (July 1, 2014 through June 30, 2015).

Downed Wildlife Monitoring

KWPII biologists have been implementing a year-round intensive monitoring program to document downed (i.e., injured or dead) wildlife incidents involving HCP-listed and non-listed species on the project site and its vicinity since operations began in July 2012.

Intensive monitoring consisted of systematic searches are conducted on foot within circular plots centered on the wind turbine generators (WTGs) and meteorological towers (MET). At each WTG a plot is marked with a radius equivalent to 75% of the maximum WTG rotor swept zone height which equals 75m on KWPII. All fourteen WTGs were searched once weekly as part of the KWPII fatality monitoring protocol. The three years of intensive monitoring required by the HCP was completed on July 1, 2015.

In FY 2015, the search interval mean and standard deviation (SD) in days for KWPII intensive monitoring was 7.11 (SD = 1.17) (Table 1 and Appendix 1). For the safety of the SunEdison biologists, monitoring is halted during periods when wind speeds are reported higher than 15 meters per second (m/s). During FY 2015 there was one period of extended high winds from April 26 – May 2 which contributed to a search interval mean greater than an average of seven days. Other periods of high winds occurred but they did not last for greater than five days. Notifications of a change in interval due to high winds were reported to state and federal agencies via e-mail within one week as required by the HCP. During the intensive search period, vegetation was maintained below 25cm of height when possible and is managed only during the non-breeding season for Nēnē (May - October).

Table 1. Mean and standard deviation in days per plot per WTG plot on KWPII FY 2015.

WTG	1	2	3	4	5	6	7
Mean	7.00	7.00	7.00	7.13	7.13	7.13	7.13
SD	0.69	0.69	0.74	1.14	1.12	1.21	1.34
WTG	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mean	7.13	7.13	7.13	7.13	7.13	7.15	7.15
SD	1.27	1.34	1.28	1.44	1.47	1.33	1.29
MEAN TOTAL		**7.11**		**SD TOTAL**		**1.17**	

Fatalities

Downed wildlife incidents documented at KWPII during FY 2015 are summarized in Table 2. Locations of fatalities found with reference to WTGs and site facilities are described using ArcMap in Figure 1. Two of these incidents involved HCP-covered species or species of concern – two Nēnē were reported to DOFAW and USFWS within 24 hours. Details of all HCP-covered fatalities are provided in Downed Wildlife Incident Reports submitted to DOFAW and USFWS within three days of each discovery.

Table 2. Documented wildlife fatalities at KWPII in FY 2015.

Species	Date	Location (WTG)	Distance to Turbine (m)
HCP Covered Species and Species of Concern			
Nēnē	12/22/14	8	28
Nēnē	02/23/15	11	22
MBTA and Other Non-Covered Species			
Gray francolin	07/03/14	4	73
White-tailed tropicbird	07/14/14	5	68
Black francolin	07/14/14	6	2.5
Gray francolin	07/22/14	8	180
White-tailed tropicbird	11/03/14	6	67
African silverbill	11/11/14	11	43
Gray francolin	11/17/14	5	1
Eurasian skylark	01/29/15	2	20
Eurasian skylark	02/02/15	11	39
Eurasian skylark	02/10/15	13	16
Gray francolin	03/23/15	6	2
Eurasian skylark	04/23/15	13	35
Eurasian skylark	04/28/15	3	30
Black francolin	05/05/15	13	1
Gray francolin	05/12/15	6	2
Black francolin	06/09/15	12	1

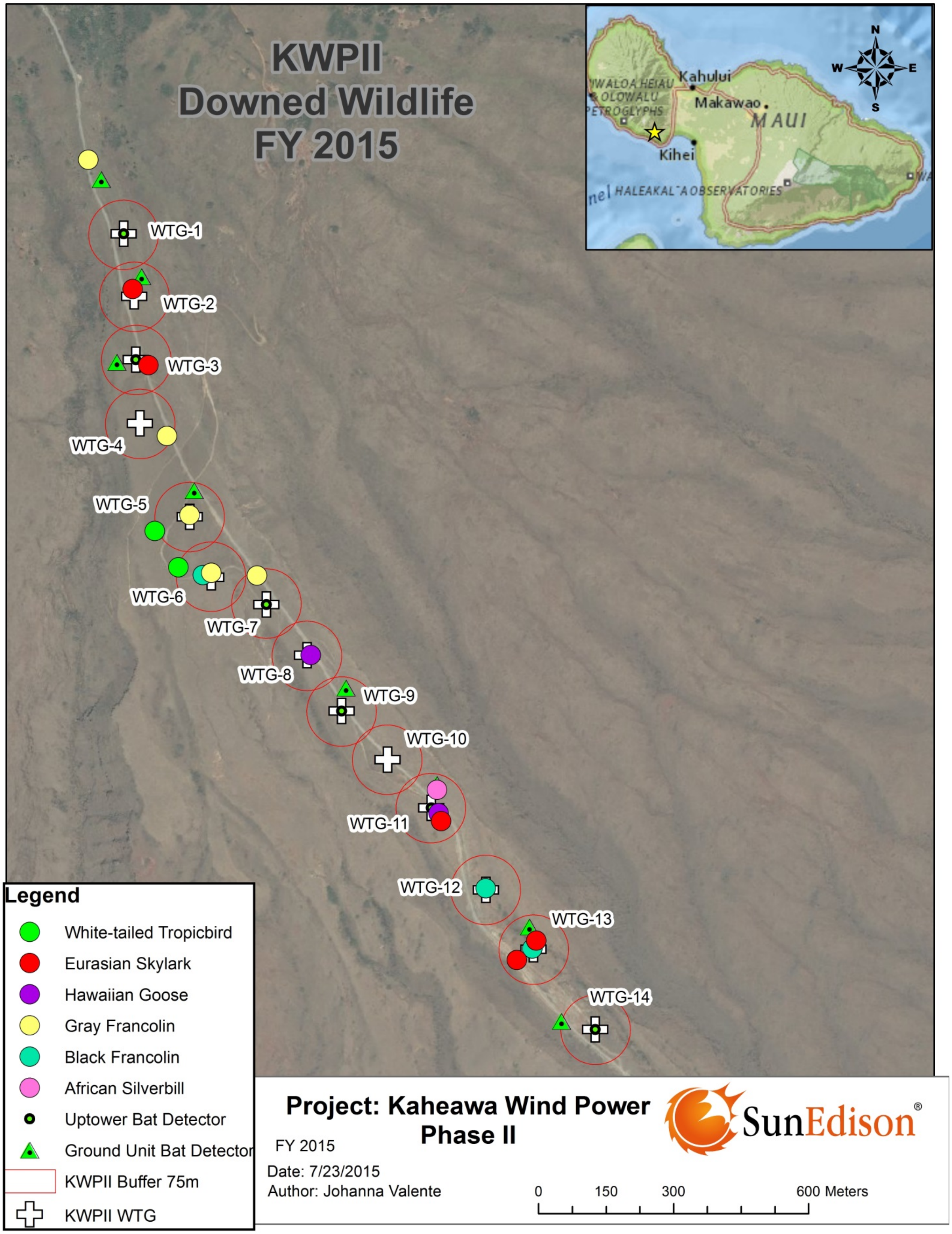

Figure 1. All downed wildlife observed over FY 2015 throughout KWPII in reference to WTGs, meteorological towers, wildlife acoustics monitors, and site facilities.

Independent SEEF and CARE Study

In October 2013, independent contractor WEST, Inc. was chosen to conduct up to 60 SEEF trials per size and cover class combination and a minimum of 20 CARE trials of each size class on each KWP project site. Trials were conducted over a one-year period beginning March 2014 using small mammal and medium and large sized bird surrogates across three vegetation classes: bare, grass, and shrub. WEST was informed of the search schedule on a daily basis and carcasses were placed in accordance with the approved work plan, without the knowledge of searchers. Searchers used neon flagging to “tag” each trial carcass found and detection results were reported daily to WEST along with notes of carcass status and questions related to findings. WEST conducted 252 SEEF and 50 CARE trials from March 2014 through March 2015 at KWPII.

Carcass Retention Trials

CARE trials are used to estimate how long a carcass remains detectable to searchers before complete removal or obscuring by scavengers or weather conditions. Trials proctored by WEST were conducted using CAGO, Rhode Island crossed chickens, and Muscovy ducks as surrogates for Nēnē, WTSH for HAPE and NESH, and commercially produced rats for bats. CAGO had been obtained from the USDA-APHIS in Alaska. The chickens and ducks were from Maui farmers. WTSH carcasses are generally fledglings and adults found dead by the public and delivered to Sea Life Park on Oahu or collected by DOFAW on Maui. Our state and federal wildlife collection permits for KWPI are numbers WL 15-05 and MB24151B-0, respectively. Rat carcasses were purchased from Layne Laboratories, Inc. in California, a pet food company. These rats are brown and/or black and are the Layne Laboratory “Small Colored” size category (approximately 11.3 cm in body length) and were chosen to mimic body size of Hawaiian hoary bats (Figure 2).

Figure 2. Hawaiian Hoary bat and rat surrogate for CARE and SEEF trials.

CARE trials conducted by WEST on KWPII used five CAGO, two chickens, two ducks, one Ring-necked pheasant, 20 WTSH, and 20 rats (Appendix 2). All WEST trials were for one month. Fatality estimates use the data as it has been collected (up to 30 day trials). CARE results are presented here considering only the first 14 days of the trials to compare current trials to past trials that only lasted 14 days. The CARE mean and SD for each surrogate in days were 14.0 for CAGO (SD = 0), 14.0 for duck (SD = 0), 14.0 for chicken (SD = 0), 14.0 for Ring-necked pheasant (SD = 0), 12.65 for WTSH (SD = 4.16) and 4.2 for rats (SD = 4.27). Game cameras are also randomly placed on CARE trial carcasses to gather information on scavenger types and effects of wind, rain and decomposition.

Searcher Efficiency Trials

SEEF trials provide estimates of carcass detection probability and are an important component of downed wildlife monitoring at KWPI. WEST, Inc. conducted all SEEF trials for FY 2015 as part of a year-long study that began on March 2014 and ended in March 2015. Trials were controlled by a qualified proctor and conducted in conjunction with the daily search plan. Searchers were not informed in advance that a trial had been initiated. Small mammal and medium and large size bird carcasses were randomly placed using ESRI^{TM} ArcMap point generator feature in bare, grass and shrub vegetation classes. During the study, at total of 252 carcasses were used; 19 CAGO, two Muscovy ducks, 12 Rhode Island crossed chickens, one ring-necked Pheasant, 85 WTSH, and 133 rats (Appendix 3). Carcasses that were not available when checked by the proctor after searches concluded were not included in data set. A total of 64 carcasses were eliminated from the KWPII dataset. The mean for SEEF in FY 2015 for large, medium and small carcasses was 78.1 % (N = 32), 66.7% (N = 81), and 34.7% (N = 75). Table 3 shows the overall searcher efficiency percentages for all ground cover types.

Table 3. KWPII SEEF results for all vegetation classes in FY 2015.

Veg Type	Large	Medium	Small Mammal
Bare	83.3% (N=18)	73.7% (N=38)	51.2% (N=43)
Grass	71.4% (N=14)	59.5% (N=42)	12.9% (N=31)
Shrub	N/A	100% (N=1)	0% (N=1)

Canine Assisted Searcher Efficiency Trials

The canine trial results were not included in the site results used for fatality estimation described above. Teresa Gajate, an experienced canine handler, and her dog, Makalani were contracted for the 20-week trial (Figure 3). During FY 2015 canine efficiency was assessed using bird and bat surrogates in grass, bare and shrub vegetation classes. Carcasses were randomly dropped in two or three WTG plots per search day. Plots selected for canine trials had been searched 1-3 days prior during scheduled human searches to serve as a research comparison.

Throughout the study, the canine team was partnered with a KWP biologist. The biologist conducted a preliminary sweep of the area to ensure there was no Nēnē or Pueo near or within the plot before the dog was allowed to search. Comprehensive environmental and trial efficiency data were logged regularly. Special considerations were also made to limit adding odors to carcasses that could bias the trial. Sandwich gloves and zipties were used, instead of latex gloves and duct tape, to place and identify SEEFs during canine trials. SEEFs were tossed to the approximate point location and proctors avoided walking in a straight line when moving with the carcass. Different proctors were used to avoid canine familiarity or human association to SEEF carcasses. Plots which did not contain a carcass were also searched in order to ensure the canine was thoroughly searching an area regardless of carcass presence.

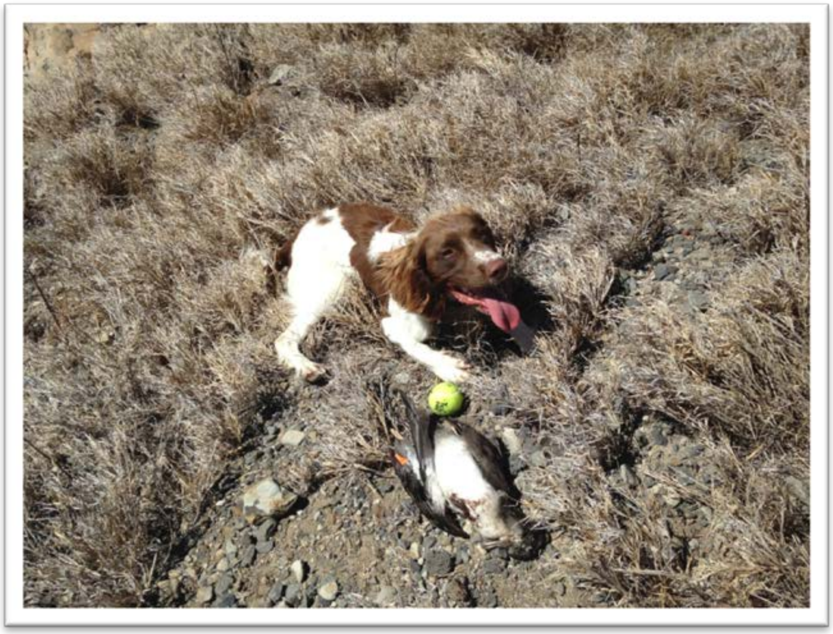

Figure 3. Contracted canine, Makalani, with WTSH SEEF find.

In order to effectively compare both project sites as well as create a stronger confidence level within the data, KWPI and KWPII data has been totaled in one report (Appendix 4). Overall total results showed a canine searcher efficiency percentage of 93.9% (Table 4) revealing an exceedingly competent K-9/ handler team that was successful within the difficult limitations of the KWP project.

Table 4. Overall results of the canine assisted monitoring using three HCP surrogate carcasses sizes and three vegetation classes.

Total Overall SEEFs Veg Class				**Total Overall SEEFs Size Class**			
Vegetation Class	Total Possible	Total Found	SEEF%	**Size Class**	Total Possible	Total Found	SEEF%
Bare	51	49	96.1%	**Small**	110	99	90.0%
Grass	170	162	95.3%	**Medium**	116	112	96.6%
Shrub	43	37	86.1%	**Large**	38	37	97.4%
Total	**264**	**248**	93.9%	**Total**	**264**	**248**	93.9%

Scavenger Trapping

A predator trapping program was initiated in July 2014 after an increase of predators was detected using Moultrie™ game cameras and from WEOP records. Trapping included eight A24 Goodnature™ self-resetting traps, six DOC250™ body grip traps, and five Hav-a-hart™ live capture traps (Figure 4). During FY 2015 14 mongoose (Figure 6), one rat and seven cats were caught using the approved trapping protocol and monitoring frequency (Table 5).

Traps were placed in areas where WEOP and game camera observations revealed high predator numbers and were rotated in order to ensure that all plots were represented when evaluating predation levels and trap effectiveness. Supplementary traps may be added if monitoring reveals additional need. Trapping is intended to decrease scavenging rates of CARE trials and downed wildlife, and may have the added benefit of improving Nēnē fledgling survival and nesting success. All traps were designed to minimize inadvertent interaction with nesting birds.

Figure 4. Cat in Hav-a-hart™ live trap.

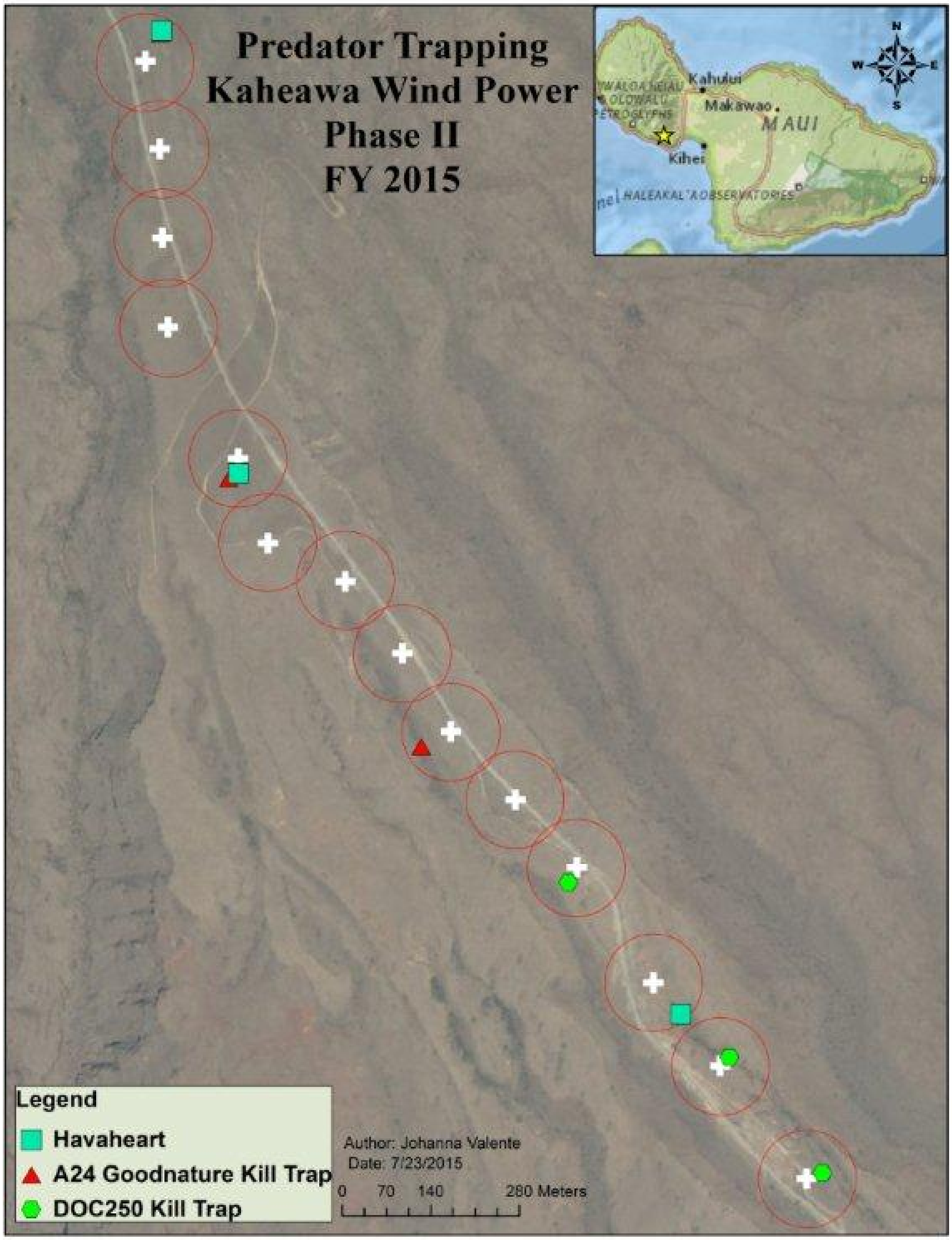

Figure 5. Location of KWPII predator traps

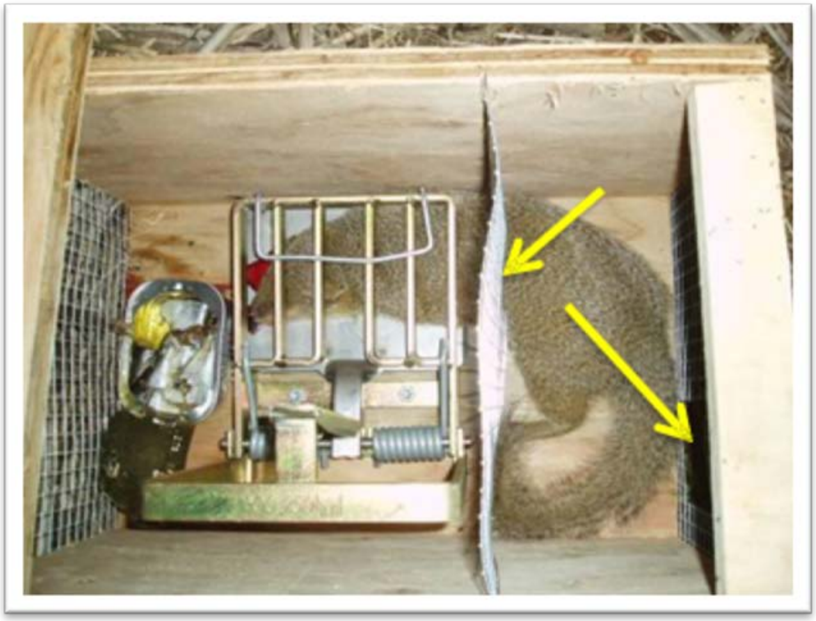

Figure 6. Doc-250 trap encased in a "bird-safe" box with arrows pointing to the 2 separate entrances that must be negotiated to access and trigger the trap mechanism itself.

Table 5. KWPI trapping and monitoring protocol.

Trap Type	Species Targeted	Monitoring Frequency	Frequency of Baiting/Re-setting	Frequency of Cleaning and Re-locating
Good Nature A24	Mongoose, Rat	Monthly	Monthly	Minimum 1x per 6 months
DOC 250	Mongoose, Rat	Weekly	Weekly	Minimum 1x per 3 months
Havahart Live	Cat, Mongoose	48 Hours	2-7 Days	Minimum 1x per 3 months
Pig Coral	Feral Pig	48 Hours	2-3 Days	Minimum 1x per 3 months

Estimating Adjusted Take

Two Nēnē and no bat, HAPE or NESH fatalities were observed during FY 2015. The total observed take for each species at KWPII since operations began is three Nēnē and three bats. The fatality estimators used in this report were developed by USGS and have been recommended by DOFAW and USFWS. The estimator's output is a value that represents the number of fatalities that has not likely been exceeded during the survey period. Values can be generated for varying levels of "credibility" (confidence), expressed as a percentage (e.g., 50%, 80%, etc.) - the higher the desired level of credibility, the more conservative (higher) the estimated value. At the request of USFWS the more conservative 80% credibility level is reported.

The total estimated take at the 80% credibility level for KWPII HCP species is seven and 18 adults for Nēnē and bat, respectively (Huso et al 2015). At the request of USFWS the more conservative 80% credibility level is reported. Indirect take (IDT) for bats is one and IDT including lost future productivity for Nēnē would be one. The Tier 2 amended take limit of 11 bats is exceeded.

Hawaiian Hoary Bat Monitoring

In order to better understand variations in bat activity specifically near the WTGs, we deployed nine Wildlife Acoustics SM2BAT+ ™ detectors with one microphone (mic) each in October 2013 throughout KWPII. All of the SM2BAT+™ mics were replaced with SM3BAT™ mics and are mounted at 6.5 meters height. Seven were placed near the WTGs while one was placed near a gulch edge; each mic was positioned horizontally, pointing SW (away from the prevailing NE trade winds). In addition to the ground units and as an adaptive management measure, a total of seven SM3BATs™ were also deployed in nacelles equipped with one mic pointing backwards and parallel to the top of the nacelle. The nacelle detectors began recording in January 2015. All detectors are on from one hour before sunset to one hour after sunrise.

In FY 2015 detectors recorded bat activity at all eight ground WTG locations at KWPII during 204 of 2864 detector nights (7.1%) while only five of the seven detectors at nacelle height recorded activity during 35 of 1036 detector nights (3.4%) (Table 6). Ground level bat activity was detected during every hour between 1800 hours and 0600 hours while the nacelle units only detected activity between 1900 hours and 0100 hours. Bat presence by month, turbine and hour are shown in Figures 7, 8, and 9.

Table 6. Hawaiian Hoary bat nights with detections and total detection nights at KWPII in FY 2015.

Detector Location (WTG)	Total Detector Nights	Total Detector Nights with Activity	% Detector Nights with Activity/Total Detector Nights
Ground Detectors			
1	360	25	6.9
2	359	27	7.5
3 (Gulch)	360	21	5.8
5	360	11	3.1
9	345	25	7.3
11	360	25	6.9
13	360	24	6.7
14 (Gulch)	360	46	12.8
Totals	**2864**	**204**	**7.1**
Nacelle Detectors			
1	176	13	7.4
3	176	10	5.7
5	146	1	0.7
7	162	0	0
9	169	0	0
11	42	1	2.4
14	165	10	6.1
Totals	**987**	**35**	**3.4**

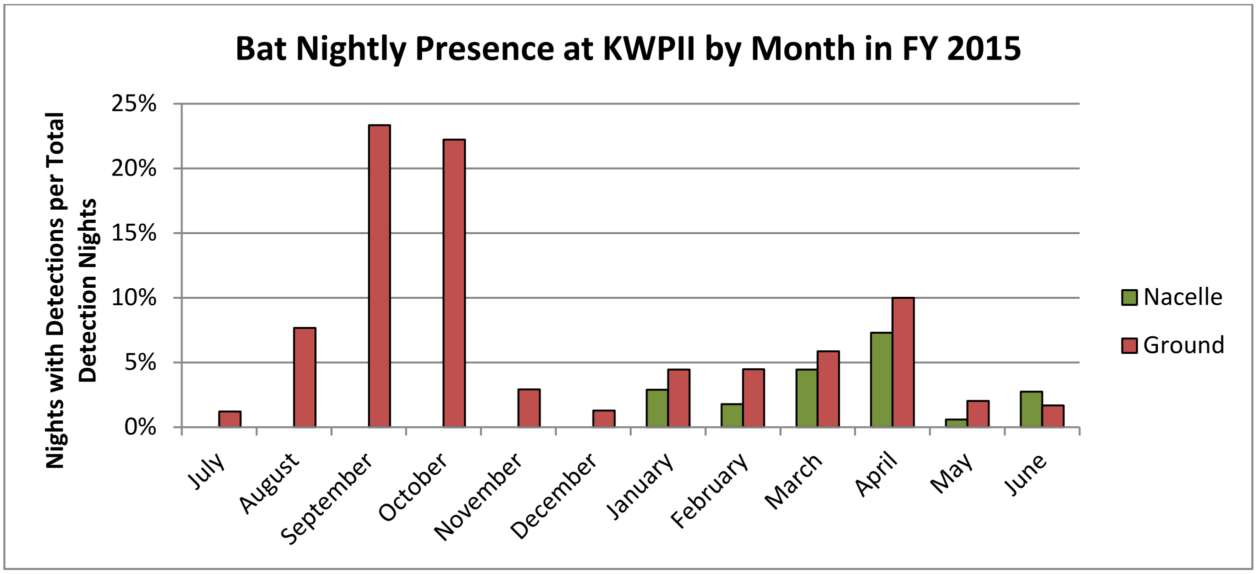

Figure 7. Bat nightly presence at KWPII by month in FY 2015 (nacelle detectors began recording in January 2015).

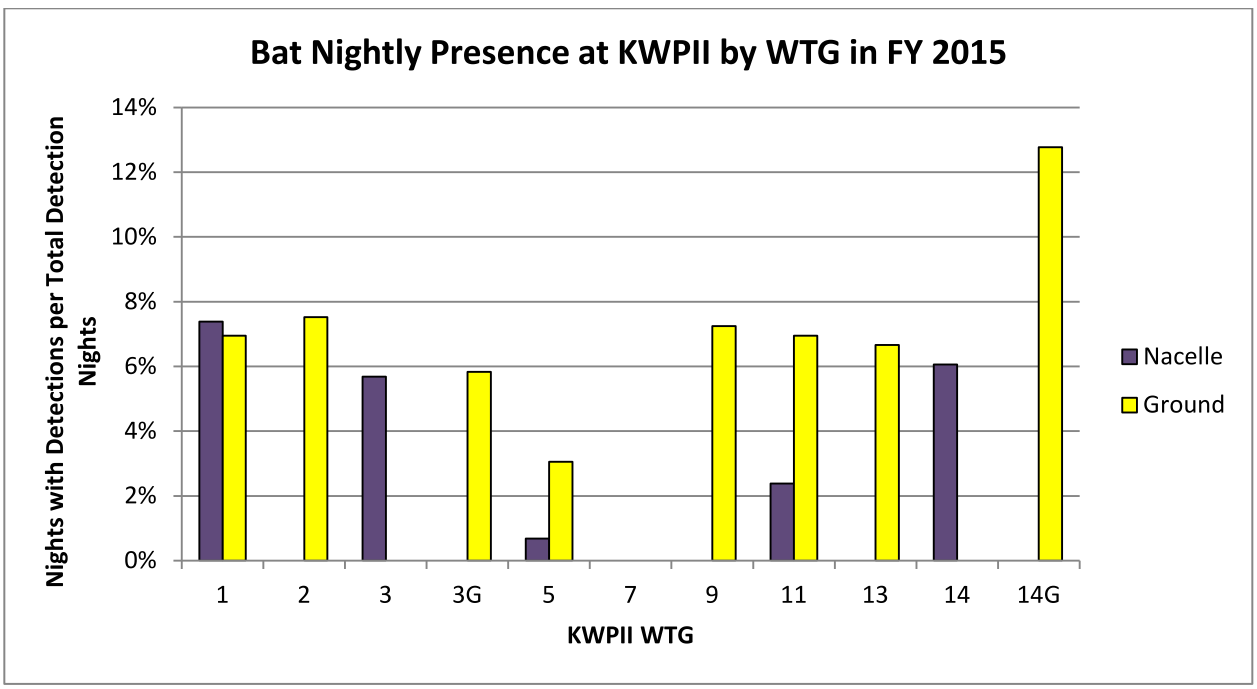

Figure 8. Bat nightly presence at KWPII by turbine (WTG) during FY 2015 (these locations range from the highest elevation on the left (WTG-1) and lowest on the right (WTG-14G)).

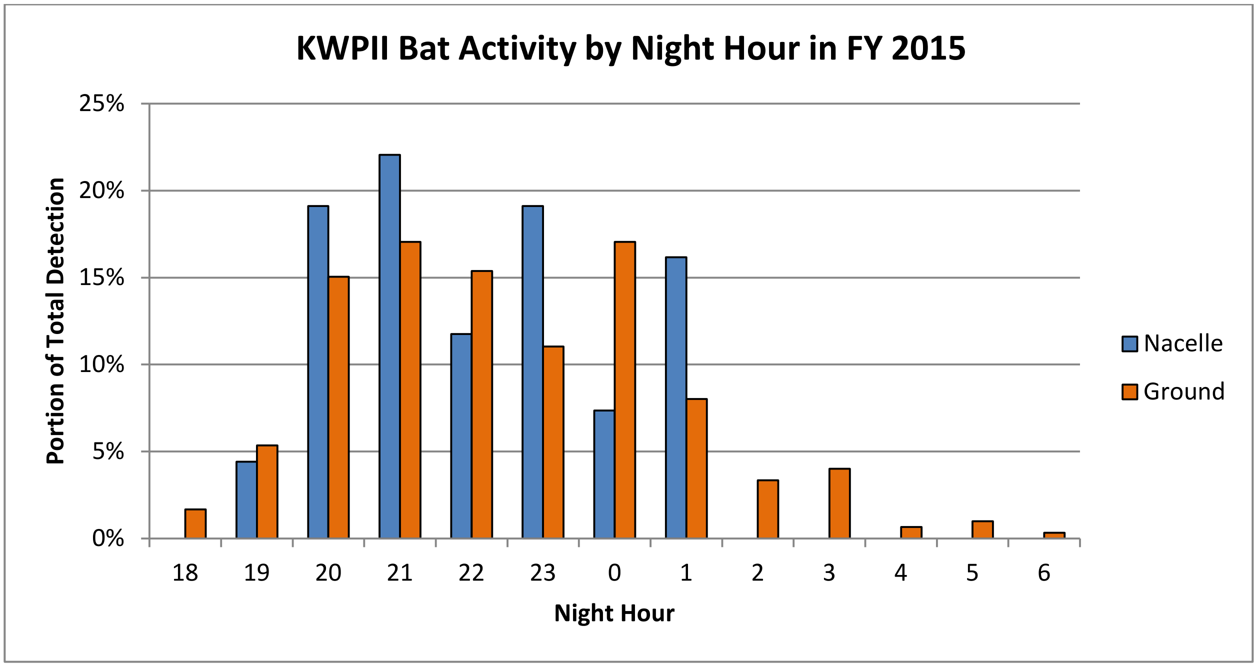

Figure 9. Bat detection by night hour in FY 2015.

Wildlife Education and Observation Program

The WEOP helps to ensure the safety and well-being of native wildlife in work areas and along site access roadways. The training provides useful information to assist staff, contractors, and visitors to be able to conduct their business in a manner consistent with the requirements of the HCP, CDUP, land use agreements and applicable laws. Records of wildlife observations by WEOP-trained staff are also used by the HCP program to identify patterns of wildlife use of the site.

WEOP trainings were given to 22 personnel who were on-site regularly for two days or more (Appendix 8). The personnel were trained to identify covered and non-covered species of wildlife that may be found on-site and what protocol to follow, as determined in the HCP, when a downed wildlife is found. The trainees were also made aware of driving conditions and received instruction on how to drive and act around wildlife.

A total of 207 observations have been reported to date during this fiscal year on KWPII, including 190 Nēnē (HAGO), five PUEO, 10 cats, one mongoose, and one WTSH (Figure 10). Data collected was used to better protect and understand HCP species and their habitat use.

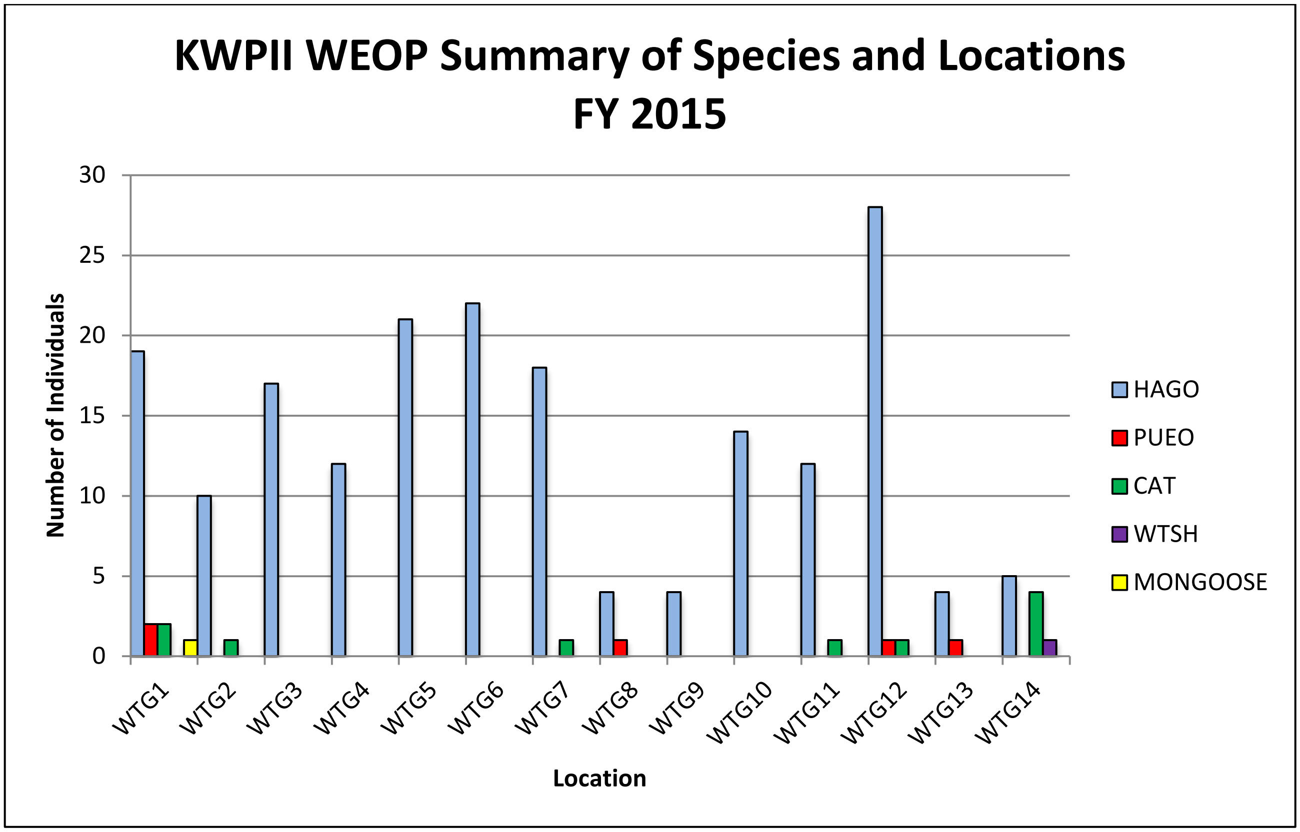

Figure 10. Wildlife observed and recorded as part of WEOP at KWPII by species and turbine location.

Vegetation Management

The HCP team manages ground cover at a stature that will improve monitoring efficiency without compromising soil stability and minimize impacts to native plants. Due to Nēnē nesting season vegetation management activities within the plots are currently managed between the months of May to October, while areas associated with the WTG pads are managed year round according to the Fire Management Plan.

Previously, dry conditions at KWPII allowed for plant growth to be naturally sustained below 25cm of height. This year, due to an intense rainy season on KWPII, vegetation management was deemed necessary as part of KWPII HCP compliance and vegetation management goals. Rocky and steep terrain conditions at KWPII require all treatment be done via weed whackers and herbicide application. In an effort to clear as much vegetation as possible two Altres temporary employees were hired to assist our vegetation management needs.

Treatment for plot areas began on July 2, 2014. In total, 942 hours of labor by the HCP team managed 225,008 square meters (Table 7 and Table 8). Tall grasses were reduced to 8cm in height (Figure 11 and Figure 12), and non-native shrubs and trees were cut out and removed from the plots.

Vegetation management for KWPII plots will not resume in FY 2016 as searching in the grass will be eliminated with the abbreviated monitoring that only occurs on graded pads and roads. This will allow the plots to grow over and should reduce the presence of Nēnē on site foraging on freshly cut grass.

Table 7. Total hours recorded for vegetation management during FY 2015.

Method	Total Hours Worked	Target Species
Weed Whack	913	Molasses grass, Kikuyu grass, Lantana
Herbicide Application	29	Lantana, Balloon Plant, Fireweed

Table 8. Approximate area of vegetation targeted during FY 2015.

Method	Species	Approximate Area (Square Meters)	KWPII WTG
Weed Whack	Molasses grass, Kikuyu grass, Lantana	190,518	1-14
Herbicide Application	Lantana, Balloon Plant, Fireweed	34,490	1-14

Figure 11. KWPII WTG-1 before treatment using weed whacker.

Figure 12. KWPII WTG-1 after treatment using weed whacker.

KWPII Revegetation

Revegetation goals for KWP II are specified in Section 6.7 and Appendix 8 of the KWPII HCP, as summarized below:

1) Address the immediate need to stabilize exposed soils following construction activities at KWPII, in accordance with erosion and sedimentation control best management practices and National Pollution Discharge Elimination System (NPDES) storm water discharge permitting requirements.
2) Re-introduce native plant species in selected areas throughout the site over the next several years, to re-establish native plant species in areas that have been overgrown with non-native species for a century or more.

Goal 1 was accomplished with hydroseeding and hardscraping potential erosion areas as prescribed in Appendix 8 of the HCP and completed shortly after construction ended with watering intervals that continued into Year 1. In FY 2014 a plan was submitted and approved by state and federal agencies proposing to meet the prescribed standards of Goal 2 by selecting a singular "restoration site" in the vicinity of the adjacent KWPI project, outside of KWPI search plots.

The plan proposed installing a minimum of 5,000 individual plants during the first three years following construction with a 75% success survival rate after one year, in accordance with Appendix 8. In addition to the planting goal, the HCP specifies that the location of plantings will be determined in consultation with the DLNR and USFWS. Onsite native seed collection commenced in June 2013. Propagation of native seedlings was contracted by Kula Native Nursery.

Upon the completion of FY 2014, it was reported that a Rainbird™ irrigation system had been installed over approximately 2500 square meters using drip irrigation attached to a 5,000 gallon tank and that a total of 2,472 native plants had been introduced to the restoration site. In FY 2015, 2,761 additional plants were installed with the help of SunEdison personnel and volunteer groups (Figure 13). In June 2015, native plant species totaled 5,233 'Ohi'a (*Metrosideros polymorpha*), 'Akia (*Wilkstroemea oahuensis*), Ko'Oko'Olau (*Bidens micrantha*),'Iliahi (*Santalum freycinetianum*), Naupaka kuahiwi (*Scaevola gaudichaudiana*), 'Ulei (*Pyrus anthyllidifolia*), and 'A'ali'i (*Dodonaea viscosa*), to complete Goal 2 of KWPII revegetation efforts (Figure 14). Planting success continues to be determined by calculating the average survival through bi-weekly randomized counts of 100 plants in each of the top, middle and bottom sections of the restoration site. Survival counts will continue into FY 2016. If it is determined in the following year that survival counts have dropped below 75%, additional native plants will be purchased and introduced to the revegetation site. Currently survival rates average 80%.

Figure 13. KWPII revegetation volunteer day.

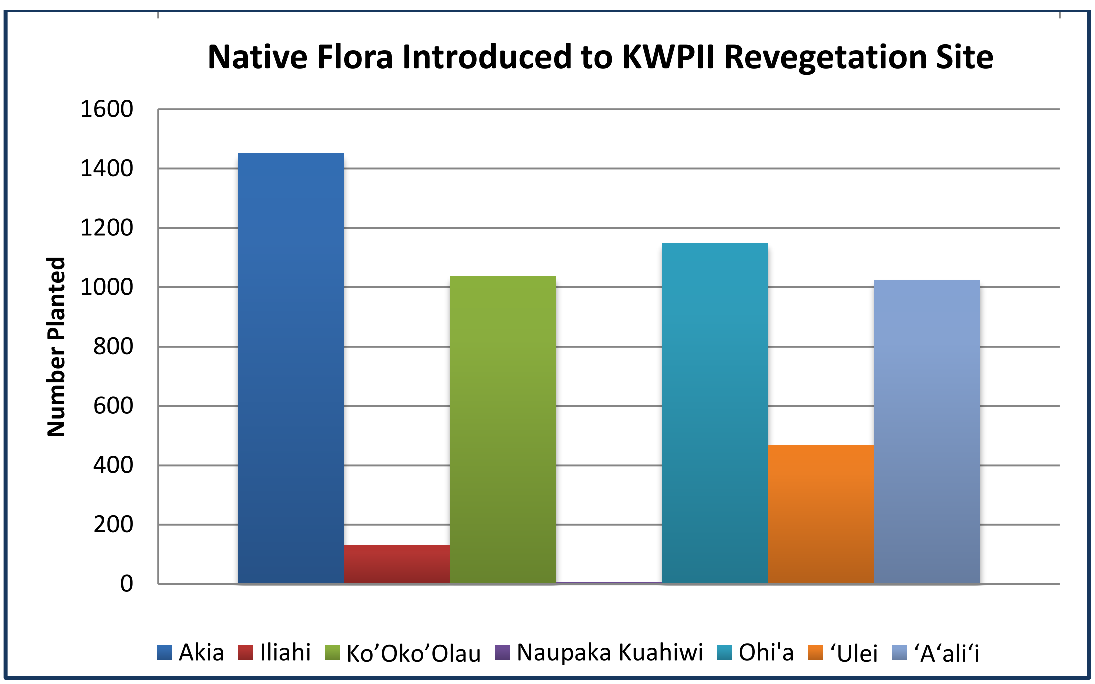

Figure 14. Native plant restoration by species.

Mitigation

East Maui Seabird Survey

In the unlikely event the initial five year mitigation targets at Makamaka’ole for the threatened NESH are not met, East Maui is being surveyed for potential additional mitigation sites. Maui Nui Seabird Recovery Project has been contracted for this survey currently in progress (during May – August 2015) and has been funded with $56,062 to provide equipment and support survey costs. The first detector deployment occurred May 16, 2015. The survey will assess areas adjacent to Haleakala National Park, Maui in the area below Ko’olau Gap and above Keanae by deploying Wildlife Acoustics SM2™ and SM3™ acoustic detectors at 60 locations in approximately 8,000 hectares situated between 3,000 - 8,000 ft. altitudes. The first deployment locations are shown in Figure 15.

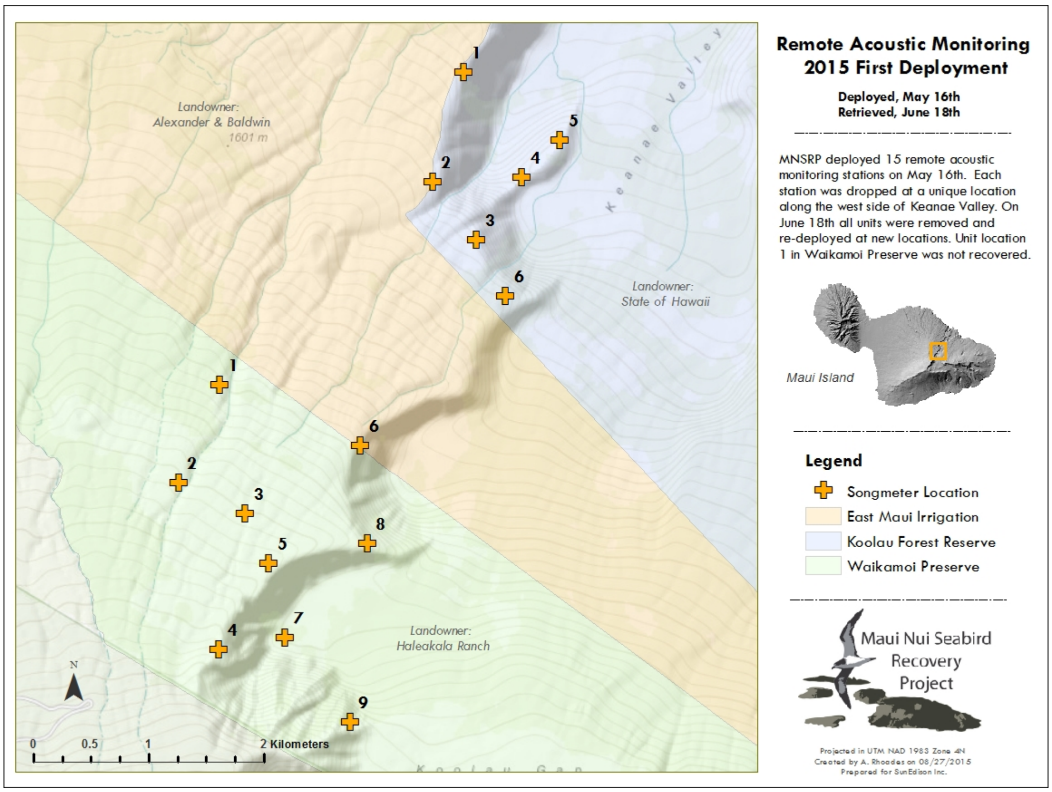

Figure 15**. May 16, 2015 deployments in areas adjacent to Haleakala National Park in the area below Ko'olau Gap and above Keanae.**Seven SM3™ and eight SM2™ automated Wildlife Acoustic detectors will be deployed four times in one month increments from May – August 2015 (15 sites/month). The surveys will help evaluate potential colony locations, estimate the numbers of birds, assess predator activity, and develop a management feasibility assessment.

Hawaiian Petrel and Newell's Shearwater - Makamakaole

Figure 16. Two completed enclosures on the Makamaka'ole Seabird Mitigation site (Enclosure B is left and Enclosure A is right).

Twice weekly site visits to Makamaka'ole continue and focus on predator trapping and tracking and ongoing maintenance of both enclosures (Figure 16). Monitoring checklists have been created to ensure consistent oversight. These checklists include sound system battery checks, game camera data collection, burrow checks for erosion damage, signs of bird activity and ongoing perimeter checks of fences and culverts. The Victor™ rat snap traps, Doc 200™ body grip traps (all encased in "bird-safe" boxes), and Hav-a-hart™ live traps (only deployed outside the enclosures) are routinely maintained (Table 9). Experimentation with bait and trap types have been ongoing. Five game cameras have been deployed to monitor small mammal activity near culverts.

Table 9. Makamaka'ole trapping data by species and location for FY 2015.

Trap Location	Type Type	Quantity Deployed	Number Caught
Outside A	Hav-a-hart Live	2	2 mongoose, 2 cats
	Victor Rat Snap	4	28 rats, 6 mice
	Doc 200 Body Grip	9	31 mongoose, 1 rats, 2 mice
Inside A	Victor Rat Snap	6	8 rats, 42 mice
Outside B	Hav-a-hart Live	2	2 mongoose, 1 cat
	Victor Rat Snap	3	12 rats, 1 mouse
	Doc 200 Body Grip	6	27 mongoose, 5 rats
Inside B	Victor Rat Snap	6	29 rats, 8 mice

Ten tracking tunnels inside Enclosure A and 10 inside Enclosure B have been inked and baited every other month to assess small mammal activity (Table 10). Since January 24, 2014 no mongoose have been detected or trapped inside either enclosure. On January 7th we received our approved protocol to continue using Diphacinone bait blocks (Appendix 9). Twenty-five and 22 bait stations using Diphacinone bait blocks will continue to be deployed inside Enclosure A and Enclosure B, respectively.

Table 10. Makamaka'ole rodent density summary FY 2015, as the average % of 10 tunnel's surface area covered with paw prints.

	July 2014 Totals		September 2014 Totals		November 2014 Totals	
	% Enclosure A	% Enclosure B	% Enclosure A	% Enclosure B	% Enclosure A	% Enclosure B
Mouse	35	6	9	0	6	16
Rat	0	8	0	0	0	1
Mongoose	0	0	0	0	0	0
	January 2015 Totals		**March 2015 Totals**		**May 2015 Totals**	
	% Enclosure A	**% Enclosure B**	**% Enclosure A**	**% Enclosure B**	**% Enclosure A**	**% Enclosure B**
Mouse	0	1	10	0	1	0
Rat	0	0	0	1	0	0
Mongoose	0	0	0	0	0	0

Erosion inside and outside of enclosures continues to be monitored closely. Specially fabricated hydrologic flumes are attached to the outflow sections of two culverts at Enclosure A. These flumes direct water away from the enclosure, preventing erosion directly outside of the culvert tube and limiting the amount of displaced sediment load entering neighboring streams. Uki (*Machaerina augustifolia*) propagated by Kula Native Nursery continue to be out-planted in and around the enclosures to stabilize soil in disturbed areas and to add to native flora within the mitigation area. We planted 1639 Uki during FY 2015 with more of a variety of out-plantings scheduled for FY 2016.

Figure 17. H brace inside Enclosure B providing additional fence support.

In FY 2014 32 and 30 artificial burrows were installed in Enclosure A and B, respectively. In FY 2015 the remaining 38 burrows needed to reach our required 50 burrows per enclosure were installed by March 24th; 18 in Enclosure A and 20 in Enclosure B. Acoustic attraction systems were turned on March 3rd and will continue broadcasting calls through November 2015. Technicians are conducting bimonthly night surveys, started on March 12th, to ensure the sound systems are working correctly and to monitor bird activity in the area.

A combination of winter storms, saturated soil and strong winds created damage to part of the east south-east facing fence on both enclosures. The damage included posts shifting in both enclosures with partial tears and bending of the flashing on Enclosure B. H braces were constructed, five in Enclosure B and three in Enclosure A, along the inside of the fence to add extra support where posts shifted (Figure 17), and the torn flashing was replaced.

On June 22nd a game camera set on burrows under the north speaker inside Enclosure B captured a HAPE on the ground. An additional camera was then set at the same location to record video. Two days later, on June 24th, both a HAPE and NESH were recorded on these game cameras (Figure 18). Both species were captured several more times in the following days on these game cameras (Figure 19). With the confirmation of both target species landing inside Enclosure B, all night surveys have halted until fledgling season, November, and monitoring of these burrows is strictly done via game camera. We have implemented this hands-off approach in an effort to not disturb any prospecting birds.

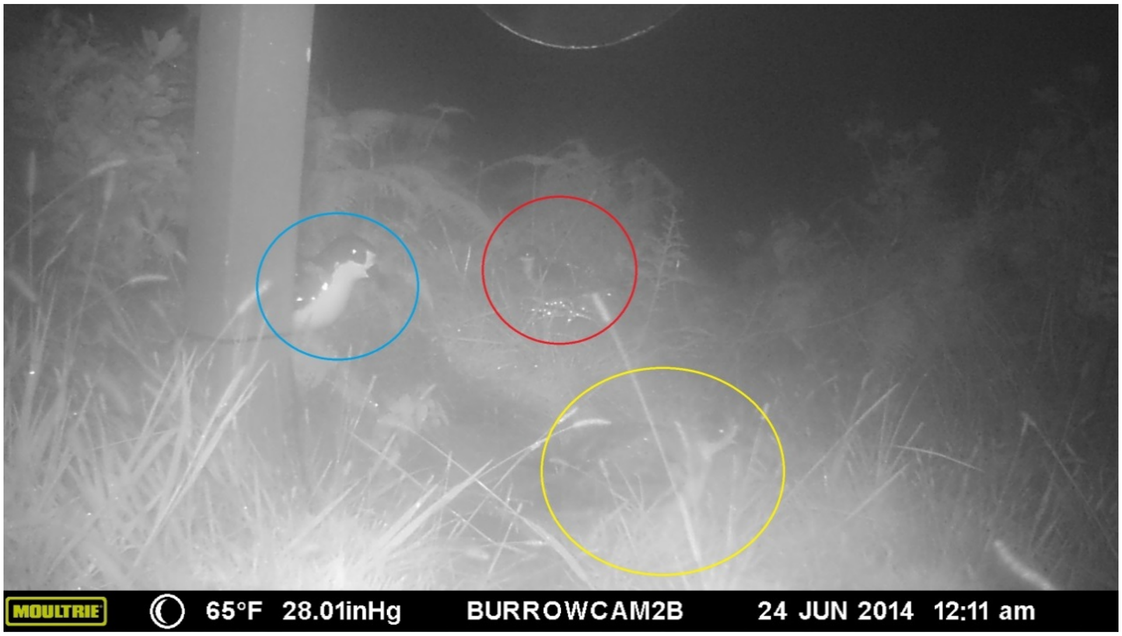

Figure 18. On June 24, 2015 a Newell's shearwater (red circle) and Hawaiian petrel (yellow circle) were photographed via game camera. This game camera is positioned below the north speaker inside Enclosure B near burrows and a Hawaiian petrel decoy (blue circle).

Figure 19. Newell's shearwater sighting on June 28, 2015 inside Enclosure B; below north speaker and next to burrow entrance.

Nēnē – Haleakala Ranch Pen

The KWPII HCP states that SunEdison will provide funding to DOFAW by the beginning of 2016 for an additional Nēnē release pen as well as five years of funding for conducting predator control, vegetation management and monitoring. SunEdison is presently considering pen location and construction opportunities in collaboration with DOFAW.

Hawaiian Hoary Bat

Complete funding obligations for Tier 1 and Tier 2 bat mitigation ($375,000) has been provided in FY 2014 Q4, by KWPII for habitat restoration at Kahikinui Forest Reserve on Maui. The Tier 1 and 2 bat permitted take of 11 adults as amended has been exceeded. An application to amend the HCP and state and federal take license and permit to increase take for bats and Nēnē was made May 8, 2015 to the USFWS and DLNR-DOFAW. The amendment application and additional mitigation proposals for KWPII are in review.

Adaptive Management

In accordance with the KWPII HCP, low wind speed curtailment (LWSC) at 5 m/s was initially required to be in effect for the months of April through November. This period was extended to ultimately begin mid-February and continue through mid- December in response to fatalities documented at KWPII on March 13, 2013 and February 26, 2014, and at KWPI on December 14, 2013. Prior to May 2014, 50% of observed fatalities at KWPI and KWPII had occurred in April and September, suggesting that collision risk was higher during these months. LWSC was therefore increased from 5 m/s to 6 m/s on April 10 through April 30, 2014, and was proposed to be raised to 6 m/s again in September.

On June 6, 2014 SunEdison offered an adaptive management proposal to the USFWS and DOFAW for bats and on July 29, 2014 the LWSC was raised to 5.5 m/s between February 15th and December 15th. KWP continues to investigate ultrasonic bat deterrent but the technology has not yet proven to be effective or feasible at nacelle height.

Agency Visits and Reporting

During FY 2015, KWPII attended and hosted several meetings with agencies to discuss a variety of topics. Breakdowns of the meetings are noted in Table 11.

Date	Who	Where	Topics
7/1/14	USFWS, DOFAW, Tetra Tech, SWCA, Auwahi Wind	Honolulu	HUSO post-construction estimator workshop
7/8/14	USFWS and DOFAW	Honolulu	KWP coordination meeting
7/22/14	USFWS, DOFAW, SWCA	Honolulu	Modifying current monitoring efforts, how to agree on methods for estimating fatalities to measure take exceedance, how to use data from multiple years of intensive monitoring, how to move forward with amendments
8/21/14	USFWS, DOFAW, NPS, Maui Nui Seabirds, Kauai Seabirds	Makamaka’ole	Site visit and night survey
8/22/14	USFWS and DOFAW	Honolulu	KWP/Makamaka’ole coordination meeting
10/24/14	USFWS, DOFAW, Tetra Tech, SWCA, Auwahi Wind	Honolulu	ESRC, Endangered Species Recovery Committee, annual meeting
10/29/14	DOFAW	KWP I&II	DOFAW visited the site to evaluate vegetation management
11/5/14	USFWS and DOFAW	Honolulu	KWP/Makamaka’ole coordination meeting
12/8/14	USFWS and DOFAW	Honolulu	KWP/Makamaka’ole coordination meeting
12/10/14	DOFAW	Honolulu	Nēnē Recovery Action Group Annual Meeting
12/16/14	USFWS and DOFAW	Honolulu	ESRC annual meeting continuation, request for comments on the Resource Equivalency Analysis (REA), and request for comments on interim monitoring
1/13/15	USFWS and DOFAW	Honolulu	KWP/Makamaka’ole coordination meeting
2/12/15	USFWS and DOFAW	Honolulu	KWP/Makamaka’ole coordination meeting
2/17/15	NARS	Wailuku	Annual Makamaka’ole permit renewal
3/31/15	USFWS and DOFAW	Honolulu	ESRC meeting, request for determination from the ESRC on post-intensive downed wildlife monitoring protocols
4/14 – 4/15/15	USFWS, DOFAW, Tetra Tech, SWCA, Auwahi Wind, HT Harvey, BCI	Honolulu	Bat Workshop
6/4/15	USFWS and DOFAW	Honolulu	KWP/Makamaka’ole coordination meeting

Table 11. KWPII agency meetings for FY 2015.

KWP continues to notify agencies of non-ESA/non-MBTA fatalities via email within 24 hours and sends out a downed wildlife report within three calendar days.

A Quarterly report for FY 2015 Q1, Q2 and Q3 was provided.

Expenditures

The total HCP related expenditures in FY 2015 is $402,101 (Appendix 10).

Citations

Manuela M. P. Huso, Daniel H. Dalthorp, David A. Dail, and Lisa J. Madsen. 2015. Estimating wind-turbine caused bird and bat fatality when zero carcasses are observed. Ecological Applications. http://dx.doi.org/10.1890/14-0764.1

Kaheawa Wind Power II, LLC. 2013. Kaheawa Pastures Wind Energy Generation Facility, Habitat Conservation Plan: Year 1 Annual Report. First Wind Energy, LLC, Wailuku, HI 96793.

Kaheawa Wind Power II, LLC. 2014. Kaheawa Pastures Wind Energy Generation Facility, Habitat Conservation Plan: Year 2 Annual Report. First Wind Energy, LLC, Wailuku, HI 96793.

Shoenfeld, Peter, S. 2004. Suggestions Regarding Avian Mortality Extrapolation. Prepared for the Mountaineer Wind Energy Center Technical Review Committee.

Appendices

Appendix 1. KWPII monitoring interval data.

July, 2014

WTG Search Plot														Avg. Monthly	Total # Searched
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	7.00	70
1-Jul	1-Jul	1-Jul	1-Jul	1-Jul	1-Jul	1-Jul	1-Jul	1-Jul	1-Jul	1-Jul	1-Jul	1-Jul	1-Jul		
8-Jul	8-Jul	8-Jul	8-Jul	8-Jul	8-Jul	8-Jul	8-Jul	8-Jul	8-Jul	9-Jul	9-Jul	9-Jul	9-Jul		
14-Jul	14-Jul	14-Jul	14-Jul	14-Jul	14-Jul	14-Jul	14-Jul	14-Jul	14-Jul	14-Jul	14-Jul	14-Jul	14-Jul		
21-Jul	21-Jul	21-Jul	21-Jul	21-Jul	21-Jul	21-Jul	21-Jul	21-Jul	21-Jul	21-Jul	21-Jul	22-Jul	22-Jul		
28-Jul	28-Jul	28-Jul	28-Jul	28-Jul	28-Jul	28-Jul	28-Jul	28-Jul	28-Jul	28-Jul	28-Jul	28-Jul	28-Jul		

August, 2014

WTG Search Plot														Avg. Monthly	Total # Searched
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	7.06	56
4-Aug	4-Aug	4-Aug	4-Aug	4-Aug	4-Aug	4-Aug	4-Aug	4-Aug	4-Aug	4-Aug	4-Aug	4-Aug	4-Aug		
11-Aug	11-Aug	11-Aug	11-Aug	11-Aug	11-Aug	11-Aug	11-Aug	11-Aug	11-Aug	11-Aug	11-Aug	12-Aug	12-Aug		
18-Aug	18-Aug	18-Aug	18-Aug	18-Aug	18-Aug	18-Aug	18-Aug	18-Aug	18-Aug	18-Aug	18-Aug	19-Aug	19-Aug		
25-Aug	25-Aug	25-Aug	25-Aug	25-Aug	25-Aug	25-Aug	26-Aug	26-Aug	26-Aug	26-Aug	26-Aug	27-Aug	26-Aug		

September,2014

WTG Search Plot														Avg. Monthly	Total # Searched
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	7.03	70
2-Sep	2-Sep	2-Sep	2-Sep	2-Sep	2-Sep	2-Sep	2-Sep	2-Sep	2-Sep	3-Sep	3-Sep	3-Sep	3-Sep		
8-Sep	8-Sep	8-Sep	8-Sep	8-Sep	8-Sep	8-Sep	8-Sep	9-Sep	9-Sep	9-Sep	9-Sep	9-Sep	9-Sep		
15-Sep	15-Sep	15-Sep	15-Sep	15-Sep	15-Sep	16-Sep	16-Sep	16-Sep	16-Sep	16-Sep	16-Sep	17-Sep	17-Sep		
22-Sep	22-Sep	22-Sep	23-Sep	23-Sep	23-Sep	23-Sep	23-Sep	23-Sep	23-Sep	23-Sep	23-Sep	24-Sep	24-Sep		
29-Sep	29-Sep	29-Sep	29-Sep	29-Sep	29-Sep	29-Sep	29-Sep	29-Sep	30-Sep	30-Sep	30-Sep	30-Sep	30-Sep		

October, 2014

WTG Search Plot														Avg. Monthly	Total # Searched
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	7.01	56
6-Oct	6-Oct	6-Oct	6-Oct	6-Oct	6-Oct	6-Oct	6-Oct	6-Oct	6-Oct	6-Oct	6-Oct	6-Oct	6-Oct		
14-Oct	14-Oct	14-Oct	14-Oct	14-Oct	14-Oct	14-Oct	14-Oct	14-Oct	14-Oct	14-Oct	14-Oct	14-Oct	14-Oct		
20-Oct	20-Oct	20-Oct	20-Oct	20-Oct	20-Oct	20-Oct	20-Oct	20-Oct	21-Oct	21-Oct	21-Oct	21-Oct	21-Oct		
27-Oct	27-Oct	27-Oct	27-Oct	27-Oct	27-Oct	27-Oct	27-Oct	27-Oct	27-Oct	27-Oct	27-Oct	28-Oct	28-Oct		

November,2014

WTG Search Plot														Avg. Monthly	Total # Searched
1	2	3	4	5	6	7	8	9	10	11	12	13	14	7.02	56
3-Nov	3-Nov	3-Nov	3-Nov	3-Nov	3-Nov	3-Nov	3-Nov	3-Nov	3-Nov	5-Nov	5-Nov	5-Nov	5-Nov		
10-Nov	10-Nov	10-Nov	10-Nov	10-Nov	10-Nov	11-Nov	11-Nov	11-Nov	11-Nov	11-Nov	11-Nov	11-Nov	11-Nov		
17-Nov	17-Nov	17-Nov	17-Nov	17-Nov	17-Nov	17-Nov	17-Nov	17-Nov	18-Nov	18-Nov	18-Nov	18-Nov	18-Nov		
24-Nov	24-Nov	24-Nov	24-Nov	24-Nov	24-Nov	24-Nov	24-Nov	24-Nov	25-Nov	25-Nov	25-Nov	25-Nov	25-Nov		

December,2014

WTG Search Plot														Avg. Monthly	Total # Searched
1	2	3	4	5	6	7	8	9	10	11	12	13	14	7.01	70
1-Dec	1-Dec	1-Dec	1-Dec	1-Dec	1-Dec	1-Dec	1-Dec	1-Dec	2-Dec	2-Dec	2-Dec	2-Dec	2-Dec		
8-Dec	8-Dec	8-Dec	8-Dec	8-Dec	8-Dec	8-Dec	8-Dec	8-Dec	9-Dec	9-Dec	9-Dec	9-Dec	9-Dec		
17-Dec	17-Dec	17-Dec	17-Dec	17-Dec	17-Dec	17-Dec	17-Dec	17-Dec	18-Dec	18-Dec	18-Dec	18-Dec	18-Dec		
22-Dec	22-Dec	22-Dec	22-Dec	22-Dec	22-Dec	22-Dec	22-Dec	22-Dec	22-Dec	22-Dec	22-Dec	22-Dec	24-Dec		
29-Dec	29-Dec	29-Dec	30-Dec	29-Dec	29-Dec	29-Dec	29-Dec	29-Dec	29-Dec	30-Dec	30-Dec	30-Dec	30-Dec		

January, 2015

WTG Search Plot														Avg. Monthly	Total # Searched
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	7.07	56
5-Jan	5-Jan	5-Jan	5-Jan	5-Jan	5-Jan	5-Jan	5-Jan	5-Jan	7-Jan	7-Jan	7-Jan	7-Jan	7-Jan		
13-Jan	13-Jan	13-Jan	13-Jan	13-Jan	13-Jan	14-Jan	14-Jan	14-Jan	14-Jan	14-Jan	14-Jan	14-Jan	14-Jan		
20-Jan	20-Jan	20-Jan	20-Jan	20-Jan	20-Jan	20-Jan	20-Jan	20-Jan	20-Jan	20-Jan	20-Jan	21-Jan	21-Jan		
27-Jan	27-Jan	28-Jan	28-Jan	28-Jan	28-Jan	28-Jan	28-Jan	28-Jan	28-Jan	28-Jan	29-Jan	29-Jan	29-Jan		

February, 2015

WTG Search Plot														Avg. Monthly	Total # Searched
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	7.00	56
2-Feb	2-Feb	2-Feb	2-Feb	2-Feb	2-Feb	2-Feb	2-Feb	2-Feb	2-Feb	2-Feb	2-Feb	4-Feb	4-Feb		
10-Feb	10-Feb	10-Feb	10-Feb	10-Feb	9-Feb	9-Feb	9-Feb	9-Feb	9-Feb	9-Feb	9-Feb	9-Feb	9-Feb		
16-Feb	16-Feb	16-Feb	16-Feb	16-Feb	17-Feb	16-Feb	16-Feb	16-Feb	16-Feb	16-Feb	16-Feb	17-Feb	17-Feb		
23-Feb	23-Feb	23-Feb	23-Feb	23-Feb	23-Feb	23-Feb	23-Feb	23-Feb	23-Feb	23-Feb	23-Feb	23-Feb	23-Feb		

March, 2015

WTG Search Plot														Avg. Monthly	Total # Searched
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**		
2-Mar	2-Mar	2-Mar	2-Mar	2-Mar	4-Mar	4-Mar	4-Mar	4-Mar	4-Mar	4-Mar	4-Mar	4-Mar	4-Mar		
9-Mar	9-Mar	9-Mar	9-Mar	9-Mar	9-Mar	9-Mar	9-Mar	9-Mar	11-Mar	11-Mar	11-Mar	11-Mar	11-Mar		
16-Mar	16-Mar	16-Mar	16-Mar	16-Mar	16-Mar	16-Mar	16-Mar	16-Mar	16-Mar	16-Mar	16-Mar	16-Mar	16-Mar	7.00	70
23-Mar	23-Mar	23-Mar	23-Mar	23-Mar	23-Mar	23-Mar	23-Mar	23-Mar	23-Mar	23-Mar	23-Mar	24-Mar	24-Mar		
30-Mar	30-Mar	30-Mar	30-Mar	30-Mar	30-Mar	30-Mar	30-Mar	30-Mar	30-Mar	30-Mar	30-Mar	31-Mar	31-Mar		

April, 2015

WTG Search Plot														Avg. Monthly	Total # Searched
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**		
6-Apr	6-Apr	6-Apr	6-Apr	6-Apr	7-Apr	7-Apr	7-Apr	8-Apr	8-Apr	8-Apr	8-Apr	8-Apr	8-Apr		
13-Apr	13-Apr	13-Apr	13-Apr	13-Apr	13-Apr	13-Apr	14-Apr	14-Apr	15-Apr	15-Apr	15-Apr	15-Apr	15-Apr		
21-Apr	21-Apr	21-Apr	21-Apr	21-Apr	21-Apr	21-Apr	21-Apr	22-Apr	22-Apr	22-Apr	23-Apr	23-Apr	23-Apr	7.04	45
28-Apr	28-Apr	28-Apr	HW	HW	HW	HW	HW	HW	HW	HW	HW	HW	HW		
High winds April 26 – May 2															

May, 2015

WTG Search Plot														Avg. Monthly	Total # Searched
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	7.15	56
4-May	4-May	4-May	4-May	4-May	4-May	5-May	5-May	5-May	5-May	6-May	6-May	5-May	5-May		
12-May	12-May	12-May	12-May	12-May	12-May	12-May	12-May	12-May	12-May	13-May	13-May	13-May	13-May		
18-May	18-May	18-May	18-May	18-May	18-May	18-May	18-May	18-May	19-May	19-May	19-May	19-May	19-May		
26-May	26-May	26-May	26-May	26-May	26-May	26-May	26-May	26-May	27-May	27-May	27-May	27-May	27-May		

June, 2015

WTG Search Plot														Avg. Monthly	Total # Searched
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	7.11	70
2-Jun	2-Jun	2-Jun	2-Jun	2-Jun	2-Jun	2-Jun	2-Jun	4-Jun	4-Jun	4-Jun	5-Jun	5-Jun	5-Jun		
8-Jun	8-Jun	8-Jun	8-Jun	8-Jun	8-Jun	8-Jun	8-Jun	8-Jun	9-Jun	9-Jun	9-Jun	9-Jun	9-Jun		
15-Jun	15-Jun	15-Jun	15-Jun	15-Jun	15-Jun	16-Jun	16-Jun	16-Jun	16-Jun	16-Jun	16-Jun	16-Jun	16-Jun		
22-Jun	22-Jun	22-Jun	22-Jun	22-Jun	22-Jun	23-Jun	23-Jun	23-Jun	23-Jun	23-Jun	23-Jun	24-Jun	24-Jun		
29-Jun	29-Jun	29-Jun	29-Jun	29-Jun	29-Jun	29-Jun	29-Jun	29-Jun	29-Jun	29-Jun	29-Jun	30-Jun	30-Jun		

Appendix 2. KWPII CARE trials from the WEST independent study (O=missing/removed, I=intact, nc=not checked, S=scavenged, but still present).

TRIAL DETAILS					DAYS																		
Day 1 Date	**WTG #**	**Dist From Turbine (m)**	**Species**	**Cover Class**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**9**	**11**	**13**	**15**	**17**	**19**	**21**	**23**	**25**	**27**	**29**	**30**
3/31/2014	4	54	CAGO	Grass	I	I	I	I	I	I	I	nc	S	I	nc	S	S	S	S	S	S	S	S
3/31/2014	6	89	RATS	Grass	O																		
3/31/2014	12	52	RATS	Grass	O																		
3/31/2014	14	39	RATS	Bare	S	S	O																
3/31/2014	1	23	WTSH	Bare	I	I	I	I	I	I	I	nc	I	I	nc	I	I	I	S	S	S	S	S
3/31/2014	2	24	WTSH	Bare	I	I	I	I	I	I	I	nc	I	I	nc	I	I	I	I	S	S	S	S
3/31/2014	7	13	WTSH	Bare	I	I	I	I	I	I	I	nc	I	I	nc	I	I	S	I	I	S	S	S
3/31/2014	13	11	WTSH	Bare	I	I	I	I	I	I	I	nc	I	I	nc	I	I	S	S	S	S	S	S
5/7/2014	4	18	RATS	Bare	S	S	S	O															
5/7/2014	5	22	RATS	Bare	I	S	S	O															
5/7/2014	6	37	RATS	Grass	S	O																	
5/7/2014	12	76	RATS	Grass	S	S	S	O															
5/7/2014	18	20	WTSH	Grass	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
5/7/2014	4	72	WTSH	Grass	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
5/7/2014	7	38	WTSH	Bare	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
5/7/2014	10	32	WTSH	Bare	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
6/8/2014	13	55	CAGO	bare	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
6/8/2014	1	41	RATS	bare	I	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S
6/8/2014	4	44	RATS	Grass	I	I	I	I	I	O													
6/8/2014	5	70	RATS	Grass	I	I	O																
6/8/2014	9	43	RATS	Grass	I	I	O																
6/8/2014	10	23	RATS	Bare	I	I	I	O															
6/8/2014	5	57	WTSH	Grass	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
6/8/2014	5	32	WTSH	Bare	I	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S
6/8/2014	6	58	WTSH	Grass	I	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S
6/8/2014	7	41	WTSH	Grass	I	I	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S

6/8/2014	14	60	WTSH	Bare	I	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S
9/7/2014	5	47	CAGO	Grass	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S	FS	FS	FS	FS
9/7/2014	14	25	RATS	Bare	O																		
9/7/2014	9	21	WTSH	Bare	I	O																	
9/7/2014	10	66	WTSH	Grass	O																		
9/7/2014	11	68	WTSH	Grass	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
9/7/2014	11	60	WTSH	Bare	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
11/24/2014	4	32	CAGO	Grass	I	I	I	I	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S
11/24/2014	13	47	CAGO	Grass	I	I	I	I	I	I	I	I	I	S	S	S	S	S	S	S	S	S	S
11/24/2014	8	30	DUCK	Bare	I	I	I	I	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S
11/24/2014	3	27	RATS	Grass	I	I	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S
11/24/2014	5	72	RATS	Grass	I	I	O																
11/24/2014	7	49	RATS	Grass	I	I	I	I	I	I	I	I	S	O									
11/24/2014	11	33	RATS	Grass	I	I	I	I	I	S	O												
11/24/2014	4	22	WTSH	Grass	I	I	I	I	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S
11/24/2014	13	50	WTSH	Grass	I	I	I	I	I	I	I	I	I	S	S	S	S	S	S	S	S	S	S
1/19/2015	2	38	CKN	Bare	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
1/19/2015	11	14	CKN	Bare	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
1/19/2015	4	42	DUCK	Grass	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
1/19/2015	8	16	RNPH	Bare	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
1/19/2015	2	67	RATS	Bare	I	I	I	S	S	S	O												
1/19/2015	8	23	RATS	Bare	I	I	S	S	S	S	O												
1/19/2015	11	38	RATS	Grass	I	O																	
1/19/2015	1	68	WTSH	Grass	I	I	I	I	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

Appendix 3. KWPII SEEF trials from the WEST independent study.

Date	Species	WTG #	Distance From Turbine (m)	Cover Class	Day 1 Found?	Day 1 Found Date	Day 1 Available?
3/30/2014	CAGO	4	54	Grass	N	03/31/14	Y
3/30/2014	RATS	6	89	Grass	N	03/31/14	N
3/30/2014	RATS	12	52	Grass	N	04/01/14	N
3/30/2014	RATS	14	39	Bare	Y	04/01/14	Y
3/30/2014	WTSH	1	23	Bare	Y	03/31/14	Y
3/30/2014	WTSH	2	24	Bare	Y	03/31/14	Y
3/30/2014	WTSH	7	13	Bare	Y	03/31/14	Y
3/30/2014	WTSH	13	11	Bare	Y	04/01/14	Y
4/19/2014	RATS	10	40	Bare	N	04/27/14	N
4/19/2014	RATS	10	30	Bare	N	04/27/14	N
4/19/2014	RATS	11	31	Bare	N	04/27/14	N
4/19/2014	RATS	11	26	Grass	N	04/27/14	N
4/19/2014	RATS	12	45	Grass	N	04/28/14	N
4/19/2014	RATS	13	18	Grass	N	04/28/14	N
4/19/2014	RATS	14	46	Bare	N	04/28/14	N
4/19/2014	WTSH	8	39	Grass	Y	04/23/14	Y
4/19/2014	WTSH	10	33	Grass	N	04/27/14	Y
4/19/2014	WTSH	13	39	Bare	Y	04/28/14	Y
5/6/2014	RATS	4	18	Bare	Y	05/06/14	Y
5/6/2014	RATS	5	22	Bare	N	05/06/14	Y
5/6/2014	RATS	6	37	Grass	N	05/06/14	Y
5/6/2014	RATS	12	76	Grass	N	05/06/14	Y
5/6/2014	WTSH	4	20	Grass	N	05/06/14	Y
5/6/2014	WTSH	4	72	Grass	Y	05/06/14	Y
5/6/2014	WTSH	7	38	Bare	Y	05/06/14	Y
5/6/2014	WTSH	10	32	Bare	N	05/06/14	Y
5/11/2014	RATS	1	24	Grass	N	05/13/14	Y
5/11/2014	RATS	4	7	Bare	N	05/14/14	Y
5/11/2014	RATS	7	32	Bare	N	05/14/14	N
5/11/2014	WTSH	4	48	Bare	Y	05/14/14	Y
5/11/2014	WTSH	7	55	Grass	N	05/14/14	Y
5/11/2014	WTSH	10	74	Grass	Y	05/14/14	Y
5/12/2014	RATS	11	71	Grass	N	05/14/14	N
5/12/2014	RATS	12	35	Bare	Y	05/14/14	Y
5/12/2014	RATS	13	41	Grass	N	05/14/14	Y
5/19/2014	CAGO	9	23	Grass	N	05/19/14	Y
5/19/2014	RATS	3	4	Bare	Y	05/19/14	Y
5/19/2014	RATS	10	67	Grass	N	05/19/14	Y
5/19/2014	RATS	10	35	Grass	N	05/19/14	Y
5/19/2014	RATS	11	55	Bare	N	05/19/14	Y

5/19/2014	WTSH	2	45	Bare	Y	05/19/14	Y
5/19/2014	WTSH	13	22	Bare	Y	05/20/14	Y
6/2/2014	WTSH	9	37	Grass	N	06/03/14	Y
6/2/2014	WTSH	11	61	Grass	Y	06/03/14	Y
6/7/2014	CAGO	13	55	Bare	Y	06/09/14	Y
6/7/2014	RATS	1	41	Bare	Y	06/10/14	Y
6/7/2014	RATS	4	44	Grass	N	06/10/14	Y
6/7/2014	RATS	5	70	Grass	N	06/10/14	N
6/7/2014	RATS	9	43	Grass	N	06/11/14	N
6/7/2014	RATS	10	23	Bare	N	06/11/14	N
6/7/2014	WTSH	5	57	Grass	Y	06/10/14	Y
6/7/2014	WTSH	5	32	Bare	N	06/10/14	Y
6/7/2014	WTSH	6	58	Grass	N	06/10/14	Y
6/7/2014	WTSH	7	41	Grass	N	06/10/14	Y
6/7/2014	WTSH	14	60	Bare	N	06/11/14	Y
6/28/2014	CAGO	5	48	Bare	Y	06/30/14	Y
6/28/2014	WTSH	11	36	Bare	N	07/01/14	Y
6/30/2014	RATS	2	52	Bare	N	06/30/14	Y
6/30/2014	RATS	4	18	Bare	Y	06/30/14	Y
6/30/2014	RATS	6	7	Bare	Y	06/30/14	Y
6/30/2014	RATS	8	12	Bare	N	07/01/14	Y
6/30/2014	RATS	13	50	Bare	N	07/01/14	Y
7/6/2014	RATS	10	26	Bare	N	07/09/14	N
7/6/2014	RATS	12	16	Bare	N	07/09/14	N
7/6/2014	RATS	4	20	Grass	N	07/09/14	N
7/6/2014	RATS	6	11	Bare	N	07/09/14	N
7/6/2014	RATS	8	12	Bare	Y	07/09/14	Y
7/6/2014	WTSH	3	10	Bare	Y	07/09/14	Y
7/6/2014	WTSH	8	18	Bare	Y	07/09/14	Y
7/6/2014	WTSH	11	20	Bare	Y	07/09/14	Y
7/6/2014	WTSH	12	43	Bare	N	07/09/14	Y
7/27/2014	RATS	1	38	Bare	Y	07/28/14	Y
7/27/2014	RATS	3	18	Bare	N	07/28/14	N
7/27/2014	RATS	4	56	Bare	N	07/28/14	N
7/27/2014	RATS	12	70	Grass	N	07/28/14	Y
7/27/2014	WTSH	1	28	Grass	Y	07/28/14	Y
7/27/2014	WTSH	2	8	Bare	Y	07/28/14	Y
7/27/2014	WTSH	4	30	Grass	N	07/28/14	Y
8/2/2014	RATS	3	31	Bare	N	08/04/14	N
8/2/2014	RATS	4	24	Bare	N	08/04/14	N
8/2/2014	RATS	8	10	Bare	N	08/04/14	N
8/2/2014	WTSH	3	11	Bare	Y	08/04/14	Y
8/2/2014	WTSH	7	21	Bare	Y	08/04/14	Y
8/16/2014	CAGO	5	12	Bare	Y	08/18/14	Y
8/16/2014	WTSH	4	62	Grass	N	08/18/14	Y

8/16/2014	WTSH	7	37	grass	N	8/18/2014	Y
8/16/2014	WTSH	12	78	Bare	Y	08/18/14	Y
8/16/2014	WTSH	14	74	Bare	Y	08/19/14	Y
8/18/2014	RATS	1	38	Grass	N	08/18/14	N
8/18/2014	RATS	4	70	Grass	N	08/18/14	Y
8/18/2014	RATS	5	61	Grass	N	08/18/14	Y
8/18/2014	RATS	10	38	Bare	N	08/18/14	N
8/18/2014	RATS	12	12	Bare	N	08/18/14	Y
8/23/2014	RATS	2	21	Bare	Y	08/25/14	Y
8/23/2014	RATS	4	47	Grass	N	08/25/14	Y
8/23/2014	RATS	7	34	Grass	N	08/25/14	N
8/23/2014	RATS	7	63	Bare	N	08/25/14	N
8/23/2014	RATS	9	55	Bare	N	08/26/14	Y
8/23/2014	RATS	9	31	Grass	N	08/26/14	N
8/23/2014	RATS	12	73	Grass	N	08/26/14	N
8/23/2014	RATS	12	35	Bare	N	08/26/14	N
8/23/2014	WTSH	3	37	Grass	Y	08/25/14	Y
8/23/2014	WTSH	8	30	Grass	Y	08/26/14	Y
9/6/2014	CAGO	5	47	Grass	Y	9/8/2014	Y
9/6/2014	RATS	14	25	Bare	N	9/9/2014	N
9/6/2014	WTSH	9	21	Bare	N	9/9/2014	N
9/6/2014	WTSH	10	66	Grass	N	9/9/2014	N
9/6/2014	WTSH	11	68	Grass	Y	9/9/2014	Y
9/6/2014	WTSH	11	60	Bare	N	9/9/2014	Y
9/15/2014	CKN	13	59	Bare	Y	9/16/2014	Y
9/20/2014	CKN	6	56	Grass	Y	9/22/2014	Y
9/20/2014	WTSH	7	59	Grass	Y	9/23/2014	Y
9/20/2014	WTSH	8	50	Bare	Y	9/23/2014	Y
9/22/2014	RATS	4	57	Grass	N	9/22/2014	N
9/22/2014	RATS	5	58	Grass	Y	9/22/2014	Y
9/22/2014	RATS	6	52	Grass	N	9/22/2014	N
9/22/2014	RATS	7	3	Bare	N	9/23/2014	N
9/22/2014	RATS	8	37	Grass	N	9/23/2014	N
9/22/2014	RATS	12	47	Bare	Y	9/23/2014	Y
9/29/2014	CKN	7	43	Grass	Y	9/29/2014	Y
9/29/2014	RATS	3	60	Grass	N	9/29/2014	N
9/29/2014	RATS	4	11	Bare	Y	9/29/2014	Y
9/29/2014	RATS	7	40	Bare	Y	9/29/2014	Y
9/29/2014	RATS	9	7	Bare	Y	9/29/2014	Y
9/29/2014	WTSH	5	11	Bare	Y	9/29/2014	Y
9/29/2014	WTSH	11	36	Grass	Y	9/30/2014	Y
10/5/2014	CAGO	12	50	Bare	Y	10/6/2014	Y
10/5/2014	RATS	6	64	Bare	N	10/6/2014	Y
10/5/2014	RATS	8	10	Bare	Y	10/6/2014	Y
10/5/2014	RATS	9	47	Grass	N	10/6/2014	N

10/5/2014	RATS	11	28	Grass	N	10/6/2014	N
10/5/2014	RATS	13	76	Grass	N	10/7/2014	N
10/5/2014	WTSH	5	57	Grass	Y	10/6/2014	Y
10/5/2014	WTSH	8	43	Bare	Y	10/6/2014	Y
10/5/2014	WTSH	8	33	Grass	Y	10/6/2014	Y
10/5/2014	WTSH	11	44	Grass	Y	10/6/2014	Y
10/13/2014	RATS	14	37	Bare	Y	10/14/2014	Y
10/25/2014	CAGO	6	63	Bare	Y	10/27/2014	Y
10/25/2014	WTSH	2	40	Bare	N	10/27/2014	Y
10/25/2014	WTSH	6	34	Bare	Y	10/27/2014	Y
10/25/2014	WTSH	13	33	Grass	Y	10/28/2014	Y
10/27/2014	RATS	4	31	Bare	N	10/29/2014	Y
10/27/2014	RATS	4	24	Grass	N	10/27/2014	Y
10/27/2014	RATS	6	47	Grass	N	10/27/2014	N
10/27/2014	RATS	13	9	Bare	Y	10/28/2014	Y
11/10/2014	CAGO	1	25	Bare	Y	11/11/2014	Y
11/10/2014	RATS	6	30	Bare	N	11/10/2014	Y
11/10/2014	RATS	7	64	Grass	N	11/11/2014	N
11/10/2014	RATS	9	55	Grass	N	11/11/2014	Y
11/10/2014	RATS	11	50	Bare	N	11/11/2014	Y
11/10/2014	WTSH	4	39	Grass	N	11/10/2014	Y
11/10/2014	WTSH	14	5	Bare	Y	11/11/2014	Y
11/17/2014	CAGO	8	54	Bare	N	11/17/2014	Y
11/17/2014	RATS	4	15	Bare	N	11/17/2014	Y
11/17/2014	RATS	8	11	Bare	Y	11/17/2014	Y
11/17/2014	RATS	11	37	Heavy Shrub	N	11/18/2014	Y
11/17/2014	RATS	12	69	Grass	N	11/18/2014	N
11/17/2014	WTSH	6	59	Grass	Y	11/17/2014	Y
11/17/2014	WTSH	8	31	Grass	N	11/17/2014	Y
11/17/2014	WTSH	14	51	Bare	N	11/18/2014	Y
11/23/2014	CAGO	4	32	Grass	Y	11/24/2014	Y
11/23/2014	CAGO	13	47	Grass	Y	11/24/2014	Y
11/23/2014	DUCK	8	30	Bare	Y	11/24/2014	Y
11/23/2014	RATS	3	27	Grass	N	11/24/2014	Y
11/23/2014	RATS	5	72	Grass	N	11/24/2014	Y
11/23/2014	RATS	7	49	Grass	N	11/24/2014	Y
11/23/2014	RATS	11	33	Grass	Y	11/25/2014	Y
11/23/2014	WTSH	4	22	Grass	Y	11/24/2014	Y
11/23/2014	WTSH	13	50	Grass	Y	11/25/2014	Y
11/25/2014	WTSH	12	72	Heavy Shrub	Y	11/25/2014	Y
11/29/2014	WTSH	4	8	Bare	Y	12/1/2014	Y
12/1/2014	RATS	4	19	Bare	N	12/1/2014	Y
12/1/2014	RATS	5	57	Grass	N	12/1/2014	N
12/1/2014	RATS	7	68	Grass	N	12/1/2014	N

12/1/2014	RATS	8	8	Bare	Y	12/1/2014	Y
12/8/2014	RATS	10	75	Grass	N	12/9/2014	Y
12/8/2014	RATS	12	74	Bare	Y	12/9/2014	Y
12/8/2014	RATS	13	54	Grass	N	12/9/2014	N
12/8/2014	RATS	14	30	Bare	N	12/9/2014	Y
12/8/2014	WTSH	8	45	Grass	N	12/8/2014	Y
12/8/2014	WTSH	11	61	Bare	Y	12/8/2014	Y
12/15/2014	RATS	5	21	Bare	Y	12/17/2014	Y
12/15/2014	RATS	5	55	Grass	N	12/17/2014	Y
12/15/2014	RATS	6	16	Bare	N	12/17/2014	N
12/15/2014	RATS	11	29	Bare	N	12/18/2014	N
12/15/2014	WTSH	8	18	grass	Y	12/17/2014	Y
12/16/2014	WTSH	1	18	Grass	Y	12/17/2014	Y
12/25/2014	CAGO	3	68	Grass	Y	12/29/2014	Y
12/25/2014	CAGO	7	22	Bare	N	12/29/2014	Y
12/25/2014	WTSH	7	70	Grass	Y	12/29/2014	Y
12/25/2014	WTSH	8	7	grass	N	12/29/2014	Y
12/31/2014	WTSH	2	11	Bare	Y	1/2/2015	Y
12/31/2014	WTSH	3	40	Grass	Y	1/5/2015	Y
12/31/2014	WTSH	5	50	Grass	N	1/5/2015	Y
1/4/2015	RATS	2	42	Bare	Y	1/5/2015	Y
1/4/2015	RATS	2	44	Grass	N	1/5/2015	N
1/4/2015	RATS	6	25	Bare	N	1/5/2015	N
1/4/2015	RATS	10	45	Grass	Y	1/7/2015	Y
1/4/2015	RATS	13	61	Grass	N	1/7/2015	Y
1/18/2015	CAGO	11	29	Grass	Y	1/20/2015	Y
1/18/2015	CKN	2	38	Bare	Y	1/20/2015	Y
1/18/2015	CKN	11	14	Bare	Y	1/20/2015	Y
1/18/2015	CKN	7	23	Bare	Y	1/20/2015	Y
1/18/2015	DUCK	4	42	Grass	Y	1/20/2015	Y
1/18/2015	PHST	8	16	Bare	Y	1/20/2015	Y
1/18/2015	RATS	2	67	Bare	N	1/20/2015	Y
1/18/2015	RATS	8	23	Bare	N	1/20/2015	Y
1/18/2015	RATS	11	38	Grass	N	1/20/2015	N
1/18/2015	WTSH	1	68	Grass	N	1/20/2015	Y
1/19/2015	RATS	13	27	Grass	N	1/21/2015	Y
1/19/2015	RATS	13	54	Grass	N	1/21/2015	Y
1/19/2015	RATS	14	20	Bare	N	1/21/2015	Y
1/26/2015	CAGO	14	12	Bare	N	1/29/2015	N
2/2/2015	CAGO	6	15	Bare	Y	2/2/2015	Y
2/2/2015	CAGO	11	43	Grass	Y	2/2/2015	Y
2/2/2015	WTSH	2	31	Grass	N	2/2/2015	Y
2/2/2015	WTSH	9	58	Bare	Y	2/2/2015	Y
2/9/2015	WTSH	10	45	Grass	Y	2/9/2015	Y
2/9/2015	WTSH	14	40	Bare	N	2/9/2015	Y

2/16/2015	CAGO	5	59	Bare	N	2/16/2015	Y
2/16/2015	CKN	7	39	Grass	N	2/16/2015	Y
2/16/2015	RATS	5	77	Grass	N	2/16/2015	N
2/16/2015	RATS	6	22	Grass	Y	2/16/2015	Y
2/16/2015	RATS	8	40	Grass	N	2/16/2015	Y
2/16/2015	RATS	8	29	Bare	N	2/16/2015	Y
2/16/2015	RATS	9	28	Grass	N	2/16/2015	Y
2/21/2015	CKN	5	62	Grass	N	2/23/2015	N
2/21/2015	WTSH	9	13	Grass	N	2/23/2015	N
2/21/2015	WTSH	10	47	Bare	Y	2/23/2015	Y
2/23/2015	RATS	5	71	Grass	N	2/23/2015	N
2/23/2015	RATS	5	67	Grass	N	2/23/2015	N
2/23/2015	RATS	11	22	Bare	N	2/23/2015	N
2/28/2015	CKN	6	31	Grass	Y	3/4/2015	Y
2/28/2015	CKN	9	48	Grass	N	3/4/2015	Y
2/28/2015	RATS	5	77	Grass	N	3/2/2015	Y
2/28/2015	RATS	8	30	Bare	N	3/4/2015	Y
2/28/2015	RATS	9	40	Grass	N	3/4/2015	Y
2/28/2015	RATS	9	46	Grass	N	3/4/2015	Y
2/28/2015	WTSH	7	65	Grass	N	3/4/2015	N
2/28/2015	WTSH	11	43	grass	N	3/4/2015	Y
3/2/2015	RATS	12	52	Grass	N	3/4/2015	N
3/2/2015	RATS	13	18	Bare	N	3/4/2015	Y
3/9/2015	CKN	5	33	Bare	Y	3/9/2015	Y
3/9/2015	RATS	6	70	Grass	N	3/9/2015	N
3/9/2015	RATS	7	61	Grass	N	3/9/2015	N
3/9/2015	RATS	8	43	Grass	N	3/9/2015	Y
3/14/2015	CKN	13	13	Bare	Y	3/16/2015	Y
3/14/2015	RATS	14	52	Bare	N	3/16/2015	N
3/14/2015	WTSH	3	42	Grass	Y	3/16/2015	Y
3/14/2015	WTSH	8	38	Bare	Y	3/16/2015	Y
3/23/2015	WTSH	3	45	Bare	N	3/23/2015	Y
3/23/2015	WTSH	7	47	Grass	Y	3/23/2015	Y

Appendix 4. Canine trial report.

Kaheawa Wind Energy Canine Trial Report

Prepared by: Teresa Gajate, Matthew Pratt, Johanna Valente and Sarah Scheel
April, 2015

Introduction

Post construction carcass searches have been used to estimate fatality rates of birds and bats at wind energy facilities (Erickson et al. 2002). Estimation of fatalities includes the efficiency of the searchers and the removal of carcasses by scavengers. Both of these factors vary considerably through vegetation cover, weather, and topographical challenges. Wildlife biologists have increasingly used canine searchers to monitor for downed wildlife. The olfactory capabilities of a dog greatly improve the efficiency of carcass searches, particularly when compared to unfavorable or difficult conditions for human searchers (Arnett 2006). Kawailoa Wind Power, a wind energy facility managed by SunEdison in Oahu, Hawaii, has reported that specially trained search dogs teamed with humans are more efficient and effective than human-only search methods (KAW HCP 2014). Kaheawa Wind Power (KWP), a wind energy facility managed by SunEdison and based in Maui, could also benefit from a canine/handler downed wildlife monitoring program. However, due to the difficult environmental challenges and a concern for endangered species found inhabiting the project site, a trial period to study canine efficiency at the wind facility was proposed. Teresa Gajate, a seasoned canine handler, and her dog, Makalani, were contracted for this trial. Makalani was specifically selected and trained for the KWP project site with the understanding that high winds, variable weather, high vegetation, uneven terrain and onsite endangered wildlife are all sensitive aspects that would need to be mitigated for. During an intensive nine-month preparation, Makalani was successfully trained in obedience, socialization, conditioning and searching. A 20-week Canine Efficiency Trial was then conducted between September 2014 to and February 2015. The study was developed to determine the feasibility of canine monitoring at the KWP with the project site's specific constraints in mind. This report reviews the selection and training of the canine as well as trial methodology, results, and final recommendations.

Selecting a Canine

Every canine is an individual, just as every human is, thus there is no fool-proof formula for selecting the perfect search canine. However, for the knowledgeable trainer many factors, such as breed, bloodlines, age, size and temperament, can be taken into consideration to create an informed prediction. As a general rule, working canine breeds (as opposed to toy or show breeds), are more capable of handling the intense requirements of searching. Breed can also help determine whether the canine will have hunt drive or prey drive, as well as the approximate size and weight of the canine as an adult. A search canine must be non-aggressive to people and other canines, have good work ethic, and be both confidant and friendly. Breed and bloodlines are the first determining factors in canine selection, and are considered together. Just because a puppy may be of a working breed, if the parents are not working dogs, there is a low chance of the puppy being a good worker. It is especially important for the dog to have a strong working mother. Bloodlines can also be a strong indicator of temperament and the trainer can often meet both parents and see them work. Once a breed is selected, age is the second determining factor. A puppy is considered available to train between the ages of 8 weeks to 1 year. If a puppy is available, the trainer has the opportunity to tailor their training to the specific requirements of the job, working with a "blank slate". A closer relationship may also exist between trainer and canine when raised from a puppy, which can mean the team, can begin working sooner. However, a downside of starting with a puppy is there is more chance involved. One can never fully predict if a

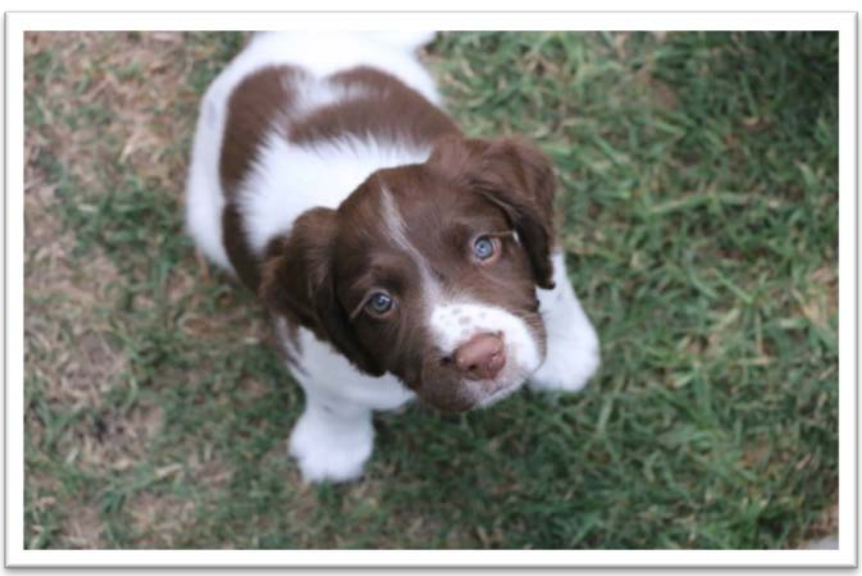

Figure 1. Makalani, 8 weeks old

puppy will succeed or fail as a search canine until the training is nearly complete. An adult dog between 1 to 2 years is beneficial because some of the basic training is oftentimes already completed, and the canine is already of age to work, which can shorten training time. There is also less risk using an adult dog as their ability to work is already known. Any canine over two years is not desired due to the fact that they often come with baggage – such as poor training, bad habits and questionable history. Finally, size is often a determining when selecting a canine depending on the type of work the dog will be engaged in. Size can affect a canine's health, their ability to work an area, ease and economy of travel, and a smaller canine can be easily carried if injured.

Training and Assessment

Every trainer will have their own style and techniques, which must be tailored to the canine being trained. While methods are individual, an experienced trainer should always begin with a basic foundation of the most critical skills, have a reliable timeframe for training, and an assessment of the canine in key areas to determine whether they are suitable to begin work. With over fifteen years of experience in training search canines, Teresa uses a very reliable timeline (Table 1). Makalani took to his training with particular alacrity, and was able to begin working sooner than average, at 8 months of age and only after 5 months of training.

Table 1. Canine handler, Teresa Gajate's training timeline for working dogs.

Age of Canine	Training Time Prior to Work
Puppy (8 weeks to 1 Year)	1 to 1.5 years
Adult (1-2 Years)	6 months to 1 year

Training Foundation

Five main phases of training were to be met with success before the canine could enter the Kaheawa project sites. These phases include obedience, socialization, conditioning, source familiarity and assessment. Obedience is the understanding of precise commands with an instant response time along with specific search commands for recall and emergency stop. Because KWP has definitive requirements in regards to avoiding wildlife, Makalani could not be distracted by protected or common wildlife and needed to always be aware and alert to commands.

Socialization was necessary in order to make sure the canine is able to conduct himself calmly and passively in a wide variety of situations. The canine must be able to handle stress of travel in either a plane or car, and must be able to remain in a crate for long periods of time. Socialization training followed the guidelines of the Canine Good Citizen Certification (CGC) and Airport Etiquette test to fully prepare the dog. Conditioning was necessary to train the physical body of the dog. A search canine must be conditioned to have high stamina and tough paw pads to handle rough terrain in order to effectively search for extended periods of time. Source familiarity is a training process to recognize the target odor(s) source. During this phase of training, Teresa attempted to recreate the targeted sights and smells of the KWP project site in order to mimic a working trial.

Scent of both SEEF species and HCP species were used to train the canine to distinguish between target odors and distractions (undesired odors). As a general rule, training a canine to recognize a target odor is achieved by associating the desired odor with a reward, thus inspiring canine to search out that odor. A canine must be able to continue working, even if there is no odor, and thus no reward, to find. He must be able to work through fatigue, to a reasonable extent, and not be deterred by difficult terrain. A successful canine/handler team relies heavily on the ability to communicate effectively. The handler must be able to comprehend and recognize the difference between searching and crittering. Crittering is the term used for the actions of a canine in which while working, chase wildlife found in the search area. A handler needs to know the difference between a false alert and a genuine alert, and any other specific tics of the canine. A fully trained canine should never give false alerts or be prone to crittering.

Assessing a canine/handler team is the last step in training in order to evaluate a working dog. The assessment is performed by an independent detection canine evaluator to ensure honest and reliable appraisal of the canine, and canine/handler team working together. Teresa and Makalani were evaluated as a successful team and began canine assisted searcher efficiency trials at KWP on September 25, 2014.

Trial Methodology and Factors Considered

Trials were developed to be completely random and unbiased. Randomized points were created for KWPI and KWPII in bare, grass and shrub vegetation classes using ArcMap© random point generator. Trials were either "blind" or "double blind". Blind trials were placed by a SunEdison technician monitoring the study. Double blind trials were placed by a technician, Biologist or contracted personal without previous notification to the handler or technician monitoring the study. Carcasses were thawed prior to placement and were dropped at the generated point location on the morning of each trial. Small medium and large carcasses were used as surrogates for target HCP species. Small class surrogates, representing bats, were dark-colored rats, Wedge-tailed Shearwaters (WTSH) were used for medium surrogates to represent seabirds, Canadian Geese (CAGO), ducks, and chickens were used as large surrogates representing the Hawaiian Goose, or Nēnē. CAGOs were obtained from the USDA-APHIS in Alaska. WTSH carcasses are generally deceased fledglings that have been found by the public and delivered to Sea Life Park on Oahu. Rat carcasses came from Layne Laboratories, Inc. in California, a pet food company. These rats are brown and/or black and are the Layne Laboratory "Small Colored" size category (approximately 11.3 cm in body length) and were chosen to mimic body size of Hawaiian hoary bats (Figure 3). The chickens and ducks were locally sourced from Maui Farmers.

Figure 2. Makalani alerting on a small rat

Figure 3. Hawaiian hoary bat and rat SEEF comparison used in trials

KWP plots were searched without a canine 1-3 days prior to canine monitoring as part of the regular KWP monitoring interval and to serve as a comparison. Throughout the study, the canine team was partnered with a KWP technician. The technician conducted a complete preliminary search of the area to ensure there was no Nēnē or Pueo near or within the plot before the canine was allowed to search. During the trial, the technician would continue to observe the area for HCP species while the plot was searched by the canine.

Comprehensive environmental and trial efficiency data were logged regularly; each SEEF was considered a separate "trial" for statistical purposes (Table 2). Special considerations were made to ensure a further unbiased approach in consideration of the canine's olfactory senses. As a means of limiting odors that did not pertain to the SEEF carcass, sandwich gloves and zipties were used in place of latex gloves and duct tape to place and identify SEEFs during KWP proctored trials. SEEFs were "thrown" or tossed to the point location and proctors avoided walking in a straight line when moving the carcass. Proctors were rotated to avoid canine familiarity or human association to SEEF carcasses. Plots were also searched in which no carcasses were placed in order to ensure the canine was thoroughly searching an area regardless of carcass presence.

Table 2. Comprehensive environmental and trial efficiency data for KWP project sites.

KWPI		KWPII	
Average Wind Speed (mph)	7.65	Average Wind Speed (mph)	9.84
Average time on plot (min)	49.62	Average time on plot (min)	48.26
Average Temperature (F)	77.52	Average Temperature (F)	78.51
Max wind speed (mph)	27	Max wind speed (mph)	29
Overall number of SEEFS	124	Overall number of SEEFS	123
KWPII Double Blind SEEF trials	25	KWPII Double Blind SEEF trials	11
KWPII WEST SEEF Finds	9	KWPII WEST SEEF Finds	13

Results

The Canine Searcher Efficiency Trial consisted of a total number of 247 separate SEEF trials with 189 blind trials and 36 double blind. On average, Makalani took 48 minutes to complete the searching of a 75m plot; this included breaks for carcass identification and collection (Figure 4). Overall total results showed a canine searcher efficiency percentage of 93.9% (Table 3). No correlation was found between searcher efficiency and vegetation class. However, the time it takes to find a SEEF in dense (shrub) vegetation is significant, showing a positive correlation between thicker vegetation classes and the time taken to locate a carcass (Figure 5). There is little association between searcher efficiency and carcass size (Table 3). Due to a fewer number of large-sized surrogates, a random sample was taken to analyze carcass size data. Results showed no difference in searcher efficiency between WTSH and rat findings and a searcher efficiency of 100% using large carcasses. While there is a positive correlation from shrub to bare on KWPI vegetation classes, there is a negative correlation from shrub to bare on KWPII (Figure 6). This is likely due to a lack of shrub-class vegetation on KWPII and a smaller sampling size in comparison to KWPI (Table 3). Overall, results showed a high percentage of searcher efficiency revealing an exceedingly competent canine/ handler team that was successful within the difficult limitations of the KWP project sites.

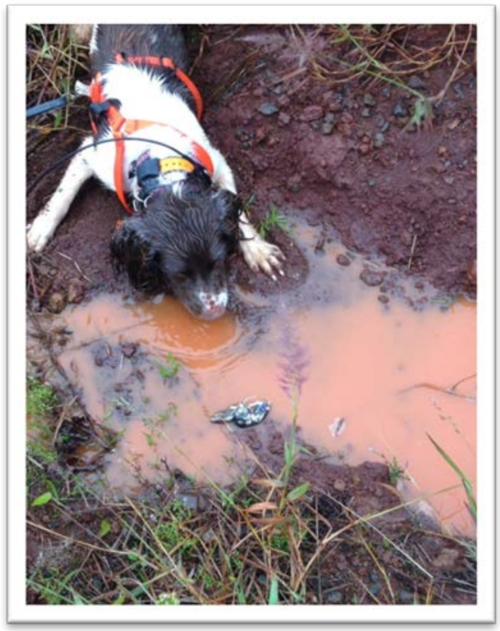

Figure 4. Makalani alerting on a rat carcass located in the rain.

Table 3. Overall results of canine assisted monitoring using three HCP surrogate carcass sizes and three vegetation classes.

Total Overall SEEFs Veg Class				**Total Overall SEEFs Size Class**			
Vegetation Class	Total Possible	Total Found	SEEF%	**Size Class**	Total Possible	Total Found	SEEF%
Bare	51	49	96.1%	**Small**	110	99	90.0%
Grass	170	162	95.3%	**Medium**	116	112	96.6%
Shrub	43	37	86.1%	**Large**	38	37	97.4%
Total	**264**	**248**	93.9%	**Total**	**264**	**248**	93.9%

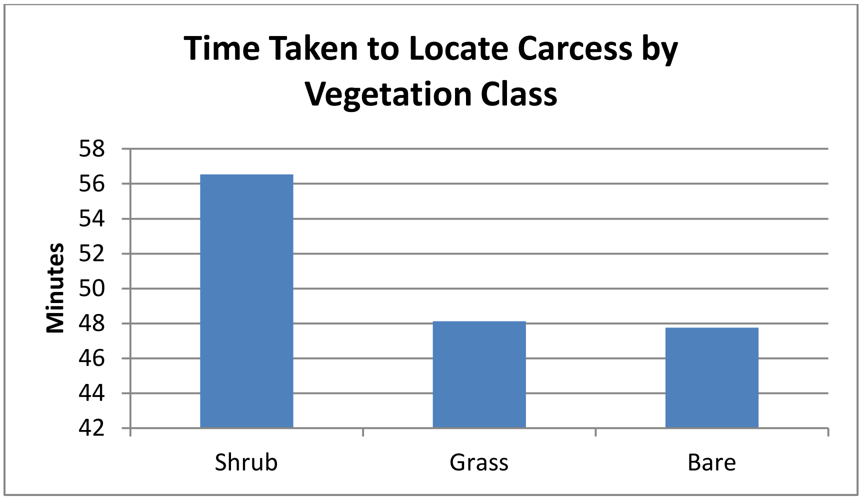

Figure 5. Minutes taken to locate SEEF carcasses at the KWP project site by vegetation class.

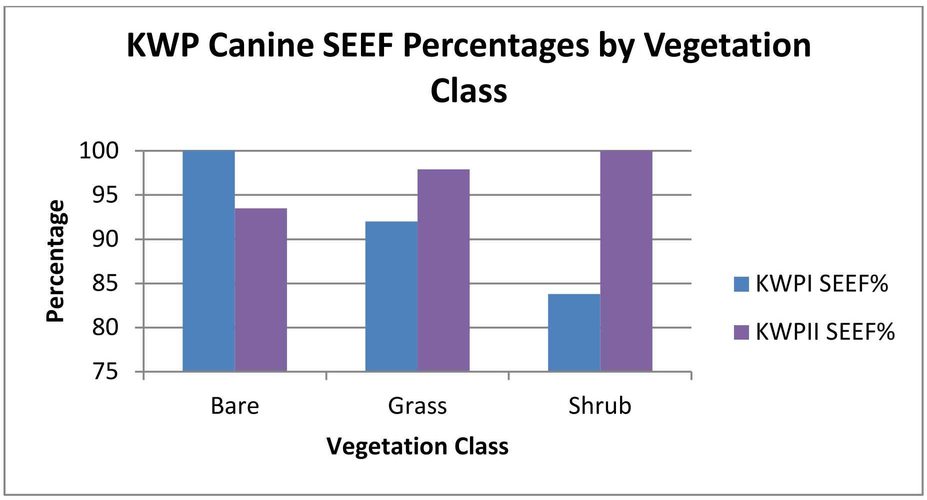

Figure 6. Searcher efficiency percentage by project site and vegetation class.

Table 4. Total SEEF results for vegetation class by project site.

KWP I Overall SEEFs			
Veg Classification	**Total Possible**	**Total Found**	**KWPI SEEF%**
Bare	20	20	100
Grass	75	69	92.0
Shrub	37	31	83.8
Overall	**132**	**120**	**90.9**
KWPI West SEEFS Found	25		
KWPI Double Blind SEEF TRIALS	9		
KWP II Overall SEEFs Veg Class			
Vegetation Class	**Total Possible**	**Total Found**	**KWPII SEEF%**
Bare	31	29	93.5
Grass	95	93	97.9
Shrub	6	6	100
Overall	**132**	**128**	**97.0**
KWPII WEST SEEF Found	12		
KWPII Double Blind SEEF Trials	11		

During the canine trials, a separate, year-long, human searcher efficiency study was conducted by WEST, Inc. WEST is an independent contractor chosen to proctor trials using the same surrogate carcasses and vegetation classes. Carcasses were left up to 30 days in the field to give searcher multiple attempts to locate the surrogates. Searchers were also given the opportunity to search a plot prior to canine trial searching in order to detect and report the carcass first. A total of 37 surrogate carcasses were found and reported by the canine/handler teams that were not first located by human searchers. Of these finds, many of the carcasses detected were originally reported by WEST as "lost in the field" most likely predated or moved, and undetectable. The canine team was able to discover SEEF carcasses under multiple feet of thick grass and the small bones of a rat after over a month without detection by humans. Human searcher efficiency data for the periods of March 2014-March 2015 is described in the table below, showing an overall efficiency of 57.0% in comparison to the canine's 93.9% (Table 5).

Table 5. Human searcher efficiency trial results from an independent trial conducted March 2014-March 2015

WEST, Inc. Human Searcher Efficiency Trials							
Total Overall SEEFs Veg Class				**Total Overall SEEFs Size Class**			
Vegetation Class	Total Possible	Total Found	SEEF%	**Size Class**	Total Possible	Total Found	SEEF%
Bare	194	149	76.8%	**Small**	183	74	40.4%
Grass	170	79	46.5%	**Medium**	172	114	66.3%
Shrub	71	20	28.2%	**Large**	80	60	75.0%
Total	**435**	**248**	57.0%	**Total**	**435**	**248**	57.0%

Notable Finds

A number of notable finds should also be mentioned during the trial in order better describe canine/handler efficiency at KWP. On February 10, 2015 a partially decomposed Eurasian Skylark was found by Makalani 15 meters and 30 degrees from KWPII WTG-13, under approximately 6 inches of rock. The carcass was not visible and it took the canine handler and the technician more than 10 minutes to dig out and identify what the canine was alerting on (Figure 7 and Figure 10).

Figure 7. Makalani notable find: Eurasian Skylark ground under 6" of rock at KWPII WTG-13.

On February 6, 2015, the canine alerted on a small 1" blue ziptie. These zipties were placed around the back legs of a rat, bat surrogate, to identify SEEF trials placed by our 3rd party contractor, WEST. This particular rat SEEF had been missing for two days, most likely predated, and the tag that had been found was moved from its original drop location (Figure 8).

On February 19, 2015, a portion of a Nēnē carcass was found by an HCP Technician on KWPI WTG-12. The technician continued to search the area for over one hour but was unable to locate the rest of the carcass. Makalani was onsite and was able to alert on the head and a portion of the breast within 15 minutes. Several instances were also noted of the canine alerting on SEEFs in such deep brush, both shrub and high grass, that it would take both the technician and Teresa several minutes to locate the carcass (Figure 9).

Figure 8. 1" blue ziptie normally used to identify rat SEEF carcasses was located separately by

Interactions with Wildlife

While special precautions were taken to limit canine interaction with wildlife, it was also understood that these dealings could be possible. Due to Makalani's obedient nature and strong training regime, it was decided that a muzzle could negatively affect canine searcher efficiency and was therefore unnecessary. The handler was directed to immediately call back Makalani if Nēnē were observed and to place him on lead if Nēnē were more than 50m away and present within the project area. Throughout the trials all interactions Makalani had with any wildlife (both protected and non-protected) were monitored and recorded.

Figure 9. Makalani alerting in dense vegetation

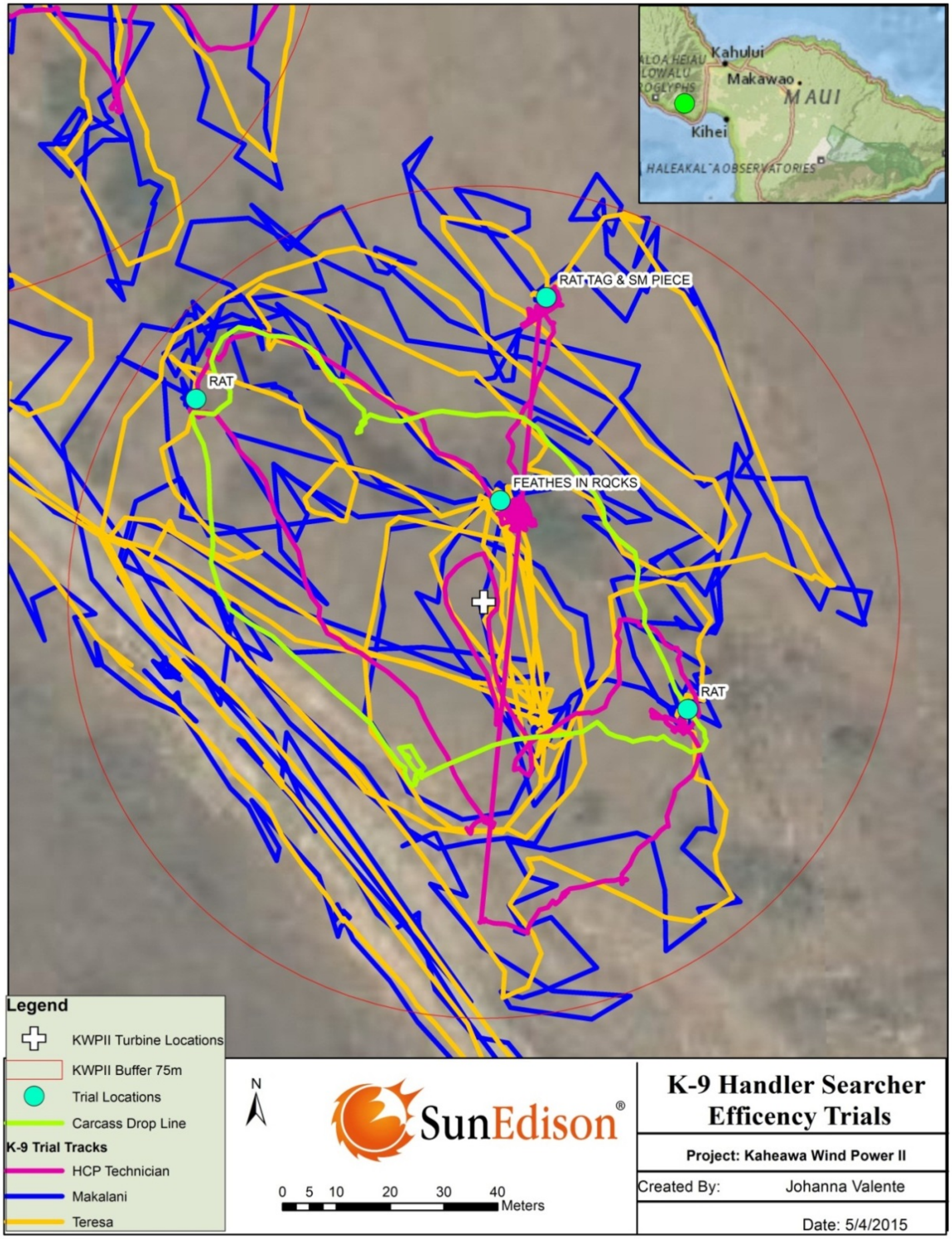

Figure 10. Makalani's tracks associated with his SEEF detections and the locating a Eurasian Skylark carcass on February 10, 2015 found at KWPII WTG-13.

Analysis of Canine Tracks

In past studies of canine efficiency, it has been noted that canine searcher techniques rely heavily on environmental factors, wind speed and direction in particular, in order to pick-up the scent of a carcass (Arnett 2006). In many aspects, scent works in a similar manner as smoke or liquids. Scent follows the slope of the path of least resistance. Scent rises from its original source, and makes multiple circles; reaching a high spot in the air and looping back toward the ground and collecting in "pools" and diffusing (Figure 11). Scent is highly dependent on environmental topographical factors, such as humidity, precipitation, air temperature, vegetation and topography. The scent could fall into low areas away from the target carcass or rise up with warm air and be carried away. Both of these factors have a tendency to confuse a canine. Commonly, scent cones are used to describe the natural movement of a scent and a canine's technique towards the target odor. Coning plumes are the movement of scent away from the carcass and widening as the distance between the carcass and the scent grows, diffusing in the shape of a cone. Canine "cone" tracks will often show a wider search initially and tightening its pattern as they are able to narrow down to the location of the scent (Figure 12) (Sjrotuck 200).

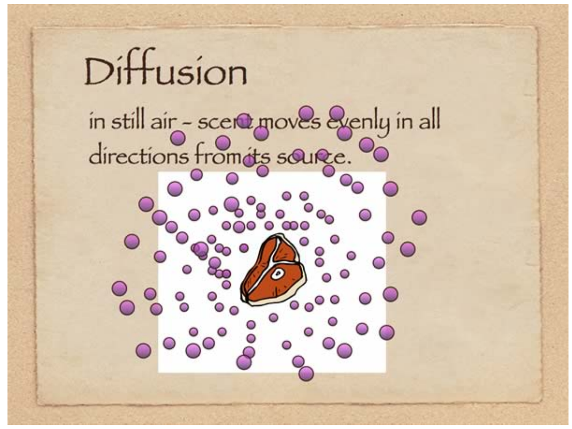

Figure 11. Illustration of scent diffusion

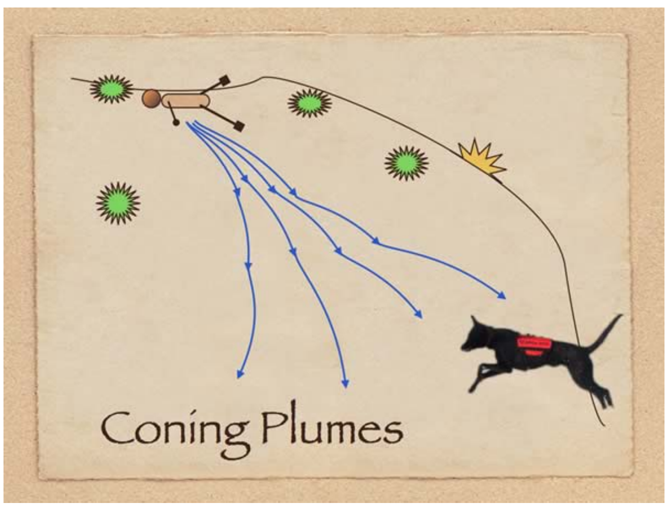

Figure 12. Illustration on coning pattern.

In order to better understand canine approached searching, Makalani was outfitted with a Garmin© Astro Collar and GPS tracking device to record his search pattern. Canine handler Teresa Gajate and HCP Technician Matthew Pratt also carried GPS devices to record their tracks simultaneously to also study the canine's reactions to its handler and the trial proctor. In Figure 10, lines show the tracks of Matthew, Teresa, Makalani, and the "Carcass Drop Line" in which Matthew placed thawed carcasses during the early morning of the search date. Matthew also collected data related to the turbine plot searched available on Table 6. From an analysis of Figure 10, we can say that Makalani and Teresa started on the West side of the plot, working at a perpendicular angle to the wind direction (SW). From the sharp tracks of the western portion of the plot, it is clear that Makalani did not catch the scent of a carcass until moving above (NE) of the carcass at close range. He then makes a clear move to the location of the scent and seems to bound around a bit nearby (most likely being rewarded). Makalani then moves to find the Eurasian Skylark, as previously mentioned, an unknown, decomposed fatality that had been buried in the gravel at the edge of the turbine pad. Moving from the location of the rat, there is a decisive line directly to the fatality, and Makalani must have caught a clear scent. From the fatality, the canine progressed first to the left (SE) of the WEST SEEF and then above it (N) before targeting in on the odor.

Finally, from the West SEEF, Makalani catches the scent and moves toward the carcass in a "cone" form from the SE until detected. It is also clear from the carcass drop line used by Matthew earlier in the day that Makalani was not tracking the scent of the proctor or the proctor's tools to follow his trail to the carcasses as the tracks do not align in any form.

Table 6. Data taken for Canine Trials KWPII WTG-13 on February 10, 2015

Plot Data: February 10, 2015	
Time:	09:20-10:33am
Location:	KWPII WTG-13
Temperature:	72°
Average Wind Speed:	8-10 mph
Wind Direction:	SW
Precipitation:	Light drizzle with fog
Cloud Cover:	100%
Total Minutes on Plot:	73

Recommendations and Conclusions

The canine efficiency study conducted at the Kaheawa Wind Power facility shows that a canine's ability to detect a carcass is superior to a human searcher and more efficient. Each 73-75m radius plot averaged 48.3 minutes per plot, including time for data collection and breaks. This is approximately 1/3 of the time it would take a human monitor to search the same area. Based on a comparison of results between human SEEF trials and Canine trials, a canine/handler team with averages of 94% is more effective than the human average of 56%. Yet there are many other variables to take into account.

For example, while the canine is a more efficient searcher based on minutes in the field, three hours was found to be approximately the maximum amount of time the canine would be able to work in a given day. The canine is also more sensitive to the elements, particularly heat, and would not be able to perform at strongest efficiency under straining environmental conditions. As noted previously, while it is recommended to carefully choose a puppy with good breeding lines, it cannot be guaranteed that the canine chosen will become a good working dog.

Therefore, if available, it may be an advantage to the company to choose a canine/handler team with previous conservation and wildlife detection experience to match the needs of the project site. Most importantly, it is not the canine that should be seen as the investment, but rather the trainer and handler. While a working dog is an excellent tool for efficient conservation work, an experienced trainer/handler must be carefully selected to create a positive team relationship that will "drive" the canine towards the level of work required. The amount of skill and experience needed of the handler paired with the special requirements of the canine is not cost efficient in comparison to a single human tasked with downed wildlife monitoring and general field work.

It is recommended that the acquisition of canine/handler teams focus on the unique needs of a particular project site (in this case KWP). The most cost-effective method would most likely be to hire a highly skilled trainer to manage 3-5 canines and 2-3 technicians with canine experience. Technicians would then be able to search multiple plots daily by exchanging canines throughout the day and accomplishing other general field work as needed. A separate program manager would also be necessary to run and report data and ensure the program's compliance. Contracted canine/handler teams could also be used but would require a greater expense to hire multiple canines and/or canine handlers to complete weekly searching regimes required during intensive monitoring periods.

In conclusion, the most effective method of searcher efficiency found at Kaheawa Wind Power is the use of a skilled canine/handler team. Focusing on the needs of a specific project site, the budget available, and preparing in advance for the requirements of intensive monitoring, will yield strong and positive results.

END

Appendix 5. Take Estimation for Nēnē at KWPII.

Credibility level (1 - ?)					Posterior distribution for total fatality for 3 years.					
0.8						g = P(observe| arrive):	0.648	95% CI:	0.624	0.672
Yr	Observed Fatalities	g	min(g)	max(g)	Years	80% credible maximum:	**7**			
1	1	0.63	0.58	0.657	1	m	P(total = m)	P(total > m)		
2	2	0.659	0.64	0.67	2	0	0	1		
						1	0	1		
						4	0.248	0.575		
						5	0.218	0.356		
						6	0.153	0.203		
						7	0.095	0.108		

Appendix 6. Take Estimation for Bats at KWPII.

Credibility level (1 - ?)						Posterior distribution for total fatality for 3 years.				
0.8						g = P(observe| arrive):	0.299	95% CI:	0.208	0.399
Yr	Observed Fatalities	g	min(g)	max(g)	Years	80% credible maximum:	**18**			
1	1	0.372	0.211	0.553	1	m	P(total = m)	P(total > m)		
2	2	0.314	0.214	0.43	1	0	0	1		
3	0	0.211	0.112	0.337	1	1	0	1		
						11	0.071	0.524		
						12	0.067	0.457		
						17	0.038	0.211		
						18	0.033	0.178		

Appendix 7. Nēnē Accumulated Indirect Take and Lost Productivity at KWPII.

Year	2013	2014	2015	
Observed Fatality	1		2	
Estimated Fatality Multiplier	2.33		2.33	Total
Estimated Fatality	2.33		4.66	**7.0**
Indirect Take Multiplier			0.09	
Indirect Take			0.42	**0.4**
Accrued Take		2.33	2.56	
Lost Productivity Accrued		0.23		**0.2**

Appendix 8. WEOP training log for FY 2015.

Date	Name	Affiliation
7/14/2014	[redacted]	GE
7/24/2014	[redacted]	First Wind
9/2/2014	[redacted]	Altres
9/2/2014	[redacted]	Altres
9/3/2014	[redacted]	Altres
9/5/2014	[redacted]	Rope Partner
9/25/2014	[redacted]	Self-Employed, K-9 Handler
9/30/2014	[redacted]	GE
9/30/2014	[redacted]	GE
10/20/2014	[redacted]t	Maui Nui Seabirds
10/20/2014	[redacted]	Maui Nui Seabirds
11/10/2014	[redacted]	First Wind
12/4/2014	[redacted]	Self-Employed, K-9 Handler
12/4/2014	[redacted]	First Wind
12/4/2014	[redacted]	First Wind
2/7/2015	[redacted]	Family Member
2/9/2015	[redacted]	Self-Employed, K-9 Handler
2/9/2015	[redacted]	Family Member
2/24/2015	[redacted]on	Rope Partner
2/24/2015	[redacted]	Rope Partner
5/6/2015	[redacted]	GE
6/15/2015	[redacted]	SunEdison

Appendix 9. Approved protocol for Diphacinone use at Makamaka'ole.

January 7, 2015

Protocol for Diphacinone Restricted-Use in West Maui

To: Ms. Katie Swift, Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Room 3-122
Honolulu, Hawaii 96850

From: Sarah Scheel, HCP Manager
First Wind Energy, LLC
Kaheawa Wind Power I&II
3000 Honoapiilani Hwy
Wailuku, HI 96793

Re: Updated Protocol for Diphacinone Restricted-Use in West Maui

Scope of Project

SunEdison operates the Kaheawa Wind Power (KWPI and KWPII) facilities at Kaheawa Pastures, West Maui. The KWPI and KWPII wind energy projects are located on State of Hawaii Conservation District land on the leeward slopes of West Maui at elevations between 800 and 3300 ft. In accordance with the State and Federally approved Habitat Conservation Plans (HCPs) for the projects, a final mitigation plan was approved in January 2012 to establish two artificial nest sites protected by a predator resistant enclosure. The enclosed nesting sites are located across the northwestern edge of NARS land, the adjacent leased ranch area, and a portion of the West Maui Forest Reserve.

These nest sites were designed to attract Hawaiian Petrels *(Pterodroma sandwichensis)* and Newell's Shearwaters *(Puffinus newelli)* in order to provide a net conservation benefit for both species. In accordance with the HCPs the preferred location for mitigation is West Maui. As stipulated in the approved plan, KWPI/KWPII has constructed two enclosures totaling approximately 7.41 acres (3.92 and 3.49 respectively) that were completed on September 5, 2013. Both enclosures were constructed using guidelines established in collaboration with the NARS and DOFAW. Installation of the fence was accomplished by Maui Feral Animal Removal Experts (FARE) with consultation from Steve Sawyer of EcoWorks Global.

This scope includes completely eradicating feral cats, mongoose, rats and mice inside the enclosures (Figure 1) and controlling any future ingress using a combination of bait stations that contain Diphacinone and lethal traps.

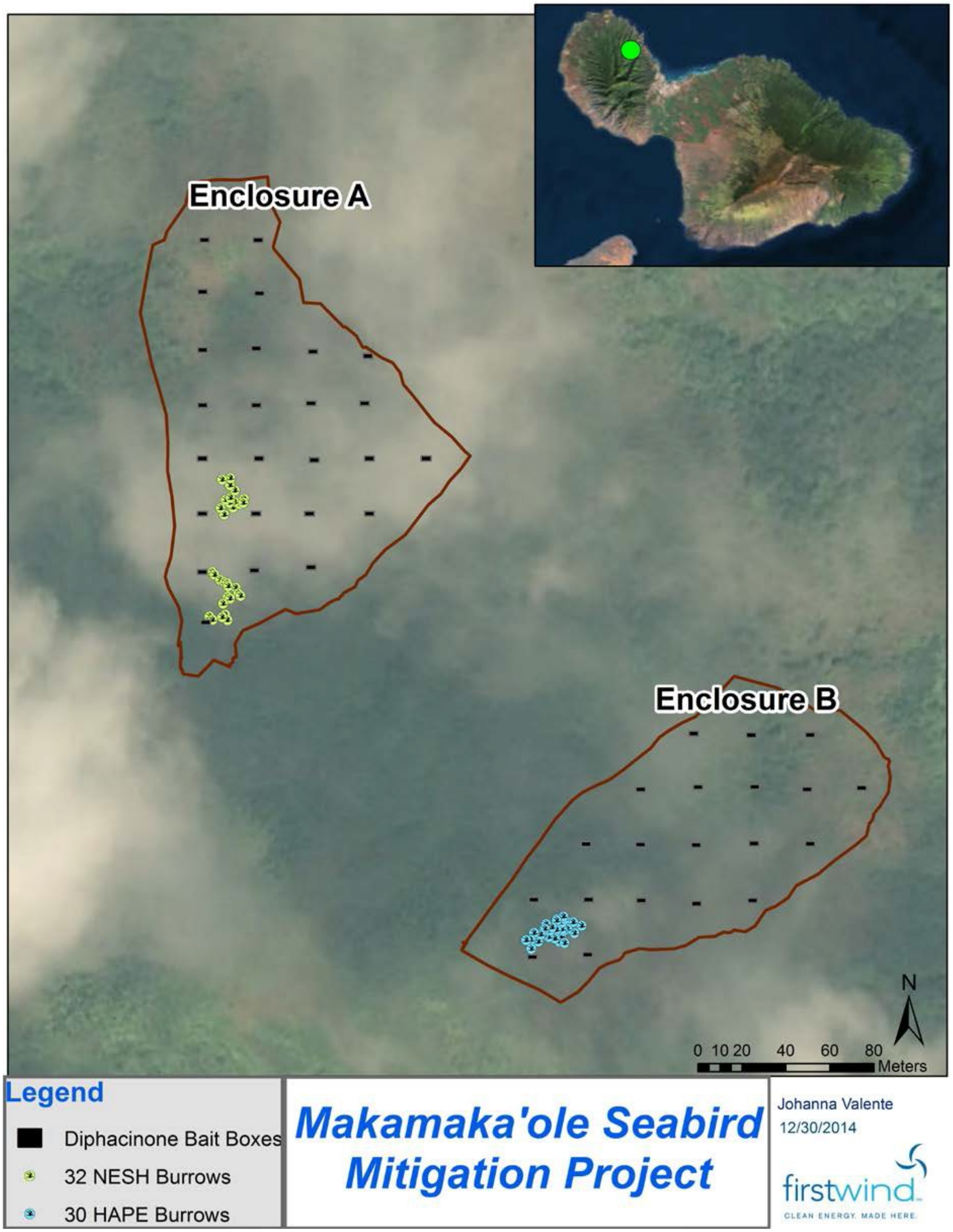

Figure 1. Diphacinone bait box placement inside Enclosure A (25) and Enclosure B (20).

Methods

Location

Diphacinone is, and will only be, used inside the two fenced enclosures (Enclosure A and Enclosure B). The enclosures are situated on three different land jurisdictions owned by the State of Hawaii within the Conservation District: West Maui Natural Area Reserve (Kahakuloa Section); West Maui Forest Reserve; and a privately-leased parcel. To further reduce predator ingress into the enclosures, lethal trapping methods that target rodents, mongoose, and feral cats are employed within a 25-foot buffer surrounding the enclosures, where practicable. Signs and warnings of these lethal trapping methods are posted outside each enclosure.

Access

There is limited public access to where the fenced enclosures are located; the enclosures themselves are locked and public access is not permitted without explicit approval, as dictated by signs on the enclosure doors. An ungulate fence was installed by DLNR along the northern border of the project area in 2007, in order to minimize ungulate access. As a result of this fence, and combined with feral animal control measures already in place by DLNR, feral pigs are rarely found.

Applicators

Sarah Scheel, Manager HCP Compliance (Certification #C40710)
Kaheawa Wind Power I&II
3000 Honopiilani Hwy
Wailuku, HI 96793
Phone: 808-463-3005
Cell: 808-292-9358
Email: sscheel@firstwind.com

Spencer Engler, Makamaka'ole Lead Technician (Certification #C40711)
Kaheawa Wind Power I&II
3000 Honopiilani Hwy
Wailuku, HI 96793
Phone: 808-866-7917
Email: sengler@firstwind.com

Additional Applicators

Other First Wind staff and/or collaborators (TBD) will work under the supervision and training of Sarah Scheel and Spencer Engler.

Target Species

Black Rat/Ship Rat/Roof Rat (*Rattus rattus*)
Norway Rat (*Rattus norvegicus*)
Polynesian Rat/ Pacific Rat (*Rattus exulans*)
House Mouse (*Mus musculus*)

Bait Stations

Locking tamper resistant Aegis-RP bait stations (Figure 2) were procured from Crop Production Services, Kahului, Hawaii (808-871-2622).

Bait

Ramik® Mini-bars, active ingredient Diphacinone, (Figure 3) were procured from Del's Farm Supply, Kahului, Hawaii (808-873-0101).

Figure 2. Aegis-RP locking tamper resistant bait station.

Application of Diphacinone

Eight Ramik® Mini-bars (1 oz. each) are placed in each bait station. Bait stations are 25 meters apart in a grid totaling 25 in Enclosure A and 22 in Enclosure B (Figure 1). Bait stations were first deployed concurrently with the initial enclosure construction (October, 2012) and will continue to be used. A combination of Victor™ Rat snap traps and Doc 200™ body grip traps, all encased in "bird safe" boxes, are also used within the enclosures as an added measure to eliminate rodents. Both forms of eradication will continue for the life of the project.

The bait stations are checked at least once every two weeks, and replaced or replenished as needed. Actual check frequency will depend on consumption, spoilage rates, and rodent activity determined by tracking tunnel results and lethal trapping efforts. There is potential to add additional Ramik ®Mini-bars per bait station (up to 16 per station) if the rodent population increases. The label permits a more aggressive distribution for very dense rodent populations.

Storage of Diphacinone

In accordance with the label, Ramik® Mini-bars are stored in their original container inside a lockable cabinet, within the HCP Manager's office at the Kaheawa O&M building inaccessible to children and non-target animals (Figure 4).

Figure 4. Ramik® Mini-bars stored in their original container, inside a lockable cabinet, within the Kaheawa O&M HCP Manager's office.

Monitoring of Efficacy of Diphacinone

Tracking tunnels inside each enclosure were deployed prior to baiting to obtain a baseline of rodent activity. These tunnels will be deployed at least every other month, within the enclosures during and after active baiting to ensure the rodent population remains down. The amount and frequency of Diphacinone deployed at each bait station is also recorded.

Disposal of Diphacinone

In accordance with the label, and their customer service, Ramik® Mini-bars will be transported offsite and disposed of with other household garbage.

RESTRICTED USE PESTICIDE

DUE TO HAZARD TO NON-TARGET SPECIES

For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

For use by government conservation agencies and their authorized representatives only.

ACCEPTED

December 17, 2013

Under Hawaii Pesticides Law
As Supplement to Product No.
9084.9

Ramik® Mini Bars
All-Weather Rat & Mouse Killer

EPA REG. NO. 61282-26

SLN No. HI-980005

ACTIVE INGREDIENT:

Diphacinone (2-Diphenylacetyl-1, 3-Indandione)……………………………..	0.005%
OTHER INGREDIENTS: ……………………………………………………………	99.995%
TOTAL: …………………………………………………	100.000%

SPECIAL LOCAL NEED SUPPLEMENTAL LABEL

For Distribution and Use Only in the State of Hawaii

For Control of Rodents and Mongoose

For use only in forests, wetlands, coastal areas, offshore islands, and other non-crop areas to protect native Hawaiian plants and animals

FOR CONSERVATION PURPOSES ONLY

This label is valid until December 16th, 2018, or until otherwise amended, withdrawn, cancelled, or suspended.

KEEP OUT OF REACH OF CHILDREN
CAUTION

ENVIRONMENTAL HAZARDS

This product is extremely toxic to mammals, birds and other wildlife. Dogs, cats and scavenging mammals and birds might be poisoned if they feed upon animals that have eaten this bait. Do not apply directly to water or to intertidal areas below the mean high water mark. Do not allow bait to be exposed on soil surface. Do not contaminate water when disposing of equipment wash water.

See Federal label (EPA Reg. No. 61282-26) for complete precautionary statements.

If signs of poisoning or potential exposure to animals other than the target species on this label, and/or damaged or vandalized bait stations are discovered, bait must be removed from all bait stations or all of the bait stations removed. Report these adverse events to the Pesticides Branch of the Hawaii Department of Agriculture (HDOA) within 24 hours [Phone: (808) 973-9401]. Bait stations cannot be rebaited or placed back into the area without permission from HDOA and USFWS.

ALL users shall submit a written description of the proposed baiting program to the U.S. Fish and Wildlife Service, Pacific Islands Fish & Wildlife Office. Descriptions must be submitted **at least** six weeks prior to the proposed initiation of treatment. In addition to details of how the proposed use will comply with the label, the submittal should include a map of the locations of each bait station and the resource(s) to be protected, and a plan to monitor impacts on target species and resource response. Baiting cannot be initiated until the proposed use has been approved by the U.S. Fish and Wildlife Service. Submit to: U.S. Fish & Wildlife Service, Pacific Islands Fish & Wildlife Office, Rm. 3-122, 300 Ala Moana Blvd., Honolulu, HI 96850. Telephone: (808) 792-9459, Fax: (808) 792- 9581. Proposals may be submitted via email to BaitStationReview@fws.gov.

STORAGE AND DISPOSAL

See Federal Label (EPA Reg. No. 61282-26) for "**STORAGE AND DISPOSAL**" text.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Persons using this product shall comply with all applicable directions, restrictions, and precautions found on this labeling and that of the label of the federally registered product (EPA Reg. No. 61282-26) upon which this use is based. This label must be in the possession of the user at the time of pesticide application.

READ THIS LABEL: Read this entire label and follow all use directions and precautions. To be used only for the sites, pests, and application methods described on this SLN label. **IMPORTANT:** For use in tamper resistant bait stations only. Do not expose children, pets, or other non-target animals to rodenticides. To help prevent accidents:

1. When not in use, store this product in a location out of reach of children and pets.
2. **Apply bait in tamper-resistant bait stations only.** These stations must be resistant to destruction by dogs and children under six years of age, and must be used in a manner that prevents children from reaching into bait compartments and obtaining bait. Bait must be placed on rods within the bait stations so that it cannot be removed from the stations. In areas prone to vandalism or where feral pigs are present, bait stations must be anchored to the ground or in trees to prevent access to the bait.
3. Dispose of product container, unused, spoiled and unconsumed bait, and damaged bait stations, as specified on the Federal label (EPA Reg. No. 61282-26).

USE RESTRICTIONS: For the control only of Indian Mongoose (*Herpestes auropunctatus*), roof (black) rats (*Rattus rattus*), Norway rats (*R. norvegicus*), Polynesian rats (*R. exulans*), house mice (*Mus spp.*), and other invasive rodents in native ecosystems, such as forests, wetlands, coastal areas, and offshore islands, and other non-crop areas, to protect native Hawaiian plants and animals.

Do not apply bait in a manner in which it may contaminate water sources. Do not apply bait in flood prone areas if flooding is expected to occur during the treatment period.

APPLICATION DIRECTIONS: Bait stations must be placed in one of the following configurations: a square or rectangular grid, a grid based on triangular equidistant points, or a circular web configuration. New placements must be stocked with 16 ounces of bait (16 blocks) until bait remains in the stations for several subsequent checks. Bait stations must be checked frequently enough to maintain an uninterrupted supply of fresh bait. Under most conditions, stations must be checked at no greater interval than every 14 days. New placements may need to be checked as often as every other day, until bait take declines. New placements also need to be checked more frequently to ensure there are no problems with nontarget exposure or vandalism. During periods when an independent monitoring method (such as tracking tunnels or chew cards) indicates that target species activity is increasing, the frequency of checking stations may need to be increased. Bait stations must contain no fewer than 8 blocks of fresh bait. Replace contaminated or spoiled bait. Do not use bait stations for mouse or rat control during a mouse population irruption.

FOR RATS and MONGOOSE: A buffer of bait stations must extend a minimum of 225 meters (740 feet) in all directions for rats and 550 m (1800 feet) for mongoose beyond the boundary of the resource to be protected. The presence of a coastline or pest-proof fence bordering the resource on one or more sides would permit the truncation of the prescribed buffer in the direction of the water or fence. Intervals between stations within the grid must be 25 to 50 meters (75 to 150 feet), with allowances where localized on-the-ground conditions preclude adherence to this distance. **FOR MICE:** A buffer of bait stations must extend a minimum of 100 meters (328 feet) in all directions beyond the boundary of the resource to be protected. The presence of a coastline or pest-proof fence bordering the resource on one or more sides would permit the truncation of the prescribed 100 meter buffer in the direction of the water or fence. Intervals between stations within the grid must be 4 to 25 meters (13 to 82 feet), with allowances where localized on-the-ground conditions preclude adherence to this distance.

Check area for dead animals and spilled bait each time stations are visited. Using waterproof gloves, collect and dispose of any dead animals and spilled bait. Spoiled or uneaten bait and dead animals must be removed from the site and disposed of in a secured, covered trash receptacle or taken to an approved waste disposal facility.

Bait stations must display the name and phone number of the certified applicator. Treated areas shall be posted with warning signs stating, "*This area has bait stations containing diphacinone poison to control rodents and/or mongooses. If you have any questions, please call* (Complete the sign with the name and phone number of the certified applicator and their affiliation). "

24(c) Registrant:
HACCO, Inc.
110 Hopkins Drive
Randolph, WI 53956

Issue Date:	December 17, 2013
Expiration Date:	December 16, 2018
EPA SLN:	HI-980005

Appendix 10. KWPII expenditures for FY 2015.

KWPII	Cost
Permit Compliance	$82,189
Seabird Management	$62,243
Vegetative Management	$32,736
Fatality Monitoring	$35,310
Equipment and Supplies	$11,854
First Wind Labor	$208,328
Total Cost for FY 2015	**$432,660**