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STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

DEPT. COMM. NO. 9

October 9, 2017

The Honorable Ronald D. Kouchi,
President
and Members of the Senate
Twenty-Ninth State Legislature
State Capitol, Room 409
Honolulu, Hawaii 96813

The Honorable Scott K. Saiki, Speaker
and Members of the House of
Representatives
Twenty-Ninth State Legislature
State Capitol, Room 431
Honolulu, Hawaii 96813

Dear President Kouchi, Speaker Saiki, and Members of the Legislature:

For your information and consideration, I am transmitting a copy of the Interim Report Regarding The Pueo Study Conducted By The Department Of Land And Natural Resources And The University Of Hawaii At Mānoa For The Period April 1, 2017 – August 1, 2017, as required by Senate Resolution 6, Senate Draft 1, Regular Session of 2017. In accordance with Section 93-16, HRS, a copy of this report has been transmitted to the Legislative Reference Bureau and the report may be viewed electronically at http://dlnr.hawaii.gov/reports/.

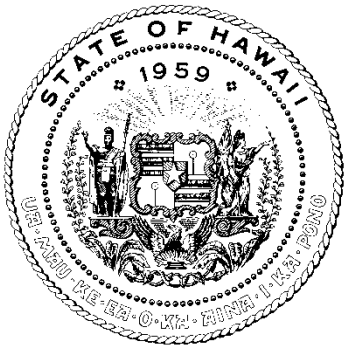
Sincerely,

SUZANNE D. CASE
Chairperson

Enclosure

REPORT TO THE TWENTY-NINTH LEGISLATURE
STATE OF HAWAII
2018 REGULAR SESSION

INTERIM REPORT REGARDING THE PUEO STUDY CONDUCTED BY THE DEPARTMENT OF LAND AND NATURAL RESOURCES AND THE UNIVERSITY OF HAWAII AT MĀNOA FOR THE PERIOD APRIL 1, 2017 – AUGUST 1, 2017



Prepared by

THE STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
&
THE UNIVERSITY OF HAWAII AT MĀNOA
COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT

In response to
Senate Resolution 6, Senate Draft 1
Twenty-Ninth Legislature
2017 Regular Session

Honolulu, Hawaii
October 2017

The Pueo Project

Summary of activities April – August 2017

Population size, distribution and habitat use of the Hawaiian Short-eared Owl (*Asio flammeus sandwichensis*) on O'ahu

Dr. Melissa Price & Dr. Javier Cotín

College of Tropical Agriculture and Human Resources
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Summary of activities and results

The Pueo project is a collaboration between the Department of Land and Natural Resources (DLNR) and the University of Hawai'i at Mānoa. This study addresses two chief research needs: (1) improved population monitoring; and (2) habitat distribution on O'ahu. The project also engages public participation through a citizen science effort.

During the first two months of the project, a Pueo survey protocol was developed and tested (see annex 1 and 2). During the pre-survey scouting 60 field sites were visited and 260 viewpoints identified and recorded. Additionally, one Pueo nest was found at the Kaneohe Marine Corp Base (MCBH), with evidence of a possible second nest at Hamakua Marsh.

Following the development of the survey protocol, 35 survey sites, from six different habitats types, were randomly selected for standardized surveys. To date, 29 surveys of the 105 (35 sites that will be visited three times each, see details in protocol) have been completed. In total we have detected 11 Pueo and four Barn owls at seven different sites (including the pre-survey scouting).

During the initial four months of the project, utilizing two citizen science approaches, we gathered 90 records of Pueo on O'ahu. Of these, 40 were downloaded from e-bird (a global citizen science network), and 50 were obtained from our own citizen science efforts through the project website www.pueoproject.com (which has received more than 1,400 visitors to date).

Media materials, including leaflets, a blog, Facebook website and twitter account, have been created and are updated frequently with news and progress on the project. By the end of 2017, the project will have been presented in at least ten venues (high schools, biologists, retirement houses, etc.) to reach a broad and local audience. Additionally, the project has been or will be presented in two international congresses, including 2017 Hawai'i Conservation Conference and the 2017 World Owl Congress.

The Pueo project has a great network of collaborators including the Bishop Museum, U.S. Fish and Wildlife Services (USFWS), Maui Nui Seabird Recovery Project (MNSRP), a National Geographic Photographer, and has been in the media and news, including the Star Advertiser and the Midweek magazine.

Expected timeline for the research project

- **April – July 2017:** Develop website, scouting field sites, obtaining permits and access to private, state and federal lands, develop and test survey methodology.
- **August 2017 – January 2018:** Pueo Survey and pre-analysis of data. Continue citizen science project, collaborations and outreach activities.
- **February – April 2018:** Analyze data and develop statistical models.
- **May 2018:** Write Final Report (which will be turned into a publication).
- **June 2018:** Deliver final report to the University of Hawai'i and DLNR Division of Forestry and Wildlife (DOFAW) and public authorities.

Acknowledgments

Thanks to all the land owners that have provided access to their lands, and to the O'ahu residents for their interest and love for the Pueo.

Activities and results

1. Research activities

Aside from the congresses, talks and presentations, the following are the main research activities that have been carried out for the Pueo project.

- Recording the Pueo observations on O‘ahu from e-bird citizen science portal. 40 records.

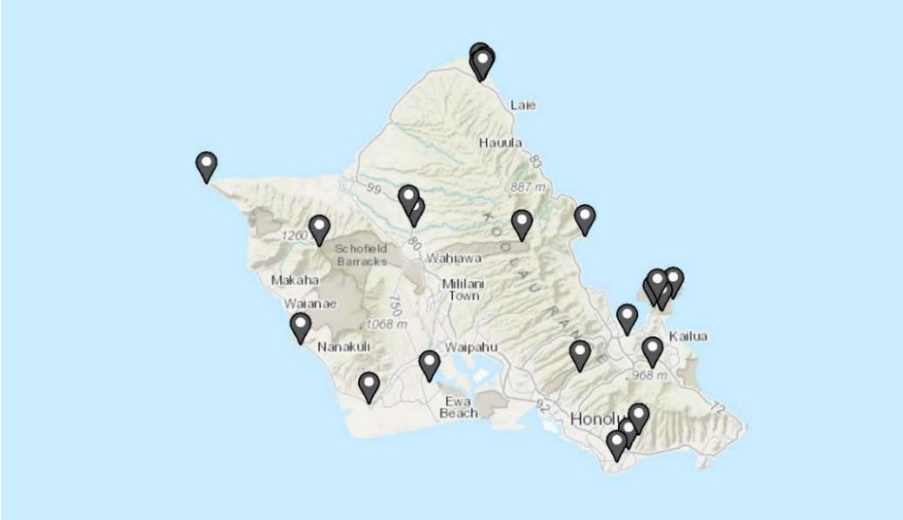

Figure 1. Pueo sightings obtained from e-bird on O‘ahu.

- Recording the Pueo observations on O‘ahu and the Hawaiian Islands through the citizen science portal [www.pueoproject.com.](http://www.pueoproject.com) More than 50 records for the Hawaiian Islands, 45 of them on O‘ahu.

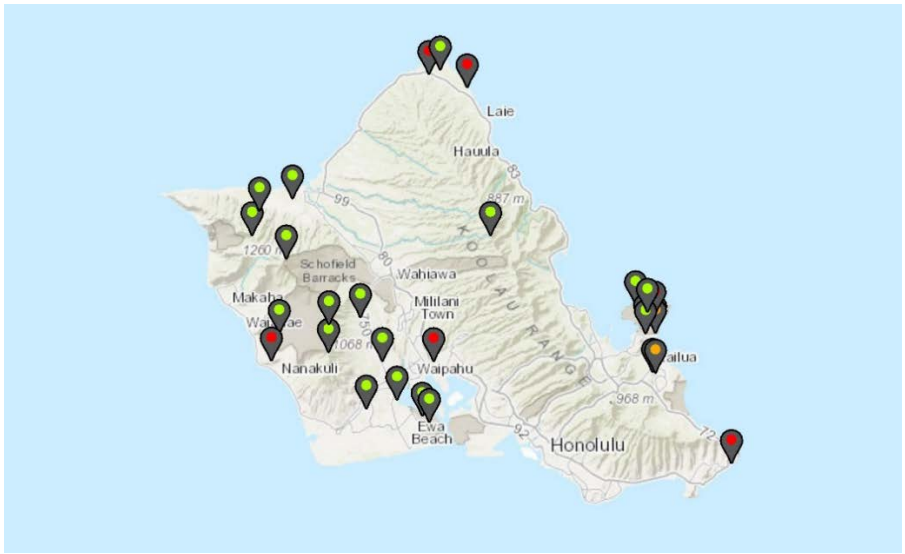

Figure 2. Pueo sightings obtained from the Citizen Science efforts of the Pueo project website.

- Development of a Pueo survey protocol. See Annex 1 and Annex 2 for the protocol.
- Pre-survey development and design. During the first two months, State, Federal and private lands were scouted. 60 sites across the island were visited and 260 viewpoints were recorded (for survey purposes).

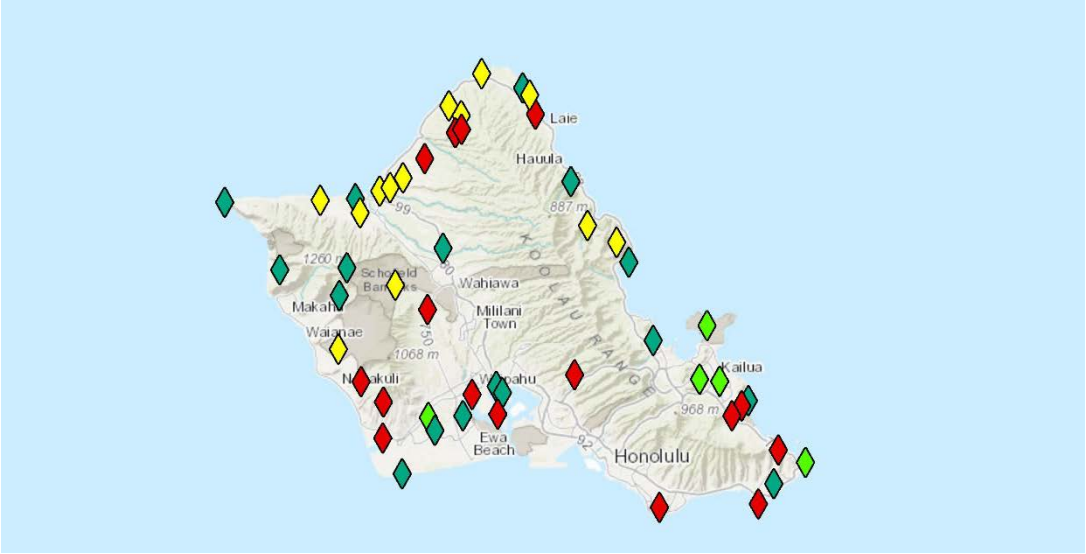

Figure 3. Field sites visited during the survey scouting and development. N=60.

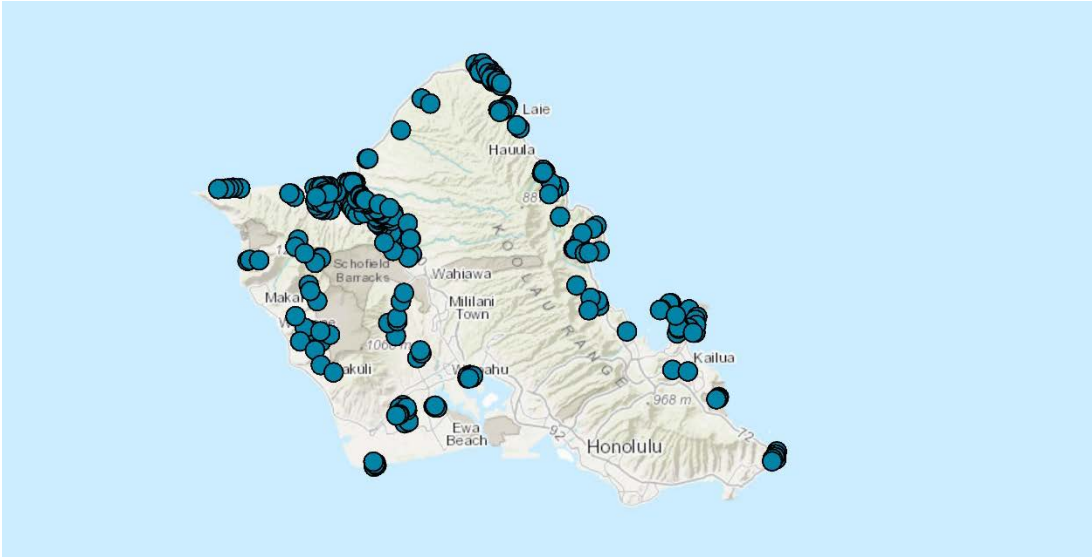

Figure 4. Viewpoints recorded during the pre-survey stage. N=260.

- Survey site selection. 35 survey sites from six different habitat types were randomly selected using ArcGIS Pro. The six different habitat types are:
    - Wetland
    - Grassland
    - Agricultural fields
    - Shrub-land
    - Alien Forest
    - Native Forest

  Five sites were selected for each habitat type, except for grassland, where 10 sites were selected, as this habitat is the main habitat for the species in its worldwide distribution.

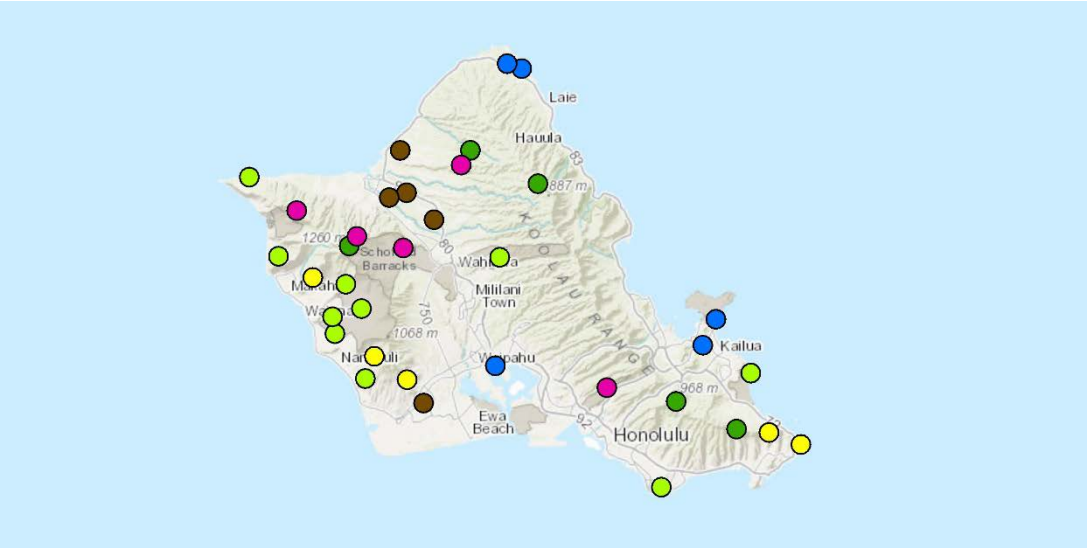

Figure 5. Sites selected. Wetland (blue circles), Grassland (light green circles), Agricultural fields (brown circles), Shrub-land (yellow circles), Alien Forest (pink circles), Native Forest (dark green circles).

- Ongoing Pueo surveys. As of August 30th, we have carried out 29 surveys, detecting five Pueo at four sites (see Pueo sightings for more details). Pueo surveys normally take place 90 minutes before sunset until civil twilight (see Survey protocol, annex 1, for more details). Sites with easy access involve six working hours, while sites with difficult access can involve up to two days, requiring hiking and overnight camping.

From the Pueo project we have also collaborated with other researchers, to extend our efforts:

- Field trip planned for the end of the year with the Maui Forest Bird Recovery Project, to scout the potential survey sites for future Pueo surveys. http://www.mauiforestbirds.org
- Future plans to carry out genetic analyses of Pueo populations (when funding is available).
- Grant proposal writing for funding of future research. This is the first year of the project (funding ends in the first half of 2018 for this first phase).

- Continue the study of Pueo diet analysis with Dr. Sheila Conant, University of Hawai'i, which started in 1990.
- Trapping, banding and transmitter attachment of Pueo with USFWS and DOFAW partners, during a Kaho'olawe field trip. The expedition team was formed by Jamie Bruch (KIRK), Emily Bjerre (USFWS), Jenny Hoskins (USFWS), Jay Penniman (Maui Nui Seabird Recovery Project) and Javier Cotin (University of Hawai'i).
  https://www.pueoproject.com/single-post/2017/06/20/Pueo-expedition-to-Kahoolawe

Figure 6. Kaho'olawe expedition Team.

- Collaboration with the Bishop Museum to collate data on Pueo from museum skins, with the Collections Manager Molly Hagemann.

Figure 7. Pueo at the Bishop Museum collection.

2. Pueo (and Barn owl) sightings

So far we have detected 11 Pueo during this four month period (assuming that the six Pueo detected during the pre-surveys did not disperse more than 30 miles in one month).

Pre-survey period (until end of July 2017):

- Two Pueo detected on a very frequent basis at Hamakua Marsh.
- Four Pueo (two adults + two owlets) at Marine Corp Base Hawai'i (MCBH). The nest was found, with one owlet. The other owlet was already a fledgling.

Figure 8. Owlet at MCBH

Ongoing survey (end of July 2017- 30th August):

- University of Hawai'i West O'ahu: One Pueo detected
- Dole Plantation: One Pueo detected.
- Lualualei Naval Base: Two Pueo detected.
- Waianae Kai Forest Reserve: One Pueo detected.

Figure 9. Pueo at Lualualei Naval Base

Also, we have detected the introduced owl species, **the Barn Owl.** So far, four have been recorded.

- Kawainui Marsh: One Barn owl detected in the forest
- James Campbell National Wildlife Refuge: One Barn owl hunting in the fields
- Waianae Kai Forest Reserve: Two Barn owls in the forest.

3. Citizen Science and Pueo project Website

The main activities realized towards citizen science efforts were:

- Website about the project. www.pueoproject.com

Figure 10. Pueo website www.pueoproject.com

The website has information about the project, the two species of owls present in the Hawaiian Islands, which are the introduced Barn Owl (*Tyto alba*) and the native Hawaiian Short-eared Owl or Pueo (*Asio flammeus sandwichensis*).

Figure 11. ID features of the two main owl species present in the Hawaiian Islands.

The key feature of the website is a web application for reporting Pueo sightings.

Figure 12. Web app for reporting Pueo sightings.

We have received more than 50 Pueo reports during the last five months, which are more than the records registered in e-bird (the main tool for reporting bird sightings in USA) in the last 20 years!

We also have received many emails from people interested in the project. Now, we have a list of 25 volunteers that are willing to join our surveys. So far, 10 of these volunteers joined the official Pueo surveys.

To update the volunteers and the general public, a blog within the website is frequently updated.

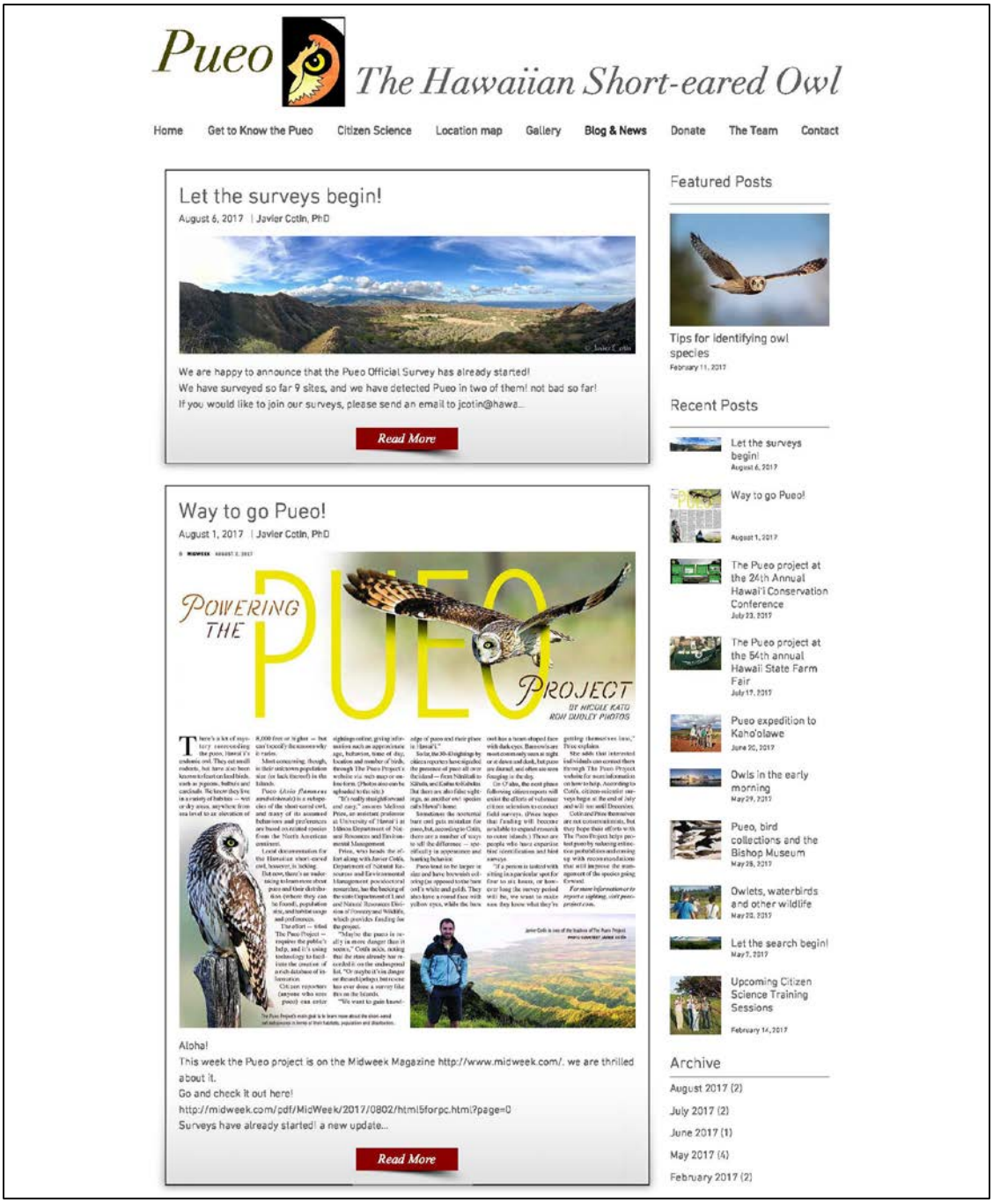

Figure 13. Example of two posts of the blog within the Pueo project website www.pueoproject.com

The website has been received **1458 visitors (with 4654 page visits)**. More than the 50% of the visitors were from Hawai'i, although there have been visits from all over the world (see map below).

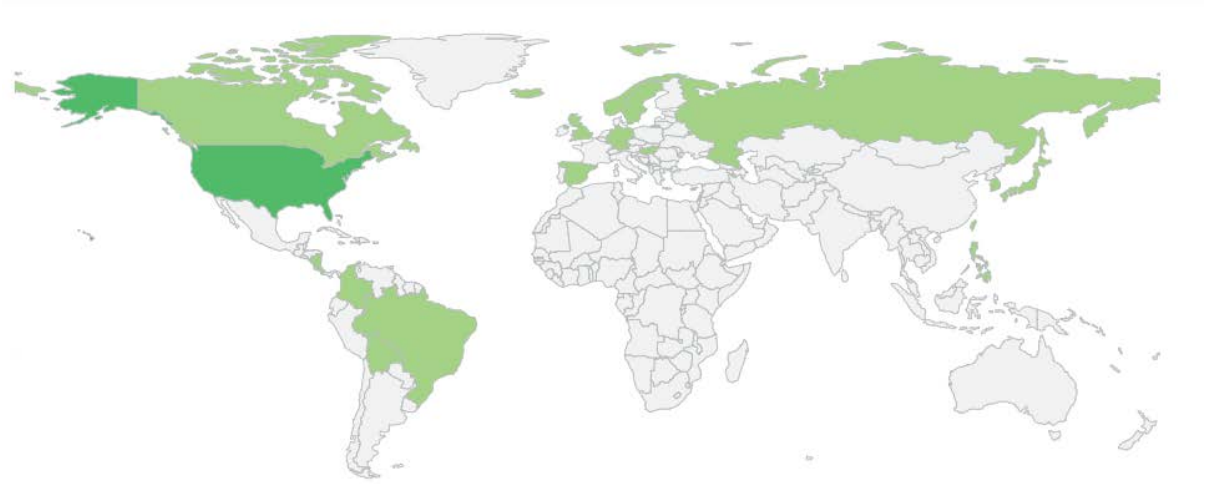

Figure 14. Countries that visited the Pueo project website.

In order to reach a broader audience, a Facebook website https://www.facebook.com/Pueoproject and a twitter account https://twitter.com/pueoproject were also created.

Finally, leaflets and informative sheets were designed for sharing with the general public.

Figure 15. Example of leaflet used during the citizen science project and outreach activities.

4. Outreach activities

The main outreach activities that have taken place in the last four months are:

- Presentation about the Pueo project for the O'ahu Army Natural Resource Program (OANRP) – May 4, 2017 http://manoa.hawaii.edu/hpicesu/dpw.htm
- Presentation about the Pueo project for the Hawaiian VINE project – June 1, 2017 https://www.facebook.com/hawaii.vine.project/
- Representation of the Pueo project at the College of Tropical Agriculture and Human Resources table at the Hawai'i State Farm Fair, July 15th and 16th. http://www.hawaiistatefarmfair.org

Figure 16. Stand of the Pueo Project at the Education Pavilion of the Hawai'i State Farm Fair

- Collaboration and partnership with the book's author Hooked by the Stars, Aline LaForge http://www.hookedbythestars.com http://www.wisebirdbooks.com a story about the Pueo's Voyage to Hawai'i.

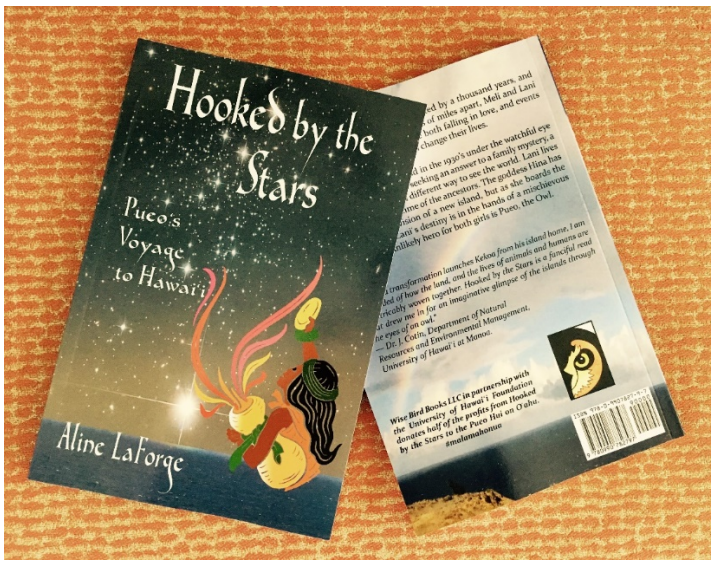

Figure 17. Cover of the book Hooked by the Stars, with the Pueo project logo.

- Presentation of the Poster "Distribution of the Pueo or Hawaiian Short-eared Owl: Utilizing Citizen Science to Aid Monitoring Surveys" at the 24th Hawai'i Conservation Conference - Hawai'i Conservation Alliance. July 18th to 20th 2017. http://www.hawaiiconservation.org/conference

Figure 18. iPoster presented at the HCC conference.

Future outreach activities planned for the following weeks:

- Development of undergraduate-based observation research at UH West O'ahu campus.
- Development of research with K-12 schools, with the coordination of the teacher Liz King, from Mid-Pacific Institute.
- Talk for the Hawai'i Audubon Society and the Hawai'i Conservation Alliance Talk Story Series.
- Presentation of the Pueo project for retirement homes (15 Craigside, retirement community in Nu'uanu).
- Collaboration with the Boys Scouts of America. Caleb Turner, District Executive, will include participation and collaboration with the Pueo project and its fieldwork in the process of obtaining the Bird Study merit badge. http://www.scoutinghawaii.org
- Oral Presentation about the results of the Pueo project at the **World Owl Congress 2017** (Évora, Portugal), at the end of September 2017. http://www.woc2017.uevora.pt

Figure 19. World Owl Conference Website

- Collaboration with the **National Geographic Photographer, Erika Larsen.** She will be joining the project for two weeks during November, in order to promote our study and photograph the research and cultural aspects of it. http://www.erikalarsenphoto.com

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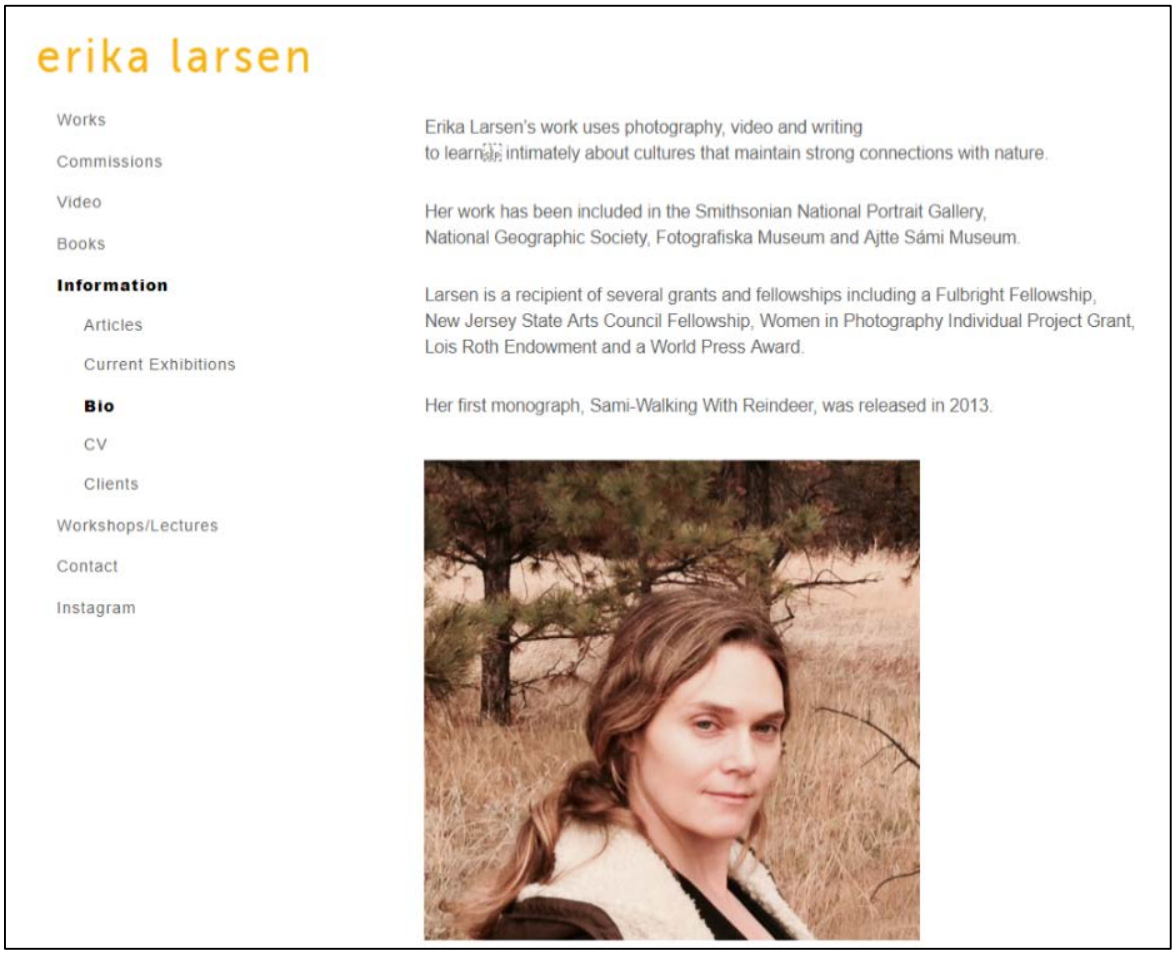

Figure 20. Erika Larsen, National Geographic Photographer

The Pueo project has been cited and promoted on the following media and news:

- College of Tropical Agriculture and Human Resources (CTAHR) news. Article titled "Way to go Pueo!" Issue 309. April 26, 2017.
- University of Hawai'i news http://www.hawaii.edu/news/2017/05/23/pueo-project
- Star Advertiser. Article titled "Yearlong project to study habitats of Hawaiian owl". May 23, 2017.
- Midweek Magazine. Article titled "Powering the Pueo project" by Nicole Kato. August 2, 2017.
- And we are currently working on an article for the Elepaio journal, from the Hawai'i Audubon Society. http://www.hawaiiaudubon.org/elepaio-journal

5. Future Studies

Upon the completion of the island-wide distribution modeling for Pueo on O‘ahu, we strongly recommend further studies be conducted on distribution, biological threats and life history traits for this species. Below are specific recommendations and approximate costs.

- Coordinated survey efforts for each Main Hawaiian Island. Pueo are known to exist throughout the State with very little information on habitat needs and occupancy. Such an effort could be conducted over a one year time span with temporary field assistants coordinated to conduct Pueo surveys on each island during the same time period along with data analysis and distribution modeling. Below is the approximate cost for a one-year State-wide inventory of Pueo.

Item	Cost	Volume	Subtotal	Indirect Costs (10%)	Total
Project coordinator UH researcher					
Stipend	$65000	1	$65000	$0	$65000
Equipment	$2500	1	$2500	$250	$2750
Conference travel	$7000	1	$7000	$700	$7700
Inter-island travel for site scouting and training	$1000	10	$10000	$1000	$11000
Field assistants					
Salary (3000 per month, 4 months)	$12000	5	$60000	$6000	$66000
Undergraduate student assistantship	$5000	5	$25000	$2500	$27500
Car rental (4x4)	$10000	5	$50000	$5000	$55000
Mileage	$8000	5	$40000	$4000	$44000
Field and data collection					
Field equipment/survey equipment	$7500	5	$37500	$3750	$41250
Workshops					
Inter-island stakeholder workshops	$1000	5	$5000	$500	$5500
Inter-island training workshops	$1500	5	$7500	$750	$8250
		Total:	**$309,500**	**$24,450**	**$333,950**

- Breeding ecology studies to identify needs and preferences of breeding habitat, nest site characteristics and reproductive success to inform improved habitat management specific to Pueo.
- Foraging ecology studies to evaluate Pueo diet in different habitat types during the breeding and non-breeding seasons. Results from previous studies suggest Pueo might be a great source of biocontrol for bird pest species impacting crops, such as bulbuls, as well as rodent pests.
- Cultural/indigenous knowledge studies to include in-depth analysis of Hawaiian newspapers and interviews with cultural practitioners regarding Pueo habitat use, breeding ecology, and diet in the past, as well as an enriched understanding of what Pueo mean to Hawaiian people and culture.

Below is the cost estimate for biological and cultural studies described above. Note that combining efforts on both the State-wide inventory above with the biological and cultural studies will likely reduce costs.

Item	Year 1	Year 2
Personnel		
Postdoctoral fellowship stipend	$65,000	$68,250
Graduate salary (pueo biological studies)	$25,000	$26,250
Graduate salary (pueo cultural studies)	$25,000	$26,250
Undergraduate student assistantship (biological)	$10,000	$10,000
Undergraduate student assistantship (cultural)	$10,000	$10,000
Other		
Mileage (for travel to and from field sites)	$5,000	$5,000
Equipment (field work, analysis)	$5,000	
Dissemination of work (conferences, publications)	$5,000	$5,000
Indirect costs (state-to-state 17.5%)	$14,875	$14,438
Total	**$164,875**	**$165,188**
Grand Total	**$330,063**	