Plants of Kahoʻolawe: A Bi-lingual Digital Resource

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Introduction
Native Hawaiian culture is heavily dependent upon biological resources (marine and terrestrial), primarily plant material. Much of the contemporary biological knowledge about plants in Hawai‘i are available only in English and not presented in Hawaiian, an official language of the State of Hawai‘i and Native Hawaiians of the archipelago. Because of its unique history and limited land mass Kahoʻolawe was chosen for this pilot project.

Joseph F. Rock Herbarium
A herbarium is a collection of preserved plants stored, catalogued, and arranged systematically for study by professionals and amateurs from many walks of life.
The Joseph F. Rock herbarium houses, preserves and collects voucher specimens (Picture 2) of plants that reflect the teaching, research and project efforts of faculty, staff and students at UH Mānoa. The collection includes more than 8000 specimens of cultivated plants as well as native Hawaiian flora.

Kanaloa: Kahoʻolawe Island Reserve
There is an inherently Native Hawaiian purpose to the Kahoʻolawe Island Reserve, as recognized by history, the public, and in State and Federal laws, including but not limited to the statutory framework for the Kahoʻolawe Island Reserve Commission (KIRC) and the constitutional protection of customary and traditional access.

After the attack on Pearl Harbor in 1941, the U.S. declared martial law, which started the use of Kahoʻolawe as a bombing range. In 1993 Congress voted to end military use of Kahoʻolawe and authorized $400 million for ordnance removal. The KIRC is now established to manage the activities on the island and transfer of access control was returned from the U.S. Navy to the State of Hawai‘i on November 11, 2003.

Project Objectives
✓ Identify the vascular plant species recorded on Kahoʻolawe from a literature review and update species names to reflect current taxonomy.
✓ Develop a database model for the dissemination of the plants of Kahoʻolawe checklist. Including:
  ✓ Searchable list of more than 200 plants
  ✓ Presentation of taxonomic plant information, descriptions, identifying characteristics, island distribution, cultural information, and digital photographs.
✓ Develop an educational website in both Hawaiian and English languages for the dissemination of botanical and cultural knowledge pertaining to the plants of Kahoʻolawe.

Methodology
Compiling Plants of Kahoʻolawe Checklist
A literature review was conducted to identify the plant checklist of Kahoʻolawe. The database is based on observations made from the four most recent botanical surveys of Kahoʻolawe Island: the Hawaiian Heritage Program reconnaissance survey (February and March 1992), the Division of Forestry survey (April 21-25, 1980) by Corn et al. (1980), and the Navy survey (November 22-27, 1978) for the U.S. Department of the Navy Environmental Impact Statement (1979), and citations in the Manual of Flowering Plants of Hawaii.

Species names were updated utilizing the International Taxonomic Integrated System (www.ITIS.gov) and Hawaii Ecosystems at Risk (HEAR) “Plants of Hawaii” digital photographs (www.HEAR.org) were connected to the database, when available. Classifications of plant origin were determined utilizing the United States Department of Agriculture (USDA) plants database (www.plants.USDA.gov)

In the Joseph F. Rock Herbarium an internal search for herbarium specimens was conducted (Picture 3). Digital images were created of each representative specimen by scanning (Picture 2). A database model was developed for dissemination of the plants of Kahoʻolawe with online interface including presentation of taxonomic plant information, descriptions, digital photographs and scans of herbarium specimens.

Hawaiian Language Application
The English website interface terms were adapted to Hawaiian terms, through cultural and linguistic consultation with Kalei Nuʻuhiwa (University of Hawai‘i at Mānoa, Hawaiian Language M.A.).

Results
A new biological plant database and digital collection of plants of Kahoʻolawe was developed (www.herbarium.hawaii.edu) to increase general access to herbarium specimens and related digital plant photographs.

Plants of Kahoʻolawe Checklist
When utilizing historically published literature, the online HEAR project and consultation with KIRC and members of PKO a total of 242 plant species (61 families), including monocots, dicots, ferns and whisk ferns, have been taxonomically identified. Digital images were compiled for 85% (208 species) of the Kahoʻolawe check list. The internal Joseph F. Rock Herbarium search yielded 73% (178 herbarium specimen) of the compiled species list.

Hawaiian Language Interface
All interface terms were translated from English to Hawaiian. This was interesting because for many of the terms there was not a 1:1 ratio in translation so some Hawaiian phrases were used multiple times.

Discussion
From this project is a functional bi-lingual digital library, a standard methodology for compiling previously documented biological data and increased awareness and use of the library reference collection.

Areas to improve on in regards to a bi-lingual digital herbaria, especially if dissemination of cultural knowledge of plants is included in the objectives, is to integrate cultural knowledge into the database more thoroughly, identify how a digital herbarium may be useful to cultural practitioners (if at all) and provide flexibility in the translations of terms from one language to another.

This bi-lingual module supports institutions that prioritize empowering native speakers.

References
Project Kahoʻolawe “Shiro”. http://www.shiro.org

Mahalo e: Kalei Nuʻuhiwa M.A., Liliikala Kameʻeleihiwa Ph. D, KIRC (Paul Higashino, Kahale Saito, Lyman Abbott), PKO (Kahale Saito), UH Mānoa Joseph Rock Herbarium, UH Mānoa Botany Department and na mea kanu a ʻo Kahoʻolawe.