HISC Grant #C91701/4504214: Detection and Control of Invasive Species on the Island of Hawaii – **Early Detection Program**

Final Report to the Hawaii Invasive Species Council

Early Detection and Rapid Response

Among the greatest threats to the health of our native forests is the proliferation of invasive species. These invaders outcompete native plants, disrupt biogeochemical processes, disturb ecosystem services, host forest pests and pathogens, and impact the continuity of cultural practices and local traditions. The state has prioritized EDRR programs as the cost effective approach to ranking and managing invasive species. Statewide ISC EDRR programs have led to the successful island-eradication of 32 priority species, developed tracking systems to measure progress, and have partnered with industry to voluntarily reduce imports of new invasive plants.

Project funds will support a portion of costs for three full time EDRR Technicians to carry out the Plant Pono Endorsement Program; Conduct roadside, nursery, and hotspot surveys; Develop and integrate the use of UAV technology into statewide EDRR programs; and Provide plant ID and control advice to the Big Island Community. Ensuring the tenure of these three skilled biologists makes them available for a range other separately funded projects including the Mamalu Poepoe Airport Survey project, island-wide ROD surveillance, suppression of invasive propagule pressure at military installations, and research in support of improved invasive species management strategies.

Expected Outcomes:

- **200 miles of roadside surveys;**

  BIISC EDRR Staff surveyed 105 miles of road in 2018. Planned surveys in the Puna and Ka`u district were cancelled due to the lava flow and poor air quality south of Volcano. Instead, more effort was focused on aerial surveys for ROD and the development of UAV survey techniques for both ROD and eradication targets.

- **21 nurseries regularly engaged to maintain best practices and endorsement status;**

  All 21 nurseries remained active in the Plant Pono program. Surveys were conducted by BIISC staff in 2018 at 33 businesses across the island of Hawaii, and compared to the same 33 businesses surveyed in 2017. This included all retail nurseries on the island, 19 of which were Plant Pono endorsed, 14 not endorsed. We counted the total number of nurseries carrying any of eight no-grow invasive plants. All eight species were found for sale at least once. In 2017, 20 nurseries (56%) had carried at least one no-grow species. In 2018, that amount was cut in half--just 8 nurseries carried a no-grow species (23.5%).

  Among endorsed nurseries, in 2017, 21% of endorsed nurseries still carried at least one no-grow plant (allowed in their phase-out year). By 2018, there were none.
  An indirect effect is possible, as the number of *unendorsed* nurseries carrying no-grow plants also declined from 86% to 57%. The previously common no-grow plants Australian Tree Fern, African Tulip, Asparagus Fern, and Washingtonia fan palms were not found for sale in any retail nursery in 2018.

One caveat, this is a single point in time study, and at least three years of data are planned before declaring the successful phase-out of a species. BIISC added the aggressively invasive Autograph Tree, *Clusia rosea*, to the no-grow list for the first time in 2018, and its sale will be tracked in future years.

BIISC conducted a survey to understand public attitudes and behaviors regarding gardening habits, home landscaping choices, and native and invasive species, and familiarity with the Plant Pono brand, collecting responses from 89 members of the public to guide the program direction. BIISC held 6 lectures, staffed info booths featuring the Plant Pono program at 11 community fairs and held nine focused neighborhood meetings about how to "plant pono" and support the Plant Pono endorsed businesses, and published one article per month in LICH magazine. BIISC also contacted the HDOA Marketing Program, to seek guidance in improving the marketing of the Plant Pono brand.

- **Coordination of Plant Pono with the landscape industry (in addition to growers);**

The Landscape Industry Council of Hawaii is now an active supporter and offers one Plant Pono article in every monthly publication of Landscaper Magazine. One landscape business has signed on as an official Plant Pono Business. Further progress in recruiting landscapers was halted this year by the demise of the Plant Pono website, due to the successful hacking of a UH server in March. Without the website, there is no simple, user-friendly way to check on the risk associated with a new plant, or to find out whether we were a legitimate business, so we did not recruit further.

The loss of the website, which could not be recovered, provided a timely opportunity to improve the features of the site. BIISC's Plant Pono Specialist took the lead in development of a new site with better plant searching capability, based on features landscapers look for in plants, a blog posting function to provide timely updates, and a fresh modern look. The new, improved website was launched in early 2019.

- **500 acres surveyed by UAV for *Eleagnus umbellata*;**

This objective was proposed as a case study, to develop functional workflows for the delineation of populations of early detection target species using a UAV. 40 acres were surveyed for *Eleagnus umbellata*, by UAV and on foot, but the plant could not be reliably detected using our current UAV set up. The work was shifted to focus on *Rubus seiboldii*, which can be easily spotted from the air in its current range, primarily in disused pasture in Mountain View. UAV surveys proved to be effective in ruling out areas that did not need to be surveyed, reducing the initial Rubus survey area by a third, and identifying sites beyond the initial 500 m buffer that did need additional surveys. Once the workflow was developed on Rubus, BIISC rapidly branched out to the other species listed below, several in support of partner agency objectives.

Species	**Acres Flown**
AXIAXI Axis Deer	265
CERSPP Ceratocystis spp.	4876 (Reported separately, BIISC ROD report).
CRYMAD Rubbervine	12
FICMAC Moreton Bay Fig	45
HEDGAR Himalayan Ginger	230
ILECAS Dahoon Holly	23
MORCER Wax myrtle	18
MORFAY Faya Tree	772
PASTAR Banana Poka	226
RHIMAN Mangrove	28
RUBSIE Moluccan raspberry	110

- **UAV training provided to three partners on three other islands**:

  UAV Training was designed to get small conservation programs up and running with use of UAVs, including the many who have already purchased-but not yet used-their own UAV. In partnership with UH Hilo's Spatial Data and Visualization Lab, a training workshop was presented to 30 attendees at the Society for Conservation Biology Oceania Section Conference in New Zealand (July, 2018). Neighbor Island workshops funded by this grant were delayed by a series of natural disasters until early 2019. On Maui, Axis Deer were successfully mapped inside a fenced conservation unit using a UAV-mounted FLIR device, recently purchased by DOFAW and DOFAW staff were trained to continue this work. On Kauai, the ROD response team was trained to use UAV to map and pinpoint suspect trees for sampling.

  On the Big Island, BIISC has conducted UAV surveys for the Three Mountain Alliance (Banana Poka), NARS (Toilet Brush Ginger), DOFAW (Faya Tree), HAVO (ROD), and community volunteers (Moreton Bay Fig).

- **Other accomplishments:**

  First on-island detection of Fatuoua villosa. This species is naturalized on Oahu but was not known from the island of Hawaii. It scored at 9, high risk, on the HPWRA. Approximately ten plants discovered in a newly established native plant garden on state land. Ten seedlings were hand-pulled during two sessions, and the site was monitored through the end of the year. As the plants were found in a newly planted garden and also reported from a nursery on Oahu, it is suspected that the species may be a contaminant of potting soil.