



## HISC Research and Technology Investments to Protect Against Alien Invasive Species

Position paper developed by the HISC Research and Technology Working Group, adopted June 26, 2016

*Research and technology are vital functions to Hawaii's management strategy against alien invasive species. The Hawaii Invasive Species Council should strive to maintain a consistent funding mechanism to support a balanced and diverse research and technology portfolio targeting high-priority species.*

This position paper articulates the role of research and technology (R&T) in the management of alien invasive species (AIS) in Hawaii. It advocates for its consistent and strategic support by the Hawaii Invasive Species Council (HISC), and recommends that funding of R&T should target a diversity of priority topics and capitalize on the economic efficiency of small and moderate research projects.

### The role of R&T

The HISC was established in 2003 as an interagency collaboration for coordinating actions that protect Hawaii from AIS with missions in prevention, control, outreach and research. Since 2005, the HISC has invested over \$3.2M in R&T. With these investments have come new knowledge and better techniques in support of the HISC mission. Some of these recent accomplishments include:

- Biocontrol agent exploration and screening for Miconia, Tibouchina, Rubus, ginger, etc..
- Hot water sanitation technology for local nursery plant export

- Ecology and management of aquatic invasive species
- Successful release of the biocontrol agent against Erythrina Gall Wasp
- Invasive ant monitoring and control
- Development of control technologies for more efficient management of Miconia, Albizia, Little Fire Ant and Coqui Frog
- Economics of prevention, early detection and control

The HISC Strategic Plan for 2015-2020 includes a goal to develop an inter-agency research strategy by:

- Identifying inter-agency research priorities.
- Identifying and connecting researchers with users.
- Facilitating priority setting and planning processes.
- Re-establishing funding for research priorities.

Most of the HISC-funded R&T takes place at the University of Hawaii (UH). UH has broad traditional expertise in wildlife biology, ecology, botany, entomology, plant pathology, and weed science, and there is a growing need for non-traditional disciplines in economics, social science, political science, engineering, geography, climatology and systems analysis to assist in addressing the IAS issue. The critical invasive species issues of Hawaii include the legacy species (e.g., Miconia, Little Fire Ant, Coqui Frog, mongoose, etc.), as well as new species

introductions continuously being discovered (e.g., Rapid Ohia Death, Ohia Rust, Coconut Rhinoceros Beetle, etc.) that present challenges demanding immediate scientific attention to understand the problems and identify best solutions.

In order to maintain peak readiness and flexible response, a continuous investment in R&T is a necessary and important element of HISC expenditure. The greatest return on this investment will be achieved by supporting a diversity of scientific disciplines related to AIS management studying the fundamental and applied aspects of legacy and new species management. This should also include mechanisms to forecast the likelihood of future invasions, e.g., weed risk assessment, with preemption as the main motivation.

Beyond UH, strong collaborations exist with Hawaii Department of Agriculture (HDOA), Hawaii Department of Land and Natural Resources (DLNR) and the federal agencies United States Department of Agriculture (USDA), United States Geological Survey (USGS) and National Park Service (NPS). Each of Hawaii's Invasive Species Committees (ISCs) have a strong presence in their respective counties and are the major recipients of HISC funding in prevention, control and outreach. Their functions are science-based and data-driven and offer excellent opportunities for collaborative research and scholarship. In fact, many of the control objectives previously funded include research and adaptive management elements. Collaboration between practitioners and research specialists should be facilitated, encouraged, and embraced.

AIS control and eradication are long-term (decadal) commitments, while prevention is a mission in perpetuity. Priority setting for research needs should be an adaptive

process with annual iterations that compare the unmet needs of practitioners against the unforeseen needs in responding to novel introductions. All Research and Technology outcomes should include actions that transfer new knowledge and technologies to end users and demonstrate a measureable management impact. For instance, a modest budget to build solid intelligence on a new species introduction would likely have high immediate impact in determining the feasibility of eradication.

### **Research allocation**

HISC has invested approximately 8.7% of total funding over the last decade to R&T projects, excepting a total lapse in allocations between 2011 and 2014 owing to budget shortfalls. The Research and Technology Working Group recognizes that resources are limited, and R&T funding requests must be balanced against the needs of other functions HISC strives to support (i.e., prevention, control and outreach). In that sense, every dollar invested in R&T is taken away from the above actions with a direct translation in performance. Thus, it is not *how much* is invested in R&T, but rather *how* R&T is invested and how much of a return it offers to the other actions.

In industry, Research and Development Intensity (RDI) is defined as expenditures in R&D divided by the firm's sales revenues. In the case of HISC-sponsored expenditures, revenues aren't being generated *per se*, but productivity is being measured. Thus, R&T investments may be best viewed as process innovations in efficiency that include changes in equipment, techniques and models adopted to improve productivity.

R&T investments (RTI) in future HISC funding models should ideally remain consistent with total expenditures, in order

to maintain the reliability of these services. The optimal level of RTI may require further study, but at present we suggest that it be maintained at or near current levels of ~9% of total allocations.

### **Focus on small and modest projects**

To build and maintain the diverse R&T portfolio advocated here, we recommend an increased focus on small and modest-sized projects and proposals, to complement the larger and more expensive endeavors that are sometimes needed. For example, a project with base tier funding, i.e., <\$40K, would support a graduate student assistantship with travel and supply funds. Other incremental funding tiers would also support soft-funded PIs and expand missions that include control, thus warranting larger funding commitments (e.g., >\$100K). Assuming flat growth in allocations and 9% RTI, HISC could support up to 12 graduate theses and/or dissertation projects each year, or up to four PI-supported projects. Given that student projects are often 2- to 4-year commitments that should be honored to completion, we could anticipate over a 10-year period up to 40 MS and PhD graduates with degrees in AIS management; a true investment of intellectual capital! Small and modest-sized R&T projects can also be leveraged as important “seed” funding for securing or matching federal and other non-state sources, further increasing the return on investment.