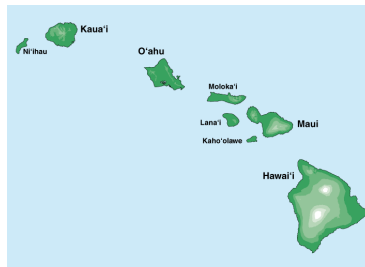

State of Hawai'i Collaborative Plant Health Emergency Response Plan (PHERP) And Reference Manual

Year 1 Final Version:
December 2013

APPENDICES



United States Department of Agriculture
Animal and Plant Health Inspection Service (APHIS)
Plant Protection and Quarantine (PPQ)



Hawai'i Department of Agriculture (HDOA)
Plant Industry Division



Hawai'i Invasive Species Council (HISC)



Coordinating Group on Alien Pest Species (CGAPS)

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❖ APPENDIX A: ACRONYMS IN ALPHABETICAL ORDER:

CAPS:	Cooperative Agricultural Pest Survey
CBP:	Customs and Border Protection
CGAPS:	Coordinating Group on Alien Pest Species
CTAHR:	College of Tropical Agriculture and Human Resources (University of Hawai'i)
DLNR-DOFAW:	Department of Land and Natural Resources, Division of Forestry and Wildlife
EPA:	Environmental Protection Agency
ESF:	Emergency Support Function
FEMA:	Federal Emergency Management Agency
HEDN:	Hawai'i Early Detection Network
HDOA:	Hawai'i Department of Agriculture
HDOH:	Hawai'i Department of Health
HDOT:	Hawai'i Department of Transportation
HISC:	Hawai'i Invasive Species Council
HTA:	Hawai'i Tourism Authority
ICS:	Incident Command System
IMT:	Incident Management Team
ISC:	Invasive Species Committee
JIC:	Joint Information Center
JIS:	Joint Information System
LO:	Liaison Officer
MAC:	Multi-Agency Coordination (Group)
NIMS:	National Incident Management System
NPS:	National Park Service
PCSU:	Pacific Cooperative Studies Unit
PHERP:	Plant Health Emergency Response Plan
PIO:	Public Information Officer
SPHD:	State Plant Health Director (based at USDA-APHIS-PPQ)
SPRO:	State Plant Regulatory Official (based at HDOA)
TNC:	The Nature Conservancy
UH:	University of Hawai'i
USDA-APHIS-PPQ:	U.S. Department of Agriculture, Animal Plant Health Inspection Services, Plant Protection and Quarantine
USFS:	United States Forest Service
USFWS:	United States Fish and Wildlife Service

❖ APPENDIX B:

Key Entities in Hawai'i To Assist in a Collaborative Plant Pest Response

-Expanded Descriptions, Roles, and Contacts-

Responding to an outbreak of an emergency plant pest or disease outbreak will require the coordination of multiple agencies. A list of local, state, and federal agencies, as well as other entities, along with their likely level of participation roles in an outbreak, is listed below. A description along with in what way they may be of help follow. See also Contact Table in the main plan; Section 5D for an abbreviated version, as well as the Matrix in Section 5C for an “at a glance” look of how entities can assist.

Entity Table for a Collaborative Plant Health Response:

Lead Entities	Support Entities	Add'l Contributors	Unique Situations
HDOA	CGAPS	Bishop Museum	Botanical Gardens
USDA-APHIS-PPQ	CTAHR Extension	County Officials and Departments	CBP
	DLNR-DOFAW	EPA	Civil Defense / Emergency Mgmt.
	HISC	Governor's Office	County Parks and Recreation (urban forestry / parks)
	ISCs	HDOH	Hawai'i Ant Lab
	Watershed Partnerships	HEDN	HDOT
		HTA	Law Enforcement
		Industry	Military, including Army Natural Resources Program
		PCSU	NPS
		USFS	PBARC (USDA-ARS)
		USFWS	Plant Boards (National and Western)
			SEB and FAC
			The Nature Conservancy
			University of Hawai'i
			Weed Risk Assessment

Acronyms of Collaborators, in Alphabetical Order:

CBP:	Customs and Border Protection
CGAPS:	Coordinating Group on Alien Pest Species
CTAHR:	College of Tropical Agriculture and Human Resources (University of Hawai'i)
DLNR-DOFAW	Hawai'i Department of Land and Natural Resources, Division of Forestry and Wildlife
EPA:	Environmental Protection Agency
HEDN:	Hawai'i Early Detection Network
HDOA:	Hawai'i Department of Agriculture
HDOH:	Hawai'i Department of Health
HDOT:	Hawai'i Department of Transportation
HISC:	Hawai'i Invasive Species Council
HTA:	Hawai'i Tourism Authority
ISC:	Invasive Species Committees
NPS:	National Park Service
PBARC:	Pacific Basin Agricultural Research Center (USDA-Agriculture Research Service)
PCSU:	Pacific Cooperative Studies Unit
SEB and FAC:	State Emergency Board and Food and Agriculture Committee (USDA)
TNC:	The Nature Conservancy
USDA-APHIS-PPQ:	U.S. Department of Agriculture, Animal Plant Health Inspection Service, Plant Protection and Quarantine
USFS:	USDA Forest Service (U.S. Forest Service)
USFWS:	United States Fish and Wildlife Service

Key to Symbols:

✓ A checkmark indicates the key contact for the associated entity for an emergency response. In most cases, the contact has been either actively involved in the development of this plan or plant pest issues in general.

Lead Entities:

- ❖ Hawai'i Department of Agriculture (HDOA)
- ❖ U.S. Department of Agriculture-Animal Plant Health Inspection Services- Plant Protection and Quarantine (USDA-APHIS-PPQ)

❖ HAWAII DEPARTMENT OF AGRICULTURE (HDOA), DIVISION OF PLANT INDUSTRY

ABOUT:

HDOA has about 240 employees, with the main goal of the agency being to work to support, enhance and promote Hawaii's agriculture and aquaculture industries. HDOA's Division of Plant Industry, with about 95 employees, is comprised of three Branches: Plant Quarantine (PQ), Plant Pest Control (PPC), and a Pesticides branch.

INVOLVEMENT WITH PLANT PESTS:

The HDOA Plant Pest Control Branch (PPC): Contains, controls or eradicates pests of plants which could cause significant economic damage to agriculture, our environment, and quality of life. This is achieved through statewide programs using chemical, mechanical, biological, and integrated control measures to eradicate or control plant pests, including insects and mites, gastropods, weeds, and plant pathogens.

The HDOA Plant Quarantine Branch (PQ): Regulates the importation and movement within the islands of all plants, nondomestic animals (including vertebrate and invertebrate), and microorganisms. Its primary goal is to prevent the introduction of harmful insects, plant diseases, illegal animals and other pests into Hawaii'i. Its Inspectors all possess authority to access public and private property for pest control/eradication purposes.

The HDOA Pesticides Branch: Regulates the distribution and use of pesticides to ensure safety and availability of important pesticides in Hawaii'i.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- HDOA is the lead state entity in responding to a plant health emergency.
- Well versed in ICS systems (see Section 2D) and will generally be Incident Commander in ICS set up.
- Strong expertise in pest management skills and has key regulatory authority.
- The State Plant Regulatory Official (SPRO), Neil Reimer, is based at HDOA and routinely works closely with USDA-APHIS-PPQ; HDOA is the key liaison with other state, federal, and local organizations.
- Confirm identification or provide specimen to appropriate taxonomic authority for identification.
- Conduct delimitation surveys and determine scope and level of initial response.
- Conduct investigations on reported and/or suspected new detections.
- Communicate and coordinate activities with appropriate local, state, and federal agencies, academia, industry, and other appropriate organizations as related to program responsibilities.
- Establish and maintain safe quarantine areas and/or determine appropriate movement restrictions for equipment, plants and/or plant products.
- Prioritize activities and areas of greatest urgency for state response and recovery personnel in the field.
- Coordinate control activities to ensure compliance with local, state, and federal laws, including environmental compliance.

CONTACTS:

- Main Administrative Office: 1428 S. King Street, Honolulu, HI 96814, (808) 973-9560
- Website: <http://hdoa.hawaii.gov/>
- To Report a Pest: 643-PEST

- ✓ Dr. Neil Reimer, Acting Administrator, Plant Industry Division, neil.j.reimer@hawaii.gov, 808-973-9535
- ✓ Darcy Oishi - darcy.e.oishi@hawaii.gov, Acting Manager, Plant Quarantine Branch, 808-832-0566
- Bernarr Kumashiro - Bernarr.R.Kumashiro@hawaii.gov 808-973-9534
- Thomas Matsuda Thomas.K.Matsuda@hawaii.gov Pesticides Program Manager 808-973-9404

Island Offices:

- **O'ahu:** Honolulu International Airport, (808) 837-8413; **After Hours Emergency: (808) 837-8092**
- **Hawai'i Island:** 16E Lanikaula Street, Hilo, HI, 808-974-4141;
-Hilo airport, 974-4146 , Keahole Airport, Kailua-Kona, 808-326-1077
- **Maui:** 635 Mua Street, Kahului, HI; Kahului airport, 808-872-3848
- **Kaua'i:** 4398A Pua Loke Street, Lihue, HI, 808-274-3071

❖ **UNITED STATES DEPARTMENT OF AGRICULTURE-ANIMAL AND PLANT HEALTH INSPECTION SERVICE- PLANT PROTECTION AND QUARANTINE (USDA-APHIS- PPQ) ABOUT:**

USDA provides leadership on food, agriculture, natural resources, rural development, nutrition, and related issues based on sound public policy, the best available science, and efficient management. Within the USDA, these areas of responsibility for the USDA's undersecretaries are likely to have components of interest during a plant emergency:

- *Marketing and Regulatory Programs:*
-Includes Animal and Plant Health Inspection Service (includes PPQ) and Agricultural Marketing Service (includes organic food certification, etc. impacts growing areas where certain pesticides need organic substitutions)
- *Research Education and Economics:*
-Includes Agricultural Research Service , National Institute of Food and Agriculture (funds extension), Economic Research Service, National Agricultural Statistics Service (identifies crops, number of farms, and economic value)
- *Rural Development's Rural Business Cooperative Service*
- *Farm and Foreign Agricultural Services :*
-Includes Farm Service Agency
- *Natural Resources and Environment*
-Includes Forest Service and Natural Resources Conservation Service (soil conservation strategies include plantings of ground covers which may be hosts and repositories of pest populations)

The mission of USDA-APHIS is to *protect the health and value of American agriculture and natural resources.*
Website: http://www.aphis.usda.gov/about_aphis/

INVOLVEMENT WITH PLANT PESTS:

- *Safeguard agriculture and natural resources from the entry, establishment, and spread of plant pests and noxious weeds.*
- *Develop and Implement the National Response Framework (See Section 2H in the main document), working cooperatively with national and international plant protection organizations; Federal, State, Tribal, and local agencies; universities; industries; and private , focusing on four key elements: preparedness, prevention, response, and recovery.*¹ Specific APHIS -PPQ activities include:
 - pest exclusion;
 - pest survey and detection;
 - pest eradication;
 - pest management, including the use of biological control; and
 - development of sampling and survey methods for use in field programs.

¹USDA Emergency Response Manual, Section 2, Overview, PPQ's Role in Protecting U.S. Plant Health, http://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/epm.pdf

- cooperating with other federal agencies, states, farmers, foreign governments and private organizations to carry out program activities
- *Other major USDA-APHIS-PPQ responsibilities carried out in conjunction with other stakeholders include:*
 - inspecting and certifying domestic products for export,
 - regulating the import and export of endangered plant species,
 - ensuring that imported seeds are free of noxious weeds, and
 - enforcing APHIS regulations on genetically engineered organisms and other products that present risks.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- APHIS-PPQ is the lead federal program for plant health emergencies.
- The State Plant Health Director (SPHD), Vernon Harrington (currently Stuart Stein holds the acting position) is based at USDA and routinely works closely with HDOA.
- The following is how PPQ may help, though most actions would require that the invasive species be a federal quarantine pest.
 - Provide identification services.
 - Provide funding for technical resources for plant pest survey and detection, monitoring, and outreach.
 - Assist other agencies, as needed, in the detection, evaluation, monitoring, and eradication, of new plant pest introductions.
 - Coordinate with state and local agencies to define quarantine and buffer zones.
 - Assist in activities including, disposal, cleaning and disinfecting.
 - Conduct trace-back, trace forward.
 - Consult with state and local authorities regarding eradication proceedings.
 - Issue a declaration of extraordinary emergency as appropriate.
 - Prepare information for dissemination to the public and targeted concerned groups and create increased awareness of invasive plant pests through information and education. (Hawai'i is on the USDA-APHIS Hungry Pest Site, which might be handy in emergency news: <http://www.hungrypests.com/the-spread/hawaii.php>)
 - Provide assistance to states for the control of plant pests that may be established including development of National Environmental Policy Act documentation, project planning and other technical support.

CONTACTS:

- Main Administrative Offices: 300 Ala Moana Blvd. Rm 8-120, Honolulu, HI 96850, 838-2780
- ✓ Stuart Stein, Acting State Plant Health Director (SPHD), (808) 838-2780, Stuart.H.Stein@aphis.usda.gov
(Vernon Harrington, State Plant Health Director, (808) 838-2780, vernon.harrington@aphis.usda.gov)
- ✓ Dorothy Alontaga, State Operations Support Officer, (808) 838-2780, Dorothy.S.Alontaga@aphis.usda.gov
- Lisa Ishibashi, Survey Specialist, 808-838-2780, yolisa.c.ishibashi@aphis.usda.gov
- Carol Russell, State Operations Support Officer, (808) 838-2780, Carol.E.Russell@aphis.usda.gov

Support Entities:

- ❖ **Coordinating Group on Alien Pest Species (CGAPS)**
- ❖ **College of Tropical Agriculture and Human Resources Cooperative Extension Services (CTAHR- CES, University of Hawai'i)**
- ❖ **Department of Land and Natural Resources: Division of Forestry and Wildlife (DLNR-DOFAW)**
- ❖ **Hawai'i Invasive Species Council**
- ❖ **Invasive Species Committees**
- ❖ **Watershed Partnerships**

❖ **COORDINATING GROUP ON ALIEN PEST SPECIES (CGAPS)**

ABOUT:

In Hawai'i, interagency contact and cooperation is embodied in the Coordinating Group on Alien Pest Species CGAPS. CGAPS is a multi-agency partnership to coordinate more effective protection for Hawaii's economy, environment, health, and way of life from harmful alien pests. Formed in 1995, the CGAPS partnership is comprised primarily of management-level staff from every major agency and organization involved in invasive species work in Hawai'i, including federal, state, county and private entities. The CGAPS partnership works on collaborative projects to strengthen Hawaii's biosecurity program, including prevention, early detection & rapid response, and long-term control of widespread terrestrial and aquatic invasive species. Members participate in quarterly meetings to improve communications, increase collaborations, and to promote public awareness.



Clarification of relationships with other groups: CGAPS was intended to engage executive-level participation, but resulted in involvement of management level staff. Recognizing the ongoing need for executive-level participation, CGAPS advocated for passage of legislation that created the HISC. Despite many of the same people participating in different partnerships, the ISCs, CGAPS, and HISC share no formal relationship.

INVOLVEMENT WITH PLANT PESTS:

- Beginning in the late 1990's, CGAPS facilitated successes of the newly formed island-based Invasive Species Committees (ISCs), and continues with grant writing and fundraising to support dedicated staff for each ISC as a partial solution to gaps in existing early detection and rapid response capacities.
- Works with legislators to write and introduce new legislation, and provides information for decision making.
- Continues to facilitate communication and cooperation among agencies.
- Secured grant funding for development of this plan.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- Assist with any communication needs, such as assisting the Public Information Officer, following his or her direction and working with them to identify needs and accomplish communication tasks.
- Assist with supplemental communications, such as helping to draft articles, press releases, or alerts for, or in conjunction with, the PIOs/ IC Team.

CONTACTS:

- website: www.cgaps.org
- ✓ Christy Martin, Public Information Officer, (808) 956-7564; cell phone: (808) 722-0995; christym@rocketmail.com

❖ **COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES COOPERATIVE EXTENSION SERVICES (CTAHR-CES, UNIVERSITY OF HAWAI'I)**

ABOUT:

The CTAHR Cooperative Extension Service (CES) is a part of the world's largest non-traditional education system, the Cooperative Extension System, which can be found in almost all of the 3,150 counties in the 50 states as well as all of the U.S. Territories. It is a partnership between federal, state, and local governments and has responsibility for providing science-based information and educational programs in agriculture, natural

resources, and human resources. Moreover, CES interfaces with research faculty in CTAHR who are able to assist with specific expertise. Each county's extension program is overseen by a CTAHR administrator who is responsible for all CTAHR resources and activities in the county. About 55-65 faculty statewide have full or partial extension responsibilities, with the assistance of additional support personnel.

INVOLVEMENT WITH PLANT PESTS:

- CTAHR is an important resource for assisting the agricultural community and the public to address problems with invasive species including plant pests.
- CTAHR's Agricultural Diagnostic Service Center provides insect identification, nematode counts, and disease diagnosis; soil, plant, water, and feed analysis; and sales of seeds of vegetable and papaya cultivars developed by the college.
- Educational materials such as brochures, publications, and videos are also available at county extension offices for use by the general public.
- County agents are available for individual consultations (time permitting) and can provide educational workshops and short-courses covering various topics in agriculture. (Services provided by county agents are often free of charge, or may carry a nominal fee.)

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- *Identification:* CTAHR extension agents and other faculty are often able to make tentative and/or precise identifications, and routinely communicate with other academic and agency specialists.
- *Communication:* CTAHR's Agricultural Extension Service has offices on major islands and provides a routinely used mechanism for farmers, nurserymen, ranchers, and public citizens to report and address potentially new pests.

CONTACTS:

- A 2013-2014 Directory of CTAHR is available at <http://www.ctahr.hawaii.edu/site/Peopl.aspx>
- ✓ J. Kenneth Grace, Associate Dean and Associate Director of Research.
-Dr. Grace has agreed to serve as the liaison for finding the best expertise in CTAHR for specific plant health emergency response issues. kennethg@hawaii.edu, 808-956-8131
- ✓ Barry Brennan, Specialist Emeritus, Plant and Environmental Protection Sciences (PEPS), UH-Manoa, 808-956-0885, barryb@hawaii.edu
- ✓ Michael Melzer, Assistant Researcher, PEPS, UH-Manoa, (808) 956-2830, 956-6512, melzer@hawaii.edu
- Maria Gallo - Dean and Director
- Carl Evensen - Associate Dean and Associate Director of Cooperative Extension
- **CTAHR Extension Offices by County:**
 - Hawai'i County Extension Office:** 875 Komohana Street, Hilo; komohana@ctahr.hawaii.edu
County Administrator: Russell Nagata, (808) 981-5199, russelln@hawaii.edu
-Other Hawai'i Co. Extension Offices: Kamuela 887-6183, Kona 322-4896
 - Honolulu Extension Office, O'ahu:** 1955 East-West Rd. Ag Sci III Room 217, honolulu@ctahr.hawaii.edu
County Administrator: Raymond Uchida, (808) 956-7138, (808) 956-7290, uchidar@ctahr.hawaii.edu
-Other O'ahu Extension Offices: Kahe'ohe 247-0421, Wahiawa 622-4185
 - Kaua'i County Extension Office:** State Office Building, 3060 Eiwa Street, Room 210 Lihue;
lihue@ctahr.hawaii.edu ; County Administrator: Roy Yamakawa, (808) 274-3471, yamakawa@hawaii.edu
 - Maui County, Kahului Extension Office**
310 Kaahumanu Ave., Bldg. 214, Kahului, kahului@ctahr.hawaii.edu
County Administrator: Robin Shimabuku, (808) 244-3242, shimabukur@ctahr.hawaii.edu
 - Moloka'i Extension Office (Maui Co.):** Hoolehua, (808) 567-6932, molokai@ctahr.hawaii.edu

❖ DEPARTMENT OF LAND AND NATURAL RESOURCES: DIVISION OF FORESTRY AND WILDLIFE (DLNR-DOFAW)

ABOUT:

The Hawai'i DLNR is the managing agency for natural and cultural resources through enforcement and permitting activities on Conservation District lands as well as on-the-ground management. The Division of Forestry and Wildlife manages more than a million acres of public land for watershed protection, forestry, conservation, public hunting and recreation. The Division was formed more than a century ago to address the loss of forests to land uses, feral animals and their resultant impact on the state's water supply for agriculture and human consumption.

INVOLVEMENT WITH PLANT PESTS:

- Focus is on forest pests: insects, diseases, invading plants.
- Current efforts to address invasive species include helping to fund Invasive Species Committees (ISCs) and landscape level Watershed Partnerships. Helps to manage grants for the ISCs and others
- The urban forestry program is working with the horticulture industry and the US Forest Service to develop a weed risk assessment to prevent new invasive species from being introduced through forestry or the nursery trade.
- DLNR-DOFAW employs an entomologist that spends approximately 50% of her time on invasive insect pests (including wasps and thrips)
- Each of the branches also has an invasive species technician supervised under the Forestry program. The invasive species technicians are located at each of the island offices/baseyards (Hilo, Maui, O'ahu, and Kaua'i) and are supervised by the foresters there. Their role varies from island to island, but basically they focus on invasive plant control.
- Also active in leadership roles in CGAPS, ISCs, and HISC as well as development of this plan.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- DLNR-DOFAW can be a strong partner in assisting with plant health emergency responses.
- If the plant pest is a threat to natural areas, DOFAW's staff could participate on survey and control both inside and outside of DLNR-DOFAW managed lands.
-Example: staff have been trained on brown tree snake response with the assumption that the snake would likely establish outside DLNR lands first – this could be same for plant pests.
- Access to specialized equipment (dozers, back hoes, chainsaws, etc.) that may be needed.
- May have additional survey capacity for remote areas.
- Have a radio system in place for remote communications if needed.
- DLNR-DOFAW's Urban Forestry program (Kaulunani) has a small grant program, with funds potentially available on relatively short notice.

CONTACTS:

- Main Administrative Offices: 1151 Punchbowl Street, Room 325, Honolulu, Hawai'i 96813
- ✓ Robert Hauff, Forest Health Coordinator 808-587-4174, Robert.D.Hauff@hawaii.gov
- ✓ Joshua Atwood, Invasive Species Coordinator 808 587-4154, joshua.p.atwood@hawaii.gov
- Cynthia King, DLNR-DOFAW Entomologist Tel. 808-587-0019, Cynthia.B.King@hawaii.gov
- Roger Imoto, Administrator, phone: 808-587-4181; Roger.H.Imoto@hawaii.gov
- *DLNR-DOFAW District Managers:*
 - **Hilo:** Lisa Hadway, 808-974-4220, Lisa.J.Hadway@hawaii.gov
 - **Maui:** Scott Fretz, , 808-984-8107, Scott.Fretz@hawaii.gov
 - **O'ahu:** David Smith, 808-973-9787, David.G.Smith@hawaii.gov
 - **Kaua'i:** Galen Kawakami, 808-274-3436, Galen.K.Kawakami@hawaii.gov
- *Kaulunani Urban and Community Forestry Program*, DLNR-DOFAW, Honolulu (808) 270-7230, www.kaulunani.com
Teresa Trueman-Madriaga, Coordinator, 808-672-3383, ttm@hawaii.rr.com

❖ HAWAII INVASIVE SPECIES COUNCIL (HISC)

ABOUT:

HISC is a State interdepartmental collaboration, established in 2003 by the Hawaii's State Legislature. The HISC was created *for the special purpose to provide cabinet / policy level direction, coordination, and planning* for the control and eradication of harmful invasive species infestations throughout the State. The HISC fulfills its mandate by issuing resolutions, providing plans, and strategically disbursing funds to enhance invasive species prevention, control, outreach, and research.



INVOLVEMENT WITH PLANT PESTS:

- Aims to maintain a comprehensive overview of issues and strategically support invasive species prevention, early detection, and control projects across the State for terrestrial and aquatic invasive species primarily through policy recommendations and funding support.
- Focuses on interagency coordination and providing support for projects, both within member agencies and with partner organizations, that might not otherwise be supported in departmental budgets. (For example, the HISC provides support for non-agency partners such as the Hawai'i-Pacific Weed Risk Assessment and the county-based Invasive Species Committees.)

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- Can bring together (in a meeting or otherwise) cabinet-level agency representatives and decision makers for government coordination and support to facilitate coordination or resource sharing between departments.
- Can coordinate the State's position on invasive species issues, adopt resolutions, and allocate State funds.
- HISC is mandated to advise the Governor and the Legislature on invasive species matters.
- The HISC typically provides support for detection and response programs in each county, including the county-based Invasive Species Committees (ISCs), and personnel from these programs may be able to assist in a response.
- Funding: Depending on the timing and duration of response, HISC funds may be available for related activities.
- HISC's support staff, including a Planner and an Interagency Coordinator, may be able to assist in coordination and outreach, and they have agreed to be the primary liaison for updating the contacts within this plan.

CONTACTS:

- Web: <http://hisc.hawaii.gov>
- Joshua Atwood, HISC Coordinator; 808-587-4154, joshua.p.atwood@hawaii.gov

❖ INVASIVE SPECIES COMMITTEES (ISCS)

ABOUT:

ISCs are island-based partnerships, each guided by a "board-like" committee of individuals from government agencies, non-government organizations, and private businesses committed to protect each island from the most threatening invasive pests. Each committee is responsible for selecting targets and reviewing progress. ISCs were formed using long-term staff employed through the Pacific Cooperative Studies Unit and the Research Corporation of the University of Hawai'i (RCUH) to act as early detection and rapid response teams to conduct containment and eradication of targeted invasive species.

The ISCs evolved on each island from an earlier committee focused on addressing specific harmful invasive plants, such as the weed tree, *Miconia calvescens*, on Maui and the Big Island, or fountain grass, *Pennisetum setaceum*, on O'ahu. The miconia experience dramatized the need for rapid response and control work on each of the main islands for new invasive pests that have the potential to severely impact the economy, ecosystem, watersheds, human health, and quality of life.

INVOLVEMENT WITH PLANT PESTS:

- In addition to combating miconia on most islands; each ISC also focuses on a suite of species deemed eradicable from each island. Early detection efforts have included the following types of surveys: periodic roadside surveys for a predetermined list of invasive plant species; botanical gardens and nurseries to detect new invasive plants that may become naturalized; landing zones used by natural resource agencies; nurseries and new housing developments for little fire ants; residential areas for banana bunchy top virus; surveys for naio thrips; and snake response surveys.
- Early detection outreach and education activities by the ISCs include: workshops for government and private agencies that work outdoors or in natural resource activities to train workers about how to identify and report early detection species; display booths at public events featuring early detection species and activities; classroom visits to train students in detecting and reporting unusual stinging ants; and regular newspaper articles about early detection species, including those featured as HDOA New Pest Advisories.
- The ISCs also serve as “reporting centers” for the early detection of plant pests. Reports come in as phone calls, emails or “walk ins.” Unless the species reported is common or easily identified, ISC staff will refer reports to on-island HDOA staff. In the case of Moloka’i, which does not have any on-island HDOA PQ staff, MoMISC takes voucher specimens to send to HDOA.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

The ISCs may be able to provide the following resources/expertise:

- Trained field staff familiar with: basic plant, vertebrate and invertebrate identification, survey techniques, herbicide use, helicopter surveys, GPS use, remote backcountry work, mapping, and GIS data analysis
- Equipment: Trucks/vehicles, specialized equipment including chainsaws, tractors, pumps, hand and power tools
- PR/Outreach expertise and extensive on-island contacts: assistance with articles, news releases, multi-media campaigns, social media
- Administrative expertise tracking expenditures

CONTACTS:

- **Website:** <http://www.hawaiiinvasivespecies.org/iscs>
- **Big Island ISC (BIISC):**
 - ✓ Springer Kaye, Manager; office: (808) 933-3340; skaye@hawaii.edu; hotline: (808) 961-3299; website: www.biisc.org
- **Maui ISC (MISC)**
 - ✓ Teya Penniman, Manager, office: 808-573-MISC(6472) or 573-6471; misc@hawaii.edu
-MISC was formed in 1999, as the first island-based ISC. MISC works to control more than 20 invasive plant species, including miconia, pampas grass, fountain grass, and ivy gourd, three vertebrate species (coqui frog, veiled chameleon, and mitred conure) and banana bunchy top virus. MISC has eradicated more than eight species from the islands of Maui and Lanai and continues to evaluate new targets for feasibility of eradication. MISC’s work is scientifically based and data-driven. Outreach and education are vital components of MISC’s overall program. The early detection of the little fire ant is a key component of MISC’s operation.
- **Moloka’i / Maui ISC (MoMISC)**
 - ✓ Lori Buchanan, MoMISC Coordinator, office:808-954-6585, cell:808-336-0625; lbuchanan@tnc.org
-MoMISC was formed in 2000 as a subcommittee of MISC, which provides administrative and fiscal support. However, MoMISC has its own committee of local experts, which sets priorities and selects targets for survey and control work. MoMISC has been exceptionally successful at achieving eradications of early detection species. MoMISC serves a key role on the island of Moloka’i as a reporting / response center, providing voucher specimens to HDOA for unknown pest species. MoMISC works in close association with USDA-APHIS on surveys and outreach activities. MoMISC has an active outreach program in the local community.
- **O’ahu ISC (OISC)**
 - ✓ Julia Parish, OISC Manager, cell: 808-292-669, oisc@hawaii.edu
office: (808) 266-7994 fax: 808-266-7995; www.oahuiscc.org
-OISC was formed in 2001. Target species include: miconia, devil weed, fountain grass, Himalayan blackberry, pampas grass, spiked pepper and glory bush.
- **Kaua’i ISC (KISC)**

✓ Keren Gundersen, Project Manager, office: 808-821-1490; kgunder@hawaii.edu

KISC was formed in December 2001, with *Miconia calvescens* being its top priority. If *Miconia* escapes the Wailua area and becomes established in the rugged terrain of the Halelea Forest Reserve, it will challenge all of Kaua'i's resources to control it. Approximately 100,000 acres of native wet forest, prime habitat for *Miconia*, are at risk. Other targeted weeds include: pampas grass, fire weed, fountain grass, ivy gourd, and long thorn kiawe, all of which pose a threat to the native ecosystems, but are incipient enough to potentially be controlled.

❖ WATERSHED PARTNERSHIPS (Hawai'i Association of Watershed Partnerships)

ABOUT:

The first Watershed Partnership in Hawai'i was formed in 1991 on East Maui when several public and private landowners realized the benefits of working together to ensure the conservation of a shared watershed that provided billions of gallons of fresh water to the area. Ten additional such partnerships have since been established statewide, encompassing over one million acres of critical forest lands. The Hawai'i Association of Watershed Partnerships was established in 2003, and currently consists of one partnership on Kaua'i, two on O'ahu, three on Maui, one on Moloka'i, one on Lana'i, and three on the Big Island.

INVOLVEMENT WITH PLANT PESTS:

- Watershed Partnerships work to target the main threats of feral ungulates (hoofed animals such as cattle, pigs, goats, sheep, deer) which destroy forest vegetation leaving ground bare and soils exposed, invasive weed species which can take over a native forest and impact its efficacy in water collection, wildfires, and forest pests and disease, all of which impact forest health and functionality.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- Watershed partnerships have staffs with potential capability and willingness for collaborative plant health emergency response in certain circumstances.
- Potential to build in flexibility for staff time for future bio-invasion emergencies (approximately 1-2 weeks of time) in their grant budgets.

CONTACT:

- ✓ Randal Bartlett; hawpcoordinator@gmail.com, coordinator@eastmauiwatershed.org, (808) 573-6999; Website: www.hawp.org
- **Specific Watershed Partnerships:**
 - **Kaua'i:**
Kaua'i Watershed Alliance, Trae Menard, Coordinator, tmenard@tnc.org
The Nature Conservancy, Kaua'i Program, 4371 Puaole Street, Suite C. Lihue, HI 96766; (808) 587-6257
 - **Moloka'i:**
East Moloka'i Watershed Partnership, Edwin Misaki, Coordinator, emisaki@tnc.org
The Nature Conservancy, Moloka'i Program, Po Box 220, Kualapuu, HI 96757, (808) 553-5236
Website: www.nature.org/ourinitiatives/regions/northamerica/unitedstates/hawaii/howwework/east-molokai-watershed-partnership.xml
 - **O'ahu:**
Wai'anae Mountains Watershed Partnership, Yumi Miyata, Coordinator, wmwpcordinator@gmail.com
2551 Waimano Home Road, #202, Pearl City, HI 96782; (808) 453-6110
Website: <http://hawp.org/partnerships/waianae-mountains-watershed/>
Ko'olau Mountains Watershed Partnership, Mary Ikagawa, Coordinator, kmwpcordinator@gmail.com
2551 Waimano Home Road, Bldg #202, Pearl City, HI 96782.; (808) 453-6110
Website: <http://hawp.org/partnerships/koolau-mountains-watershed/>
 - **Maui:**
East Maui Watershed Partnership, Randal Bartlett, Coordinator, coordinator@eastmauiwatershed.org, P.O. Box 431, Makawao, HI 96768, (808) 573-6999; Website: www.eastmauiwatershed.org
West Maui Mountains Watershed Partnership, Christopher Brosius, Coordinator, brosius@hawaii.edu, P.O. Box 13240, Lahaina, HI 96761, (808) 661-6600; Website: www.westmauiwatershed.org

Leeward Haleakalā Watershed Restoration Partnership, Arthur Medeiros, Coordinator,
auwahi@yahoo.com, P.O. Box 652, Makawao, HI 96768, (808) 573-8989, Website: www.lhwrp.org

- **Lānaʻi:**

- **Lānaʻi Forest and Watershed Partnership**

- (Current status in flux and uncertain due to change in ownership of the watershed)

- **Hawaiʻi Island:**

- **Kohala Watershed Partnership**, Melora Purell, Coordinator, coordinator@kohalawatershed.org,

- P.O. Box 437182, Kamuela, HI 96743, (808) 333-0976, www.kohalawatershed.org

- **Three Mountain Alliance**, Colleen Cole, Coordinator, tcolleencole@gmail.com.

- P.O. Box 52, Resources Management, Hawaiʻi Volcanoes National Park, HI 96718, (808) 985-6197,

- Website: <http://hawp.org/partnerships/three-mountain/>

- **Mauna Kea Watershed Alliance**, Cheyenne Hiapo Perry, Coordinator, chperry@hawaii.edu

- 160 Baker Avenue. Hilo, HI 96720, (808) 937-5170

Additional Contributors:

- ❖ **Bishop Museum**
- ❖ **County Officials**
- ❖ **Environmental Protection Agency (EPA)**
- ❖ **Hawaiʻi Department of Health (HDOH)**
- ❖ **Hawaiʻi Early Detection Network (HEDN)**
- ❖ **Hawaiʻi Tourism Authority**
- ❖ **Industry Trade Associations and Groups (including Agriculture groups)** (Listed at end of Appendix B)
- ❖ **U.S. Forest Service**
- ❖ **U.S. Department of Interior Fish and Wildlife Service (USFWS)**

❖ **BISHOP MUSEUM**

ABOUT:

Bishop Museum has the world's largest biological collections for Hawaiʻi (about 4 million specimens). The Museum is conducting field surveys to document the distribution of these organisms and is organizing information from its collections and the associated scientific literature into comprehensive computerized databases. This information assists natural resource agencies in managing Hawaii's rich endemic biota.

A major project of Bishop Museum is the Hawaii Biological Survey (HBS), an ongoing natural history inventory of the Hawaiian archipelago. It was created to locate, identify, and evaluate all native and non-native fauna and flora within the state and to maintain the reference collections of that biota for a wide range of uses. The HBS has published its annual Records of the Hawaii Biological Survey since 1994. This is the primary source of research on new island and state records of our fauna and flora.

INVOLVEMENT WITH PLANT PESTS:

Bishop Museum staff has offered assistance with identification for arthropods, mollusks, and plants. The museum is a key resource for the ISCs, as it is where they send non-native plant specimens for definitive identification and vouchers. That system has worked exceptionally well since Oʻahu Early Detection botanists (with OISC) have been stationed at Bishop Museum as Research Associates.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- Identification
- Can serve on scientific advisory panel based on area(s) of expertise.
- With additional funding, staff can become more involved in incident responses.

CONTACT:

- ✓ Neal L. Evenhuis, Senior Entomologist, 808-848-4138, neale@bishopmuseum.org
- Clyde T. Imada, Research Specialist (Botany), 808-848-4175, cimada@bishopmuseum.org
- Shepherd P. Myers, Entomology Collections Manager, shepherd.myers@bishopmuseum.org
- Allen Allison, Senior Zoologist, 808-848-4145, allison@bishopmuseum.org

❖ COUNTY GOVERNMENTS

INVOLVEMENT WITH PLANT PESTS:

Various departments, including Water Departments and Economic Development offices, have helped fund invasive species issues with watershed protection in mind. Some have provided funding to help address plant pests. In addition, all counties in Hawai'i confront plant pests in county parks and urban settings.

Departments of Environmental Management (or equivalent) have the responsibility of continuous performance of all matters relating to sewer operation and maintenance of sewer systems; solid waste disposal and landfill programs; vehicle disposal; and other environmental projects, including recycling programs of the counties. Department of Environmental Management is also a key support agency for Civil Defense (Emergency Management) emergencies.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- Funding: Some County Governments are currently providing significant funding to Invasive Species Committees and Watershed Partnerships; this may be able to be expanded into funding for emergency response efforts.
- Assist with providing personnel and logistical support.
- Waste removal: In some responses, coordination with county solid waste management efforts and managing disposal of waste materials may be crucial; all counties have a Department of Environmental Management or equivalent.
- Urban forestry and botanical parks could be important partners and have collaborated in the past.
- County level Emergency Management can have a key role in CoR level 4 Responses.

CONTACT:

NOTE: Approach to the respective Mayors' Offices during a response should be made through the IC Team (IC or via the PIO), working with the Chair of HDOA and/or DLNR, by State Civil Defense, or by one or more of the County Mayors.

- *City and County of Honolulu:*

MAYOR

Kirk Caldwell, 530 S. King Street, Rm. 300, Honolulu, HI 96813, (808) 768-4141

MANAGING DIRECTOR'S OFFICE: (808) 768-6634 Fax (808) 768-424

Ember Lee Shinn, Managing Director, Georgette T. Deemer, Deputy Managing Director

DEPARTMENT OF EMERGENCY MANAGEMENT

Melvin Kaku, Director (808) 723-8960, Peter Hirai, Deputy Director, (808) 723-8952

DEPARTMENT OF PARKS AND RECREATION

Toni P. Robinson, Director, Kapolei, HI (808) 768-3001

DEPARTMENT OF ENVIRONMENTAL SERVICES

Lori M. K. Kahikina, P.E., Director,

Timothy A. Houghton, Deputy Director, Ross S. Tanimoto, P.E., 2nd Deputy Director

1000 Uluohia Street, Suite 308, Kapolei, HI 96707; (808) 768-3486

-Landfill (808) 768-3486

-HPower: 682-0261

-Recycling Information (808) 768-3200

-Environmental Concern Line (808) 768-3300

- *County of Maui*

OFFICE OF THE MAYOR

Alan Arakawa, Mayor (808) 270-7855, email: mayors.office@mauicounty.gov

200 South High St, Kalana o Maui Bldg, Wailuku, HI 96793

**Extremely supportive in invasive species efforts.*

MAUI COUNTY COUNCIL

**Very supportive of work on invasive species; passed separate resolutions supporting: invasive species work; protection of watersheds; and biological control.*

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Kyle Ginoza, (808) 270-8230, environmental.mgmt@mauicounty.gov

ENVIRONMENTAL COORDINATOR

Rob Parsons (808) 270-8250, rob.parsons@mauicounty.gov

The Maui County Environmental Coordinator's Office provides access to information and resources, and serves as an advocate to see that important environmental concerns are brought before decision makers. In addition, the Environmental Coordinator responds to and coordinates a broad range of environmental issues, including Watershed Protection, Invasive Species, Agricultural Sustainability, Marine Protection, and Renewable Energy.

- *Played key role in developing early detection training workshops on snakes and other vertebrates for county workers.*
- *Organized outreach activities to support retention of HDOA inspector positions during Reduction in Force (RIF).*
- *Was active with development of Aquatic Invasive Species Management Plan.*

OFFICE OF ECONOMIC DEVELOPMENT

Teena Rasmussen – Director, (808) 270-7710, economic.development@mauicounty.gov

- *OED provides significant support to addressing invasive species and has in the past provided emergency funding for new incipient pests, such as the wiliwili gall wasp.*
- *Funding for survey and outreach work on Little Fire Ant, for work on Banana Bunchy Top Virus (BBTV), and for biological control agent for Miconia*

DEPARTMENT OF WATER SUPPLY

Pamela Pogue, Planning Director, (808)- 463-3110

Provides significant support to island-based Watershed Partnerships, Invasive Species Committees, and koa-wilt program to address forest invaders.

- *County of Hawai'i*

OFFICE OF THE MAYOR:

William P. Kenoi, Mayor, cohmayor@co.hawaii.hi.us website: <http://hawaiicountymayor.com/>

East Hawai'i: 25 Aupuni Street, Hilo, (808) 961-8211

West Hawai'i: 74-5044 Ane Keohokalole Highway, Bldg C, Kailua-Kona, (808) 323-4444

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Acting Director: Dora Beck, P.E. email:hcohdem@co.hawaii.hi.us

East Hawai'i: 2100 Kanoelehua Avenue, C-5 (Puainako Town Center), Hilo, (808) 961-8083

West Hawai'i: 74-5044 Ane Keohokalole Highway, Bldg D, Kailua-Kona, (808) 323-4411

COUNTY COUNCIL

Amy Miwa, aide to Jay Yoshioka, (808) 961-8015.

- *Helpful with Big Island Invasive Species Committee issues.*
- *Additional Council Involvement with Invasive Species: Most of the councilmembers are supportive--all have shown interest in the albizia control plan, and Zendo Kern has introduced a bill to battle "unsafe flora." In addition, Dennis Onishi and Joe Kamelamela were involved with an albizia stakeholders meeting.*

- *County of Kaua'i*

OFFICE OF THE MAYOR:

Bernard P. Carvalho, Jr., Mayor, (808) 241-4900, mayor@kauai.gov

4444 Rice St, Lihue, HI 96766

DEPARTMENT OF PUBLIC WORKS, SOLID WASTE DIVISION

(808) 241-4839 , www.kauai.gov/publicworks/solidwaste

OFFICE OF ECONOMIC DEVELOPMENT:

George Costa, Director, (808) 241-4949, gcosta@kauai.gov

Bill Spitz, Agriculture Specialist, (808) 241-4953 , Email: cwspitz@kauai.gov

❖ ENVIRONMENTAL PROTECTION AGENCY (EPA)

INVOLVEMENT WITH PLANT PESTS:

- Serves the public, state and local agencies, businesses, and groups interested in the environment, environmental health issues and EPA regulations.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- Can provide information relevant to environmental compliance.

CONTACT:

- Dean Higuchi, Press Officer/Congressional Liaison/Public Affairs
(808) 541-2710; higuchi.dean@epa.gov
U.S. EPA, Region 9, Pacific Islands Contact Office,
Federal Building, 300 Ala Moana Blvd., Room 5-152, P.O. Box 50003, Honolulu

❖ GOVERNOR'S OFFICE

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

Approaching the Governor to call for a "Governor Declared Emergency" for funding and other assistance in a serious plant health Emergency may be a very important strategy. Provision of funds may be an option. Engaging Civil Defense to provide assistance is also an option.

CONTACT:

Approach to the Governor of Hawai'i during a plant health emergency response could properly be made by the IC Team working with the Chair of HDOA and/or DLNR, by State Civil Defense, or by one or more of the County Mayors.

- Office of the Governor, The Honorable Neil Abercrombie, 808-586-0034
- Office of the Lieutenant Governor, The Honorable Shan Tsutsui, 808-586-0255

❖ HAWAI'I DEPARTMENT OF HEALTH (HDOH)

INVOLVEMENT WITH PLANT PESTS:

- HDOH is one of six agencies with votes on the Hawaii Invasive Species Council (HISC). Gary Gill, Deputy Director of DOH, serves as the DOH Director's representative on the Hawai'i Invasive Species Council.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- HDOH has responsibilities for pesticide regulation, delegated by the EPA.
- In Hawai'i, the Health Department (Clean Water Branch) is the lead state agency for the National Pollutant Discharge Elimination System (NPDES). DOH's rules have emergency provisions.

CONTACT:

- Gary Gill, Deputy Director for Environmental Health, 808-556-4424; Email: gary.gill@doh.hawaii
- Laura McIntyre, DOH Environmental Planning Office, Email: Laura.McIntyre@doh.hawaii.gov

❖ HAWAI'I EARLY DETECTION NETWORK (HEDN)

ABOUT:

HEDN consists of a suite of web-based products and tools that facilitate the capture, management and referral of pest reports from the public; provide efficient methods of interagency communication; provide notification of incoming reports in near real-time; and increase public awareness of invasive species early detection. The program strives to foster and support active community surveillance for island-specific early detection target species. The Report-A-Pest (RAP) system (www.reportapest.org) and Early Detection Toolkit are the most basic components. For a description of other HEDN associated products, such as the 643-PEST Hotline Online Report Form, Interagency Rapid Notification System (IRNS) and Pest Report Access Tool (PRAT), see <https://docs.google.com/document/d/1fpKboEGReyr3Hlw42->

[DCddipBA4-GantKfONdydopRI/edit?usp=sharing](#). Note: See also more detail on HEDN in the main document, Section 2C.

INVOLVEMENT WITH PLANT PESTS:

- The Hawai'i Early Detection Network (HEDN) is a program designed to support invasive species public outreach and early detection efforts.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- The Report-A-Pest system and Early Detection Toolkit are designed to encourage the early detection and rapid response for new and incipient invasive species. This program could enable earlier discovery, an immensely important consideration.
- Also can assist in communications and in email communications for delimiting surveys.

CONTACT:

- website: www.reportapest.org;
- ✓ Sky Harrison, 808-264-2799; skyh@hawaii.edu;
- ✓ Elizabeth Speith, 808-264-4757; speith@hawaii.edu

❖ **HAWAII TOURISM AUTHORITY (HTA)**

ABOUT:

The Hawai'i Tourism Authority (HTA) is the State's tourism agency responsible for setting tourism policy and direction; developing and implementing the State's tourism strategic and brand management plans. HTA continues to invest and promote natural areas and Hawaii's environment as a uniquely special place.

INVOLVEMENT WITH PLANT PESTS:

Funding: HTA awards grant funding through its Natural Resources Program and Kūkulu Ola – Living Hawaiian Culture Program under its Product Enrichment Program (PEP). The PEP allows the HTA to leverage tourism dollars to support community-led initiatives that also create sustainable and authentic experiences for residents and visitors. As part of this, there have been several grant awards related to mitigating effects of invasive species. For example, the Hawai'i Ant Lab was funded for a project involving "Impacts of Stinging Ants at Hilo Beach Parks and Pana'ewa Zoo", to protect public access to natural resource areas managed by the County of Hawai'i from infestations of the Little Fire Ant; improve visitor experiences by managing risks of being stung; train control techniques to staff; and develop a management system to be integrated with other maintenance activities.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- *Funding:*
HTA is a potential funding source for small grants, through PEP and other programs, which could conceivably be timed to assist an ongoing emergency eradication effort. HTA periodically solicits proposals for its PEP, which supports community-based projects. Applications must be submitted through either a County or through the Hawai'i Community Foundation. There are four opportunities/deadlines throughout the year. Instructions are given at <http://www.hawaiitourismauthority.org/about-hta/rfps/>

CONTACT:

- ✓ Kelii Wilson; Hawai'i Tourism Authority, (808) 973-2281, kwilson@hawaiitourismauthority.org
- Questions regarding Hawaiian Culture and Natural Resources RFPs can be referred to: Hawai'i Community Foundation, Larissa Kick, (808) 566-5565, lkick@hcf-hawaii.org

❖ **INDUSTRY TRADE ASSOCIATIONS AND GROUPS (INCLUDING AGRICULTURE GROUPS)**

**See listings in Appendix C.*

❖ PACIFIC COOPERATIVE STUDIES UNIT (PCSU)

ABOUT:

The Pacific Cooperative Studies Unit (PCSU) has a forty year history of working to protect cultural and natural biodiversity in the Pacific while encouraging a sustainable economy. Originally founded to support research in U.S. National Parks, the unit has also expanded its efforts to work cooperatively with private, state and federal land organizations, including The Nature Conservancy, Kamehameha Schools, and the State DLNR and HDOA.

Projects range from finding ways to eradicate *Miconia* and other alien invasive weeds to managing watersheds on Maui and O'ahu, to restoring Hawaii's endangered plant species, to studying endangered bird species on Maui and Kaua'i. Studies on cultural resources are also conducted, particularly where they interact with natural resource management. Often the Unit works as a middleman, allowing agencies to pool and coordinate their efforts so that they can attack problems across the landscape at an appropriate scale. It also provides access to UH scientists, as well as those elsewhere. The PCSU has also produced a series of technical reports on Hawaiian and Pacific natural and cultural resource research and management issues that are widely used by managers and scientists alike.

INVOLVEMENT WITH PLANT PESTS:

- PCSU provides comprehensive administrative support and oversight to projects collaborating in this Plan in association with CGAPS, HISC, invasive species committees, watershed partnerships, Army environmental (OANRP), Hawaii Ant Lab, HEDN, and HPWRA.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- The PCSU project staff of 350 has a variety of skills that could be re-purposed for short term emergency response.

CONTACT:

- ✓ David Duffy, Unit Leader, (808) 956-8218, dduffy@hawaii.edu
University of Hawai'i at Manoa, Department of Botany, 3190 Maile Way, St. John #408, Honolulu

❖ U.S. FOREST SERVICE

ABOUT:

Presence of the U.S. Forest Service (U.S. Department of Agriculture) in Hawai'i consists of the Institute of Pacific Islands Forestry (an institute devoted to biodiversity and forestry research) and the Pacific Southwest Region's State and Private Forestry Program. It is primarily based at a facility near UH-Hilo.

INVOLVEMENT WITH PLANT PESTS:

- Although the U.S. Forest Service has no national forest land in Hawai'i, it conducts research on Pacific Island forest management and ecology, and provides technical advice and training to Hawai'i and other island forestry programs.
- It also supports a major biological control effort for seriously invasive weeds in Hawai'i, including strawberry guava and *Miconia calvescens*.
- The Forest Service also assists state forestry programs involving plant pests and pest plants by providing forest health evaluations and funding in certain circumstances.
- USFS also currently provides the chairperson for CGAPS.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- Funding is from the Forest Service available in the following categories:
 - 1) Prevention and suppression of insect and disease pests of trees (and emergency suppression);
 - 2) Detection monitoring, emergency suppression and (non-emergency) suppression; and
 - 3) Invasive plant control funding.
- USFS has authority for spending funds on pest suppression on all forest lands, federal, state and private (though no institutional authority to access lands).

CONTACT:

- ✓ Jodi Chew, Pacific Island Liaison, US Forest Service, 737 Bishop Street, Suite 2390, Honolulu, HI (808) 348-1926, jschew@fs.fed.us
- ✓ Robert Hauff of DOFAW is a key state liaison with the Forest Service for forest health issues: Robert Hauff, Forest Health Coordinator, Division of Forestry and Wildlife, DLNR 1151 Punchbowl Street, Room 325 Honolulu, HI 96813, (808) 587-4174, Robert.D.Hauff@hawaii.gov
- *Also:*
 - Sheri Smith, Regional Entomologist, USDA Forest Service, Forest Health Protection, 2550 Riverside Drive, Susanville, CA 96130, 530-252-6667, ssmith@fs.fed.us
 - Phil Cannon, Regional Forest Pathologist, USDA Forest Service, 1323 Club Drive, Vallejo, CA 94592, 707-562-8913, pcannon@fs.fed.us
 - David Bakke, Regional Pesticide Use Specialist and Invasive Plant Program Manager, USDA Forest Service, 1323 Club Drive, Vallejo, CA 94592, 707-562-8916
 - Ric Lopez, IPIF Director, US Forest Service, Pacific Southwest Research Station, 60 Nowelo Street, Hilo Hawaii 96720 808-854-2601, rdlopez@fs.fed.us
 - Also potential access to other specialists (entomologists and pathologists) in the region and throughout the forest service on a case-by-case basis.

❖ UNITED STATES DEPARTMENT OF INTERIOR FISH AND WILDLIFE SERVICE (USFWS)

ABOUT:

USFWS Ecological Services maintains an Invasive Species Coordinator at the Pacific Islands Field Office in Honolulu and a number of other Hawai'i-based staff that work on invasive species issues.

USFWS National Wildlife Refuges in Hawai'i support invasive species control programs as part of their overall habitat restoration activities.

USFWS Office of Law Enforcement administers the Lacey Act, which prohibits the importation and interstate movement of listed injurious species.

USFWS is also responsible for monitoring the import, export, transport, sale, receipt, acquisition or purchase of any fish or wildlife or plant possessed, transported, or sold in violation of any law, treaty, or regulation of the U.S., or in violation of Indian tribal law, as well as interstate or foreign commerce of any fish or wildlife taken, possessed, transported, or sold in violation of any law or regulation of any State or foreign law, or plants in violation of any law or regulation of any State.

Invasive Species Work:

- Large focus on Brown Treesnake in HI, CNMI, and Guam - Mostly coordination on interdiction and control efforts, research, grant monitoring.
- Also other invasive species work (aquatic, terrestrial, biosecurity and quarantine issues) in the Pacific ecoregion.
- Active participants in leadership roles in CGAPS, ISCs, and HISC.

INVOLVEMENT WITH PLANT PESTS:

- Limited at this time, except for control efforts in the NWHI refuges and section 7 consultation requirements related to ESA (biological opinions) on federally-related projects that may affect listed threatened and endangered species. This includes Hazard Analysis and Critical Control Point (HACCP) planning, which include measures to follow at critical control points to prevent the inadvertent introduction of invasive species due to a proposed action.
- Depending upon availability, may be able to provide limited discretionary funding support to the Invasive Species Committees (ISCs) for statewide early detection and rapid response of high-priority invasive species.
- Involved in the development of this plan as steering committee members.

HOW THEY CAN HELP IN A RESPONSE

- *Personnel:* FWS has a large staff at the Federal Building at 300 Ala Moana Blvd. in Honolulu, with scattered staff across the Hawaiian islands. Some of these personnel may be available for emergency response in some instances. FWS has a small number of Law Enforcement personnel, who may be able to assist in enforcement aspects of invasive species issues.
- *Consulting:* For both big picture situations as well as on the ground issues, such as environmental compliance concerns.
- *Funding:* Limited funding options may be available.

CONTACT:

- ✓ Earl Campbell, Assistant Field Supervisor, Invasive Species & Terrestrial Marianas Issues, 808-792-9400, earl_campbell@fws.gov
- ✓ Domingo Cravalho, Invasive Species Biologist, 808-792-9445 domingo_cravalho@fws.gov
- ✓ Joshua Fisher, Invasive Species Biologist, 808-792-9452, joshua_fisher@fws.gov

Contributors in Unique Situations

- ❖ **Botanical Gardens**
- ❖ **CBP (Customs and Border Protection)**
- ❖ **Civil Defense**
- ❖ **County Parks and Recreation (urban forestry/parks)**
- ❖ **Emergency Services / FEMA**
- ❖ **Hawai'i Ant Lab**
- ❖ **HDOT, Hawai'i Department of Transportation**
- ❖ **Law Enforcement**
- ❖ **Military, including Army Natural Resources Program (ANRP), featuring O'ahu (OANRP)**
- ❖ **NPS, National Park Service (U.S. Department of the Interior)**
- ❖ **PBARC, Pacific Basin Agricultural Research Center (USDA-ARS)**
- ❖ **Plant Boards (National and Western)**
- ❖ **SEB and FAC**
- ❖ **The Nature Conservancy of Hawai'i**
- ❖ **University of Hawai'i**
- ❖ **Weed Risk Assessment**

❖ **BOTANICAL GARDENS**

INVOLVEMENT WITH PLANT PESTS:

Botanical Gardens have unique responsibilities to be vigilant in avoiding introducing source material for plant invasions and plant pests, as many of Hawaii's invasive plants were first introduced (decades ago) via botanical gardens, and there are examples of plant pests that first established and spread from gardens (e.g., *hala* scale on Maui). At this time, most of Hawaii's gardens are extremely aware and collaborative with the entities concerned with plant health and addressing such issues, and they have an important role in educating the public on plant health issues.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- Identification: personnel at botanical gardens likely to detect a plant pest and report it.
- Response efforts.
- Education efforts: National Tropical Botanical Garden, Lyon Arboretum, and Honolulu Botanical Gardens are among those gardens most active in plant health education programs.

CONTACT:

- National Tropical Botanical Garden, Kaua'i, (808) 332-7324, www.ntbg.org/
- Lyon Arboretum, (808) 988-0456, O'ahu, www.hawaii.edu/lyonarboretum/
- Honolulu Botanical Gardens, O'ahu (808) 522-7060, www.honolulu.gov/parks/hbg/
Contact: Joshlyn Sand jsand@honolulu.gov

❖ **CBP -- CUSTOMS AND BORDER PROTECTION** (DHS-CBP, AN AGENCY WITHIN THE DEPARTMENT OF HOMELAND SECURITY)

ABOUT:

Customs and Border Protection is responsible for air/sea/military passengers/cargo and air and sea conveyance entering the United States from foreign countries. CBP conducts exams and retains information relating to the entry of passengers and cargo.

INVOLVEMENT WITH PLANT PESTS:

Inspection and Quarantine: CBP enforces specific quarantines for USDA-APHIS-PPQ through a memorandum of agreement. Exams are conducted, and when insect and diseases are discovered, CBP sends them to the PPQ Hawai'i Plant Inspection Station for identification. PPQ retains all records for pest interceptions and other data. Action is taken either by CBP or PPQ on those interceptions found to be under regulation, and if found not to be under regulation, no action is taken.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- If it has been determined that the emergency response relates to an area of CBP responsibility, the agency can assist with information that may be useful in determining the source of the incident.

CONTACT:

- ✓ James Kosciuk, Port of Honolulu, Chief Agriculture Specialist, 300 Ala Moana Blvd, Rm 2500, Honolulu, HI 96850, (808) 356-4100, james.kosciuk@dhs.gov

❖ **CIVIL DEFENSE / EMERGENCY MANAGEMENT**

ABOUT:

The Emergency Management (EM) function, (also known as Civil Defense on the State Level), is responsible for coordinating preparedness, response, recovery, and mitigation of emergencies and disasters - including fires, volcanoes, floods, tsunamis, and hurricanes. All levels of government have EM/CD function, from local (county) to state to federal. Nationally, the function falls under FEMA (Federal Emergency Management Agency), which falls under the Department of Homeland Security (DHS). EM uses NIMS, ICS, and Emergency Operations Centers, and involves State and County Departments in assisting in addressing the emergency.

INVOLVEMENT WITH PLANT PESTS:

Emergency Management is not normally involved with plant pests, but under appropriate circumstances can assist with serious and large plant health emergencies.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

Resources and funding: Civil Defense can potentially assist in securing resources for emergency response in certain circumstances. Civil Defense departments are relatively small, but they can mobilize substantial interdepartmental resources by implementing ESF-11.

CONTACT:

• *State Level:*

Department of Civil Defense Division, State of Hawaii
3949 Diamond Head Road, Honolulu, HI 96816 (808) 733-4301

- ✓ Steven Yoshimura
Acting point of contact for this PHERP and associated responses, including integration of ESF-11.
syoshimura@scd.hawaii.gov, 733-4300 x576 (office) or 354-4263 (work cell).
- Leighton Ah Cook, Branch Chief for Training, Education and Information
lahcook@scd.hawaii.gov, 733-4300 x521.
- Major General Darryl Wong, Adjutant General and Director; Doug Mayne, Vice Director.
-

• *County Level:*

O'ahu:

City and County of Honolulu Department of Emergency Management, 650 South King Street,

Honolulu, HI 96813, (808) 723-8960

- ✓ Melvin Kaku, Director, mkaku@honolulu.gov, (808) 723-8951
- ✓ Peter Hirai, Deputy Director, PHirai@honolulu.gov, (808) 723-8960
- ✓ Crystal van Beelen, Disaster Preparedness Officer
cvanbeelen@honolulu.gov, (808)723-8956, (808) 499-7435

Kaua'i:

County Civil Defense Agency, Suite 100, 3990 Kaana Street, Lihue, Hawaii, 96766;
(808) 241-1800, emops-kcda@scd.hawaii.gov, Mark B.L. Marshall, Emergency Management Officer

Maui:

County Civil Defense Agency, 200 South High Street, Wailuku, HI 96793-2155
(808) 270-7285 civil.defense@mauicounty.gov, Anna Foust, Emergency Management Officer

Hawai'i:

County Civil Defense Agency, 920 Ululani St.Hilo, HI 96720;
(808) 935-0031, (808) 935-3311 (after hours); civil_defense@co.hawaii.hi.us

• **Federal Level:**

- ✓ Todd L. Smith, USDA APHIS, ESF 11 Coordinator, FEMA Region IX.
160 Foss Creek Circle, #1172, Healdsburg, CA 95448
Phone/Fax: (707) 431-1847; Cell: (970) 631-3279

❖ COUNTY PARKS AND RECREATION, URBAN FORESTRY/PARKS

INVOLVEMENT WITH PLANT PESTS:

Each County has a network of county parks, which require plant health management. Many of these are beach parks with many coconut trees and other palms, which are likely to be threatened with new invasions of pests in the near future.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

Identification, Survey, and Response: County parks have personnel who may detect plant pests and could assist with emergency response within their park areas. Health of coconut trees is also particularly important in many of Hawaii's county parks. As Austin Braaten, of Parks and Recreation, C&C of Honolulu noted (11-6-13): "We now have lots of capacity to assist: 24 certified tree climbers, arborists, lift trucks, chainsaws, etc.- don't be afraid to call us. Our division head Stan Oka is very supportive of OISC and we have the flexibility to help."

CONTACT:

- Hawai'i County:
East: (808) 961-8311; West: (808) 323-4322 ; <http://www.hawaiicounty.gov/parks-and-recreation/>
- Honolulu/Oahu
(808) 768-3003 www.honolulu.gov/parks/aboutus.htm
✓ Contact: Joshlyn Sand jsand@honolulu.gov
✓ Contact: Austin Braaten abraaten@honolulu.gov
- Kaua'i County:
(808) 241-4460;
<http://www.kauai.gov/Government/Departments/ParksRecreation/ParkFacilities/tabid/105/Default.aspx>
- Maui County
(808) 270-7230; <http://www.co.maui.hi.us/index.aspx?NID=287>

❖ HAWAII ANT LAB (HAL)

ABOUT:

The Hawai'i Ant Lab was established about 2008, has four employees, and is led by Dr. Cas Vanderwoude, who has extensive experience in research and management of pest ants throughout the Pacific region, New Zealand and Australia.

INVOLVEMENT WITH PLANT PESTS:

Major focus to date has been on the Little Fire Ant (LFA), a very tiny but serious pest and which arrived in the State before 1999, currently plagues windward Hawai'i island, but threatens to spread across the State. HAL efforts have focused on how to control, contain and eradicate LFA.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

HAL expertise is essential for guiding eradication of certain incipient ant populations, most likely LFA, Red Imported Fire Ant, or the Tawny Crazy Ant. Involvement is dictated by availability of funding. In case of an emergency funding would be provided by HDOA-PPC and as such HAL is a de-facto PPC entity although prolonged involvement will jeopardize ongoing research projects. (Darcy Oishi, HDOA-PPC, pers. comm.)

CONTACT:

- ✓ Cas Vanderwoude, 16E Lanikaula Street, Hilo, Hawai'i 96720, 808-315-5656, casperv@hawaii.edu

❖ **HAWAI'I DEPARTMENT OF TRANSPORTATION**

INVOLVEMENT WITH PLANT PESTS:

HDOT is one of six agencies with a vote on the Hawai'i Invasive Species Council (HISC).

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- *Quarantine and Resources:* Can be helpful in road closures as part of an effort to quarantine certain infected areas to prevent transport of the emergency pest. Potential for sharing of resources (e.g., barriers for quarantine delineation) through the HISC.

"Depending on the duration, HDOT regards a Plant Health Emergency Response as incidental and is able to provide traffic control devices from maintenance funds at our Highway District offices on Oahu, Hawaii, Maui and Kauai. In addition, we are able to quarantine areas at our Harbors and Airports using their maintenance funds." David J. Rodriguez, 11-6-13

- *Funding Assistance for Plant Pest Emergencies along State Highways:* HDOT Highways Division has a Statewide Noxious Invasive Pest Program (SNIPP) that addresses invasive species issues, available at <http://hidot.hawaii.gov/highways/landscape-architecture-program/> One facet of the program involves "Early Detection and Rapid Response", described as "Support and enhance the State's capacity to identify, report and effectively respond to newly detected or localized invasive species." The program provides an avenue for requesting HDOT assistance for plant pest emergencies along State highways.

CONTACT:

- 869 Punchbowl Street, Suite 504, Honolulu, Hawaii 96813, (808) 587-2165
- ✓ David Rodriguez, (808) 587-2150, David.J.Rodriguez@hawaii.gov
Special Assistant to the Director of DOT and serves as the DOT Director's representative on the HISC.
- HDOT, Highways Administrator's office, (808) 587-2220, Edwin.H.Sniffen@hawaii.gov
- District Offices:
 - Oahu District Office Administrator; 831-6703, Pratt.Kinikaka@hawaii.gov
 - Kaua'i District Office Administrator; 241-3000, Raymond.J.McCormick@hawaii.gov
 - Maui District Office Administrator; 873-3538, Ferdinand.Cajagal@hawaii.gov
 - Hawai'i District Office Administrator 933-8866, Stanley.Tamura@hawaii.gov

❖ **LAW ENFORCEMENT**

ABOUT:

State and Federal agricultural inspectors and pest control personnel have very limited law enforcement authority and capacity. As a consequence, coordination with law enforcement agencies is often necessary in order to enforce laws/regulations. A particularly dramatic example involves HDOA's difficulty

in making use of the rigorous State law that provides for penalties of up to \$200,000 and/or 3 yr imprisonment for the transport, harboring, or import of a snake with the intent to propagate, sell or release the prohibited animal. HDOA does not have the authority to stop and search baggage and passengers, without “probable cause” because of 4th Amendment protections; neither can they obtain and enforce warrants when snakes are reported without assistance from other State or municipal law enforcement officials. The same applies for interdiction and emergency response for plant pests. Law enforcement capability would be needed in the event of intentional plant pest introductions and for enforcement of quarantines on the movement of high-risk items within defined areas. A further problem is that the seriousness of smuggling animals and plants or non-compliance with related laws “has not yet been generally appreciated among significant sectors of the law-enforcement, legal, and judicial communities in Hawai‘i”.²

INVOLVEMENT WITH PLANT PESTS:

Up to this point, predominantly for snakes (which have much more stringent penalties and are reportable to 911)- and snake incidents have dominated HDOA’s experience with law enforcement entities, though some coordination with law enforcement agencies has been used to enforce laws/regulations that apply to plant pests.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

Enforcement - Success in doing this will often rely on relationships of understanding built up over time. County police have been most frequently enlisted by HDOA, but other law enforcement entities can potentially assist and have assisted as well.

CONTACT:

- **Police Departments**

Contact phone numbers for County Police are non-emergency numbers. A dispatcher typically assists with resolution of the situation.

Hawai‘i County Police Department

Hilo: (808) 961-2214, 349 Kapi‘olani Street,

There are 8 stations on the Big Island: <http://www.hawaiiipolice.com/contact-us/police-stations>

Honolulu Police Department

801 South Beretania Street, Honolulu, HI 96813 (808) 529-3111

There are 10 police stations or substations on O‘ahu <http://www.honoluluupd.org/contact/>

Kauai County Police Department

Lihue District Commander (808) 241-1638

Hanalei District Commander (808) 246-8104

Waimea District Commander (808) 338-1831

Maui County Police Department

Wailuku: (808) 244-6400; Lahaina: (808) 661-4441

- **Department of Public Safety, Sheriff Division**

Carries out law enforcement services statewide by protecting all persons and property within the premises under control of the Judiciary and all State facilities. The Sheriff Division may have special authority in the vicinity of harbors and airports.

1177 Alakea Street., Room #418, Honolulu, Hawaii 96813 (808) 587-2640

<http://dps.hawaii.gov/about/divisions/law-enforcement-division/sheriff-division/>

Honolulu Airport Unit – 24 hour dispatch (808) 836 – 6606

Hawai‘i (Big Island) Section (808) 933 – 8833

Kauai Section (808) 482 – 2470

Maui Section (808) 244 – 2900

² Kraus, F., and D. Cravalho. 2001. The risk to Hawai‘i from snakes. *Pacific Science* 55(4): 409-417. Available at scholarspace.manoa.hawaii.edu/handle/10125/2508

- **DLNR Division of Conservation and Resource Enforcement (DOCARE)**

Kalanimoku Building, 1151 Punchbowl St. Honolulu, HI 96813
(808) 587-0400 ; Enforcement: (808) 643-DLNR

DOCARE is most likely to be involved if illegal wildlife is the issue. Their assistance may be appropriate for a response on State Conservation Lands.

- **U.S. Fish and Wildlife Service – Law Enforcement**

U.S. Fish & Wildlife Service, 3375 Koapaka St. B296, Honolulu, HI 96819

✓ Contact: George Phocas, (808) 861-8525; george_phocas@fws.gov

FWS Law Enforcement can help especially in instances where smuggling of injurious wildlife species is involved, but also when smuggling of plants that transport plant pests is involved.

- **Federal Bureau of Investigation**

91-1300 Enterprise Street, Kapolei, HI 96707, (808) 566-4300

The FBI may get involved to assist prosecution in instances involving smuggling and other intentional introductions.

❖ U.S. MILITARY

ABOUT:

Hawai'i is the most militarized state in the U.S., with 250,000 acres of land controlled by the U.S. Military. On Oahu, nearly 25% of the 594 mi² island is controlled by the armed forces³, with over 100 installations, involving Army, Navy, Air Force and Marines. The Military in Hawai'i has strong programs to address invasive species issues, and is generally supportive of efforts to address invasive species. As an example, The O'ahu Army Natural Resources Program (OANRP), based at the U.S. Army Garrison Hawai'i, Schofield Barracks, is particularly exemplary and is open to collaboration in emergency response within their mission guidelines.

It must be recognized that in the context of the PHERP, there are potential pitfalls of communication in accessing military lands when needed for emergency response. This creates the need for reliable liaison individuals who can assist in obtaining permission for plant health survey and emergency responses through the relevant command structure.

Special Cases:

- **O'ahu Army Natural Resources Program (OANRP)**

The U.S. Army Garrison Hawaii's OANRP is responsible for managing more than 100 endangered species of plants, snails and birds of the Wai'anae and Ko'olau Mountains. The program has about 50 staff members and routinely collaborates with partner agencies.

- **Pōhakuloa Training Area (PTA)**

Pōhakuloa Training Area (PTA), on Hawai'i island between Mauna Loa and Mauna Kea, is a large military facility with an Environmental Division that bears resemblance to OANRP, and they have a large staff that can play a key role in species detection for Hawai'i Island.

INVOLVEMENT WITH PLANT PESTS:

- OANRP: Conducts regular weed surveys and have targeted 61 incipient weed species for eradication in their management units, including the notorious weed *Chromolaena odorata* (see Appendix F, Case Study 5). In addition, OANRP has participated in a number of collaborative invasive species control projects including coqui, naio thrips, Waianae fountain grass, and *Chromolaena* and is a willing contributor to emergency response on O'ahu if guidelines allow it.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- Primarily in dealing with species on military lands; beyond this, the concept would need to be developed. As an example, OANRP is limited to addressing threats that affect training, threats that are introduced via training, or threats that directly impact endangered species they are required to manage. While this does allow some

³ Friary, R., and G. Bendure. 2000. Lonely Planet Guide: O'ahu. Lonely Planet Publications, Oakland, CA.

leeway in working on a variety of invasive and pest issues, the connection to Army lands or training is an important component.

CONTACTS:

Liaisons for plant health-related survey & emergency accesses to military lands:

- **Navy:**

- ✓ Cory Campora, US Navy (civilian entomologist), cory.campora@navy.mil, (808) 471-1170 x244
NAVAC Hawaii OPHC3I, 400 Marshall Road, Building A-4, Pearl Harbor

- **Air Force**

- ✓ William E. Grannis; william.grannis@us.af.mil (808) 449-4049

- **Marines:**

- ✓ Lance Bookless; lance.bookless@usmc.mil, (808) 257-6920 x226
Alternate: Todd Russell; todd.russell@usmc.mil, (808) 216-7135

- **Army:**

- ✓ Mark Leong, US Army (civilian entomologist), mark.k.leong@us.army.mil, (808) 864-1038
Directorate of Public Works, U.S. Army Garrison, Hawaii
948 Santos Dumont Avenue, Bldg 105, Wheeler Army Airfield, Schofield Barracks
- **OANRP:** U.S. Army Garrison Hawai'i, Schofield Barracks,
 - ✓ Michelle Mansker, Chief, michelle.l.mansker.civ@mail.mil, (808) 655-9189.
 - ✓ Jane Beachy, Ecosystem Restoration Program Manager, jane.r.beachy.ctr@mail.mil, (808)295-3378
Kapua Kawelo, Biologist, hilary.k.kawelo.civ@mail.mil
- **Pōhakuoloa Training Area (PTA):** Natural Resources Office, MM 30 Saddle Road, Hilo,
 - Peter Peshut, Army Biologist, PTA (Regulatory, Military or process info)
 - Lena Schnell, Senior Program Manager, CSU-CEMML, PTA NRO
Office (808) 969-3340 Cell (808) 315-0300 lena.schnell@rams.colostate.edu
(For Getting access, permission to work with NRO staff)
 - Pamela Sullivan, Invasive Plants Program Manager (808) 315-2501
(For Technical info on plant management)
 - Rogelio Duratt, Wildlife Program Manager (808) 345-0547
(More for native species, but also ungulate control contracts)

❖ NATIONAL PARK SERVICE (NPS) - UNDER THE U.S. DEPARTMENT OF THE INTERIOR

ABOUT:

The National Park Service (NPS) manages seven parks in Hawai'i, four of which have control of invasive plants as a major program component: Hawai'i Volcanoes, Haleakala, Kalaupapa, and Kaloko-Honokohau. The largest, Hawai'i Volcanoes NP, covers 323,000 acres.

INVOLVEMENT WITH PLANT PESTS:

- Haleakala NP, (33,000 acres) has provided strong support to the Maui Invasive Species Committee (MISC) for combatting invasive plant threats before they reach the park.
- Hawai'i Volcanoes NP has a particularly ambitious program of containing and eradicating pest plants within the park. The park has surveyed and mapped 134 invasive plant species since the 1980s; at least 13 of them seem to be eradicated and many others contained (Benitez et al. 2012). The park has a relatively large cadre of workers trained in plant control and pesticide use. Park personnel have periodically participated in Big Island Invasive Species Committee (BIISC) activities and could likely assist outside the park with certain high-priority eradications under some circumstances. In addition, the park has many personnel trained in the use of the ICS system for fire-fighting.
- Exotic Plant Management Team:
http://www.nature.nps.gov/biology/invasivespecies/Documents/EPMT_PrgmInfoSheet_20080214.pdf

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

Resources available for survey, control, education, etc. for incursions within park lands. Some NPS employees may be potentially available to assist emergency response outside of Parks in certain instances, but would likely need to establish an MOU.

CONTACT:

- **Hawai'i Volcanoes National Park**
PO Box 52, Hawai'i Volcanoes NP, HI 96718; Fax: 808-985-6029;
✓ David Benitez, Ecologist, Alien Plant Program, david_benitez@nps.gov, (808) 985-6085
✓ Rhonda Loh, Chief of Natural Resource Management; rhonda_loh@nps.gov, (808)985-6098
- **Haleakala National Park**
P.O. Box 369, Makawao, Maui, HI 96768
✓ Matt Brown Chief of Natural Resource Management, (808) 572-4490, matt_brown@nps.gov
- **Exotic Plant Management Team**
✓ Jeremy Gooding, jeremy_gooding@nps.gov

❖ **PBARC (U.S. PACIFIC BASIN AGRICULTURAL RESEARCH CENTER, USDA-AGRICULTURAL RESEARCH SERVICE)**

INVOLVEMENT WITH PLANT PESTS:

The mission of PBARC is to develop basic and applied information to strengthen agriculture in Hawai'i and the Pacific Basin in an environmentally acceptable and sustainable manner, including demonstrating appropriate strategies for managing crop pests and providing economically viable technologies for controlling quarantine pests.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

PBARC's staff may be able to assist with eradications in certain instances, when the special expertise of individual scientists may be needed. APHIS-PPQ and HDOA are generally familiar with the work of PBARC scientists. PBARC entomologists and plant pathologists can assist in identification, detection and mitigation of invasive species. PBARC scientists also have expertise in quarantine treatments.

CONTACTS:

- Web: http://www.ars.usda.gov/Main/site_main.htm?modecode=53-20-03-00
- Address: 64 Nowelo Street , Hilo, HI 96720
- Marisa Wall, Research Food Technologist, current (2013) Acting Director of PBARC, (808) 959-4343, marisa.wall@ars.usda.gov
- Eric Jang, Supervisory Research Entomologist, (808) 959-4340, eric.jang@ars.usda.gov
- Peter Follett, Research Entomologist, (808) 959-4303 Peter.Follett@ars.usda.gov

❖ **PLANT BOARDS (NATIONAL AND WESTERN)**

ABOUT:

The National Plant Board's (NPB) mission is to facilitate the protection of agriculture, horticulture, forestry, and the environment on state, national and international levels. The Board (NPB) is made up of the principal plant pest regulatory officials of each member commonwealth and state of the U.S, and provides national representation and communication between the Eastern, Southern, Central and Western Plant Boards. Hawai'i is a member of both the NPB and the Western Plant Board.

INVOLVEMENT WITH PLANT PESTS:

USDA-APHIS-PPQ-EDP (Emergency and Domestic Programs) typically convenes a teleconference with the NPB shortly after the detection of a new plant pest or an outbreak has occurred to provide initial information about the incident. NPB members and leadership are briefed on a broad range of issues related to the incident, including the pest's regulatory importance, infestation delimitation, response

strategies, biological and ecological considerations, economic impact, trade implications, and other pertinent information.

HOW THEY CAN HELP IN EMERGENCY RESPONSE:

These organizations can help disseminate information relevant to addressing any national/regional repercussions of a plant emergency in Hawai'i and in some instances for helping to avoid reintroduction of the pest to Hawai'i.

CONTACT

- Membership in the boards changes periodically but is continually updated at <http://www.nationalplantboard.org/>
- Hawai'i's representative on the NPB and WPB is the State Plant Regulatory Official, Neil Reimer of HDOA.

❖ **State Emergency Board (SEB) / Food and Agriculture Council (FAC)**

ABOUT:

Both SEB and FAC are active in Hawai'i, meeting quarterly at the Federal Building in Honolulu.

Food and Agriculture Council: FACs are considered USDA's "primary vehicles for administering programs to address agricultural and rural development concerns at the local level." The state councils are comprised of the administrators of the USDA agencies that deliver programs through state and local offices. Primary members of FAC:

- USDA Farm Service Agency
- USDA Natural Resources Conservation Service
- USDA Rural Development
- Note:* CTAHR is invited to send a representative to FAC and SEB meetings. Michael Melzer represents CTAHR at both SEB and FAC meetings.

The three agencies rotate annually as Chair. Other entities/individuals are invited as deemed appropriate by the primary members. County FACs implement programs, policies, and procedures at the county level and are charged with coordinating among the agencies for maximum efficiency of personnel and co-location of offices.

State Emergency Board: The SEB functions to identify State-level or interagency issues related to incidents affecting agriculture and rural communities and/or USDA personnel and facilities and to provide a basis for regional interagency coordination in prioritizing relief efforts.

Primary members of SEB:

- | | |
|---|--|
| - USDA Farm Service Agency | - USDA National Agriculture Statistics Service |
| - USDA Animal and Plant Health Inspection Service | - USDA Natural Resources Conservation Service |
| - USDA National Institute of Food and Agriculture
(no office in Hawai'i) | - USDA Rural Development |
| - USDA Food and Nutrition Service | - USDA Forest Service |
| - USDA Food Safety and Inspection Service | - USDA National Agriculture Statistics Service |
| - USDA Forest Service | - USDA Natural Resources Conservation Service |
| | - USDA Rural Development |
- *Note:* As noted above, CTAHR is also represented at SEB meetings.

Link with FSA and SEB:

The FSA State Executive Director (currently Diane Ley) chairs the Hawai'i SEB and is responsible for providing leadership and coordination for all USDA emergency programs at the State level. FAC State Committee members may attend SEB meetings. Other Federal and State government officials may be invited by the Chairperson.

INVOLVEMENT WITH PLANT PESTS:

Plant pests become a topic of discussion at FAC and SEB meetings when they are perceived to pose a direct threat to farmers' livelihoods.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

USDA agencies provide loans in emergency situations, but apparently not normally for economic damage to crops resulting from emergency eradication operations. The USDA Farm Service Agency provides a range of loan programs to assist qualified agricultural producers including specialized emergency situations, but for pest damage would be limited to situations where weather was a primary driver of a pest infestation.

Producers who experience loss of crops; unanticipated production expenses; loss of sales; or loss of markets due to Federal, State or County mandated eradication of pests, diseases, viruses, etc. may want to determine if they qualify for one of the various loan programs offered by the USDA Farm Service Agency.

Among USDA agencies, APHIS is apparently the only one that has authority and possible access to federal funds for reimbursement for expenses related to damage from pest eradication. The Plant Protection Act of 2000 http://www.aphis.usda.gov/plant_health/plant_pest_info/weeds/downloads/PPAText.pdf gives authority for the Secretary of Agriculture to decide to compensate owners for destruction of property; the Secretary may or may not do this, or the compensation may be limited in application and scope.

CONTACTS:

- ✓ Diane Ley, State Executive Director, diane.ley@hi.usda.gov
Hawai'i and Pacific Basin Farm Service Agency State Office,
737 Bishop Street, Mauka Tower Suite 2390, Honolulu
(808) 441-2704; toll Free: 1-866-794-1079,

❖ THE NATURE CONSERVANCY, HAWAII PROGRAM (TNCH)

ABOUT:

The Nature Conservancy's Hawai'i Program (TNCH), established in 1980, is a private, nonprofit group working to protect native species and ecosystems, primarily by protecting the lands and waters they need to survive. They have forged partnerships with business, government, individuals, and organizations that share a concern about the escalating rate of extinction and habitat loss worldwide. They have been effective at acquiring private land for conservation by gift, exchange, purchase, conservation easement, or management agreement, managing many parcels as a public trust themselves, while transferring other lands to entities such as the National Park Service, Fish and Wildlife Service, and the State of Hawai'i.

TNCH manages ten nature preserves on five islands; over the past 35 years, they have brought over 200,000 acres into conservation in Hawai'i. In addition, TNCH is working with communities on four islands on community-based near shore marine protection.

INVOLVEMENT WITH PLANT PESTS:

- Roughly 90 percent of the staff and budget of TNCH's "stewardship" or conservation management program is directed at control of pigs, goats, axis deer, weeds, alien algae, and other pest species.
- TNCH has a history of contributing substantially toward addressing invasive species issues and was instrumental in forming the Coordinating Group on Alien Pest Species (CGAPS) in 1995.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- TNCH staff has a history of pitching in when needed to address island-specific invasive species issues. They may find a way to provide personnel or funding in critical situations.

CONTACT:

- ✓ Trae Menard, TNC of Hawai'i, Kaaui Program, (808) 587-6257 (Main Office), tmenard@tnc.org
4371 Puaole Street, Suite C. Lihu'e, HI 96766
- ✓ Mark Fox, Director of External Affairs, The Nature Conservancy of Hawai'i
923 Nu'uuanu Avenue, Honolulu, (808) 587-6234, mfox@tnc.org

❖ UNIVERSITY OF HAWAII

ABOUT AND INVOLVEMENT WITH PLANT PESTS:

There is an enormous amount of specialized expertise in campuses and departments of the University of Hawai'i System potentially relevant to detection and emergency response to plant pests. For example, there are 55-65 faculty and staff in the UH College of Tropical Agriculture and Human Resources (CTAHR) alone, who have one or more responsibilities for dealing with new (invasive) pests. Additional expertise exists in departments in the UH College of Arts and Sciences, primarily for detection and identification.

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

University of Hawai'i staff may be willing and able to assist with eradications in certain instances, when the special expertise of individual scientists may be needed. APHIS-PPQ and HDOA are generally familiar with the work of UH scientists from presentations at entomology and plant pathology conferences, as well as past assistance.

CONTACTS:

- Website: <http://www.hawaii.edu/>
- ✓ J. Kenneth Grace, Assoc. Dean and Assoc. Director of Research, kennethg@hawaii.edu, (808) 956-813. Based at UH-Manoa, Dr. Grace is willing to help serve as a liaison/contact for finding the best expertise among CTAHR scientists for specific emergency response issues.
- Examples of Expertise:
 - *Arnold Hara* (ornamental entomologist), arnold@hawaii.edu, (808) 981-5199
Dr. Hara, based in Hilo, is an ornamental entomologist focusing on the development of pest management programs for tropical floricultural crops, including how to prevent spread of serious pests of such crops. He also develops integrated pest management techniques for new invasive pests in Hawaii's tropical landscapes. www.ctahr.hawaii.edu/haraa
 - *Mark Wright* (invasive species) (808) 956-7670, markwrig@hawaii.edu
Dr. Wright, based at UH-Manoa, is engaged in efforts to mitigate impacts of serious pests in Hawai'i. His current projects include varroa mite management; ecology and control of coffee berry borer in coffee; ecology and biocontrol of papaya mealybug in papaya; and management of banana bunchy top virus. www.ctahr.hawaii.edu/wrightm/mark.htm
 - *James Leary* (weed management) leary@hawaii.edu, (808) 352-8774
Dr. Leary, based on Maui, is involved in statewide work developing novel invasive weed management techniques that improve efficacy, efficiency and safety.
 - *Robert Cowie* (molluscs), cowie@hawaii.edu, (808) 956-4909,
Dr. Cowie is one of world's experts in the taxonomy and ecology of molluscs in Hawaii and other Pacific Islands and is very knowledgeable about pathways by which invasive molluscs invade new areas. www.hawaii.edu/~cowie/rob/rhccpage.htm

❖ WEED RISK ASSESSMENT

(Hawai'i Pacific Weed Risk Assessment (HPWRA))

ABOUT AND INVOLVEMENT WITH PLANT PESTS:

In 1994-95, Australia and New Zealand pioneered a type of Weed Risk Assessment involving a series of questions on a plant's biology and ecology. It became widely used and recognized as successful and was adapted and tested for Hawai'i and the Pacific beginning in 1998 by Dr. Curtis Daehler of UH-Manoa, with Forest Service and DOFAW support. HPWRA has since become recognized as an effective tool for many purposes related to plant invasions in the Pacific, including assistance in planting decisions by the landscape industry. It is an important tool in the "Plant Pono" program, presented by the website <http://www.plantpono.org>

HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- HPWRA is an important repository for information on ecology and biology of invasive weeds, including some such as *Rauvolfia vomitoria* and *Chromolaena odorata*, that could become targets

within the framework of this plan. The Weed Risk Assessment Specialist could assist in obtaining the latest available information.

- In theory, HPWRA has much more potential to be effectively used with the prediction/documentation of invasiveness of new weeds from a management potential. For example, could be used to justify additions to HDOA noxious weed list or restricted plant list for pest plant species such as *Chromolaena odorata* and *Rauvolfia vomitoria*.

CONTACTS:

- ✓ Chuck Chimera, Weed Risk Assessment Specialist, hpwra@yahoo.com, (808) 573-6471, Hawai'i Pacific Weed Risk Assessment, Piiholo, Maui <http://www.plantpono.org>

APPENDIX C: INDUSTRY DESCRIPTIONS AND CONTACTS

(Trade Associations, Bureaus, Producers, Growers, Farmers, Ranchers, Landscapers, etc.)

OVERVIEW / HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

The private sector can play a role in plant health response in Hawai'i by being a valuable resource for emergency prevention, preparation, response and recovery. Below are some suggested avenues of input /responsibilities that industry may be asked to assist with; in order to mobilize additional support for the response efforts within the agricultural and other industry, there will likely need for specific outreach.

Trade Associations and Bureaus:

- Act as a communications link for members, such as providing pertinent plant pest information available on their website to help get the word out. (CGAPS or another entity would provide/design the image and the basic information.)
- Encourage members to participate in informal surveillance system.
- Supply a liaison, upon request to the HDOA or ICS response team.
- Help with control and eradication efforts under the direction of HDOA.
- Provide site specific information which may affect emergency response. *(Note: The association/bureau would not have that information but could act as a liaison in requesting it from members. It would be up to the individual members to comply.)*
- Ideally maintain list of potential resources (transportation equipment, etc.).

Producers / Growers:

Crop producers, nursery owners, and others directly involved with plant production may be asked to accept the following responsibilities:

- Alert HDOA or CTAHR when there is a potential new pest species or location.
- In the event of a suspected plant pest, maintain information for tracking plant or plant product shipments, in the event that a trace-back and/or trace-forward become necessary. *[Note- Farm representative noted that options for trace-back/trace forward may be limited as many farmers may not have an accurate system for this; though some food crop farmers will due to food safety certification requirements and nurserymen often will.]*

SPECIFIC ENTITIES AND CONTACTS:

❖ **Hawai'i Farm Bureau Federation (HFBB)**

ABOUT:

The HFBB was incorporated in the 1950s and has grown into the present statewide organization consisting of approximately 2200 member families in ten "counties" located throughout the State. These counties include:

- | | |
|---------------------------------|----------------------------------|
| ▪ East O'ahu County Farm Bureau | ▪ Kona County Farm Bureau |
| ▪ Hamakua County Farm Bureau | ▪ Maui County Farm Bureau |
| ▪ Hilo County Farm Bureau | ▪ Moloka'i County Farm Bureau |
| ▪ Ka'u County Farm Bureau | ▪ South O'ahu County Farm Bureau |
| ▪ Kaua'i County Farm Bureau | ▪ West O'ahu County Farm Bureau |
| ▪ Kohala County Farm Bureau | |

CONTACTS:

- Main office: 2343 Rose Street, Honolulu, Hawaii, 96819, info@hfbf.org, website: www.hfbf.org (808) 848-2074, neighbor-islands (800) 482-1272,
- ✓ Janet Ashman, MCFB/HFBB, Policy and Legal Advisor to Maui Farm Bureau. Also an active participant in invasive species issues including CGAPS issues. ashman.janet@gmail.com; 808-226-5483

❖ Landscape Industry Council of Hawai'i (LICH)

ABOUT:

The Landscape Industry Council of Hawai'i has been an umbrella organization representing landscaping trade associations from every island in Hawai'i. LICH held a conference at the Blaisdell Center in Honolulu on October 10, 2013, on the topic of native plants. Such conferences would be ideal venues for interacting with LICH and other industry groups regarding Plant Health Emergency Response. LICH publishes their magazine which goes to 6,000 landscape professionals, as well as an email newsletter that goes out to 1,000 landscape professionals.

Associations under this umbrella have included:

- Aloha Arborist Association: <http://www.alohaarborist.com/>
- American Society of Landscape Architects: <http://www.hawaiiasla.org/>
- Big Island Association of Nurserymen: www.hawaiiplants.org info@hawaiiplants.com
- Hawaii Export Nursery Association: (808) 969-2088, www.hena.com, info@hena.org
- Hawai'i Island Landscape Association: <http://hilahawaii.com>
- Hawai'i Society of Urban Forestry Professionals (Honolulu): www.hsufp.org, info@hsufp.org
- Maui Association of Landscape Professionals: <http://www.malp.org>

CONTACTS:

- Web: <http://www.hawaiiscape.com>
- ✓ Chris Dacus, President.
Chris Dacus is a landscape architect, formerly with the Hawai'i Department of Transportation, and known to most CGAPS participants for his past involvement on invasive species issues. Cell: 808-799-3101; chris.dacus@gmail.com
- ✓ Christy Martin of CGAPS and Chuck Chimera of HPWRA are currently Board members of LICH.

❖ Organic Farmers

• Hawai'i Organic Farming Association (HOFA)

76-789 'lo Place, Kailua-Kona, HI 96740, (808) 969-7789, HOFA@hawaiiorganic.org

• Hawai'i Cooperative of Organic Farmers (HICOF):

PO Box 728, Waialua, HI 96791, (808) 637-4555, info@hicof.org

• Hawai'i Farmers Union United <http://hawaiifarmersunionunited.org>

"We represent and advocate for small family farmers and ranchers on all the Hawaiian Islands. We assert that a multitude of small diversified farms who implement regenerative techniques in growing and raising our food will create a resilient, vital and productive agricultural system to feed Hawaii's people." There are island-based chapters on Maui, the Big Island, O'ahu, and Kaua'i. Most members are said to be organic farmers, especially on Maui and Kaua'i."

❖ Ranchers Organizations – Hawai'i Cattlemen's Council

ABOUT:

The Hawai'i Cattlemen's Council, Inc. (HCC) is the statewide umbrella organization comprised of the five county level Cattlemen's Associations. Their 110+ member ranchers represent over 60,000 head of beef cattle - more than 75% of all the beef cattle in the State. Ranchers are the stewards of over 1 million acres of land in Hawai'i, or 25% of the State's total land mass. HCC is also unified with the National Cattlemen's Beef Association (NCBA), so its members are represented on a County level, State-wide level and National level. The Hawai'i Cattlemen's Council, Inc. represents the individual island Cattlemen's Associations throughout Hawai'i. The Council actively promotes positions in favor of improving grazing land health, animal health and husbandry, production capacity and marketing growth, and many other issues faced by grazing land users in the State.

- Hawai'i Beef Industry Council (HBIC) – allied with Hawai'i Cattleman's Council. HBIC is a non-profit organization working for the cattle producers of Hawai'i in areas of education, promotion and research. The Hawai'i Beef Industry Council office is located in Kamuela on the Big Island of Hawai'i, in the same building as the Hawai'i Cattlemen's Association (the membership division of Hawai'i's beef industry).

INVOLVEMENT WITH PLANT PESTS / HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

- HI Cattlemen's Council produced a white paper supporting biocontrol for fireweed in 2012.
- Some members are currently assisting the fireweed biocontrol effort by growing the moths in screened cages.

CONTACTS:

- Web: <http://www.hicattle.org/hawaiicattlemencouncil.aspx>
- Alex Franco, President of the Hawai'i Cattlemen's Council.
- ✓ Alan Gottlieb, chairs the Government Affairs Committee and is actively involved in policy issues. gottlieb@hawaii.rr.com; (808) 885-5599; PO Box 437199, Waimea, HI 96743

❖ **Forestry: Hawai'i Forest Industry Association**

INVOLVEMENT WITH PLANT PESTS / HOW THEY CAN HELP IN AN EMERGENCY RESPONSE:

Strong communication network for landowners doing forestry and also active with lobbying at the legislature.

- www.hawaiiforest.org/; P.O. Box 66, 'O'ōkala HI 96774, (808) 933-9411

SPECIFIC AGRICULTURAL CROPS:

❖ **Sugar**

Today Hawaiian Commercial & Sugar Company (HC&S), A Division of Alexander & Baldwin, Inc. is the state's largest farm, with 36,000 acres under cultivation, and is Hawaii's sole producer of raw and specialty sugar. HC&S has 800 full-time employees on Maui and a payroll of over \$35 million.

- **Hawaiian Commercial & Sugar Company**
P.O. Box 266, Pu'unene, Maui, Hawai'i 96784, www.hcsugar.com
Rick W. Volner, Jr., General Manager, (808) 877-0081

❖ **Pineapple**

Once a dominant crop in Hawaii, decline in Hawaii's pineapple industry occurred mainly because foreign-based canneries had labor costs only about 10% of those in Hawai'i. As the Hawai'i canneries closed, the industry shifted to producing fresh pineapples. During the decline and transition, the Pineapple Research Institute of Hawai'i bred the MD-2 pineapple cultivar, now the world's pre-eminent fresh fruit cultivar. All of the canneries eventually closed, the last one on Maui in 2007. Dole Food Co. and Maui Gold Pineapple Co. continue to produce fresh pineapples in Hawaii, mostly for the local market.

- **Dole Plantation:** 64-1550 Kamehameha Hwy, Wahiawa, Hawai'i 96786
(808) 621-8408, sales@doleplantation.com <http://www.dole-plantation.com/>
- **Maui Gold Pineapple Company,** Pukalani, HI
(808) 877-3805; <http://www.pineapplemaui.com/history.php>

❖ **Coffee**

- **Hawaii Coffee Association:** PO Box 168, Kealahou, HI 96750
president@hawaiicoffeeassoc.org, 1.408.940.5282, <http://www.hawaiicoffeeassoc.org/>
- **Kona Coffee Council:** P.O. Box 2077, Kealahou, HI 96750
<http://www.kona-coffee-council.com/>
- **Kona Coffee Farmers Association:** PO Box 5436, Kailua-Kona, HI 96745
info@KonaCoffeeFarmers.org
- **Maui Coffee Association:** P. O. Box 1089 Kula, Maui, Hawaii 96790
President: Sydney Smith (808) 572-0072; <http://mauicoffeeassociation.blogspot.com/>

-52 Maui coffee farms are business members. On June 15, 2013, the Association had a “CBB workshop” at the Kula Community Center; as a result, members should be well-informed about coffee berry borer issues.

❖ **Macadamia Nut**

- **Hawai'i Macadamia Nut Association**, PO Box 4983, Hilo, HI 96720
phone: 808-969-8033, info@hawaiimacnut.org

❖ **Fruit**

- **Hawai'i Tropical Fruit Growers (HTFG)**
PO Box 1162, Captain Cook, HI 96704, (808) 969-7926; ken@mycoffee.net
-HTFG is dedicated to tropical fruit research, education, marketing and promotion

❖ **Orchids**

- **Hawai'i Orchid Growers Association, Orchid Growers of Hawai'i**
P.O. Box 4153; Hilo, HI 96720, info@ogoh.org; <http://www.hawaiiorchidgrowers.org/>
- **Hilo Orchid Society**, P.O. Box 4294, Hilo, HI 96720; <http://www.hiloorchidsociety.org/>
- **Honolulu Orchid Society, Inc.**
P.O. Box 558, Honolulu, HI 96809, <http://www.honoluluorchidsociety.org/>
- **Kona Orchid Society**
P.O. Box 4566, Kailua-Kona, HI 96745,
KOS@konaorchidsociety.org, www.konaorchidsociety.org
- **Kunia Orchid Society**, P.O. Box 893956, Mililani, HI 96789; kuniaorchid@altavista.com
- **Maui Orchid Society**
PO Box 2061, Kahului, HI 96733, jakitake@hotmail.com (Bert K. Akitake, M.D. – President)
- **Pacific Orchid Society of Hawai'i**
P.O. Box 1091, Honolulu Hi. 96808,
mitchella001@hawaii.rr.com (Adele Mitchell); http://pos_hawaii.tripod.com/

❖ **Palms**

- **Hawai'i Island Palm Society (chapter of the International Palm Society)**
P.O. Box 1585, Keaau, HI 96749, www.hawaiiislandpalmsociety.com
(808) 333-5626 (Tim Brian, President), begteb@hawaii.rr.com;
Palm Society of Maui (chapter of the International Palm Society)
P.O. Box 893; Paia, Maui, HI 96779 ; phone: 808-280-0788 (Sunya Echternach)

❖ **Seed Crops (GMO's)**

ABOUT:

Hawai'i Crop Improvement Association (HCIA) is a nonprofit trade association representing the agricultural seed industry in Hawai'i. The agricultural seed industry produces GMO seeds in Hawai'i for export to the growers on the U.S. mainland. The companies that constitute HCIA's membership grow and develop varieties of several seed crops, including corn, soybeans, sunflowers and rice. Hawaii is the world's leading producer of seed corn, which accounts for 96 percent of the state's \$247.2 million ag-biotech industry.

CONTACTS:

- **Website:** www.hciaonline.com; For making contact: <http://www.hciaonline.com/contact-us/>
- **Monsanto:** Locations in Kihei, Hanapepe, Haleiwa, Kaunakakai, Lahaina www.monsanto.com
Maui: (808) 249-2500 Moloka'i: (808) 553-5070
- **Syngenta** www.syngenta.com/country/us/en/agriculture/seeds/pages/seeds.aspx
- **Dow Agrosciences** www.dowagro.com
- **Pioneer Hi-Bred** <http://www.pioneer.com/web/site/portal/>

➤ **APPENDIX D:**
**LINKS TO CURRENT EFFORTS: CATALOGING EXISTING SPECIES
SPECIFIC RESPONSE PLANS IN HAWAI'I**

Purpose: This reference page is a compilation of existing species and/or area specific management plans throughout the State, including those in draft form. The intention is to create awareness among partners as to what is already in place and what may still be needed, as well as to build on each other's efforts.

GENERAL PLANT PEST PLANS:

❖ ***Naio thrips:***

“Rapid Response for Naio / *Myoporum* thrips (*Klambothrips myopori*) on O’ahu”

Three page plan discussing rapid response to Naio thrips on O’ahu. It is noted that response will be different on each island, and other islands are welcome to use this outline as a basis for their own rapid response discussions. Currently, the thrips is known to be established only on the Big Island. Additional plans for the islands of Kaua’i, Maui, and Hawai’i are being developed in FY14.

- *Created:* December 28, 2011- from a meeting with members from DLNR, HDOA, and OISC discussing rapid response on O’ahu.
- *Available through:* Rob Hauff, DLNR, DOFAW - Robert.D.Hauff@hawaii.gov
- *Key Contacts* for information and updates: Same as above (R. Hauff)

“Development of naio thrips (*Myoporum* thrips: *Klambothrips myopori*) early detection and rapid response plans for islands of Kaua’i, Maui and Moloka’i”

- *Funded for 2014*
- *To be Created by:* DLNR-DOFAW via Cynthia B.A. King, (Cynthia.B.King@hawaii.gov) and Robert D. Hauff, (Robert.D.Hauff@hawaii.gov) through a grant by the Hawai’i Invasive species Council (HISC)

❖ ***Chromolaena odorata:*** (see Appendix F, Case Study 5)

“Responding to the invasion of the notorious plant *Chromolaena odorata* on O’ahu”

- *Created:* 2011. This is a detailed, thorough plan detailing the pest species and control and eradication techniques. Status- needs update as much control and new survey work has been done and outreach has evolved.
- *Available online:* As an appendix to a 2011 annual report of the O’ahu Army Natural Resources Program at http://manoa.hawaii.edu/hpicesu/DPW/2011_YER/016.pdf (Most of their plans and publications are at <http://manoa.hawaii.edu/hpicesu/dpw.htm>)
- *Key Contacts* for information and updates: Jane Beachy (jane.r.beachy.ctr@mail.mil) of the O’ahu Army Natural Resources Program.

ANT SPECIFIC:

❖ ***Red Imported Fire Ant and New Ant Species:***

“A plan for prevention of establishment of new ant species in Hawai’i, with special attention to the Red Imported Fire Ant (*Solenopsis invicta*) and Little Fire Ant (*Wasmannia auropunctata*).”

- *Created:* Revised August 2007, by the Hawai’i Ant Group.
- *Available:* at [www.littlefireants.com/Hawaii%20Ant%20Group%20\(2007\).pdf](http://www.littlefireants.com/Hawaii%20Ant%20Group%20(2007).pdf)
- *Key Contacts* for information and updates: Cas Vanderwoude, Hawai’i Ant Lab, Web: www.littlefireants.com, 808-315-5656; Darcy Oishi, HDOA, PQ.

❖ ***Little Fire Ant:***

“Operational plan for management of *Wasmannia auropunctata* (Little Fire Ant) on the island of Maui, Hawai’i.”

Draft #2.

- *Created:* December 2009; authored by Vanderwoude, C., T. Penniman, K. Paracuelles, F. Starr, and K. Starr.
- *Available:* online at www.littlefireants.com/maui%20plan%20public.pdf
- *Key Contacts* for information and updates: Cas Vanderwoude, casperv@hawaii.edu Hawai'i Ant Lab, 808-315-5656

❖ **Funded for 2014:**

Hawai'i Ant Lab: Statewide harmonization of Invasive ant detection and response.

Proposal to develop a multi-agency plan that addresses both detection and response activities, eliminating redundancies and finding means to address "holes" in the current framework.

- *Key Contacts:* Darcy Oishi, HDOA, darcy.e.oishi@hawaii.gov, Cas Vanderwoude, Hawai'i Ant Lab, casperv@hawaii.edu

ADDITIONAL SPECIES SPECIFIC (Not Necessarily Plant Pests) PLANS

(in alphabetical order):

❖ **Aquatic Species:**

"State of Hawai'i Aquatic Invasive Species Management Plan"

- *Created:* September 2003
- *Available:* Online at http://hawaii.gov/dlnr/dar/pubs/ais_mgmt_plan_final.pdf
- *Key Contacts for information and updates:* Jono Blodgett, Division of Aquatic Resources, jb88@hawaii.edu

❖ **Avian Influenza:**

"A Surveillance Plan for Asian H5N1 Avian Influenza in Wild Migratory Birds in Hawai'i and the U.S. Affiliated Pacific Islands"

- *Created:* May 2006- U.S. Fish and Wildlife Service (Pacific Islands Fish and Wildlife Office) and National Wildlife Health Laboratory, Honolulu Field Station, U.S. Geological Survey.
- *Available:* Through HISC, Josh Atwood Joshua.P.Atwood@hawaii.gov
- *Key Contacts:* for information and updates: Earl Campbell, USFWS

"Multi-Agency Response to a Highly Pathogenic Avian Influenza Animal Emergency"

- *Created:* February 2008. Table-Top Exercise "Pale Ma'i Lele" conducted 8-16-2007
- *Revised:* Ongoing- June 2013
- *Key Contacts* for information and Updates: Samuel Goldstein, USDA-WS; Joshua Fisher, USFWS joshua_fisher@fws.gov

❖ **Brown Tree Snake (BTS):**

"BTS Control & Eradication Strategic 5-Year Plan Outline: FY 2012-2016."

13 pages. Focus is on prioritizing critical activities, funding, and improved coordination.

- *Created:* Draft form, updated November 25, 2011
- *Update:* BTS strategic planning document will be completed at the December 2013 BTS Technical Working Group meeting.
- *Available:* through USFWS, Domingo Cravalho, Domingo_Cravalho@fws.gov or Earl Campbell.
- *Key Contacts for information and updates:* Same as above (D. Cravalho and E. Campbell)

❖ **Coqui Frog:**

Hawaii's Coqui Frog Management, Research and Education Plan

- *Created:* Last updated: May 2010
- *Available:* Online at <http://www.hawaiiinvasivespecies.org/hisc/pdfs/201003coquiplan.pdf>

❖ **West Nile Virus (WNV):**

West Nile Virus Response Plan, by the Maui County Interagency Working Group. 11 page document.

- *Created:* February 2006.

- Available: HISC, Josh Atwood (Joshua.P.Atwood@hawaii.gov)

Hawai'i Department of Health, West Nile Virus (WNV), "Preventing the establishment of WNV in Hawai'i." 8 page document.

- Created: Updated Jan 14, 2005
- Available: HISC, Josh Atwood (Joshua.P.Atwood@hawaii.gov)

ADDITIONAL GROUP SPECIFIC:

❖ **Kaua'i Invasive Species Committee (KISC):**

Action Plan (cir. 2007).

This action plan outlines all of their targets. Within each species of control, there is a "methods" section. Since creation, additional early detection species have been added- including the plants glory bower (*Clerodendrum macrostegium*) and wax myrtle (*Morella cerifera*), and other early detection species they have opportunistically treated such as rubber vine and mule's foot fern. Priority targets include: PLANTS: Miconia (*Miconia calvenscens*), Long Thorn Kiawe (*Prosopis juliflora*), Fireweed (*Senecio madagascariensis*) – eradicated, Fountain Grass (*Pennisetum setaceum*), Pampas Grass (*Cortaderia jubata* or *C. selloana*), Ivy Gourd (*Coccinea grandis*), False Kava or "Golden awa" (*Piper auritum*), Cattail (*Typha latifolia*). Giant Reed Grass (*Arundo donax*). ANIMALS: Coqui Frogs (*Eleutherodactylus coqui*) - eradicated, Little Red Fire Ant (*Wasmannia auropunctata*), Mongoose (*Herpestes auropunctatus*, 4), Snakes, Rabbits, and other Vertebrates.

- Created: 2007
- Available: <http://www.hear.org/kisc/pdfs/2007kiscactionplan.pdf>
- Contacts: Keren Gundersen, KISC Coordinator kgunder@hawaii.edu

❖ **East Maui Watershed Partnership:**

Updated 5 Year Weed Management Plan FY2014-19.

Vision: To maintain or improve the structure and composition of the East Maui Watershed Partnership's (EMWP) core tropical broadleaf forest by containing all existing habitat-modifying weeds and preventing the introduction of new ones. Pest Plant species of focus:

Miconia calvenscens, Hedychium gardnerianum Cortaderia jubata, Pinus spp. Sphaeropteris (Cyathea) cooperi, Passiflora mollissima Morella faya, Addl efforts: Clidemia hirta, Psidium cattleianum, Hedychium gardnerianum and Psidium cattleianum.

- Created: 2013
- Contacts and Available Through: Randy Bartlett, Program Manager, East Maui Watershed Partnership (EMWP), www.eastmauiwatershed.org, coordinator@eastmauiwatershed.org

Additional Note Regarding HISC and the Integration of the Above Plans:

As part of their work this year with their strategic planning process, the Hawai'i Invasive Species Council (HISC) has recently brought on a planner to look at existing species-specific plans, including working with partners on ones that that may not be formalized yet. The intention is to incorporate the plans under a "Lei of Protection" concept: a suite of plans reviewed, endorsed, or produced by the HISC. The final product will be an adaptive package of biosecurity and control plans.

This page is a starting resource in that direction. It is envisioned that all plans above and others in development will be either hosted on the HISC website (with the author's permission) or will be linked from the HISC site.

➤ **APPENDIX E:** **EXISTING MOUs AND WRITTEN AGREEMENTS**

MOUs (Memoranda of Understanding) are important written agreements that describe the roles and responsibilities of each participant in the MOU. The guidelines for preparing this PHERP⁴ state *“It is important to have written agreements that describe the roles and responsibilities of each participant in the plan. The individual States should determine the precise form of the written agreements.”*

While it was not feasible within the development time of this plan to produce written agreements for each participant, the topic has been introduced, discussed, and agreed among the collaborators for pursuit in the future.

The first three MOUs below can be directly related to plant pests; we have also included the additional MOUs as examples of agencies working together, which may also be good model agreements as the entities in this plan move forward in establishing their own MOUs.

❖ **MOU between USDA- APHIS-PPQ and HDOA**

- Provides for cooperation to protect agricultural, horticultural and timber and natural plant resources from losses caused by plant pests or noxious weeds.
- This MOU confirms that HDOA and USDA-APHIS-PPQ have an agreement for cooperation; it covers personnel, equipment, state’s access for private lands, etc.
- USDA-APHIS-PPQ has similar MOUs with all states.
- Available through: Dorothy Alontaga, USDA APHIS PPQ State Operations Support Officer, (808) 838-2780, Dorothy.S.Alontaga@aphis.usda.gov

❖ **MOU between USDA- APHIS-PPQ and DHS-CBP**

- Documents details of Section 421(a) of the Homeland Security Act of 2002 which transfers certain agricultural import and entry inspection functions to the Secretary of Homeland Security from Secretary of Agriculture.
- Available through: http://www.aphis.usda.gov/plant_health/moa_dhs/index.shtml

❖ **MOU between the National Park Service and Hawai’i NPS Exotic Plant Management Team**

- In Development

❖ **MOU between USFWS and Hawai’i DLNR**

- Focuses on the “Programmatic Environmental Impact Statement for the Control and Eradication of Invasive Rodents and Mongoose in Hawai’i Using an Integrated Pest Management Approach (IPM)”

❖ **MOU between National Park Service (NPS) and Hawai’i DLNR-DOFAW**

- For Firefighting Assistance.

Acronyms:

DHS-CBP: Department of Homeland Security, Customs and Border Protection.

DLNR: Hawai’i Department of Land and Natural Resources

HDOA: Hawai’i Department of Agriculture

USDA- APHIS-PPQ: US Department Of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine

USFWS: US Fish and Wildlife Service

⁴ USDA-APHIS-PPQ document, “Standards for Plant Health Emergency Management Systems” 2003

➤ **APPENDIX F:** **CASE STUDIES**

CASE STUDY 1:

Detection and Response to Red Imported Fire Ant (*Solenopsis invicta*) in New Zealand (2001 to present)

-A Demonstration of Exemplary Successful Exclusion Through Emergency Response-

The Invasion:

The South American red imported fire ant (RIFA) has invaded the southern USA over the past 75 years and become recognized as perhaps the most notorious of invasive ants, still the focus of an APHIS-PPQ quarantine to retard its continued spread within the USA.⁶ RIFA had established in California by 1998 and seems poised to invade Hawai'i, but has not yet done so. Over the past two decades, it has reached Australia, New Zealand, Singapore, Malaysia, Taiwan, mainland China, and the Philippines. Of these Pacific Rim countries, only New Zealand has been able to exclude RIFA through emergency response. Colonies were found and eradicated at ports of entry on the North Island of New Zealand in 2001, 2004, and 2006. In 2007, a RIFA colony was eradicated from a sailboat that had come from the Caribbean.³

The Response:

All three RIFA incursions in New Zealand were detected early enough that extensive spread had not occurred. In each case, a single nest was found, and its characteristics indicated that dispersal of mated flying queens could have occurred in the two previous years, with a likely maximum dispersal distance of 2 km. The single RIFA nest found in June 2006, with ca. 30,000 worker ants, somewhat typical of the three incursions, was quickly destroyed.

A movement control area, extending 2 km out from the original nest site, was established to prevent the inadvertent spread of any remaining RIFA colonies on contaminated material by placing restrictions on moving risk items beyond a single property within the Controlled Area, or out of the Controlled Area without prior approval.² Risk goods included Red Imported Fire Ants, soil, gravel, hay and silage, plants, plant material and garden waste, including compost, and goods other than roadworthy vehicles that had been outdoors and in contact with soil for more than 24 hours. Also included were firewood, bark, wood chips and other wood products, as well as used electrical goods other than small portable appliances. The notice did not restrict the collection of rubbish by the municipal authority, which was covered by special arrangements. The movement control zone was well advertised, and information distributed to all residents in the area.²

The quarantine, deemed essential from a biosecurity standpoint, caused considerable inconvenience for people working and living in the within the area, but good compliance was received.^{4,5} Over 900,000 baiting samples were collected and checked for RIFA infestation. Six aerial insecticide treatments were carried out in areas that could not be covered effectively on foot. After three years of quarantine, treatment, and surveillance, involving contractors and cooperation from local residents and businesses, a successful eradication was declared.

The Lesson:

New Zealand has been remarkably successful in eradicating three incursions of RIFA at or near ports of entry. The lesson is that effective and tenacious surveillance (including education of port workers) resulting in early detection, rigorous quarantine and treatment of the invaded areas, and follow-up for three years paid off. The first detection and eradication at Auckland International Airport in February 2001 was to some degree fortuitous and led to extensive annual surveys (which

continue today) in high-risk areas. Much attention was paid to the biology of the pest¹, based on an abundant relevant literature.

¹Anonymous. 2007. Red Imported Fire Ants – Auckland Airport 2001. An invasive species case study for the Convention on Biological Diversity. www.cbd.int/doc/submissions/ias/ias-nz-ant-2007-en.pdf

²Biosecurity New Zealand. 2006. Movement controls imposed for Whirinaki Red Imported Fire Ant response, 23 June 2006. www.biosecurity.govt.nz/media/23-06-06/rifa.htm

³Biosecurity New Zealand. 2007. Red Imported Fire Ants located on yacht, 24 February 2007. <http://www.biosecurity.govt.nz/media/23-02-07/rifa>

⁴Biosecurity New Zealand. 2009. MAF Biosecurity New Zealand declares Red Imported Fire Ants eradicated from Whirinaki, 24 April 2009. <http://www.biosecurity.govt.nz/media/24-04-2009/declare-rifa-eradicated-from-whirinaki>

⁵Christian, S. 2009. Red Imported Fire Ants eradicated from Napier. New Zealand Ministry of Agriculture and Forestry. <http://www.docstoc.com/docs/148601406/RED-IMPORTED-FIRE-ANTS-ERADICATED-FROM-NAPIER>

⁶USDA-APHIS-PPQ. 2010. Imported Fire Ant Program Manual. http://www.aphis.usda.gov/import_export/plants/manuals/domestic/downloads/fire_ant.pdf

CASE STUDY 2:

Eradication of Chrysanthemum White Rust in Hawai'i, January 2004

*-A Successful Collaborative Emergency Response in Hawai'i
For An APHIS-PPQ Target Quarantine Pest for the USA-*

Background:

When a federal quarantine pest is found in the USA, APHIS-PPQ typically collaborates with the state department of agriculture and others to attempt eradication. Improving the success rate of such efforts is a primary reason for APHIS-PPQ to encourage states to produce Plant Health Emergency Response Plans. Relatively few federal quarantine pests turn up in Hawai'i, however, and fewer still have been successfully eradicated. Eradication of Chrysanthemum White Rust (CWR, *Puccinia horiana*, P. Henn., Uredinales: Pucciniaceae) in 2004 was a fortuitous exception and stunning success.

CWR originated in eastern Asia and has become widespread in the Far East, Europe, Africa, Australia, Central America and South America. There have been outbreaks in Canada and the USA beginning in the early 1990s.³ CWR had long been an APHIS-PPQ quarantine pest, and a more rigorous federal rule was enacted after 2000 to assist in its continued exclusion from the USA.³ USDA-APHIS-PPQ policy is to eradicate CWR upon detection wherever and whenever it is found.

The Invasion and Response:

In January 2004, CWR was found at a commercial ornamental plant nursery in Hawai'i, and successfully eradicated three days later.² CWR causes conspicuous lesions on the leaves of florist chrysanthemum and some close relatives; the characteristic symptoms are light yellow chlorotic spots on the upper leaf surface.¹ Buff-white, raised pustules eventually appear on the lower leaf surface. Spores appear on the undersides of the leaves and germinate under very high humidity. Very moist conditions cause CWR to spread quickly, and it takes only two hours of leaf wetness for successful infection, with new pustules appearing in 2-4 weeks after infection.¹ A large number of plants in a half-acre area were promptly destroyed at the nursery by roguing, bagging, burning, and burying, following the APHIS-PPQ protocol.^{1,2,5} The fast and successful response was due in large part to the willingness of the nursery owner to allow and assist HDOA and APHIS-PPQ, along with nursery employees and cooperators from UH-CTAHR and an Invasive Species Committee, to destroy the plants. CWR has not been found in Hawai'i in nearly a decade since.

The Lesson:

In certain instances, there is high potential for "statewide" successful eradication of a damaging plant disease or other pest, given early detection and landowner cooperation.

Cooperation of the nursery owner was of utmost importance. In situations like this, USDA-APHIS-PPQ generally relies on collaboration with the state department of agriculture and its authority. It would have taken much longer (and may not have been successful) if there had been a need for HDOA to first designate the CWR as a "Pest for Eradication" via board action and obtain a court order – see Hawai'i PHERP, Section 3B, FAQ no. 3. (APHIS-PPQ has ample authority under the Plant Protection Act to eradicate quarantine pests when discovered in the USA but would likely have needed a court order to fully exercise their federal authority in this case without landowner cooperation – see PHERP, Section 3B, FAQ no. 1.)

Outbreaks in the USA have continued (with many successful though presumably somewhat costly eradications) so that as of October 2012, APHIS-PPQ was in the process of reassessing whether the rigorous strategy is still warranted.⁴ Realistically, eradications may often delay pest establishment,

not prevent establishment over the long term, but even then provide time for developing workable Integrated Pest Management (IPM) strategies. Experience has shown that this disease can be managed in nursery situations with the careful and thorough disposal of infected plants and weekly survey and fungicide sprays.²

¹Anonymous. 2004. Chrysanthemum White Rust Found in Hawai'i. Ka Lono Pua ("The Flower News"), Vol. XI No. 1, February 2004, p. 6. College of Tropical Agriculture and Human Resources, University of Hawai'i at Manoa, Cooperative Extension Service.
http://www.ctahr.hawaii.edu/oahu/downloads/newsletter/04_feb.pdf

²Plant Industry Division. 2005. Chrysanthemum white rust (CWR). Hawai'i Department of Agriculture, Annual Report for 2004, p. 24.
<http://hdoa.hawaii.gov/wp-content/uploads/2013/01/Annual-Report-04-text.pdf>

³USDA-APHIS-PPQ. 2005. Proposed rules. Cut Flowers from Countries with Chrysanthemum White Rust. Federal Register Vol. 70, No. 129, pp. 39194-39199, Thursday, July 7, 2005.
www.gpo.gov/fdsys/pkg/FR-2005-07-07/html/05-13313.htm

⁴USDA-APHIS-PPQ. 2012. Proposed rules. Chrysanthemum White Rust Regulatory Status and Restrictions. Federal Register Vol. 77, No. 211, p. 65840, Wednesday, October 31, 2012
www.aphis.usda.gov/plant_health/plant_pest_info/cwr/downloads/FRN-12-001-2.pdf

⁵USDA-APHIS-PPQ. 2012. Chrysanthemum White Rust Eradication Protocol for Nurseries Containing Plants Infected with *Puccinia horiana* Henn.
www.aphis.usda.gov/plant_health/plant_pest_info/cwr/downloads/cwrplan.pdf

CASE STUDY 3:

Eradication of Little Fire Ant from the Island of Maui by Hawai'i Department of Agriculture and Collaborators: 2009-2013

*-Verification of the Roles of Outreach Efforts and Rapid Response
in the Detection and Eradication of a Pest Species-*

Background:

Little Fire Ant (LFA, *Wasmannia auropunctata*), one of the world's worst pest ants, was first found in Puna on the Big Island of Hawai'i in 1999. (See narrative on LFA in Appendix H, POTENTIAL TARGETS OF COLLABORATIVE EMERGENCY RESPONSE, ANTS.) Barriers to LFA eradication or containment (e.g., lack of successful bait/toxicant approaches, public apathy) resulted in its irreversible establishment and spread. By 2013, it had spread widely in the Hilo-Puna area and was recognized as having an enormous impact on quality-of-life for humans.

Since the invasion and response failure on the Big Island, investigations by the Hawai'i Ant Lab (www.littlefireants.com), collaborative with HDOA, have essentially solved most problems associated with inadequate bait/toxicant approaches.^{4,5} The fact that queen LFA do not have nuptial flights (but only disperse by walking) is an important characteristic making eradication more feasible.

Several institutions on Maui recognized the threat of LFA (to human quality-of-life, pets, agriculture, and wetland birds) from the beginning in 1999, and have continually been concerned about apparent inadequacy of interisland quarantine and the difficulty of detecting LFA. Surveys have been conducted, as follows:

-Since 2001, HDOA has conducted annual surveys for LFA at Kahului Airport, Kahului Harbor, and other high risk sites, including certified nurseries.

-In 2003, U.S. Geological Survey (USGS) conducted a brief survey for LFA using established methodology.¹ Surveys focused on non-certified nurseries and locations with mature fish-tail palm (*Caryota* spp.) plantings.

-In 2005, Maui Invasive Species Committee (MISC) conducted a survey for LFA, by having students collect ants using methods outlined in the "Hoike o Haleakala" science curriculum, a multi-disciplinary, science-based environmental education curriculum designed to help sustain the native Hawaiian landscape and culture by helping students establish and deepen connections to the land and the culture it supports.²

-An extensive ant survey on Maui by USGS in 2007-2008 was aimed primarily at finding LFA. About 18,000 ants were collected on 4,300 chopsticks at 360 sites, primarily at new developments (which often import palm trees from the Big Island). From these, 823 locations were determined for 23 ant species, but LFA was not found.³

The Invasion and Response:

The single detection of LFA to date on Maui (Waihe'e) was triggered by a woman who had learned about LFA from her children's LFA education through the Hoike o Haleakala project in school, validating the value of that outreach program. Following the report of the Waihe'e detection to HDOA in October 2009, HDOA (with effort by both Plant Quarantine and Plant Pest Control divisions) took the lead in eradication of the initial 2009 LFA invasion site, assisted by MISC and Maui County.^{5,6} Following the Waihe'e detection, LFA education and survey have been ramped up, but no new LFA populations have been found on Maui. LFA have not been reported on Moloka'i, Lana'i, or Kahoolawe, the other islands of Maui County.

The “Operational plan for management of *Wasmannia auropunctata* (Little Fire Ant) on the island of Maui, Hawai‘i”⁵, provides a good template for future cooperation to achieve LFA eradications. An area of less than 2 acres was treated and monitored and eradication seemed achieved.⁶ Monitoring continued after success was declared; several small pockets of LFA were found, most recently in March 2013, triggering additional treatment and continued monitoring.

The Lesson:

Apathy to LFA can be overcome by brutal experience (as has happened on the Big Island) with invasive ants and by education, as demonstrated to some extent on “LFA free” islands. In Maui County, it is likely that many institutions may be willing to pitch in to help respond to an LFA emergency. The same may be the case on Kaua‘i and O‘ahu. Aggressive surveillance and public outreach are likely to be crucial in finding LFA populations while they are as small as possible.

¹Conant, P., and E. VanGelder. 2003. Survey protocol for detecting new infestations of little fire ant (LFA) *Wasmannia auropunctata*. Unpublished. Hawai‘i Department of Agriculture and Hawai‘i Ant Group.

²Hoike Curriculum. 2002. Finding the Little Fire Ant. Coastal Unit 4, Activity #1. 20 pp. <http://www.hoikecurriculum.org/activity/finding-the-little-fire-ant/>

³Starr, F., K. Starr, and L. Loope 2008. Survey for ants on the island of Maui, Hawai‘i, with emphasis on the Little Fire Ant (*Wasmannia auropunctata*). Pacific Cooperative Studies Unit, University of Hawai‘i at Manoa, Honolulu, HI. Technical Report 156. 47pp. <http://manoa.hawaii.edu/hpicesu/techr/156/v156.pdf>

⁴Vanderwoude, C., and B. Nadeau. 2009. Application methods for paste bait formulations in control of ants in arboreal situations. Proceedings of the Hawaiian Entomological Society 41: 113–119. Available at scholarspace.manoa.hawaii.edu/handle/10125/14460

⁵Vanderwoude, C., T. Penniman, K. Paracuelles, F. Starr, and K. Starr. 2009. Operational plan for management of *Wasmannia auropunctata* (Little Fire Ant) on the island of Maui, Hawai‘i. December 2009. Available at www.littlefireants.com/maui%20plan%20public.pdf

⁶Vanderwoude, C., K. Onuma, and N. Reimer. 2010. Eradicating *Wasmannia auropunctata* (Hymenoptera: Formicidae) from Maui, Hawai‘i: The use of combination treatments to control an arboreal invasive ant. Proceedings of the Hawaiian Entomological Society 42: 23–31. Available at scholarspace.manoa.hawaii.edu/handle/10125/19914

Note: As the PHERP was in the stages of preparation, it was discovered that a small population of LFA was found in the course of routine monitoring at the Waihe‘e site in March 2013; eradication treatments continue.

CASE STUDY 4:

The Case of *Rauvolfia vomitoria* -How To Stop the “Next Miconia”? (Example 1)-

Background -The Original Miconia:

The invasive tree *Miconia calvescens* (Melastomataceae) had been introduced in Hawai'i in the early 1960s without any great attention and was sold at nurseries for two decades.² By the late 1970s, it had become an enormous problem in Tahiti, and some in Hawai'i had recognized this. In the early 1980s, F.R. Fosberg of the Smithsonian Institution warned Hawai'i authorities that “it is the one plant that could really destroy the native Hawaiian forests.”⁶ At that time, miconia was well known to be planted and spreading on the Big Island. Individuals and organizations mounted sporadic, local “eradication” campaigns; however, no control effort was sustained in Hawai'i until miconia was discovered 8km from Haleakala National Park on Maui in 1990; individuals and agencies on Maui conducted volunteer efforts to remove miconia and started to raise the profile of this issue.^{2,6} As a result, the entire genus *Miconia* (with 1000 spp.) was given Noxious Weed status (see main document, Section 3B, FAQ no. 5) by HDOA on 22 August 1992 under HRS Chapter 68. This authorized (but did not fund) HDOA to conduct control on private land.

An interagency Melastome Action Committee (MAC), formed on Maui in August 1991, began to convene regularly to plan strategy and solicit funding. Miconia was also present on O'ahu and Kaua'i, and by this time, the dramatic impacts of miconia on biodiversity and watersheds (based primarily on information from Tahiti) became increasingly known and made this species notorious.^{2,3,4,6,7} This led to the establishment of “Invasive Species Committees” (ISCs – see Appendix B) on Maui, Moloka'i, the Big Island, O'ahu, and Kaua'i, with primary objectives of addressing miconia and “stopping the next miconia,” i.e., preventing the costly delay of action against a very serious invasive plant species capable of undergoing rapid range expansion. Hawai'i's Invasive Species Committees have been addressing miconia with varying levels of success and have achieved eradications of some other high-risk invasive plant species (e.g., CASE STUDY 6). But has anything with dramatic high risk similar to miconia been addressed?

The Next Miconia?:

Arguably, the weed tree *Rauvolfia vomitoria* (Apocynaceae), the poison devil's pepper, may clearly merit a designation as “the next miconia”.

The Invasion and Response:

An incipient population of *Rauvolfia vomitoria*, a tree that can grow up to 60 ft tall, is present in North Kohala, Hawai'i island, within an area of about 2000-3000 acres. It was first noticed by field workers about 1998, and had become a concern 10 years later as its rampant spread became recognized. It continues to spread rapidly, and has invaded pastures, gulches and closed-canopy alien and mixed alien-ohia forest in North Kohala. The current distribution is at 600-1600 ft elevation, from Makapala to 'Iole in North Kohala. It has not yet invaded the nearby native forests but it is efficiently bird dispersed and is shade tolerant – similar to miconia. The tree responds vigorously after cutting, with numerous new stems arising from the cut stump. It grows very quickly. After mowing, resprouts reach a height of 3-4 feet within two months. Trees aged 5-8 years are 30 feet tall, and covered in fruit. 2,6-dimethoxybenzoquinone, a benzoquinone, is a highly toxic chemical compound found in every part of the tree.¹ Its Weed Risk Assessment score of 21 (vs. 14 for miconia) is indicative of its overall characteristics.¹

The source of *R. vomitoria* in Hawai'i is unknown, but it is possibly from an historic medicinal garden. It is native to tropical Africa (where it is found as high as 5800 ft elevation) and apparently found naturalized in the USA only in Hawai'i and Puerto Rico (possibly a concern for USDA-APHIS-PPQ).

There have been preliminary evaluations of what it would take for effective response. Landowners are reportedly amenable to control efforts. As recently suggested by botanists at Bishop Museum,⁵ "*Rauvolfia vomitoria* represents a severe threat to both agriculture and natural areas in Hawai'i, and the North Kohala population should be a prime target for a coordinated rapid response."

The Lesson:

Rauvolfia vomitoria poses a threat that should be promptly addressed – arguably comparable to that presented by *Miconia calvescens* in the 1990s, when institutions were established with the intent of achieving a solution. However, 15-20 years later, although *Rauvolfia vomitoria* deserves noxious weed/restricted list designation, there is no obvious path to that happening. Nor is there an obvious funding source that recognizes that addressing such weeds sooner instead of later will be very cost effective.

¹Chimera, C.G. 2010. Hawai'i Weed Risk Assessment for *Rauvolfia vomitoria*. Hawai'i Invasive Species Council. <http://plantpono.org/files/Rauvolfia%20vomitoria.pdf>

²Conant, P., A.C. Medeiros, and L.L. Loope. 1997. A multi-agency containment program for miconia (*Miconia calvescens*), an invasive tree in Hawaiian rain forests. Pages 249-254 in J. Luken and J. Thieret (eds.), *Assessment and Management of Invasive Plants*. Springer-Verlag.

³Giambelluca, T.W., R.A. Sutherland, K. Nanko, R.G. Mudd, A.D. Ziegler. 2010. Effects of Miconia on hydrology: A first approximation. In L.L. Loope; J.Y. Meyer; B.D. Hardesty, and C.W. Smith. *Proceedings of the 2009 International Miconia Conference*, Keanae, Maui, Hawai'i, May 4-7, 2009. <http://www.hear.org/conferences/miconia2009/proceedings/>

⁴Johnson, M.T. 2010. Miconia Biocontrol: Where Are We Going and When Will We Get There? In L.L. Loope; J.Y. Meyer; B.D. Hardesty, and C.W. Smith. *Proceedings of the 2009 International Miconia Conference*, Keanae, Maui, Hawai'i, May 4-7, 2009. <http://www.hear.org/conferences/miconia2009/proceedings/>

⁵Kennedy, B.H., S.A. James, and C.T. Imada. 2010. New Hawaiian plant records from Herbarium Pacificum for 2008. Bishop Museum Occasional Papers. 107: 19–26. <http://hbs.bishopmuseum.org/pubs-online/pdf/op107p19.pdf>

⁶Medeiros, A.C., L.L. Loope, P. Conant, and S. McElvaney. 1997. Status, ecology, and management of the invasive tree *Miconia calvescens* DC (Melastomataceae) in the Hawaiian Islands. Pages 23-35 in Records of the the Hawai'i Biological Survey for 1996, N.L. Evenhuis and S.E. Miller (eds.), *Bishop Museum Occasional Papers* No. 48. <http://hbs.bishopmuseum.org/pdf/melastome97.pdf>

⁷Nanko, K., T.W. Giambelluca, R.A. Sutherland, R.G. Mudd, M. A. Nullet, and A.D. Ziegler. 2013. Erosion potential in *Miconia calvescens* stands on the island of Hawai'i. *Land Degradation & Development*, DOI: 10.1002/ldr.2200, published online 24 Jan. 2013.

CASE STUDY 5:

Response to Discovery of *Chromolaena odorata* on O'ahu Military Lands

-How To Stop the "Next Miconia"? (Example 2)-

Background:

Chromolaena odorata (Asteraceae), chromolaena, Siam weed, or devil weed, is native to extreme southern U.S., Mexico and Central America. It is poisonous to humans and livestock and forms dense, monotypic tangles in favorable habitat outside its native range, with each plant up to 12 ft tall and producing up to 800,000 wind-dispersed seeds per year.¹ It is a major pest of crops such as coconuts, rubber, tobacco and sugar cane in tropical Asia and Africa; some agricultural areas in SE Asia have been abandoned because of chromolaena. It is regarded as one of the world's worst weeds and a high-priority for eradication in Australia (for example), where it is established in only a few small infestations in northern Queensland. The Australian government rationalizes that it is far more cost-effective to prevent Siam weed's spread than to try to control what could become large infestations. Therefore all known outbreaks of chromolaena are being controlled in Australia, with the aim of eradication.²

The Invasion and Response¹:

O'ahu Army Natural Resources Program (OANRP) staff members discovered an infestation of chromolaena during routine road surveys on January 11, 2011, in the Kahuku Training Area (KTA) on Oahu's North Shore. The crew collected a specimen, which they suspected was chromolaena. The specimen was submitted to the Bishop Museum's O'ahu Early Detection program, and Museum botanists verified that the specimen was *Chromolaena odorata*. Several scenarios are plausible for how chromolaena reached Hawai'i, but the most likely one seems to be that it came with Hawai'i training exercises of a military unit from Guam, where chromolaena is abundant.

OANRP staff, with help from the O'ahu Invasive Species Committee (OISC), Bishop Museum and Hawai'i Department of Agriculture (HDOA) have developed a detailed map of the *Chromolaena* infestation in KTA, and a comprehensive plan for addressing chromolaena³ was drafted in 2011. At that time, the known infestation was thought to cover 838 acres. Effective control methods exist and literature searches suggest that the majority of seeds persist in the soil only about a year.

Jane Beachy reports (OANRP, pers. comm., 7-15-13) that "the plan needs updating, as we've done a lot of control since it was written, the infestation maps have changed, new sites have been found, and outreach strategies have evolved."

In January 2013, an outlier site was discovered along a trail in Kahana Valley. One mature and several immature plants were found at the site. It is suspected that recreational park users acted as a vector. Management efforts in Kahana are being led by OISC. In May 2013, OANRP staff found a new large infestation at Schofield Barracks, in the McCarthy Flats area. Hundreds of plants are present at Schofield, and are all located in the lower portion of Mohiakea gulch. Military training is likely responsible for bringing *Chromolaena* from KTA to Schofield. OANRP is conducting primary management at this site. Currently, 931 acres on O'ahu are infested with chromolaena, and the species has not been found on neighbor islands.

The Lesson:

The beginnings of *Chromolaena* management represent an excellent example of the potential for effective response through interagency collaboration. Having discovered the new invasion through routine surveys, the OANRP staff had the knowledge to realize that this was a potentially very serious invasive plant species and submitted a sample for verification to Bishop Museum botanists.

Containment of the infestation to prevent spread to agricultural lands of O‘ahu and other islands seems a high priority and may be feasible. It is also undoubtedly a serious threat to native ecosystems. The continued collaboration of OANRP with OISC, HDOA, DLNR-DOFAW, and Bishop Museum is anticipated to provide a strong opportunity for achieving such containment. Eradication may even be possible because of a short-lived seed bank. Cooperation received to date from the Hawai‘i Motorsports Association for providing outreach for minimizing dispersal opportunities on off-road vehicles is promising.

¹Beachy, J.R. 2011. Hawai‘i confronts invasive superweed on Kahuku Training Area. Public Works Digest, May-June 2011, p. 30-31. <http://manoa.hawaii.edu/hpicesu/DPW/other/publicworksdigest.pdf>

²Australia Natural Heritage Trust. 2003. Weed Management Guide: Siam weed or chromolaena (*Chromolaena odorata*). 6p. <http://www.environment.gov.au/biodiversity/invasive/weeds/publications/guidelines/alert/pubs/c-odorata.pdf>

³Anonymous. 2011. *Chromolaena odorata* Management Summary and Control Plan. O‘ahu Army Natural Resources Program. University of Hawai‘i at Manoa, Pacific Cooperative Studies Unit. December 2011. http://manoa.hawaii.edu/hpicesu/DPW/2011_YER/016.pdf

CASE STUDY 6:

Recent Maui County Plant Eradications by MISC and MoMISC *-Making “Easy” But Important Plant Eradications-*

Background:

Since 2001, Hawaii’s “Invasive Species Committees” (ISCs, see Appendix B) have operated on all six of the main, non-privately held Hawaiian islands. These inter-agency partnerships have the objective of eradication or containment of pests targeted by their respective committee boards.¹ In practice, the incipient invasive species are often targeted on one particular island even though they may be widespread elsewhere in the state; indeed, rampant invasiveness elsewhere in the state is often a primary impetus for targeting a pest. The experience of the two ISCs operating in Maui County, reported below, is illustrative.

The Invasions and Response²:

On Maui, Moloka’i, and Lana’i, which comprise three of the four islands of Maui County, single-island eradications have been achieved for 12 plant species and eradication is likely imminent for an additional eight species.

There are two ways for an invasive plant species to become targeted for eradication in Maui County: review during an annual priority-setting process held by each ISC, or as a rapid response to a newly-discovered species brought to the committee’s attention at a regular (bi-monthly) meeting. New discoveries of incipient species are typically made by committee members, staff, or other resource professionals in the community. Evaluation criteria include: risk to the island’s environment, health, agriculture or economy, with special emphasis on environmental threats, feasibility, and cost of management options. Information about the relative risk posed by a potential target derives from several sources, including the expert knowledge of committee members and other local botanists, use of the Hawai’i Pacific Weed Risk Assessment (HPWRA) and relevant scientific literature and websites.

Delimitation methods included active and passive strategies, which involved roadside surveys, backyard searches in residential areas, and ground sweeps in rural or wildland areas. These were all conducted by a trained field crew at the initial detection site and surrounding areas. Roadside surveys on Maui were conducted in 2000 and 2009 by two botanists driving all paved roads searching for a list of specific plants.

Use of outreach also played an important role. Facilitation of passive surveys focused on teaching the public how to identify target species. Activities included 19 early detection workshops since 2008 for conservation workers; field professionals such as county road workers and parks and recreational staff, dock workers, federal agricultural inspectors; and members of the general public. Participants received an informative field guide about the target species. Publication of articles in the local newspaper highlighted early detection targets (www.hear.org/misc/mauinews). Outreach professionals attended community events and worked with local schools to inform the public about target species. The U.S. Geological Survey’s Pacific Basin Information Node (see HEDN, Appendix B) spearheaded a multi-agency reporting system to facilitate rapid response to incipient pests, which includes an online reporting tool (www.reportapest.org). These activities have resulted in valid reports from the public.

Management work at each infested site was conducted by ISC staff or partner agencies. Work on private lands was performed after obtaining permission from the landowner. Eradication techniques included hand-pulling or treatment with herbicide. Seed heads from flowering grasses were typically cut and bagged before treatment with herbicide. Geospatial information was collected at each

infested site. Eradications were achieved by repeat visits to known infested sites at intervals designed to ensure that plants did not fruit or set seed. Any available information about seed longevity was considered in determining the likelihood that a remaining seedbank had been exhausted. Site visits and surveys of surrounding areas continue to be made around all known locations of target species. There is always the chance that serial eradications will be necessary, particularly because of interisland transport, most notably of species that travel on hapu'u (*Cibotium*) logs sold commercially, including *Rubus ellipticus* and *Melastoma* spp.

As a result of these efforts, seven plant species were eradicated from Maui: *Enchylaena tomentosa*, *Macaranga mappa*, *Melastoma septemnerium*, *Melastoma sanguineum*, *Parkinsonia aculeata*, *Rhodomirtus tomentosa*, and *Rubus ellipticus*. Four species were eradicated from Moloka'i: *Cortaderia jubata*, *Macaranga tanarius*, *Pennisetum setaceum*, and *Ulex europaeus*. Two species were eradicated from Lana'i: *Cryptostegia grandiflora* and *Macaranga mappa*.

In addition to the successes outlined above, eight more invasive plant species are on target for eventual eradication within Maui County: on Maui these are *Acacia retinodes*, *Maclura pomifera*, *Silybum marianum*, and *Verbascum thapsus*; on Moloka'i these are *Arundo donax* [IUCN 100], *Cryptostegia madagascariensis*, *Salsola kali*, and *Setaria palmifolia*. The known extents of these populations have been delimited and efforts are focused on exhausting seedbanks or controlling sprouts from vegetative regrowth.

The Lesson:

It is revealing how cost effective these plant eradications have been, though single island eradications may need to be repeated because of continuing interisland transport. MISC resources devoted to those on Maui comprised less than 1% of the MISC budget for all work on invasive species, dominated by the cost of containment of the weed tree miconia, pampas grass, and coqui frogs.

Although there is typically considerable collaboration with these eradications, the buck stops with the individual ISC, which has responsibility for keeping track of checking and rechecking/revisiting the sites of each target species to assure lack of survival and reproduction. Continuing island-wide surveillance is also a feature of this strategy. The ISCs are serving a valuable role with these relatively "easy" and sometimes "slow" eradications.

¹Kraus, F., and D. C. Duffy. 2010. A successful model from Hawai'i for rapid response to invasive species. *Journal for Nature Conservation* 18:135–141.

²Penniman, T.M., L. Buchanan, and L. L. Loope. 2011. Recent plant eradications on the islands of Maui County, Hawai'i. Pages 325-331 in C.R. Veitch; M.N. Clout, and D.R. Towns (eds.), *Island Invasives: Eradication and Management*. IUCN, Gland, Switzerland.
http://www.issg.org/pdf/publications/Island_Invasives/pdfHQprint/3Penniman.pdf

CASE STUDY 7:

The Notorious Tawny Crazy Ant (TCA, *Nylanderia fulva*), a New and Severe Threat among Potential Ant Invaders for Hawai'i -The Importance of Readiness-

Background:

In March 1999 when Little Fire Ant (LFA, *Wasmannia auropunctata*) was first detected in Puna of the Big Island, HDOA was behind the curve in responding, partly because LFA's discovery was a surprise for Hawai'i, essentially on no one's radar. Subsequently, HDOA efforts to respond were hindered by inadequate public and commercial awareness; low staffing levels; lack of access to nursery sales records (to enable 'trace forward'); the difficulty of detecting this ant; lack of a registered ant control product for use in orchard fruit and vegetable crops; the failure of most people to take the threat of LFA invasion seriously; and the likelihood that the ant had been present for as long as a decade before being discovered.² (Later, the source of Hawaii's invasion was discovered to be Florida, based on precise genetic match.⁵) HDOA was unable to mount an eradication effort and enactment of an intra-island quarantine to prevent infected nurseries from selling plants and spreading LFA. This experience demonstrates the importance of readiness and planning for prevention and potential rapid response for high-risk introductions such as RIFA or TCA.

The Potential Invasion and Preparation for Response:

Sudden, explosive outbreaks of unidentified pests are relatively rare; an unknown ant species attracted much attention after its discovery in Texas in 2002 by a pest control operator in a suburb of Houston, where it was observed to be displacing Red Imported Fire Ants (RIFA). A firm identification was finally achieved a decade later as a South American species, *Nylanderia (Paratrechina) fulva*, apparently native to roughly the same region in northern Argentina and southern Brazil as LFA and RIFA.^{1,9} A dramatic outbreak of a similar ant had been reported in 2008 on St. Croix, Virgin Islands⁷; 2012 taxonomic treatments lead to the interpretation of both Caribbean and Florida collections as *N. fulva*.^{1,9} *N. fulva*, at first named the Rasberry Crazy Ant after the surname of the pest control operator and discoverer, has recently been given the official common name, Tawny Crazy Ant (TCA). A tentative range map suggests that TCA has established populations in 24 counties in Texas, 20 counties in Florida, and a few sites in southern Mississippi and southern Louisiana.^{1,6} (However, there may not be an active effort to survey the entire extent of TCA populations.)

This "new" invasive ant tends to quickly become ecologically dominant and displaces most other species wherever it establishes. TCA invades people's homes, nests in crawl spaces and walls, achieves very high abundance, and (like RIFA) damages electrical equipment. Large numbers of this ant have accumulated in electrical equipment, causing short circuits and clogging switching mechanisms resulting in equipment failure.⁶ TCA also thrives in wildland areas, where it has been documented to rapidly attain densities 100x or more greater than the combined abundance of all other ants.³ Where the TCA populations are densest, RIFA are eliminated. Even in regions where the TCA population is less dense, RIFA populations are drastically reduced. Other ant species, particularly native species, are also eliminated or drastically diminished. TCA invasion has substantially reduced biodiversity at the base of the food chain in areas where they have displaced RIFA.^{3,8}

TCA are much harder to control than RIFA.^{4,6,8} "They don't consume most of the poison baits that kill RIFA mounds, and they don't have the same kinds of colony boundaries that RIFA do. That means that even if they're killed in a certain area, the supercolony survives and can swarm back over the area."⁸ "They don't sting like RIFA does, but aside from that they are much bigger pests. There are videos on YouTube of people sweeping out dustpans full of these ants from their bathroom. You have to call pest control operators every three or four months just to keep the infestation under

control. It's very expensive.. Potential range.. is unknown. So far, most of the colonies are in fairly wet environments with mild winters, near the coast, so it may be the case that they can't thrive in drier or colder climates, and that RIFA will remain dominant in those areas."⁸

The reproductive members of the species don't fly. So in the unlikely event that accelerated spread by humans is lacking, TCA colonies can advance only about 200 meters a year. Nursery products appear to be a key pathway of spread for TCA.⁸ Apparently there is no USDA TCA quarantine comparable to the USDA RIFA quarantine. Is there likely to be such a quarantine eventually? "The Texas and federal Departments of Agriculture consider the pest to be a major concern for agriculture and have assigned a Best Management Practices Task Force to help control this pest. However, reliable estimates for the damage and potential impact of this new pest are still lacking, in part, because its taxonomic uncertainty has prevented any previous research or historical accounts from being used effectively."¹

The Lesson:

TCA appears to be a very high-risk species for Hawai'i. Hawai'i can potentially benefit from the considerable attention being paid to this ant in southeastern U.S., as more detailed information becomes available regarding biology and management strategies for TCA. The 2013 RIFA/invasive ant conference at Virginia Beach had presentations on TCA; it may be warranted for Hawai'i to send someone to the annual RIFA conference (usually in southeastern U.S.) in 2014 and subsequent years to maximize opportunity for being fully informed.

¹Gotzek, D., S.G. Brady, R.J. Kallal, and J.S. LaPolla. 2012. The importance of using multiple approaches for identifying emerging invasive species: The case of the Raspberry Crazy Ant in the United States. *PlosOne* 7(9), e45314

²Krushelnycky, P.D., L.L. Loope, and N.J. Reimer. 2005. The ecology, policy, and management of ants in Hawai'i. *Proceedings of the Hawaiian Entomological Society* 37: 1-25. scholarspace.manoa.hawaii.edu/handle/10125/103

³LeBrun, E.G., J. Abbott, and L.E. Gilbert. 2013. Imported crazy ant displaces imported fire ant, reduces and homogenizes grassland ant and arthropod assemblages. *Biological Invasions* 15: 2429-2442.

⁴McDonald, D.L. 2012. Investigation of an Invasive Ant Species: *Nylanderia fulva* Colony Extraction, Management, Diet Preference, Fecundity, and Mechanical Vector Potential. Ph.D. Dissertation, Texas A&M University, College Station, TX. urbanentomology.tamu.edu/pdf/McDonald_2012.pdf

⁵Mikheyev, A.S., S. Bresson, and P. Conant. 2009. Single-queen introductions characterize regional and local invasions by the facultatively clonal little fire ant *Wasmannia auropunctata*. *Molecular Ecology* 18: 2937–2944.

⁶Texas A&M AgriLife Research Extension. 2010. Tawny (Raspberry) Crazy Ant [*Nylanderia fulva*]. College Station, TX. <http://urbanentomology.tamu.edu/ants/raspberry.html>

⁷Wetterer, J. K., and J.L.W. Keularts. 2008. Population explosion of the hairy crazy ant, *Paratrechina pubens* (Hymenoptera: Formicidae), on St. Croix, US Virgin Islands. *Florida Entomologist* 91: 423-427.

⁸University of Texas at Austin. 2013. News archive: Invasive Crazy Ants Are Displacing Fire Ants, Researchers Find, May 13, 2013 [relates to LeBrun et al. 2013 article in *Biological Invasions*]. www.utexas.edu/news/2013/05/16/invasive-crazy-ants-are-displacing-fire-ants-researchers-find/

⁹Zhao, L., J. Chen, W.A. Jones, D.H. Oi, and B.M. Drees. 2012. Molecular comparisons suggest Caribbean Crazy Ant from Florida and Raspberry Crazy Ant from Texas (Hymenoptera: Formicidae: *Nylanderia*) are the same species. *Environmental Entomology* 41: 1008–1018.

❖ APPENDIX G:

Identification in Action: Summary of New Pest Advisories:

Purpose: The purpose of this page is to familiarize the reader with a sampling from HDOA's "new pest advisories" (<http://hdoa.Hawaii.gov/pi/ppc/new-pest-advisories/>) which indicates the finder and identifier of pests not known previously to occur in Hawai'i. This sampling suggests that initial discoveries are often made by HDOA staff or by agriculture practitioners, and identifications are typically made by local identification experts in CTAHR and HDOA and frequently confirmed by specialist experts around the world. The identification process is further detailed in the main PHERP document, Section 4, Step 2.

Naio thrips, *Klambothrips myopori*: Samples of heavily galled naio, *Myoporum sandwicense*, were collected from the Waikoloa area of Hawai'i Island on March 20, 2009, and submitted to UH. Specimens of a black thrips, extracted from the samples were tentatively identified as *Klambothrips myopori* Mound and Morris by both the UH and HDOA. This identification was confirmed by G. Watson of the California Department of Food and Agriculture (CDFA) and S. Nakahara (Thysanoptera) Systematic Entomology Laboratory, Agricultural Research Service, USDA.

Asian citrus psyllid (ACP), *Diaphorina citri*: Specimens of an insect not previously known to occur in the State were found in a sample of navel orange tree foliage from Waiakea on the island of Hawai'i on May 1, 2006, by a HDOA staff member. The specimens, identified as the Asian citrus psyllid (ACP), *Diaphorina citri* Kuwayama, were confirmed by the USDA Systematic Entomology Laboratory in Beltsville, Maryland, on May 5, 2006.

***Puccinia psidii* rust:** In April 2005, an ohia plant, *Metrosideros* sp., infected by a rust disease was submitted to the UH CTAHR, Agricultural Diagnostic Service Center's (ADSC) Plant Disease Diagnostician Desmond Ogata by a Waimanalo (O'ahu) grower who specializes in native plants. There were no records of a rust disease on ohia in Hawai'i or elsewhere. In May 2005, rose apple, *Syzygium jambos*, heavily infected with a similar rust disease was observed. Based on records of a rust disease that is known to occur on ohia-related plant species, this rust was tentatively identified as *Puccinia psidii* Winter by Eloise Killgore of HDOA and Janice Uchida of UH CTAHR. The identification of this rust pathogen was later confirmed (2006) by Dr. Shaobin Zhong, UH CTAHR, using DNA profiles for *P. psidii*.

Erythrina gall wasp (EGW), *Quadrastichus erythrinae*: Samples of gall-damaged leaves and stems of the coral tree, *Erythrina variegata* L., were first collected in Manoa, O'ahu, on April 19, 2005, by UH graduate student, H.C. Kuo. The galls were induced by the plant as a reaction to wasp larvae developing within the plant tissue. The adult wasps which emerged from the galls were tentatively identified as the erythrina gall wasp (EGW), *Quadrastichus erythrinae* Kim, initially by the student and later by the UH CTAHR. Through photos, the identification was confirmed by J. La Salle of the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia.

Stinging Caterpillar, *Darna pallivitta*: Specimens of a stinging nettle caterpillar were first found infesting rhaps palm at a nursery in Panaewa on the Big Island in September 2001. They were tentatively identified as *Darna pallivitta* Moore by D. Tsuda, UH Insect Diagnostic Clinic, and B. Kumashiro, HDOA and confirmed by Dr. M. Epstein of the Smithsonian Institution.

Little fire ant (LFA), *Wasmannia auropunctata*: Specimens of a tiny ant were first collected by a resident of Hawaiian Paradise Park, located in the Puna District of the Big Island, in March 1999 and submitted to HDOA. They were identified as the little fire ant (LFA), *Wasmannia auropunctata* (Roger), by HDOA Plant Quarantine Insect Specialist, N. Reimer.

Giant whitefly, *Aleurodicus dugesii*: In May 2002, a sample of red hibiscus leaves heavily infested with a whitefly previously not known to occur in Hawai'i was collected on O'ahu at the Honolulu International Airport. It was identified as the giant whitefly, *Aleurodicus dugesii*, Cockerell by B. Kumashiro, HDOA Taxonomist and confirmed by J. Dooley of USDA-APHIS in California.

Glassy winged sharpshooter (GWSS), *Homalodisca coagulata*: In May 2004, several specimens of an unidentified leafhopper were collected in a residential area of Waiiau (Pearl City), O'ahu. The leafhopper was identified as the glassy winged sharpshooter (GWSS), *Homalodisca coagulata* (Say), by HDOA Insect Taxonomist B. Kumashiro, and confirmed by R. Gill, California Department of Food and Agriculture (CDFA).

Pickleworm, *Diaphania nitidalis*: In November 2003, specimens of a caterpillar previously not known to occur in Hawai'i were found damaging cucumber fruits in central O'ahu by members of UH CTAHR. Subsequent surveys revealed additional damage by this insect on zucchini and kabocha squash (pumpkin) in the central O'ahu area. Specimens were tentatively identified as the pickleworm, *Diaphania nitidalis* Cramer by D. Tsuda, UH CTAHR and confirmed by M. Alma Solis, Research Entomologist, with the USDA Systematic Entomology Lab in Beltsville, MD.

Varroa mite, *Varroa destructor*: In April 2007, a beekeeper in Manoa on the island of O'ahu observed tiny red mites in several abandoned honey bee hives which he obtained several miles away in Makiki. After reporting it to HDOA, specimens were collected and identified as the varroa mite, *Varroa destructor* Anderson and Trueman. The identification was confirmed by the USDA Systematic Entomology Laboratory in Beltsville, Maryland. Prior to this detection, Hawai'i was one of the few places in the world free of this very destructive honey bee pest.

❖ **APPENDIX H:** Potential Targets of Collaborative Emergency Response

Purpose of this Section: This plan can be used for emergency response to a wide range of pests. The pests addressed in this “potential targets” appendix may be good examples of what pests might warrant collaborative response. If these (or others) can be recognized conceptually in advance as worthy targets by those likely to collaborate, it should make planning easier. This is not intended to be a full repository of potential species of concern, rather a useful overview of some key species that have been at the forefront of concern.

➤ ANTS

- RED IMPORTED FIRE ANT
- LITTLE FIRE ANT
- TAWNY CRAZY ANT
- ODOROUS HOUSE ANT

➤ MAJOR PESTS OF COCONUT AND OTHER PALMS

- INSECTS OF COCONUT AND OTHER PALMS
- MITES OF COCONUT AND OTHER PALMS
- NEMATODES OF COCONUT AND OTHER PALMS
- PHYTOPLASMAS OF COCONUT AND OTHER PALMS
- VIROIDS OF COCONUT AND OTHER PALMS

➤ NON-PLANT PESTS

- SNAKES
- BATS
- BITING FLIES

➤ ANTS

Hawai'i lacks native ants. Ants are notorious invaders worldwide and represent an entirely introduced component of Hawaiian ecosystems. The establishment of about 50 ant species over the past two centuries has wide ranging effects on agriculture, other sectors of the economy, and the conservation of native biodiversity. The threat of additional destructive ant species, such as the red imported fire ant arriving and establishing in Hawai'i underscores the importance of a surveillance network for early detection and operational plans for rapid response (Krushelnycky et al. 2005).

• Red Imported Fire Ant (*Solenopsis invicta*) (See Appendix F, Case Study 1)

The South American red imported fire ant (RIFA) was first intercepted by HDOA inspectors in 1991. Identified as among Hawaii's "Ten Least Wanted" pests in a 1996 educational brochure produced by CGAPS, this notorious species has invaded more than 125 million ha in the southern U.S. since the 1930s despite a USDA federal quarantine (USDA-APHIS 2010). In 1998, RIFA reached California and has since been gradually spreading in the southern half of the state, a situation that poses an immense threat to Hawai'i because of its high volume of trade with California. RIFA has invaded numerous Caribbean islands from Florida in the past 2-3 decades, and it is capable of doing the same in the Pacific unless concerted action is taken. In the past 15 years, it has reached Australia, New Zealand (where it has been eradicated, see Appendix F, Case Study 1), Singapore, Malaysia, Taiwan, mainland China, and the Philippines.

In the continental U.S., RIFA threatens public health and safety, industry, biodiversity and quality of life. Its aggressive nature and powerful sting have occasionally caused the deaths of people, injury to many people annually, and injury and death of wildlife, livestock, and pets. If *S. invicta* establishes in Hawai'i, it is likely to invade most non-rainforest areas, except for the highest-elevation areas on Hawai'i's volcanoes. Consequently, it has the strong potential to negatively affect agricultural lands, parks, residential and other private properties, tourist destinations and native biodiversity in natural areas. RIFA colonies grow rapidly and reach exceptional sizes; individual mature nest mounds may contain up to 200,000 workers, and there can be more than 500 mounds per hectare. Large numbers rapidly swarm onto anything that is unfortunate enough to disturb the colony, and each individual ant can deliver multiple painful stings. Naïve people, i.e. tourists and children, are most at risk for being stung. Attracted to electric equipment, RIFA commonly infests and damages electrical distribution systems, communication systems, air conditioners, well pumps, traffic boxes, and airport runway lights. If RIFA becomes established in Hawai'i, extensive use of pesticides to protect the state's residents, wildlife, tourist industry, agriculture, and other industries would almost certainly be employed, as it has been in the continental U.S. An analysis of the potential annual economic costs of RIFA to Hawai'i (statewide) produced an estimate (in US\$ 2006) of \$211 million/year, comprised of \$77 million in damages and expenditures and \$134 million in foregone outdoor opportunities to households and tourists (Gutrich et al. 2007).

An interagency Hawai'i Ant Group met from 1999 to 2007 to develop strategy against ant invasions with special attention to RIFA. A conceptual plan for preventing and responding to ant incursions, with special attention to RIFA, was developed (Hawai'i Ant Group 2007). This plan is useful but needs refinement to fill in details of rapid response efforts if and when RIFA is detected. Very rapid response to a RIFA incursion is crucial because RIFA queens disperse by nuptial flights.

• Little Fire Ant (*Wasmannia auropunctata*) (See Appendix F, Case Study 3)

The invasive little fire ant (LFA), native to the Neotropics (South and Central America), has emerged in the past few decades as a major exotic pest likely "in the early phases of a pantropical explosion" (Wetterer and Porter 2003). It has invaded Pacific Islands, including Galapagos (ca. 1935), New Caledonia (1972), Solomon Islands (1974), Wallis and Futuna (1981), Vanuatu (1998), Hawai'i (1999), Tahiti (2004), New Guinea (2006) and Guam (2011). Australia, where LFA was first detected in 2006, is still combatting its establishment at multiple sites in Queensland. Populations have also established in West Africa -- Gabon (1914) and Cameroon (1959). Populations currently spill over into the subtropics as far north as 32°+ N in Bermuda and Israel and about 30° N in Florida. LFA is most problematic in newly-invaded, human-occupied tropical areas (Wetterer and Porter 2003).

LFA was first found and reported in Hawaiian Paradise Park in the Puna District on the island of Hawai'i in March 1999. As soon as LFA was detected, HDOA developed a pest advisory and assigned entomologist Patrick Conant to lead efforts to address this new invasion. It was found that LFA were being dispersed by movement of infested plants. Before the end of 1999, three additional populations were discovered, one 20 acres in area (Conant *et al.* 2007). The interagency Hawai'i Ant Group (active 1999-2007) served as a support group for HDOA and advocated the view in September 1999 that combating the little fire ant was exceptionally important both in its own right and since it makes an excellent surrogate for combating RIFA. HDOA efforts involved detection, experimental efforts at eradication of local populations, and a partial inter-island quarantine. Efforts were hindered by low staffing levels; inadequate public and commercial awareness; lack of access to nursery sales records (to enable 'trace forward'); the difficulty of detecting this ant; lack of a registered ant control product for use in orchard fruit and vegetable crops; the failure of most people to take the threat of LFA invasion seriously; and the likelihood that the ant had been present for as long as a decade before being discovered. HDOA demurred from an eradication effort and enactment of an intra-island quarantine to prevent infested nurseries from selling plants. The LFA invasion on Hawai'i Island number had escalated to 31 populations covering over 76 ha by January of 2004; eight populations involved nursery infestations, and the nurseries were still selling plants (P. Conant unpubl. data in Krushelnycky *et al.* 2005).

As of February 2007, the Hawai'i invasion had occupied 50 sites and occurred as high as 1500 ft [460m] elevation (Conant *et al.* 2007). [However, there may be a possibility that LFA can move much higher (at least under certain circumstances) based on an apparent high-elevation record of 1645m (5430 ft) near Monterey, Mexico (Wetterer and Porter 2003).] As of 2013, formerly discrete populations were converging over the districts of Puna and Hilo, with various outliers. Populations first appeared in the Kona area of Hawai'i island by 2010. Many of these infestation sites include nurseries, farms, and orchards.

Nursery shipments leaving Hilo for other islands have been checked prior to shipment by baiting for LFA by HDOA inspectors for several years, but to date there have been no measures other than attempts at comprehensive public education for preventing within-island spread on Hawai'i.

The current policy for inter-island shipments leaving Hilo involves peanut butter baiting of any plants growing in media or soil before shipping; if *W. auropunctata* is detected, plants must be treated with insecticide before leaving the island. It is generally agreed that this baiting methodology is partially but not fully effective. A communication from experts at USDA, Agricultural Research Service (ARS) in Florida to the Hawai'i Ant Group (E. VanGelder, pers. comm., 2004) suggests that a policy at least as rigorous as the federal quarantine for RIFA is needed to be successful -- i.e., requiring either that the production site be certified as RIFA-free or all risk goods shipped out of the high-risk area be treated (Hawai'i Ant Group 2007). See USDA-APHIS (2010, 2013) for a description of their RIFA quarantine.

Still, as recently as mid-2009 other Hawaiian islands were unknown to have *W. auropunctata* except for a single Kaua'i population (discovered by HDOA's 'trace forward' effort in 1999), which has until recently (now near eradication) proved remarkably resistant to eradication, apparently because of the problem of treating LFA in trees (addressed by Vanderwoude and Nadeau 2009). A single population was discovered on the island of Maui in September 2009, and eradicated through a collaborative effort led by HDOA and its Hawai'i Ant Lab (Vanderwoude *et al.* 2009, Vanderwoude *et al.* 2010); the same is now being done on Kaua'i, though the infestation is larger.

LFA spreads very slowly on its own (by walking, not flying, queens) but is notoriously difficult to detect at low densities.

- **Tawny (Raspberry) Crazy Ant (TCA, *Nylanderia fulva*) (See Appendix F, Case Study 7)**

This highly problematic ant was discovered at the Houston airport in 2002 and finally definitively identified a decade later as a South American species (Gotzek *et al.* 2012). Apparently TCA is so aggressive that it locally displaces RIFA and is considered an equally undesirable invasive ant (Texas A&M AgriLife Research Extension 2010). Taxonomic confusion slowed the understanding of this species; it is apparently conspecific with populations in Florida and is already fairly widespread in southeastern U.S. (Zhao *et al.* 2012). TCA appears to be a very high-risk species for Hawai'i. Hawai'i should likely target it for prevention, detection and response as soon as possible.

• **Odorous House Ant (*Tapinoma sessile*)**

The odorous house ant is a widely distributed native species found throughout mainland U.S., in Canada, and in Mexico. Its common name is derived from a peculiar coconut-like odor produced in its anal glands.

This ant was found at an upland site in Kula, Maui, Hawai'i (Buczowski and Krushelnycky 2012). "Although *T. sessile* possesses many of the traits shared by most invasive ant species and is a significant urban pest in the continental USA, this represents the first confirmed record for this species outside its native North American range. Our survey of the site revealed a relatively large (ca. 17 ha) infestation with many closely spaced nests, possibly all belonging to a single supercolony as suggested by the lack of aggression or only occasional non-injurious aggression between workers from distant nests. The odorous house ant is currently abundant at this site, despite the presence of seven other introduced ant species, including the big-headed ant (*Pheidole megacephala*) and the Argentine ant (*Linepithema humile*). Based on its behavior at this site, *T. sessile* may successfully invade other temperate areas in the future, and should be watched for by biosecurity programs." (Buczowski and Krushelnycky 2012).

It is unknown at this time whether *Tapinoma sessile* is established in other areas of Hawai'i.

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➤ MAJOR PESTS OF COCONUT AND OTHER PALMS

Coconut (*Cocos nucifera*) is generally considered a Polynesian introduction, though alternatively it could well have reached Hawai'i by floating. Prior to statehood, coconut was the official tree of the Territory of Hawai'i. From an early date it has received special protection by Hawai'i's agricultural quarantine laws and rules. The palm genus *Pritchardia* is comprised of 23 endemic species, some of which are extinct and nine of which are federally listed as Endangered. Numerous other palm genera and species comprise a major component of landscaping in Hawai'i and are highly important to the tourism industry. To date, Hawai'i's palms are relatively free of high-impact pests, considering that a host of pest species of coconuts and other palms are rampant in other parts of the world, including INSECTS, MITES, A NEMATODE, PHYTOPLASMAS, AND VIROIDS. The potential emergency response targets included below are Hawai'i CAPS survey targets for 2013.

INSECTS OF COCONUT AND OTHER PALMS

• Red Palm Weevil, *Rhynchophorus ferrugineus* (Coleoptera: Curculionidae)

Red palm weevil is native to southeastern Asia and Pacific Islands (Thomas 2010). It arrived in the Arabian Peninsula in the 1980s and has since spread throughout the Middle East, North Africa, and Mediterranean Europe. In late 2008, it was discovered on the island of Curaçao in the Dutch West Indies - the first time it had been found in the New World (Thomas 2010). It was subsequently found in Orange Co., California, in August 2010 (Garcia 2010). Malumphy and Moran (2007) gave its distribution as Bahrain, Bangladesh, Cambodia, China, Egypt, France, Greece, India, Indonesia, Iran, Iraq, Israel, Italy, Japan, Jordan, Kuwait, Laos, Malaysia, Myanmar (Burma), Oman, Pakistan, Palestinian Authority Territories, Papua New Guinea, Philippines, Qatar, Saudi Arabia, Solomon Islands, Spain, Turkey, Sri Lanka, Taiwan, Thailand, United Arab Emirates, Vietnam and Western Samoa.

Red palm weevil has been a devastating insect pest to palms over a wide area of Europe-Asia and is expanding its range (Li et al. 2009). It dramatically affects date palms (*Phoenix* spp.), wherever it has been introduced, but numerous other palm genera are hosts, including coconut. Malumphy and Moran (2007) gave the following host list: the palms, *Areca catechu*, *Arenga saccharifera*, *Arenga pinnata*, *Borassus flabellifer*, *Borassus* sp., *Calamus merrillii*, *Caryota cumingii*, *Caryota maxima*, *Cocos nucifera*, *Corypha utan* (= *C. gebanga*, *C. elata*), *Corypha umbraculifer*, *Elaeis guineensis*, *Livistona chinensis*, *Livistona decipiens*, *Livistona saribus* (= *Livistona cochinchinensis*), *Livistona subglobosa*, *Metroxylon sagu*, *Oneosperma horrida*, *Oneosperma tigillarum*, *Oreodoxa regia*, *Phoenix canariensis*, *Phoenix dactylifera*, *Phoenix sylvestris*, *Sabal umbraculifera*, *Trachycarpus fortunei* and *Washingtonia* sp., plus sugar cane, *Saccharum officinarum* and century plant, *Agave americana*. In 2012, the first round of APHIS NAPPPRA designations included exclusion of eight palm genera from the USA as potential hosts of red palm weevil: *Brahea*, *Butia*, *Calamus*, *Euterpe*, *Manicaria*, *Metroxylon*, *Oncosperma*, and *Roystonea*.

This is a high-profile pest and USDA-APHIS (2010) has issued New Pest Response Guidelines.

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- **South American Palm Weevil, *Rhynchophorus palmarum* (Coleoptera: Curculionidae)**

South American palm weevil is another notorious member of the genus *Rhynchophorus* with the potential for much damage in the USA (Hoddle 2011, Molet et al. 2011). Until now it has been confined to the New World tropics (EPPO 2005, Molet et al. 2011), but has shown tendencies to become an apparent incipient invader in southern California (Hoddle 2011).

Distribution:

North America: Mexico, USA (California?)

Caribbean and Central America: Belize, Costa Rica, Cuba, Dominica, El Salvador, Grenada, Guadeloupe, Guatemala, Honduras, Martinique, Nicaragua, Panama, Puerto Rico, St. Vincent, Trinidad and Tobago

South America: Argentina, Bolivia, Brazil (Alagoas, Amazonas, Bahia, Matto Grosso do Sul, Minas Gerais, Pará, Sergipe), Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Surinam, Uruguay, and Venezuela

R. palmarum is common in virgin forests and in agroecosystems exploiting oil palms; the altitudinal range is from sea level up to 1200 m (EPPO 2005). The Countries reporting the largest damage to crops in palm plantations include Costa Rica, Colombia, Venezuela and Brazil. Since the beginning of this century, *R. palmarum* has been reported as one of the most important pests on commercial palm plantations, mainly of *Cocos nucifera* and *Elaeis guineensis* and on ornamental palms (EPPO 2005). Larvae feed on the growing tissue in the crown of the palm, often destroying the apical growth area and causing eventual death of the palm. Economic damage depends on the palm species and on the number of larvae infesting the plant. It has been reported that populations of 30 larvae are sufficient to cause the death of an adult coconut palm.

R. palmarum has been reported on 35 plant species in 12 different families; it is most economically important to palms and sugarcane. *Cocos nucifera* (coconut), *Elaeis guineensis* (African oil palm), *Euterpe edulis* (assai palm), *Metroxylon sagu* (sago palm), *Phoenix canariensis* (Canary Island date palm), *Phoenix dactylifera* (date palm), and *Saccharum officinarum* (sugarcane) are considered primary hosts. *Ananas comosus* (pineapple), *Annona reticulata* (custard apple), *Artocarpus altilis* (Fosberg breadfruit), *Carica papaya* (papaya), *Citrus* spp. (citrus), *Mangifera indica* (mango), *Musa* spp. (banana), *Persea americana* (avocado), *Psidium guajava* (guava), and *Theobroma cacao* (cocoa) are considered secondary hosts. (Molet et al. 2011)

In 2012, the first round of APHIS NAPPRA (Not Authorized Pending Pest Risk Assessment) designations included exclusion from the USA of eight palm genera as potential hosts of the South American palm weevil: *Acromia*, *Attalia*, *Bactris*, *Desmoncus*, *Euterpe*, *Manicaria*, *Metroxylon*, *Roystonea*, *Sabal*, *Syagrus*, and *Washingtonia*.

In addition to directly damaging plant tissue, *R. palmarum* is the vector of the nematode *Bursaphelenchus cocophilus* (Molet et al. 2011). *Bursaphelenchus cocophilus* is the causal agent of the red-ring disease, which causes serious economic losses in palm plantations in South and Central America.

References:

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- **Palmetto Weevil, *Rhynchophorus cruentatus* (Coleoptera: Curculionidae)**

The largest weevil in North America is the palmetto weevil, *Rhynchophorus cruentatus* Fabricius. The palmetto weevil is native to Florida and is the only species of palm weevil in the continental United States. The palmetto weevil was formerly considered a minor pest, attacking only severely wounded and dying trees. However, it is starting to gain status as a pest of stressed nursery and transplanted palms (Weissling and Giblin-Davis 2010); given the invasive record of its congeners, this suggests that it has incipient potential for establishing an invaded range where native “natural enemies” do not keep it in check.

Rhynchophorus cruentatus has been recorded from the southeastern coastal plain of the United States (Florida, Georgia, South Carolina, Louisiana, Texas). It was recently found in the Bahamas (Thomas 2010).

Host range: The palmetto weevil is closely associated with the cabbage palmetto (*Sabal palmetto*), a palm native to the southeastern U.S. In addition, the native saw palmetto (*Serenoa repens*) appears to be an acceptable alternate host. Several other palms, most of them introduced species, have been observed with larval infestations. These include the Canary Island date palm (*Phoenix canariensis*), *P. dactylifera*, *Pritchardia* sp., *Washingtonia* sp., royal palms (*Roystonea* sp.), *Latania* sp., coconut palm (*Cocos nucifera*), and *Caryota* sp. (Weissling and Giblin-Davis 2010).

Rhynchophorus cruentatus has the most restricted host range of the species considered here. Its native host is *Sabal palmetto*. Although it seems to mostly attack wounded or dying palms, it can be a severe pest of sabal palms in landscape situations, especially where newly planted trees are under stress (Thomas 2010). In Florida, it has occasionally reached severe pest status on *Phoenix canariensis* in nurseries (Hunsberger *et al.* 2000). Hunsberger *et al.* (2000) and Florida Division of Plant Industry records list other palm hosts as *Bismarckia nobilis*, *Washingtonia* sp., *Serenoa repens*, *P. dactylifera*, *Pritchardia* sp., *Roystonea* sp., *Cocos nucifera*, *Latania* sp., *Caryota* sp., and *Thrinax radiata*.

References:

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Weissling, T.J., and R.M. Giblin-Davis. 2010. Palmetto weevil, *Rhynchophorus cruentatus* Fabricius (Insecta: Coleoptera: Curculionidae). Univ. Florida, IFAS Extension. <http://edis.ifas.ufl.edu/in139>

- **Coconut Rhinoceros Beetle *Oryctes rhinoceros* (Coleoptera: Scarabaeidae)**

Coconut rhinoceros beetle (CRB) is native to Southern Asia and has spread in Asia and the Western Pacific. It was accidentally introduced and is now established on the Pacific Islands of Palau, Fiji and Samoa. It is a serious pest of coconut palm *Cocos nucifera*, betelnut *Areca catechu*, and *Pandanus* species. It is also known to attack banana, taro, pineapple and sugar cane. (Hinckley 1973, Bedford 1980, Smith and Moore 2008).

CRB was detected on Guam on September 12, 2007, and was the target of a concerted (but ultimately unsuccessful, Ridgell 2011) eradication effort on that island, a cooperative effort between USDA (APHIS and Forest Service), Guam Department of Agriculture, and the University of Guam (Smith and Moore 2008, USDA-APHIS 2007, 2011).

An excellent new synopsis of CRB biology, detection, and control methods has recently become available (Molet 2013); it seems the best single reference to use for an emergency response for CRB.

References:

Bedford, G.O. 1980. Biology, ecology, and control of palm rhinoceros beetles. *Ann. Rev. Entomol.* 25: 309–339.

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MITES OF COCONUT AND OTHER PALMS

• Red Palm Mite, *Raoiella indica* (Acari: Tenuipalpidae)

The red palm mite, a pest of coconut and other important ornamental and fruit-producing palm species, has invaded the Western Hemisphere and is in the process of colonizing islands in the Caribbean, as well as areas on the U.S. mainland. Until recently, the red palm mite was found in India, Pakistan, Iran, the United Arab Emirates, Israel, Egypt, Sudan, Oman, Malaysia, Philippines, Mauritius, and Reunion (Hoy et al. 2010, Pena et al. 2012). However, in 2004, this pest was detected in Martinique, Dominica, Guadeloupe, St. Martin, Saint Lucia, and Trinidad and Tobago in the Caribbean. It was found in Puerto Rico in 2006 and southern Florida in 2007. By April 2009, it had spread to five Florida counties: Broward, Miami-Dade, Martin, Monroe and Palm Beach (Hoy et al. 2010). This mite is easily distributed by wind currents and movement of infested plants through nursery stock and cut branches of plants. It is spreading rapidly and has recently reached Mexico, Venezuela, Colombia and Brazil (Kane et al. 2012). It is considered likely to establish throughout tropical and subtropical areas of the Western Hemisphere (Hoy et al. 2010).

When *R. indica* was first encountered in the Caribbean islands in 2003-2004, the extensive damage to coconut palms on the islands was thought to be due to 'lethal yellowing' (LY), a highly prevalent disease of palms in various countries of the Caribbean Basin. This confusion arose because LY infection, like red palm mite feeding, results in extensive chlorosis and yellowing of the lower leaves. However, in a very early stage, LY disease differs in that it causes coconuts of all stages to drop from the tree, it distorts the emerging inflorescences and it causes the male flowers to become dark brown (Pena et al. 2012). This mite is a polyphagous species that can reach very high populations and cause significant damage to various plant species; it is the first mite species observed feeding through the stomata of its host plants (Carrillo et al. 2012). All documented reproductive hosts (91 plant species) to date of *R. indica* are monocots from the orders Arecales (Arecaceae), Zingiberales (Heliconiaceae, Musaceae, Strelitziaceae, Zingiberaceae) and Pandanales (Pandanaceae); most are palms of the family Arecaceae that originated in areas of the Eastern Hemisphere (Carrillo et al. 2012).

References:

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Kane, E.C., R. Ochoa, G. Mathurin, E.F. Erbe, J.J. Beard. 2012. *Raoiella indica* (Acari: Tenuipalpidae): an exploding mite pest in the neotropics. *Experimental and Applied Acarology* 57: 215–225.

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• **Coconut Mite, *Aceria guerreronis* (Acari: Eriophyidae)**

Over the past 30 years the coconut mite, originally native to Southern Asia, has emerged as one of the most important pests of coconut and has spread to most coconut production areas worldwide (Navia et al. 2005). It attacks young fruits of the coconut palm, *Cocos nucifera*, to which it is almost exclusively confined (Howard and Moore 2006). It colonizes the meristematic tissue beneath the bracts, causing fruit scarring and abortion, and can reduce yield by up to 60% (Galvao et al. 2012).

Aceria guerreronis is apparently still absent in the Pacific Islands. It was first recorded in the USA in the Florida Keys in 1984 and is still more abundant there than on the Florida mainland (Howard and Moore 2006).

References:

Galvao, A.S., J.W.S. Melo, et al. 2012. Dispersal strategies of *Aceria guerreronis* (Acari: Eriophyidae), a coconut pest. *Experimental and Applied Acarology* 57:1–13.

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NEMATODES OF COCONUT AND OTHER PALMS

• **Red Ring Nematode, *Bursaphelenchus* (= *Rhadinaphelenchus*) *cocophilus* (Nematoda: Secernentea: Tylenchida: Aphelenchina: Aphelenchoidea: Bursaphelenchina)**

Bursaphelenchus cocophilus causes red ring disease of palms. Symptoms of red ring disease were first described on Trinidad coconut palms in 1905. Red ring disease can appear in several species of tropical palms, including date, Canary Island date and Cuban royal, but is most common in oil and coconut palms. The red ring nematode parasitizes the palm weevil *Rhynchophorus palmarum* L., which is attracted to fresh trunk wounds and acts as a vector for *B. cocophilus* to uninfected trees.

Red ring nematode is found in areas of Central America, South America and many Caribbean islands, specifically Barbados, Belize, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, French Guiana, Grenada, Guyana, Honduras, Mexico, Nicaragua, Panama, Peru, San Blas Islands, St. Vincent, Surinam, Tobago, Trinidad and Venezuela.

In some areas, mainly from Mexico to South America and in the lower Antilles, *B. cocophilus* is co-distributed with its primary vector, *R. palmarum*. The red ring nematode has not yet been reported from the continental U.S., Hawai'i, Puerto Rico or the Virgin Islands (as of 2000). *R. palmarum* has been found in Central and South America and east from some of the West Indies to Cuba.

In Trinidad, red ring disease kills 35 percent of young coconut trees. In nearby Tobago, one plantation lost 80 percent of its coconut trees. Over a 10-year period in Venezuela, 35 percent of oil palms died from red ring disease. In Grenada, 22.3 percent of coconut palms were found to be infected. Of those infected, 92 percent had been invaded by palm weevils. It is estimated that 72 percent of those weevils were carrying *B. cocophilus* (Esser and Meredith 1987).

Considering that more than eight million acres of coconut palms are grown, red ring nematodes are one of the most important pests in the tropics.

Although *B. cocophilus* and *R. palmarum* are not found in Florida, some other potential beetle vectors of the red ring nematode - *Metamasius hemipterus* and *Rhynchophorus cruentatus* - are common in Florida. If the nematode were introduced to Florida, an epidemic could potentially occur. Therefore, this nematode is of great regulatory concern.

Reference:

Brammer, A.S., and W.T. Crow. 2002. Featured creatures: Red ring nematode *Bursaphelenchus cocophilus*. University of Florida and Florida Department of Agriculture and Consumer Services. Available at http://entnemdept.ufl.edu/creatures/nematode/red_ring_nematode.htm

PHYTOPLASMAS OF COCONUT AND OTHER PALMS

• Lethal Yellowing and Related Phytoplasmas of Palms

Lethal yellowing (LY) is a fatal systemic disease of coconut and other palms. Reports of dying coconut palms exhibiting LY-type symptoms date back to 19th century in the Caribbean region (Oropeza et al. 2005). During the past four decades, epiphytotics of LY in Jamaica and Florida have been characterized by rapid spread and high losses -- coconut palms were nearly eliminated in southern Florida in the 1970s. (Coconut palms have since been partially restored through the use of LY-resistant genotypes.) The disease is now known to affect 37 palm species (in numerous genera, including *Pritchardia*) in southern Florida, mostly non-native species (Harrison and Elliott 2012). The disease is caused by a phytoplasma transmitted in southern Florida by a planthopper *Haplaxius (Myndus) crudus* (Harrison and Elliott 2012). The phytoplasma is a systemic pathogen that invades the phloem tissue of palms. It is not known to survive outside either its plant or insect hosts. The planthopper is a piercing and sucking insect, feeding on the contents of the plant host vascular system, including the phloem. The insect moves the phytoplasma from palm to palm during its feeding cycles.

Other LY-type diseases of palms associated with phytoplasmas are turning up in Florida (Harrison et al. 2008). LY and LY-type diseases also occur in other locations in the Caribbean and Central America as well as other parts of the world (e.g., Africa, Mpunami et al. 1999; Malaysia, Nejata et al. 2009).

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VIROIDS OF COCONUT AND OTHER PALMS

- **Cadang-cadang and Tinangaja** (from Eden-Greene and Mpunami 2005)

Cadang-cadang is a slow decline disease that results in premature death of coconut palms in the Philippines. The disease was first reported from a plantation on San Miguel Island in 1931; by 1980 it had killed more than 80 million palms on San Miguel and other neighbouring islands but spread is generally slow (0.5 km a year) and it only occupies about the central 1/3 of the Philippines (apparently absent from Luzon and Mindanao). It causes yellow leaf spotting, reduced growth and reduced frond production which results in reduced crown size, cessation of nut production and eventual death within 5- 20 years. Cadang-cadang has been the major reason for prohibiting movement of Philippine coconut germplasm to many countries.

A similar disease known as Tinangaja occurs in Guam. Symptoms differ slightly from those of cadang-cadang in that nuts are characteristically small, elongated and lack a kernel. The disease was first reported as a destructive disease of coconut palms in Guam in 1917; it apparently spread slowly and destroyed the coconut industry of Guam over the next 40 years. No commercial coconut industry has existed in Guam since 1946 but the disease is still widespread on the island, with the incidence varying from one location to another.

Research on cadang-cadang disease began in the Philippines about 1950, and by 1982 the coconut cadang-cadang viroid or CCCVd was identified as the causal pathogen. This discovery provided a means of diagnosing the disease, and gave impetus to further research on related diseases, which showed that Tinangaja was also caused by a viroid. The mode of natural spread of these diseases has not been established.

Reference:

Eden-Greene, S.J., and A.A. Mpunami. 2005. Indexing and pathogen characterization. Pages 371- 394 in Batugal, P, V Ramanatha Rao and J Oliver (editors), Coconut Genetic Resources. International Plant Genetic Resources Institute – Regional Office for Asia, the Pacific and Oceania (IPGRI-APO), Serdang, Selangor DE, Malaysia.

➤ NON-PLANT PESTS

This Plant Health Emergency Response Plan does not specifically address non-plant pests (in taxonomic groups not normally addressed by USDA-APHIS). However, the following taxa are included here to call attention to serious non-plant pests that are likely targets for requiring future coordinated collaborative responses in Hawai'i. HDOA has authority to address most if not all of these.

- **SNAKES**

The Brown Tree Snake (BTS, *Boiga irregularis*), native to parts of Australia and Indonesia, was accidentally transported to the island of Guam shortly after World War II. Over the following two decades it spread throughout the island, with its severe impacts perceived only gradually, not becoming clear until the 1980s (Rodda and Savidge 2007). Under the right conditions, BTS is capable of high rates of reproduction and population growth, and densities of 100/ha were attained in Guam prior to food-source depletion. The secretive nocturnal arboreal snake occurs in all habitats on Guam, from grasslands to forests. BTS caused the extirpation of 13 of Guam's 22 native breeding birds and contributed to the extirpation of several species of native bats and lizards. In addition, the snake continues to damage domestic poultry, pets, the island's electrical power infrastructure, and human health. Dispersal of the snake from Guam to other islands is an enormous threat. To protect other vulnerable Pacific islands, the U.S. government annually spends several million dollars inspecting cargo outbound from Guam to exclude BTS. Guam has direct air and sea transportation links to Hawai'i (Rodda and Savidge 2007). Additionally, methods are being refined for local control/eradication efforts (Clark and Savarie 2012, Clark et al. 2012). If BTS were to establish in Hawai'i, biodiversity impacts would be enormous, and total annual damage to the State economy would likely be between \$593 million and \$2.14 billion (Shwiff et al. 2010).

The past four decades have seen a dramatic increase in the rate of pet reptile introduction and release in Hawai'i, in spite of the fact that their possession is illegal (with very substantial penalties). Given the burgeoning number of species bred and available within the U.S. mainland pet trade, Hawai'i and other Pacific islands remain highly vulnerable to further introductions. Many snake species introduced as pets may well

prove just as great a threat to native avifaunas as has the brown tree snake, judging from their ecological attributes ((Rodda et al. 1997, Kraus and Cravalho 2001, Loope et al. 2001, Reed and Rodda 2009, Reynolds et al. 2012) . Among the commonly kept species, boas, pythons, rat snakes (*Elaphe*), bullsnakes (*Pituophis*), and most pit vipers (Crotalinae) specialize on endothermic prey, and many of the rat snakes and pit vipers have an ontogenetic switch from ectothermic to endothermic prey. King snakes (*Lampropeltis*) are vertebrate generalists. Many boas, pythons, pit vipers, and rat snakes are arboreal and feed primarily, or to a large extent, on avian prey. All these taxa have clutch sizes of the same magnitude as brown tree snakes or, in the case of the commonly kept *Boa*, *Eunectes* (anaconda), and *Python* species, are much larger (30 to >100). Several of these species can potentially produce two or more clutches per year when food is freely available, as it is in Hawai'i, where the environment is artificially enriched with an abundance of alien rodents, lizards, and birds. Furthermore, some species are suspected to be facultatively parthenogenic, a useful attribute for colonizing oceanic islands. Most of these species are nocturnal. The only ecological parameter for which some of these common pet species cannot match brown tree snakes is elevational range. In its native New Guinea, brown tree snakes can live at elevations from sea level to 1,400 m. Most commonly kept pythons and boas probably cannot live at such high altitudes, although many *Elaphe*, *Lampropeltis*, *Pituophis*, and pit vipers would have no trouble doing so, judging from their native latitudinal and elevational ranges. Most of the snakes captured and identified in Hawai'i are in the genera *Boa*, *Python*, *Elaphe* (corn and rat snakes), *Pituophis* (bull and gopher snakes), and *Thamnophis* (garter snakes) (Kraus and Cravalho 2001).

References:

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- Vice, D.S., and M.E. Pitzler. 2012. Brown Treesnake control: Economy of scales. *Human–Wildlife Interactions* 6(2):237-241.

• **BATS**

Hawai'i is one of the few locations on Earth free of rabies and makes a great effort to keep that status. The presence of bats in arriving cargo is a serious and recurring threat (Constantine 2003), with a recent case reported in April 2012, involving a Little Brown Bat, *Myotis lucifugus* (Star-Advertiser staff 2012). A rabid bat (a

Large Brown Bat, *Eptesicus fuscus fuscus*) was captured in a container from a ship at Honolulu Harbor in April 1991 (Sasaki et al. 1992).

References:

Constantine, D.G. 2003. Geographic translocation of bats: known and potential problems. *Emerging Infectious Disease* 9(1): 17-21. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2873759/pdf/02-0104.pdf>

Sasaki, D.M., C.R. Middleton, T.R. Sawa, C.C. Christensen, and G.Y. Kobayashi. 1992. Rabid bat diagnosed in Hawai'i. *Hawai'i Medical Journal* 51(7): 181-185. Abstract: Since 1966, the Hawai'i State Government has been conducting Fluorescent Rabies Antibody (FRA) testing on animal brains as part of a statewide rabies-surveillance program. On April 3, 1991, the Department of Health (DoH) laboratory diagnosed the first case of rabies detected in the State. A large brown bat, *Eptesicus fuscus fuscus*, captured in a transport container that had just been off-loaded from a ship at Honolulu harbor, was caught. Its brain was examined and showed typical fluorescent staining patterns for rabies virus. The USPHS Centers For Disease Control (CDC) rabies laboratory confirmed the diagnosis 2 days later. The successful interception of this rabid animal was the result of close cooperation between the private sector (Sea Land Service, Hawaiian Stevedores) and the Hawai'i State Government Departments of Health and of Agriculture.

Star-Advertiser staff. 2012. Little Brown Bat captured at airport tests negative for rabies. *Honolulu Star Advertiser*, April 4, 2012. <http://www.staradvertiser.com/news/breaking/146182965.html?id=146182965>

• **BITING FLIES**⁵, including biting midges, sand flies, blackflies, and mosquitoes

Biting flies are flies that attack man and other animals and include the following families or groups of flies: biting midges (Ceratopogonidae), sand flies (Psychodidae), blackflies (Simuliidae), and mosquitoes (Culicidae). Collectively, these flies are found throughout the world, many in the tropics and subtropics. They are small, even tiny, and include many species, some of which are vectors of diseases while others bite and cause considerable nuisance and health-related problems. The ones of concern to Hawai'i occur primarily in the southern U.S., Asia, South Pacific, and Oceania. Many of these species are fungus feeders, and their habitats usually include decaying vegetation and/or damp, semi-aquatic habitats. These pests could enter the State on live plants, especially those with associated decaying material. They may also be transported in small boats or airplanes transiting from other Pacific islands or by passengers or cargo arriving in commercial boats and airplanes. They were recently prevented from entering the State on Polynesian voyaging canoes returning from the South Pacific. Psychodidae (sand flies) occur in the southern U.S. and in the tropics. They are bloodsucking and are known to be vectors of several diseases. They also occur in Europe, South America, and Southern Asia. The larvae occur in decaying vegetable matter, mud, moss, or water, sometimes in drainage or sewers. Simuliidae (blackflies) are vicious biters and serious pests in some parts of U.S. They attack livestock and can cause death to livestock and humans. They have a wide distribution and are most numerous in the temperate and sub-arctic regions of the U.S. In the U.S., it is not a vector of disease, but in Africa, Mexico, and Central America, they are vectors of diseases. Culicidae (mosquitoes) larvae feed on algae and organic debris. Adults are vectors of various diseases, and feed on nectar and plant juices.

The introduction and establishment of any one of these pests could cause serious harm to Hawaii's tourist-based economy, severely impact Hawaii's native and non-native fauna, and forever change the way people live in the islands.⁵

[Note: An apparently little known happening is the recent establishment of a *Culicoides* (biting midge) species in Hawai'i. Frank Howarth (pers. comm., June 8, 2013) will be including it in an updated version of G. Nishida's Hawai'i Arthropod Checklist. Known from both O'ahu and Maui, this biting midge apparently does not bite humans but (based on the biology of many *Culicoides* species) may have impacts on certain bird species (Howarth, pers. comm.) – likely an important research topic.

References:

⁵ Text on biting flies quoted from (quoted from www.hawaiiinvasivespecies.org/pests/bitingflies.html)

Kilpatrick, A.M., Y. Gluzberg, J. Burgett, and P. Daszak. 2004. Quantitative risk assessment of the pathways by which West Nile Virus could reach Hawai'i. *EcoHealth*, Volume 1, Number 2.

LaPointe, D.A. 2007. Current and potential impacts of mosquitoes and the pathogens they vector in the Pacific Region. *Proceedings of the Hawaiian Entomological Society* 39: 75-81. scholarspace.manoa.hawaii.edu/handle/10125/1237

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➤ APPENDIX I: INCIDENT COMMAND SYSTEM (ICS) – AN EXTENDED PRIMER

Purpose of This Section:

It is recognized that while some of those working with invasive/pest species in Hawai'i are already well versed in the Incident Command System (ICS), and have already worked with coordinated inter/intra agency efforts (simulated or real) using ICS methodology^{6,7}, many are new to the subject and/or have not yet had in-depth ICS training or experience. Because of the emphasis on using ICS within the emergency response effort proposed in this plan, this appendix is being presented to assist those not familiar with ICS in gaining a better initial understanding of some preliminary aspects. The end of this section includes information on where to find out more, including free online courses. (There is also an introduction to ICS as part of a section on NIMS, ICS, ESF 11, etc. in Section 2D in the actual PHERP.)

ICS Overview and Basic Features:⁸

ICS is essentially a standardized framework for communications that emphasizes the need for a common operating picture, and is applicable to both simple and complex emergencies.⁹ Developed in the early 1970s by an interagency task force as an approach to managing rapidly moving wildfires in California, ICS is now widely used throughout the United States and internationally for emergency and event management, including plant health emergencies.

ICS is known for its modular organization that:

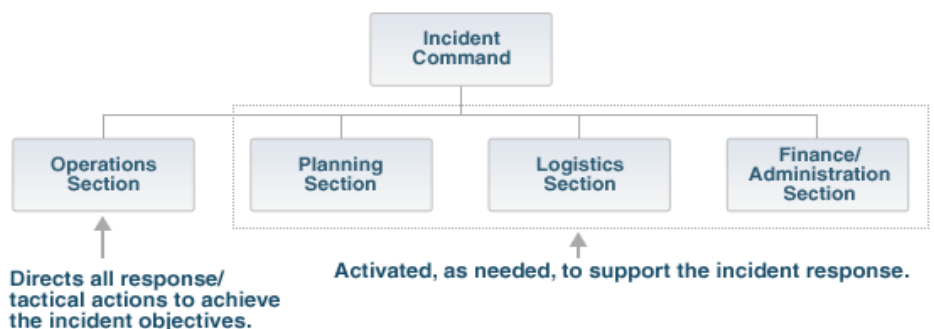
- Develops in a top-down, modular fashion, based on size and complexity of the incident.
- Is determined based on incident objectives and resource requirements. Only those functions or positions necessary for a particular incident are filled.
- Expands and contracts in a flexible manner. When needed, separate functional elements may be established.
- Requires that each element have a person in charge, but that the maximum number of workers one person supervises is ideally five and no more than seven.

The standardized top-down ICS approach to incident management has three prime goals:

- **Enable a coordinated response** among various jurisdictions and agencies.
- **Establish common processes** for planning and managing resources.
- **Allow for the integration** of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure.

Five Major Functions Within ICS:

There are 5 major functions in ICS: Incident Command (IC), Operations, Planning, Logistics, Finance / Administration, and these 5 functions / positions are the foundation upon which an incident management organization develops.



Major Sections within an ICS. Source: <http://emilms.fema.gov/IS100b/assets/ICS0104030.g>

⁶ Writeup ('hotwash') from the 2008 RIFA exercise (see Section 6 of main plan) is available through USDA-APHIS-PPQ in Honolulu from Carol Russell: Carol.E.Russell@aphis.usda.gov or Dorothy Alontaga: dorothy.s.alontaga@aphis.usda.gov.

⁷ Writeup from an actual ICS incident addressing an incipient invasion of varroa mite in Hilo (see Section 6 of main plan) is available through HDOA from Neil Reimer: neil.j.reimer@hawaii.gov or Darcy Oishi: darcy.e.oishi@hawaii.gov.

⁸ Much of the text that follows is directly excerpted from the online course, "ICS-100B Introduction to Incident Command System", by the Federal Emergency Management Agency (FEMA), Emergency Management Institute, <http://training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=is-100.b>

⁹ APHIS Emergency Response Manual 2010. http://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/epm.pdf

The Incident Commander (IC) is the only position that is always staffed in ICS applications. The IC sets the objectives, strategies and priorities, and has overall responsibility for the incident. Including IC, the five major incident management functions apply to incidents of all sizes and types, though in a small effort, the IC may accomplish all management functions. The Incident Commander creates and staffs only the other sections that are needed.

In most operations, there is an IC and an Operations section, and the latter 3 functions are activated as needed for size and scale; if not activated, those roles fall under IC or Operations.

Brief Descriptions of the Five Major Incident Management Functions of General Staff:

Command

- ✓ Manages the overall incident by establishing objectives, planning strategies, and implementing tactics.
- ✓ Ensures overall incident safety.
- ✓ Provides information services to internal and external stakeholders, including those affected, agency executives, and senior officials.
- ✓ Establishes and maintains liaison with other agencies participating in the incident.
- ✓ Supervises the Command Staff and General Staff (Section Chiefs) or otherwise provides for their functions.

Operations

- ✓ Conducts operations to reach the incident objectives.
- ✓ Establishes tactics and directs all operational resources.

Planning

- ✓ Supports the incident action planning process by tracking resources, collecting/analyzing information, and maintaining documentation.

Logistics

- ✓ Arranges for resources and needed services (personnel, supplies, and equipment) to support achievement of the incident objectives.

Finance & Administration

- ✓ Monitors costs related to the incident.
- ✓ Provides accounting, procurement, time recording, and cost analyses.

Further details of each ICS Management Functions and job descriptions can be found in the APHIS Emergency Response Manual 2010,

http://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/epm.pdf,
Chapter 4, page 65

Web Address:

Additional Command Staff Functions

Depending upon the size and type of incident or event, the Incident Commander may designate personnel to provide information, safety, and liaison services; together these make up the Command Staff.

- **Public Information Officer (PIO):** Serves as the conduit for information to internal and external stakeholders, including the media, stakeholders, and the public.
- **Safety Officer:** Monitors safety conditions and develops measures for ensuring the safety of all incident personnel.

- **Liaison Officer:** Serves as the primary contact for other agencies assisting at an incident.

Command Staff reports directly to the Incident Commander. In a complex incident, Assistant Officers may be assigned to each of the Command Staff functions.

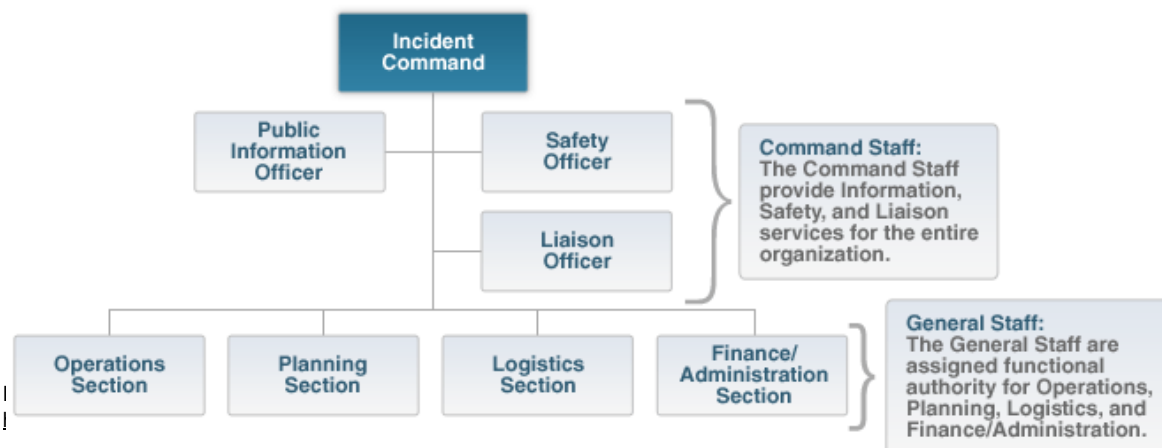
Integration of Command Staff and General Staff :

The diagram below shows the schematic organization of how Command Staff and General Staff interact. Note that each reports directly to incident command.

Span of Control:

The number of individuals or resources that one supervisor can manage effectively during an incident. Effective span of control on incidents may vary from three to seven.

Additional General Staff Functions:



- **Section Chiefs:**
 - Responsible for a functional Section (Operations, Planning, Logistics, Finance), IF the Incident Commander had decided to delegate out a section.
 - Each Section Chief can maintain his or her span of control by adding Branch Directors and Unit Leaders.
 - Branch Chiefs report to the Section Chief; Unit leaders in turn report to branch chiefs thereby creating the command hierarchy essential to ICS.
 - Each responds directly to the Incident Commander.
- **Deputy Incident Commander:**
 - A Deputy Incident Commander may be designated to perform specific tasks, perform the incident command function in a relief capacity, and represent an assisting agency that shares jurisdiction.
 - Note that if a Deputy is assigned, he or she must be fully qualified to assume the Incident Commander's position.

Relationship between ICS structure and organization and the roles someone may hold within their own agency:

There is *no* correlation between the ICS organization and the administrative structure of any single agency or jurisdiction. This is deliberate, because confusion over different position titles and organizational structures has been a significant stumbling block to effective incident management in the past.

Example: Someone who serves as a director every day may not necessarily hold that title when deployed under an ICS structure.

FAQ: “Why Use ICS- Isn’t it a bit much as far as lines of authority, paperwork, etc.?”

Agreed that to new users, ICS may seem a rather formal, and perhaps even over the top method for pest species efforts, especially with the training, scenarios, logistics, forms, etc. involved. However, it is a system that gets beyond traditional emergency management, into the realm of pest management because it has shown to be effective¹⁰.

¹⁰ APHIS 2010 Emergency Response Manual and/or APHIS 2012 National Plant Health Emergency Management Framework.

To explore the validity of using ICS in a plant health emergency, it is noted that weaknesses in incident management are often *not* due to lack of knowledge or resources, but rather due to:

- Lack of accountability, including unclear chains of command and supervision.
- Poor communication, due to both inefficient uses of available communications systems and conflicting codes and terminology.
- Lack of a planning process, in orderly, systematic way.
- No common, flexible, predesigned management structure that enables leads to delegate responsibilities and manage workloads efficiently.
- No predefined methods to integrate interagency requirements into the management structure and planning process effectively.

Using ICS has shown to be effective¹¹ in addressing and avoiding these weaknesses in all types of incident response, making more effective use of resources we have available.

Resources:-Where to find out More on ICS:

FREE ONLINE TRAINING COURSES:

- **Online Introductory ICS course:** “ICS-100B Introduction to Incident Command System” (previously called ICS 100), under the Federal Emergency Management Agency (FEMA), Emergency Management Institute. This course used objectives developed collaboratively by the National Wildfire Coordinating Group, the United States Fire Administration, the United States Department of Agriculture and the Emergency Management Institute. It is a 3 hour course that can be taken online free of charge at <http://training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=is-100.b>
- **ICS-102, Deployment Basics:** This course is designed to help prepare FEMA response partners for deployment to a domestic incident. <http://training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=is-102.c>

ICS FORMS and INSTRUCTIONS:

- **APHIS Emergency Response Manual 2010** – has detailed ICS descriptions of what tasks are often in plant health response and also has the forms in the appendix. http://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/epm.pdf
- **Incident Command System (ICS) Resource Center:** Includes a summary of ICS principles, job aids, forms, position checklists, and additional resources. <http://training.fema.gov/EMIWeb/IS/ICSResource/index.htm>

ADDITIONAL RESOURCES:

- **National Incident Management System (NIMS) Resource Center:** Provides guidance for the adoption of NIMS/ICS. <http://www.fema.gov/national-incident-management-system>
- **National Response Framework (NRF) Resource Center:** Provides resources for implementing the NRF. <http://www.fema.gov/national-response-framework>

EXAMPLES of ICS in HAWAII:

Hawai'i Department of Agriculture (HDOA) “To Bee or Not to Bee” ICS scenario and follow up training with the Varroa mite.¹²

¹¹ Online Course, “ICS-100B Introduction to Incident Command System”, Federal Emergency Management Agency (FEMA), Emergency Management Institute. <http://training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=is-100.b>

¹² Writeup from an actual ICS incident addressing an incipient invasion of varroa mite in Hilo (see Section 6 of main plan) is available through HDOA from Neil Reimer: neil.j.reimer@hawaii.gov or Darcy Oishi: darcy.e.oishi@hawaii.gov.

➤ APPENDIX J: State Emergency Support Function (ESF) 11

-Portions of the State ESF 11 are included in this appendix as a separate attachment.-

As discussed in Section 2D, an Emergency Support Function (ESF) document is a support annex to the State's (or Federal) "Plan for Emergency Preparedness Disaster Response and Assistance". The ESF 11 in particular, applies to agriculture emergencies including animal or plant health issues.

Emergency support functions are on the "coordination" (or support) side of a response (versus the command side) to support the existing ICS framework during incident or emergency response. The ESF 11 function provides coordinated state-federal response when a major emergency or disaster overwhelms state and local government ability to respond to certain public needs.¹³

There is both a Federal and State ESF 11 document; the State ESF 11 would be enacted by Civil Defense/ Emergency Management and/or in a Governor Declared Emergency. Essentially, when the Civil Defense is activated to assist with the response declared as an Emergency¹⁴, they activate the State's Emergency Operations Center (EOC) and proceed using the State's Plan for Disaster Response and Assistance, with special attention to ESF 11 for Agricultural and Natural Resource Emergencies. Relevant portions of the State ESF 11 are included as part of this appendix (being sent as a separate attachment).

ESF 11 CONTACT INFORMATION:

State Level:

Department of Civil Defense Division, State of Hawaii

3949 Diamond Head Road, Honolulu, HI 96816 (808) 733-4301

- Major General Darryl Wong, Adjutant General and Director; Doug Mayne, Vice Director.
- **Steven Yoshimura:** Acting point of contact for this PHERP and associated responses, including integration of ESF-11. syoshimura@scd.hawaii.gov, 733-4300 x576 (office) or 354-4263 (work cell).

Federal Level:

- **Todd L. Smith,** USDA APHIS, ESF 11 Coordinator, FEMA Region IX.
160 Foss Creek Circle, #1172, Healdsburg, CA 95448
Phone/Fax: (707) 431-1847; Cell: (970) 631-3279

¹³ For more information on ESF 11, see USDA-APHIS's webpage on ESF 11 at http://www.aphis.usda.gov/emergency_response/esf_11/esf11.shtml

¹⁴ More information on enacting integrating Civil Defense in a Response is detailed in 2H, "State Emergency Management and Governor Declared Emergency".