A PLAN FOR PREVENTION OF ESTABLISHMENT OF NEW ANT SPECIES IN HAWAII, WITH SPECIAL ATTENTION TO THE RED IMPORTED FIRE ANT (*Solenopsis invicta*) AND LITTLE FIRE ANT (*Wasmannia auropunctata*)

August 2007 Revision

BACKGROUND

Ants are notorious invaders world wide and are recognized as a major cause of native species extinctions, especially in Hawaii, where the native biota evolved in the absence of native ant species (Howarth 1985, Cole et al. 1992, Gillespie and Reimer 1993, Reimer 1994, Wilson 1996, LaPolla et al. 2000). Although more than 40 species of ants are established in Hawaii, many habitats are still ant-free and there are numerous other ant species that could invade new habitats and/or attack different prey if they become established in Hawaii (Loope et al. 2001).

The potential for new ant invasions in Hawaii is exemplified by the relatively recent (1999) discovery of the little fire ant (*Wasmannia auropunctata*) on the east side of Hawaii and on Kauai (Conant and Hirayama 2000). Native to central and South America, the little fire ant (LFA) has invaded several tropical and subtropical areas, including west Africa, Florida, and, in the Pacific, New Caledonia, Wallis and Futuna, the Solomon Islands, Tuvalu, the Cook Islands, Vanuatu, Tahiti, and the Galapagos Islands (Wetterer and Porter 2003, Krushelnycky et al 2005). Named one the "worlds 100 worst invasives" (Lowe et al 2000), LFA occurs in high densities and has a painful sting. It impacts wildlife populations, domestic animals, and public health, and can be a serious agricultural pest, enhancing homoptera populations, and stinging agricultural workers (Wetterer and Porter 2003, J. Manaute pers. comm. 2007). Although eradication efforts have been underway for the small population of LFA on Kauai, LFA has spread rapidly on east Hawaii, probably via the sale and transport of nursery stock.

Whereas numerous invasive ant species are potential invaders of Hawaii, the red imported fire ant (*Solenopsis invicta*) poses the most immediate and obvious threat. Native to South American, this notoriously destructive and aggressive stinging ant poses a serious threat to biodiversity, human and animal health, the economy, and quality-of-life in Hawaii. Extremely difficult to eradicate once established, the red imported fire ant (RIFA) is dispersed primarily via the transport of goods, and has invaded over 300 million acres in the southern United States since the 1930s despite federal imported fire ant quarantine measures. In 1998 RIFA was discovered to have invaded California, posing a high risk to Hawaii due to the huge quantities of goods shipped to Hawaii from California. This risk has recently been heightened considerably with the discovery of RIFA in Australia in 2001 (McCubbin and Weiner 2002), New Zealand in 2001, 2004, and 2006 (New Zealand Ministry of Agriculture and Forestry 2006), Malaysia in 2001 (Na and Lee 2001), Taiwan in 2003 (Chen et al 2006), China in 2004 (China Daily 2005), and Hong Kong in 2005(Xinhua News Agency 2005).

In infested areas, RIFA threatens injury or death to humans, livestock, pets, and wildlife, and damages crops, plants, electrical equipment, and irrigation systems, causing nearly $6 billion annually across the southern United States (Drees and Lard 2006). RIFA's effects on biodiversity in invaded habitat in North America are exceptionally well documented (Wojcik et al 2001). If RIFA is allowed to become established in Hawaii, it will no doubt cause disastrous economic and ecological impacts. Based on impacts on the mainland, Gutrich et al (2007) conservatively estimated a RIFA invasion of Hawaii would cost the state over $200 million dollars a year in actual costs and forgone tourist and recreation income.

To reduce the probability of establishment of new invasive, damaging ants in Hawaii, state, federal, and private partners will work together to implement a strong prevention program. This plan describes actions recommended to achieve prevention of further ant invasions in Hawaii, and eradicate them should they be discovered, using a multi-agency approach, with special attention to RIFA and LFA.

OBJECTIVES AND GOALS OF THE PLAN

The overall objective is to prevent the introduction and establishment of ant species not currently established and widespread in Hawaii. The immediate goal is to establish operational programs for prevention, detection, rapid response, public outreach, and plan coordination/implementation, to minimize RIFA and LFA risk to Hawaii. Therefore, the contents of several elements below specifically address RIFA and LFA. Actions are identified within each of the five elements of the plan for the purpose of effectively achieving each element's specific goal (see below).

ELEMENTS OF THE PLAN

I. Prevention - To prevent as many RIFA/ant introductions as possible.

II. Detection - To detect any RIFA introductions or new LFA island introductions promptly, before they become established

III. Response - To respond to and eradicate all detected RIFA and new LFA introductions immediately

IV. Public Outreach - To educate the public about RIFA and LFA, so the public knows what they are, what they do, why we want to do all we can to keep RIFA out and LFA from spreading, and how to identify and report potential RIFA and LFA encounters. And, have a continued program established to maintain public interest/knowledge.

V. Coordination/implementation – To ensure effective implementation of this plan and coordination with regional ant prevention efforts

RECOMMENDED MINIMAL PREVENTION MEASURES

ELEMENT I: PREVENTION

This element consists of both policy actions and operational actions. The operational program that is implemented will involve both state and federal agencies. The Hawaii Department of Agriculture (HDOA) will take the lead for domestic prevention actions. The U.S. Department of Agriculture (USDA) (with Department of Homeland Security [DHS] assistance) will take the lead for international prevention actions.

1. Pathways

1.1. High risk RIFA pathways will be identified:

1.1.1. HDOA and USDA-Center for Plant Health Science and Technology will work together to draft a RIFA risk assessment for Hawaii, modeled on New Zealand's RIFA Hazard Identification & Import Release Assessment (see New Zealand Ministry of Agriculture and Forestry 2002). The document produced will be dynamic, with changes made as the transport of commerce and ant/RIFA pathways change. Should the USDA's Hawaii risk assessment proceed, it will provide some (foreign imports) or all (foreign and domestic imports) of the information needed on RIFA pathways.

1.1.2. Should the USDA Hawaii risk assessment proceed, the Hawaii Ant Group (HAG) will work with them to ensure that RIFA and other ants are thoroughly covered in the assessment.

1.2. High-risk LFA pathways will be identified. HDOA will identify high-risk pathways for transport of LFA within Hawaii. Consideration will be given to pathways identified in the LFA risk assessment prepared for Biosecurity New Zealand (see Harris et al 2005). The information gathered will be documented and used to develop an inspection program and guide the establishment of regulations for goods being shipped off infested islands (currently, aside from one small contained population on Kauai, only the island of Hawaii is infested). The document produced will be dynamic, with changes made as the transport of commerce and ant/LFA pathways change.

2. Quarantine

2.1. RIFA quarantines will be developed:

2.1.1. USDA will work with HDOA and DHS, and in consultation with the Hawaii Ant Group, toward drafting and implementing a RIFA quarantine, modeled on the federal (USDA) RIFA quarantine, for high-risk goods entering HI from foreign countries known to have RIFA infestations (including but not limited to Australia, Taiwan, Hong Kong, China, Malaysia), or high risk goods entering the continental US from these countries and destined to or through Hawaii. The quarantine will include

requirements, and provide protocols for, use of effective treatments and practices for packaging,
transporting, and treating high-risk goods entering Hawaii.

2.1.2. Using the information from Prevention #1.1 HDOA, with input from the HAG, will develop and implement a RIFA/ant quarantine, and establish pre-entry regulations for all high-risk items under their jurisdiction entering Hawaii from the U.S. mainland. Aside from protections offered through the USDA federal fire ant quarantine, Hawaii currently has no proactive, pre-shipment regulations in place for minimizing shipments of RIFA or other ant infested materials to Hawaii. These regulations will require, and provide protocols for, use of effective treatments and practices for packaging, transporting, and treating high-risk goods entering Hawaii. The USDA HI Ant Policy (see Appendix 1) and its accompanying risk assessment provide justification for implementing these even for RIFA, for which regulations would otherwise be restricted by preemption of the federal RIFA quarantine.

2.1.3. HDOA/HAG will put together a new rules-change package, for submittal to the HDOA rules change process that will allow for inspection of and/or treatment requirements for non-plant high-risk commodities.

2.2. An LFA quarantine will be developed:

2.2.1. Using the information from Prevention #1.2, HDOA will establish a more rigorous inter-island quarantine for LFA, using the federal RIFA quarantine as a model. The quarantine will include regulations/procedures for mitigating the risks associated with all identified high-risk pathways, and will include a requirement that all plants undergo an approved treatment before being shipped off island.

2.2.2. HDOA/HAG will put together a new rules-change package, for submittal to the HDOA rule change process, that will allow for inspection of and/or treatment requirements for non-plant high-risk commodities, and that will include approved LFA treatment requirements for plants.

2.3. HDOA will work to revise state rules/regulations to add stringent penalties for violations of import/quarantine regulations (currently none exist except those associated with the federal IFA quarantine). However, in most cases, holding of commodities provides ample incentives for compliance.

3. Interdiction

3.1. HDOA (for domestic imports) and USDA (for foreign imports) will use the information obtained from Prevention #1.1 and 1.2 to guide development of a (or improve the existing) RIFA/ant interdiction program. The program will be dynamic, with changes made as the transport of commerce and ant/RIFA pathways change.

3.2. USDA, within their jurisdictions, will work toward full implementation and enforcement of the Hawaii ant policy (see Appendix 1). The policy states that all species of ants intercepted at US ports of entry and destined to or through the state of Hawaii require quarantine action and are considered reportable if: 1) they are not already well established in Hawaii, and 2) life stages found in a shipment indicate the ability to reproduce. Regarding the latter, one of the following criteria must be met before action is taken: 1) reproductive queens present (with or without workers), 2) workers with eggs, larvae or pupae present, or 3) workers only present, in shipments that cannot be thoroughly searched and have conditions conducive to colony survival (e.g. container shipments where soil might be present, with root crops, earth moving equipment, etc.). Actions:

3.2.1. USDA will (for the short term), via formal channels, submit guidelines to DHS instructing them to broadly interpret the USDA Hawaii Ant Policy's criteria for taking action on a shipment. These guidelines will be developed in consultation with the Hawaii Ant Group, and will at least specifically address the criteria "workers only present in shipments that cannot be thoroughly inspected and with conditions conducive to colony survival (e.g. container shipments where soil might be present, with root crops, earth moving equipment, etc.)." The conditions conducive to colony survival given in the policy are preceded by an "e.g.", meaning "for example", and therefore DHS should be instructed to include all conditions conducive to survival. Conditions conducive to survival will be defined by USDA in consultation with the Hawaii Ant Group, and provided to DHS. These conditions will be based on information in the scientific literature, interception records of other states and countries, and consultation with ant experts.

3.2.2. USDA will (for the long term), work toward changing the Hawaii Ant Policy such that the criteria for taking action is "ant or ants present", with no exceptions.

3.2.3. USDA will (or will instruct DHS to) treat infected material using an appropriate pesticide or equivalent effective method, or remove and kill all ants present before goods are released.

3.3. HDOA, USDA, and DHS will ensure that qualified inspection teams are at all ports of entry armed with the latest technologies/ant attractants for inspecting all goods identified as potential ant/RIFA pathways, and capable of conducting periodic 100% inspection "blitzes" of incoming goods. Personnel will achieve expertise in ant detection through specialized training and participation in specialist meetings, often at the national level. Resources must be consistent with the challenge at hand. HDOA and DHS will work toward an agreement between the two agencies that allows DHS to enforce HI state laws at international and inter-island ports.

3.4. HDOA (for intra- and inter-state shipments) and USDA (for international shipments) will work with industries/activities identified (by Prevention #1.1 and

1.2) as potential pathways, to minimize shipments of infested material to, and between islands in Hawaii, and to intercept any arriving shipments escaping the preventive protocols. This will include addressing 'means of conveyance' pathways such as shipping containers (a known ant pathway).

3.5. Given the NZ finding (see Harris et al 2005) that air passengers from infested islands were one of the most likely pathways for LFA introduction to NZ, and the recognition by the HAG that this is an unaddressed, and likely high risk, pathway in Hawaii:

3.5.1. HDOA-PQ will either staff the passenger areas of inter-island airport terminals on infested islands, or, enter into a formal collaborative agreement with DHS-TSA (similar to the agreement between DHS and CDFA), whereby DHS is given the authority to enforce state law

3.5.2. For the short term, HDOA will educate and work with TSA and the airlines, and request that TSA and airline staff refer any passengers carrying risk goods to HDOA.

3.6. HDOA will work to boost ant diagnostic capacity in Hawaii, through the hiring of additional trained staff and/or establishment of collaborative diagnostic efforts with UH, the ISCs, or other relevant entities.

3.7. HDOA will improve (standardize and computerize) its tracking system for nursery stock shipped inter-island, such that the destination of plants from a particular nursery or shipment is readily available and retrievable, with a minimal amount of time and effort, by HDOA staff. HDOA's new information database, named INVICTA and scheduled to be in use this year (2007), may resolve this issue. If not, an improved system for rapid tracking of high-risk goods will be developed and implemented.

4. Ports, Pacific Ant Prevention Plan (PAPP)

4.1. USDA will work toward gaining active GUAM and CNMI involvement in PAPP, and enhancing ant prevention and interception efforts in those territories. This is especially important due to the expansion of RIFA range across the Pacific, the amount of goods entering not only HI but Guam and CNMI from infested countries/states, and the propensity for transfer of pests between the territories and Hawaii (and vice versa).

4.2. USDA will increase participation in regional initiatives (e.g. PAPP efforts) to manage invasive ants offshore.

4.3. USDA, with the assistance of the Hawaii Ant Group, and as a member of the Pacific Ant Group (PAG) and contributor to the PAPP, will investigate the feasibility of implementing a hygiene policy/program for foreign ports and

container yards identified as having a high risk of harboring RIFA/ants. (See Nendick and Sarty (2006) for results of a test of one potential program).

4.4. USDA and HDOA, as members of PAG, and contributors to the PAPP, will investigate in cooperation with other PAG members, the feasibility of implementing a hygiene policy for U.S. ports and container yards identified as having a high risk for harboring RIFA/ants. (See Nendick and Sarty (2006) for results of a test of one potential program).

4.5. HDOA will investigate development and implementation of a hygiene policy for Hawaii ports and container yards identified as having a high risk for harboring LFA.

5. Outreach

5.1. Two of the three incursions in New Zealand were discovered and reported by citizens; public awareness is therefore crucial to the detection effort. Island Invasive Species Committees (ISCs) will coordinate and conduct public outreach activities on their respective islands; informing the public about the threats posed by RIFA and LFA, the necessity of alerting HDOA to a possible RIFA site, and building support for RIFA, LFA, and general invasive ant prevention, detection, response, and control actions. HDOA/HAG will provide the ISCs with copies of RIFA and LFA response plans (see Response #6.1) in order to assist them with these outreach efforts.

ELEMENT II: DETECTION

HDOA will take the lead for detection actions. Detection will be implemented through HDOA personnel actions, through cooperative actions with state (Hawaii Department of Health [HDOH], Hawaii Department of Land and Natural Resources [HDLNR]) and federal (National Park Service, US Fish and Wildlife Service, US Department of Defense) agencies, with interagency groups (ISCs), and through reporting by a knowledgeable public.

1. Surveys

1.1. HDOA, with the assistance of the ISCs (funding provided), will conduct biannual (2 x per year) inspections of all nurseries (certified, uncertified portions of certified nurseries, and cooperating uncertified) using proven detection techniques, e.g. spam, peanut butter, and sugar baits. If only one protein bait is used, the effectiveness of spam for attracting LFA, or PB for attracting RIFA will be evaluated. Inspection staff will be increased to meet the increased workload requirements. Inspections will initially focus on detecting RIFA and LFA, and when capacity increases, will broaden to include detection of any new ant species. Survey protocols are given in Appendix 3 (for RIFA) and Appendix 4 (for LFA). All Solenopsis and suspected LFA collected during nursery inspections will be examined via microscope by a PQ entomologist or trained staff. Data collection and storage protocols will be standardized and provided by HDOA.

1.2. HDOA and (funding provided) the ISCs, will regularly survey high-risk areas such as construction sites, landscaped sites, military bases, areas surrounding ports and cargo warehouses, etc. HDOA will coordinate survey activities on military bases with base environmental departments. Port areas will be surveyed 4x per year. HDOA and ISCs will increase their staff and resources so as to have adequate survey coverage in each of the counties. Surveys will be conducted via bait trapping, visual searches, and other appropriate methods. Survey protocols are given in Appendix 3 (for RIFA) and Appendix 4 (for LFA). With regard to baiting, if only one protein bait is used, its effectiveness for attracting both RIFA and LFA will be evaluated. All Solenopsis and suspected LFA collected will be examined via microscope by a PQ entomologist or trained staff. Data collection and storage protocols will be standardized and provided by HDOA.

1.3. HDOA and ISCs will bolster their survey program through annual application for outside funding specifically for ant surveys. Examples include the Cooperative Agriculture Pest Survey (CAPS) and the USDA Fire Ant Quarantine program, which provide funding to State Agriculture Departments for RIFA and (in the case of CAPS) LFA surveys. In addition, the Hawaii Ant Group will work with state and federal lawmakers to obtain appropriation of (or identify a source for) additional funds needed for RIFA and LFA detection.

1.4. HDOA will coordinate with existing state and federal pest detection programs to incorporate RIFA detection into these programs, e.g., incorporating RIFA detection into the HDOH Vector Control light-trapping program. Catches in HDOH-VC mosquito light traps at ports will be checked on a regular basis by trained HDOH staff for the presence of ants. Captured ants will be submitted to HDOA for identification.

1.5. An annual summary of detection efforts (e.g. areas covered and results) will be compiled and made available to the Hawaii Ant Group. This will include RIFA/LFA survey data compiled annually for the CAPS program, as well as the results of other surveys conducted as per the instructions in this (Detection #1) section of the plan.

2. Outreach

2.1. HDOA, HDOH, ISCs, and Hawaii Invasive Species Council (HISC) outreach staff will deliver RIFA and LFA outreach/information materials to target groups, e.g. physicians/health workers, pest control operators, state and federal agency personnel, longshoremen, airport personnel, landscape/nursery industry personnel, the general public. Outreach materials, and resources for developing new RIFA and LFA materials, will be posted on the HEAR website's invasive ant page.

2.2. The HISC public outreach workgroup and RIFA plan cooperators will work to get state-wide implementation of a school curriculum that, in addition to covering RIFA/LFA awareness, involves surveying of ants by students and protocols for reporting pertinent results of surveys to HDOA. This curriculum has already been developed and implemented on Maui with positive results.

3. Reporting

3.1. All individuals (except HDOA staff) will be instructed to report suspected RIFA, LFA, or other new ant species via HDOA's pest hotline, or mail-in of specimens (see Appendix 2: RIFA Reporting Protocol).

3.2. The Hawaii Ant Group will identify disincentives to report new ant species and work with the appropriate agencies/groups to remove them. This will include working towards, via a change in state rules or legislation, a provision for compensation for condemned or destroyed crops, or loss of organic certification.

4. Diagnostics

4.1. HDOA will work to boost ant diagnostic capacity in Hawaii, through the hiring of additional trained staff and/or establishment of collaborative diagnostic efforts with UH, the ISCs, or other relevant entities.

ELEMENT III: RESPONSE

HDOA will take the lead on rapid response activities. Rapid response activities will be implemented by field personnel in one or more of the following groups: HDOA, HDOH, HDOT, HDLNR, ISCs. Each group will be responsible for compliance with state environmental regulations. Any issues amongst the agencies that need to be resolved will be identified and brought to the attention of the Hawaii Ant Group for discussion of solutions.

1. Response Management and Evaluation

1.1. The Hawaii Ant Group will work with state and federal lawmakers and agencies to identify, prior to need, a source for funds for RIFA/LFA eradication. For example, the potential to use USDA-ARS funds given to the University of Hawaii for fruit fly control will be explored.

1.2. Decision-making tools to decide on the nature of management responses will be developed and included in RIFA and LFA response plans (see Response #6 .1). These will include defining the circumstances under which a response will be initiated. The definition will make clear, for example, under what circumstances a full/official LFA response would be initiated if, say, a one-hectare infestation, or infested nursery, were found on one of the currently uninfested islands. It will also clarify the survey coverage needed before the implementation of interim rules would be requested.

1.3. A system for data management, documentation and evaluation of a response will be developed, in order to ensure information is readily available for decision making, e.g. for deciding which, and when, sites need monitoring or retreatment. This information will be included in RIFA and LFA response plans (see Response #6 .1).

1.4. Protocols to assess failure/success of a RIFA or LFA response will be developed, in order to provide an objective basis from which to the make the decision to continue or discontinue an eradication attempt, or revise an eradication strategy. Protocols will include the definitions or guidelines to be used to declare RIFA or LFA successfully eradicated or areas "RIFA/LFA-free". This information will be included in RIFA and LFA response plans (see Response #6.1).

2. Agency Roles/Responsibilities

2.1. Roles, authorities, responsibilities and resource arrangements of all agencies/groups involved in RIFA and LFA rapid response activities will be identified, and included in respective RIFA and LFA response plans (see Response #6.1).

2.2. HDOA field personnel will have the responsibility of conducting RIFA eradication operations, including population delineation, initial treatments, and

follow-up monitoring and treatments. HDOH field personnel will assist HDOA in eradication operations. In the event of a RIFA detection, RIFA eradication will be designated as this field crew's highest priority. In the event eradication activities are prolonged, other field crews will be made available by their home agencies/groups to assist, and will operate under HDOA/HDOH discretion.

2.3. HDOA will work with USDA to finalize the MOU that will allow USDA/PPQ to gain right of entry under HDOA authority, and have it signed by all necessary individuals as soon as possible.

3. Containment

3.1. Prior to actual need, HDOA will develop RIFA/LFA containment strategies, including quarantine regulations and movement controls for materials that are known or probable RIFA/LFA pathways (for example, soil and mulch). These strategies will be included in respective RIFA and LFA response plans (see Response #6.1).

3.2. In the event RIFA, or LFA (on a currently uninfested island) is detected, HDOA-PQ will immediately implement an interim rule to prevent removal of soil, plant material, and other high-risk material from the area until eradication is confirmed. This includes restricting an infested nursery from selling or shipping goods (on or off island) until the nursery is determined to be RIFA or LFA free (as defined in response plans). Given that an immediate interim rule currently requires that the governor declare the situation a state of emergency, the Hawaii Ant Group will:

3.2.1. Put together a response package and use HISC to prep the governor regarding a declaration of emergency for RIFA found on any island, or LFA on islands other than the Big Island. This will include prepackaging submittals (one for RIFA, one for LFA) for interim rules, and briefing the HI Board of Agriculture chairperson on these prepackaged submittals.

3.2.2. Pursue a legislative solution to the obstacle of needing lengthy board review, or a governor declaration of emergency, in order to implement a rapid response.

3.3. HDOA and HAG will work towards, via a change in state rules or legislation, a provision to provide compensation for condemned or destroyed crops, or loss of organic certification. This action applies to both containment and eradication activities.

4. Population Delimitation

4.1. In the event RIFA or LFA (on uninfested islands) is detected, delimiting surveys will commence immediately. Surveys will be scheduled and conducted such that the population is delimited as rapidly as weather conditions allow. Delimiting survey protocols are given in Appendix 4 (LFA) and Appendix 5 (RIFA), and

will be included in LFA and RIFA response plans (see Response #6.1). The protocols will be adjusted and amended as necessary by the HAG and HDOA, in consultation with RIFA/LFA experts worldwide, as new technologies are developed and tested.

4.2. Outreach strategies for maximizing the likelihood that all colonies of a detected population are found, will be developed and included in RIFA and LFA response plans (see Response #6.1).

4.3. A timeline will be developed to determine how fast right of access to private property can be obtained by HDOA/HDOH to conduct delimiting surveys (see "Treatment" #5.1).

5. Treatment

5.1. HDOA has listed RIFA, and is in the process of listing LFA as a species for control and/or eradication. This designation allows HDOA staff to obtain a court order to access and treat land without owner permission, if necessary. A timeline will be developed to determine how fast right of access to private property can be obtained by HDOA/HDOH. If the process to gain right of access takes more than several days, the HAG will identify and pursue solutions that will shorten the process down to a workable time frame. This action applies to both population delineation and treatment activities.

5.2. Authority to access/treat private property will be extended to designated response crew(s) to the extent possible. In practice, non-HDOA/HDOH personnel (such as DLNR and ISCs) may treat properties where they are freely given permission, leaving the "hard-sell" cases to the agencies with legal authority.

5.3. Treatment strategies for RIFA and LFA eradication will be developed prior to need and included in RIFA and LFA response plans (see Response #6.1). Treatment strategies will be developed in consultation with state and USDA authorities and RIFA/LFA experts worldwide, and will include strategies for treating infestations under different size and land use scenarios. Strategies will be adjusted and amended as necessary by the Hawaii Ant Group and HDOA as new technologies are developed and tested. A preliminary RIFA treatment strategy is given in Appendix 5.

5.4. Post-treatment monitoring protocols, for evaluation of the effectiveness of treatments, will be developed prior to need, and included in respective RIFA and LFA response plans (see #6.1 of this section). Protocols will be developed in consultation with state and USDA authorities and LFA/RIFA experts worldwide. They will be adjusted and amended as necessary by the Hawaii Ant Group and HDOA as new technologies are developed and tested. A preliminary RIFA post-treatment monitoring protocol can be found in Appendix 5.

5.5. The need for and availability of pesticide application equipment (including helicopter bait spreaders), and persons with the necessary pesticide applicator licenses, will be determined for each island. Identified gaps in availability will be addressed, e.g. purchase of equipment, or pesticide training/licensing of appropriate individuals on island.

5.6. If RIFA is detected in an area that cannot, according to label, be treated by available pesticides, HDOA will apply for a federal emergency exemption for the use of these pesticides in such an area within 48 hours, and will immediately pursue application for a quarantine exemption (or public health exemption if necessary) for up to three years. All information that will be needed when applying for these federal exemptions will be provided by HDOA-Pesticides Branch and included in the RIFA response plan (see #6.1 of this section).

5.7. HAG and HDOA will pursue funding for pesticide efficacy studies for LFA. The research will be conducted on the big island to determine the most effective treatment strategies for LFA in various use scenarios (e.g. crops, pasture, nursery stock, etc).

5.8. HAG and HDOA will investigate and pursue pesticide registration options, including treatments for LFA in crops and on rangeland. Pesticides available for use in Hawaii, and the type of sites on which they can be used, are given in Appendix 6a, 6b, and 6c. Pesticides for which a HI registration is needed are given in Appendix 6d. HDOA Pesticides Branch is pursuing a Special Local Needs registration for the use of Amdro in pastures to treat LFA.

6. **Rapid Response Plans**

6.1. Rapid response plans will be drafted for both RIFA and LFA, and will include several components identified in Commonwealth of Australia (2006):

a. Identification of agreed roles, authorities, responsibilities and resource arrangements of all involved agencies/groups
b. Decision-making tools for deciding the goal of the response, i.e. eradicate, contain or control
c. Containment strategies, including quarantine and movement controls
d. Emergency response procedures (survey and treatment protocols, outreach strategies) in a variety of contexts, including residential, commercial, industrial, and conservation areas.
e. Post-treatment monitoring protocols for evaluation of treatments
f. A system for data management, documentation and evaluation of responses
g. Protocols to assess the failure/ success of a response, so an objective basis exists from which to decide whether to continue, discontinue or revise a response strategy or goal

Where appropriate, components will be developed in consultation with USDA, state authorities, and ant experts worldwide. They will be adjusted and amended as necessary by the HAG and HDOA, as new technologies are developed and

tested. The response plans will be implemented immediately upon detection of RIFA in Hawaii, or LFA on islands other than the big island.

ELEMENT IV: PUBLIC OUTREACH

HISC outreach staff will take the lead on statewide coordination issues and the ISCs will take the lead on conducting island outreach activities. Outreach will be aimed at educating the public and other stakeholders about RIFA/LFA identification and impacts so they can be an effective part of an early detection system, and can make informed decisions regarding RIFA/LFA prevention and response programs that affect them. To the extent possible, outreach will also include that needed to educate judges and the legal system of the seriousness of potential violations of ant prevention regulations.

1. The ISCs, with the assistance of HDOA, will deliver outreach materials, such as information sheets, brochures, posters, news articles, and presentations. Materials will address RIFA/LFA identification, biology, and impacts; and what the public can expect (e.g. response activities) if RIFA/LFA are detected. Materials will be tailored to specific groups. Potential groups to be targeted include: teachers/students, landscape industry, farmers (nursery, crop, cattle, poultry), hotel/visitor industry, local government officials, state and federal agency personnel, outdoor recreation industry (Golf, etc.), conservation groups, pest control operators, Humane Society, gardeners clubs/organizations, physicians/health workers, veterinarians, the utility industry, longshoremen, dock workers, airport personnel, shippers, and the public at large. Outreach materials, and resources for developing additional RIFA and LFA materials, will be posted on the HEAR website's invasive ant page.

2. The HISC outreach specialists will work with Hawaii schools to incorporate RIFA and LFA curriculum, such as that developed by Maui's Na Kumu Project. If possible, the curriculum will include a RIFA version of the ant survey activity that was tested (with positive results) in the schools of Hilo, Hawaii.

3. HDOH will send out RIFA and LFA information to all physicians in the state through their Epidemiology Branch.

4. The Hawaii Ecosystems at Risk project will post Hawaii Ant Group activities and documents on its web page, and keep the RIFA, LFA, and invasive ant information on its website updated, in order to serve as a public information source.

ELEMENT V: PLAN IMPLEMENTATION/COORDINATION:
Two issues necessitate extra effort to implement this plan. First, due to a high degree of inter-agency involvement, much coordination among agencies will be required. Secondly, Hawaii was an active participant in efforts to address the problem of invasive ants at a regional level, via development of the Pacific Ant Prevention Plan (PAPP). The PAPP was endorsed by the Pacific Plant Pest Organization, funding was secured for a New Zealand based PAPP coordinator, and implementation of the PAPP is underway. It is in Hawaii's best interest, where appropriate, to coordinate local activities with those of the PAPP. Given the above:

1. A coordinator will be designated or hired to: a) facilitate local implementation of the plan, including participation by and communication among agencies/groups; b) coordinate management, research, and outreach activities among agencies/groups; c) ensure objectives of the plan are considered in broader management plans that incorporate a wide range of management issues; d) ensure coordination of local efforts with regional Pacific Ant Prevention Plan (PAPP) efforts; e) work with experts world wide to exchange knowledge/research results.

2. HDOA will work with other Hawaii ant group agencies to standardize data collection, storage, retrieval, and exchange among the islands, and, for consistency, with PAPP

3. The Hawaii ant group will establish a process and timeline for review and revision of this plan and its implementation

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APPENDIX 1
HAWAII ANT POLICY

Change in Quarantine Action Policy for Ants Intercepted from Commodities Destined to the State of Hawaii

USDA, APHIS, PPQ, National Identification Services, April 10, 2002

Policy Change. Effective immediately, all species of ants (Formicidae) intercepted at U.S. ports of entry and destined to, or through, the State of Hawaii require quarantine action and are considered reportable if :
(1) they are not already established and widespread in Hawaii and
(2) life stages found in a shipment indicate the ability to reproduce (see below).

1) The following ant species are currently established and widespread in Hawaii. No action is required if these species are intercepted and positively identified.

Anoplolepis gracilipes (F. Smith, 1857)) name change for A. longipes
Camponotus variegatus (F. Smith, 1858)
Cardiocondyla emeryi Forel, 1881
Cardiocondyla nuda (Mayr, 1866)
Cardiocondyla venustula Wheeler, 1908
Cardiocondyla wroughtonii (Forel, 1890)
Cerapachys biroi Forel, 1907
Hypoponera opaciceps (Mayr, 1887)
Hypoponera punctatissima (Roger, 1859)
Hypoponera zwaluwenburgi (Wheeler, 1933)
Leptogenys falcigera Roger, 1861
Monomorium destructor (Jerdon, 1851)
Monomorium floricola (Jerdon, 1851)
Monomorium sechellense Emery, 1894) name change for M. fossulatum
Monomorium liliuokalanii (Forel, 1899)) name change for M. minutum
Monomorium pharaonis (Linnaeus, 1758)
Paratrechina bourbonica (Forel, 1886)
Paratechina longicornis (Latreille, 1802)
Paratrechina vaga (Forel, 1901)
Pheidole megacephala (Fabricius, 1793)
Plagiolepis alluaudi Emery, 1894
Ponera swezeyi (Wheeler, 1933)
Quadristruma emmae (Emery, 1890)
Solenopsis geminata (Fabricius, 1804)
Solenopsis papuana Emery, 1900
Stumigenus godeffroyi Mayr, 1866
Strumigenys lewisi Cameron, 1886
Strumigenus rogeri Emery, 1890
Tapinoma melanocephalum (Fabricius, 1793)
Technomyrmex albipes (F. Smith, 1861)
Tetramorium bicarinatum (Nylander, 1846)

Tetramorium simillimum (F. Smith, 1851)
Tetramorium tonganum Mayr, 1870
Trichoscapa membranifera (Emery, 1869)

2) Do not take action routinely when worker ants alone are found in a shipment. One of the following criteria must be met before taking action.

* Reproductive queen present (with or without workers).
* Workers with eggs, larvae, or pupae present.
* Workers only are present in shipments that cannot be thoroughly inspected and with conditions conducive to colony survival (e.g. container shipments where soil might be present, with root crops, earth moving equipment, etc.).

Review of Hawaiian Ant Pest Risk Analysis and Justification for New Action Policy. National Identification Services (NIS) evaluated a Pest Risk Analysis (PRA) conducted by the Hawaii Ant Group in cooperation with APHIS Policy and Program Development staff on the effects of introduction of exotic ants to the Hawaiian Islands. To address the proposed policy, NIS considered the potential impact of exotic ants on the Islands and the impact on trade that a more restrictive policy would impose.

NIS accepts the proposal that exotic ant species not present or widely distributed on the Hawaiian Islands should be excluded from Hawaii. The proposal explains that ants could not have co-evolved with native flora and fauna in Hawaii because the State has no native ant species. Consequently, plants and animals on the Islands are particularly susceptible to herbivory, predation and competition from ants. This susceptibility is evidenced by a number of publications that document serious impacts caused by introduced ant species in Hawaii. This proposal would protect Hawaii from many ant taxa that PPQ currently considers non-quarantine significant.

We could not possibly evaluate each of the many thousands of ant species exotic to Hawaii. Nonetheless, the PRA indicates that virtually any exotic ant species can threaten the Islands. The PRA noted that because the delicate Hawaiian ecosystems did not evolve with native ants, exotic ant species pose multiple threats to these systems. Herbivorous species pose potential direct impacts as agricultural pests or by feeding on endangered or threatened plants (e.g. Atta spp.). Other ants may displace native ground-dwelling bees that are sole pollinators of threatened native plants. A number of ant species displace large amounts of soil, significantly changing ecosystems. When introduced into new areas, ant species become more aggressive, and their impact is thereby more pronounced.

Although the literature contains numerous examples of adverse impacts caused by ants, the Hawaii Ant Group PRA cited one paper that described how three species of introduced ants caused multiple extinctions of native plant and animal species in Hawaii. Two of those ant species were not actionable under previous APHIS policy.

Ants are rarely intercepted with cargo imported into Hawaii. The PIN-309 database contains records of the actionable taxa of ants considered as quarantine pests. From 1985 -2002, PIN-309 records indicate only 2 ant interceptions resulting from PPQ inspections on commodities imported into Hawaii. We do not have records for formerly non-significant ant taxa that were intercepted

during that period. However, we know from collective experience that few shipments are held for identification of intercepted ants, in general. Furthermore, this policy parallels current policy of the State of Hawaii Department of Agriculture. Therefore, we expect that the impact on trade resulting from enacting this policy will be negligible.

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Joe Cavey, Branch Chief
National Identification Services
Riverdale, Maryland

Jim Smith, Assistant Director
Port Operations
Riverdale, Maryland

APPENDIX 2

ANT REPORTING PROTOCOL

All individuals, including industry, organization and agency personnel, and the general public, will be instructed, via outreach and education efforts, to report suspected RIFA, LFA, or new ant species, via one of two ways:

1. Via calling the toll free HDOA pest hotline phone number (643-PEST)

2. Via pest collection and mail-in instructions as given in CTAHR Kauai ("Identifying the Little Fire Ant: A New Invasive Species on Kauai") and Big Island ("Stop the Little Fire Ant") LFA flyers

APPENDIX 3

SURVEY PROTOCOL FOR DETECTING NEW INFESTATIONS OF RED IMPORTED FIRE ANT *Solenopsis invicta* July 2007

The following protocol was developed from information in the sources listed at end of this document. Sugar baits were included because RIFA have been found to sometimes prefer sugar baits (see Stanley 2004).

Supplies needed:

- Map of site to be surveyed (digital, actual, or hand-drawn with landmarks)
- 50 mm plastic dishes or vials with tight fitting lids (such as Gelman® dishes) to secure ants without use of an additional enclosure. Opaque containers are preferable if available, but standardize with whatever is available.
- Bright Flags or flagging (use to mark trap locations or corners of survey area as necessary; use the same color throughout the island survey)
- Spam, cut into ½ to 1 inch squares, and jar of PB
- 20% sugar solution
- Bag of cotton balls
- Wax pencil or permanent/sharpie marker
- Field notebook and pencil, spreadsheet data forms, and/or hand-held computers for entering data
- GPS unit

Prior to conducting field survey:

1. Identify/locate high-risk sites. High-risk sites are those associated with risk goods. Goods from infested states or countries that can be considered high risk include: plant material (nursery stock, turf/sod, trees); plant products (hay, straw, wood, mulch, bark), soil/potting mix and other landscaping material; sea containers; air and sea container packing material; building/construction materials; used machinery and equipment, used electrical equipment; vehicles; used car parts; used animal equipment and animal containers, personal goods and any material stored on fire ant infested ground.

   Sites associated with these goods include:

   - Ports (air and sea)
   - Shipping container yards

- Warehouses and other facilities receiving risk material
- Nurseries/landscape suppliers (certified and uncertified).
- Landscaped areas (resorts, golf courses, new neighborhood developments, parks, roadside plantings, etc).
- Development/construction sites (construction materials, used machinery)
- Matson yards where shipped vehicles are stored before owners pick them up
- Car lots receiving vehicles from infested states or countries
- Other businesses associated with high-risk goods.
- Locations receiving used machinery, used electrical equipment
- Personal effects, e.g. shipments of homeowner possessions
- Locations referred by calls from the public
- Dumpsters and trash cans in any of these areas

Ask HDOA, HDOT, etc, for business categories that could be associated with high-risk goods. Locate businesses in these categories via a search of the yellow pages, discussions with HDOA, HDOT, trade associations, etc.

2. Prioritize sites based on the amount of high-risk material they receive and from where they receive it. Obtain this information via consultation with appropriate agencies. Determine site visit order based on site priority.

3. Obtain permission to access property.

4. Prepare field map of site

<u>Survey Procedure</u>:

Use surveys with bait/attractants, supplemented with visual searches, to determine presence or absence of RIFA at high-risk sites.

Surveys are best conducted when air temperatures are above 65°F and below 90°F, preferably between 70 and 90 degrees. Baiting activities are not effective if soil temperature is below approximately 65 degrees, or if standing water is present.

1. Record the following information into a field notebook, spreadsheet form, or hand-held computer:
   - Surveyor (your name)
   - Date
   - Time
   - General weather description (estimate of % cloud cover, wind speed, temperature)

- Property type/name (e.g. a residence, Joes Nursery, Richardson Beach Park, etc)
- Property owner
- Property address
- General size of area surveyed (e.g. “approx. 2 acres”)
- General description of the site, i.e. type and quantity of vegetative and/or ground cover on site
- Approximate number of bait dishes or vials placed out
- Whether GPS data was taken (yes/no)
- Whether RIFA was found (yes/no)

2. Place a piece of spam and dab of PB in one plastic dish, and cotton ball soaked in 20% sugar solution in a second plastic dish. Place these bait-traps at least 1m apart on the ground. On hot sunny days, place bait-traps in shady areas, out of direct sunlight.

3. Continue placing two bait traps (one with sugar solution, one with spam & PB) every 15m (50 feet) or less, in a grid pattern over the entire area to be surveyed. If the survey area is large, at least bait the perimeter and high-risk sites within it. Small flags or brightly painted chopsticks can be used to mark the bait trap locations.

4. Leave the bait traps in place for 1-2 hours if conditions are ideal, such as a dry, clear, calm day of 70 to 75 degrees. Less ideal conditions may require the baits to remain in place overnight. In very warm weather, RIFA workers forage in the evening and night.

5. If possible, while bait traps sit, conduct visual searches for RIFA colonies. New RIFA colonies do not make a conspicuous mound for several months. Up welling can be seen before a mound is established. The soil brought to the surface is of a fine texture, not coarse. RIFA colonies are usually found in open, sunny areas such as lawns, pastures, or fields. Also look at areas that have water on a consistent basis, such as around the base of trees, by dumpsters and trash cans, and next to water bodies (the interface between a swimming pool concrete area and turf, for example), and look for evidence of soil up-welling or mound building.

6. GPS the site: take GPS readings at several of the bait trap sites as reference locations. Assign each reference site a unique number. Write the number of the reference site on the two bait dishes at that site, using a wax pencil or permanent marker/sharpie. Write the number on the bait dish, as opposed to the lid (to avoid confusion in the lab if lids get mixed up or misplaced). Record the bait trap number for each GPS reading.

7. Collect the traps by simply putting the top onto the dish and closing firmly. Number and map each bait dish as you collect them. Write each trap’s number on

the dish (not the lid) with a wax pencil or sharpie. Label its location on your map by hand (with the aid of your GPS reference points) or by taking a GPS reading of the location and recording the bait trap number and its corresponding GPS reading in your fieldbook, data sheet or hand-held computer. Collect all bait traps, and markers (if used, e.g. flagging, chopsticks), from the area when completed.

8. Back at the office/lab, freeze ants a minimum of overnight to kill them, or place each sample in a labeled vial of alcohol (label with your name, survey date, site location, bait trap #)

9. Screen specimens for RIFA via available keys and microscope. If RIFA are identified, or you have specimens that are possibly RIFA (you're not sure), contact HDOA immediately to notify them and to arrange for identification of suspect specimens or verification of your IDs.

10. At least once a week, download GPS data gathered into the PC assigned to the RIFA survey. Using Arcview, make a map of sites surveyed and results of the survey. Coordinate with HDOA Chemical & Mechanical Control Branch to ensure the same map projections, and map symbols, are used on all islands.

11. Enter info/data from field notebooks, spreadsheet forms, or hand-held computers into an excel spreadsheet. Coordinate with HDOA Chemical & Mechanical Control Branch to ensure the same spreadsheet format is used for all surveys.

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APPENDIX 4

SURVEY PROTOCOL FOR DETECTING AND DELIMITING INFESTATIONS OF LITTLE FIRE ANT (LFA)
Wasmannia auropunctata
November 2003
Updated July 2007

PEANUT BUTTER CHOPSTICK METHOD:
This method allows for relatively quick coverage of large areas. However, it relies on trained surveyors that can accurately identify LFA in the field with a hand lens. ***When trained surveyors are not available, follow the instructions given here under "Prior to conducting field surveys", but exclude step 4. Then conduct the field survey as described in Appendix 3 under "Survey Procedures" with the following modifications: 1) instead of placing two bait dishes every 15m, place one bait dish every 3m; and 2) bait each dish with a dab of PB. Label and map the dishes as described in Appendix* **3.** ***Us the type of dishes/vials described in Appendix 3 under "Supplies Needed".***

<u>Supplies needed</u>:

- Jar of PB (the cheap hydrogenated kind works best)
- Chopsticks (buy by the case at local paper-products companies)
- Orange day-glo spray paint (the kind WITHOUT toluene in it)
- Plastic-bags for disposing of used chopsticks
- Ziploc bags (quart size)
- Permanent/sharpie marker
- Raid (spray can) insecticide
- Bright colored flagging (use the same color throughout the island survey)
- Field notebook & pencil
- Small cooler with blue ice
- Sling psychrometer
- GPS unit

<u>Prior to conducting field surveys</u>:

1. **Identify/locate high-risk sites. These include:**
    a. Uncertified nurseries
    b. Large landscape operations conducted since 1990 (big island) or between 1990-present (other islands), i.e. such as new building sites, subdivisions, golf courses, newly developed or renovated hotels/resorts
    c. Landscaping firms and private and public gardens that receive and plant out nursery stock, e.g., DOT landscaping facilities (such as the airport nursery at Kahului) and the numerous landscaping facilities at the larger hotels/resorts.

d. Calls from the public
e. Sites with fishtail palms

Uncertified nurseries (those not approved by HDOA for exporting plants out of state) are top priority. There is no list of such nurseries, unless a nursery association on your island has one. Try the yellow pages. Landscape Association may also be helpful in locating these nurseries.

Sites with large landscape operations conducted since 1990 can be identified via discussion with landscapers, nursery association, building contractors, community members/organizations, etc. Also perhaps visually, based on appearance, i.e. landscaping projects that appear to have been installed since 1990, especially those with fishtail palms or even other palms (on the big island many sites were infested with LFA via the planting of infested fishtail palms, Caryota spp).

To locate landscapers, try the Landscape Association, Nursery Association, or yellow pages. If you can get landscapers to tell you, ask them if they have bought plants from the Big Island in the past and even which nurseries they got their palms from. Please don't reveal to them which nurseries on the Big Isle had LFA in the past. We need the cooperation of nurserymen in order to slow the spread of alien pests.

Regarding calls from the public, if/when a new infestation is reported by a citizen, it is very important to ask them NOT to spray or apply toxic baits until you have been to the site, identified the ant and, if it is LFA, delineated and mapped the infestation. Explain to them that suppressing a LFA population will make it extremely hard to find the ants and delineate the infestation. And, that we have to determine the extent of the infestation in order to determine whether or not eradication is feasible.

If you ask homeowners to collect specimens for you, try to make a point that THIS fire ant is very small (about as long as a penny is thick; about 1/16"), and much smaller than the local "red ant" (*Solenopsis geminata*) so people don't send you those. Tell them to put peanut butter on a chopstick where they see the ants, preferably in the shade; leave it out about 1 hour; then put chopstick with ants into in a zip lock bag; be sure to write name, address, and phone number on the bag; put bag with ants in it in freezer; and freeze it over night. Tell them they can then drop the bag at your office or mail it in to you.

2. **Prioritize identified sites**
Prioritize sites based on likelihood they received plants from the big island (use information gained from conversations with property/business owners, landscapers, nurseries, HDOA, etc.). Survey sites in order of priority, in case limited time/resources prevent covering all sites during the period for which funding is granted for these surveys.

3. **Obtain permission to access property**
   Call property owners and obtain permission to access and survey for LFA. This step may best be left to HDOA cooperators (check with them first).

4. **Prepare chopsticks to be used in the survey**
   Chopsticks need to be painted with day-glo paint so you can relocate them in the field. Both sides need to be painted. If you paint only one side, you will waste time trying to place every stick paint-side up on the ground. You only need to paint the two ends (paint them well). You don't need to paint the middle.

   Make a sandwich of 1" X 2" boards 3 ft long, with the chopsticks lined up transverse between them so you can flip them over easily. Use rubber bands on the ends of the boards to hold the chopsticks in. Paint each end of the chopsticks then flip the sandwich over and paint the other side of each end. Alternatively, line up as many as you can on a junk table and spray paint the ends of all day-glo orange. Flip them over when dry and spray again.

   When painted and dry, break all chopsticks in half. This can be done by using a chopper of some kind (like a corn detassler) to cut the sticks in half. Next, separate the sticks so you end up with 4 short sticks per pair of chopsticks. One end of each half stick will now be orange.

   You will need a lot of prepared-chopsticks. Prepare a case or box at a time.

<u>Survey Procedure</u>:

Use the peanut-butter-on-chopsticks (PBC) method described below to survey for LFA. Peanut butter (PB) is currently the best-known attractant for LFA. HDOA has consistently used PB when they survey for LFA. Therefore, in order to ensure chopstick attractiveness to LFA, and maintain consistency across surveys in the state, use only PB as bait.

LFA do not like hot sun. Morning or overcast days are the best times to bait. If surveying at midday on hot, low humidity days, try to place baits in shady spots.

1. Record the following information into a rite-in-the-rain field notebook:
   - Surveyor (your name)
   - Date
   - Time
   - General weather description (estimate of % cloud cover, wind speed, temperature)
   - Sling psychrometer reading at start and finish of site survey

- Property type/name (e.g. a residence, Joes Nursery, Richardson Beach Park, etc)
- Property owner
- Property address
- General size of area surveyed (e.g. “approx. 2 acres”)
- General description of the site, i.e. type and quantity of vegetative and/or ground cover on site
- Approximate number of bait sticks placed out
- Whether GPS data was taken (yes/no)
- Whether LFA was found (yes/no)
- Approximate/estimated size of LFA infestation (if LFA was found)

2. Starting at the corner or edge of the area (or property) to be surveyed, dip the unpainted end of a chopstick in peanut butter so you get a very light coating extending about ½ way up the stick. Place the PB chopstick on the ground. Whenever possible, place at the bases of trees/shrubs, and in shady spots.

3. Continue placing chopsticks on the ground, every 3m, around the entire perimeter of the property in question.

4. Leave the chopsticks in place for at least 45 minutes, but not more than 2hrs before collecting them.

5. When you collect the sticks, identify presence/absence of LFA as you collect them.
    a. If LFA are not present, shake off as many of the other ants (or other insects) that are on the stick as possible and deposit used sticks into a plastic bag for later disposal. PROCEED TO #6 BELOW.
    b. If LFA, or possible LFA (ants you think might be LFA, but you’re not sure) are present around the perimeter of the site, you know the infestation extends to neighboring sites.
        i. Collect some of the LFA for lab/HDOA confirmation. Put the chopstick with ants into a zip lock bag. Write the site address and date on the Ziploc with permanent marker. Make sure no ants are on the outside of the bag, then put the bag into another Ziploc, so the sample is double bagged.
        ii. Mark the exact location with flagging
        iii. SKIP TO #9 BELOW

6. Continue the survey by placing chopsticks on the ground every 3m in a grid pattern over the entire property in question, i.e. place them 3m apart along transects that are themselves 3m apart.

   Be psychologically prepared: surveys will require placing out a lot of PB sticks. In the Galapagos, a 30ha site (with sticks placed every 3m) required 33,638 PB sticks for one monitoring event. LFA are tiny and move slowly,

and are thus believed to not forage far for food. Therefore, 3m spacing of bait sticks is required to assure a chance of detecting them.

7. Leave the chopsticks in place for at least 45 minutes, but not more than 2hrs before collecting them.

8. When you collect the sticks, identify presence/absence of LFA as you collect them.
    a. If LFA are not present, shake off as many of the other ants (or other insects) that are on the stick as possible and deposit used sticks into a plastic bag for later disposal.
    b. If LFA, or possible LFA (ants you think might be LFA, but you're not sure) are present:
        i. Collect them for lab/HDOA confirmation: put the chopstick with ants into a zip lock bag. Write the site address and date on the Ziploc with permanent marker. Make sure no ants are on the outside of the bag, then put the bag into another Ziploc, so the sample is double bagged.
        ii. Mark the exact location with flagging.

9. When all survey chopsticks at the site have been collected:
    a. Store all bagged LFA (and possible LFA) samples in the cooler.
    b. Spray the inside of the plastic bag containing the other used chopsticks with Raid (one or two zaps) to kill any ants present, and tie the bag closed.

10. If LFA were found during the survey, delimit the infestation, i.e. locate the boundaries of it (it should be fairly easy to determine based on the flags you placed when LFA were found) and mark them with flagging. If LFA were found on any chopsticks at the perimeter of the survey area you will need to extend the survey out from those points, in order to determine the boundary. If LFA are found on any perimeter chopsticks that coincide with a property boundary, you will have to contact the adjacent lot owner before continuing. Ask the owner of the property you just surveyed if they know the neighbor's names so you can contact them and extend the survey.

11. GPS the site. If LFA were found, GPS the boundary of the infestation. If the infestation goes to the property line, GPS the infestation up to, and along, the property line so a polygon can be drawn of the infestation. If LFA were not found take one GPS reading at the site so the general survey-location can be mapped.

12. Back at the office/lab, put all ant samples collected into the freezer a minimum of overnight to kill them. If LFA (or possible LFA) were collected, contact HDOA immediately to notify them and to arrange for identification of specimens, or verification of your IDs.

13. At least once a week, download GPS data gathered into the PC assigned to the Wasmannia survey. Using Arcview, make a map of sites surveyed and results of the survey. Coordinate with HDOA Chemical & Mechanical Control Branch to ensure the same map projections, and map symbols, are used on all islands.

14. Enter info/data from field notebooks, data forms or hand-held computers into an excel spreadsheet. Coordinate with HDOA Chemical & Mechanical Control Branch to ensure the same spreadsheet format is used for all surveys.

Note: to conduct simultaneous LFA and RIFA surveys, one protein and one sugar bait (as described in Appendix 3) can be placed out at every 5th PB chopstick placed on the ground.

APPENDIX 5

PRE-TREATMENT, TREATMENT, AND POST-TREATMENT PROTOCOLS FOR THE RED IMPORTED FIRE ANT *Solenopsis invicta* July 2007

The following protocol was developed from information in the sources listed at end of this document. Sugar baits were included because RIFA have been found to sometimes prefer sugar baits (see Stanley 2004).

Baiting activities are not effective if soil temperature is below approximately 65 degrees, or if standing water is present. Surveys are best conducted when air temperatures are above 65°F and below 90°F, preferably between 70 and 90 degrees.

Initial Response

1. Spot-treat the nest(s) at the site of the find via drenching with chlorpyrifos, diazinon, or other approved drench (see Appendix 6a). See Drees 2002 regarding considerations for applying mound drenches.

2. Follow spot-treatment of nests with ground application of a contact insecticide within a 50m radius of the nest(s).

3. Conduct visual surveys (see "Visual Surveys" below) for additional nests within a 500m radius of the treated nest(s). If more nests are found, treat as in #1 and #2 above.

4. Flag, map, and record GPS coordinates of all RIFA nests.

5. To assess effectiveness of the spot-treatment, at approximately 3-7 days post treatment, within a 200m radius of the treated nest(s):
    - Place 1 pitfall trap at 10m intervals (i.e. 1 pitfall per 10m x 10m grid). Try to place traps such that they are shaded during the hottest part of the day. Use vials/containers at least 42mm in diameter for traps. Use a 50:50 mix of propylene glycol and water as the preservative in the pitfalls. After adding the preservative, add a drop of dish soap to break the surface tension of the liquid. In order to increase trap catch, bait the rim of the pitfall traps if possible, using blended tuna, or other smelly food product, by smearing around the inside rim of the cup or vial.
    - Let sit for 2-3 days, then collect

Initial Delimiting Survey

1. At approximately 3-7 days post spot-treatment of nest(s), within a 500m radius of the treated nest(s), conduct an initial delimiting survey as follows:
    - Lay 2 protein, and 2 sugar baits (placed approximately 1m apart on the ground) per 10m x 10m grid. A protein bait consists of a ½" to 1" piece of Spam dipped in peanut butter placed in a 50mm diameter vial or dish. A sugar bait consists of a cotton ball soaked in 20% sugar solution and placed in a 50mm diameter vial or dish. Each vial/dish should come equipped with a tight fitting lid. Small flags or orange chopsticks can be used to mark the bait locations if necessary. On hot sunny days, try to place baits in shady areas (create shade over the trap if necessary, using rocks or other debris).
    - If conditions are ideal, such as a dry, clear, calm day of 70-75^{o}F, let bait sit 1-2 hours, then collect. Less ideal conditions may require the baits to remain overnight. In very warm weather, RIFA workers forage in the evening and night. Baiting activities are not effective if soil temperature is below approximately 65 degrees, or if standing water is present.
    - To collect the baits, simply cap the vials/dishes and deliver to HDOA for identification.

2. If RIFA are found within the 500m radius area, locate nest(s), get a GPS reading, treat, and conduct visual searches as described in #1 - #4 of "Initial Response", wait approximately 3-7 days, and continue with the initial delimiting survey using each find as a center from which to measure the 500m radius. Continue until no RIFA are found within a 500m radius of each treated RIFA nest.

3. When the population has been delimited, simultaneously:
    - Begin the broader delimiting survey
    - Begin treatment of the population

Broad Delimiting Survey

1. Determine the larger area that needs to be surveyed to ensure no spread from the area of the original find. Do this using known RIFA biology, age and social type of nest, mating flight modeling (backward and forward), tracing, and public outreach. Determine:
    - Radius within which all areas should be surveyed
    - Radius within which targeted high risk areas should be surveyed
    - Radius within which risk sites identified by tracing should be surveyed.

2. Survey using 2 protein and 2 sugar baits per 10m x 10m grid, as described under "Initial Delimiting Survey' #1.

3. In areas inaccessible to survey, treat for 3 yrs with a granular IGR bait containing pyriproxyfen (Distance, Esteem), fenoxycarb (Award) or methoprene (Extinguish), followed within 1-2 weeks by a granular bait containing hydramethylnon (e.g. Amdro). Regarding IGR baits, wherever possible use those containing pyriproxyfen or fenoxycarb. As noted in Stanley (2004), methoprene may not be totally effective in reducing or eliminating brood production in RIFA, and in some circumstances RIFA queens can eventually overcome sterility effects and resume egg production. Determine length of time between IGR and hydramethylnon bait applications, and number of treatments per year, based on consultation with U.S. and foreign RIFA experts and HI ant experts.

Treatment

ALL areas within the delimited infestation will be chemically treated. Preferred pesticides for treatment are those approved for RIFA use by HDOA (see Appendix 6a). If the infestation is large, aerial application will be used to the fullest extent possible. Aerial broadcast allows greater uniformity of bait application, and is cheaper than hand or vehicle based broadcast when dealing with large infestations. When applying baits adjacent to water bodies, minimize the risk of runoff by applying baits when ants are actively foraging, i.e. when they will collect the bait particles quickly.

1. The preferred treatment for RIFA is to treat with a granular IGR bait containing pyriproxyfen (Distance, Esteem), fenoxycarb (Award) or methoprene (Extinguish), followed within 1-2 weeks by a granular bait containing hydramethylnon (e.g. Amdro). Regarding IGR baits, wherever possible use those containing pyriproxyfen or fenoxycarb (Stanley [2004] noted that methoprene may not be totally effective in reducing or eliminating brood production in RIFA, and in some circumstances RIFA queens can eventually overcome sterility effects and resume egg production). Determine length of time between IGR and hydramethylnon bait broadcasts, and number of treatments per year based on post-treatment monitoring results and consultation U.S. and foreign RIFA experts and HI ant experts. If the infestation occurs in crop or pasture/rangeland, where pesticide labels prevent the use of Amdro or other hydramethylnon baits:
    - If the infestation is relatively large (several thousand hectares), alternative treatment strategies will be employed using pesticides available for use in Hawaii (see Appendix 6b). For instance, a possible treatment for grazed pasture might include broadcast with Esteem (IGR) followed by individual mound treatments with a carbaryl drench. Alternative treatments have not been well tested and may not be as effective as hydramethylnon baits. Post-treatment monitoring results will guide the extent to which alternative treatments are used in a large eradication program.

- If the infestation is less than several thousand hectares, a hydramethylnon bait will be used and the harvest on those lands will be sacrificed for one year as per the pesticide label.

2. Initiate bait treatments only when soil temperature is between 65 and 90 degrees, and the treatment area is free of rain or irrigation for a minimum of 36 hours. If possible, test RIFA acceptance of bait materials by placing a small amount of bait near a known colony where activity has been recently observed. If the material is readily retrieved by foraging RIFA, then treat on that day.

3. Treat all infested areas for three years. Continue to treat all infested areas until post-treatment monitoring detects no RIFA in the infested area for at least two consecutive years.

Post-treatment Monitoring

1. Conduct intensive monitoring in permanent 0.10 ha sample plots. Select plots throughout the treatment area, preferably in a grid-like pattern. Use results to assess treatment effectiveness and to guide future treatment requirements for the larger infestation. Intensive monitoring consists of monthly bait and pitfall surveys, and periodic assessment of IGR effectiveness, as follows:
    a. Bait Surveys
        - Lay 2 protein, and 2 sugar baits per 10m x 10m grid, as described under "Initial Delimiting Survey' #1.

    b. Pitfall Surveys
        - Place 1 pitfall trap at 10m intervals (i.e. 1 pitfall per 10m x 10m grid). Try to place traps such that they will be shaded during the hottest part of the day. Use vials/containers at least 42mm in diameter for traps. Use a 50:50 mix of propylene glycol and water as the preservative in the pitfalls. After adding the preservative, add a drop of dish soap to break the surface tension of the liquid. In order to increase trap catch, bait the rim of the pitfall traps if possible, using blended tuna, or other smelly food product, by smearing around the inside rim of the cup or vial.
        - Let sit for 2-3 days, then collect

    c. Assessment of IGR Effectiveness
        - If applicable, monitor IGR effectiveness via monitoring the shift from worker brood (small larvae and pupae) to reproductive brood (large larvae and pupae with wing pads) in RIFA nests. Assess brood by sampling 3-5 weeks post treatment (see Figure 1). Sample by treating the nest with an approved drench to kill the ants, and then excavating for brood.
        - Sample at least one nest per 10m grid.

d. If RIFA are detected and/or brood assessment indicates IGR treatment was unsuccessful, re-treat.

2. Conduct less intensive monitoring every 6 months in all other areas, i.e. areas that are not permanent sample plots. Less intensive monitoring includes:
    - 1 protein and 1 sugar bait (placed at least 1m apart on the ground) per 15m x 15m (or less) grid. A protein bait consists of a ½" to 1" piece of Spam dipped in peanut butter placed in a 50mm diameter vial or dish. A sugar bait consists of a cotton ball soaked in 20% sugar solution and placed in a 50mm diameter vial or dish. Each vial/dish should come equipped with a tight fitting lid. Small flags or orange chopsticks can be used to mark the bait locations if necessary. On hot sunny days, try to place baits in shady areas (create shade over the trap if necessary, using rocks or other debris).
    - If conditions are ideal, such as a dry, clear, calm day of 70-75^{o}F, let bait sit 1-2 hours, then collect. Less ideal conditions may require the baits to remain overnight. In very warm weather, RIFA workers forage in the evening and night. Baiting activities are not effective if soil temperature is below approximately 65 degrees, or if standing water is present.
    - To collect the baits, simply cap the vials/dishes and deliver to HDOA for identification.
    - Supplement bait surveys with visual surveys of colony activity and foraging ants (see "Visual Surveys" below)

3. Conduct intensive monitoring in plots, and less intensive monitoring of other areas for two years following termination of the treatment program in order to document success.

Visual Surveys:

Search open sunny areas, and areas that have a relatively consistent source of water. These include around the base of trees, next to water bodies (the interface between a swimming pool concrete area and turf, for example), urban areas, green belts, parks, golf courses, and landscaped areas in general.

Look for evidence of soil upwelling or mound building. RIFA mounds are usually found in open, sunny areas. New RIFA colonies do not make a conspicuous mound for several months. Upwelling can be seen before a mound is established. Also look for foraging activity, and, if found, trace the foraging trail back to the colony.

If the treated area has been adequately surveyed before treatment, most colonies will have been identified. After treatment, follow up with visual surveys for colony activity.

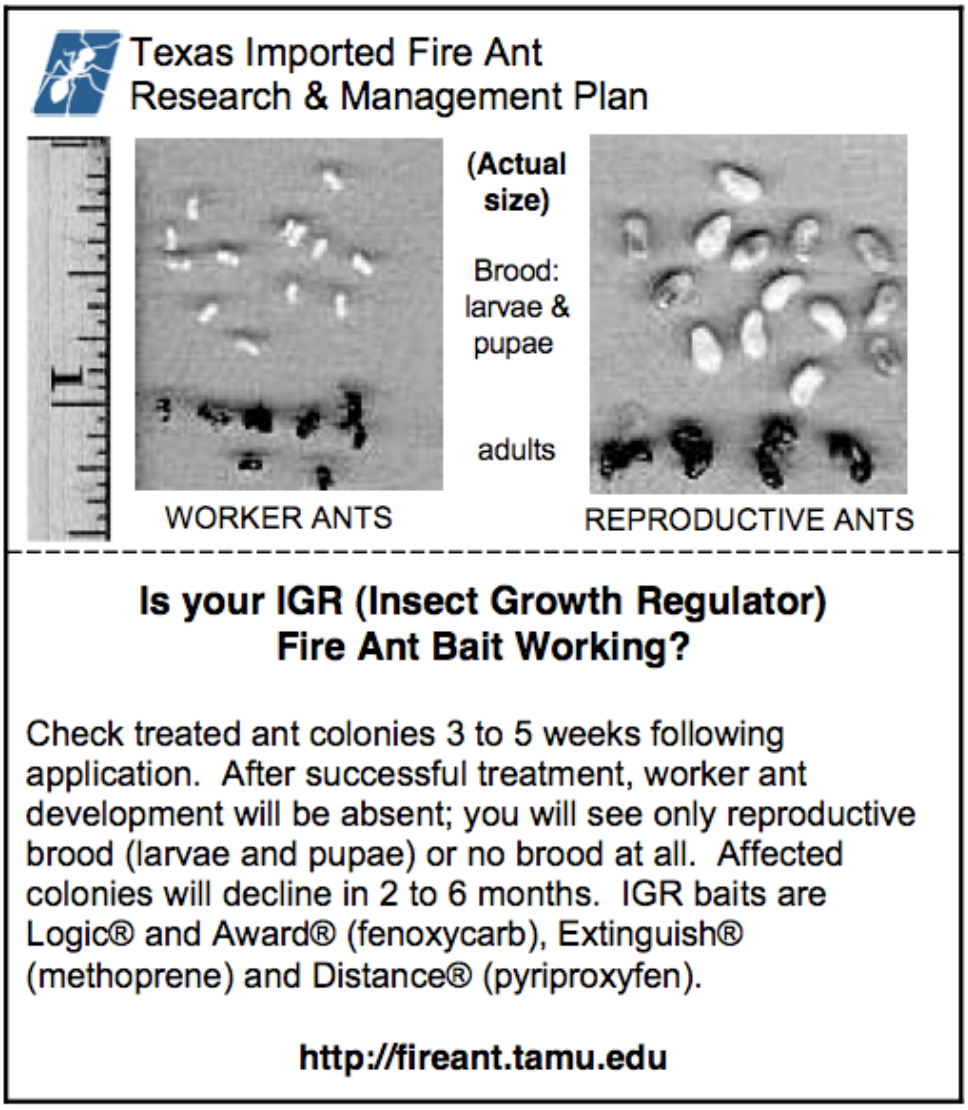

Figure 1: Method for assessing effectiveness of an IGR bait. Taken from *Fire Ant Trails,* Vol. 2(3) Appendix 2. Located on http://fireant.tamu.edu.

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APPENDIX 6a

HAWAII LICENSED AND REGISTERED PESTICIDES
APPROVED FOR USE IN RIFA CONTROL PROGRAMS
July 2007

Baits (Insect Growth Regulators, IGR)

- Award Fire Ant Bait, EPA #100-722, HDOA #9226.243
- Distance Fire Ant Bait, EPA #59639-96, HDOA #9556.73
- Esteem Ant Bait, EPA #59639-114, HDOA #9556.80
- Extinguish Professional Fire Ant Bait, EPA #2724-475, HDOA #9426.455

Baits (metabolic inhibitors)

- Amdro Pro, EPA #241-322, HDOA #9131.71
- Siege Pro, EPA #241-322, HDOA #9131.73

Mound and Nest Drenches

- Prentox Dursban 4E*, EPA #655-499, HDOA #9519.15
- Micro Flo Chlorpyrifos Pro 4 Insecticide*, EPA #51036-154, HDOA #931929
- Bifenthrin Pro Multi-Insecticide Golf Courses/Nursery*, EPA #51036-391, HDOA #9131104
- Dursban 4E Insecticide*, EPA #62719-11, HDOA #97863
- Dursban 50W in Water Soluble Packets*, EPA #62719-72, HDOA #97865
- Chlorpyrifos G-Pro 4 Insecticide*, EPA # 79676-9, HDOA #84173

Balled and Containerized Nursery Stock

- Talstar T&O Granular Insecticide, EPA #279-3130, HDOA #9329.170
- Talstar Nursery Flowable*, EPA #279-3155, HDOA #9329.169
- Talstar Nursery Granular, EPA #279-3130, HDOA #9329.168
- Bifenthrin Pro 0.2% Nursery Granular Insecticide EPA#51036-396, HDOA #9131108
- Wisdom Flowable*, EPA #5481-519, HDOA #952160
- Wisdom Nursery Granular Insecticide, EPA #5481-522, HDOA #952163
- Upstar Nursery Granular Insecticide, EPA #70506-75, HDOA #802629

Broadcast

- Talstar PL Granular, EPA #279-3168, HDOA #9329.161

Foliar Spray

- Talstar GH Flowable, EPA #279-3105-499, HDOA #9454.164
- Talstar Nursery Flowable*, EPA #279-3155, HDOA #9329.169
- Micro Flo Chlorpyrifos Pro 4 Insecticide*, EPA#51036-154, HDOA#931929

- Bifenthrin Pro Multi-insecticide Golf Courses/Nursery*, EPA #51036-391, HDOA #9131104
- Wisdom Flowable*, EPA #5481-519, HDOA #952160
- Dursban 4E Insecticide*, EPA #62719-11, HDOA #97863
- Dursban 50W in Water Soluble Packets*, EPA #62719-72, HDOA #97865
- Chlorpyrifos G-Pro 4 Insecticide*, EPA # 79676-9, HDOA #84173
- Prentox Dursban 4E*, EPA #655-499, HDOA #9519.15

***Restricted Use Pesticide**

APPENDIX 6b

ANT PRODUCTS REGISTERED IN HAWAII WITH CROP, RANGE, ETC USE

July 2007

CROPS

CROP BAITS:

AMDRO PRO FAB (EPA# 241-322, HDOA #913171)

pineapple

Fruit and nut orchard crops (applied in bait stations only)

AWARD FAB (EPA# 100-722, HDOA #9226243)

NONBEARING*:

citrus	carambola
pecans	mamey sapote
peaches	guava
apples	lychee
nectarines	blueberry
plums	avocado
mango	

*can't harvest crop for 1yr post-treatment

CLINCH ANT BAIT (EPA # 100-894, HDOA #9226268)

citrus	walnuts
almonds	potatoes

CONSERVE PROF FAB (CURRENTLY FOR RESEARCH USE ONLY) (EPA # 62719-329-73273, HDOA #85041)

most crops, including but not limited to:

tree nuts	tree fruits
citrus	soybeans
stonefruits	vegetables

ESTEEM ANT BAIT (EPA # 59639-114, HDOA #955680)

Brassica and leafy greens:
broccoli
broccoli Raab (rapini)
brussells sprouts
cabbage
cauliflower
cavalo broccolo
chinese broccoli (gailon)
chinese cabbage (bok choy and napa)
chinese mustard (gai choy)
collards
kale
kohlrabi
mizuna
mustard greens
mustard
spinach
rape greens

Bushberries:
blueberry

Curcurbits:
balsam apple
balsam pear
bitter melon
cantaloupe
chayote
chinese cucumber
chinese waxgourd
citron melon
cucumber
edible gourd
gherkin
Momordica spp.
Muskmelon
pumpkin
summer squash
watermelon
winter squash

Figs

Fruiting veggies:
eggplant
ground cherry

Onion (dry bulb only)

Pasture grass

Pome fruits:
apple
crabapple
loquat
mayhaw
oriental pear
pear
quince

Rangeland

Strawberry

Stone fruits:
apricot
cherry
chickasaw plum
damson plum
fresh plum
japanese plum
nectarine
peach
plum

chinquapin
filbert (hazelnut)
hickory
macadamia
pecan
pistachio
walnut

Tropical & sub-tropical fruits:
acerola
atemoya
avocado
biriba
black sapote
canistel
cherimoya
custard apple
feijoa
guava
ilama
jaboticaba
soursop
spanish lime
star apple
starfruit
sugar apple
wax jambu

Ugli fruit

White sapote

citrus groves
cropland

CROP CONTACT INSECTICIDE INDIVIDUAL MOUND TREATMENTS :
None

PASTURE/RANGELAND

PASTURE/RANGE BAITS:

AMDRO FAB (EPA # 73342-1, HDO #81791)
grazing land used for companion animals only, i.e. horses and other animals not for consumption

AWARD FAB (EPA # 100-722, HDOA#9226243)
grazed areas of horsefarms, only if horses are not used for consumption

CONSERVE PROF FAB (CURRENTLY FOR RESEARCH USE ONLY) (EPA # 62719-329-73273, HDOA #85041)
rangeland and permanent pasture

DISTANCE FIRE ANT BAIT (EPA # 1021-1728-59639, HDOA #955675)
non-grazed pasture and rangeland

ESTEEM ANT BAIT (EPA # 59639-114, HDOA #955680)
pasture and rangeland

EXTINGUISH PROF FAB (EPA # 2724-475, HDOA #9426545)
pasture and rangeland

PASTURE/RANGE CONTACT INSECTICIDE INDIVIDUAL MOUND TREATMENTS:
DREXEL CARBARYL 4L INSECTICIDE (EPA# 19713-49, HDOA #91817)
SEVEN 4F CARBARYL INSECTICIDE (EPA # 264-349, HDOA #952953)
SEVEN BRAND 80 WSP CARBARYL INSECTICIDE (EPA # 264-526, HDOA 9529128)
SEVEN BRAND XLR PLUS CARBARYL INSECTICIDE (EPA # 264-333, HDOA #952962)
SEVEN RP4 CARBARYL INSECTICIDE (EPA # 264-335, HDOA #952957)

WILDLIFE BREEDING AREAS

According to Drees et al 1998, "wildlife breeding areas" are considered nonagricultural lands (unless wildlife/game is to be harvested and consumed), and thus can be treated with products registered for this kind of site. There are many baits registered in Hawaii for nonagricultural use (see Appendix 5d)

NEAR/AROUND WATER

BAITS:

According to Drees et al 1998, because fire ant baits contain very small amounts of active ingredients they can be applied on shorelines close to water, but not directly in the water. Baits should be applied when ants are actively foraging. Baits available for use depend on the use of the land in question.

CONTACT INSECTICIDE INDIVIDUAL MOUND TREATMENTS:
Drees et al (1998) suggest using products with lower toxicity to fish, such as acephate (Orthene).

Reference:

Drees, B. M., C. L. Barr, D. R. Shanklin, D. K. Pollet, and K. Flanders. 1998. Managing Red Imported Fire Ants in Agriculture. Texas Agriculture Extension Service. Publication #6076. Texas A&M University, College Station, TX. 18pp.

APPENDIX 6c

GRANULAR ANT BAITS REGISTERED IN HAWAII AND SITES WHERE THEY CAN BE USED
This is a partial list. Liguids, gels, discontinued registrations, products with limited site use, bait stations, etc. are not included.

HI reg#	EPA reg#	Product	%AI	AI	Indoor use	Around Poultry houses/ animal holding areas	Parks	Noncrop/nonrange	crops	Range/pasture	Nursery	Sod farms	Golf/commercial turf	Recreation areas/turf	Industrial, institutional, and/or commercial	Home (lawn/ornamentals)
9454191	499-370	ADVANCE 375A GRANULAR AB	0.011	abamectin	Y		BIP						BIP		BIP	BIP
9454149	499-370	ADVANCE FORMULA 1	0.011	abamectin	Y		BIP						BIP		BIP	BIP
9200146	352-627	ADVION FAB	0.045	indoxacarb	N		BI	BI					BI	BI	BI	BI
81794	73342-2	AMDRO ANT BLOCK	0.88	hydra-methylnon	N	IP								IP		IP
81791	73342-1	AMDRO FAB	0.73	hydra-methylnon	N	BI	BI	BI		BI[1]			BI		BI	BI
81793	73342-5	AMDRO FAB YARD TRTMT	0.036	hydra-methylnon	N	B	B	B					B		B	B
81798	73342-6	AMDRO FIRESTRIKE FAB	0.036 0.017	hydramethylnon methoprene	N	B	B	B					B		B	B
913171	241-322	AMDRO PRO FAB	0.73	hydra-methylnon	Y	BI	BI	BI	BI[2]St[4]	*	BI[5]	BI	BI	BI	BI	BI
81795	241-322-73342	AMDRO PRO FAK	0.73	hydra-methylnon	N	BI	BI	BI		*	BI[5]	BI	BI	BI	BI	BI
9454127	499-370	ANT BAIT FORMULA 1	0.011	abamectin	Y		BI	BI					BI			BI
9226243	100-722	AWARD FAB	1.0	fenoxycarb	N	BI[7]	BI	BI	BI[8]	BI[6]	BI[5]	BI	BI	BI		BI
9346222	432-1219	FIRESTAR FAB INSECTICIDE	#####	fipronil	N							BI	BI	BI		BI
9226268	100-894	CLINCH ANT BAIT	0.011	abamectin	N	BI[9]		BI[10]	BI[11]							
985652	64240-1	COMBAT FAK GRANULES	1.00	hydra-methylnon	Individual mound treatment - no specific sites given on label											
985637	64240-25	COMBAT OUTDOOR AK	1.00	hydra-methylnon	N											P[12]
85041	62719-329-73273	CONSERVE PROF FAB (RESEARCH USE ONLY)	0.015	spinosad	N	BI	BI	BI	BI[13]	BI	BI[14]	BI	BI	BI	BI	BI
955675	1021-1728-59639	DISTANCE FIRE ANT BAIT	0.50	pyriproxyfen	N			BI		BI[15]	BI[16]	BI			BI[17]	BI
955680	59639-114	ESTEEM ANT BAIT	0.50	pyriproxyfen	N				B[18]	B						
9426545	2724-496	EXTINGUISH PLUS	0.25 0.365	hydramethylnon	Y	BI	BI	BI			BI[5]	BI	BI	BI	BI	BI
9426455	2724-475	EXTINGUISH PROF FAB	0.50	methoprene	Y	BI	BI	BI	BI	BI	BI	BI	BI	BI	BI	BI
923026	73342-2-1663	ANTS TOTAL AKB	0.88	hydra-methylnon	N	BIP	BIP	BIP					BIP	BIP	BIP	BIP
82532	73079-2	INTICE GRANULAR BAIT	5.00	orthoboric acid	Y	BP	BP						BP	BP	BP	BP
9426565	2724-498	MATRIX ROACH& ANT BAIT	2.15	hydrameth. solution	Y		Spot treatment for commercial, industrial and residential sites									
9346257	432-1262	MAXFORCE PROF FINE GRANULE	1.00	hydra-methylnon	Y			BIP			BIP	BIP	BIP	BIP	BIP	BIP

CODES:

B = broadcast, I = individual mound treatment, P = perimeter treatment, St = bait stations
*only in states listed on label; Hawaii is NOT listed

FOOTNOTES:

1= only for companion animals, ie horses and other animals not for consumption
2 = pineapple: broadcast and individual mound treatment
4 = fruit and nut orchard crops: can apply in bait stations
5 = in/around containerized or field grown ornamental and nonbearing nursery stock; can apply to soil around non-bearing fruit/nut tree nursery stock, but can't harvest from them for 1yr post-treatment
6 = on grazed areas of horsefarms, only if horses not used for consumption
7 = on non-grazed/non-crop areas of the farm, including around barns, outbuildings, fence rows
8 = on some non-bearing crops (see label); can't harvest crop for 1yr post-treatment
9 = around chicken houses
10 = around barns and equipment
11 = on citrus, almonds, walnuts, and potatoes
12 = perimeter around homes, garages, and other home buildings
13 = most crops
14 = on ornamentals; also in greenhouses
15 = non-grazed pasture and rangeland
16 = indoor or outdoor container or field grown ornamentals in commerical nurseries; ornamental tree farms; non-bearing nut and fruit trees grown in nurseries
17 = Institutional sites (areas around properties or facilities providing a service to public or private organizations), eg hospitals, schools, office buildings, sport facilities/golf, etc (see label)
18 = on several crops (see label)
19 = could not locate a finalized (non-draft) label

ACTIVE INGREDIENTS:

IGR type: s-methoprene, fenoxycarb, pyriproxyfen
Antibiotic type: spinosad**, abamectin
Othert toxicant types: hydramethylnon, fipronil, idoxycarb, boric/orthoboric acid
**spinosad is classified as an organic substance by the UDSA National Organic Standards Board

EPA REGISTRATION #S

First #series is the company id#; second #series is the product id#; third (and beyond) #series identifies additional distributors

e.g. 73342-1-2724
73342 = company id# 1 = product id#, for that company 2724 = additional distributor of the product (under a different product name)

APPENDIX 6d: PESTICIDES FOR WHICH HAWAII REGISTRATION IS NEEDED

REGISTRATION IN HAWAII SHOULD BE SOUGHT FOR THE FOLLOWING, IN ORDER TO ALLOW FOR A FULL SET OF TOOLS WITH WHICH TO RESPOND TO A RIFA INVASION:

BROADCAST ANT BAITS NOT REGISTERED IN HI:				Ind	Ar ou nd	Par	Nor	crol	Ran	Nur	Sod	
62719-304	Conserve FAB	0.015	spinosad	N								
62719-304-829	Payback	0.015	spinosad	N								
432-1433	Maxforce FC FAB	0.00045	fipronil	N							BI	I
432-1219	Ceasefire FAB	0.00015	fipronil	N							BI	I
62719-329	Conserve Prof FAB[1]	0.015	spinosad	N	BI	BI	BI	BI[2]	BI	BI[3]	BI	I

BROADCAST CONTACT INSECTICIDE GRANULES (NOT REGISTERED IN HI)												
7969-212	Over 'n Ou	fipronil	0.0103	fipronil	N							
432-896	Choice	fipronil	0.1	fipronil	N		*				*	
432-1217	Topchoice	fipronil	0.0143	fipronil	N		*				*	
432-1420	Topchoice S	fipronil	0.0103	fipronil	N		*				*	

CODES

B = broadcast, I = individual mound treatment, P = perimeter treatment, St = bait stations
*only in states listed on label; Hawaii is NOT listed

FOOTNOTES

1 = this product is currently registered in HI for research use only
2 = most crops
3 = on ornamentals; also in greenhouses

Appendix 6e

Labels Available for Use in Federal IFA Quarantine 2007

CHEMICAL	PRODUCT LABEL	MANUFACTURER/	USE IN QUARANTINE
Bifrenthrin	Talstar® Nursery Granular Insecticide	FMC Corp	containers
	Bifenthrin Pro 0.2% Nursery Granular Insecticide	Micro Flo Company	containers
	Talstar® Nursery Flowable Insecticide/Miticide	FMC Corp	containers
	Wisdom Nursery Granular Insecticide	Amvac	containers
	Bifenthrin Pro Multi-Insecticide Golf Courses/Nursery	Micro Flo Company	containers
	Cross Check GC Flowable Insecticide	Lesco	containers
	MenaceTM Nursery Granular	Nufarm	containers
	MenaceTM GC 7.9% Flowable	Nufarm	containers
	UP-Star® Nursery Granular	United Phosphorus	containers
	WisdomTM Flowable Insecticide	Amvac	containers
	Quali-Pro Bifenthrin Nursery 7.9F	Farmsaver	containers
	Attain Nursery CA Insecticide/Miticide Microemulsion	Whitmire Micro-Gen	containers
Chlorpyrifos	Dursban® 50W	Dow AgroSciences	sod
	Chlorpyrifos Pro 2 Insecticide	Micro Flo Company	B&B/containers
	Chlorpyrifos Pro 4 Insecticide	Micro Flo Company	B&B/containers
	Dursban® TNP*	Vericon/ formally U	B&B/containers
	Dursban® 4E Insecticide*	Prentiss Inc.	B&B/containers
	Dursban® 2.32 G Granular Insecticide*	Prentiss Inc.	field grown
	Dursban 2.5 Granular Insecticide	Southern Agricultur	field grown
	Chlorpyrifos G-Pro 2	Gro-Pro LLC	B&B/containers
	Chlorpyrifos G-Pro 4	Gro-Pro LLC	B&B/containers
	Quali-Pro Chlorpyrifos 4E	Farmsaver	B&B/containers
Diazinon	check to see if HI has a FIFRA section 24© exemption to use this product		
Fenoxycarb	Award® Fire Ant Bait	Syngenta	field grown/IFA-free
Fipronil	Chipco® Choice™	Bayer	sod
	Chipco® TopChoice™ Insecticide	Bayer	sod
Hydramethylnon	Amdro® Pro bait	BASF Corp.	field grown/IFA-free
	Siege® Pro bait	CB Prof. Prod/Wate	field grown/IFA-free
	Others may be available, check label for nursery use language		
Methoprene	Extinguish® bait	Zoecon/Wellmark I	field grown/IFA-free
Pyriproxyfen	Distance® Fire Ant Bait	Valent	field grown/IFA-free
Tefluthrin	Fireban Granular Ornamental Insecticide*	Uniroyal	containers

***No longer available; existing supplies can be used**