

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

**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).

Whereas numerous invasive ant species are potential invaders of Hawaii, the red imported fire ant (*Solenopsis invicta*) seems to pose the most immediate and obvious threat. This notoriously destructive and aggressive stinging ant poses a serious threat not only to biodiversity, but also to human and animal health, the economy, and quality-of-life in Hawaii. Dispersed primarily through human commerce, it has invaded over 300 million acres in the southern United States since the 1930s despite federal imported fire ant quarantine measures. Recently established in California, red imported fire ants (RIFA) may likely become the next major pest invasion in Hawaii due to the huge quantities of goods shipped to Hawaii from California. RIFA is notoriously difficult to eradicate once established. RIFA was recently (February 2001) discovered to have crossed the Pacific ocean and successfully established colonies in Australia and New Zealand.

In infested areas, RIFA threatens injury or death to humans, livestock, pets, and wildlife, and damages crops, plants, electrical equipment, and irrigation systems, causing damages of over \$1 billion annually across the southern United States. RIFA's effects on biodiversity in invaded habitat in North America are exceptionally well-documented (Wojcik et al 2001). If this ant is allowed to become established in Hawaii, it will no doubt cause disastrous economic and ecological impacts that are, at the very least, equal in magnitude to those predicted for the much-feared Brown Tree Snake. In Hawaii, economic impacts can be expected to be at least similar to those for the mainland, if not more severe, due to the extensive outdoor recreation and tourist industries, and mild climate in Hawaii.

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, using a multi-agency approach, with special attention to RIFA.

## Literature Cited

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## **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 involving prevention, detection, rapid response, enforcement, and public outreach to minimize RIFA risk to Hawaii. Therefore, the contents of three of the five elements below specifically address RIFA. Actions will be 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**

- 1. Prevention** - To prevent as many RIFA/ant introductions as possible
- 2. Detection** - To detect any RIFA introductions (incipient populations) promptly, before they become established
- 3. Response** - To respond to and eradicate all detected RIFA introductions immediately
- 4. Enforcement** - To strictly enforce all laws/regulations concerning quarantine/inspection/transport of goods and all action plan strategies and guidelines.
- 5. Public Outreach** - To educate the public about RIFA, so the public knows what RIFA is, what it does, why we want to do all we can to keep it out, and how to identify and report potential RIFA encounters. And, have a continued program established to maintain public interest/knowledge.

## **RECOMMENDED MINIMAL PREVENTION MEASURES:**

### **ELEMENT 1: PREVENTION**

The operational program that is implemented will involve both state and federal agencies, with the Hawaii Department of Agriculture (HDOA) taking the lead for domestic prevention actions and the U.S. Department of Agriculture (USDA) taking the lead for international prevention actions. Due to the complexity and constraints of the legal framework associated with prevention, this element consists of both policy actions and quarantine actions. The quarantine actions recommended here are done so under the assumption that the necessary policy actions are implemented.

1. All available information pertaining to pathways of ant/RIFA introduction will be collected by HDOA and University of Hawaii, Pacific Cooperative Studies Unit (UH-PCSU) staff, and summarized by UH-PCSU staff for use by state and federal quarantine programs in Hawaii. Information will include that gathered for RIFA from federal and state records and data, and the scientific literature. The document produced, and the details of the subsequent interception program developed, will be dynamic, with changes made as the transport of commerce and ant/RIFA pathways change. Initially, we are making the assumption (subject to reassessment) that the U.S. mail, a pathway that poses formidable detection and legal problems, is not a significant pathway for ants capable of reproduction.
2. HDOA will establish pre-entry treatment protocols effective for eliminating ants for all agricultural items entering Hawaii from the U.S. mainland. USDA, in consultation with HDOA, will do the same for international shipments entering Hawaii, or entering the continental U.S. but with Hawaii as final destination. Regulations will include requirements for use of the latest ant retarding technologies for packaging/ transporting/ treating goods entering Hawaii (for example, drenching soil of potted plants with appropriate insecticides, or equivalent methods).

3. HDOA will work with industries/activities identified by #1 as potential pathways to minimize shipments of infested material to Hawaii as well as to intercept any arriving shipments escaping the preventive protocols. Economic and regulatory incentives to ensure compliance will be explored.
4. HDOA/USDA will establish a policy of "no new ant species allowed" on any goods/persons, domestic or foreign, entering Hawaii. Should a colony of these ants be found on any goods/persons entering Hawaii, the infected material will be treated (using an appropriate pesticide drench or equivalent effective method) or the ants removed and killed, before the goods are allowed to enter Hawaii. "New ant species" will be defined as any ant species not currently established and widespread in Hawaii. A "colony" will be defined as either 1) ants that include the presence of brood (eggs, larvae, or pupae) or reproductive adults; or 2) the presence of ant workers in a commodity in which 100% inspection (to confirm the presence or absence of brood and/or reproductive adults) is not possible.
5. HDOA and USDA will establish qualified inspection teams 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.
6. Violations of import/quarantine/ant regulations will be considered serious, and appropriate measures taken. In addition, as needed, HDOA and its collaborators will push for revised or additional statutes with more stringent penalties for violations. However, in most cases, holding of commodities provides ample incentives for compliance.
7. The Hawaii Ant Group/HDOA will coordinate/conduct public outreach activities, with the aim of creating a knowledgeable public and gaining support for ant/RIFA prevention actions.

#### **ELEMENT 2: DETECTION**

HDOA, in cooperation with the Hawaii Department of Health (HDOH), will take the lead for detection actions (for details of arrangements/responsibilities, see Appendix 1 - Red Imported Fire Ant Detection Protocol). Detection will be implemented through HDOA/HDOH personnel actions, through cooperative actions with state (Department of Land and Natural Resources - DLNR) and federal (National Park Service, Fish and Wildlife Service, U.S. military) agencies, with interagency groups (Island Invasive Species Committees — ISCs, on Maui, Molokai, Hawaii, Oahu, etc.) and through reporting actions by a knowledgeable public.

1. HDOA will conduct biannual (2 x per year) inspections of all nurseries (certified and cooperating uncertified), using proven detection technologies (i.e. spam bait; venom baits, once developed). Inspection staff will be increased to meet the increased workload requirements.

2. The Hawaii Ant Group and HDOA/HDOH, with input from others, will develop effective RIFA reporting protocols for different community groups (i.e. physicians/health workers, pest control operators, state and federal agency personnel, longshoreman, airport personnel, and the general public).

3. HDOA will increase their staff so as to have two survey entomologists in each of the three smaller counties, and four survey entomologists in the larger Hawaii County. These staff will regularly survey high-risk areas such as construction sites, landscaped sites, and areas surrounding airports and cargo warehouses (etc.), using the best detection technologies available. Potential RIFA reports from all sources will be responded to promptly. Surveys will be conducted via baiting, trapping, visual searches, and other appropriate method(s). Survey staff can also survey for other pests, though RIFA and *Wasmannia* will be their first and second priorities, respectively.

4. HDOA will coordinate with other 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.

5. HDOA will bolster their survey program through annual application to the USDA Fire Ant Quarantine program for federal funding for RIFA surveys. In FY2001, \$2.2 million was available for RIFA surveys nationwide. In addition, the Hawaii Ant Group will work with state and federal lawmakers to obtain appropriation of (or identification of source for) additional funds needed for RIFA detection.

6. The Hawaii Ant Group and RIFA plan cooperators will work to get state-wide implementation of a school curriculum that, in addition to covering RIFA awareness, involves surveying of ants by students and protocols for reporting pertinent results of surveys to HDOA/HDOH.

### **ELEMENT 3: RESPONSE**

HDOA, in cooperation with HDOH, will take the lead on rapid response activities. The exact arrangement/responsibilities will depend on circumstances such as location of the RIFA site, and the extent of commitment of either agency to other emergencies at the time of the RIFA detection. Rapid response activities will be implemented by field personnel in one or more of the following groups: HDOA, HDOH, HDOT, HDLNR, ISCs. HDOA/HDOH will be responsible for compliance with state environmental regulations. Details of the arrangement/responsibilities of all involved agencies will be worked out amongst these agencies and incorporated into the plan. Any issues amongst the agencies that need to be solved will be identified and brought to the attention of the Hawaii Ant Group for discussion of solutions.

1. HDOA/HDOH field personnel will have the assigned responsibility of RIFA eradication, including population delineation, initial treatments, and follow-up monitoring and treatments (the specific roles of each agency to be determined). 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. In the event RIFA is detected, HDOA will declare it as a species for eradication. This designation allows personnel to obtain a court order to access/treat land without owner permission, if needed. 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. The possibility of obtaining legal authority for HDLNR employees will be investigated.

3. Treatment strategies to be used for RIFA eradication by the assigned field crew will be developed in consultation with USDA and state authorities prior to need (for the preliminary draft of this document, see Appendix 2 – Red Imported Fire Ant Treatment and Post-treatment Protocol). Treatment strategies will include those under different size (for example: <1 acre infested, 2 acres infested, greater than 5 acres infested); and land use (for example: pasture, ornamental turf, nursery, etc.) scenarios. Strategies will be adjusted and amended as necessary by the Hawaii Ant Group and/or HDOA/HDOH as new technologies are developed and tested. Also to be developed by these authorities will be the definition and/or guidelines to be used to declare RIFA “successfully eradicated” or areas “RIFA-free”.

4. A rapid RIFA survey program (to be used in the event of a RIFA detection) will be developed in consultation with USDA and state authorities (for the preliminary draft of this document, see Appendix 2 – Red Imported Fire Ant Treatment and Post-treatment Protocol). The program will include a recommended maximum time frame during which RIFA surveys will be completed within the initial RIFA detection area. The program will be adjusted and amended as necessary by the Hawaii Ant Group and/or HDOA/HDOH as new technologies are developed and tested.

5. In the event RIFA is detected, treatment strategies (as developed under #3 of this section) and rapid RIFA detection surveys (as developed under #4 of this section) will commence immediately.

6. If RIFA is detected in an area that cannot, according to label, be treated by the pesticides listed in #3 of this section, HDOA/HDOH will apply for a federal crisis exemption for the use of these pesticides in such an area, and will immediately pursue application for a longer term quarantine exemption (or public health exemption, if necessary). All data/information that will potentially be needed when applying for these federal exemptions (for the use of necessary pesticides in various situations) will be gathered into information packets. These information packets will be put together prior to any actual need (i.e. prior to any detection), and will be kept by appropriate lead personnel at both HDOA and HDOH.

7. Emergency exemptions for the use of Amdro in crops for treatment of *Wasmannia* will be explored.

8. Prior to actual need, the availability of pesticide application equipment and training/licenses needed for use of pesticides identified in #3 of this section, will be assessed and, if needed, acquired by the RIFA response field crew.

9. In the event RIFA is detected, HDOA shall consider quarantine to contain the infestation. If appropriate, an interim rule will be implemented to address the immediate quarantine needs of the situation. Some high-risk pathways may require inter-island quarantine until eradication is confirmed (as defined under #3 of this section). If the ants are found in a nursery, that nursery will be decertified (to stop them from shipping off island) until the nursery is determined to be RIFA free (as defined under #3 of this section).

10. Prior to actual need, quarantine/containment regulations pertaining to the movement of materials that are known or probable RIFA pathways (for example, soil and mulch) will be developed.

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

#### **ELEMENT 4: ENFORCE**

HDOA will take the lead on enforcement actions. Enforcement of regulations associated with ant prevention will be implemented by state and federal personnel having the appropriate legal authority to do so. Penalties are largely already in place.

1. As needed, HDOA and its collaborators will push for revised or additional statutes with more stringent penalties for violations of import/quarantine/ant regulations.
2. All ant prevention regulations will be strictly enforced.

#### **ELEMENT 5: PUBLIC OUTREACH**

The Hawaii Ant Group will take the lead on outreach activities. Outreach will be aimed at educating the public and other stakeholders about RIFA identification and impacts to the extent that they can serve as an effective part of an early detection system, and can make informed decisions regarding RIFA prevention 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 RIFA curriculum, being developed via Maui's Na Kumu Project, will be refined and tested in local schools. The curriculum will be expanded to include a RIFA version of the ant survey activity currently being tested (with positive results) in the schools of Hilo, Hawaii.

2. The UH-PCSU entomologist assistant will develop and deliver outreach materials, such as information sheets, brochures, posters, news articles, and presentations. Materials will address RIFA identification, biology, and impacts, and 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. HDOH will send out RIFA information to all physicians in the state through their Epidemiology Branch.
3. Bishop Museum personnel will maintain the Hawaii Ant Group web page, and develop and incorporate a RIFA web page as a public RIFA information source. Bishop Museum has already included and will continue to include ants/RIFA in their periodic public education events aimed at increasing awareness of invasive species issues.
4. The Hawaii Ecosystems at Risk (HEAR) project will incorporate more extensive “ant” (including RIFA) information on its web site.

**APPENDIX 1**  
Red Imported Fire Ant  
Detection Protocol

Instructions

RIFA Detection Coordinators will notify targeted agencies/parties about RIFA, provide any resources needed, field any calls and inquiries about RIFA, conduct the initial investigation of RIFA sightings or stings, and refer positive RIFA reports to Neil Reimer at 586-0844 (HDOA-PQ).

**RIFA Detection Coordinators**

Ron Heu at 973-9528 (HDOA-PPC) for general public, UH-CES agents, HARC, and USDA-SCS.

George Kitaguchi at 831-6767 (HDOH-Vector Control) for private/public physicians

Neil Reimer at 586-0844 (HDOA-PQ) for military, DOT (airports/harbors/highways) and private air/sea cargo handlers and maintenance crews.

Betsy Gagne at 587-0063 (DLNR) for Federal and State parks and watershed areas.

Alternative number for any potential sightings is the HDOA pest hotline 586-PEST (586-7378). Additional HDOA contact numbers for each island are: Honolulu 837-8413, Hilo 974-4141, Kona 326-1077, Kahului 873-3555, and Kauai 274-3069.

**Procedures**

Reports of RIFA will initially be investigated by the RIFA Detection Coordinator/Agency. Procedures are to: 1) collect samples, 2) examine samples under a microscope, and 3) if the find is suspected to be RIFA, submit samples to Bernarr Kumashiro (HDOA-PPC, 973-9534) or Neil Reimer (HDOA-PQ, 586-0844).

**APPENDIX 2**  
Draft Red Imported Fire Ant  
Treatment and Post-treatment Protocol

Treatment of Red Imported Fire Ant (RIFA) infestations will be exclusively by chemical means. There are no biological control agents or other techniques available that have the efficacy to achieve the necessary level of control or eradication. This treatment protocol has been developed for use by the involved agencies as mandated in the RIFA Action Plan.

Treatment occurs when an ant sample has been confirmed by HDOA to be *Solenopsis invicta* (RIFA). A pre-treatment survey, followed by treatment of all nests, and post-treatment monitoring will be carried out for each confirmed RIFA infestation.

**Pre-Treatment Survey Protocol:**

The pre-treatment survey will consist of both visual and baiting techniques to determine the extent of the infestation.

A visual survey would be to look at areas that have water on a consistent basis, such as around the base of trees, next to water bodies (the interface between a swimming pool concrete area and turf, for example), and looking for evidence of soil up-welling or mound building. RIFA mounds are usually found in open, sunny areas such as lawns, pastures, or fields. New RIFA colonies do not make a conspicuous mound for several months. Up-welling can be seen before a mound is established.

On a warm, sunny day, ant foraging activity can be observed, and the foraging trail can be traced back to the colony. Urban areas, green belts, parks, golf courses, and other areas that have a water source are likely areas for establishment of RIFA.

A more intensive survey would include placing baits to attract foragers, retrieving them at an interval from one hour to overnight. The most effective bait used for detection efforts is SPAM, cut in small portions (approximately one half to one inch square), and placed in an area to be surveyed at intervals of 50 feet or less. If the survey is large, small flags or orange chopsticks can be used to mark the bait locations. Baiting activities are not effective if soil temperature is below approximately 65 degrees, or if standing water is present. If conditions are ideal such as a dry, clear, calm day of 70 to 75 degrees, baits can be retrieved in one to two hours. Less ideal conditions may require the baits to remain overnight. In very warm weather, RIFA workers forage in the evening and night.

All RIFA nests should be flagged, mapped, and gps coordinates recorded.

### **Treatment Protocol:**

For optimal results, all nests within the treatment area must be treated. Prior to initiating treatments, a thorough survey of the area must be conducted and detection sites recorded as noted above. Factors affecting determination of the treatment area size include the following: type of site (private property, nursery, business park, etc.), method and history of introduction (if known), proximity of site to natural barriers such as dry areas, water bodies, etc., and man-made barriers.

Granular bait treatments using a metabolic inhibitor or Insect Growth Regulator (IGR) are the treatment methods of choice for RIFA (see Appendix 2a). These materials can be distributed by broadcasting over entire areas or small applications can be made to individual mounds. Broadcast spreaders range from small hand-held units to larger hopper units. If reproductive adults are found, a soil drench should be applied to the colony to quickly kill the reproductives and prevent local spread.

Both a metabolic inhibitor, such as Amdro (hydramethylnon), and an IGR, such as Distance (pyriproxyfen) will be used to treat RIFA colonies. If the metabolic inhibitor is used first, the IGR application will follow at least six weeks later. If the IGR is used first, the metabolic inhibitor will follow within one to two weeks. The local conditions will dictate which material is used first. Treatment should be initiated 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. RIFA acceptance of bait materials should be tested 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 treatment should occur on that day.

### **Post-Treatment Survey Protocol:**

If the treated area has been adequately surveyed before treatment, most colonies will have been identified, and follow-up surveys can consist of a visual survey for colony activity. Follow-up surveys methods should be conducted as in the pre-treatment survey. To be reasonably sure the area is free of RIFA, surveys should be performed for two years following treatment. Spam bait surveys should be conducted for a higher level of confidence.

Follow the colonies for six to eight weeks after treatment. Within a predetermined time frame, morning or afternoon, and within similar daytime temperatures, visually determine worker numbers for three to five minutes and compare to previous such counts to determine if worker numbers are declining. If the colonies have not died out, follow pesticide label instructions regarding retreatment schedules for the expected results. When workers are no longer found, proceed with Spam baiting survey.

The Spam baiting shall be done when air temperatures are between 70 and 90 °F. Baits are placed for only two to three hours and then retrieved, noting the presence or absence of RIFA. In orchards, bait every other tree in every other row. In golf courses, parks,

median strips, etc., bait at the south base of trees and other sites where colonies were found in the past. The precise density of baits will be dependent on the area to be baited, but one bait every 50 to 100 feet may be a useful density. In urban areas use one bait per property, if appropriate, and place the baits where colonies were found in the past such as bases of trees, in raised flower beds, etc. If RIFA are found, re-treat and repeat monitoring protocol. If no RIFA are found, return and repeat the baiting protocol the next year.

This protocol does not contain an exact bait density but relies on the detection staff to exercise their judgment in each situation.

### **Summary of Treatment Protocol:**

1. Confirm identification of suspected *Solenopsis invicta* find with HDOA.
2. Spot-treat the nest(s) with Amdro unless winged forms are observed, then use an approved drench.
3. Conduct Pre-treatment survey to determine infested area, as outlined in protocol.
4. Treat infested area, as defined in protocol.
5. Conduct post-treatment surveys for 2 years after treatment
  - a. Monitor known nests for 6-8 weeks after treatment. Retreat infested area according to label if ants are present after 6-8 weeks and monitor for another 6-8 weeks.
  - b. Monitor infested area at 6 month intervals for 2 years after the last treatment. Infested area should be free of *S. invicta* for 2 years.

### **Appendix 2a: Hawaii Licensed and Registered Pesticides Approved for use in RIFA Control Programs.**

#### 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

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

All Pro Dursban 4E, EPA #769-699, HDOA #9135.90

Prentox Dursban 4E, EPA #655-499, HDOA #9519.15

Talstar Nursery Flowable EPA #279-3155, HDOA #9329.169

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

Broadcast

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

Foliar Spray

Talstar GH Flowable, EPA #279-3105-499, HDOA #9454.164