Pest Management Alliance Project Final Report
Ag. No. 01-0190C; 3/01/02 – 2/28/03
Third Year of a 3 Year Project

Pest Management Alliance For The Containerized Nursery Industry

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Disclaimer. The statements and conclusions in this report are those of the contractor and not necessarily those of the California Department of Pesticide Regulation. The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed as actual or implied endorsement of such products.

Acknowledgments. We thank the participation in this project of the following containerized plant nurseries: Tree of Life Nursery, San Juan Valley, Orange Co.; El Modeno Gardens, Irvine, CA; Don's Wholesale Nursery, Anaheim; Sakaida Nursery, Trabuco Canyon; Color Spot Nursery, San Juan Capistrano; Skypark Nursery, Anaheim; the Pardee Tree Nursery, Bonsall; and Bordier's Nursery in Irvine. We also thank the South Coast Research and Extension Center, University of California, for use of their facilities for meetings and ongoing projects. We thank the California Association of Nurseries and Garden Centers for their participation in the Sept. 18, 2002 Horticulture Research and Education Conference.

This report was submitted in fulfillment of DPR Ag. No. 01-0190C, "Pest Management Alliance For The Containerized Nursery Industry," under the sponsorship of the California Department of Pesticide Regulation. Work was completed as of February 28, 2003.

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Executive Summary

The Pest Management Alliance (PMA) for the containerized nursery industry has 5 main goals:

1. To encourage statewide adoption of reduced-risk, IPM practices by containerized nursery owners.
2. To expand and strengthen dissemination of IPM information to nursery growers.
3. To substantiate cost-effective reduced-risk practices through the use of demonstrations.
4. To develop reduced risk strategies that legally certify nursery shipments free of red imported fire ants.
5. To encourage water management practices that reduce pesticides and fertilizers in run off.

To meet these goals, the PMA had 4 major objectives. The **first major objective** was to find alternatives to the use of organophosphates and carbamate insecticides to control ants. Our accomplishments for this objective include:

1. The demonstration of improved methods of monitoring for red imported fire ants (RIFA), *Solenopsis invicta* Buren, in nurseries. Improved monitoring means that pesticides are used only when the pest is found, thereby reducing the use of pesticides. We chose nurseries that had been positive for RIFA. Our first monitoring method at the Tree of Life Nursery (Fig. 1) involved the placement of protein and sugar water bait stations every 20 ft in a grid pattern around the nursery. We did this monthly for 12 months and recorded all species of ants that we found. We never found RIFA subsequent to the original infestation, thereby preventing the application of pesticides every 3 months, as the state quarantine usually requires. We thus avoided the use of pesticides on 36 acres at this nursery during the year of monitoring. We have demonstrated that effective monitoring can substitute for quarterly broadcast pesticide applications.

   At 4 other nurseries in Orange Co. we did intensive monitoring for RIFA around new infestations. Our method of placing monitors in the pattern of a wheel around the find (Fig. 2) showed the extent of the infestation in each case, thereby justifying the use of pesticide in a small area around the infestations. These data have helped persuade state quarantine officials that monitoring for fire ants is reliable. Therefore, the requirement for quarterly broadcast of pesticides in nurseries has been relaxed and only the immediate vicinity of the infestation needs to be treated.

2. Evaluating possible alternatives to organophosphate and carbamate insecticides currently used for RIFA control. All nurseries infested with RIFA are immediately treated. Thus, to evaluate new products we ran several long-term studies at golf course communities in the Coachella Valley (Figs. 3 and 4). We have demonstrated that a new pesticide, fipronil, is effective against fire ants in California. This product has a much longer residual effect than other pesticides, thus reducing the frequency of treatments (once a year instead of 4 times a year, according to experts who have tested it in other states). The fipronil does not require turning off irrigation, as do other fire ant products. Fipronil will soon be on the market in California and will be available for fire ant control.

   In the laboratory we have also successfully shown the efficacy of 4 liquid toxicants for use in fire ant bait stations that avoid any ground contamination with pesticides. These toxicants will be field tested as sites in nurseries or golf courses are available. We have also evaluated 4 drench alternatives for potted soil for ant control. As we find promising materials we will lobby the USDA for changes in regulations regarding soil incorporation of pesticides.

The **second objective** was to help reduce the amount of insecticide runoff from nurseries. The fire ant quarantine at plant nurseries requires that bifenthrin or chlorpyrifos be added to potting soil to prevent colonization of fire ants. These products have been detected in water runoff from nurseries operating under the California Department of Food and Agriculture compliance program. Chlorpyrifos is an identified pollutant that has been found in various water bodies in the state and is a listed pollutant in the Newport Bay/San Diego Creek watershed total maximum daily load (TMDL), which is in the fire ant quarantine area. The initial task was to set up a nursery site to demonstrate the protection of surface and groundwater quality (El Modeno nursery). Pesticide runoff has been significantly reduced, with bifenthrin concentrations being reduced by over 90% (Table 4). The second phase was then to have grower forums and workshops to demonstrate these practices. Many lectures, seminars, and workshops have included information fulfilling the objectives of the PMA grant (see Table 7).

For the third year we added a **third major objective:** Improved Weed Management in Nursery Production. The first task here was the use of sub-irrigation for weed management in ornamental plant production systems. We demonstrated the effect on weed production using different irrigation systems (Figs. 8-12, Tables 5,6).

Our **fourth major objective was** developing a website and newsletter for the PMA, as well as outreach efforts to disseminate information. We have set up a committee and workgroup to develop the web site, and have entered into a contract for its development. An agreement has also been reached with the California Association of Nurserymen (CAN) to host the website on their server. Two of the web pages are re-printed in Appendix I and the first newsletter is reprinted as Appendix II.

Objective I. Alternatives to organophosphates and traditional pesticides.

Task 1. Improving Monitoring Techniques for Red Imported Fire Ants

A. Tree of Life nursery.

Two ant-monitoring techniques were employed at the Tree of Life Nursery in San Juan Valley to determine if native and invasive ant species were on the property. Tree of Life Nursery is situated on 36 acres of which 20 are in actual production (Fig. 1). RIFA, *Solenopsis invicta* Buren, were discovered on the property on November 1999, and the nursery has been monitored ever since. This nursery is also special because it specializes in plants for restoration projects and tries to maintain the property free of Argentine ants, *Linepithema humile* (Mayr). Consequently, this nursery was an ideal site for demonstrating various ant-monitoring techniques.

Initially the property was inspected by CDFA. Their monitoring technique is as follows: Approximately 3 g of Spam luncheon meat is placed in a small plastic cage. The cages are staked into the ground approximately every 50 ft in a grid (20 bait stations per acre) in areas suspected of having *S. invicta*. The monitor stations are placed out in the early morning about 0900 hours and the species of ant feeding on the Spam are recorded after 4-5 hours. The monitoring system is qualitative and no attempt is made to determine the number of ants present. Properties that are positive for *S. invicta* are monitored every 3 months as part of the Quarantine Procedure. Table 1 shows the species that CDFA identified at this location.

Pesticides were applied to the one location that had RIFA. Instead of treating the entire nursery, as normally required by the quarantine protocol, we received permission to substitute intensive monitoring of the nursery for wide-scale pesticide application. We placed 148 bait stations in a grid pattern along the rows of the nursery (see Fig. 1). We used two monitoring techniques to determine the presence of RIFA and other ant species, to look for seasonal patterns in bait attractiveness to the ants, and to see whether one technique was more sensitive than the other. Each station had one protein and one sugar water bait,

placed side by side. The baits were covered with clay pots to protect them from water and animals. For the protein bait we used 9 Lives Cat Food ground to 18 mesh particle size; we filled a 15 ml tube approximately half way with the food. Next to it we placed vials of sugar water. Using liquids to monitor ant activity is based on a technique developed by Reierson *et al.* (1998) to monitor Argentine ant foraging activity. Conical vials containing 13 ml of 25% sucrose water are placed on pedestals. The vials are covered with an inverted clay pot to protect them from irrigation and wild animals. The vials containing sugar water were placed out next to the solid baits and retrieved after 24 hours. The number of ants at each station and the species was recorded. The Tree of Life nursery was monitored monthly for one year.

Results. Table 1 shows the species originally found by CDFA with their Spam baits. Table 2 shows the numbers of ants collected at either the sugar water (L) or the cat food (S), and Table 3 shows the number of monitors positive for each species. The sugar water vials collected significantly more ants than did the solid baits for *Dorymyrmex bicolor* and *D. pyramidis*, *Tapinoma sessile*, *Formica pilicornis*, and *Solenopsis xyloni*. Neither bait was effective in sampling *Pogonomyrmex occidentale, Solenopsis molesta,* or *Cardiocondyla ectopia*.

The sugar water baits were extremely effective in determining if *D. bicolor*, *T. sessile*, *F. pilicornis*, and *S. xyloni* were present throughout the year (Table 3). Only on rare occasions were ants collected at the solid bait and not at the sugar bait. *S. xyloni* was frequently found on both baits, especially during summer months. In the winter months, the sugar water baits were the most effective for the species responding to either bait.

Our intensive monitoring of this location avoided wide-scale application of pesticides. It demonstrated that sugar water is a very effective monitor for many ant species any time of the year.

B. Wheel method for monitoring fire ants at nurseries.

One of the goals of monitoring for fire ants is delimiting the location of the ants in positive nurseries. Pesticide treatments can then be put only in those areas that have the ants. We designed a "wheel method" of monitoring fire ants where ant monitors are placed around a known infestation in the form of a wheel with 8 spokes (Fig. 2). The center of the wheel corresponds to the known ant colony and sugar water and luncheon meat monitors are then placed every 10 ft along the spokes of the wheel. We left the monitors for 24 hrs and then recorded where we found RIFA. In this way we got a precise picture of the infestation and the distance the ants were foraging. We tried this method at 4 nurseries: Don's Wholesale Nursery, Sakaida Nursery, Color Spot Nursery, and Skypark Nursery, all in Orange Co.

Results. We placed a total of 145 monitors in these 4 nurseries. We found RIFA either at or within 1 ft of the monitors at 18% of the bait stations. However, sugar water missed 27% of known RIFA locations, and the luncheon meat missed 38% of known RIFA locations. The meat and sugar water side by side only missed 12% of known RIFA locations. Thus, the two monitors together were more successful than either one alone. Finally, there were 160% more ants at the sugar water than the meat monitors. Thus we have shown that a sugar water and protein bait together is more efficient than either one alone.

There are a couple of likely reasons for failure to detect RIFA at these monitors. The most important is the presence of Argentine ants, which can chase RIFA from the monitors. Another possible reason is that fire ants that have been treated with pesticides may be queenless and not interested in feeding.

C. Monitoring at other nurseries.

The Pardee Tree Nursery in Bonsall, Orange Co., has adopted our technique of monitoring for fire ants using sugar water. They have laid out a grid of sugar water monitors at 50 ft intervals throughout

their nursery as an early detection method for RIFA. Because of this monitoring state officials have not had to do additional surveys at this location.

D. Corn chips vs. luncheon meat as ant monitors

We have completed several laboratory and field trials comparing the efficacy of luncheon meat and corn chips in attracting fire ants to monitors. These trials were done at Coto de Caza and in Rancho Mirage. We do these trials in a large aluminum dish that has up to 10 tubes containing pre-weighed amounts of the test materials. The ants enter the dishes through plastic tubes and are free to take the materials back to their nests. The tubes are then weighed again. In all trials thus far the fire ants have shown preference for the luncheon meat. However, the corn chips are cheap and easy to place on the ground in larger numbers. We will continue to evaluate which material is appropriate for which circumstances.

Task 2. Replacement of Organophosphates and other Pesticides

A. Demonstrating the use of new RIFA products. We have run two demonstrations of the efficacy of fipronil at two country clubs in the Coachella Valley: Sunrise and Rancho Las Palmas, both in Rancho Mirage. At each of these locations we compared the efficacy of fipronil with the standard treatments in use by the eradication agencies. They typically apply baits containing an insect growth regulator (pyriproxyfen) followed a week later by a bait with hydramethylnon. These treatments are repeated every 3 months because they break down quickly and there is no residual action beyond a couple of days. On the other hand, granular fipronil binds tightly to the upper layer of soil and has an extended residual effect. This characteristic is important in preventing new reinfestations by fire ant queens that fly and drop into new areas, where they start new colonies. Figs. 3 and 4 show typical results. We are awaiting state approval of fipronil for use against fire ants.

B. Trials with liquid toxicants. Another plan to reduce pesticide usage is to use toxicants in sugar water bait stations, avoiding the use of any pesticides that touch the ground. We have begun laboratory and field-testing of toxicants in sugar water. We currently have 4 products with adequate water solubility for use in sugar water baits: boric acid, fipronil, thiomethoxam, and imidacloprid. In the laboratory, for each of these products we set up 10 petri dishes at each concentration of toxicant with 10 RIFA workers in each to measure the time to kill half of the ants (LT50). A second step was to set up mini-colonies consisting of 300 RIFA with a supply of the sugar water toxicant and we again measured time to kill half of the workers. We are currently doing the field-testing of these products at RIFA sites to demonstrate that the liquid toxicants can eradicate fire ants.

C. Drench Substitutes. The fire ant quarantine at plant nurseries requires that bifenthrin or chlorpyrifos be added to potting soil to prevent colonization with fire ants. These insecticides are showing up with water runoff. Our goal is to screen natural oils and non-pesticides to see whether we can find an alternative that would prevent ant colonization of potted plants. Thus far we have looked at Orange Guard (limonene), Nouguard (capsaicin), Exxant (a turpentine solution), and other plant oils. We put 300 ants into small pots with soil, added the liquid, and recorded either death of the ants or whether they left the pots. Thus far we have found that the limonene and turpentine solutions immediately cause the ants to leave the soil. The latest product we are examining is a neem oil derivative in a solid matrix that we are mixing with potting soil. We are going to show whether the material successfully keeps ants out of soil. Continued screening of these products should help to find reliable drench substitutes.

D. New fire ant bait

Ongoing demonstration of a new fire ant bait, "Chipco Firestar Fire Ant Bait", from Aventis. This bait has an extremely low concentration of fipronil (0.00015 %) in a matrix consisting of a mixture of proteins, oils, and carbohydrates. These baits may prove as effective as two standard treatments consisting of pyriproxyfen followed by hydramethylnon. We began 2 demonstrations on August, 2001 in South Orange Co. at Coto de Caza and Ladera Ranch. At that time we did pretreatment surveys of the ant populations. The first bait application at Coto de Caza was done one Sept. 6. A second application was done on November 5. The Ladera Ranch treatment was done on October 4. We did follow-up surveys of ant populations every 2 weeks. We did an additional trial of the bait at the Annenberg estate in Rancho Mirage, near Palms Springs, on Oct. 11.

Objective II. Protection of surface water and groundwater.

Task 1. Demonstration of runoff mitigation.

A very successful pesticide runoff mitigation demonstration project has been implemented at a PMA member site (El Modeno Gardens, Irvine, CA). In November 2001 we began testing the addition of polyacrylamide to assist in the mitigation of pesticide runoff from the nursery. A multiple strategy plan was implemented utilizing several of the innovations listed in our PMA plan in addition to the use of polyacrylamides. These innovations were:

- Improve irrigation management techniques to reduce pesticide and fertilizer run off.
  - El Modeno is upgrading their computerized irrigation software.
  - Irrigation system is being checked for any maintenance problems and greater attention will be paid to run times and application uniformity.

- Optimize timing of applications and select best fertilizer formulations to reduce nitrate levels in runoff.
  - Slow release fertilizers will be used whenever possible.
  - Use technology such as electrostatic sprayers to minimize off target movement of pesticides.
  - Scout more intensively so pests are taken care of early before heavy populations require more spray treatments.

- Use of vegetative border strips, grading, sand bags and holding ponds to reduce pesticide runoff.
  - Use upstream sediment traps to reduce sediment load reaching vegetative filter.
  - Move runoff from the center of roads to the side of the road in cement lined ditches.
  - Divert runoff into pipes whenever possible to prevent picking up sediment.
  - Sand bags and holding ponds to reduce pesticide runoff.

Initially, one site was chosen to develop protocols and field experience with the management of the system. As part of their RIFA monitoring program, CDPR is monitoring pesticides in the runoff prior to entering the vegetative filter, which consists of a patented Canna Lily (Tropicana) and after exiting the vegetative filter (Fig. 5). Canna lilies are planted in a cement drainage channel. Space for growing plants is in short supply, and the use of the drainage channel to grow a profitable patented plant variety has resulted in an economic incentive to implement the pesticide and nutrient mitigation and also has the added benefit of utilizing the nutrients, which would have run off the property as a pollutant. Flow and weekly nutrient monitoring is being funded by grants from CDFA-FREP (Fertilizer Research and Education Program) and the EPA 319(h) program.

The implementation of polyacrylamides (PMAs) to flocculate fine sediments out of the runoff water, which we believe will dramatically reduce the offsite movement of bifenthrin, was initiated full scale at

the nursery in January, 2002. A concentrated form of polyacrylamides is added to the turbulent stream of runoff prior to a sediment trap and pond at an approximate rate of 10 ppm. Flocculation occurs rapidly allowing the majority of the sediment to settle in the trap and pond. The sediment trap allows for easy removal of sediment with a front-end loader as opposed to allowing sediment to accumulate further into the system (i.e. vegetative filter), where removal results in higher labor costs.

When the PAM delivery point is used as the reference point, the suspended solid removal after the sediment trap was >90% for both sampling days. More reductions further occurred in the vegetated channel. When the runoff reached the end of the vegetative strip (240 m from the pond), the overall suspended solid removal was 99.6% on 05/16/2002 and 96.9% on 06/16/2002. The suspended solid content in the runoff at the end of the vegetative strip was only 15 and 32 mg L^{-1} on 05/16/2002 and 06/16/2002, respectively. The reduction in total mass of suspended solids in runoff was greater than indicated by the sediment concentration data above. The total mass of suspended solids in runoff is equal to the product of runoff volume and suspended solid concentration. Consequently the decrease in runoff over the last few years has further reduced sediment movement off-site relative to years before irrigation and pesticide best management practices (BMPs) were implemented.

Runoff samples were also analyzed for bifenthrin and permethrin. Bifenthrin concentrations in runoff generally decreased as the runoff moved through the sediment trap, pond, and the discharge channel (Table 4). For instance, on 05/16/2002, the initial bifenthrin level in runoff before the PAM release point was 10.6 µg L^{-1}, which decreased to 0.87 µg L^{-1} at the end of the vegetative strip. On 06/16/2002, the initial bifenthrin level was 3.2 µg L^{-1}, which decreased to 0.28 µg L^{-1} at the vegetative strip. Using the concentration before the PAM release point as the reference point, the reduction in bifenthrin concentration in the runoff was 91.8% on 05/16/2002, and 91.3% on 06/16/2002 (Table 4). The greatest decrease occurred after the sediment trap, but further decreases occurred through the vegetated channel. The pesticide removal was apparently correlated with the removal of suspended solids caused by the various BMPs along the runoff path.

Objective III. Improved Weed Management in Nursery Production.

Task 1. Use of Sub-irrigation for Weed Management in Ornamental Plant Production Systems

Weed and crop growth in nursery containers with reservoirs for sub-irrigation were compared to conventional pots irrigated by overhead sprinklers or by spot spitters. The use of automatic sensors for managing irrigation timing was also investigated. (See Figs. 8—12 and Tables 5 and 6). In general, sub-irrigated woody plants had significantly greater growth as indicated by plant height and by root and shoot dry weights. Weed dry weight and percent cover were also significantly reduced in the sub-irrigated treatments. In one study, initiating irrigation by the use of a moisture sensor reduced the percentage of weed cover and dry weight.

Three ornamental plant species (star jasmine, callistemon, and liriope) were grown in two locations (Irvine and Riverside). Plants were irrigated by spot spitters (one per pot), overhead irrigation, or by sub-irrigation. All pots were overseeded with common groundsel to evaluate weed control. The method of irrigation had a significant effect on plant growth and weed control. In nearly all cases shoot and root weight was greatest when plants were sub-irrigated, followed by those irrigated by spot spitters or overhead irrigated plants. Weed control was also greatest in pots that were sub-irrigated and least in those irrigated by impact sprinklers.

We also evaluated the effect of irrigating on a timed schedule as compared to irrigating when soil moisture reached a set level of dryness. We found that there was little difference in plant growth (data not shown for Riverside test), but there were differences in weed control; timed irrigation resulted in more weeds than those irrigated when indicated by soil moisture level.

Objective IV. Outreach Efforts, Including the Setting up of a Pest Management Alliance Website

Task 1. Web page setup

The Pest Management Alliance for the Containerized Nursery Industry (PMA-CNI) web page is up and running and is available for general use at **http://www.pmacni.com/**. Appendix I shows 2 pages from the web site. The web pages describes what the pest management alliance is, and provides information and links to quarantine regulations, PMA demonstration results and reports, common pests of container nurseries, and provides a calendar of nursery-related educational programs.

Task 2. Forums and workshops

Numerous lectures, seminars, and workshops have included information fulfilling the objectives of the PMA grant (see Fig. 6, Table 7). On September 14, 2000 the Nursery PMA conducted a workshop/conference at the University of California, Riverside. The workshop was attended by over 100 nursery and landscape professionals and dealt with the issues and challenges facing the nursery industry in California. Top experts in their areas gave presentations on subjects such as the Glassy Winged Sharpshooter, Red Imported Fire Ants, Pesticide Runoff, etc. A poster session was held at the end of the conference giving attendees and researchers a chance to interact. Evaluations overwhelmingly gave the workshop an excellent rating. A similar conference attended by approximately 100 growers and allied industry/agency personnel was held on September 18, 2002 (see Fig. 7). This meeting was sponsored by the PMA, UC ANR, and the California Association of Nurserymen in Riverside, California.

The PMA held a **Glassy-winged sharpshooter (GWSS) training meeting** for nurseries and allied industries on January 24, 2002. The meeting was held in Irvine, California at the University of California South Coast Research and Extension Center and attended by over 50 people. The attendees received information about the regulations for shipping plants from Craig Hanes of CDFA. County entomologists from Orange (Nick Nisson) and Napa (Joel King) Counties explained how county inspectors examine plants for adults for egg masses and adults in both the shipping and receiving counties. They also provided information regarding insecticide trials and trapping methods for monitoring. Dr. David Morgan from CDFA finished up the meeting by reporting on his work on identifying, rearing, and releasing biocontrols for GWSS.

In addition to meetings, workshops, and lectures, members of the PMA Nursery project have been interviewed by several industry magazines. Numerous tours have been conducted at El Modeno Gardens, and growers continue to call for advice on implementing runoff BMPs in their operations.

References Cited

Reierson, D.A., M. K. Rust and J. Hampton-Beesley. 1998. Monitoring with sugar water to determine the efficacy of treatments to control Argentine ants, *Linepithema humile* (Mayr)., pp. 78-82. *In* Proceedings of the National Conference on Urban Entomology.

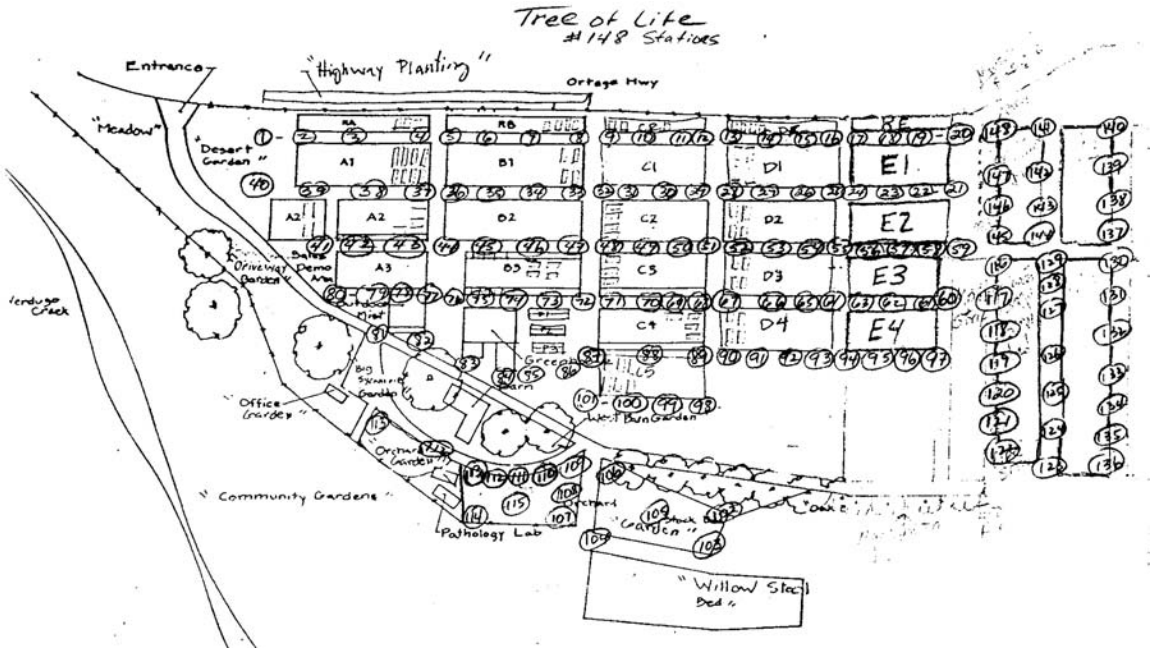

Figure 1. Tree of Life nursery, showing location of ant monitors.

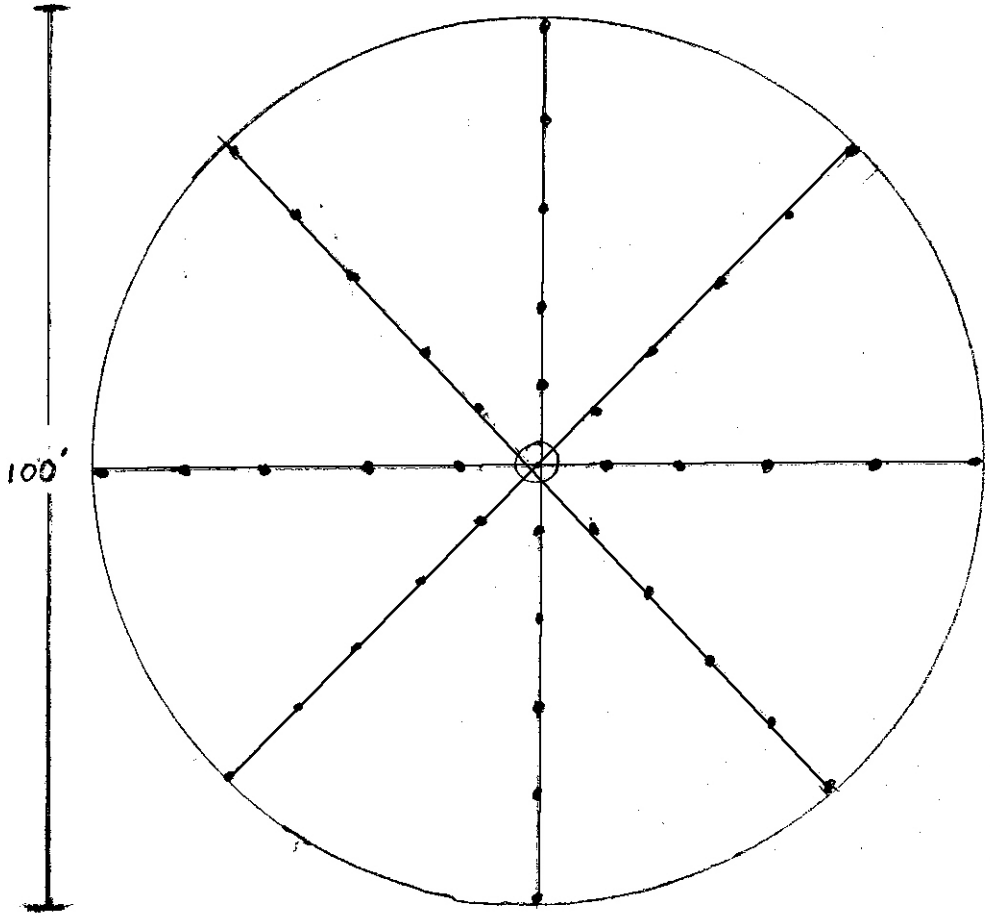

Figure 2. Wheel monitoring method. The known infestation is at the center; each spot represents a monitor location, spaced at 10 ft intervals.

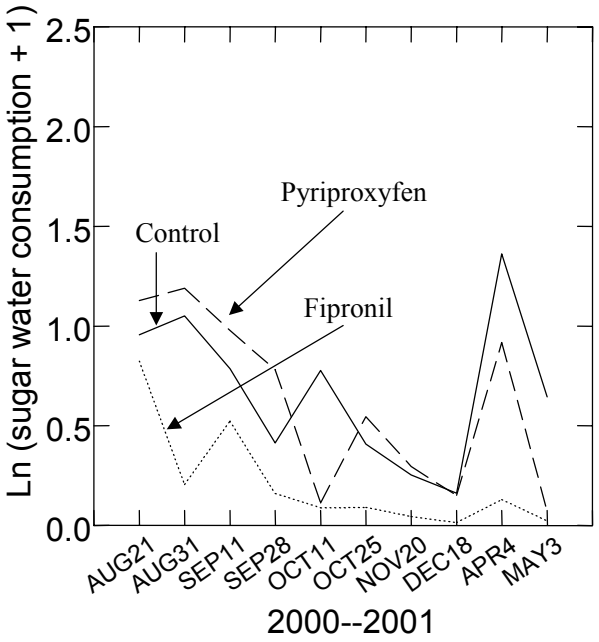

Figure 3. Comparison of consumption of sugar water by fire ants after treatment with the pyriproxyfen bait or fipronil granules, at a fairway at Rancho Las Palmas Country Club. Consumption of sugar water is a measure of foraging activity (and therefore in the number of ants) over a 24 hr period. The fipronil gave a quicker and longer-lasting reduction in fire ants than the pyriproxyfen. It is also advantageous in that the irrigation does not need to be turned off during its application.

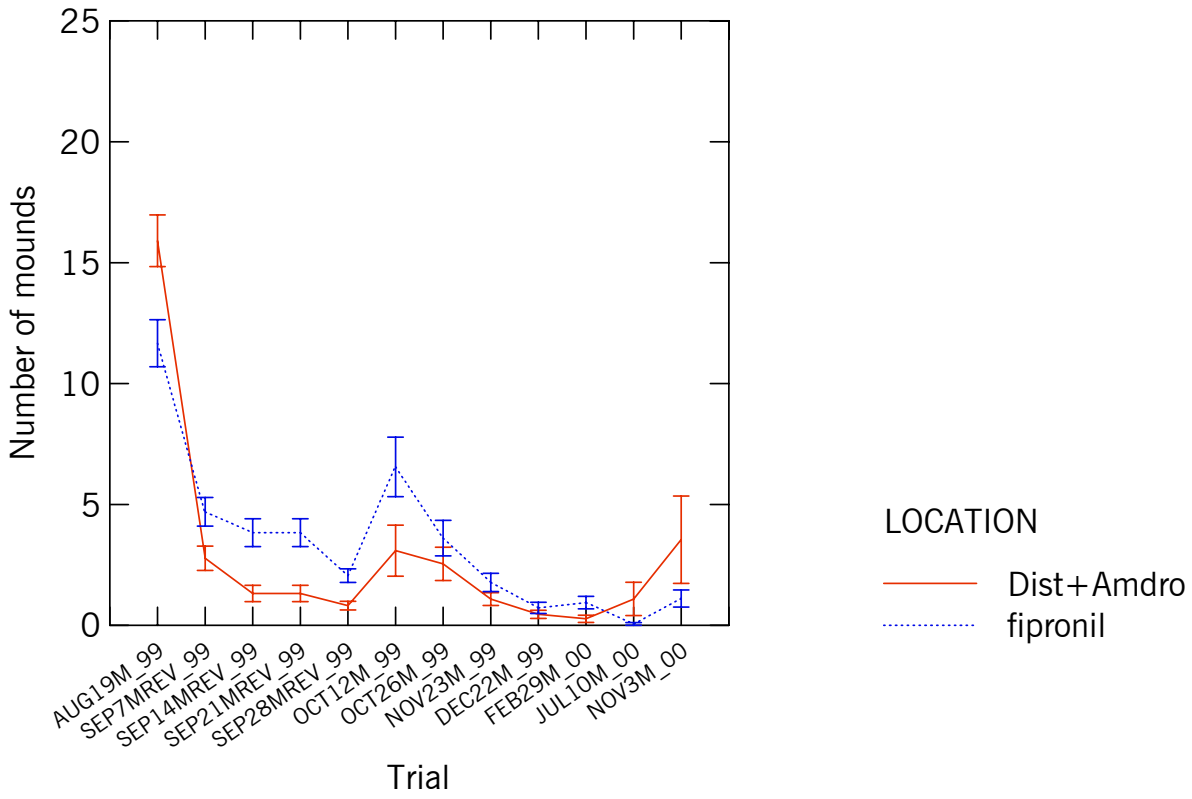

Figure 4. A comparison of standard treatments of Distance + Amdro baits with a single treatment of fipronil granules, at the Sunrise Country Club.

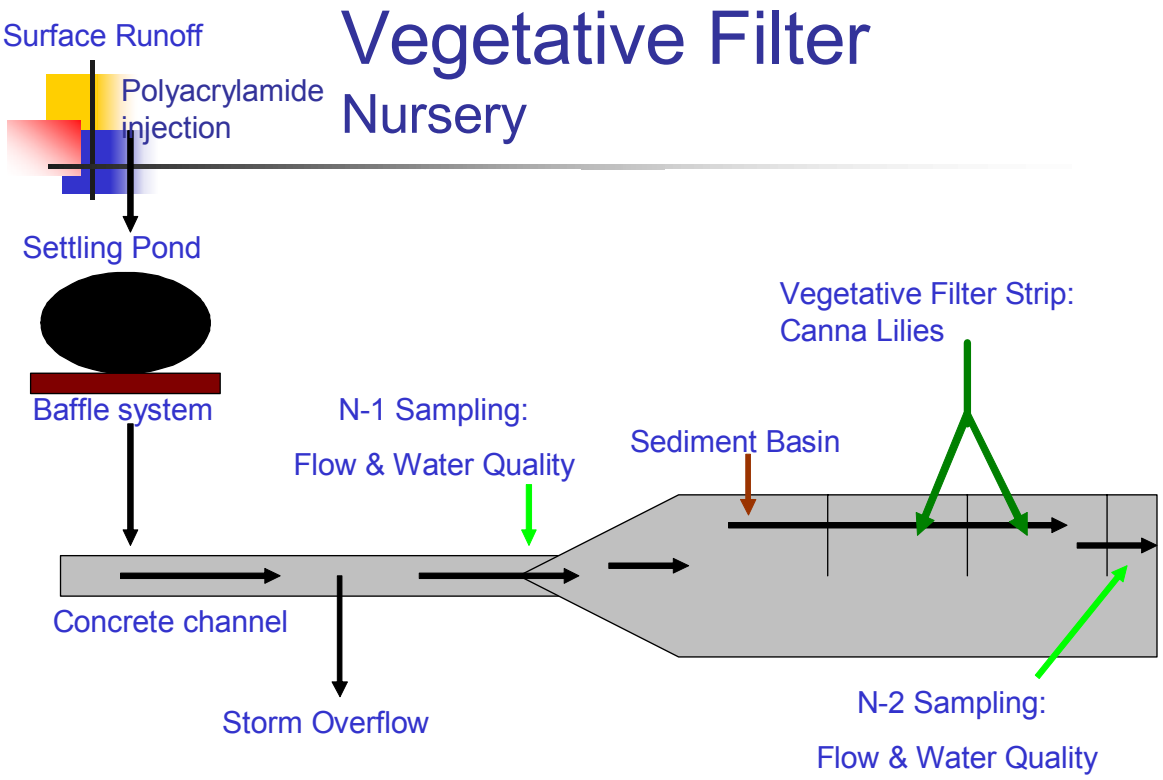

Figure 5. Schematic and picture of Vegetative Filter at El Modeno Gardens, Irvine, CA.

Figure 6. California Ornamental Research Foundation/Ornamental Horticulture Educational Continuing Conference Meeting at Bordiers Nursery and the South Coast Research and Extension Center, Irvine, California.

Research & Education
Horticulture
Conference

Presented by the California Association of Nurserymen

3947 Lennane Drive, Suite 150
Sacramento, California 95834-1973
800/748.6214 or 916/928.3900
fax 916/567.0505
www.can-online.org
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Sponsored by the California Department of Pesticide Regulation and the Nursery Pest Management Alliance Program

Continental Breakfast and lunch are included in the registration price.

CCN Pro™ Approved for 4 CEU'S

5.5 CDPR/PCA hours have been approved

DISCOVERY ZONE

Education is Success

September 18, 2002 • 8:00am - 4:00pm
University of California Riverside Extension Center
1200 University Avenue, Riverside, California 92507

Registration	**8:00am – 9:00am**
Program moderated by John Kabashima	
Educational Presentations	**9:00am – 9:50am**
SPEAKER	**TITLE**
Dr. Susan Laughlin	Welcome to the Discovery Zone
Dr. Cheryl Wilen	Nursery Pest Management Alliance
Craig Hanes	Glassy winged Sharpshooter Nursery Protocol Update
Dr. Heather Costa	Pierce's Disease Research
Break	**9:50am – 10:20am**
Educational Presentations	**10:20am – 11:45am**
SPEAKER	**TITLE**
Dr. Tim Paine	Eucalyptus Pests: Eucalyptus Long Horned Borer, Tortoise Beetle, Gall Wasp
Dr. Don Dahlsten	Eucalyptus Pests: Psyllids
Dr. Mohammad Azhar	RIFA Review of Quarantine
Dr. Michael Delwiche	Electronic Field Tree Counting Technology
Dr. Mark Hoddle	Biological Control of Avocado Pests
Lunch Break	**11:45am – 12:45pm**
Educational Presentations	**12:45pm – 3:00pm**
SPEAKER	**TITLE**
Doug Shibberu	Water Runoff Regulations
Dr. Kean Goh	Pesticides in Runoff Water From Nurseries
Dr. Darren Haver	Mitigating Pesticide Runoff From Nurseries
Dr. Anton Ploeg	Nematode Research in Ornamentals
Dr. Tom Perring	Coconut Bud Mite
Dr. Pavel Svihra	Sudden Oak Decline Overview
Nick Condos	Sudden Oak Decline Quarantine: Implications For the Nursery Industry
John Blasius	CDFA Quarantine Program
Dr. Rick Redak	GWSS Control Strategies
Poster Session	**3:00pm – 4:00pm**

*The above agenda is subject to change.

Register on or before September 12, 2002
❒ C.A.N. Member Advantage Price $85
❒ Non-Member Price $105

Register after September 12, 2002 (includes onsite registration)
❒ C.A.N. Member Advantage Price $105
❒ Non-Member Price $125

Name _____ Company _____
Address _____ City State Zip _____
Phone _____ Fax _____
Email _____ CCN Pro ID # (if applicable) _____
❒ Check payable to C.A.N. for $ _____ ❒ Charge my credit card for $ _____
❒ VISA ❒ MasterCard ❒ American Express
Credit Card Number _____ Expiration Date _____
Cardholder's Name _____ Authorized Signature _____

Cancellations: In the event you need to cancel your registration, please advise C.A.N. in writing at least 10 days prior to the program date.
A full refund less a $10 administrative fee will be issued. No shows will not be refunded.

Figure 7. Flyer used for PMA-sponsored event.

Figure 8. Weed pressure as affected by method of irrigation. On the left are sub-irrigated star jasmines. On the right are those irrigated by overhead sprinklers. Note the soil moisture sensor, which is used to regulate the irrigation of the plants. This reduces over-irrigation and runoff.

Figure 9. Effect of method of irrigation and timing on star jasmine root and top growth. Sub-irrigated plants had significantly greater top and root growth than the other two methods.

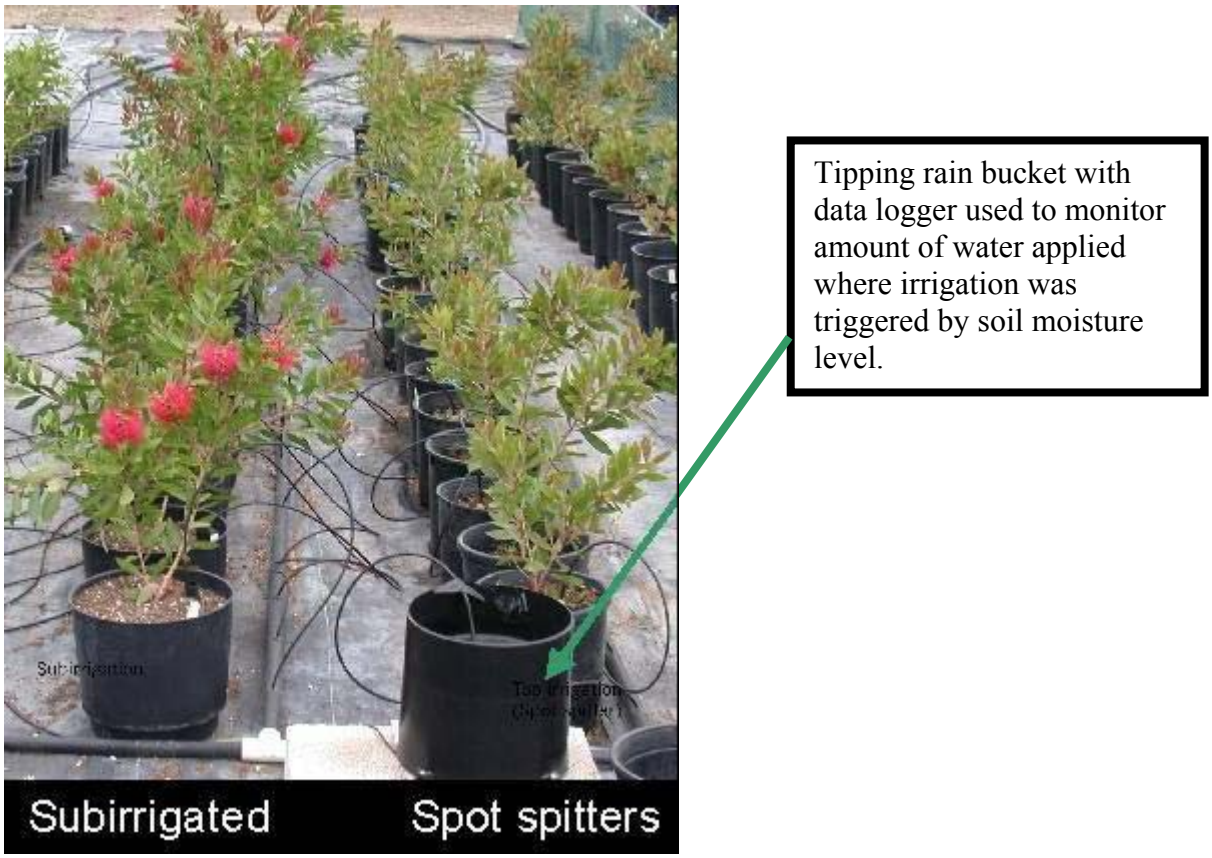


Figure 10. Effect of method of irrigation on growth of bottlebrush (*Callistemon*). Sub-irrigated plants were significantly larger than those irrigated by spot spitters and had less weed pressure.

Figure 11. Effect of the method of irrigation on crop and weed growth for star jasmine, bottlebrush (Callistemon), and liriope. Units of y-axis depends on variable.

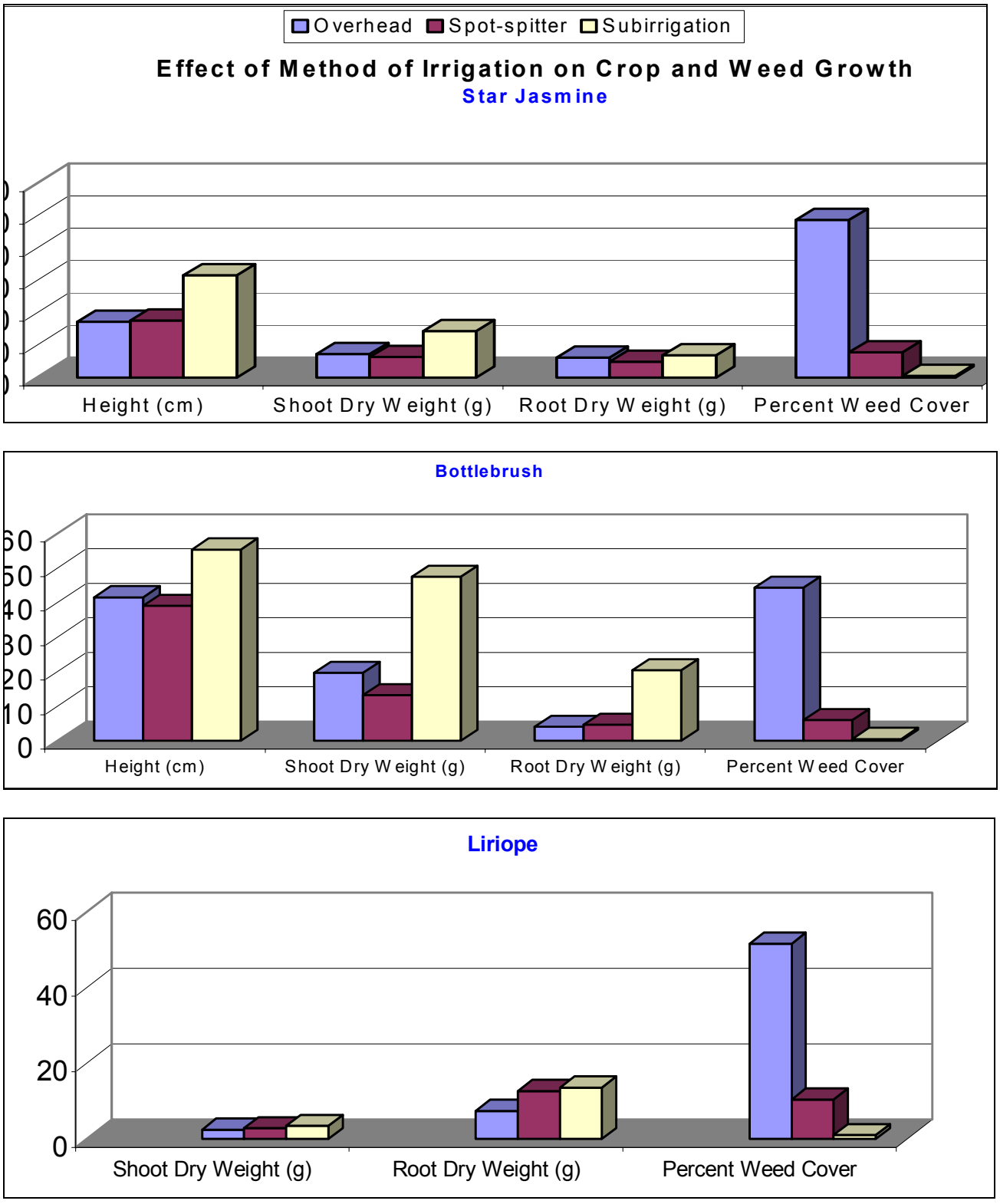


Figure 12. The effect of timed vs. sensor-initiated irrigation on crop and weed growth for star jasmine, bottlebrush (Callistemon), and liriope.

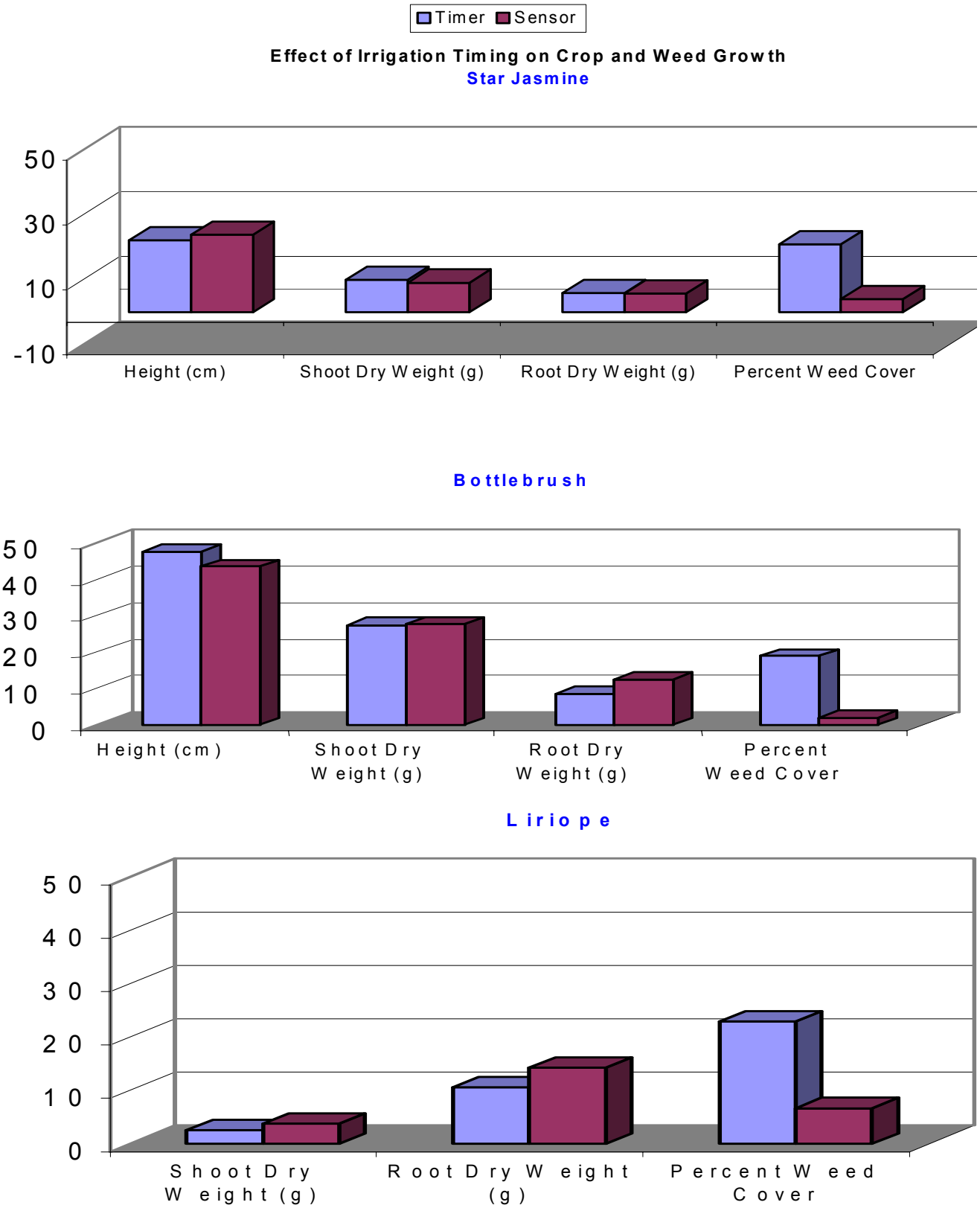


Table 1. Ant species collected at Tree of Life nursery.

Cardiocondyla ectopia Snelling
Dorymyrmex bicolor Wheeler (bicolored pyramid ant)
Dorymyrmex insana (Buckley) (pyramid ant)
Formica pilicornis Emery
Liometopum occidentale Emery (velvety tree ant)
Pogonomyrmex occidentalis (Cresson) (harvester ant)
Solenopsis molesta (Say) (thief ant)
Solenopsis xyloni McCook (Southern fire ant)
Tapinoma sessile (Say) (Odorous house ant)
*Linepithema humile (*Mayr) (Argentine ant)
Solenopsis invicta Buren (Red Imported Fire Ant)

Table 2. The species and number of ants collected at liquid and solid baits at Tree of Life Nursery. L = 25% sugar water; S = Nine Lives cat food.

	D. bicolor		*D. insana*		*T. sessile*		*F. pilicornis*		*S. xyloni*	
Date	L	S	L	S	L	S	L	S	L	S
14-Mar-00	1598	41	1	1	79	4	107	5	47	0
4-Apr-00	1707	23	25	2	132	21	132	9	112	3
3-May-00	1246	22	0	0	87	6	39	1	209	25
30-May-00	918	34	430	5	81	12	265	11	217	37
27-Jun-00	1059	75	0	0	85	31	108	5	126	20
1-Aug-00	1125	57	0	0	104	7	75	15	141	0
5-Sep-00	4068	382	0	0	246	6	303	1	523	75
3-Oct-00	2488	526	0	0	242	6	55	14	426	106
31-Oct-00	3963	37	0	0	143	2	42	0	31	5
5-Dec-00	2065	2	2	0	181	0	101	0	4	0
3-Jan-01	1505	21	0	0	0	0	46	0	15	10
6-Feb-01	974	2	0	0	61	0	412	0	40	2

Table 3. The number of monitors positive for each species and the (%) of sites for each date and species at either the 25% sugar water (L), Nine Lives cat food (S), or both (B).

	D. bicolor			*D. insana*			*T. sessile*			*F. pilicornis*			*S. xyloni*		
Date	L	S	B	L	S	B	L	S	B	L	S	B	L	S	B
14-Mar-00	15(47)	2(6)	15(47)	1(50)	1(50)		3(60)		2(40)	8(80)		2(20)	3(100)		
4-Apr-00	32(84)		6(16)	4(80)		1(20)	5(63)		3(37)	8(67)	1(8)	3(25)	3(60)		2(40)
3-May-00	34(76)	1(2)	10(22)				7(78)		2(22)	13(93)	1(7)		3(75)	1(25)	
30-May-00	34(76)	1(2)	10(22)	7(88)		1(12)	4(57)		3(43)	20(83)		4(17)	3(33)		6(67)
27-Jun-00	32(62)	1(2)	19(36)				3(60)		2(40)	9(69)	2(15)	2(15)	4(67)		2(33)
1-Aug-00	38(66)		20(34)				5(63)		3(37)	9(75)	2(17)	1(8)	6(100)		
5-Sep-00	36(52)	1(2)	32(46)				8(73)		3(27)	20(95)		1(5)	4(36)		7(64)
3-Oct-00	23(39)		36(61)				10(77)		3(23)	7(58)		5(42)	3(27)		8(73)
31-Oct-00	45(90)		5(10)				11(92)		1(8)	4(100)			2(67)		1(33)
5-Dec-00	32(94)	1(3)	1(3)	1(100)			4(100)			9(100)			1(100)		
3-Jan-01	20(67)	5(17)	5(17)							7(100)					1(100)
6-Feb-01	20(91)	1(5)	1(5)				5(100)			13(100)					1(100)

Table 4. Reductions in bifenthrin level in runoff along the runoff path [% of level measured before the polyacrylamides (PAM) delivery point].

Position	*May 2002*		*June 2002*	
	Concentration (ppb)	*Removal (%)*	*Concentration (ppb)*	*Removal (%)*
Before PAM	10.56	-	3.18	-
Pond	1.41	-86.7	0.93	-70.7
104 m[†]	9.27	-12.2	1.11	-65.0
166 m	4.26	-59.6	0.55	-82.8
187 m	2.83	-73.2	0.43	-86.6
210 m	1.68	-84.1	0.95	-70.2
240 m[‡]	0.87	-91.8	0.28	-91.3
340 m	0.96	-90.9	0.30	-90.7

Table 5. Analysis of variance showing how the different methods of irrigation and the timing of watering affected height, shoot dry weight, root dry weight, and percent weed cover of jasmine, callistemon, and liriope.

Irvine (Coastal)

Jasmine					
A. Method of Irrigation	Height (cm)	Shoot Dry Weight (g)	Root Dry Weight (g)	Root:Shoot	Percent Weed Cover
Overhead	17.29 b	7.22 b	6.07 ab	0.87	48.53 a
Spot-spitter	17.63 b	6.34 b	4.79 b	0.79	7.85 b
Subirrigation	31.53 a	14.38 a	6.88 a	0.48	0.44 c
	***	***	***	***	***
B. Timing					
Timer	22.16	10.01 a	5.93	0.66 b	20.98
Sensor	23.87	9.13 b	5.77	0.72 a	4.08
	ns	**	ns	***	ns
C. Method x Timing Interaction	ns	ns	ns	***	ns

Callistemon					
A. Method of Irrigation	Height (cm)	Shoot Dry Weight (g)	Root Dry Weight (g)	Root:Shoot	Percent Weed Cover
Overhead	41.59 b	19.68 b	4.06 b	0.28	44.41 a
Spot-spitter	39.08 b	13.2 b	4.62 b	0.41	6.06 b
Subirrigation	55.43 a	47.53 a	20.42 a	0.43	0.53 b
	***	***	***	ns	***
B. Timing					
Timer	47.53 a	27.3	8.66	0.37	18.92
Sensor	43.38 b	27.59	12.67	0.42	2.02
	***	ns	ns	ns	ns
C. Method x Timing Interaction	ns	ns	ns	ns	ns

Liriope				
A. Method of Irrigation	Shoot Dry Weight (g)	Root Dry Weight (g)	Root:Shoot	Percent Weed Cover
Overhead	2.52	7.48	3.05	51.65 a
Spot-spitter	2.88	12.68	4.09	10.44 b
Subirrigation	3.45	13.63	3.87	1.03 c
	ns	Ns	ns	***
B. Timing				
Timer	2.54 b	10.56	3.93	22.9
Sensor	3.79 a	14.22	3.59	6.66
	**	Ns	ns	ns
C. Method x Timing Interaction	ns	ns	ns	ns

For each column, different letters following the mean indicate significant differences at the $P \leq 0.05$ level by SNK multiple range test; "ns" is "no significant differences."

* = P<0.05, ** = P<0.01, *** = P<0.001

Riverside (Inland)

Table 6. Analysis of variance showing how the different methods of irrigation and the timing of watering affected the percent weed cover and the weed dry weight in potted plants of jasmine, callistemon, and liriope.

	Percent Weed Cover			**Weed Dry Weight**		
A. Method of Irrigation	Jasmine	Callistemon	Liriope	Jasmine	Callistemon	Liriope
Overhead	28.75 a	30.56 a	40.5 a	2.56 a	1.75	3.26 a
Spot-spitter	27.1 a	16.35 b	25.85 b	2.93 a	1.38	2.58 a
Subirrigation	7.75 b	5.6 c	9.9 c	1.26 b	0.65	1.29 b
	***	*	**	***	ns	*
B. Timing						
Timer	31.89 a	24.03 a	36.67 a	3.62 a	1.93 a	3.62 a
Sensor	1.7 b	0.85 b	1.00 b	0.14 b	0.001 b	0.06 b
	***	***	***	***	***	***
C. Method x Timing Interaction	***	*	***	***	ns	*

For each column, different letters following the mean indicate significant differences at the $P \leq 0.05$ level by SNK multiple range test; "ns" is "no significant differences."
* = P<0.05, ** = P<0.01, *** = P<0.001

Table 7. List of meetings and presentations related to PMA activities. March 1, 2001 – February 28, 2003.

Presentations by Les Greenberg
2001

1. March 2. Gave talk at national fire ant meetings in San Antonio, TX: "Monitoring fire ants in California".
2. March 6 and 7. Participated in County training workshops, section on fire ants, for CDFA, under direction of John Blasius, at Palm Desert, CA.
3. March 12. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
4. March 29, 3:15 pm. 10th Annual Urban Pest Management Conference, Riverside. Fire ant update.
5. March 31. Presentation on fire ants, along with Larry Cooper of CDFA, Dorsey High School, Los Angeles.
6. April 2. Demonstration of digging up fire ant colonies for Orange County Fire Ant Authority, Lake Forest.
7. April 25. Attended meeting about future of fipronil in CA, with Bryan Cahill of CDFA and Kean Goh of CDPR.
8. May 8. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
9. May 9. All county fire ant meeting, Costa Mesa. Gave report on how to estimate the age of fire ant colonies.
10. May 29. 30 min workshop about ant identification and biology for Riverside Co. Agricultural Commissioner's office, Riverside.
11. June 4-8. Application of *Beauveria bassiana* to fire ant mounds at Lake Elsinore. Ants will be sampled for a month after this application and infection rates determined by growing the fungus in the laboratory.
12. June 12. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
13. June 13. All county fire ant meeting, Costa Mesa.
14. June 25. Collection of fire ant colony at Long Beach, CA. This is the first citing of fire ants in this city.
15. June 26. Invited speaker in urban entomology section of Pacific Branch meeting of the Entomological Society of America, Park City, Utah. "Status of the Red Imported Fire Ant Invasion of California."
16. July 30 – August 17. Visited RIFA site at Coto de Caza with Orange Co. Fire Ant Authority, and placed sugar water monitors and liquid toxicants at this location.
17. August 9. Provided write-up on RIFA history, biology, and identification to Mohammed Azhar, CDFA, Costa Mesa.
18. August 9-10. Met with film crew doing documentary about RIFA in Orange Co, including visit to a field location and interview in the laboratory with Daniel Parsons.
19. August 14. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Lake Forest.
20. August 29. Surveyed new fire ant infestation in Coto de Caza with the Orange Co. Fire Ant Authority.
21. September 6. Treated a fire ant infestation with the Orange Co. Fire Ant Authority, Coto de Caza, using a new kind of fire ant bait.
22. September 11. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.

23. September 18. Gave a RIFA workshop to CDFA and Vector Control, Coachella Valley, on how to tell the age of fire ant colonies. Chapparal Country Club, Palm Desert.
24. October 4. Treated a fire ant infestation at Ladera Ranch, South Orange Co., with new fire ant bait, with the Orange Co. Fire Ant Authority.
25. October 4. Met with Mohammed Zubaidy of CDFA to discuss questions posed by the national fire ant advisory panel, in preparation for the next meeting of the Orange Co. advisory panel.
26. October 9. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
27. November 7-9. Invited to participate in symposium, "Creating a Fire Ant Free Zone," in Orlando, FL.
28. November 13. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
29. November 27. PMA meeting to discuss web page design for the group. Orange Co.
30. December 4. Met with Mohammad Azhar and others from CDFA and the Coachella Valley Fire Ant Authority to discuss ways of monitoring fire ant activity. I demonstrated devices that we have used in our research program. Palm Desert
31. December 11. Gave talk at the national meeting of the Entomological Society of America, "Liquid toxicants for Red Imported Fire Ants." San Diego, CA.

2002

32. February 11. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
33. February 13. All county fire ant meeting, Costa Mesa.
34. March 5. Invited speaker at IPM for Public Agencies Conference, sponsored by the University of California Statewide IPM Project, Buehler Alumni Center, UC Davis. "The Special Case of Fire Ants."
35. March 7. Invited speaker, Target Specialty Products' 30th Annual Seminar & Exhibit, Long Beach Convention Center. "Red Imported Fire Ant Update."
36. March 26. "Liquid toxicants for Red Imported Fire Ants." 2002 Fire Ant Conference, Athens, GA.
37. March 28-29. Trip to Fresno to collect Red Imported Fire Ants at an almond grove north of Merced. At site worked with Art Gilbert and Joan Scheiman of CDFA.
38. April 9. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
39. April 10. All county fire ant meeting, Costa Mesa.
40. April 11. "Progress in the eradication of the Red Imported Fire Ant from California." 11th Annual Urban Pest Management Conference, Riverside, CA.
41. May 1. Met with Shana Lowe and Mike Hurst of the Orange Co. Fire Ant Authority to discuss possible modeling of fire ant spread.
42. May 2. Gave a 2 hr workshop to the Riverside Co. Agricultural Commission employees, including a slide show on fire ants and visit to the fire ant laboratory.
43. May 3. Met with David Quiyamouse of CDFA to discuss treatment of fire ants in a strawberry field.
44. May 13. Met with Hugo Soto of the Riverside Agricultural Commissioner's Office about an ant identification from a sample from Blythe.
45. May 16. Met with Bill Oesterlein of the Riverside Agricultural Commissioner's Office to discuss treatment of fire ants in a strawberry field.
46. May 22. Fire ant talk ("California fire ant trials") and tour of fire ant laboratory for CAPCA (California Association of Professional Certified Applicators) at South Coast Research Station, Irvine, CA.

47. May 28. Put out bait stations for fire ants in strawberry patch with Bill Oesterlein of the Riverside Agricultural Commissioner's Office.
48. June 12. All county fire ant meeting, Costa Mesa.
49. June 17. Invited speaker, Nursery Grower's Association Meeting. "Red Imported Fire Ants." University of California, Riverside. 35 in attendance.
50. Oct. 26, 27. Presentation on fire ants at Riverside Municipal Museum, part of Smithsonian Traveling Insect Show.
51. November 18. Invited speaker for symposium "Exotic ants in urban and agricultural environments." Title of talk: "The red imported fire ant in California." Annual meeting of the Entomological Society of America, Fort Lauderdale, FL.

2003

52. February 24, 2003. Gave Entomology departmental seminar, "Critical juncture in fire ant eradication program." University of CA, Riverside.
53. February 28, 2003. Invited speaker, The Wildlife Society-Western Section 2003 Annual Conference, Symposium on Ecology and Management of Invasive Species. "Possible Impact of the Red Imported Fire Ant (*Solenopsis invicta*) in California." Irvine, CA.
54. September--February, 2003. Organization of national meeting as Program Chair, National Red Imported Fire Ant Conference, scheduled for Palm Springs, CA, March 30—April 1, 2003.

Presentations by John Kabashima and Darren Haver

2001

1. March 17. Entomology seminar. Orange Co. Cooperative Extension Master Gardener's Training Class, Costa Mesa, 53 participants.
2. March 23. Total Maximum Daily Loads (TMDL) lecture and tour. CA Ornamental Research Foundation/Ornamental Horticulture Educational Continuing Conference Meeting, Irvine, CA, 25 participants.
3. April 11. TMDL Project Lecture. Irvine Ranch Water District Board, Irvine, CA, 10 participants.
4. April 12. Red Gum Lerp Psyllid Interview, by Mike Anton, LA Times, Irvine, CA.
5. April 23. Lecture and tour of Environmental Horticulture/Natural Resources in Orange Co., UC DANR VP Lanny Lund Tour, 5 participants.
6. May 9. Nursery pesticide mitigation lecture and tour. TMDL update, Irvine, CA, 14 participants.
7. May 17. Research update. Southern California Agricultural Production Consultants Association (CAPCA), Irvine, CA, 50 participants.
8. May 18. Greenhouse whitefly biology and TMDL workshop. Greenhouse whitefly meeting, Irvine, CA, 20 participants.
9. June 6. San Diego CAPCA Meeting, Windmill Restaurant. Attendance: 150. Lecture Topic: Mitigating pesticide runoff from Nurseries
10. June 7. Photo shoot. Had Jack Kelly Clark take professional photos of the Vegetative Filter Strip at El Modeno Gardens.
11. June 14. Talked to the Chair of the CAN PPIC committee to arrange having their committee information placed on the PMA website.
12. June 19. Arranged a field visit with Jeff Bohn from Tree of Life Nursery and Dr. Cheryl Wilen to discuss setup of a trial to control liverwort. Trial would include several non pesticide techniques.
13. June 20. Met with Dr. Letey and Gan at El Modeno Gardens to evaluate how we could use long chain polyacrylamides to remove bifenthrin-containing sediment from runoff water.
14. June 28. Conducted RIFA soil repellency tests with various candidate non-toxic chemicals at SCREC.
15. July 10. Attended OC FAA oversight committee meeting to provide scientific oversight and update them on PMA projects such as the pesticide runoff mitigation work.

16. July 12. Met with manufacturer of long chain polymer polyacrylamides to discuss experiments to use their product to settle out sediments.
17. July 13. Discussed mitigation of bifenthrin in nursery runoff with the manufacturer of bifenthrin (FMC).
18. July 19. Conducted initial polymer trial at El Modeno Gardens to mitigate pesticide runoff.
19. August 6. Worked out details with Dennis Pittenger regarding placing UC Nursery Information Center leaflets on the PMA website.
20. August 14. Attended OC FAA oversight committee meeting to provide scientific oversight and update them on PMA projects such as the pesticide runoff mitigation work.
21. August 15. Attended All County RIFA meeting to provide scientific expertise and report on Pesticide runoff mitigation work.
22. August 15. Facilitated a planning meeting at El Modeno Gardens with CDPR, CDFA, UCR, and UCCE to present results of mitigation project and to plan future work that needs to be done.
23. August 29. Gave a lecture to 75 nursery professionals at the California Association of Nurserymen Certified Nursery Professional continuing education conference at the Hacienda Hotel, Los Angeles on mitigating pesticide use and offsite movement of pesticides.
24. August 31. Heard unofficially that the El Modeno Gardens vegetative filter strip may be getting an IPM Innovator of the year award.
25. Sept 4. El Modeno Gardens receives an IPM Innovator Award. Gave a lecture on Entomology, IPM and pesticide mitigation to Orange Co. College IPM Class. Approximately 20 students.
26. Sept 19. Worked out preliminary content design of the PMA Website
27. Oct 18. Gave a lecture to the Ornamental Horticulture class at Mt. San Antonio Junior College on mitigation of pesticide and fertilizer runoff from nurseries and the landscape.
28. Nov 27. Attended the PMA website meeting and evaluation. CAN has officially agreed to host the website if we buy them a server and provide content.
29. Nov 28, PMA co-sponsored a California Certified Crop Advisor training meeting on mitigation of pesticide and fertilizer pollution in runoff from nurseries and greenhouses at Edison Stadium in Anaheim. There were about 50 attendees.
30. December 19 – Hydrosorb, Inc. – Meet with Hydrosorb representatives at El Modeno Gardens for polyacrylamide demonstration.

2002

31. January 23 – UCR Total Maximum Daily Loads (TMDL) Workshop – Presentation by Darren Haver on the nursery mitigation project to UC faculty, extension specialists, and farm advisors. Approximately 20 people in attendance.
32. February 6 – California Plant and Soil Conference – Presentation by John Kabashima on Newport Bay Total Maximum Daily Loads Project including the Nursery Mitigation Project. Approximately 125 people in attendance.
33. February 25 – Society of American Florists – Presentation by Darren Haver on the nursery mitigation project to professionals in the nursery and pesticide industries. Approximately 170 people in attendance.
34. March 25. Presented a paper on mitigating bifenthrin in nursery runoff, used to comply with USDA regulations, at the National Red Imported Fire Ant Conference in Georgia.
35. April 3. Participated in the Glassy Winged Sharpshooter Nursery Task Force meeting at the Orange County Fairgrounds to provide expertise regarding nursery treatment for GWSS.
36. April 9. Participated in the Orange County Red Imported Fire Ant Oversight Committee meeting. Part of my role is to provide expertise regarding nursery treatments for RIFA.
37. April 10. Gave a lecture to the Orange County California Association of Nurserymen about exotic pests and their control, and IPM strategies to reduce pesticide usage.

38. April 12. Interviewed by the Los Angeles Times regarding PMA/UCCE sponsored research and education to reduce pesticide runoff from nurseries.
39. April 19. Orange County California Association of Nurserymen (CAN), Exotic pests, BC and water runoff mitigation from nurseries.
40. May 2. RIFA training for Riverside County Ag Comm Staff at SCREC, Biology, control and adverse impacts of the RIFA quarantine.
41. May 6. Participated in the Orange County Red Imported Fire Ant Oversight Committee meeting. Part of my role is to provide expertise regarding nursery treatments for RIFA.
42. May 20. I gave an invited talk to the Nursery Growers Association of Southern California on mitigation of runoff and pollutants such as pesticides from nursery operations.
43. May 29. Participated in the Newport Bay/San Diego Creek Watershed Management Committee meeting to provide expertise on agriculture and nursery runoff issues.
44. June 6. Participated in the Orange County Red Imported Fire Ant Oversight Committee meeting. Part of my role is to provide expertise regarding nursery treatments for RIFA.
45. June 12. Participated in the All County RIFA meeting sponsored by CDFA. My role is to report on University activities and to provide expertise regarding nursery treatments for RIFA.
46. June 19. Participated in the Newport Bay/San Diego Creek Watershed Management Committee meeting to provide expertise on agriculture and nursery runoff issues.
47. June 21. Advised Orange County Nurserymens association on the Dursban/Diazinon runoff problems in Orange County and as a result they issued a letter from their organization urging members to discontinue use or to put mitigation measures in place to prevent runoff contamination.
48. July 12. Received the American Nursery and Landscape Association "Nursery Extension Agent" award for my work on mitigation of pesticides and pollutants in nursery runoff, etc., at the ANLA National Convention in San Diego.
49. July 16. Participated in the Orange County Red Imported Fire Ant Oversight Committee meeting. Part of my role is to provide expertise regarding nursery treatments for RIFA.
50. July 17. Participated in the Glassy Winged Sharpshooter Nursery Task Force meeting at Bordiers Nursery to provide expertise regarding nursery treatment for GWSS.
51. July 17. Participated in the Newport Bay/San Diego Creek Watershed Management Committee meeting to provide expertise on agriculture and nursery runoff issues.
52. August 6. Met with Hines, Bordiers, El Modeno nurseries, and the OC Farm Bureau to discuss ways to prevent RIFA pesticides from contaminating nursery runoff water
53. August 7. Contacted Cindy Georgio from the UCR Deans office about support for the National RIFA conference
54. August 19. Gave an invited talk to the American Chemical Society, at their national meeting in Boston, on mitigation of bifenthrin in nursery runoff.
55. August 22. CAN CCNPro Trng, IPM, Entomology.
56. August 28. Photographed at El Modeno Gardens mitigation of pesticides in nursery runoff site by a photographer for article to published in Dow/Elanco's Panorama magazine.
57. September 18. CAN/PMA/UCCE Horticulture Research Education conference at UNEX, Riverside, CA. Had approximately 90 attendees. Flyer attached. I moderated the conference and gave a lecture on the Red gum lerp psyllid bc program for Don Dahlsten.
58. October 5. Gave a tour of the El Modeno pesticide mitigation project to 15 professors and graduate students from the Environmental Sciences Dept, UCR
59. October 9. Co-sponsored a frost protection meeting at the south coast research and extension center. Purpose of the meeting was to train growers to maximize their sprinkler frost control to minimize water runoff that could carry toxics and fertilizers offsite.
60. October 18. Edited video footage on effect of pyriproxyfen on fire ants.

61. October 19. Gave a lecture to the Ag in the Classroom convention attendees at SCREC on water/pesticide issues impacting nurseries, and also on RIFA.
62. October 21. Met with PMA nursery members and conducted a workshop on BMP's to mitigate toxics in runoff water and how to comply with water discharge requirments from the RWQCB.
63. October 23. Displayed a poster on PMA sponsored projects at the Southern and Coastal Region UC Cooperative Extension Conference in San Jose, CA.
64. October 29. Organized and moderated a session on bc of pests of eucalyptus at the UC Pest Management Workgroup mtg in Sacramento, CA.
65. November 5. Co-sponsored an erosion and sediment control workshop at SCREC for growers. Sediment is a major route of pesticide offsite movement.
66. November 8. Organized and moderated meeting to discuss use of physical barriers for glassy winged sharpshooter exclusion from a nursery.
67. November 15. Provided nursery presentation materials for Farm Advisor Rhonda Smith on GWSS for her to present to nurseries in N. Ca.
68. November 29. Submitted a chapter on water recycling, with emphasis on mitigating pesticide runoff in nurseries to UC ANR
69. December 3. Entomological Society of So. Calif. Update on UC ANR research on exotic pests of ornamentals, mitigation of pollutants in runoff water.

2003

70. January 30, 2003. California Irrigation Technology Institute, BMPs to reduce fertilizer and pesticide runoff from Ag and Nurseries.
71. March 13. State Water Resources Control Board TMDL Workshop, San Diego, Title of talk: Agriculture and Nursery Runoff BMPs.

Presentations by Cheryl Wilen

2001

1. March 23. IPM and TMDLs for Nurseries, UCCE training meeting, 40 people, Irvine.
2. May 11. Alternatives to Pesticides, ROPS Training Class, 25 people, Chula Vista.
3. May 16. Pests and Plant Nutrition, CCA Seminar, 50 people, Carlsbad.

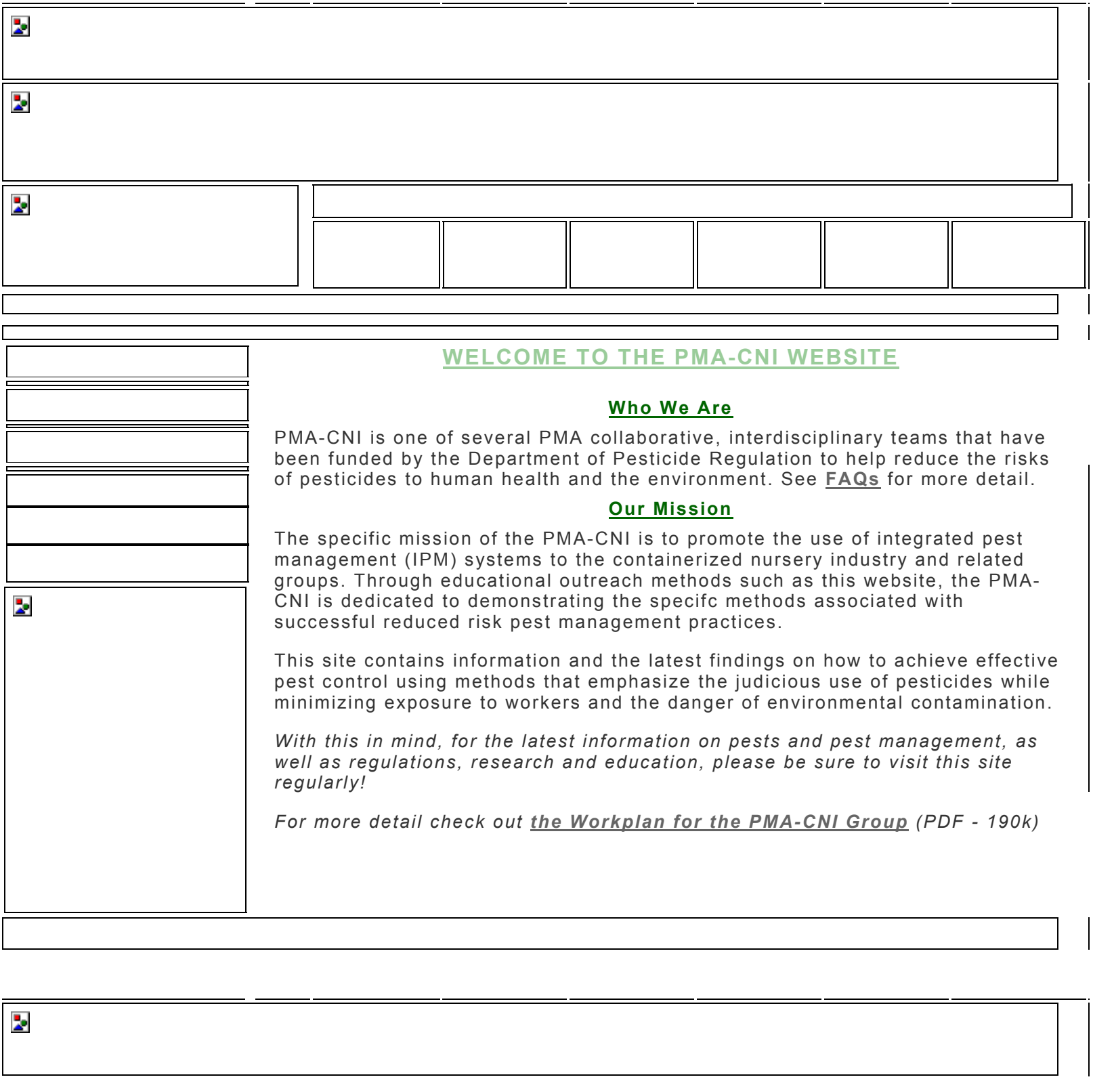
2002

4. November 5. In field demonstration of study for subirrigation system. Attended by nursery growers from four large container nurseries.
5. November 21. California Association of Nurserymen Research Committee Meeting, Riverside, CA. Subirrigation for weed control and increased crop growth in container plant production.
6. November 14. In field demonstration of study for subirrigation system. Attended by UC Farm Advisors and Specialists working with container nurseries.

Table 8. Publications

1. Kabashima, J., S.J. Lee, D.L. Haver, K.S. Goh, L. Wu, and J. Gan. In Review. Book Chapter: Pesticide Runoff and Mitigation at A Commercial Nursery Site. American Chemical Society.
2. Kabashima, J., D. L. Haver, K. Goh. In Press. Mitigation of bifenthrin in nursery runoff. Proceedings of the 2002 American Chemical Society.
3. Greenberg, L., J. Klotz, J. Kabashima. 2001. Red Imported Fire Ants. Pest Notes Publication 7487. UC ANR.
4. Greenberg, L., D. Reierson, and M. K. Rust. 2002. Submitted. Fipronil Trials in California Against the Red Imported Fire Ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae), Using Three Measures of Ant Populations. J. Econ. Entomol., 17 ms. pp.
5. Greenberg, L. and J. H. Klotz. Red Imported Fire Ants. 2001. Div. Agric. Sci. Pest Note 7487: 1-3.

Appendix I. Printout of page 1from the PMA web site.



WELCOME TO THE PMA-CNI WEBSITE

Who We Are

PMA-CNI is one of several PMA collaborative, interdisciplinary teams that have been funded by the Department of Pesticide Regulation to help reduce the risks of pesticides to human health and the environment. See **FAQs** for more detail.

Our Mission

The specific mission of the PMA-CNI is to promote the use of integrated pest management (IPM) systems to the containerized nursery industry and related groups. Through educational outreach methods such as this website, the PMA-CNI is dedicated to demonstrating the specifc methods associated with successful reduced risk pest management practices.

This site contains information and the latest findings on how to achieve effective pest control using methods that emphasize the judicious use of pesticides while minimizing exposure to workers and the danger of environmental contamination.

With this in mind, for the latest information on pests and pest management, as well as regulations, research and education, please be sure to visit this site regularly!

*For more detail check out **the Workplan for the PMA-CNI Group** (PDF - 190k)*

Appendix I. Printout of page 2 from the PMA web site.

WHAT's NEW

Archived Articles

IPM & WATER QUALITY FOR NURSERIES

Water quality in California is impacted by a number of industries and sources. With the recent setting of Total Maximum Daily Loads (TMDLs) of various materials that can impact water quality, commercial nurseries are taking a closer look at how they can reduce pesticide use as well as water runoff, which can carry potentially harmful materials.

Cheryl Wilen, Area IPM Advisor of Ornamental Crop Production and Maintenance in southern California is conducting a demonstration project for growers to help reduce herbicide use as well as reduce runoff. As part of a Pest Management Alliance grant from the California Department of Pesticide Regulation, Cheryl is using plant containers originally developed for the interiorscape industry and adapting them for outdoor use. The pots have a "well" in their base and the plants are individually subirrigated. Water runoff is minimized since the irrigation is by a system of individual tubes and connected to a moisture sensor so that the crop is only watered when a set level of drying is reached. She is also examining the use of this system in relation to weed control since the soil surface should be drier and not a good substrate for blown-in weed seeds to establish.

The study has just been established with three types of plants (Callistemon, Liriope and Star Jasmine) and two container mixes (with and without coir). The plants are established and moisture sensors in place. Rain buckets with dataloggers have also been installed to monitor water usage. Evaluation of weed cover will begin in about 3 weeks. If anyone would like to see the study in progress, contact Cheryl (858-694-2846, cawilen@ucdavis.edu) and she will arrange to show it to you.

Spring 2002
Volume 1, Issue 1

Pest Management Alliance for the Containerized Nursery Industry

Inside this Issue

For additional information on pests and pest management as well as regulations, research and education relevant to the containerized nursery industry, be sure and visit www.pmacni.com

Produced for PMA-CNI by Integrated Urban Forestry, a service of David Evans and Associates
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Laguna Hills, CA 92653
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FAX: 949/588-5058

Welcome to the inaugural edition of the newsletter for the Pest Management Alliance for the Containerized Nursery Industry (PMA-CNI). PMA-CNI is one of several PMA collaborative, inter-disciplinary teams, which have been funded by the Department of Pesticide Regulation to help reduce the risks of pesticides to human health and the environment.

The specific mission of the PMA-CNI is to promote the use of integrated pest management (IPM) systems to the containerized nursery industry and allied industry groups. Through educational outreach methods such as this newsletter and a new website, PMA-CNI is dedicated to developing and demonstrating reduced risk pest management practices.
As a supplement to PMA-CNI's website, this newsletter contains information and the latest findings on effective pest control using methods that emphasize the judicious use of pesticides while minimizing exposure to workers and the danger of environmental contamination.

PMA-CNI, in cooperation with:

dpr Department of Pesticide Regulation

RIFA Update

In February 2002, PMA-CNI released its second Final Report, summarizing activities and accomplishments for the period between June, 2000 and June, 2001. Much of the work completed during this period has focused on Red Imported Fire Ant (RIFA) Control and correlates to significant progress in terms of management and control strategies. Highlights include:

- Successful demonstration of improved monitoring techniques. Improved monitoring means that pesticides are used only when the pest is found, thereby reducing the use of pesticides. *See Demonstration on Page 2.*

- Testing of selected alternative materials to organophosphate and carbamate insecticides- both in the laboratory and the field. New materials require less frequent application, are simpler to use and show promising results. *See Alternatives on Page 2.*

- Development and demonstration of cultural practices that reduce the amount of insecticide in water that run-offs from nurseries. Catching and filtering run-off at the source is the best way to achieve State water quality goals and maintain the integrity of the nursery industry. *See Run-off Reduction on Page 2.*

UNIVERSITY of CALIFORNIA ANR Agriculture & Natural Resources

• Actively recognizing the importance of communication and outreach to all stakeholders through fledgingly PMA-CNI website and newsletter efforts. *See Demonstration on Page 2 for more*

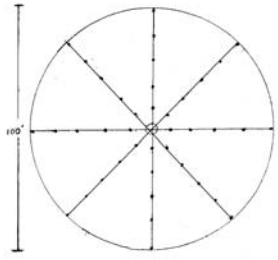
Monitoring

To demonstrate improved methods of monitoring for red imported fire ants (RIFA), several nurseries with RIFA issues were selected for monitoring.

At the Tree of Life Nursery in San Juan Capistrano, monitoring involved the placement of protein and sugar water bait stations every 20 ft in a grid pattern around the nursery.

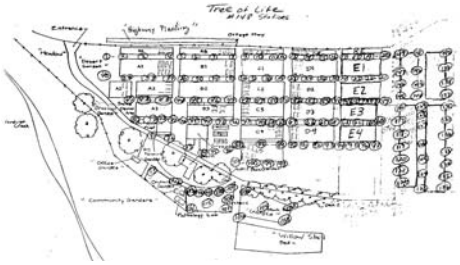
Each month, over a one year period, the number and species of ants found were recorded. Since no RIFA were found after the original infestation, it was possible to demonstrate that it was not necessary to apply pesticides every 3 months, as the state quarantine usually requires. Thus, the use of pesticides on 36 acres at this nursery during the year of monitoring was avoided. Results indicate that effective monitoring can substitute for quarterly broadcast pesticide applications.

At four other nurseries in Orange County, monitoring stations were arranged in the pattern of a wheel around the find.
This helped define the extent of the infestation in each case, thereby justifying the use of pesticide in a small area around the infestations. These data have helped persuade state quarantine officials that monitoring for fire ants is reliable. Therefore, the requirement for quarterly broadcast of pesticides in nurseries has been relaxed and only the immediate vicinity of the infestation needs to be treated.



Alternatives

To evaluate new products in the



field, several long-term studies at golf course communities in the Coachella Valley were designed. These studies demonstrate that a new pesticide, fipronil, is effective against fire ants in California. This product has a much longer residual effect than other pesticides, thus reducing the frequency of treatments (once a year instead of 4 times a year, according to experts who have

tested it in other states). The fipronil does not require turning off irrigation, as do other fire ant products. Fipronil will soon be on the market in California and will be available for fire ant control.

In the laboratory several studies have demonstrated the efficacy of 4 liquid toxicants for use in fire ant bait stations. Liquid toxicants help avoid ground contamination with pesticides. These toxicants will be field tested as sites in nurseries or golf courses are available. The use of drench alternatives in potted soil for ant control has also been tested. As findings become more definitive, plans are to lobby the USDA for changes in regulations regarding soil incorporation of pesticides.

Run-off Reduction

Until recently, meeting fire ant quarantine and water quality requirements has been a challenge. The fire ant quarantine at plant nurseries requires that bifenthrin or chlorpyrifos be added to potting soil to prevent colonization of fire ants. These products have been detected in water runoff from nurseries operating under the California Department of Food and Agriculture compliance program. Chlorpyrifos is an identified pollutant that has been found in various water bodies in the state and is a listed pollutant in the Newport Bay/San Diego Creek watershed TMDL, which is in the fire ant quarantine area. The initial task was to set up a nursery site to demonstrate the protection of surface and groundwater quality (El Modeno nursery). Pesticide runoff has been significantly reduced, with bifenthrin concentrations being reduced by 54%. The second phase was then to have grower forums and workshops to demonstrate these practices. Over 50 lectures, seminars, and workshops have included information fulfilling the objectives of the PMA grant.

Communication

As an extension of the general PMA mission, provisions for a website and newsletter are in place. Be sure

and check out the website at http://www.pmacni.com.

PMA Primer

What is PMA, the Pest Management Alliance?
The Pest Management Alliance (PMA) Program, sponsored by the Department of Pesticide Regulation (DPR), provides support for agricultural, nonagricultural and urban groups to develop and demonstrate pest management systems that reduce risks associated with pesticide use.
PMA is designed to help commodity groups address pest management issues on a statewide scale. The Alliance approach is unique in that it is devoted to reducing pesticide risks, while at the same time, establishing a dialog with DPR. ***The Pest Management Alliance (PMA) for the Containerized Nursery is an example of a PMA partnership with a commodity group.***
The Alliance promotes a concept of voluntary cooperative problem solving, which creates a climate where growers and urban and suburban residents are better informed and more willing to try to implement the reduced-risk practices that work. This program is designed to create a collaborative, interdisciplinary team that uses a systems approach—the assumption is that team members have already solved pest problems and other specialized components through applied research. The Alliance is part of a problem-solving continuum, taking the data collected from research and preparing for the next stage—**education through demonstration, and ultimately implementation.**

How does PMA work?
PMA establishes the structure for DPR to develop alliances with members of the regulated community and fund efforts to focus about reduced-risk practices and provide incentives to adopt them. DPR initiates preventive programs that are voluntary, economically sound, and effective in solving environmental and human-health problems. on issues and develop solutions. Solutions must be economically sound and reduce risk to human health and the environment. Projects address problems that alliance participants recognize as important and may include a mixture of applied research, demonstration, implementation, and outreach. Agricultural and nonagricultural groups are encouraged to submit proposals for reduced-risk projects that address key areas of concern. Examples include those that demonstrate alternatives to highly toxic pesticides, protect surface and ground water quality, develop IPM programs for public schools and other public buildings, and develop alternative reduced-risk approaches for urban pest management.
How does PMA fit into the State of California's overall Pest Management Strategy?
The efforts of PMA and other DPR activities are part of a broader objective by the California Environmental Protection Agency to encourage pollution prevention. The Pest Management Strategy, created in 1995 by DPR staff and diverse stakeholders, also directs DPR to spread information

The specific mission of the PMA-CNI is to promote the use of integrated pest management (IPM) systems to the containerized nursery industry and allied industry groups

Upcoming Events

Wednesday, March 6-Thursday, March 7, 2002
7:15 AM

Target's Annual Seminar
Long Beach Convention Center 300 E. Ocean Blvd
Long Beach, CA 90802

Top industry speakers discuss current topics and issues. Stay for the whole day or pick and choose programs you want to attend. Call (800) 352-3870 or register on-line http://stores.ontarget.cc/tgt

Thursday, October 10, 2002

IPM Strategies Symposium
Watsonville, CA

Please see CORF website at http://www.corf.org for additional information as it becomes available.

For more information on other educational programs and conferences, please refer to the PMA website at http://www.pmacni.com

Glassy Winged SharpshooterTraining Meeting

The PMA held a Glassy-winged sharpshooter (GWSS) training meeting for nurseries and allied industries on January 24, 2002. The meeting was held in Irvine, California at the University of California South Coast Research and Extension Center and attended by over 50 people. The attendees received information about the regulations for shipping plants from Craig Hanes of CDFA. County entomologists from Orange (Nick Nisson) and Napa (Joel King) Counties explained how county inspectors examine plants for adults for egg masses and adults in both the shipping and receiving counties. information regarding insecticide trials and trapping methods for monitoring. Dr. David Morgan from CDFA finished up the meeting by reporting on his work on identifying, rearing, and releasing biocontrols for GWSS.

A limited number of Chris Ono's handout is available for distribution. Please contact Cheryl Wilen (cawilen@ucdavis.edu) for a copy. For the latest information about GWSS research see http://gwss.ucanr.org/nfpubs.html and select "California Department of Agriculture, Pierce's Disease Research Symposium Proceedings, December 2001" (lots of other information on this site!). To order a copy of the **training video** (Glassy-Winged Sharpshooter Identification and Monitoring, $35, Publication V-01-A) which covers GWSS identification, biology, and monitoring in English and Spanish, see the UC Agriculture and Natural Resources Publications Catalog at http://anrcatalog.ucdavis.edu/ or call 800-994-8849.

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