

# Light Brown Apple Moth Management in Nurseries



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Cooperative Extension

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Watsonville, California

## IPM: Best Management Practices for Light Brown Apple Moth

- Judging Nursery Risk
- Training and Educating Nursery Personnel
- Prevention and Exclusion
- Monitoring (Scouting)
- Actions and Treatments
- Records and Pest history

# What is Monitoring (Scouting) ?



De tection and Evaluation of Pest  
and Disease Problems

What, Where, and How Many ?  
Record keeping to build a history  
Action or treatment ? Effective?

# What is Monitoring for LBAM ?

- Can be a component of an existing robust monitoring program
- Can be a simple, sole monitoring program to detect and destroy LBAM

# Why monitor for LBAM ?

- A “robust IPM program” is a regulatory requirement for nurseries within the quarantine zones.
- The time spent to monitor and destroy LBAM may well more than compensate for the time and money required if there is detection of LBAM by regulatory officials.

# Pest Management Team

- Leader
  - The owner/operator, the production manager, the pest control manager.
- Scout (s)
  - Trained and with good eyesight.
- Other nursery staff
  - Shipping crew, irrigation crew, pesticide applicators

" We patrol our entire jurisdiction every day, but we know where there is more likely to be trouble and we spend more time in those areas "

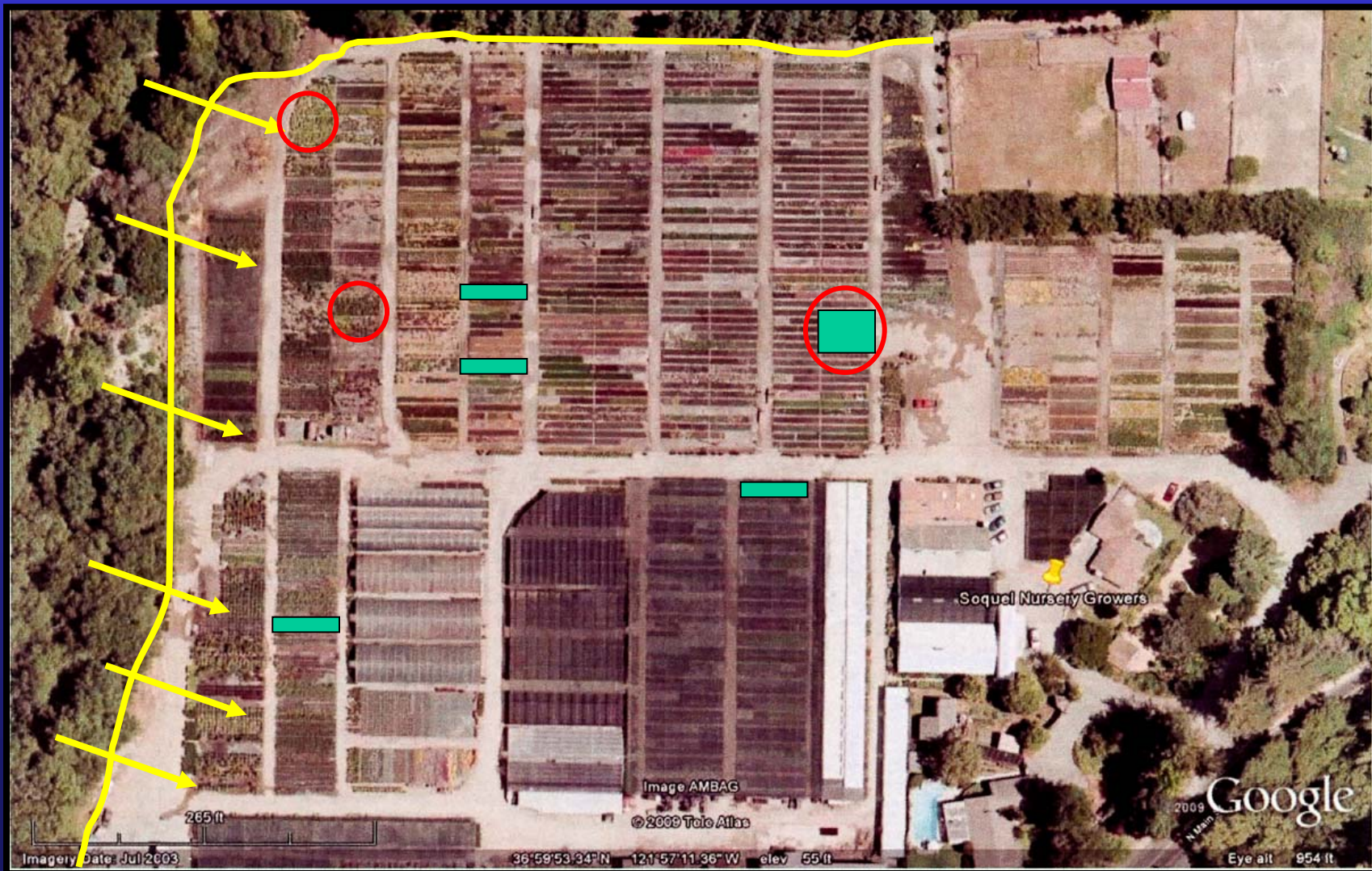
Corporal Michael McKinley  
Police Department  
City of Watsonville

# Strategic monitoring: areas of emphasis

- Nursery perimeter
  - Wild vegetation or landscapes with LBAM
  - Prevailing winds
- Hosts
  - Known listed hosts (CDFA list)
  - Nursery experiences
  - Nursery stock with “flush” of growth
- Traps



# Maps: Layout and nursery stock



# Maps: Layout and nursery stock

	#3	
	#2	
	#1	

# Maps: Layout and nursery stock

	0	0	15		16	0	0	
		1WF	1LM			0	0	
	0		2LM		14	1LM	0	
		0	1LM		12	1LM	0	
	1LM	Card	5LM		10	1LM	Card	0
	0		0		8	0	0	
	1WF		3LM		6	1LM	0	
	0		0		4	0	0	
	0		0		2	0	0	
				#6				
	7LM	Dino	0	15	16	2WF	S. Pacific	1LM
		Dino	1LM	4LM	13		Orca	1WF
	0	Grizzly	3LM		11	2LM	Dragon	0
	Grizzly	0		9	10	1LM	Impala	1LM
	1LM	Card	1LM		8	1LM	Pacific	0
	Lamborghini		0	7	6	5LM	Furore	2LM
	Lamborghini		0	5	4	0	Furore	1LM
	2LM	Maya	0	3	2		Alice	1LM
	3LM	Maya	1LM	1				
				#5				
	0	Jewel	4LM	15	16	1LM	Anastasia	0
	3LM	Toto	1LM	13	14	0	Diane	2LM
	2LM	Jewel	5LM	11	12	3LM	Mammut	0
	0	Vamp	1LM	9	10	1LM	Serena	1LM
	0	Sibiane	1LM	7	8	0	Ferrari	0
	0		1LM	5	6	1LM	Skyline	0
	0	King Alex	0	3	4	0	Italia	0
	0	Venus	0	1	2	0	Charise	0
				#4				

CARD \*  
25 WF  
14 LM

CARD \*  
48 WF X  
36 LM X

CARD \*  
12 WF X  
4 LM X

CARD \*  
29 WF  
20 LM

CARD \*  
14 WF  
32 LM

CARD \*  
5 WF  
2 LM

\* Cards were left up for 2 weeks.

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# Top 10 Most Common CA Hosts

1.	Rosaceae (Prunus, Rose)	91
2.	Myricaceae (CA wax myrtle)	27
3.	Rutaceae (Boronia, Citrus)	23
4.	Myrtaceae (Bottlebush, Myrtle)	22
	Pittosporaceae (Pittosporum)	22
6.	Eriaceae (Blueberry, Manzanita)	21
7.	Proteaceae (Conebush, Protea)	20
8.	Scrophulariaceae (Penstemon)	19
9.	Asteraceae (Dahlia)	18
10.	Lamiaceae (Sage)	16
	Rhamnaceae (Ceanothus, Rhamnus)	16

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# Trap Monitoring

## Pheromone traps

- Selective pheromone attracts migrating male moths
- Placed at nursery perimeters near known infestation
- Hung above crop



# Trap Monitoring

## Ultraviolet-light trap

- Ultraviolet light is especially attractive to migrating moths
- Placed at nursery perimeters near known infestation
- “Bug zappers” don’t allow for identification





## Strategic monitoring: frequency

- One to two weeks apart, depending on growing season, everything needs to be visually inspected.
- More frequently in those areas with more risk.
- Preceding an official inspection, or before plants go on sale, or are shipped.

# Strategic monitoring: How to walk to see LBAM symptoms



# Strategic monitoring: How to walk to see LBAM symptoms



# Strategic monitoring: How to walk to see LBAM symptoms



# Strategic monitoring: How to walk to see LBAM symptoms





# Inspection of plant

- Focus in on symptomatic shoots and leaves
- Use 10 X hand lens

# LBAM life stages



Adult moth



Egg mass

Orange Tortrix



Pupa



Larva

# Symptoms at shoot tips

- Leaves bound together with silk-like webs or threads
- Leaves chewed, with holes
- Leaves distorted



Photo: CDFA



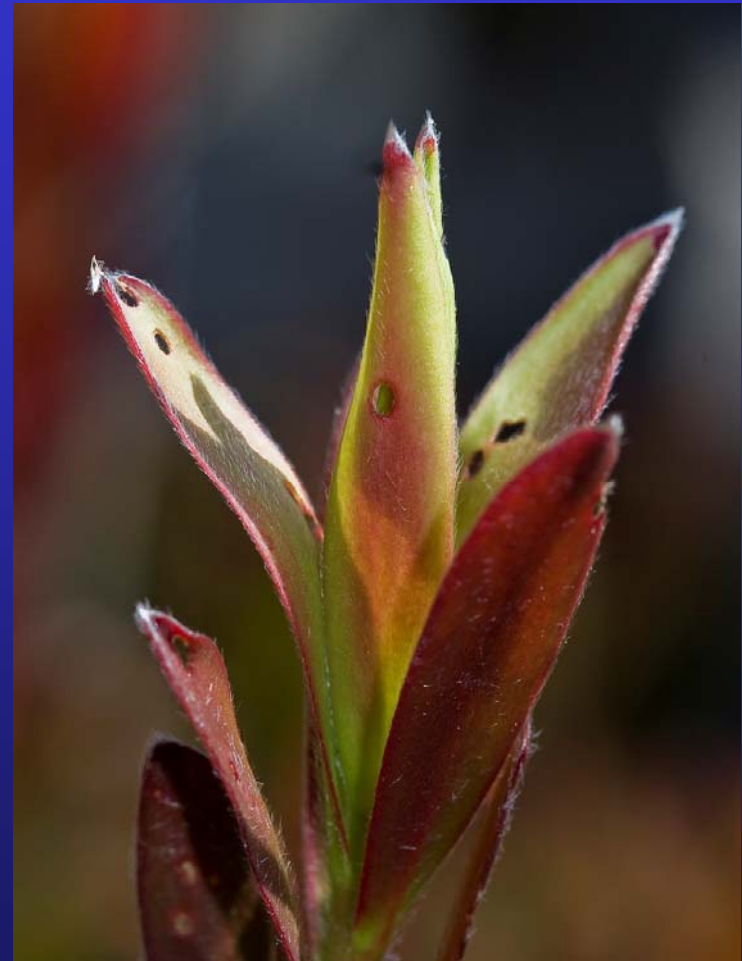
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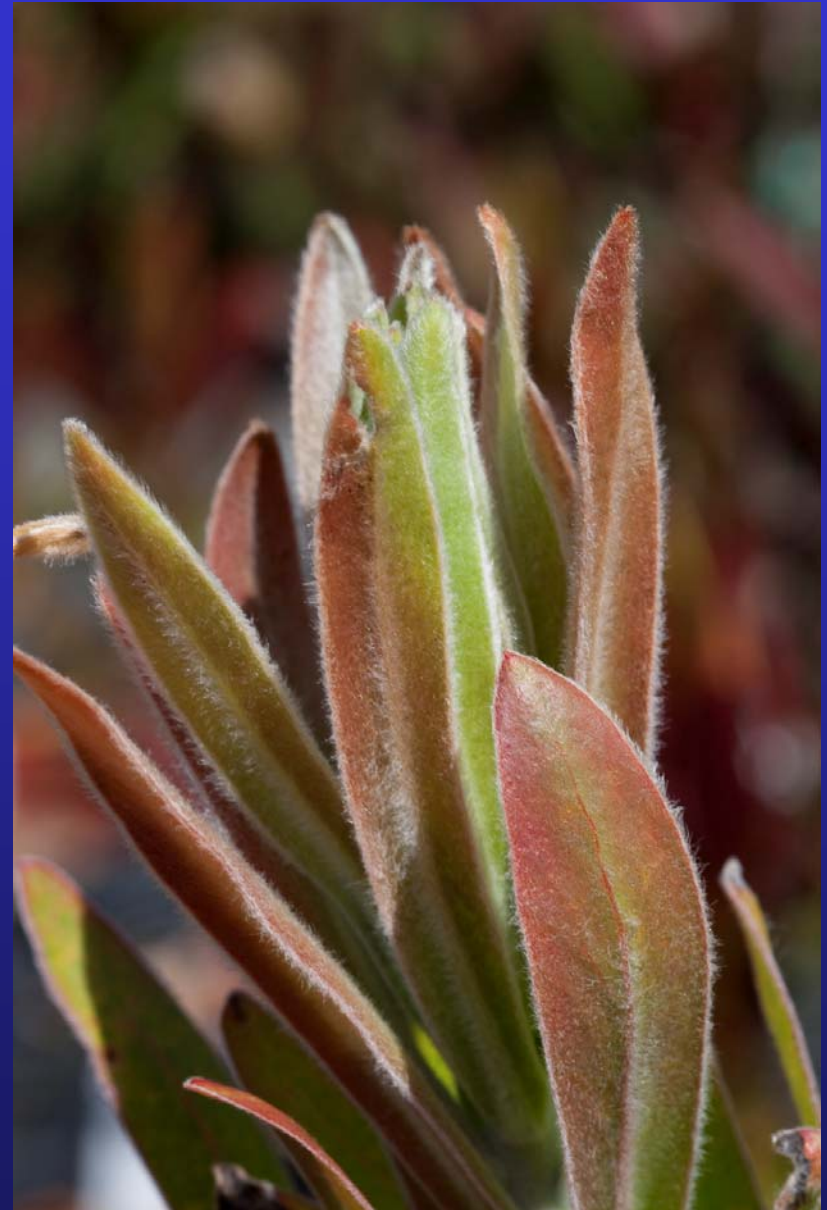
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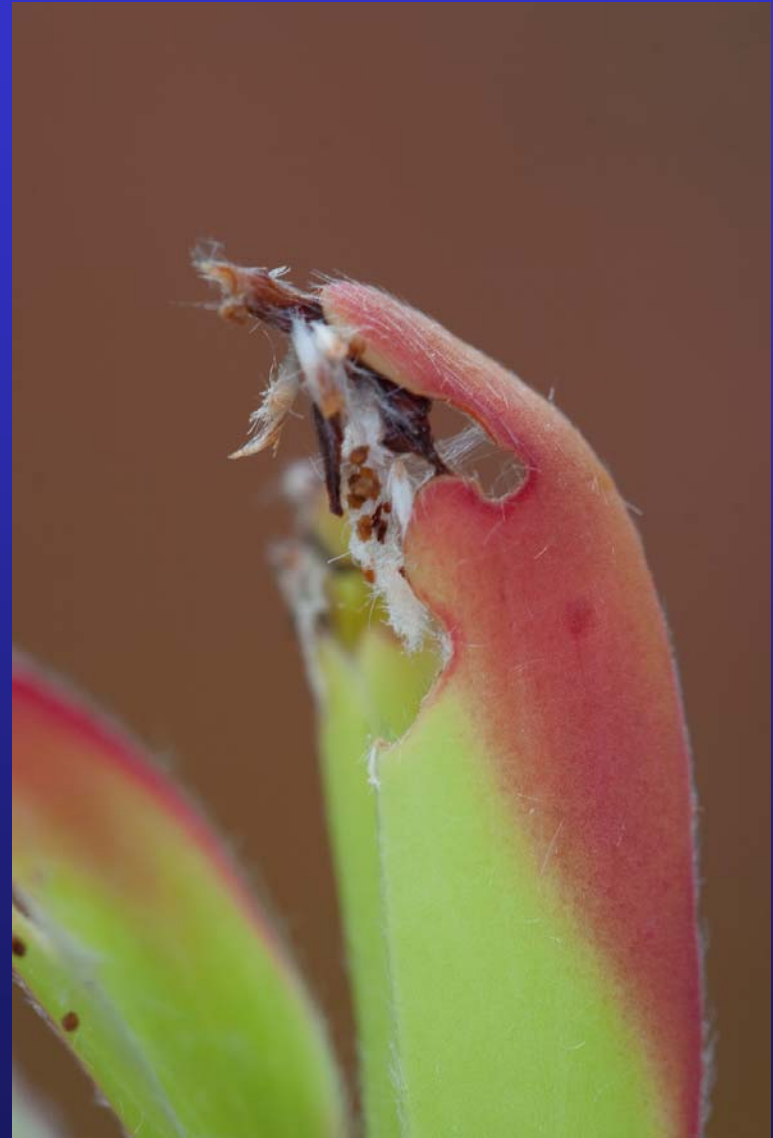
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Not LBAM



# Not LBAM



# Record Findings

- Date
- Location
- Life stage
- Host plant
- Area intensively monitored
- Area considered for treatment
- Scout or leader determining

	0	0	15	16	0	0	
	1WF	1LM		14	0	0	
	0	2LM	11	12	1LM	0	
	0	1LM	9	10	1LM	0	
CARD *	0	0	7	8	0	0	CARD *
25 WF	0	0	5	6	0	0	29 WF
14 LM	0	0	3	4	0	0	20 LM
	0	0	1	2	0	0	
	7LM	Dino	0	15	16	2WF	S. Pacific
	0	Dirlo	4LM	13	14	0	Orca
	0	Grizzly	3LM	11	12	2LM	Dragon
CARD *	0	Grizzly	0	9	10	1LM	Imbala
48 WF	0	Lamborghini	0	7	8	1LM	Pacific
36 LM	0	Lamborghini	0	5	6	0	Furore
	0	Maya	0	3	4	0	Furore
	0	Maya	1LM	1	2	0	Alice
	0	Jewel	4LM	15	16	1LM	Anastasia
	0	Toro	1LM	13	14	0	Diane
	0	Jewel	5LM	11	12	3LM	Niammu?
	0	Vamp	1LM	9	10	1LM	Serena
CARD *	0	Bibrane	1LM	7	8	0	Fanni
12 WF	0	King Alex	1LM	5	6	0	Malina
4 LM	0	Genus	0	3	4	0	Italia
	0	Genus	0	1	2	0	Charise

\* Cards were left up for 2 weeks.

# Actions and Treatments

- May have to increase monitoring frequency or intensity in the area of infestation
- Physically remove and destroy infestation
- Chemical Treatment

# Actions and Treatments

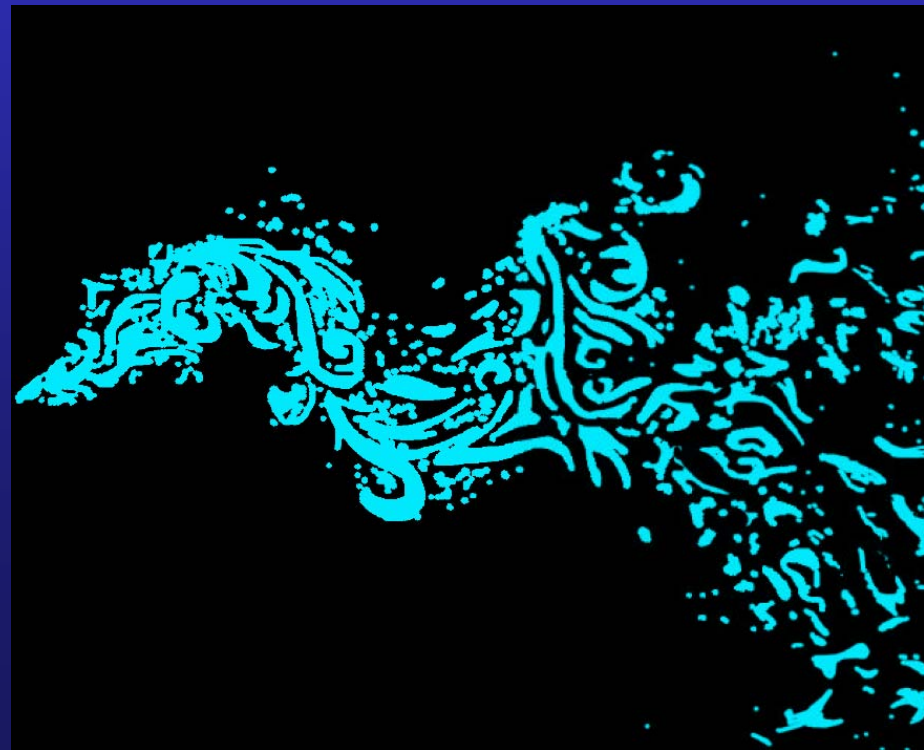
## Chemical Treatments

- Spot application (target the potentially infested area)
  - Hosts
  - Stage of growth
  - Nearness to infestation
- Chemical Treatment
  - Life stage present
  - Chemical class rotation
  - Application uniformity
  - Repeat application based on temperature and residual activity of chemical (2 weeks in summer)

Experimental

# Pheromone Mating Disruption

Female moth produces a trail of a specific minute chemical attractant into the air for the male moth





# Pheromone Mating Disruption

BIOCONTROL



## ISOMATE®-LBAM PLUS

Mating Disruption Formulation for light brown apple moth (*Epiphyas postvittana*)

This is an unregistered product approved under section 18 of FIFRA

For use in and around all agricultural crops, ornamental nurseries, business and residential outdoor areas, parks and forests

**FOR USE IN THE STATE OF CALIFORNIA ONLY**

### ACTIVE INGREDIENTS:

E-11-Tetradecen-1-yl Acetate ..... 63.88 %

(E,E)-9,11-Tetradecadien-1-yl Acetate ..... 2.64 %

**OTHER INGREDIENTS** ..... 33.48 %

**TOTAL** ..... 100.00 %

125.07 mg active ingredients per dispenser

**KEEP OUT OF REACH OF CHILDREN  
CAUTION**

### PRECAUTIONARY STATEMENTS

#### HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Avoid contact with skin, eyes or clothing. Harmful if absorbed through skin. Causes moderate eye irritation. After handling, wash thoroughly with soap and water before eating, drinking, chewing gum or using tobacco. Remove contaminated clothing and wash before reuse.

#### FIRST AID STATEMENT

**IF ON SKIN OR CLOTHING:**

- Remove contaminated clothing.
- Immediately rinse skin for 15-20 minutes using plenty of water.
- Contact a poison control center or doctor for treatment advice.

**IF IN EYES:**

- Immediately hold eyes open, slowly and gently rinse with water for 15-20 minutes. If wearing contact lenses, rinse eyes for 5 minutes, remove contact lenses, and continue rinsing.
- Contact a poison control center or doctor for treatment advice.

**HOT LINE NUMBER:** Have the product container or label with you when contacting a poison control center or doctor, or going for treatment. You may also contact Pacific Biocontrol at 1-800-999-8805 for additional information.

#### ENVIRONMENTAL HAZARDS

For terrestrial uses: Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of this product.

#### PACIFIC BIOCONTROL CORPORATION

14615 NE 13th Court, Suite A, Vancouver, WA 98685 U.S.A.  
Telephone (360) 571-2247 or 1-800-999-8805

MADE IN JAPAN  
EPA Est. No: 47265-JP-01

**NET CONTENTS:** 400 Dispenser Units  
One dispenser contains 0.00728 fl oz or 188.03 mg  
Total content of package: 2.912 fl oz or 75.21 gm

ISOMATE® is a registered Trademark of Pacific Biocontrol Corporation.

### DIRECTIONS FOR USE

**IT IS A VIOLATION OF FEDERAL LAW TO USE THIS PRODUCT IN A MANNER INCONSISTENT WITH ITS LABELING.**

**It is CRITICAL that ISOMATE-LBAM PLUS is applied as directed.**

<b>Host Sites</b>	All agricultural crops, ornamental nurseries, business and residential outdoor areas, wild lands, parks and forests.
<b>Target Pests</b>	Light brown apple moth ( <i>Epiphyas postvittana</i> ).
<b>Rate</b>	200-300 dispensers per acre (0.97-1.45 fl oz or 25.01-37.52 gm a.i. per application). Use higher rates when pest pressure is high. Do not exceed 150 gm a.i. (or 1,199 dispensers) per acre per year.
<b>Application</b>	Dispensers must be applied uniformly throughout the treated areas to obtain a reduction in mating. Twist dispensers loosely around host plant branches, vines, etc., in the top part of plant canopy.
<b>Timing</b>	Apply prior to light brown apple moth emergence in the spring. Monitor with pheromone traps and inspection of host sites. Additional applications are to be based on field scouting for the target pest. Consult your local pest control advisor or Pacific Biocontrol representative for proper timing or estimated dispenser longevity in your area.
<b>Note</b>	Isomate-LBAM Plus suppresses mating of target pest. Immigration of mated female moths of this species from adjacent external sources of infestation will reduce the level of control. Manage by: a. Treatment of external sources of infestation with Isomate-LBAM Plus. b. Treatment of external sources of infestation with an effective insecticide. c. Treatment of pheromone treated area with insecticide.
Isomate-LBAM Plus is best used in large (> 10 acres), uniform and contiguous areas. Supplementary applications of insecticide are strongly advised when Isomate-LBAM Plus is used in areas with high populations. All pests must be monitored to facilitate timely intervention with insecticides.	
<b>STORAGE AND DISPOSAL</b>	
<b>Do not contaminate water, food or feed by storage or disposal.</b>	
<b>Pesticide Storage</b>	Store in original unopened package in a dry location at temperatures below 40°F. Only unopened or unbroken dispenser packages may be stored in cold storage facilities used for food storage.
<b>Pesticide Disposal</b>	Wastes resulting from this product may be disposed of on site or at an approved waste disposal facility. Any unused, unregistered product must either be returned to the manufacturer or distributor (unopened containers) or disposed of in accordance with Resource Conservation and Recovery Act regulations following the expiration of this quarantine exemption.
<b>Container Disposal</b>	Dispose of empty dispensers and foil packets in the trash.

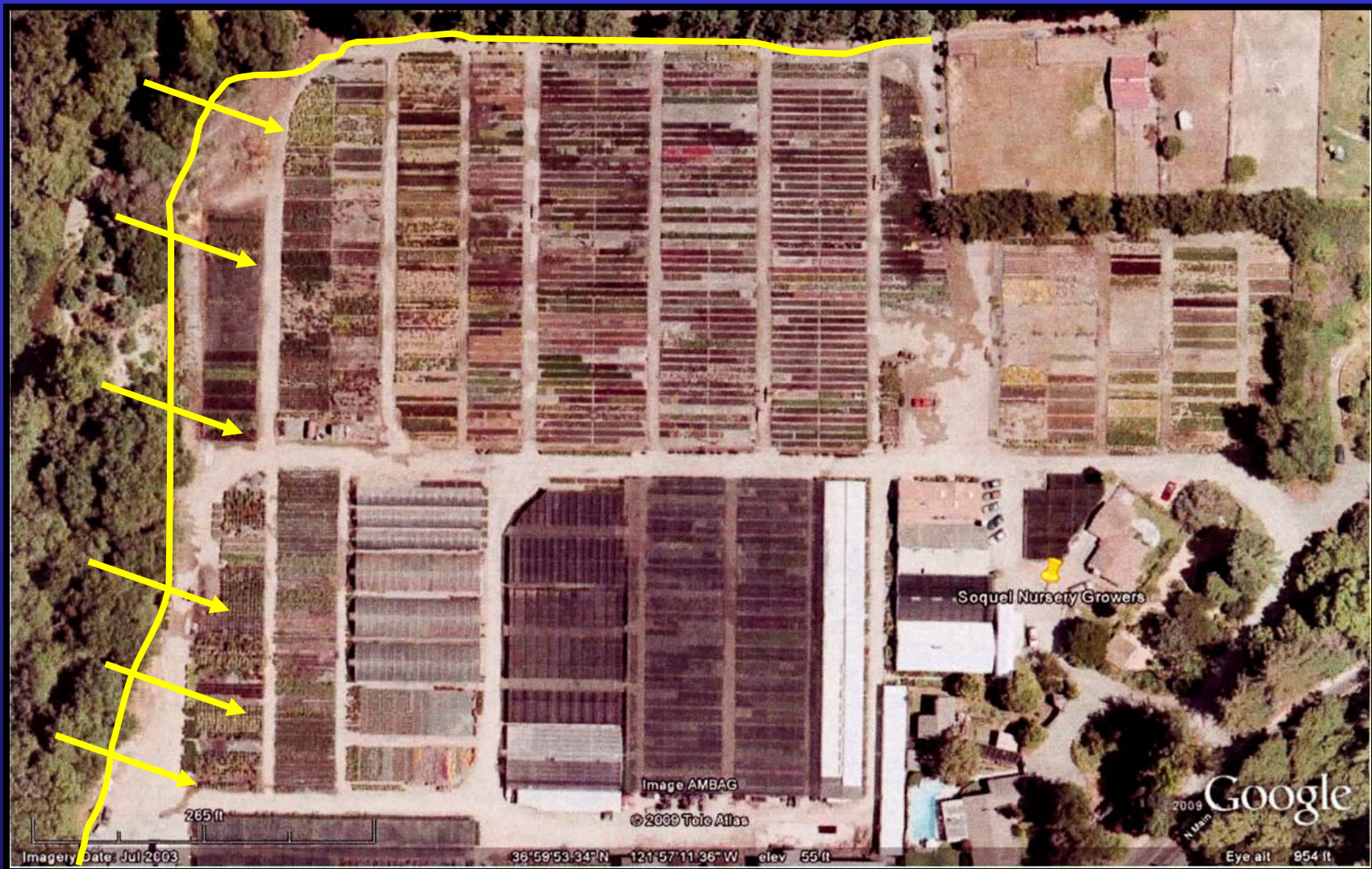
### WARRANTY AND LIMITATION OF DAMAGES

All statements concerning the use of this product apply only when used as directed. The Manufacturer makes no warranties, expressed or implied, concerning this product or its use, which extend beyond the description on the label. Read all directions carefully.

CA. Reg. 53575-07008-EE

Experimental

# Barrier traps on nursery perimeter



Experimental

# Barrier Baits

- Terpinyl acetate and brown sugar
- Vinegar (acetic acid)
- Port wine



Experimental

# Barrier traps

- Sticky tape combined with pheromone emitters or ultraviolet light



# Barrier traps

Experimental

- LBAM pheromone mixed with insecticide



## **SPLAT** Methods of Application



Dosing Gun



Caulking Gun



Metered Sprayer



Paintball Gun



Tractor



Aircraft

...and more

# Acknowledgements

- CDFA / USDA Specialty Crop Initiative
- Neal Murray, Staff Research Associate