Rice Protection from Invertebrate Pests

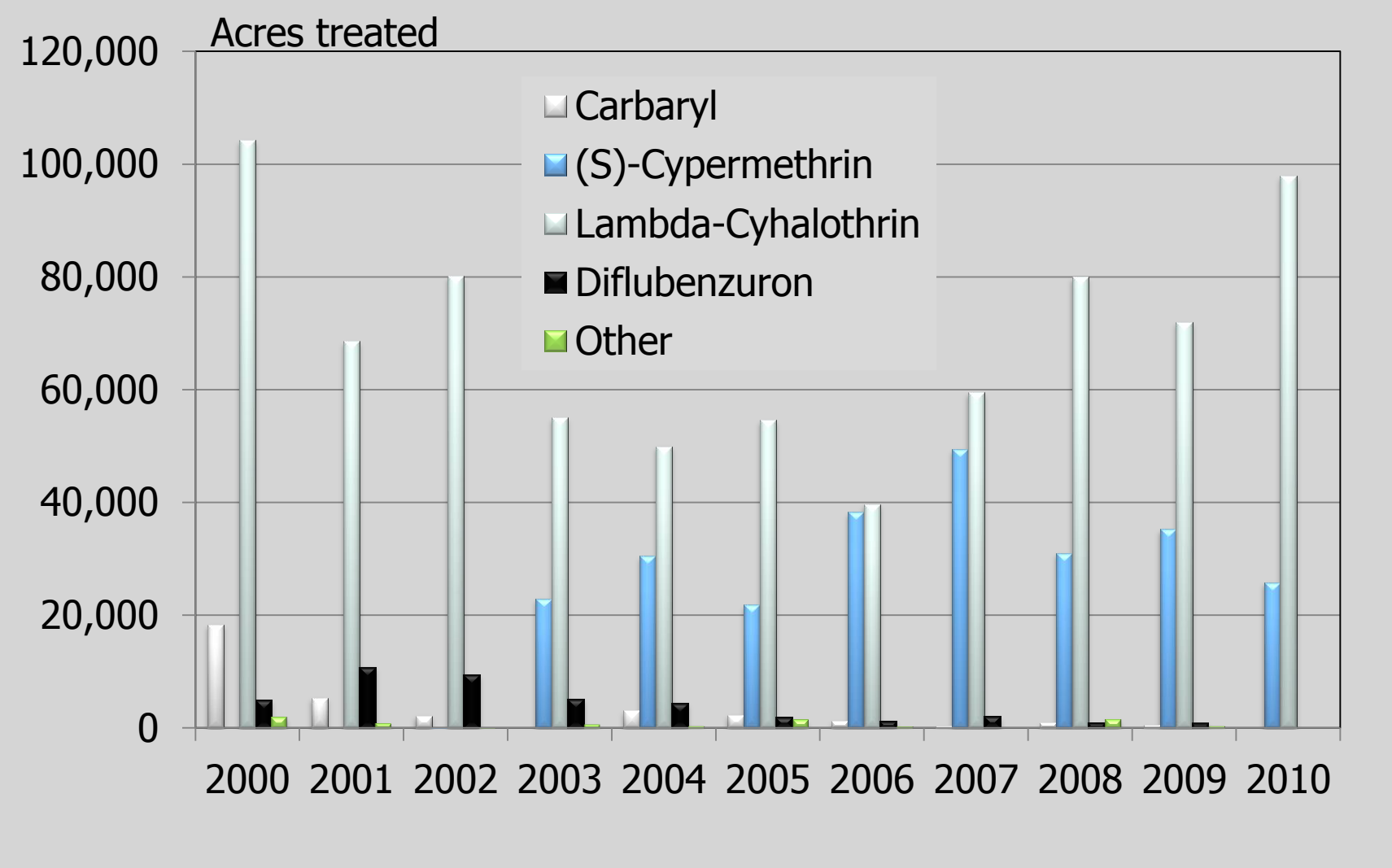
Larry Godfrey

Godfrey Laboratory:
Kevin Goding, Evan Goldman, Mohammad-Amir Aghaee + three summer student workers
RES: Ray Stogsdill
Others: Amy Bell, Kris Tollerup
Cooperator: Luis Espino

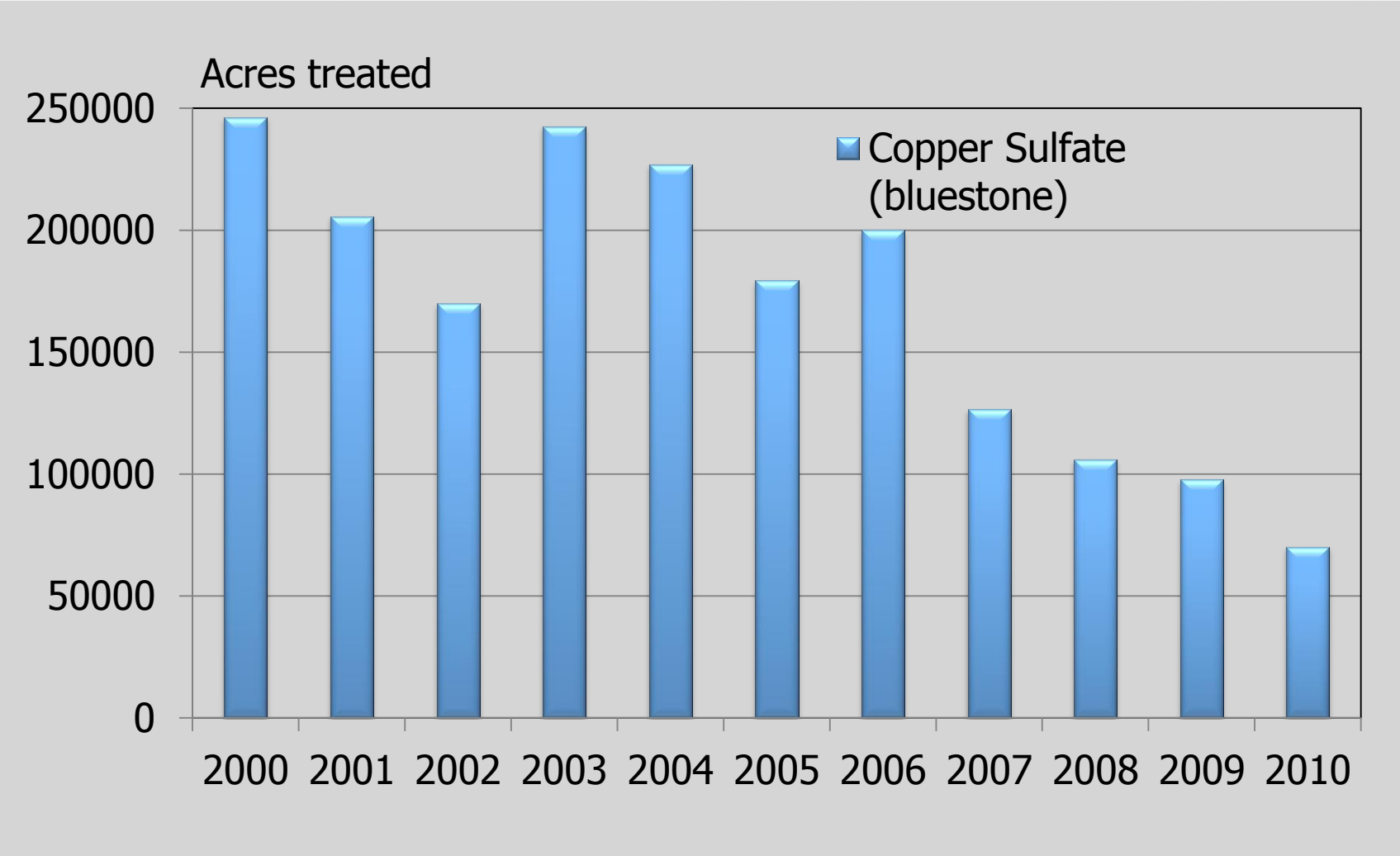
Rice Invertebrate Pest Management

- Rice water weevil (*Lissorhoptrus oryzophilus*)
- Rice seed midge (*Cricotopus sylvestris* and others)
- Crayfish (*Procambarus clarki*)
- Tadpole shrimp (*Triops longicaudatus*)
- Armyworms (*Spodoptera* spp.)

Rice Invertebrate Pest Management



Rice Invertebrate Pest Management



Rice Invertebrate Pest Management

- Environmental issues
  - Pyrethroids under re-registration by DPR due to off-site movement
  - Volatile Organic Compounds – VOCs – EC formulations
  - Presently Mustang Max and Warrior – both pyrethroids and ECs
- Invasive pests

Rice Invertebrate Pest Management

- Environmental issues
  - Pyrethroids under re-registration by DPR due to off-site movement

FREQUENTLY ASKED QUESTIONS ABOUT

Reevaluation of Certain Pesticide Products Containing Pyrethroids, California Notice 2006-13

Department of Pesticide Regulation
January 2007

The Department of Pesticide Regulation (DPR) placed certain pesticide products containing pyrethroids into reevaluation on August 31, 2006. The reevaluation is based on monitoring surveys and toxicity studies revealing the widespread presence of pyrethroid residues in the sediment of both agricultural and urban dominated California waterways at levels toxic to *Hyalella azteca (H. azteca)*. Scientists conducted sediment

Additional data from registrants

- environmental fate studies
- sediment toxicity data
- chronic sediment toxicity studies

Rice Invertebrate Pest Management

- Environmental issues
  - Volatile Organic Compounds – VOCs – EC formulations
    - recently some regulations in SJV banning use of certain products during certain times on some crops

Rice Invertebrate Pest Management

❖ Invasive pests

<u>Nothing new affecting rice</u>

- various bugs (stink bugs and related) in U.S.
- bagrada bugs – southern CA/Arizona
- Kudzu bug – SE U.S.
- brown marmorated stink bug – east coast and spreading; in CA

Brown Marmorated Stink Bug Information

Stop Brown Marmorated Stink Bug

Our new website launches the latest research findings about the invasive insect, with a photo identification guide and advice on how to control it. Learn more at StopBMSB.org.

QUICK LINKS TO STOPBMSB.ORG

- BMSB in the News
- Stink Bug Basics
- Where Is BMSB?
- Managing BMSB
- Stink Bug Presentations and Research Reports

Stink Bugs in the News

- Researchers Discover the Brown Marmorated Stink Bug's Winter Hideout (New insights into the invasive pest's behavior could help growers protect farms located near woodlands, July 2012)
- OSU Researchers Find Ag Pest Gaining Ground (Oregon Public Broadcasting, June 2012)
- Native Parasitoids Hold Promise in Stink Bug Defense (Researchers teach workshop participants to recognize natural enemies of brown marmorated stink bug, Apr. 2012)
- Stink Bugs Migrating to the Deep South (*Washington Post*, Mar. 2012)
- Storms May Have Killed Off Many Stink Bugs (*Baltimore Sun*, Feb. 2012)
- Out of Odor: Offensive-Smelling Bugs Put U.S. Farmers on the Defensive (*Wall Street Journal*, Jan. 2012)
- A Stinker of a Pest: IPM Researchers, Educators Team Up Against Brown Marmorated Stink Bug (USDA SCRI program awards $5.7 million for project to help growers cope, Dec. 2011)
- Economic Cost of Stink Bugs (C-SPAN interview with IPM Working Group members, Sept. 2011)
- Stink Bug Research Continues (video from West Virginia Public Broadcasting, Aug. 2011)
- Invasive Bugs Making a Bigger Stink (*Washington Post,* Aug. 2011)
- EPA Approves Two Insecticides for Control of Invasive Stink Bug (EPA press release, June 2011)
- Stink Bug Invasion: Is a Wasp the Solution to Save Valued Crops? (*PBS NewsHour*, May 2011)
- Mid-Atlantic Dreads Bad Summer of Foul, Hungry Stink Bugs (*New York Times,* May 2011)
- Stink Bug Spread Worries Growers Across Nation (*ABC News*, May 2011)
- Can Wasps Squash the Stink Bug Plague? (*NPR*, Apr. 2011)
- The Return of the Stink Bugs (*Washington Post,* Apr. 2011)
- Stink Bugs: It Could Be Worse (*New York Times,* Apr. 2011)
- Brown Marmorated Stink Bug Causes $37 Million In Losses To Mid-Atlantic Apple Growers (*American Fruit Grower*, Apr. 2011)
- Stink Bugs Invade Homes, Are Called Menace to Agriculture (*Good Morning America* and *ABC News,* Apr. 2011)
- Stink Bugs Meet Their Nemesis in Asian Wasp (*USA Today,* Mar. 2011)

Grain Quality

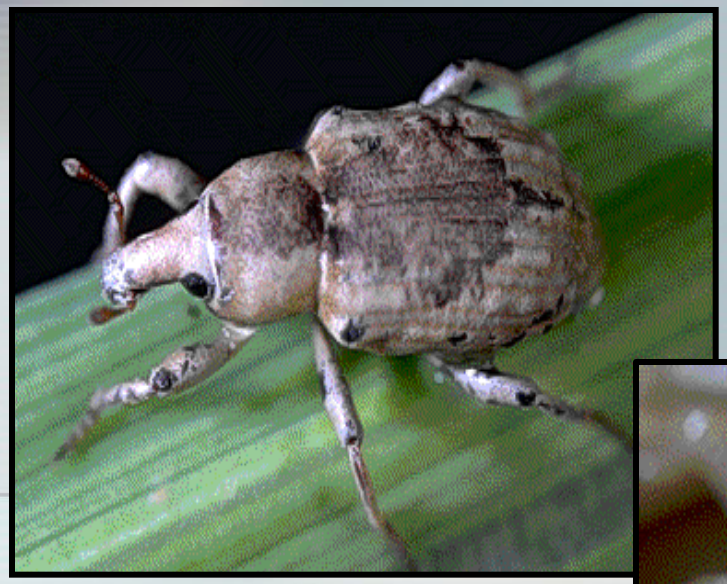
untimely rain before harvest

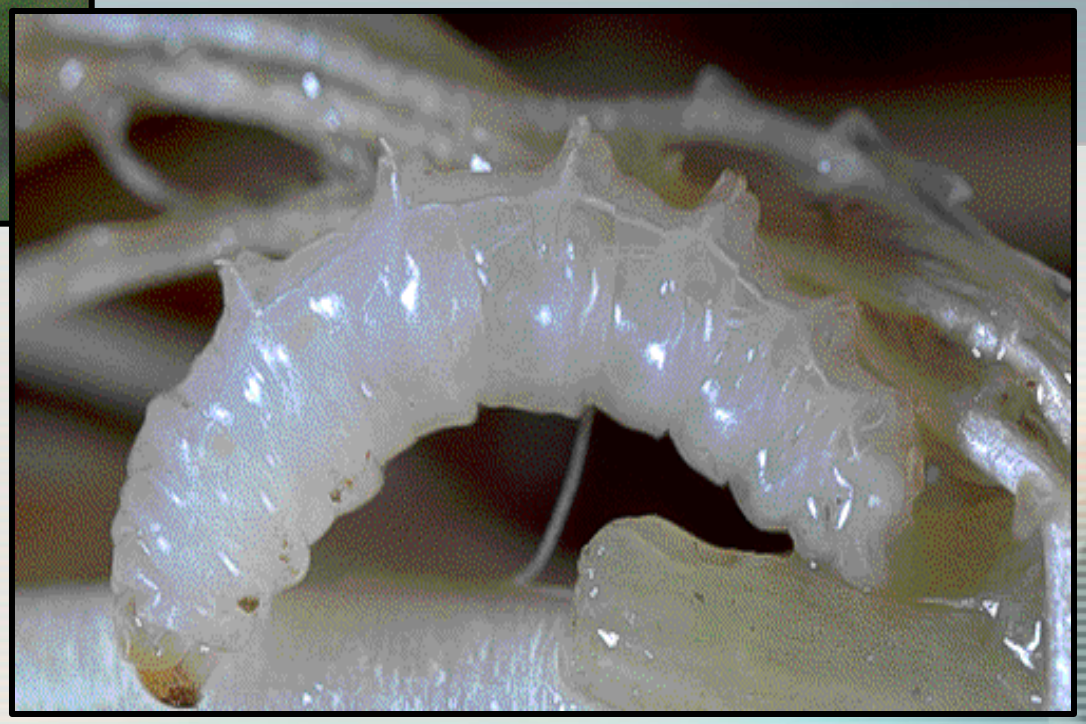
"Pecky" rice

- District 10
- ~5 years I searched for cause/insect
- this year another search and found a few red-shouldered stink bugs

2007; MS – "Robbins said a late season insect called the red-shouldered stink bug, *Thyanta spp.,* is showing up in rice in much larger numbers than he has observed in the past. "Although, I haven't seen them at threshold numbers like the rice stink bugs," Robbins said. The entomologist said the redshouldered stink bug is feeding on and damaging rice heads. "

Rice Water Weevil



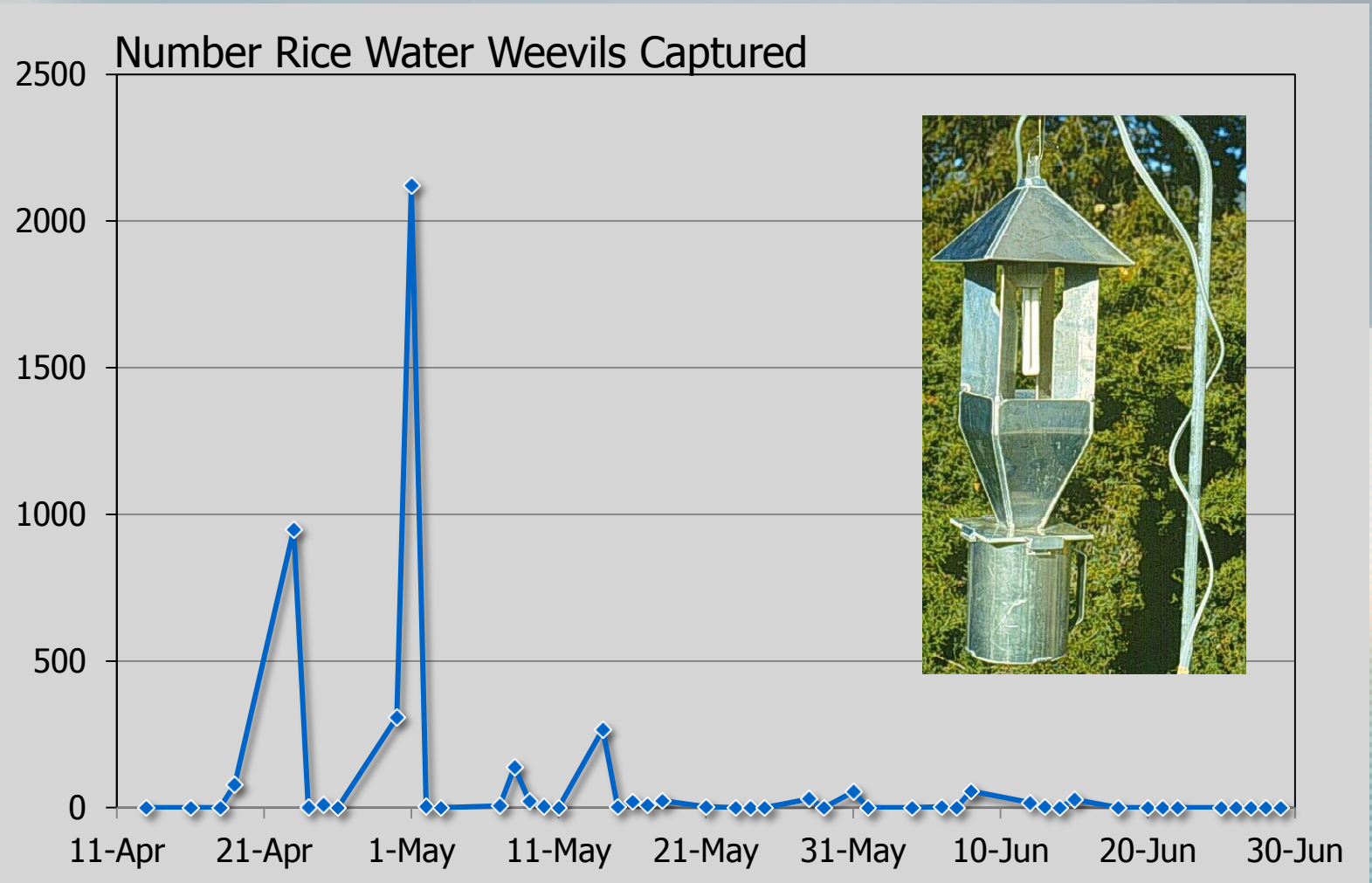


Rice Water Weevil

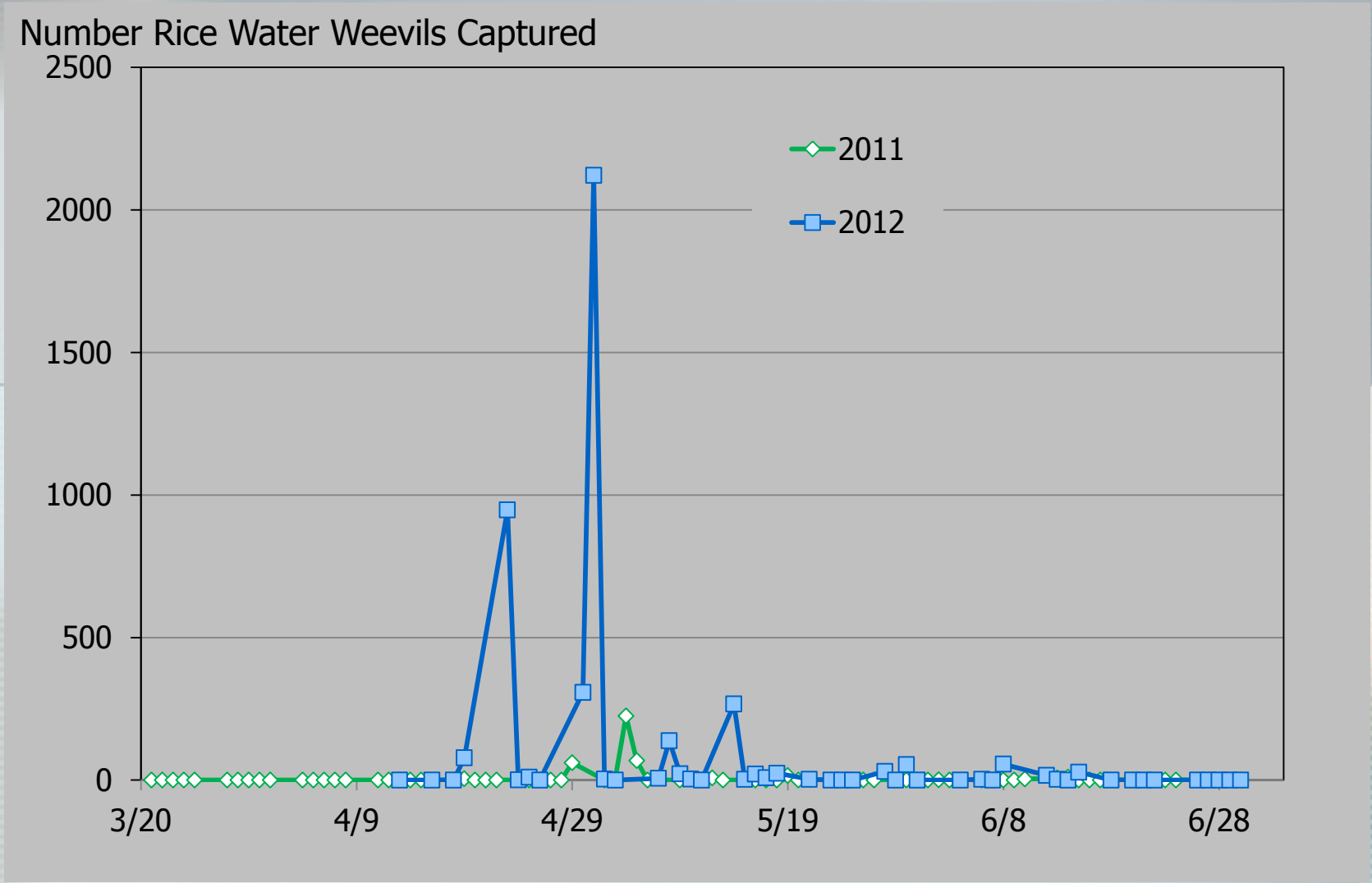
Biology

Rice Water Weevil Flight - 2012

Seasonal Total = 4157

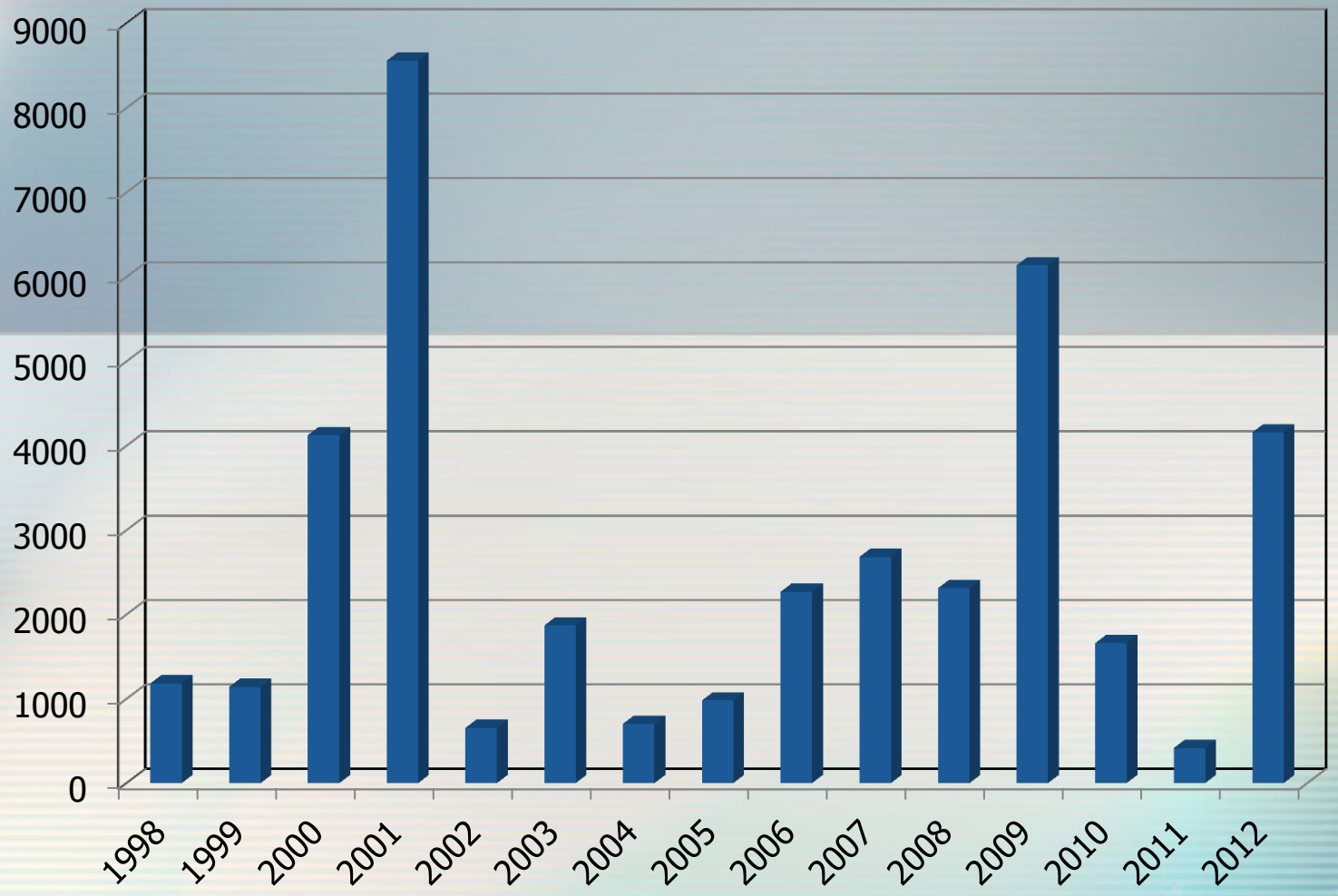


Rice Water Weevil



Rice Water Weevil

Seasonal Capture



Rice Water Weevil

Insecticide Management

Rice Water Weevil

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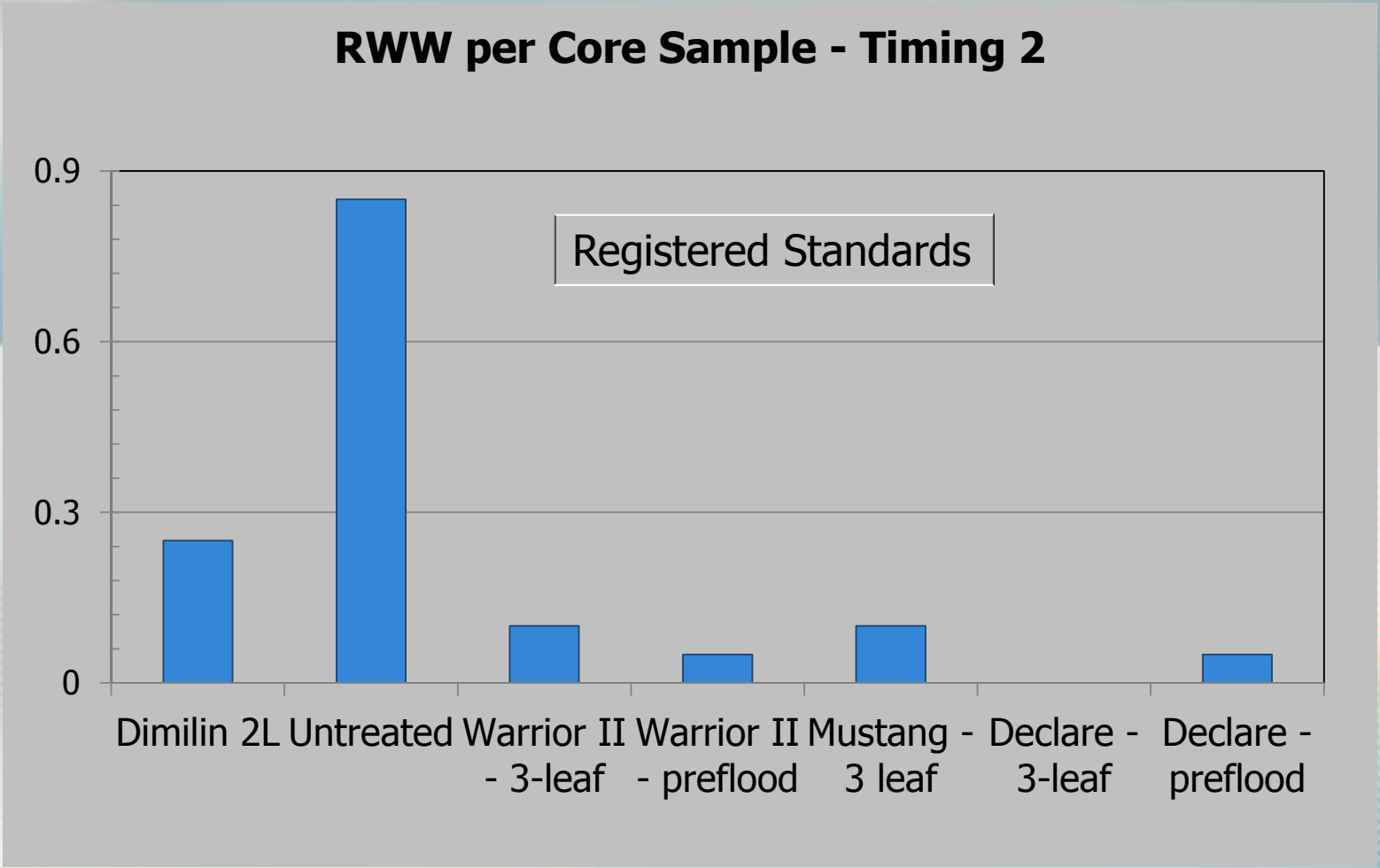


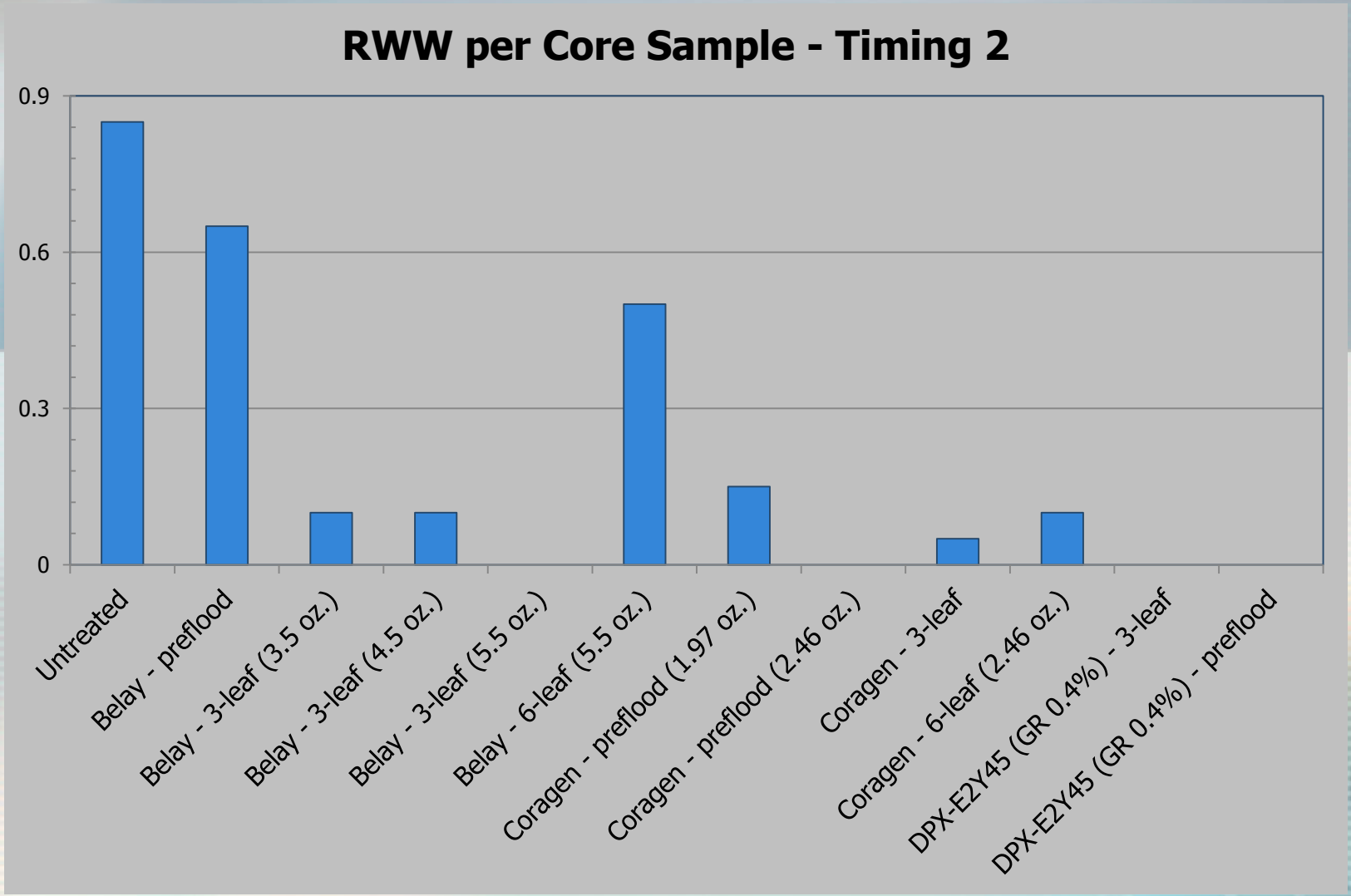
Rice Water Weevil

Insecticide Management

New Products Examined for RWW

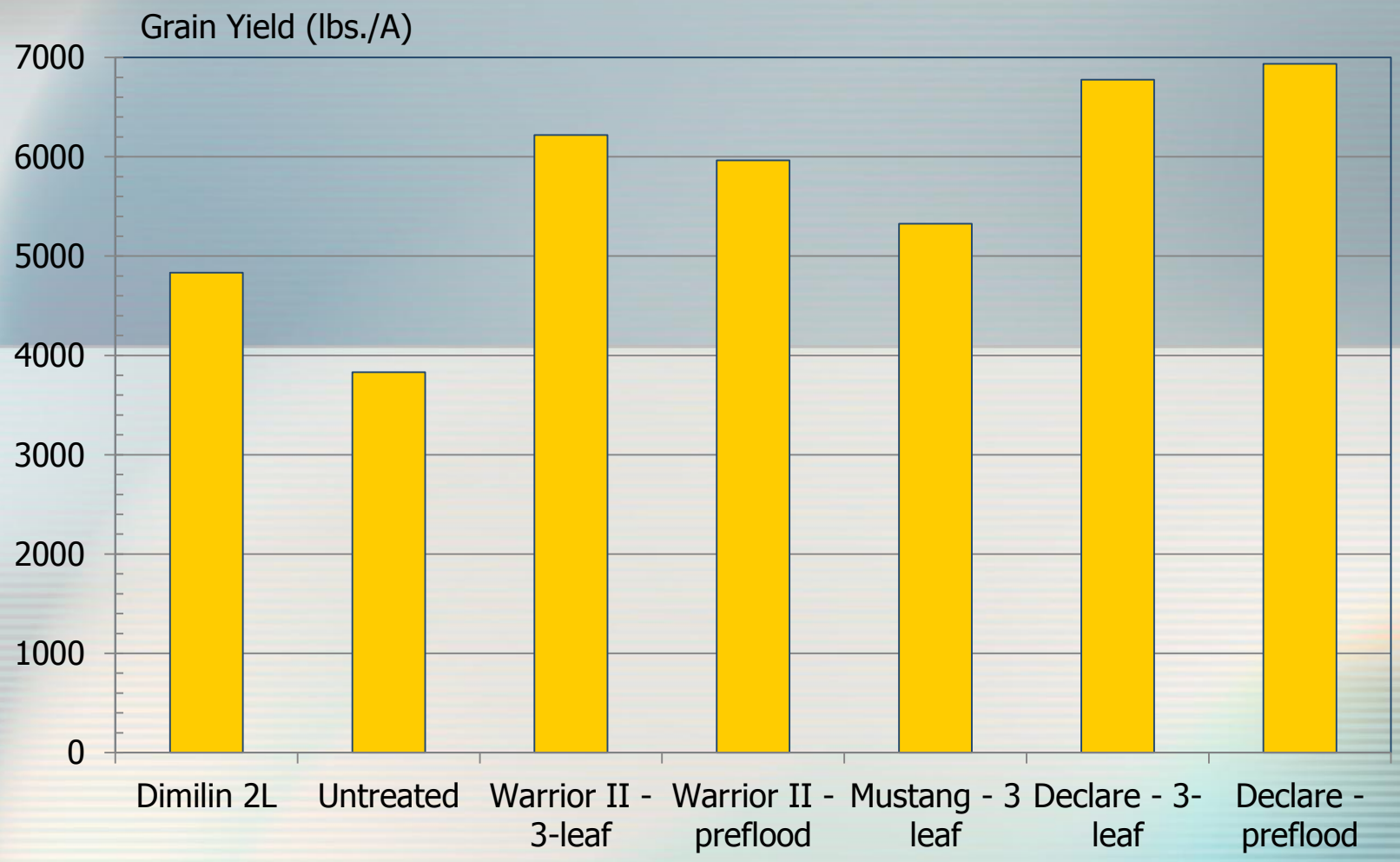
- clothianidin (Belay®)
  - Neonicotinoid product
  - registration delayed due to honey bee concerns; should be registered by 2013 use season
  - used at 3-leaf stage
- rynaxypyr (Coragen®, Dermacor®)
  - diamide product
  - used preflood
  - registration?
  - experimental granular formulation
- V-10357 & V-10358
- grubGONE! granular (and other formulations) - *Bacillus thuringiensis galleriae* , greenhouse tests

Rice Water Weevil
Insecticide Management



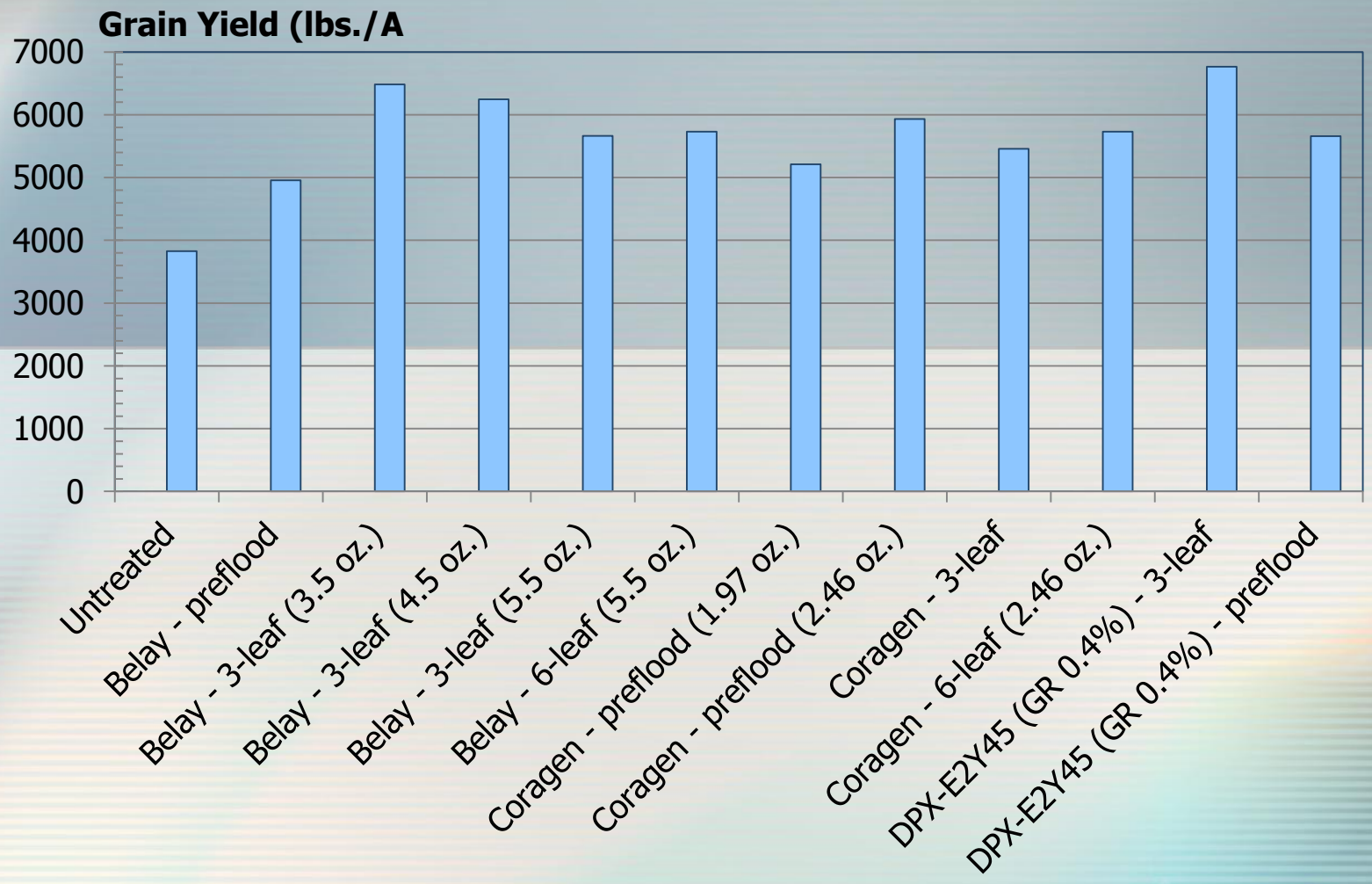
Rice Water Weevil

Insecticide Management



Rice Water Weevil

Insecticide Management



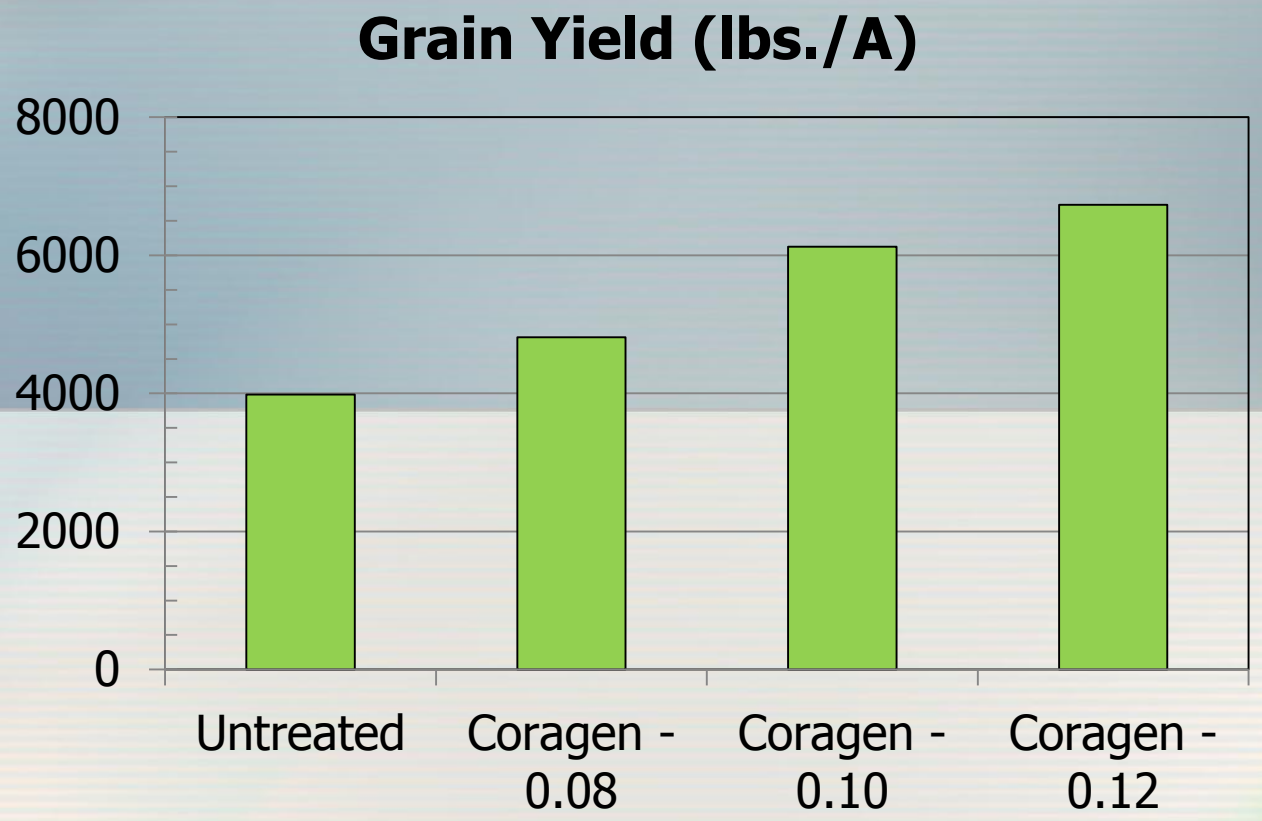
Rice Water Weevil Control - Coragen

Rice Water Weevil

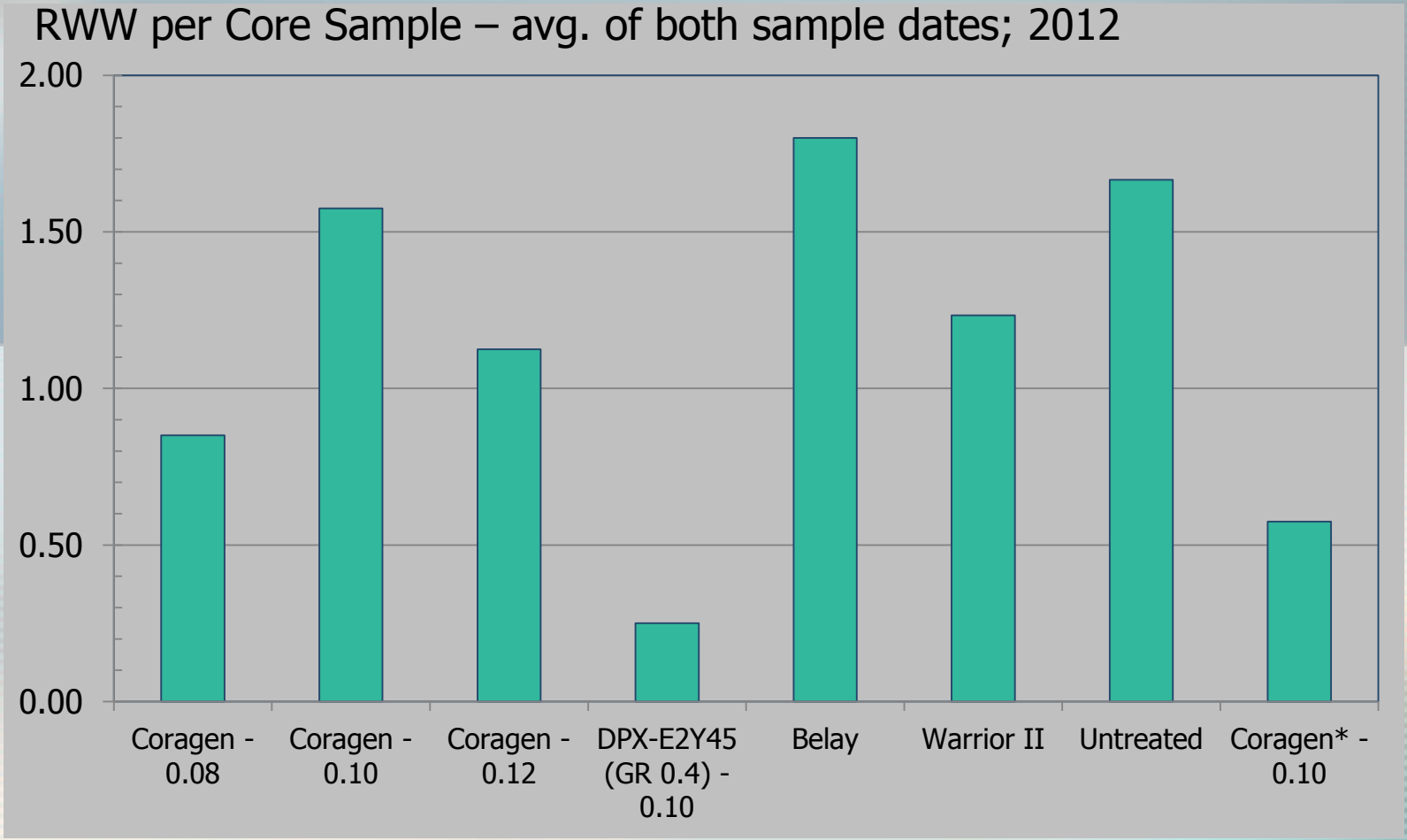
Insecticide Management
large plot study – natural infestation

Rice Water Weevil

Insecticide Management - 2011
large plot study – natural infestation



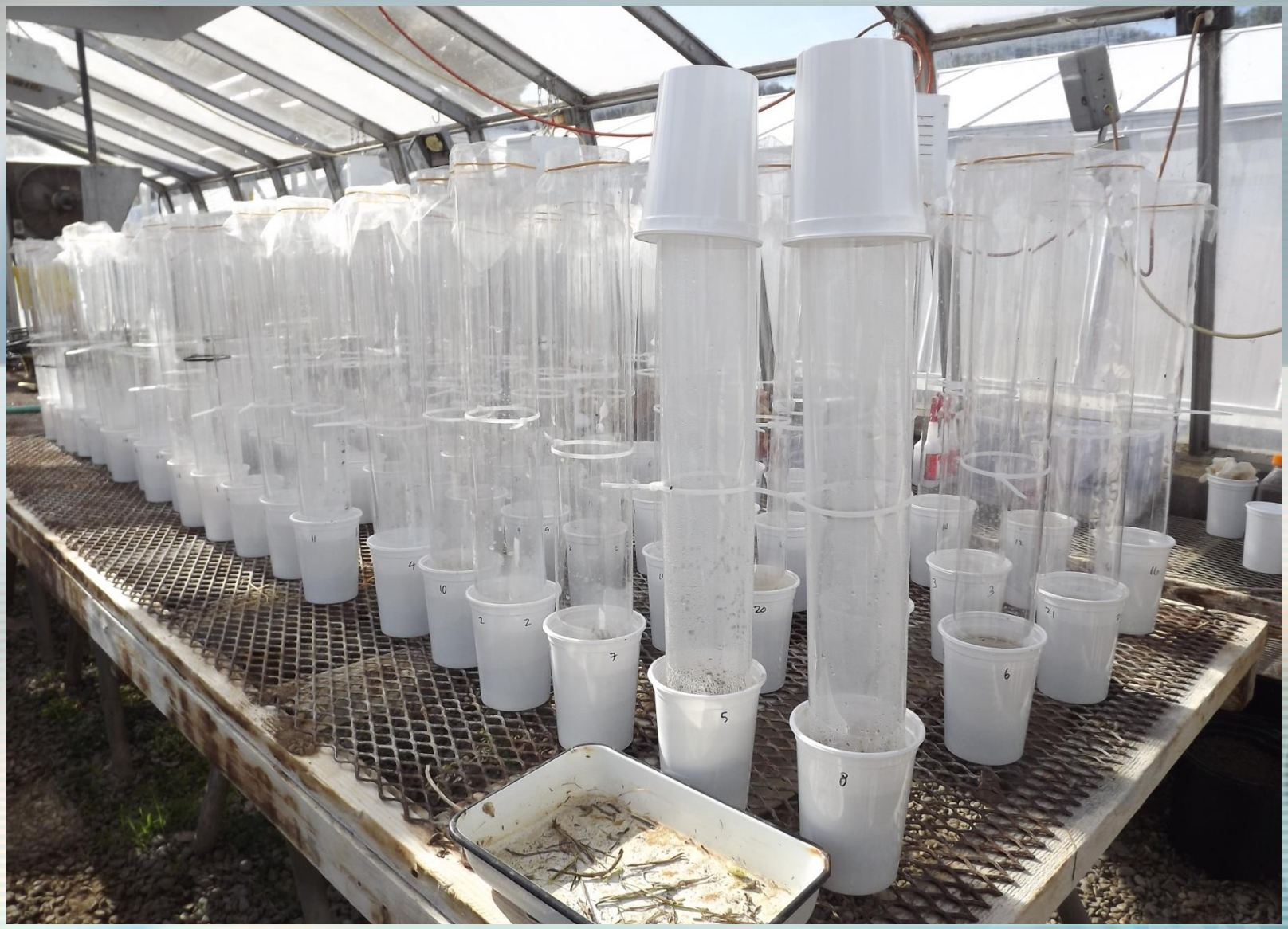
Rice Water Weevil
Insecticide Management



All treatments applied preflood, * applied 1 week before flooding

Rice Water Weevil

Insecticide Management



Results

- Tested granular and foliar *Bacillus thuringiensis* spp. *galleriae* (Btg) products in greenhouse
  - different rates in pre-flood and post-flood conditions
  - 23 treatments
- Btg not as effective as Warrior II and Aza-Direct
- Grower considering organic production, a pre-flood Btg granular application may be an option
- Study will be repeated in 2013

Rice Water Weevil

Rice Varieities

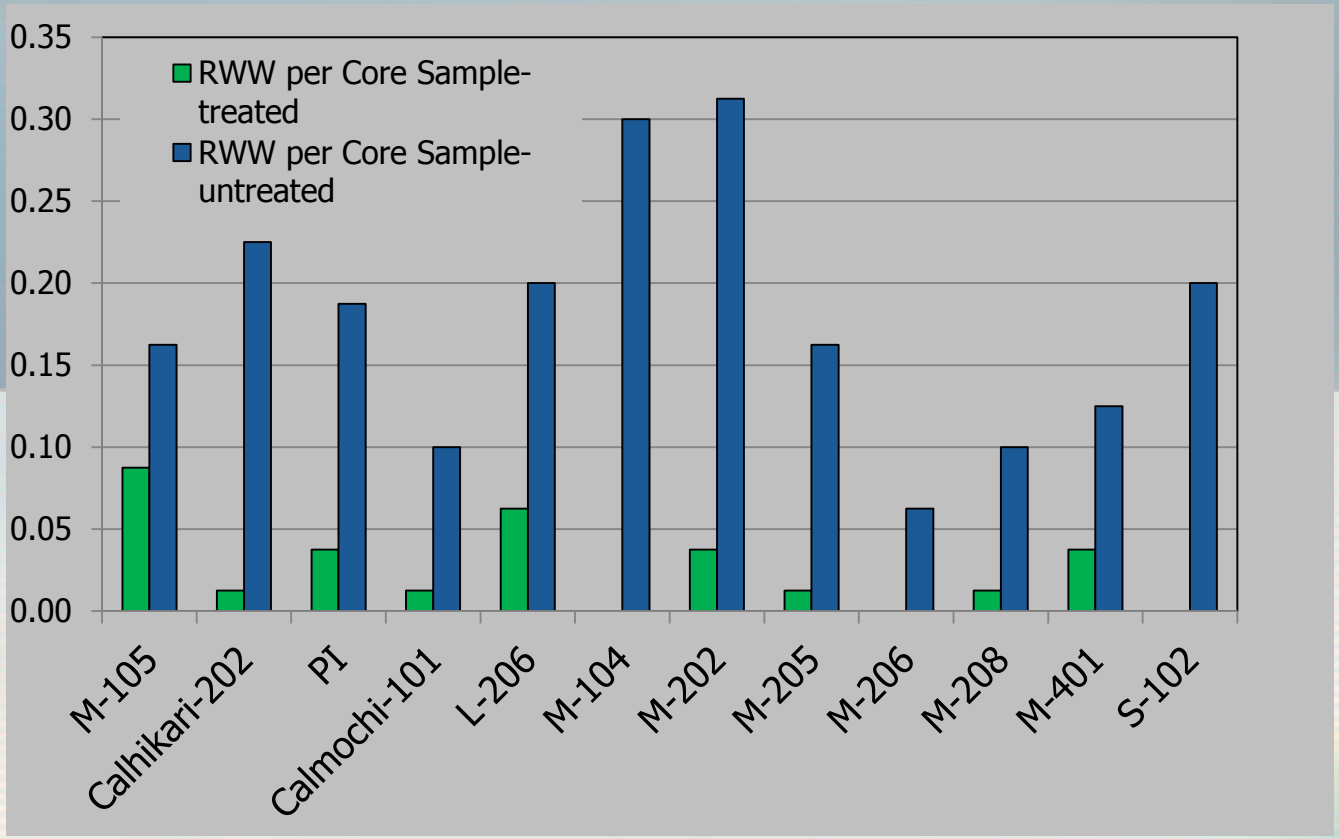
Rice Water Weevil

Rice Varieites

- Grow rice varieties in small plots
  - use commonly grown ones
  - others to get a range of grain types
- Monitor RWW infestation level
- Control RWW in ½ the plots
- Monitor impact on grain yield

Rice Water Weevil

Plant Response



data from second coring date

Rice Water Weevil

Other Approaches to Management

- winter flooding
- controlling weeds on levees
- drill-seeding / non-flooded conditions

- drained fields and RWW larvae
- top-dress N

Efficacy of insecticides against seedling pests (tadpole shrimp and seed midge)

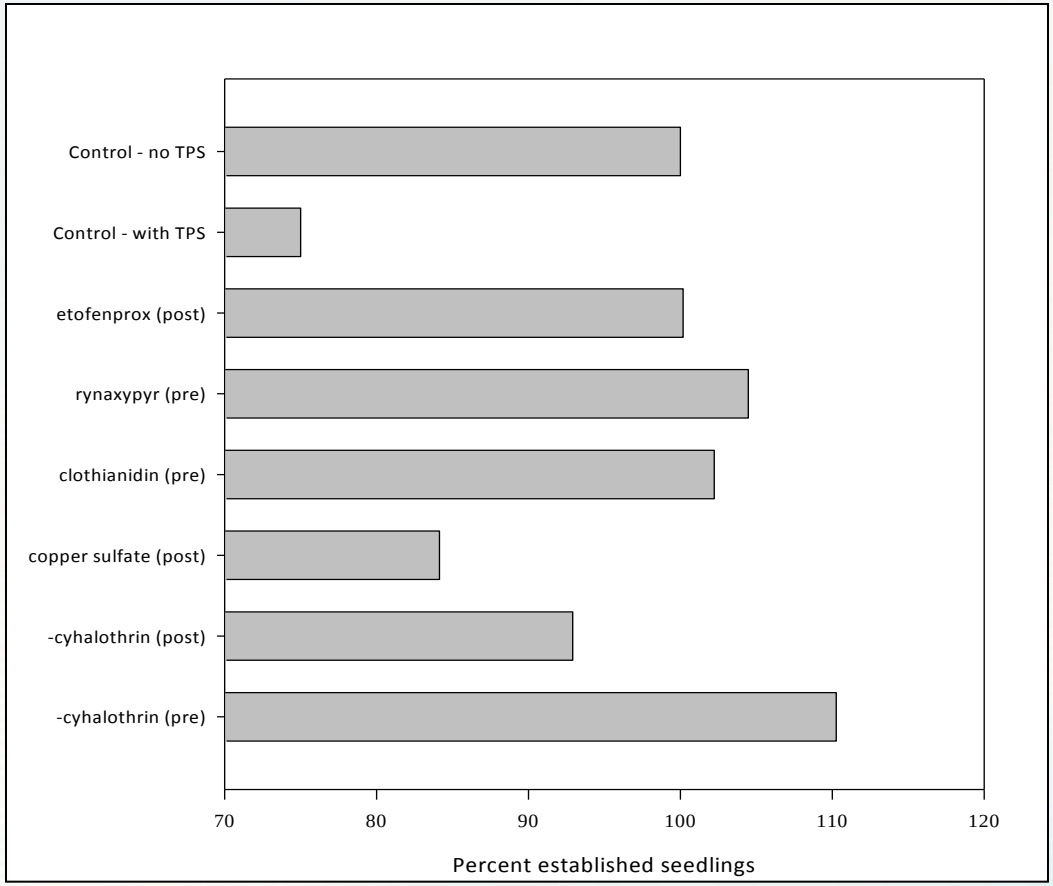
- **Why? replacement for copper sulfate and pyrethroids**

- Place shrimp in both smaller and larger rings
- Count floating shrimp and seedlings
- Count established seedlings

Product	Formulation (fl. oz.) per A	Timing
1. Untreated-no TPS	---	---
2. Belay 2.13 SC	4.5	Preflood
3. Dermacor X-100 5FS	2.46	Preflood
4. Mustang Max EW	4.0	early post-flood
5. Copper sulfate	10 lb.	early post-flood
6. Belay 2.13 SC	4.5	early post-flood
7. Untreated with TPS	---	---
8. Warrior II	1.92	early post-flood
9. Warrior II	1.92	Preflood

Efficacy of insecticides against seedling pests (tadpole shrimp and seed midge)

- **Why? replacement for copper sulfate and pyrethroids**



Efficacy of insecticides against seedling pests (tadpole shrimp and seed midge)

- **Why? replacement for copper sulfate and pyrethroids**

Other Keys to Managing Tadpole Shrimp

•Flood field quickly

•Seed as soon as possible

•Get seedlings pegged down as soon as possible

Non-target Effects of Insecticides

Influence of insecticides on non-target populations in rice and effects on mosquito larvae

2011 Product	Formulation (fl. oz.) per A	Timing
1. Belay 2.13 SC	5.5	PF
2. Warrior II	1.92	3-leaf
3. Warrior II	1.92	PF
4. Warrior II	1.92	July armyworm timing
5. Coragen	9.2	PF
6. Belay 2.13 SC	5.5	3-leaf
7. Untreated	---	---

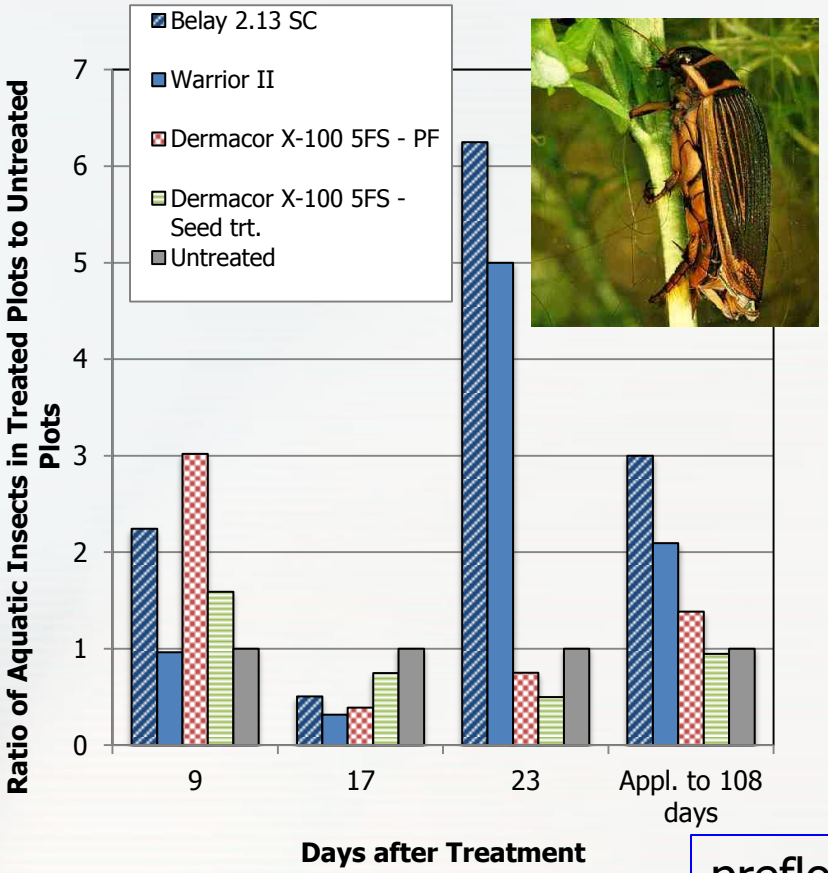
Non-target Effects of Insecticides

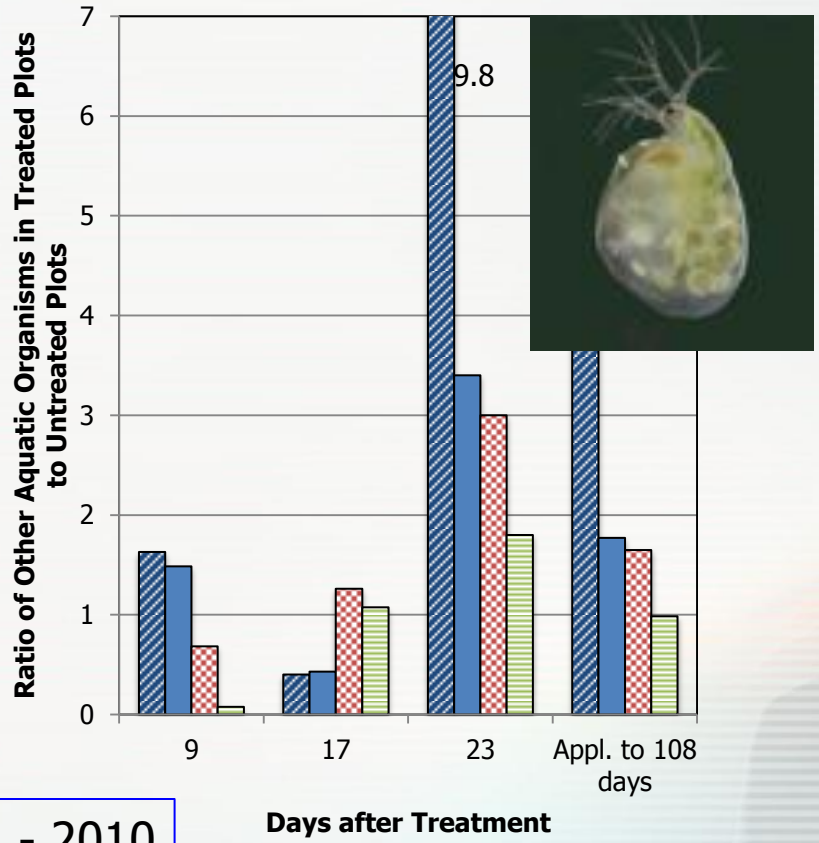
Influence of insecticides on non-target populations in rice and effects on mosquito larvae

- rationale – the need to preserve populations of non-target organisms that potentially feed on mosquito larvae and help to keep mosquito populations in check
- West Nile Virus and other mosquito-transmitted viruses important
- development of Best Management Practices

Non-target Effects of Insecticides

Influence of insecticides on non-target populations in rice and effects on mosquito larvae

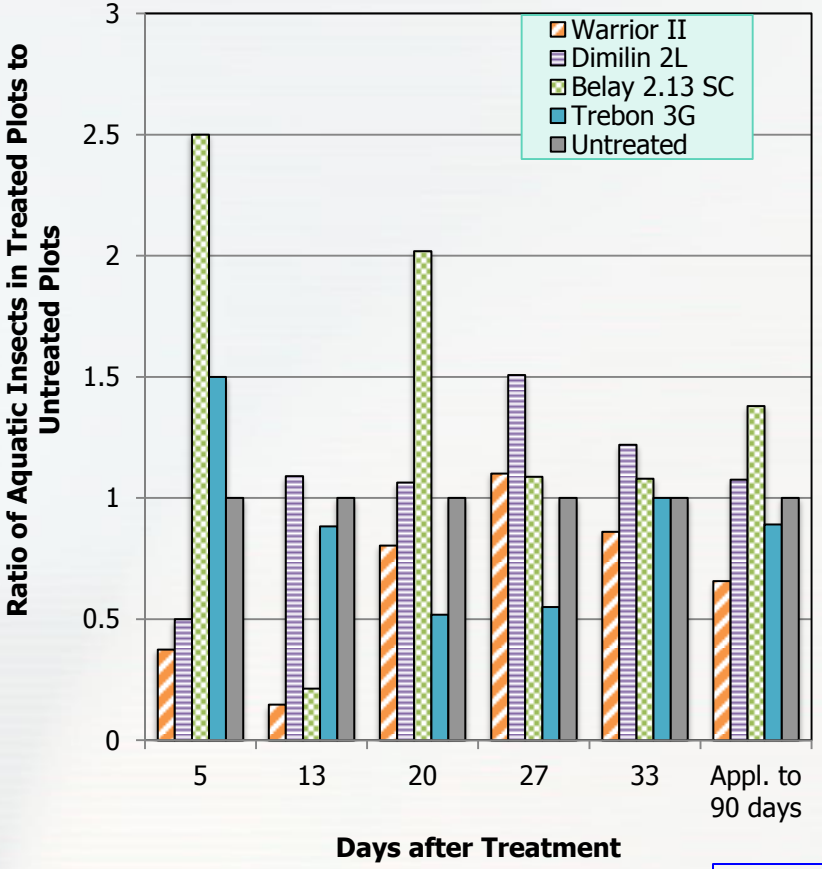


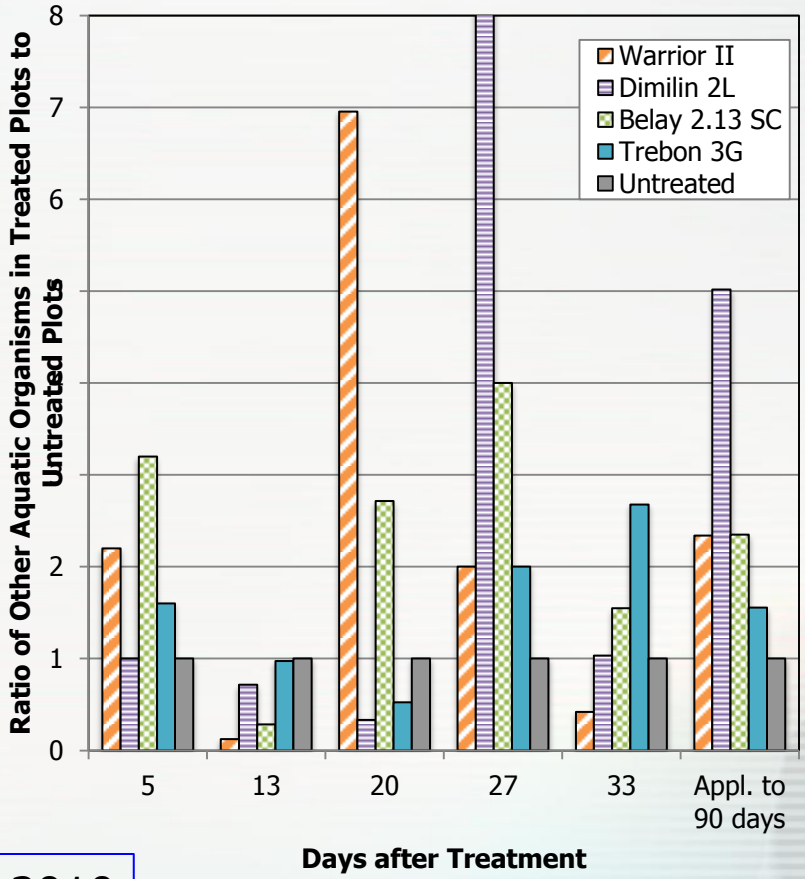


preflood - 2010

Non-target Effects of Insecticides

Influence of insecticides on non-target populations in rice and effects on mosquito larvae





3-leaf - 2010

Rice Invertebrate Pest Management