# Predicting and managing pesticide risks to bees

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IPPC
integrated plant protection center

OSU

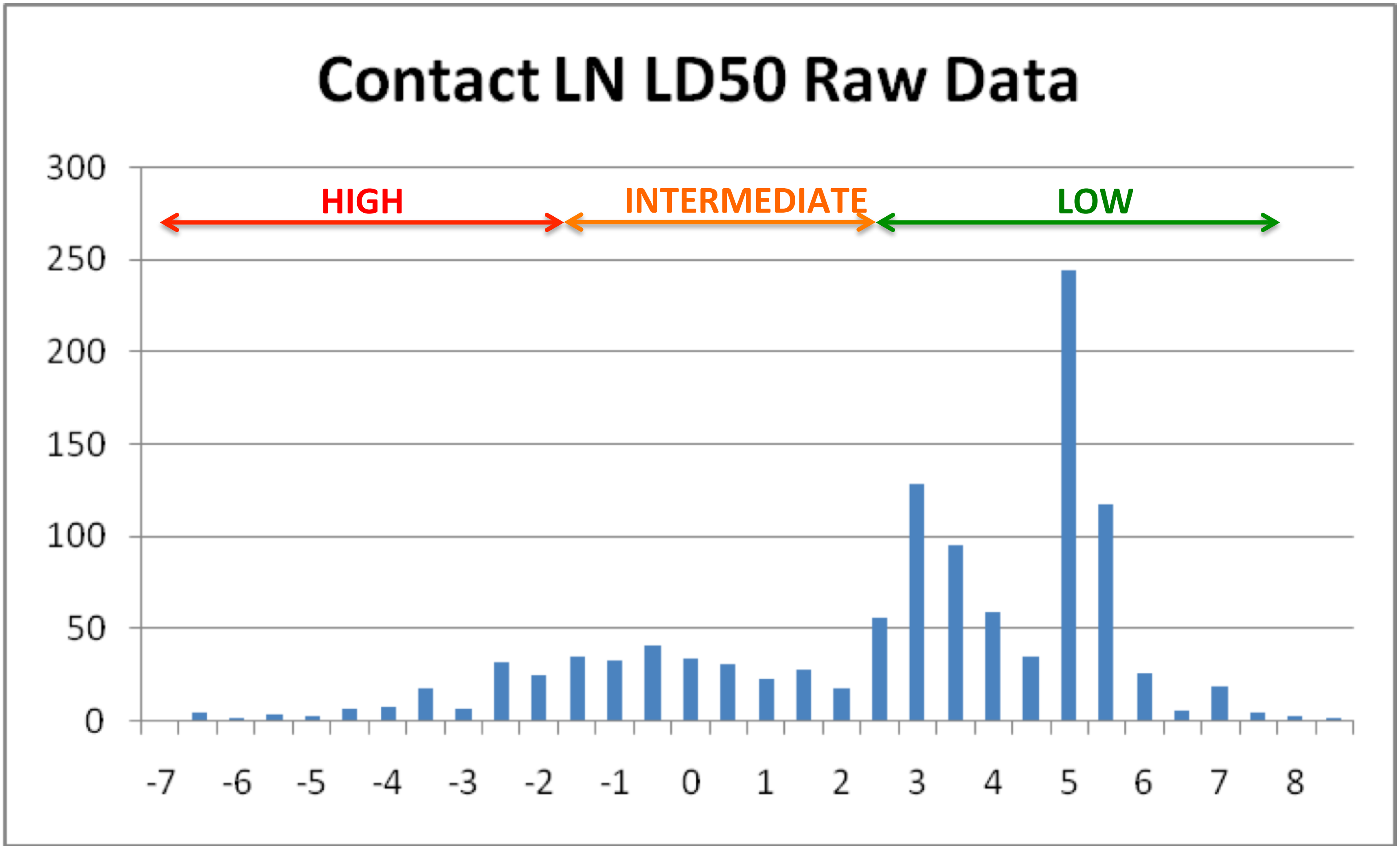
# Background

- State IPM coordinator
- Research in invertebrate ecotoxicology
- Discovered toxic synergism between fungicides and pyrethroids affecting pollinators (1,2)
- Leading program in pesticide risk assessment and management, and alternatives to pesticides
- Global engagement with farmers, agencies, industry and regulators

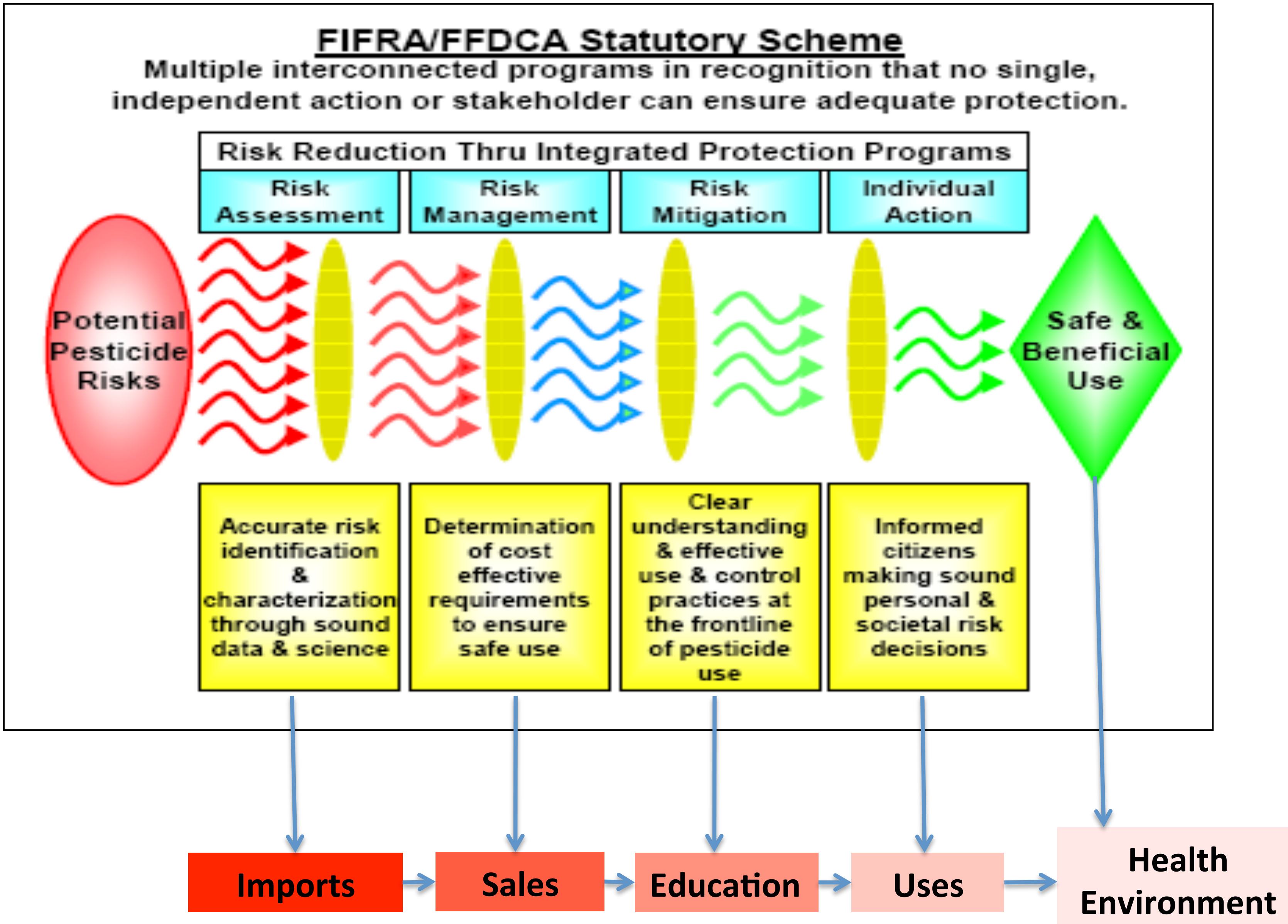
**1. Pilling, E.D., Bromley-Challenor, K.A.C., Walker, C.H., Jepson, P.C.** (1995) Mechanisms of EBI fungicide synergism with a pyrethroid insecticide in the honeybee. *Pesticide Biochemistry and Physiology* **51**, 1-11.

**2. Pilling, E.D., Jepson, P.C.** (1993) Synergism between EBI fungicides and a pyrethroid insecticide in the honeybee (*Apis mellifera* L). *Pesticide Science*, **39,** 293-299.

## Many pesticides are toxic to Apis mellifera
## *(Jepson, unpublished data)*




Hazard classification from Atkins et al (1981) Reducing pesticide hazard to honeybees




**US Pesticide regulation is set up to incorporate effective education as a key final step in pesticide risk management – in Oregon, this education is provided by OSU extension and others**

# Farmers have a history in Oregon of responding to pesticide risks, and reducing them

## E.g. pesticide stewardship partnerships

**Paul Jepson, Mary Halbleib,**

Oregon State University

**Kevin Masterson**, Oregon Department of Environmental Quality

+ about 4,000 farmers

OSU

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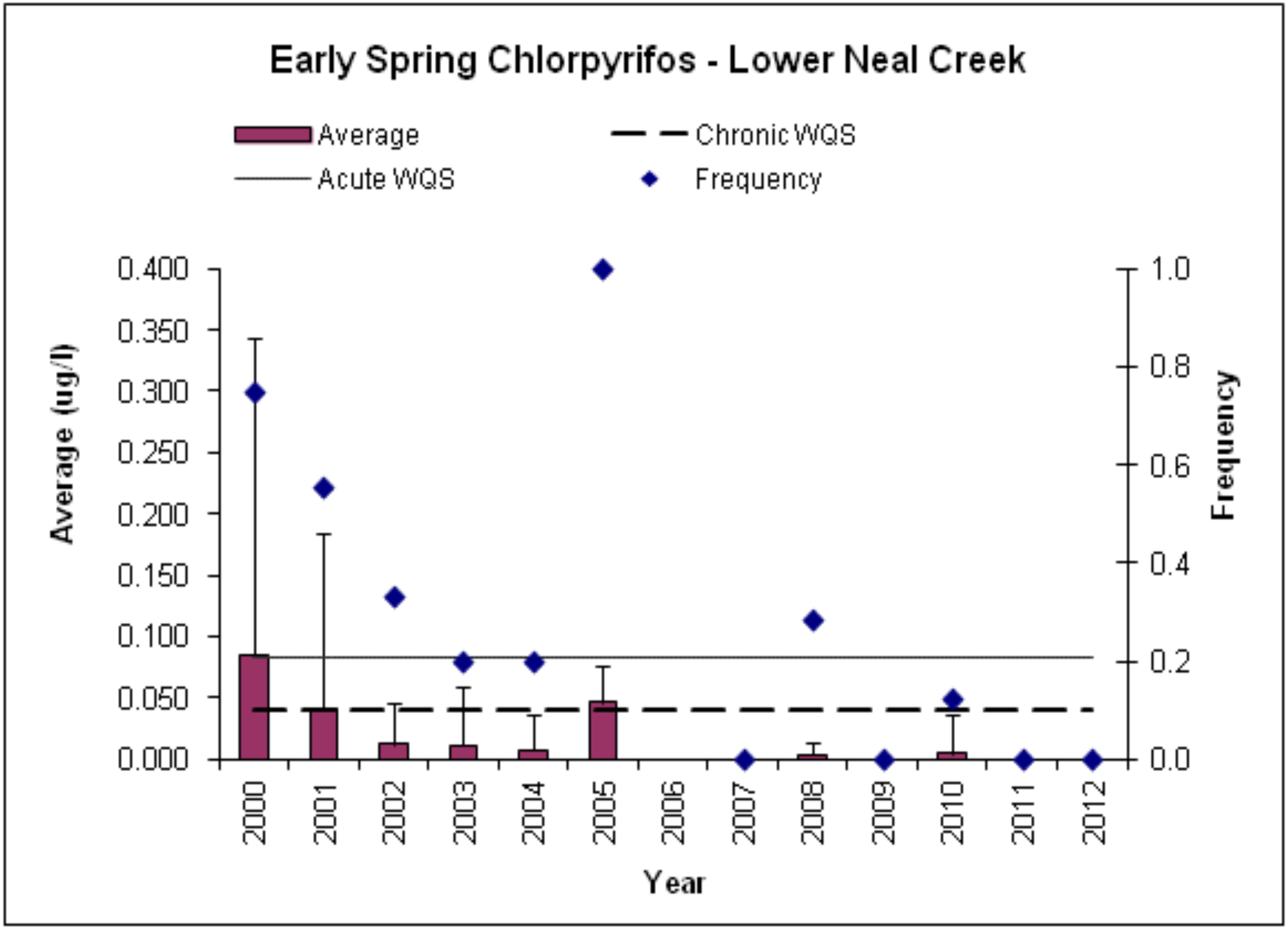
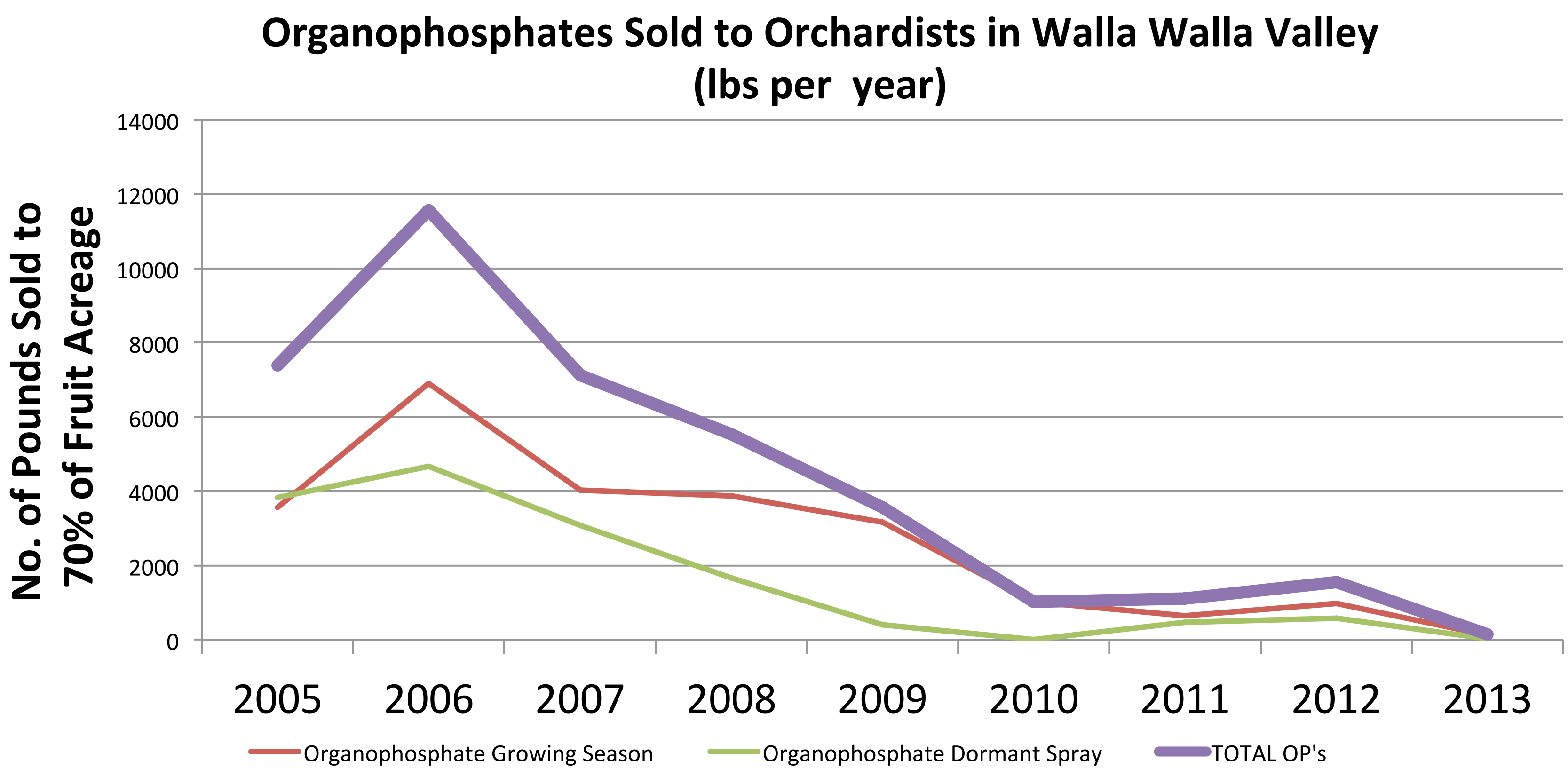
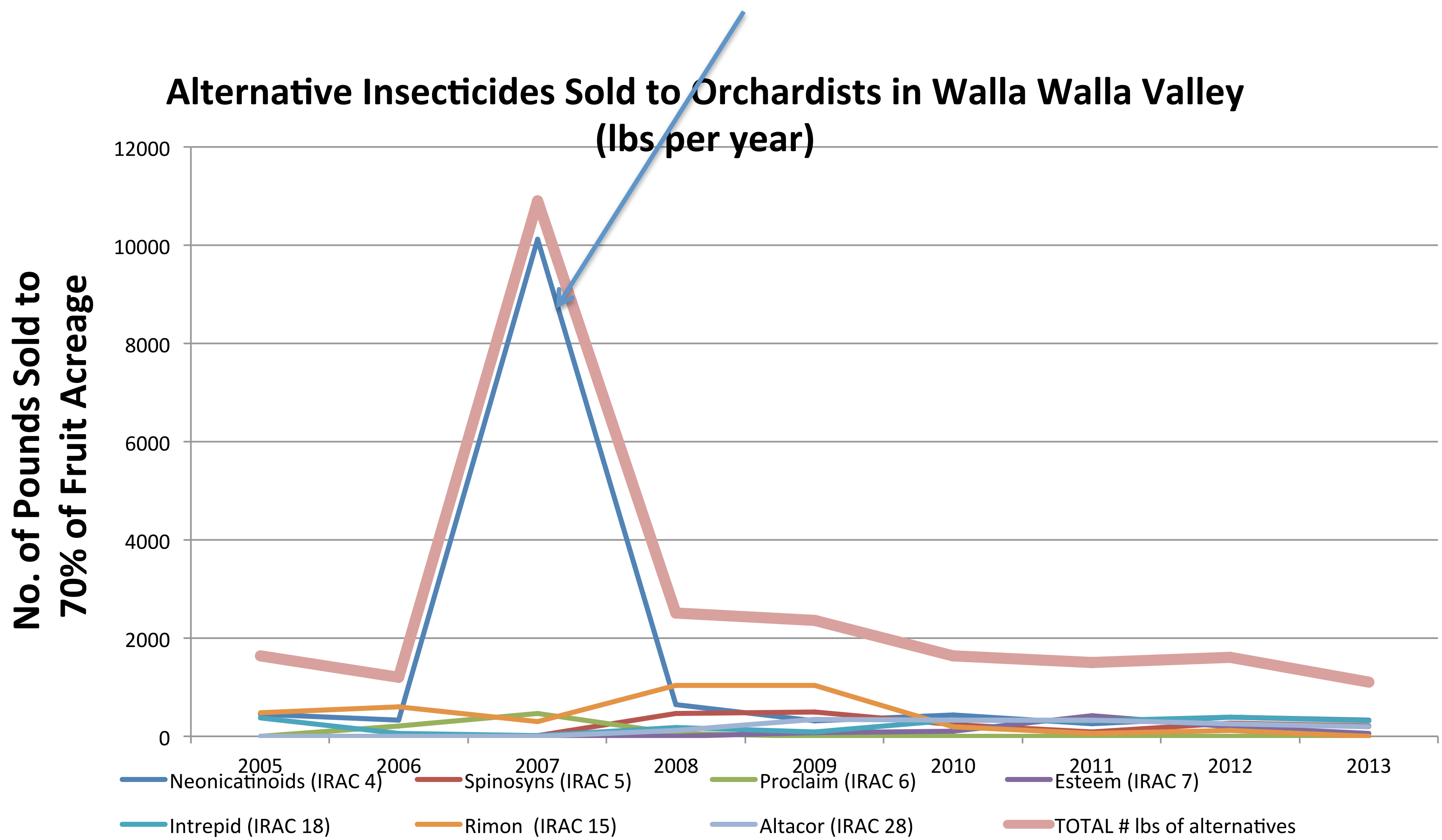
# Pesticide Stewardship Partnership Results Hood River, Oregon



## In the Walla Walla Valley, another successful PSP has developed new monitoring and decision support tools for farmers, and focused on using pesticides that are less toxic to fish. OP use has fallen considerably since 2006



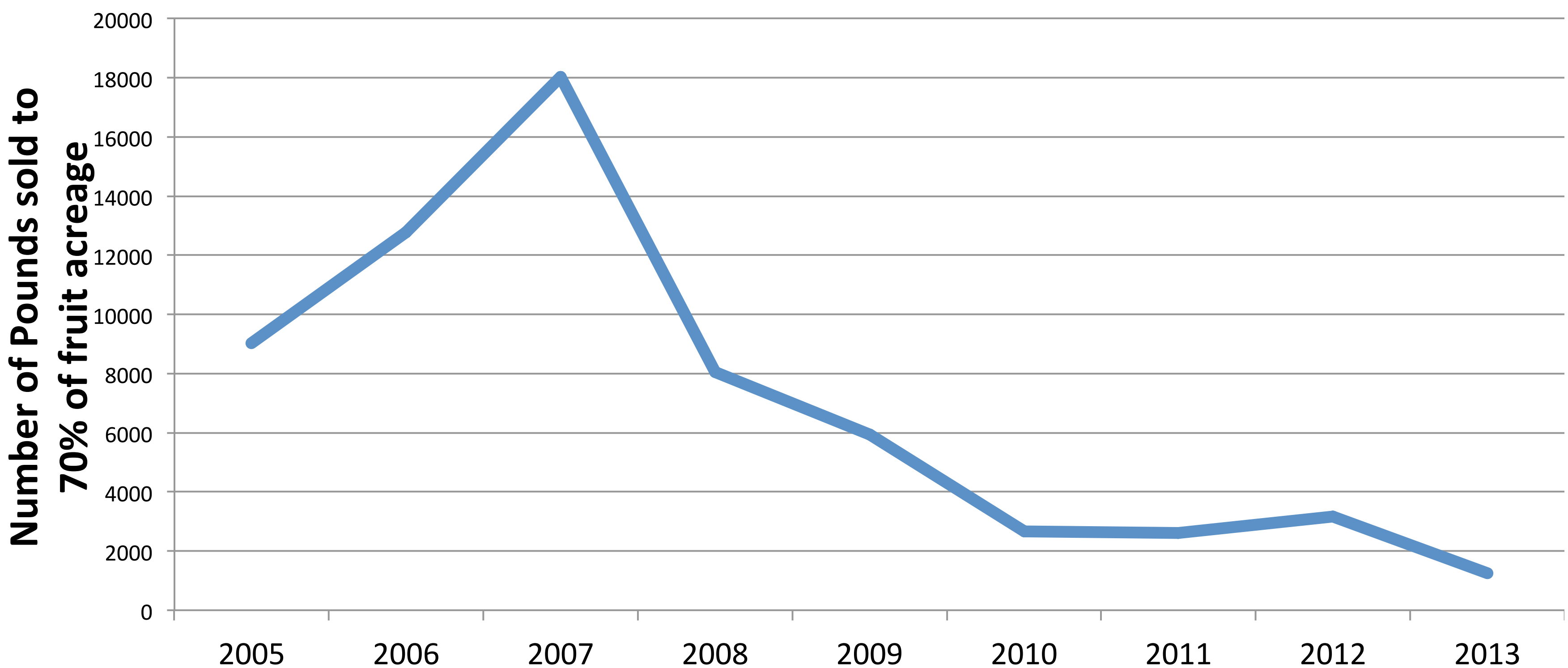
**NOTE: Neonicotinoids play an important role as a <u>transitional</u> pesticide as farmers move away from traditional broad spectrum chemistries**



**NOTE ALSO: Transitioning out of broad spectrum pesticides, supported by education and decision support tools from IPM extension education, <u>ultimately leads to greatly reduced pesticide use of any type</u>**

**<u>BUT, IPM Requires lower risk pesticide alternatives in the key transitional phases when the system is recovering</u>**

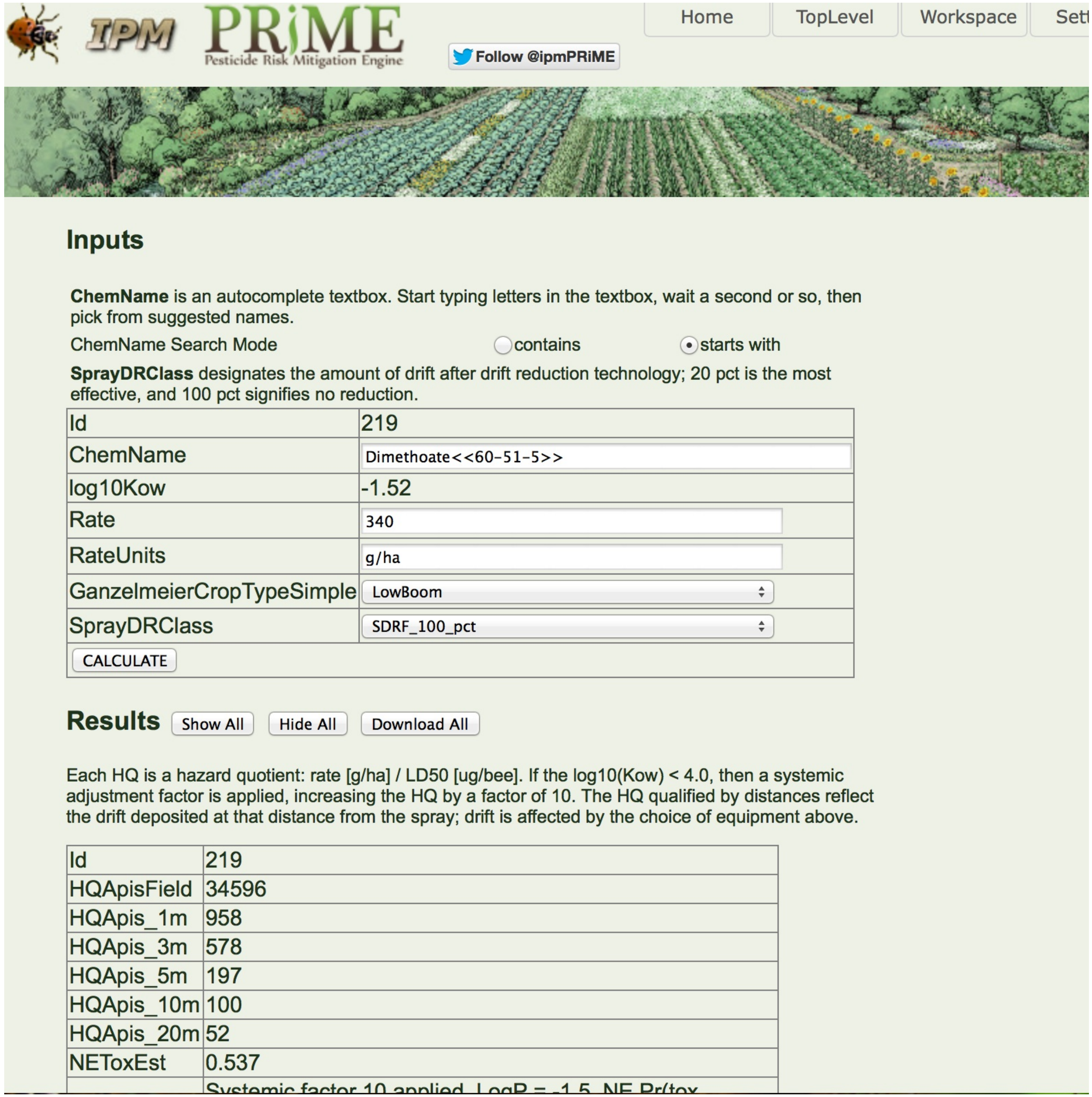
**Cumulative Insecticide Sold in Walla Walla Valley (lbs per year)**



A web-based [pesticide risk tool](#) for pollinators and natural enemies is now used in IPM extension in Oregon

**This is the state-of-the-science tool**

Farmers have responded very positively, and there is extremely high attendance at extension events that address pollinator impacts



# E.g. IPPC workshop in Wilsonville, OR for blueberry farmers:

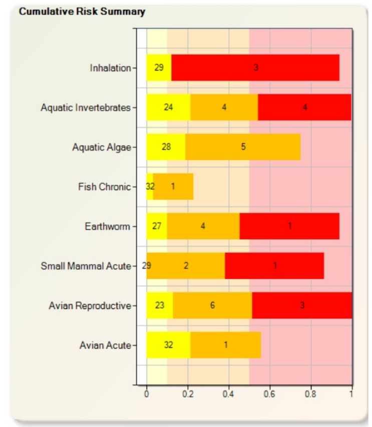
***Bee risks are actively considered in IPM extension***

**Grower program, 2012, Willamette Valley**

**Blueberries**

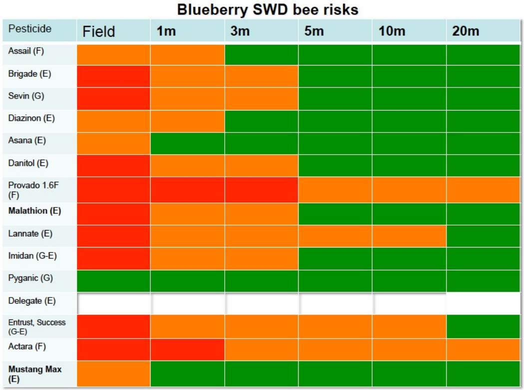
N Low Risk
N Medium Risk
N High Risk

| Summaries | Overall |
|---|---|
| N Missing | 5 |
| N Passes | 27 |
| N High Risk | 12 |
| N Medium Risk | 23 |
| N Low Risk | 197 |
| GrandTotal | 264 |

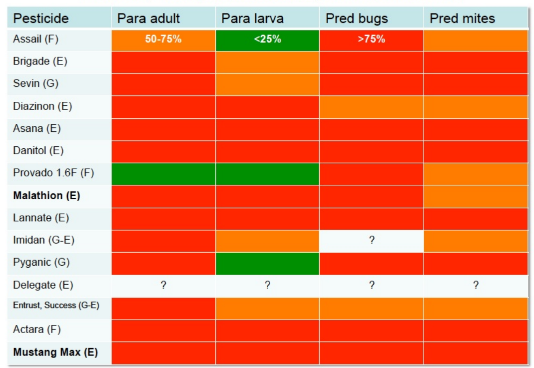



HIGH CUMULATIVE RISK FOR OVERALL CURRENT PROGRAMS

**Blueberry SWD bee risks**




**Blueberry SWD pesticide toxicity to natural enemies**




**SWD pesticide mode-of-action for rotation (+PHI)**

| Chemical class | Pesticide |
|---|---|
| Nitroguanidine nicotinoid<br>Pyridylmethylamine nicotinoid | Provado 1.6F (3), Actara (3)<br>Assail (1) |
| Spinosyn | Delegate (3), Entrust (3), Success (3) |
| Botanical | Pyganic (0) |
| Pyrethroid<br>Pyrethroid ester | Brigade (1), Asana (14), **Mustang max (1)**<br>Danitol (3) |
| Carbamate<br>Oxime carbamate | Sevin (7)<br>Lannate (3) |
| Pyrimidine organothiophosphate<br>Aliphatic organothiophosphate<br>Isoindole organothiophosphate | Diazinon (7)<br>**Malathion (1)**<br>Imidan (3) |

***THE CHALLENGE FOR FARMERS IS TO SELECT A SUITE OF PESTICIDES THAT MAXIUMIZE EFFICACY, MINIMISE BEE AND NATURAL ENEMY RISKS, CONTAIN DRIFT AND RUN-OFF, RETAIN RESISTANCE ROTATION, AND MEET PRACTICAL REQUIREMENTS FOR WORKER-REENTRY AND PRE-HARVEST INTERVAL, AND THE MARKETPLACE***

*There are many ways to minimize pesticide impacts on bees*

**Pesticides cause significant damage to beneficial insect populations.**

- Prevent overspray or drift onto adjacent habitat
- Use most targeted application
- Use active ingredients with least impact on beneficials
- Don't spray on plants in bloom
- Spray at night and when dry
- Consider alternatives:
  - Pheromone traps and baits
  - Pest-resistant crops, biological control

# Conclusions

1. Expect more changes in pesticide regulation to protect bees
2. BUT, effective regulations that balance production and protection goals take time
3. Education is an effective complement to regulation, and part of the US process
4. Farmers respond to risk challenges in Oregon, but there are many risks that may conflict with each other – bees, fish, birds, people – risk substitution is a likely consequence of sudden changes in the marketplace
5. Alternatives to pesticides within IPM programs are important also, we have a globally leading program in Oregon, and we have refocused to address pollinator risks