Neonicotinoid insectides and restricted use classification

Paul Jepson

Oregon State University

IPPC integrated plant protection center

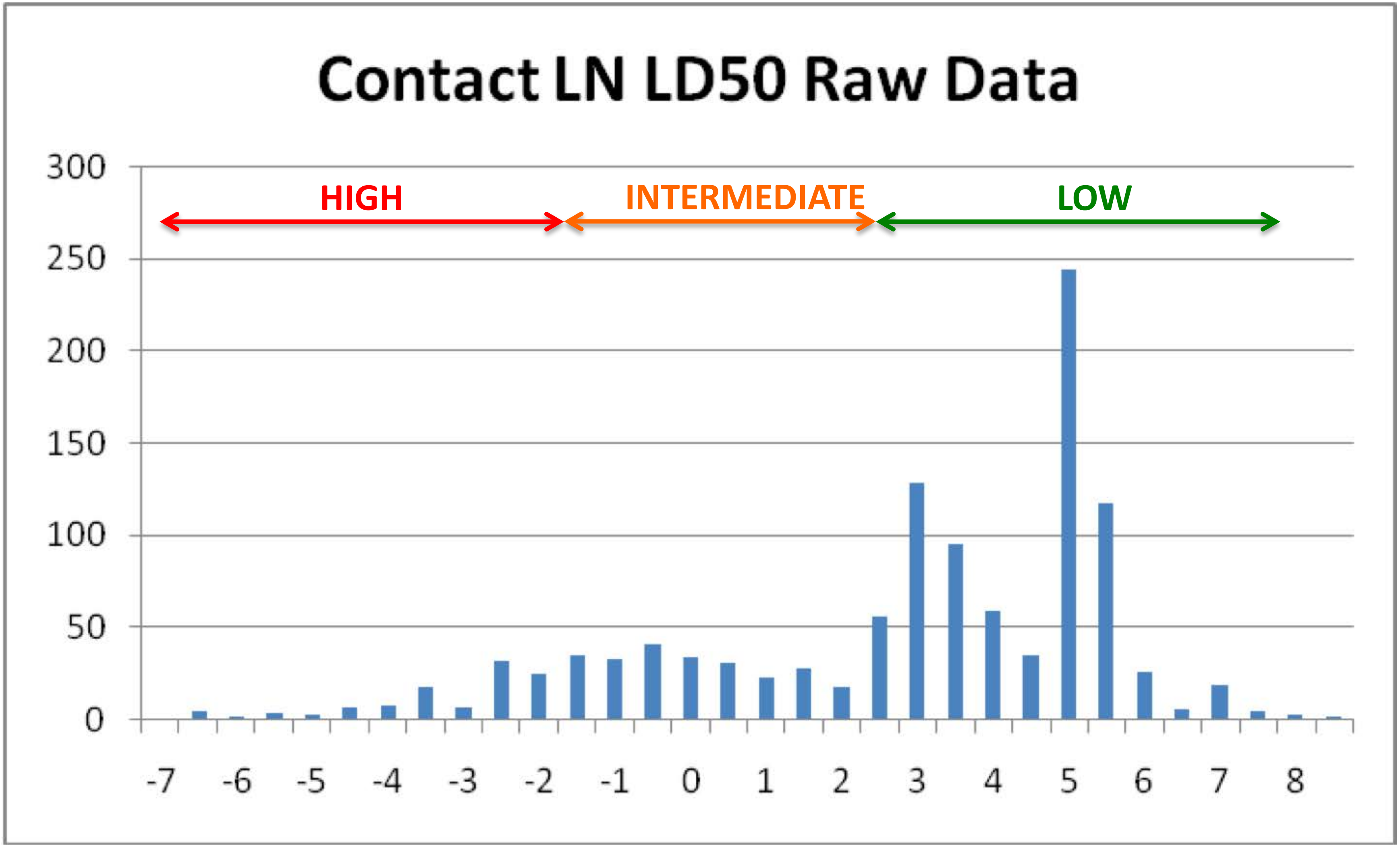
OSU

Background

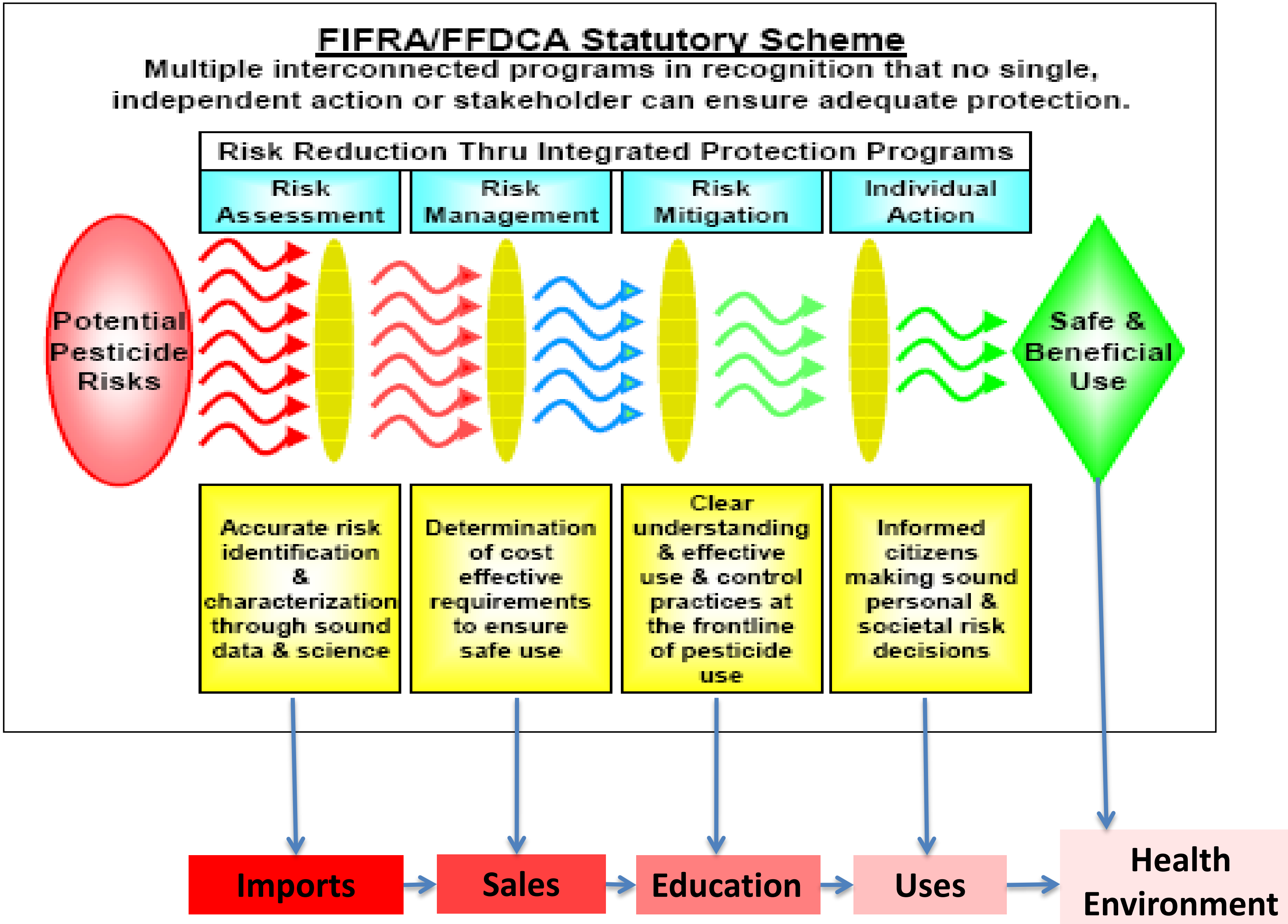
- State IPM coordinator
- Research in invertebrate ecotoxicology
- Discovered toxic synergism between fungicides and pyrethroids affecting pollinators (1,2)
- Leading program in pesticide risk assessment and management, and alternatives to pesticides
- Global engagement with farmers, agencies, industry and regulators
- Developed IPM and pesticide risk management guidelines for the Sustainable Agriculture Network (SAN) that phases out several neonicotinoids from use in pollinated crops in >50 countries
- Developing production and protection goals to inform pesticide regulation in Europe and W. Africa

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(Jepson, unpublished data)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

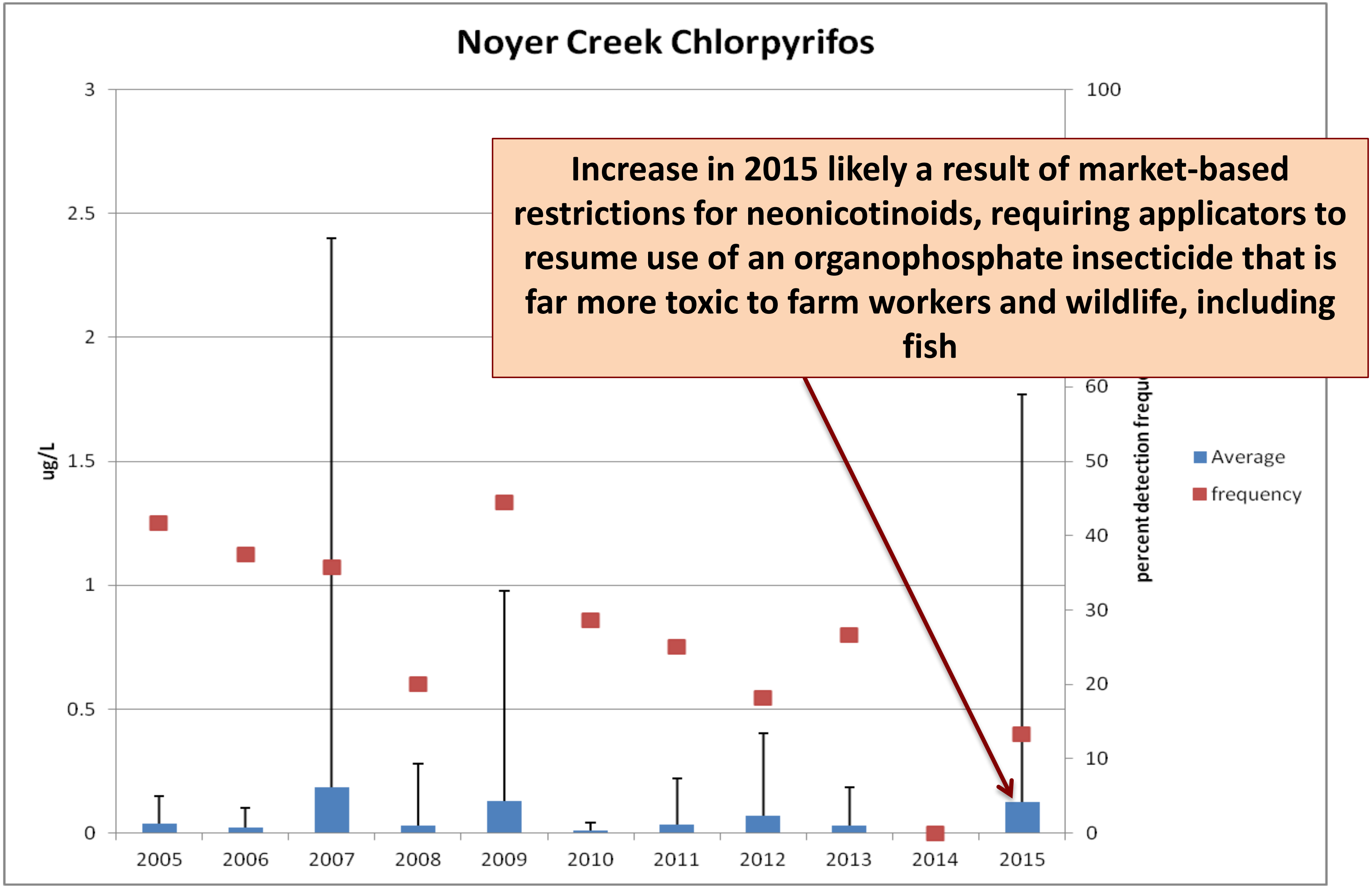
Considerations regarding regulation of individual compounds *vs* whole classes of chemistry, based upon a single criterion

- Not compatible with the current regulatory process
- Not compatible with a cost-benefit approach – RUP classification requires the decrease in risk to exceed decrease in benefits (40 CFR 152.170)
- Fails to consider differences in risks and benefits between individual compounds
  - E.G. An extensive international review (SAN) proposed phase-out of clothianidin, imidacloprid and thiamethoxam only by 2020, accompanied by pollinator risk management education
- Does not include chemistries from other mode-of-action groups that are also toxic to bees
- Does not consider other risks, including workers, vertebrates and aquatic life
- Does not consider the likelihood, or inevitability of risk substitution

Risk substitution with respect to neonicotinoid restriction was referred to in testimony in 2015, and before

This has now been confirmed for licensed applicator uses of insecticides in the Clackamas watershed, but as a result of market place, not regulatory pressures

Clackamas Watershed Pesticide Stewardship Partnership



EDUCATION CONTRIBUTED TO REDUCED IMPACTS PRIOR TO 2015

Clackamas Watershed Pesticide Stewardship Partnership

Grower actions 12 months after education events (%)	Christmas tree (N=23)	Nursery (N=20)
Used on-line weather forecasting	50	90
Adjusted application, based on weather	79	95
Adjusted application to protect sensitive site	55	90
Increased time spent scouting	83	N/A
Used less chlorpyrifos	**30**	**58**
Lower frequency of aphicide use	48	N/A

DATA FROM HALBLEIB AND JEPSON, IPPC

What might the consequences of neonicotinoid withdrawal be for unlicensed landscape and homeowner uses?

We can not say with certainty

But broad spectrum pesticides are available that pose greater risks to vertebrates including humans.

Other products (e.g. pyrethroids) trigger pest outbreaks by being toxic to natural enemies

Source: PICOL database, March 27th 2017

Alternatives must be considered before eliminating access, to avoid unintended consequences, particularly to human health in sensitive sub-populations

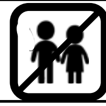
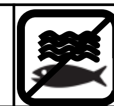
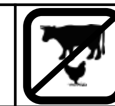
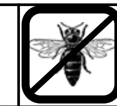
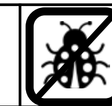
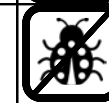
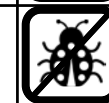
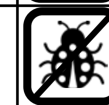
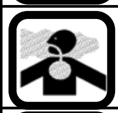
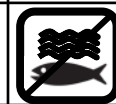
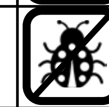
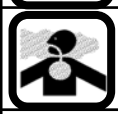
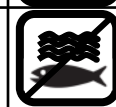
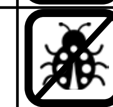
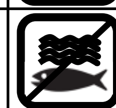
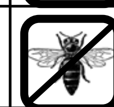
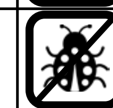
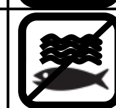
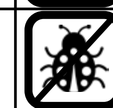
Pesticide Risks

IPPC integrated plant protection center

CONSORTIUM AGRI

Oregon State UNIVERSITY

Restricted entry (days)

NOM									
Abamec	 100		>21	>21	>21				
Acarex	 4		>21	>21	>21				
Acarius	 100		>21	>21	>21				
Acaron	 118		20	17	18				
Armada 40EC	 53		>21	>21	>21				
Attakan	 0.2		1	1	1				
Basudine	 133		>21	>21	>21				
Biobit	~0		1	1	1				

Homeowner education may include pictograms that convey risk effectively

There are many ways to minimize pesticide impacts on bees

A homeowner education program is already under development, under other legislative authorities (Miller, Melouthopoulos, Jepson)

It combined expertise in IPM, ecology, and pollinator health at OSU

It will determine first where the scope for risk reduction, and education lies

This must address the goals for pesticide use that homeowners have, the availability of alternative pesticides and practices, and ways in which homeowner decisions can be supported

Conclusions

1. Effective regulation must balance risks and benefits
2. Education is an effective complement to regulation, and part of the US process under FIFRA
3. 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
4. Risk substitution among homeowners is highly likely
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
6. Pollinator health education is addressed by other legislation, and new programs at OSU, and we are combining efforts to build homeowner education

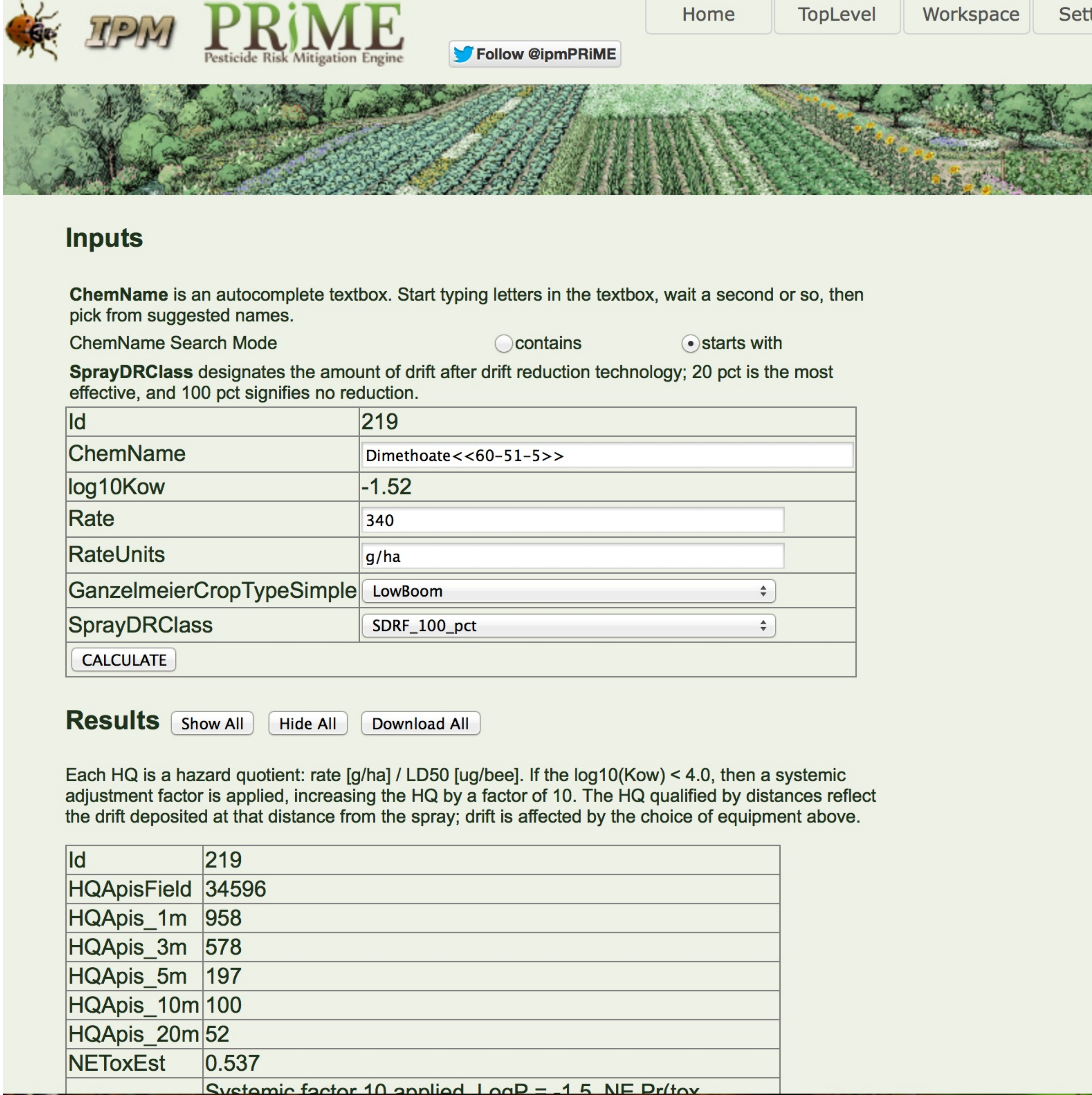
From previous testimony

Farmer education in Oregon that supports risk management decision making

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



IPM PRiME Pesticide Risk Mitigation Engine

Follow @ipmPRiME

Home | TopLevel | Workspace | Sett

Inputs

ChemName is an autocomplete textbox. Start typing letters in the textbox, wait a second or so, then pick from suggested names.

ChemName Search Mode ○ contains ● starts with

SprayDRClass designates the amount of drift after drift reduction technology; 20 pct is the most effective, and 100 pct signifies no reduction.

Id	219
ChemName	Dimethoate<<60-51-5>>
log10Kow	-1.52
Rate	340
RateUnits	g/ha
GanzelmeierCropTypeSimple	LowBoom
SprayDRClass	SDRF_100_pct
CALCULATE	

Results

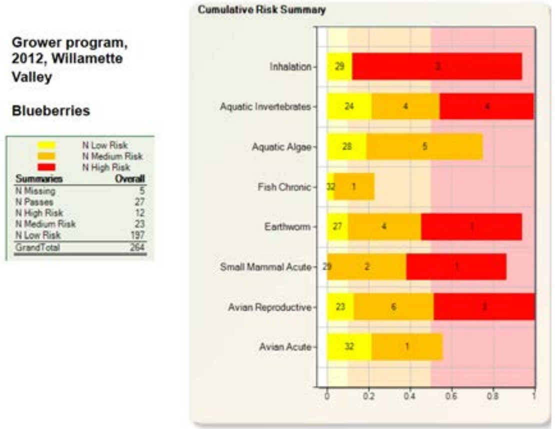
Show All | Hide All | Download All

Each HQ is a hazard quotient: rate [g/ha] / LD50 [ug/bee]. If the log10(Kow) < 4.0, then a systemic adjustment factor is applied, increasing the HQ by a factor of 10. The HQ qualified by distances reflect the drift deposited at that distance from the spray; drift is affected by the choice of equipment above.

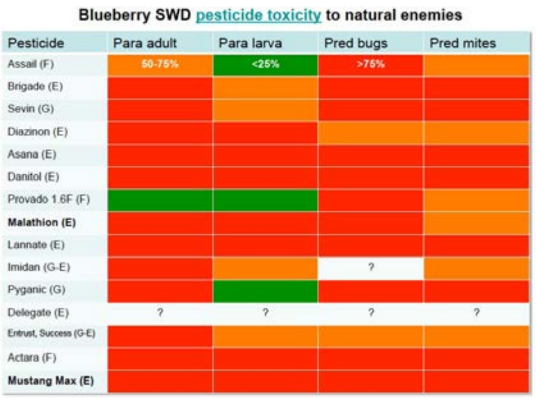
Id	219
HQApisField	34596
HQApis_1m	958
HQApis_3m	578
HQApis_5m	197
HQApis_10m	100
HQApis_20m	52
NEToxEst	0.537
	Systemic factor 10 applied. LogP = -1.5. NE Pr(tox

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

Bee risks are actively considered in IPM extension



HIGH CUMULATIVE RISK FOR OVERALL CURRENT PROGRAMS

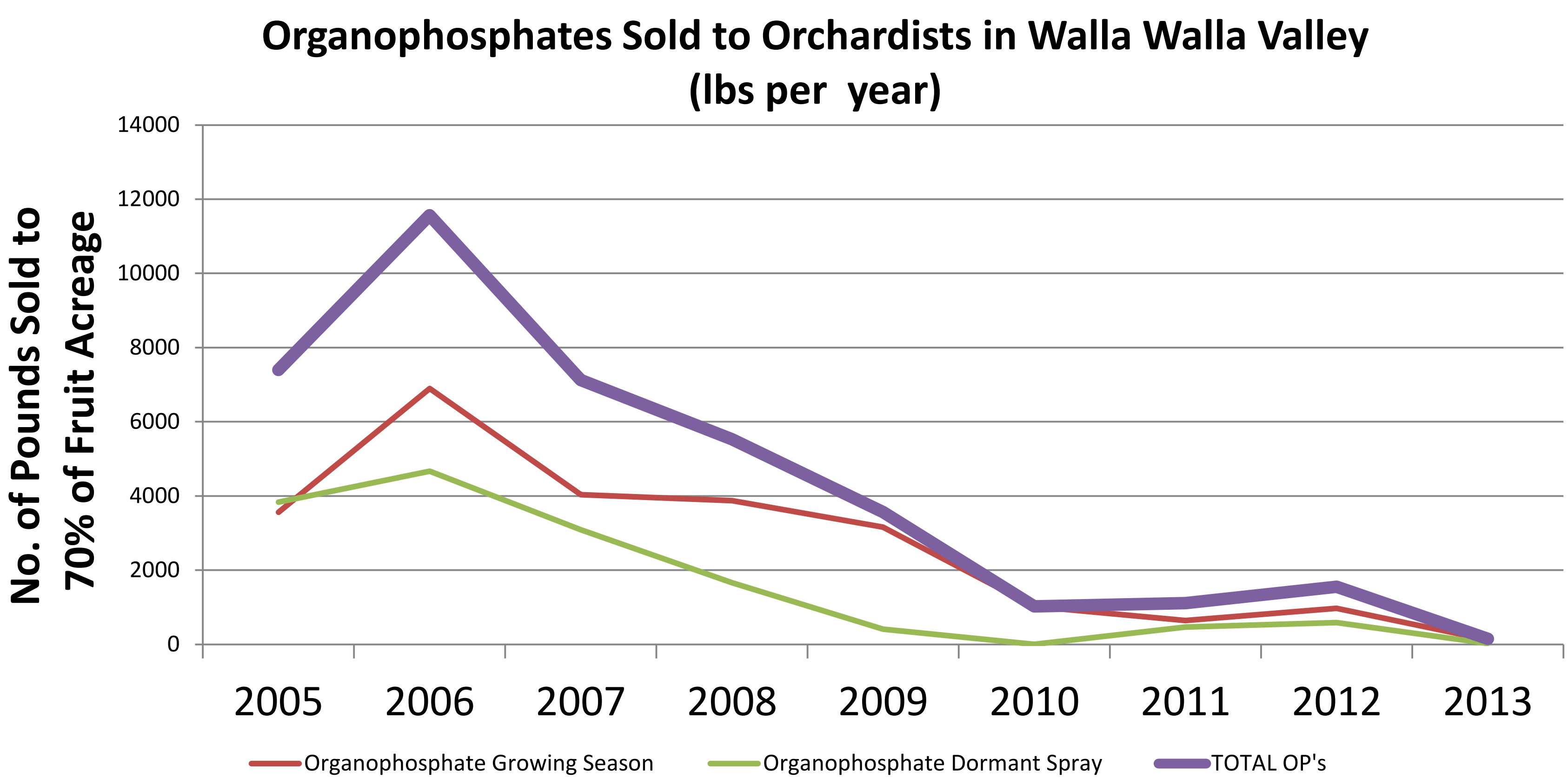


SWD pesticide mode-of-action for rotation (+PHI)

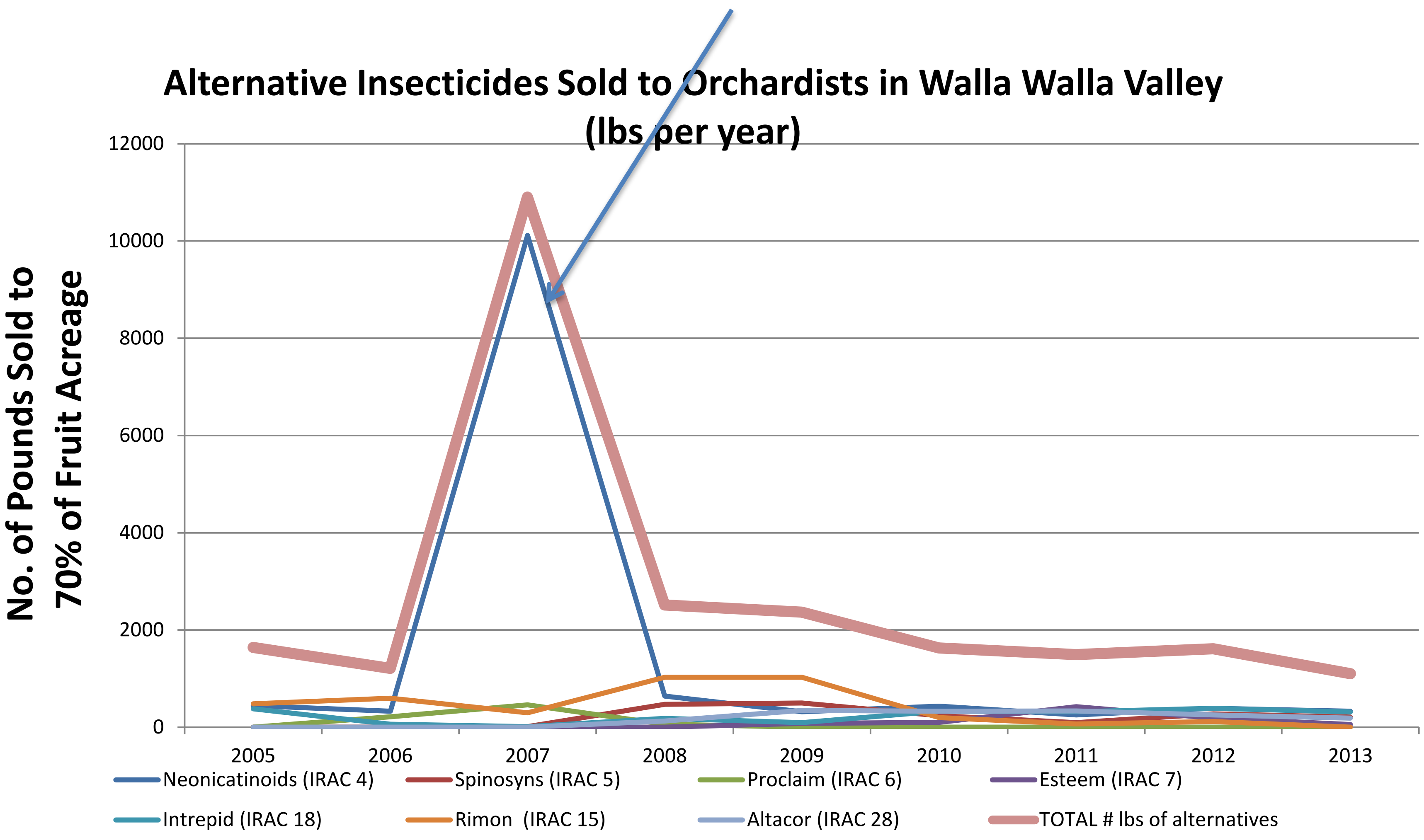
Chemical class	Pesticide
Nitroguanidine nicotinoid Pyridylmethylamine nicotinoid	Provado 1.6F (3), Actara (3) Assail (1)
Spinosyn	Delegate (3), Entrust (3), Success (3)
Botanical	Pyganic (0)
Pyrethroid Pyrethroid ester	Brigade (1), Asana (14), **Mustang max (1)** Danitol (3)
Carbamate Oxime carbamate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

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 played 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, ultimately leads to greatly reduced pesticide use of any type

BUT, IPM Requires lower risk pesticide alternatives in the key transitional phases when the system is recovering

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