Pyrethroids and Water Quality

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Environmental Monitoring
CDPR

Pyrethroids and Water Quality

I. Overview: use, properties, aquatic toxicity

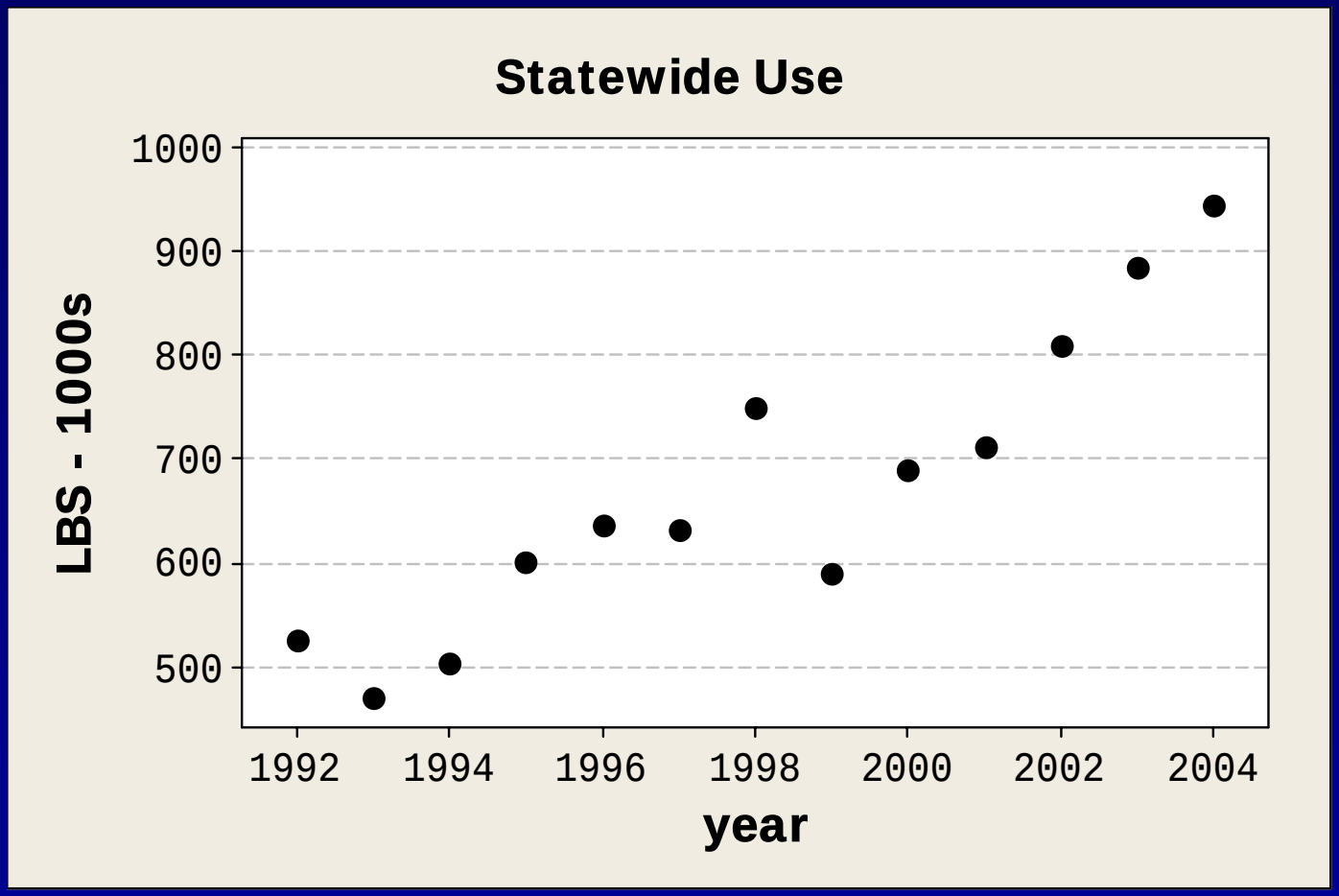
II. Recent pyrethroid monitoring

III. What is reevaluation?

IV. Synthetic pyrethroids reevaluation

V. DPR activities

PUR Synthetic Pyrethroid Use - Σ 26 AIs

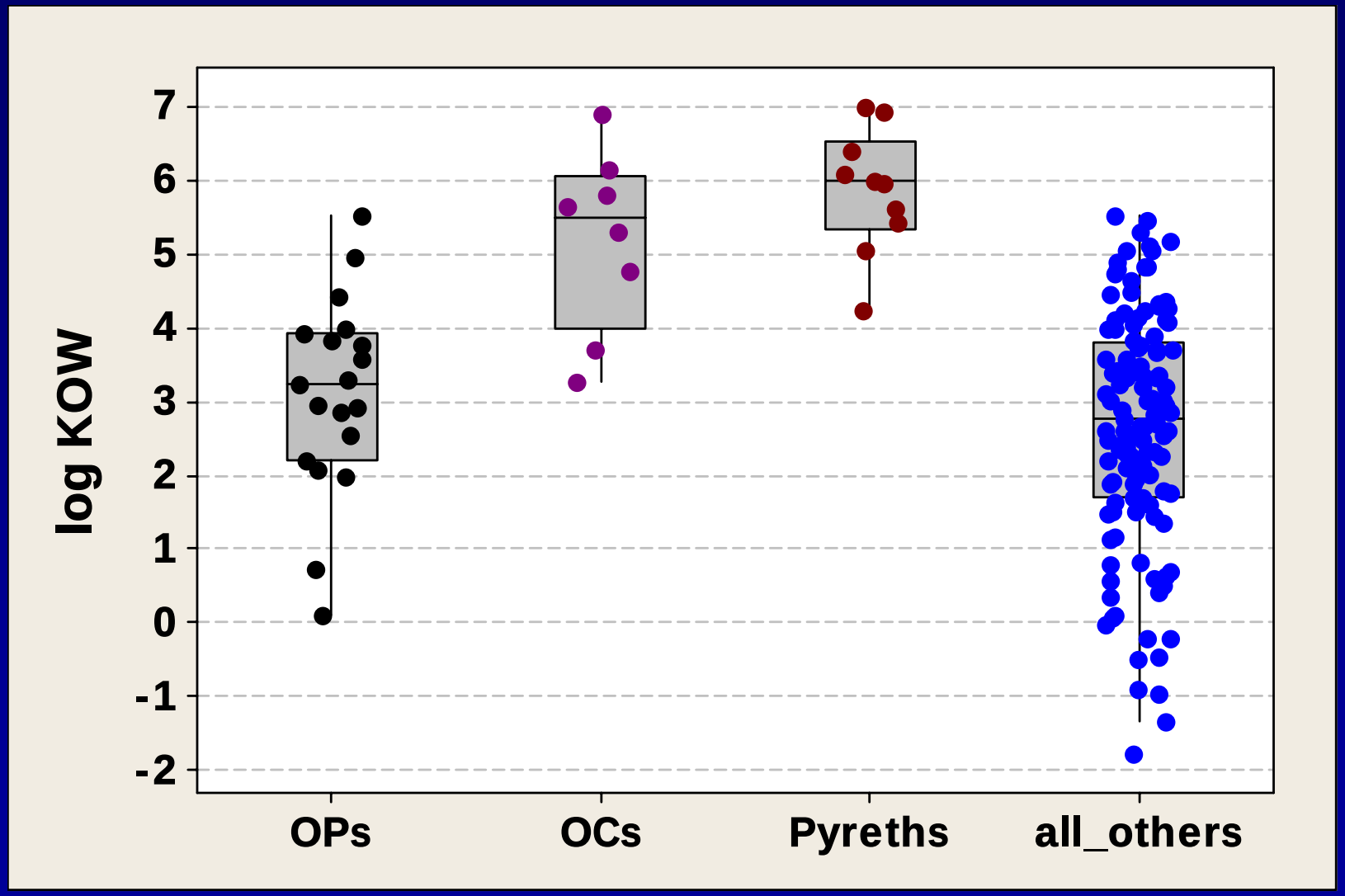


2004 TOP 7

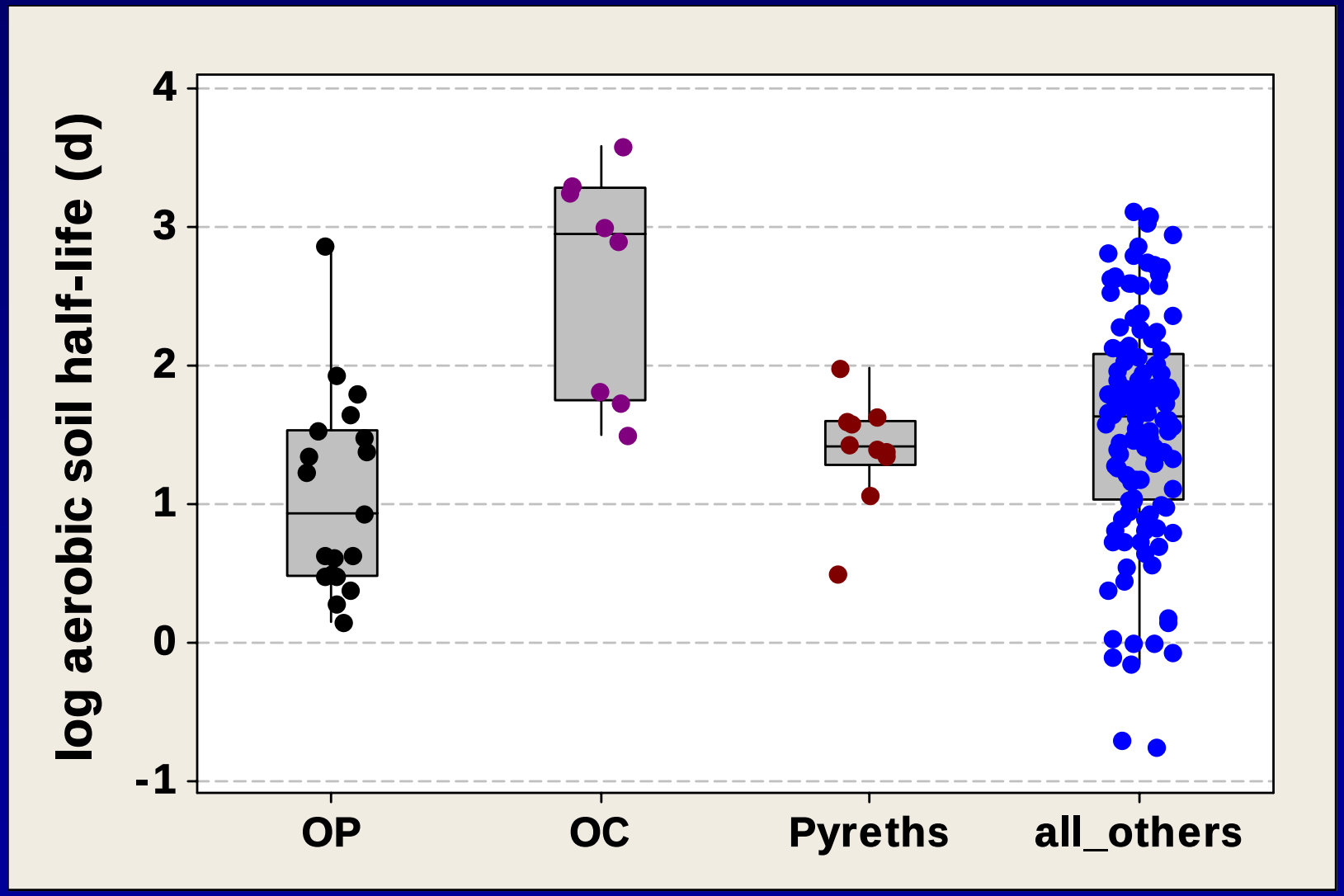
permethrin
cypermethrin
bifenthrin
cyfluthrin
fenpropathrin
λ-cyhalothrin
esfenvalerate

all > 30000 lbs in 2004

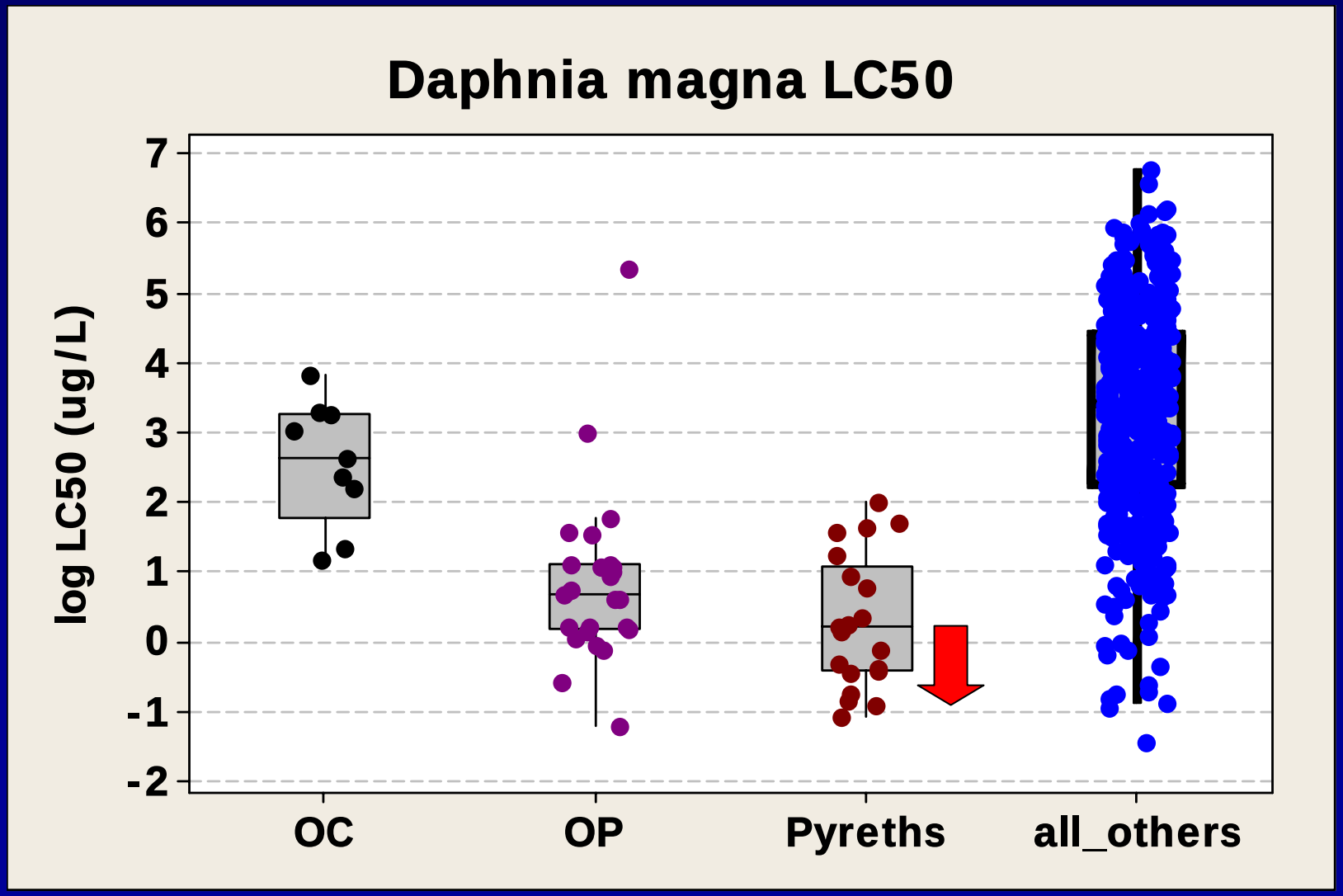
Pyrethroid Properties
hydrophobicity



Pyrethroid Properties
soil persistence



Pyrethroid Properties
relative acute aquatic toxicity



Pyrethroid Use and Properties: Summary

- Use steadily increasing - 2004 total use ~ twice 1992 total use

- Highly hydrophobic - associated with suspended and bed sediments at equilibrium

- Only moderately persistent - based on aerobic soil half-life data

- High aquatic toxicity - based on *laboratory aqueous* acute toxicity data
  - bioavailability effects -

Recent Pyrethroid Monitoring

- Pyrethroids detected in sediment, both urban/ag sites

  (Weston et al. 2004, 2005; DPR monitoring)

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- Ag detections included bifenthrin, esfenvalerate, λ - cyhalothrin, permethrin, resmethrin, fenpropathrin

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- Acute toxicity to native sediment-dwelling amphipod *Hyalella azteca* in bioassays, correlated with pyrethroid concentrations

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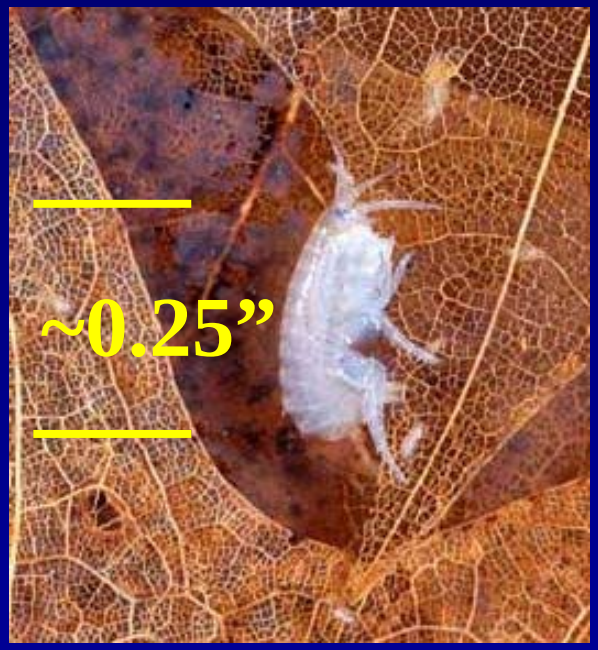
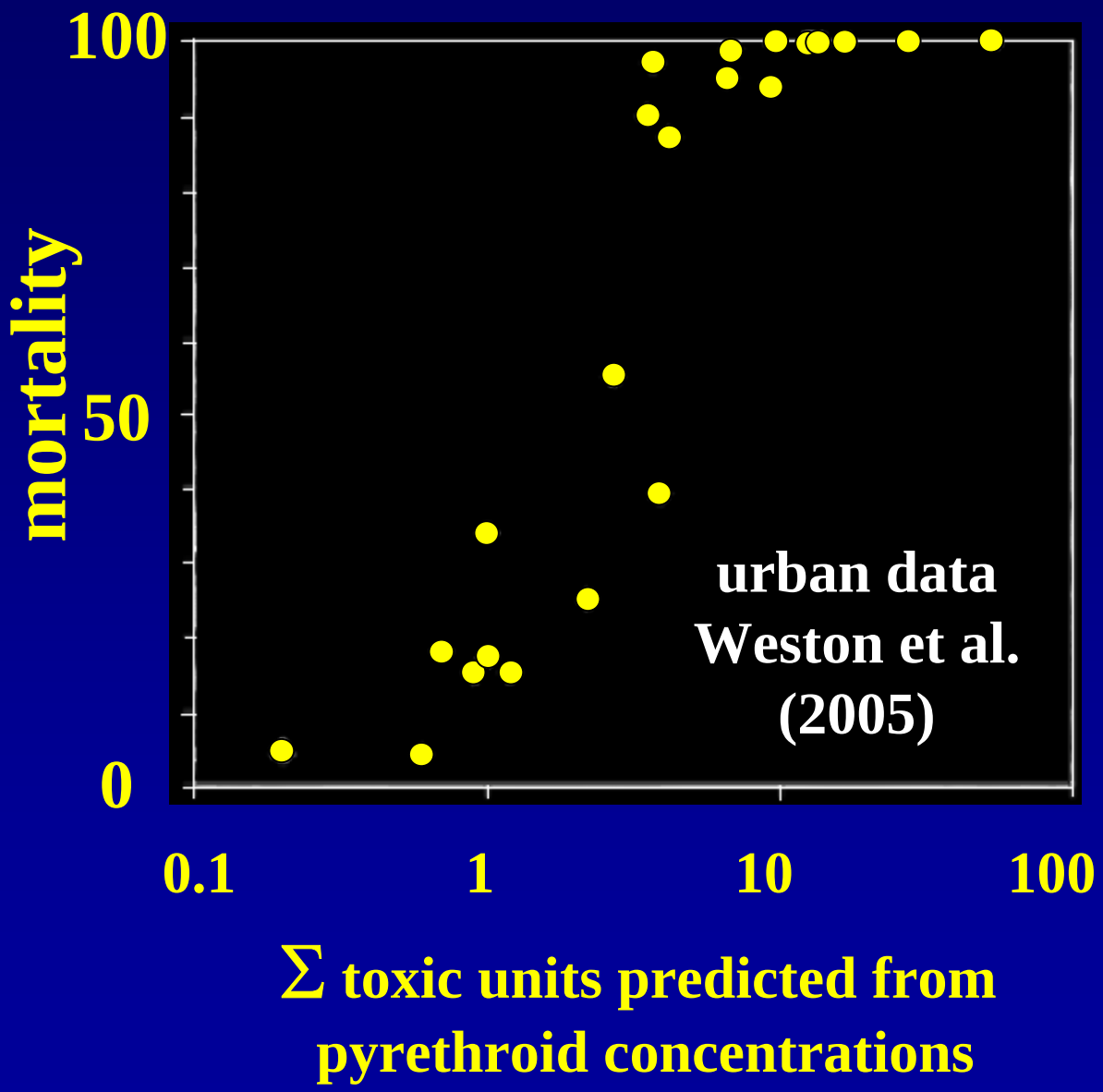
- Acute toxicity correlated with pyrethroid concentrations
- Other potential sediment toxicants (OCs, chlorpyrifos) generally far below concentrations sufficient to cause toxicity

Example: H. azteca mortality vs. pyrethroid concentrations (TUs)





Reevaluation

- DPR plans to put synthetic pyrethroid products into reevaluation

What is Reevaluation?

- DPR plans to put synthetic pyrethroid products into reevaluation
- Mechanism for obtaining additional *post-registration* data for *products* from pesticide registrants, e.g.....

spatial and temporal extent of off-site residues

sources - types of uses

mitigation practices

toxicity data

other

What is Reevaluation?

- DPR plans to put synthetic pyrethroid products into reevaluation
- DPR's mechanism for obtaining additional *post-registration* data
- Occurs when "a pesticide may have caused, or is likely to cause, a significant adverse impact", e.g.

  * public or worker health hazard
  * residue over-tolerance
  * undesireable phytotoxicity
  * environmental contamination
  * fish or wildlife hazard
  * or numerous other impacts .....

  (CCR 6220 et seq.)

What is Reevaluation?

- DPR plans to put synthetic pyrethroid products into reevaluation
- DPR's mechanism for obtaining additional *post-registration* data
- Occurs when a potential significant adverse impact
- Various possible outcomes:

  * no action

  * restricted material

  * label amendments

  * cancellation

Synthetic Pyrethroid Reevaluation

- May potentially include products with following AIs:

ALLETHRIN		FENPROPATHRIN
S-BIOALLETHRIN		FENVALERATE
D-TRANS ALLETHRIN		FLUCYTHRINATE
ESBIOTHRIN		IMIPROTHRIN
D-ALLETHRIN		LAMBDA CYHALOTHRIN
BIFENTHRIN		PERMETHRIN
CYFLUTHRIN		PHENOTHRIN
BETA-CYFLUTHRIN		PRALLETHRIN
CYPERMETHRIN		RESMETHRIN
(S)-CYPERMETHRIN		TAU-FLUVALINATE
DELTAMETHRIN		TETRAMETHRIN
ESFENVALERATE		TRALOMETHRIN
ETOFENPROX		

Final product list not yet determined - will probably exclude various pressurized and impregnated formulations

Synthetic Pyrethroid Reevaluation

- numerous products - not finalized
- Possible data requirements:

  physical-chemical properties - soil/aquatic half-lives, KOC,...

  sediment toxicity data - H. azteca, C. tentans

  monitoring data - source ID ag/urban;
  spatial/temporal extent?

  mitigation measure studies/effectiveness

Final data requirements not yet determined

Synthetic Pyrethroid Reevaluation

- numerous products - not finalized
- data requirements - not finalized
- Extended process: ~ years

  > 125 registrants, > 700 products

  other reevaluations in progress:

  diazinon dormant spray, chlorpyrifos,

  VOC TGA data, VOC product reformulation

  ==> already ~ 1000 products in reevaluation

Synthetic Pyrethroid Reevaluation

- numerous products - not finalized
- data requirements - not finalized
- extended process: ~ years
- DPR research:

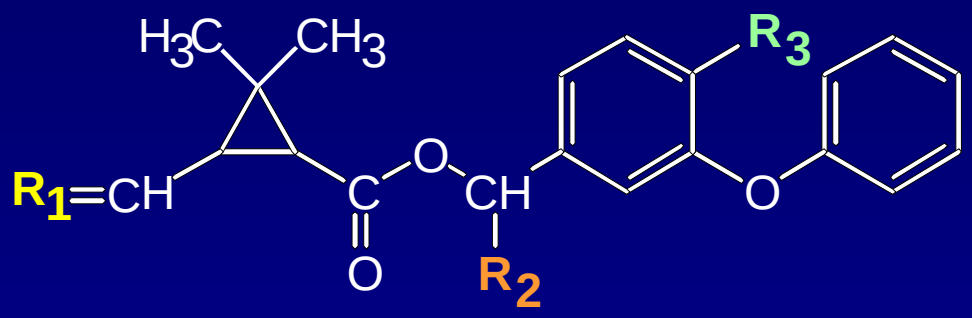
  - monitoring

  - sediment bioavailability research/measurement techniques

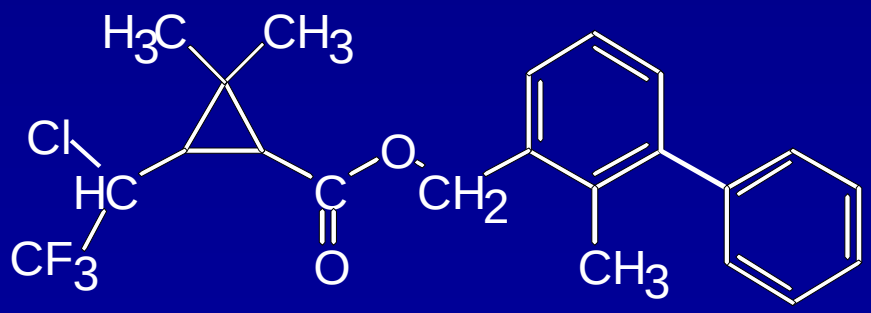
    (Jay Gan, UCR)

  - analytical method development (USGS, CDFA)

Questions?



R_1	R_2	R_3	
CCl2	CN	F	**cyfluthrin**
CCl2	CN	H	**cypermethrin**
CClCF3	CN	H	**cyhalothrin**
CCl2	H	H	**permethrin**



bifenthrin

fenvalerate