# Five Decades Later, It's Silent Spring All Over Again

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## *The Widespread Impacts of Pyrethroids in Urban Surface Waters in California*

By

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# *Silent Spring* All Over Again

- Rachel Carson began working on *Silent Spring* in 1958 – 50 years ago
- Research into environmental effects of pesticides well under way in 1950's
- Organochlorines and orgnaophosphates shown to be widely harmful

# THE FUNDAMENTAL ISSUE

"Pesticides don't kill bugs, people kill bugs"

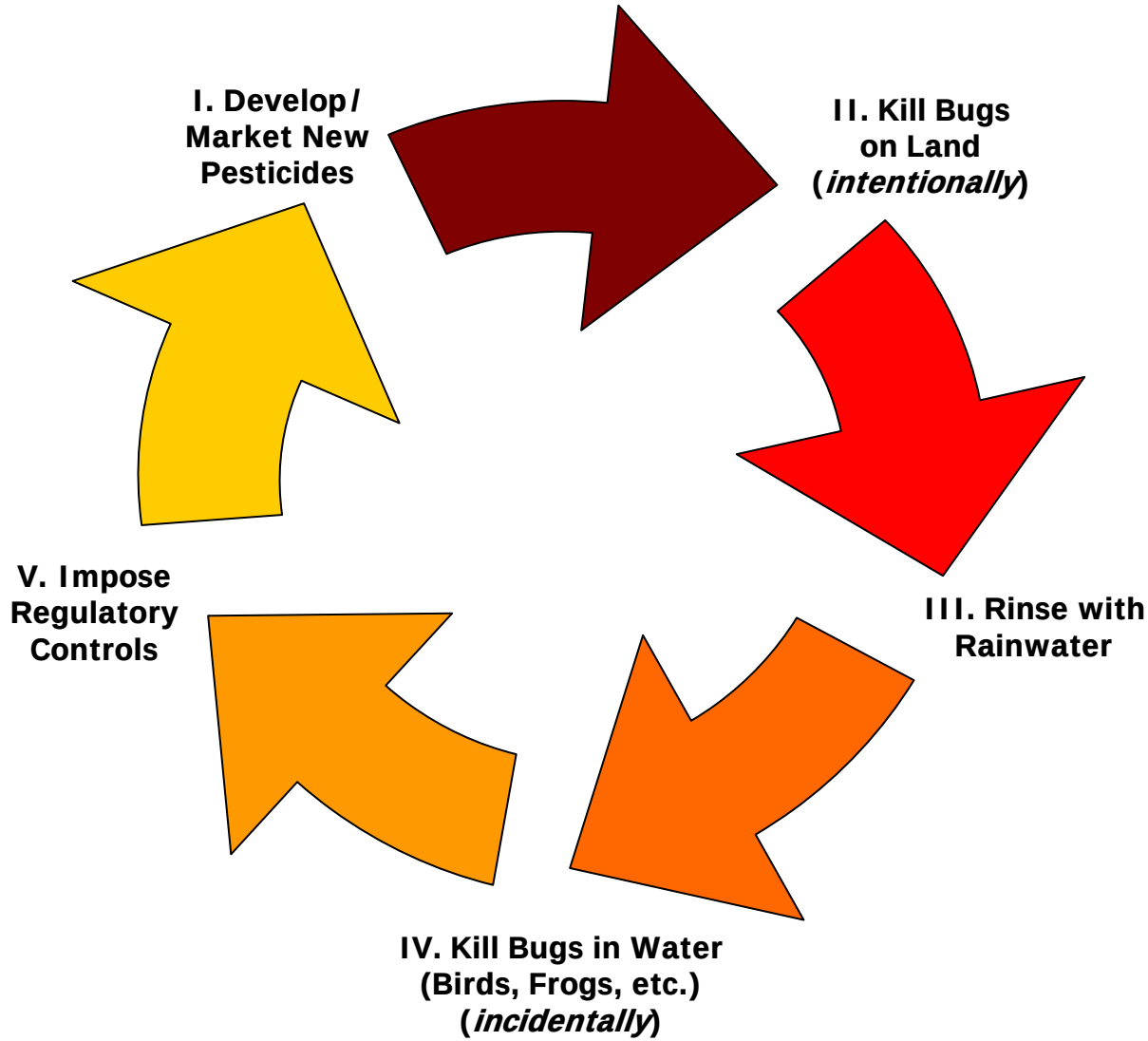

- People don't like bugs
- Chemical companies make pesticides and sell them to...
- People, who use pesticides to kill bugs

# UNFORTUNATELY:

- After application, pesticides wash into storm drains, and then surface waters, where they harm aquatic life
- Pesticides are good at killing bugs in receiving waters, too! (duh)



# CURRENT REGULATORY SCHEME: APPLY-RINSE-REPEAT



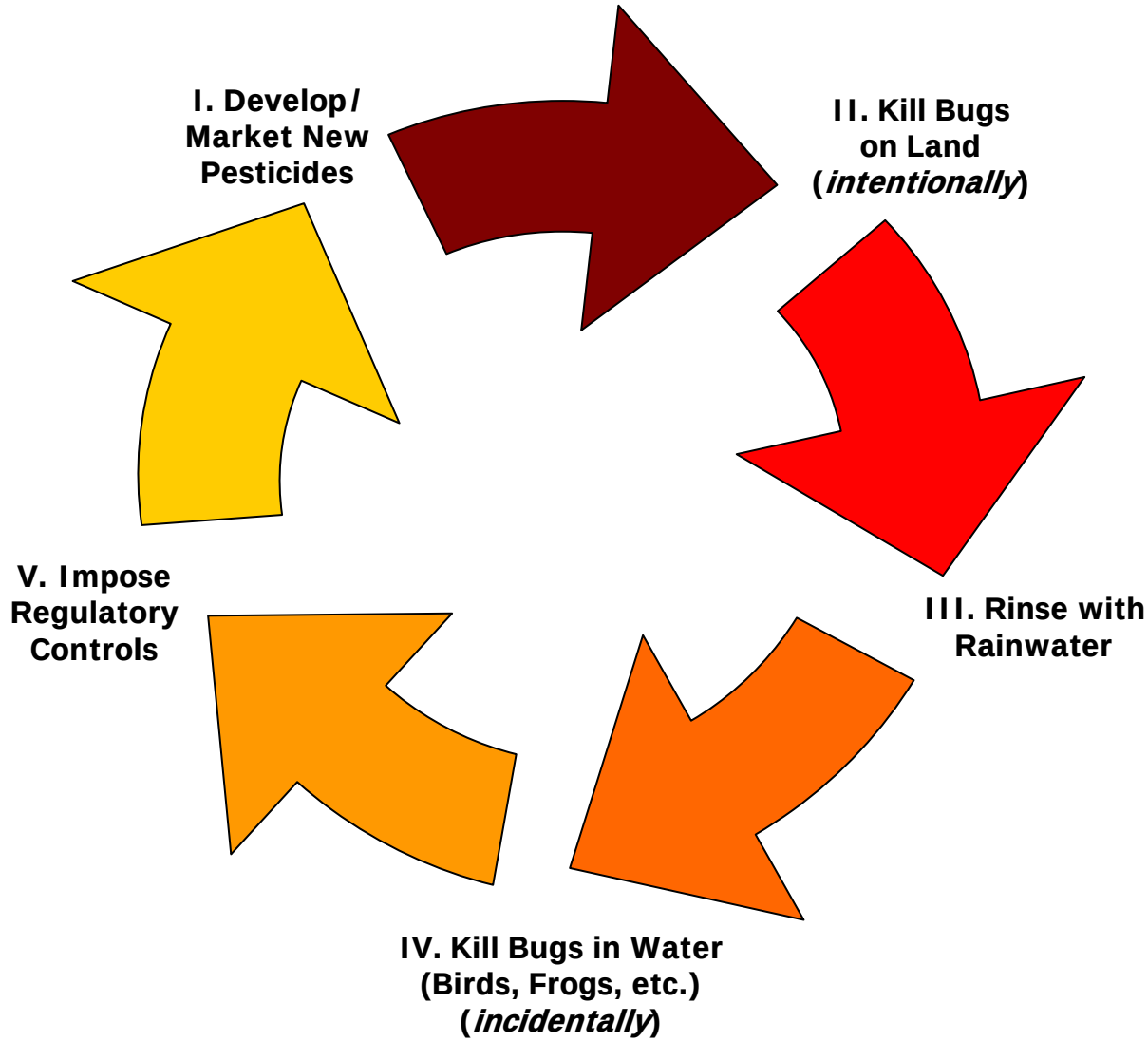
# PESTICIDE INDUSTRY RESPONSE - RECENT CASE

- Several years ago, USEPA banned urban uses of diazinon, chlorpyrifos (OPs)
- Manufacturers replaced OPs with different active ingredients *approved by USEPA* (pyrethroids)
- Urban customers continued buying products, and using them

# KEY MOMENTS IN RECENT CA HISTORY:

- *Mid-late 1990's:* OP pesticides (esp. diazinon) cause toxicity in urban streams
- *Early 2000's:* USEPA limits urban uses of diazinon and chlorpyrifos due to *human health concerns*; manufacturers switch to pyrethroids
- *Early-mid-2000's:* first 303(d) Listings, TMDLs for OP pesticides (Central Valley, SF Bay Area)
- *Mid-2000's:* Research documents toxicity due to pyrethroids *in sediments* of streams receiving urban and agricultural runoff

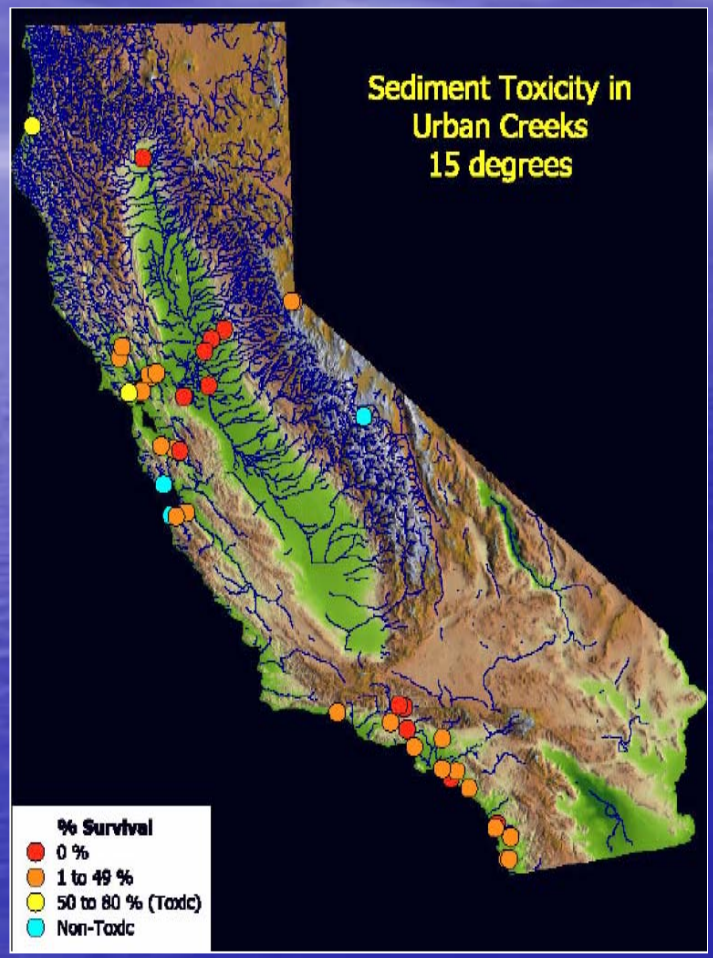
# CURRENT REGULATORY SCHEME: APPLY-RINSE-REPEAT



# Pyrethroids are:

- Synthetic versions of naturally-occurring pyrethrins
- More toxic and longer-lasting when released into the environment
- More likely to bind to particles (and persist in sediments) than OP pesticides

# SEDIMENT TOXICITY IN CA




From: California's Surface Water Ambient Monitoring Program (SWAMP; R. Holmes/ UPC 7/19/07)

- Pyrethroids are principal cause of toxicity, per final report, ES&T 2008

# Urban Use and Toxicity

- Permethrin and cypermethrin most widely used in California urban areas
- But pyrethroid toxicity varies...
- Cypermethrin and bifenthrin account for most “toxicity equivalents”

Source: TDC Environmental, 2008: “Urban Pesticides Use Trends Annual Report 2008”

# Re-evaluation (DPR)

- CA Dept. of Pesticide Regulation (DPR) has initiated regulatory process known as “re-evaluation” for pyrethroid products
- Due to discovery and publication of toxic effects of pyrethroids in California
- Allowable uses may be adjusted and mitigation measures required

# CASQA's Role

- CASQA: CA Stormwater Quality Association
- Pesticides Subcommittee is tracking pyrethroids re-evaluation process
- Retained Armand Ruby Consulting to investigate and compile available monitoring information

# Pyrethroids Data Compilation Project

- Purpose: compile all available data to document presence and effects of pyrethroids in ***urban surface waters*** in California

# Pyrethroids Monitoring Data Compilation- Results

I. Expanding diversity of pesticides research
II. Shift in research from agricultural to urban areas
III. Pyrethroids are present – and toxic – in both water and sediment
IV. Evidence widely distributed throughout CA
V. Effects on aquatic organisms are widespread throughout aquatic biosphere
VI. Shift in toxic effect from water flea (*Ceriodaphnia dubia*) to amphipods (*Hyalella azteca*)
VII. Analytical detection issues understate the extent of the problem

# I. Expanding diversity of research on presence and effects of pyrethroids

- Over 100 studies evaluated for this project
- Many studies ongoing – preliminary results included where available
- Urban focus – but notations made for
  - "Ag Studies"
  - "Methods-Research"
  - "Reviews-Regs-Resources"
  - "Study Plans"
  - "Other Pesticides"

# II. Earlier (pre-2000) pesticides research focused principally on agriculture, but that is changing

- Several dozen reports/studies summarized for this project from California urban areas
- Much additional work is ongoing or planned

# III. Pyrethroids are present in both water and sediment in urban areas

- Recent improvements in field collection and laboratory analytical protocols produce improved detection of pyrethroids, particularly in water.
- Toxic effects have been extensively documented in both matrices

# IV. Pyrethroids are found statewide

- Evidence of presence and effects of pyrethroids *in urban watercourses* is widely distributed geographically throughout the state of California.
- Studies are summarized from:
  - North coast
  - Lake Tahoe region
  - San Francisco Bay area
  - Central Valley
  - Central Coast
  - Both coastal and inland areas of southern California

# V. Effects of pyrethroids on aquatic organisms are varied

- Studies show effects throughout the aquatic biosphere
- Documented in studies involving:
  - Water column toxicity testing
  - Sediment toxicity testing
  - Bioassessments (benthic macroinvertebrates)
  - Tissue analysis

# VI. Shift in aquatic (water column) toxicity

- Observed since the phase-out of urban uses of diazinon in 2004
- Formerly, urban runoff and surface waters exhibited frequent toxicity to Ceriodaphnia, due to OP pesticides (diazinon and chlorpyrifos)
- Increasingly, the same waters are exhibiting toxicity to amphipods (Hyalella), due to pyrethroids

(based on TIEs and chemical data)

# VII. It's worse than it appears

- Some studies use analytical detection limits not sufficiently low to detect pyrethroids at environmentally-relevant concentrations.
- Some samples reported as "non-detect" may in fact contain pyrethroids at potentially harmful concentrations
- This has the effect of understating the extent of the problem

[Few commercial labs are currently capable of providing appropriate analytical detection limits on a routine basis]

# REGULATORY BREAKDOWN

- USEPA/FIFRA (Pesticide Registration)
  – Ineffective in preventing water quality impacts (OPP and OW disconnect)
- CA Department of Pesticide Regulation (DPR)
  – Gets involved after approval/use
- 303(d) Listings, TMDLs (Clean Water Act)
  – Post-impact
- Need complete revision of regulatory system
  – Should assess/prevent ecological impacts before product approval

# Rachel Carson, *Silent Spring*, 1962:

"...we have allowed these chemicals to be used with little or no advance investigation of their effect on soil, water, wildlife... Future generations are unlikely to condone our lack of prudent concern for the integrity of the natural world..."

# KEY RESOURCES

- UP3 Project: www.up3project.org/
  (*sign up for UPC e-mail list*)
- PANNA – Pesticide Action Network:
  www.panna.org/
  - Esp. PAN Pesticides Database:
    www.pesticideinfo.org/Index.html
- Beyond Pesticides:
  www.beyondpesticides.org/
  - Esp. Gateway on Pesticides Hazards:
    www.beyondpesticides.org/gateway/index.htm
- CA Dept. Pesticide Regulation:
  www.cdpr.ca.gov/

# COMMENTS/QUESTIONS

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(*Lots of Useful Links*)