# Protecting Surface Water from Pesticide Contamination in California

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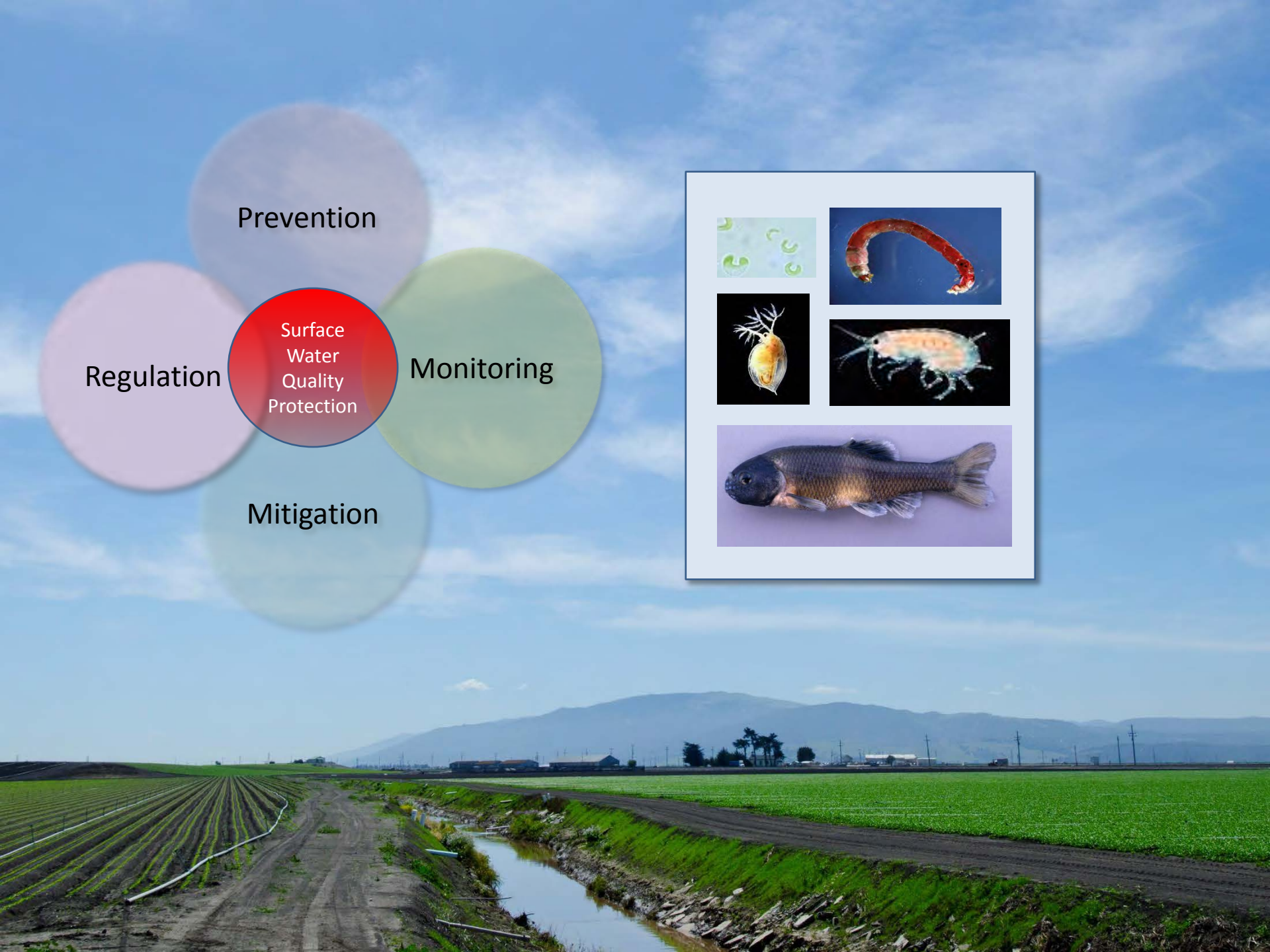

Prevention
Regulation
Surface Water Quality Protection
Monitoring
Mitigation

## Prevention

### Registration Evaluation

- Agriculture
- Urban
- Active ingredient
- Degradation products

### Decision

- Deny, Accept
- Conditional (watch list)

## PESTICIDE

- Physico-chemical properties
- Environmental Fate
- Aquatic toxicity
- Runoff potential
- Use pattern
- Risk quotients (EEC/LC50)
- Level of concern

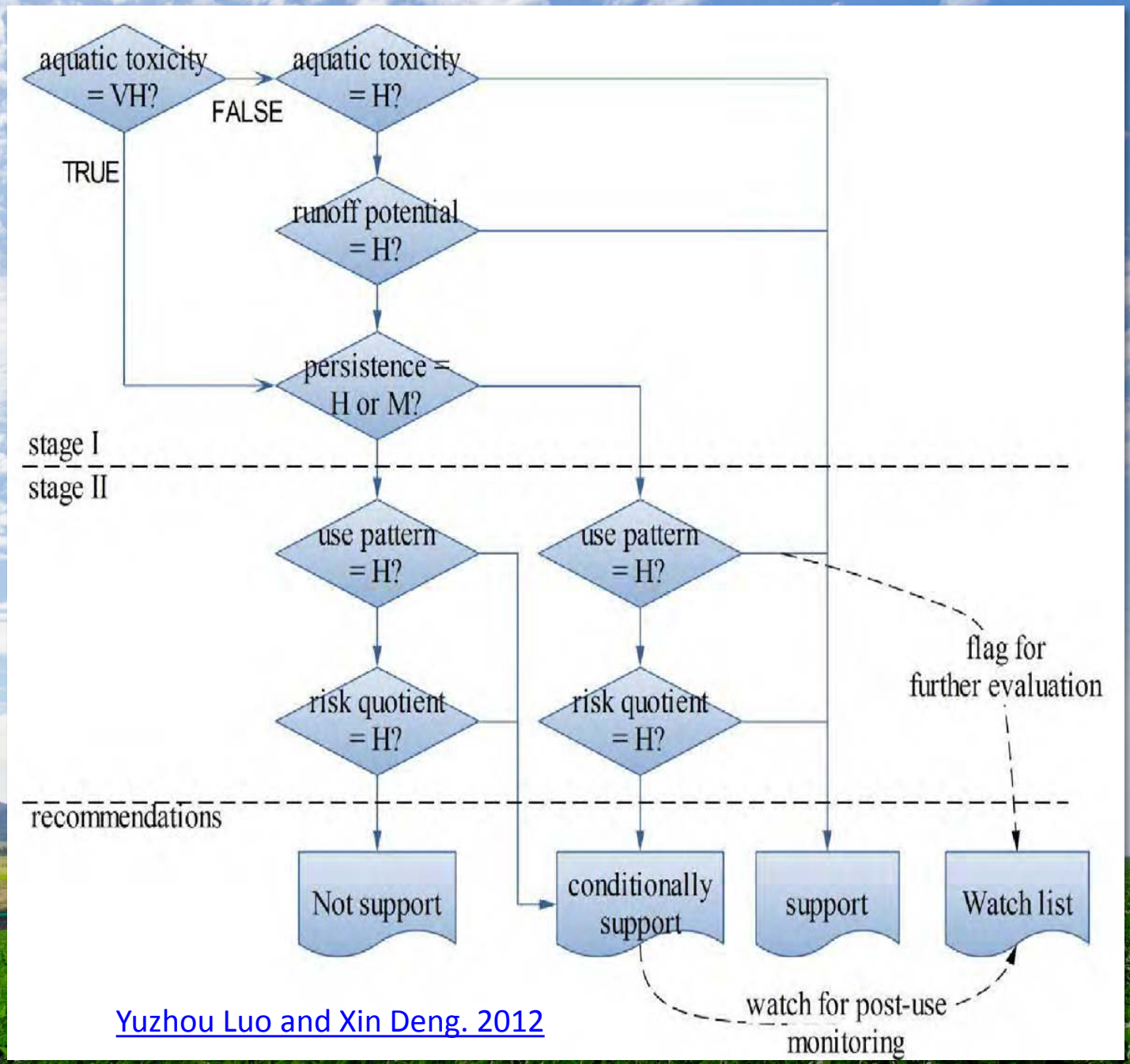
**Prevention**
**Registration**
**Evaluation**

## Physico-chemical Properties

| | |
|---|---|
| AERO | aerobic soil metabolism half-life, day |
| AERO_W | aerobic aquatic metabolism half-life, day |
| ANAER | anaerobic soil metabolism half-life, day |
| ANAER_W | anaerobic aquatic metabolism half-life, day |
| FD | field dissipation half-life, day |
| HLW | dissipation half-life in water, day |
| HLD | dissipation half-life in sediment, day |
| HYDROL | hydrolysis half-life, day |
| KOC | organic carbon-normalized soil adsorption coefficient, L/kg[OC] |
| LC50 | median lethal concentration, ppb |
| SOL | water solubility, mg/L |

**Prevention**
**Registration**
**Evaluation**

**Agriculture**




Yuzhou Luo and Xin Deng. 2012

**Prevention**
Registration
Evaluation
**Urban**

Yuzhou Luo. 2014

## Monitoring

Urban & Agriculture
Special study
Priority lists
Watch list
Chemistry vs. Toxicity

Monitoring Network

Field & Lab

Automation
Passive samplers
In-situ Bioassay
Analytical methods

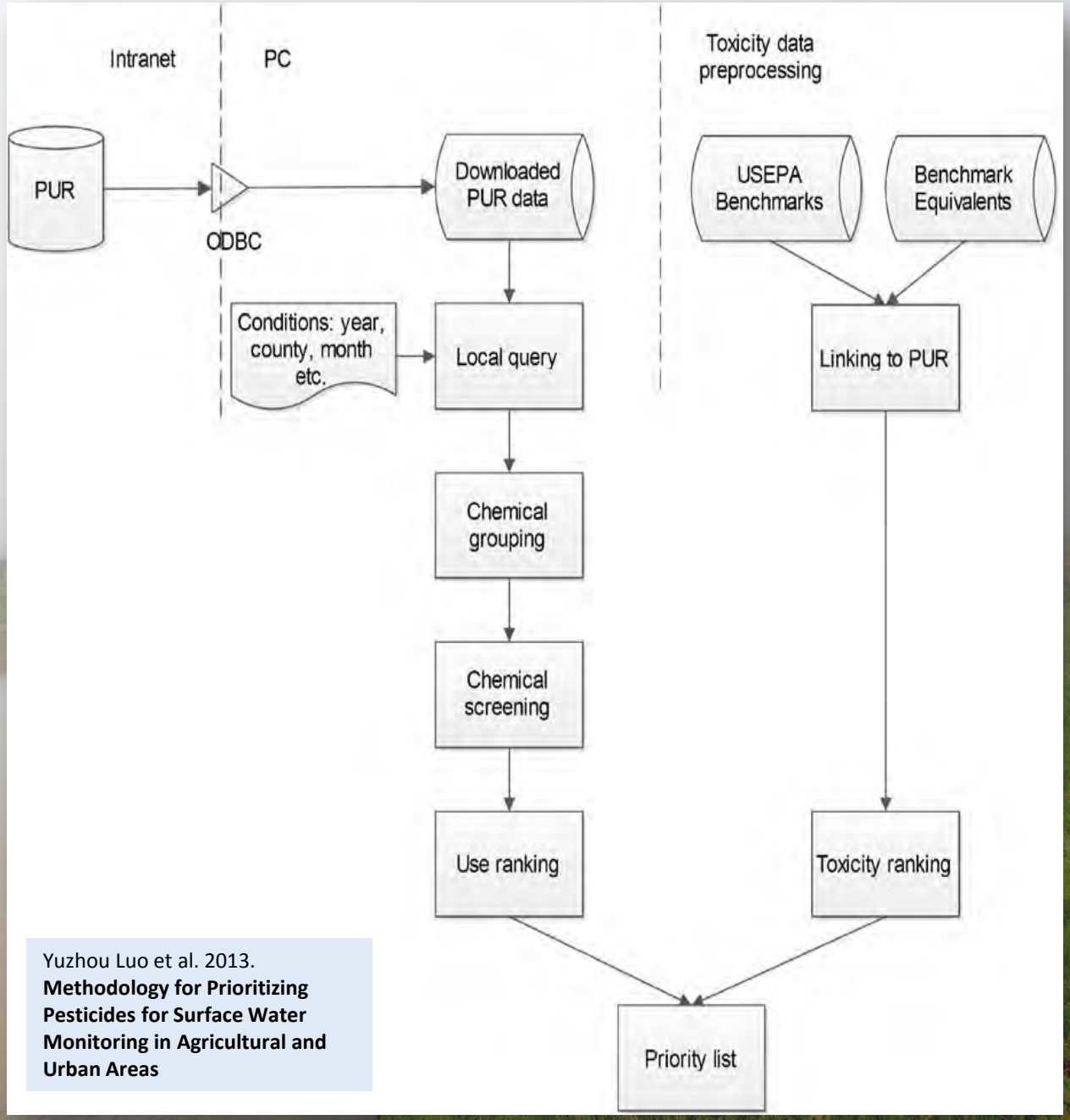
SURFACE WATER DATABASE

## Assessment
## Modeling

Fate & transport
Source identification
Trends analysis
Mitigation effectiveness
Regulatory effectiveness

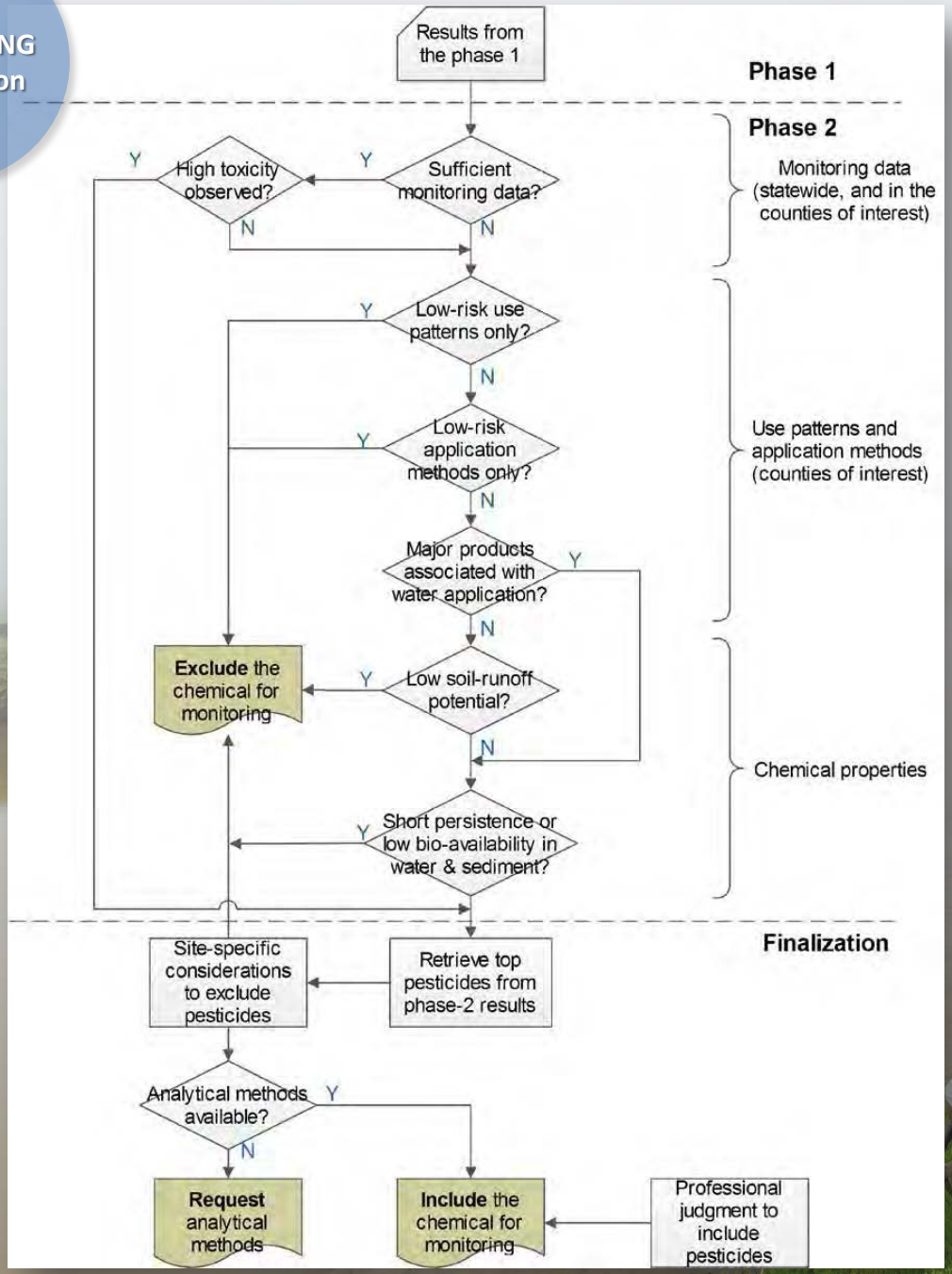
Aquatic Benchmarks

# MONITORING Prioritization




Yuzhou Luo et al. 2013.
**Methodology for Prioritizing Pesticides for Surface Water Monitoring in Agricultural and Urban Areas**

**MONITORING**
**Prioritization**



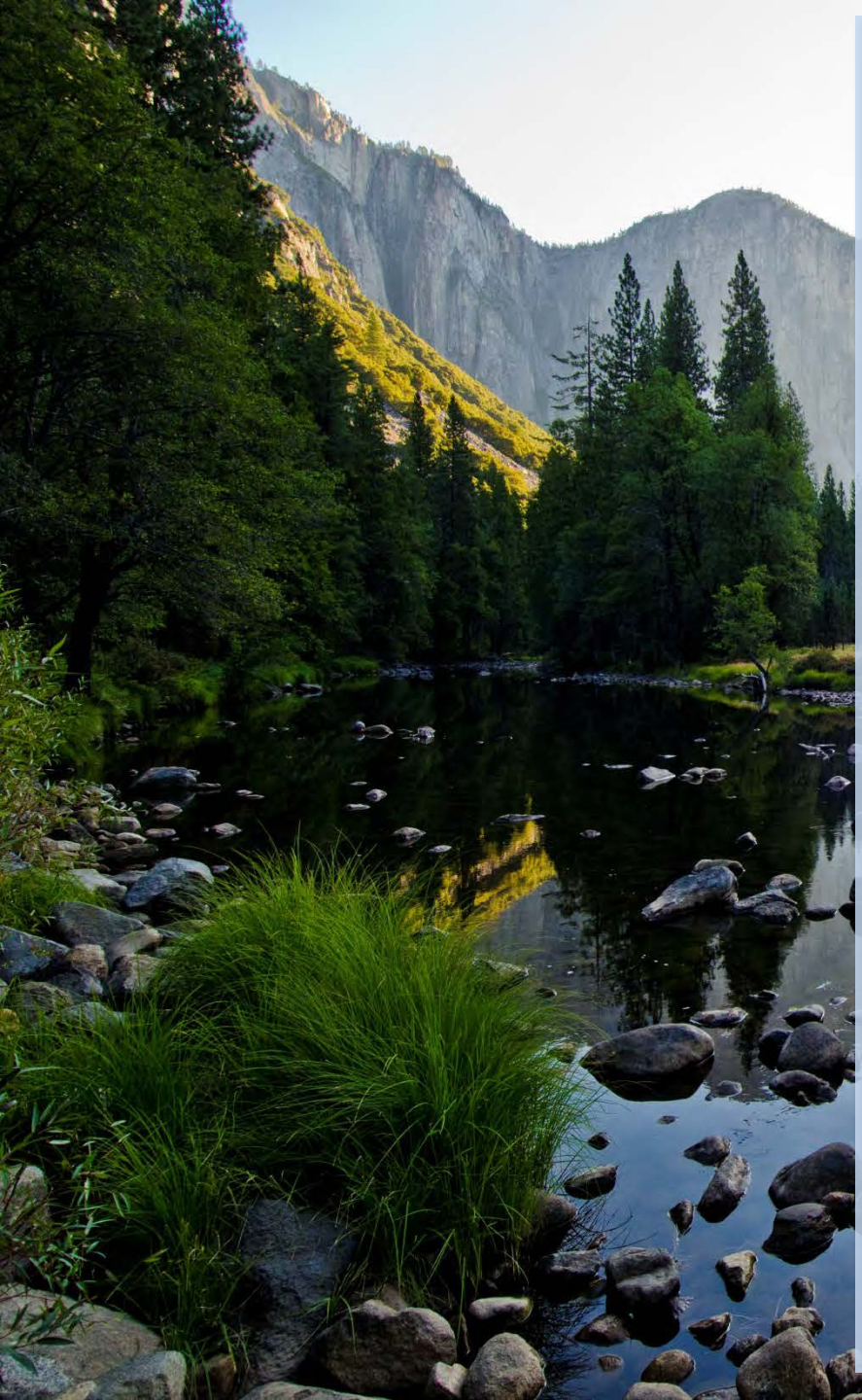

Yuzhou Luo et al. 2014. **Methodology for Prioritizing Pesticides for Surface Water Monitoring in Agricultural and Urban Areas II: Refined Priority List**

MONITORING

## Top 10 Pesticides Identified by Monitoring Prioritization Model Based on Statewide Yearly-Average Use Data from 2009-2011

| Chemical Name | Use in pound | Use score | Benchmark (µg/L) | Toxicity score | Final score |
|---|---|---|---|---|---|
| CHLORPYRIFOS | 1,271,377 | 5 | 0.05 | 6 | 30 |
| PERMETHRIN | 110,277 | 3 | 0.01 | 7 | 21 |
| COPPER | 4,938,598 | 5 | 2.05 | 4 | 20 |
| PENDIMETHALIN | 1,802,207 | 5 | 5.2 | 4 | 20 |
| PARAQUAT | 831,544 | 4 | 0.396 | 5 | 20 |
| OXYFLUORFEN | 611,999 | 4 | 0.29 | 5 | 20 |
| MALATHION | 500,470 | 4 | 0.3 | 5 | 20 |
| BIFENTHRIN | 85,113 | 3 | 0.075 | 6 | 18 |
| CHLOROTHALONIL | 844,393 | 4 | 1.8 | 4 | 16 |
| ZIRAM | 746,473 | 4 | 9.7 | 4 | 16 |

Study 290 Deng, Xin. 2014. Water Monitoring for Pesticides in Agricultural Areas of California



**Priority model pesticides based on Alameda, Contra Costa, Placer, Sacramento and Santa Clara Counties urban usage (2009-2011).**

| Pesticide | Priority Score |
|---|---|
| Bifenthrin | 30 |
| Permethrin | 28 |
| Diuron | 20 |
| Copper | 20 |
| Pendimethalin | 20 |
| Diquat dibromide | 20 |
| Cypermethrin | 20 |
| Cyfluthrin | 18 |
| Chlorothalonil | 16 |
| Bromacil | 16 |
| Prodiamine | 16 |
| Acrolein | 16 |
| Fipronil | 15 |
| Sulfometuron-methyl | 15 |
| Malathion | 15 |
| Flumioxazin | 15 |
| Oxyfluorfen | 15 |
| Cyhalothrin (lambda) | 14 |
| Oryzalin | 12 |
| Triclopyr, butoxyethyl ester | 12 |
| Imidacloprid | 12 |
| Halosulfuron-methyl | 12 |
| Oxadiazon | 12 |
| Cyfluthrin (beta) | 12 |
| Deltamethrin | 12 |
| Chlorsulfuron | 12 |
| Chlorpyrifos | 12 |
| Carbaryl | 10 |
| Diazinon | 10 |

Ensminger, M. 2014. **Ambient and Mitigation Monitoring in Urban Areas in Northern California FY2014-2015**.

## Mitigation

**Best Management Practices**
**Reevaluations**
**Use restrictions**
**Label changes**

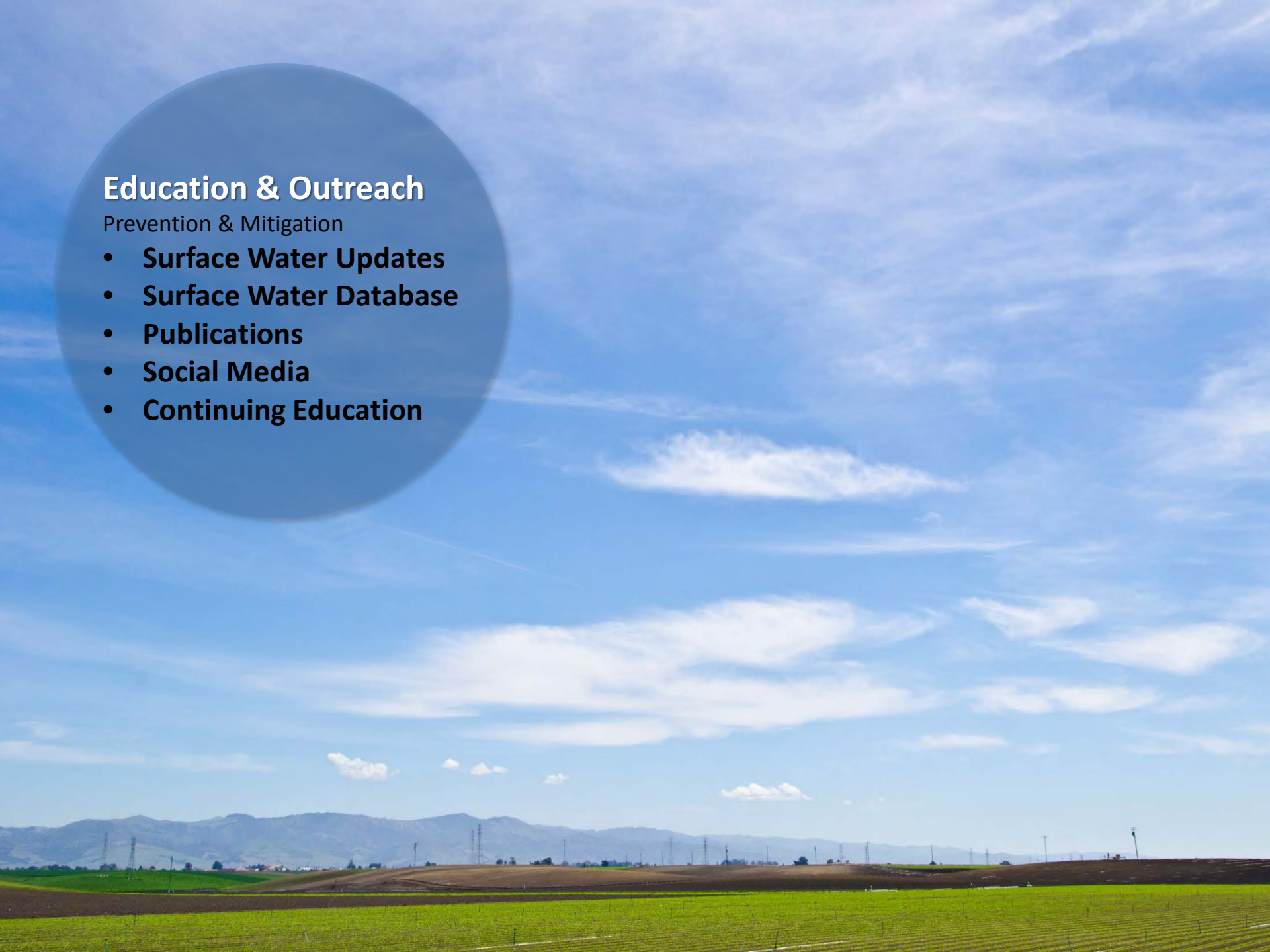
## Best Management Practices

- Water quality treatment pond
- Recirculating system
- Constructed wetland
- Vegetated buffer
- Grassed waterway
- Cover crops
- Enzymes
- PAM-Ca, sorbents

Use reduction
Irrigation management
Application technology
Rain & environmental factors
Pesticide formulation

## REEVALUATIONS

**Diazinon**
**Chlorpyrifos**
**Pyrethroids (concluded)**
**Copper Antifouling Paints**



## Education & Outreach

Prevention & Mitigation

- **Surface Water Updates**
- **Surface Water Database**
- **Publications**
- **Social Media**
- **Continuing Education**

Regulation

Enforcement

**Surface Water Protection in Outdoor Non-agricultural Settings**
3 CCR §6970 and 6972

**Dormant Insecticide Contamination Prevention**
3 CCR §6960

REGULATION

## FOOD AND AGRICULTURAL CODE

### SECTION 11501

(b) To protect the environment from environmentally harmful pesticides by prohibiting, regulating, or ensuring proper stewardship of those pesticides.

### SECTION 14102-14103

**14102**. The director shall prohibit or regulate the use of environmentally harmful materials, ... In so doing, he shall consider the effect of all such materials upon the environment, and shall take whatever steps he deems necessary to protect the environment. He shall also continue to initiate, cooperate, and collaborate with the University of California and with other state agencies in research designed to reduce and eliminate the use of environmentally harmful materials.

**14103**. In establishing criteria and regulations relating to environmental injury and protection, … the director shall consult with representatives of the Water Resources Control Board, the Departments of Public Health, Fish and Game and Conservation, and four outside experts of his selection from the fields of agricultural, biological, ecological, and medical sciences.

Consistent
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Efficient
Adaptable

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DO NOT
SPRAY