Pyrethroid Pesticide Basin Plan Amendment for the Central Valley

What San Joaquin Valley MS4s Should Expect – July 2019 Update

Robertson-Bryan, Inc.
Solutions for Progress

Paul Bedore, M.S.
Senior Scientist, Robertson-Bryan, Inc.

Outline

- Background
- Basin Plan Amendment (BPA) Overview
- Compliance Considerations
- Questions

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Background

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Background

- Pyrethroids
  - Insecticides
  - Replacements for banned organophosphate pesticides (diazinon & chlorpyrifos)
- Synthetic Analogues of natural *Pyrethrins*
  - Pyrethrins: Toxins produced by Chrysanthemums
  - Pyrethroids: pyrethrins on "steroids"

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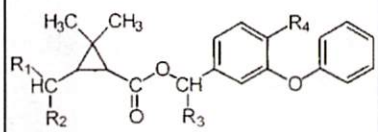
Background

- Multiple chemical pyrethroid species:
  - Regulated under BPA: Bifenthrin, cypermethrin, lambda-cyhalothrin, esfenvalerate, cyfluthrin, permethrin
  - Others: Deltamethrin, fenvalerate, fenpropathrin, others.



R_1	R_2	R_3	R_4	
CCl_2		CN	F	Cyfluthrin
CCl_2		CN	H	Cypermethrin
CBr_2		CN	H	Deltamethrin
$CClCF_3$		CN	H	Lambda-cyhalothrin
CCl_2		H	H	Permethrin
CBr_3	Br	CN	H	Tralomethrin

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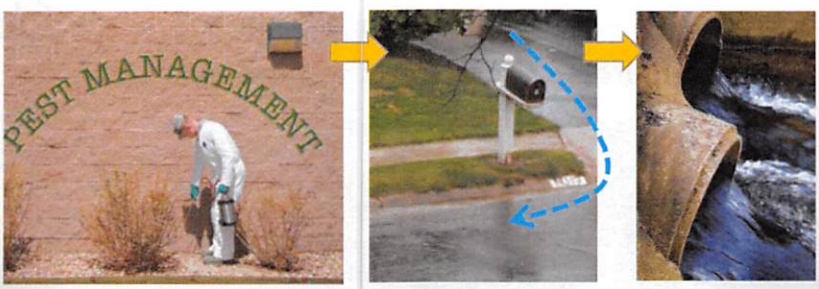
Background

- Proportion of Uses:
  - Agriculture – 47%
  - Professional pest control applications – 49%
    - Residential & commercial
  - Off-the-shelf – 4%
    - Home use, pet flea/tick treatments



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Background

1 ng/L = 1 part per trillion
1 grain of sugar into
Olympic swimming pool

- Aquatic species can be sensitive
  - *Hyalella azteca*, an aquatic crustacean, resides in many Central Valley waterways
  - 10-100x more sensitive than most other species
- Toxicity of individual pyrethroids is "additive"

Pyrethroid	96-h LC_{50} (ng/L)
Bifenthrin	0.50
Cyfluthrin	0.55
Cypermethrin	0.56
Esfenvalerate	0.85
λ-Cyhalothrin	0.30
Permethrin	7.0

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Background

- Pyrethroid Impaired Waterbodies
  - Toxicity to *H. azteca* in urban creeks
  - Central Valley waterbodies 303(d) listed
    - 2012 list – 14 waterbodies
    - 2014 list – 21 waterbodies
    - 2020 list – potential for many more
- Primary Sources - Urban storm water & agriculture

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Basin Plan Amendment (BPA) Overview

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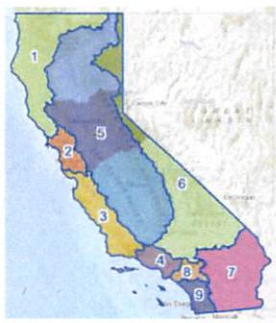
Basin Plan

- Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan)
  - Contains Water Quality Standards applicable to waterbodies in the basin
    - Beneficial Uses (e.g. WARM – warm water aquatic life)
    - Water Quality Objectives (e.g., 5 mg/L DO to protect WARM)
    - Antidegradation Policy
  - Implementation Provisions
    - Policies, plans, actions
  - Surveillance and Monitoring



California's 9 Regional Water Boards

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BPA Components

- Implementation Provisions
  - Establishes Pyrethroid "Concentration Goals" & "Triggers"
  - Conditional Discharge Prohibition
    - Prohibits discharges containing pyrethroids above "triggers"
    - Applies Basin-wide to WWTPs, stormwater, and Ag
  - TMDL – Waterbodies in Roseville and Sacramento

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BPA Components

- Surveillance and Monitoring Provisions
- Pyrethroid research plan to address uncertainties (Regional Board effort)
- Phase 2 of BPA –
  - 15 years out
  - Consider whether to adopt Water Quality Objectives

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Conditional Prohibition

- Basin Plan Amendment:

  "Beginning [February 19, 2022] discharges of pyrethroid pesticides at concentrations that exceed pyrethroid triggers (Table IV-Z) to water bodies with WARM and/or COLD beneficial uses [existing or potential] are prohibited unless a discharger is implementing a pyrethroid management plan to reduce pyrethroid levels in their discharges..."

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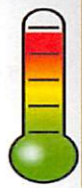
Triggers



- Two triggers
  - Acute trigger
  - Chronic trigger
- Triggers in "Concentration Goal Units" or CGUs

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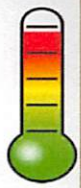
Triggers



- Acute Trigger =1 CGU_{acute}
  - Protect from high, short-term exposures that cause mortality
  - Collect sample(s) & calculate CGU_{acute} for sample(s)

$$CGU_{acute} = \frac{C_{bif}}{0.8} + \frac{C_{cyf}}{0.8} + \frac{C_{cyp}}{1} + \frac{C_{esf}}{2} + \frac{C_{lcy}}{0.7} + \frac{C_{per}}{6}$$

  - C_{bif}, C_{cyf}, C_{cyp}, C_{esf}, C_{lcy}, C_{per}, = Average dissolved pyrethroid concentrations in ng/L
  - All samples collected within 1-hour period

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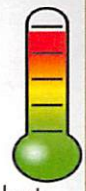
Triggers



- Chronic Trigger = 1 $CGU_{chronic}$
  - Protect from longer duration/low concentrations that cause sublethal effects (growth, reproduction, etc.)
  - Collect sample(s) & calculate $CGU_{chronic}$ for sample(s)

$$CGU_{chronic} = \frac{C_{bif}}{0.1} + \frac{C_{cyf}}{0.2} + \frac{C_{cyp}}{0.3} + \frac{C_{esf}}{0.3} + \frac{C_{lcy}}{0.3} + \frac{C_{per}}{1}$$

  - C_{bif}, C_{cyf}, C_{cyp}, C_{esf}, C_{lcy}, C_{per}, = Average dissolved pyrethroid concentrations in ng/L
  - Samples collected within 96-hour period

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Calculating CGUs - example

1. Sample & Measure – Total Pyrethroid concentrations (ng/L)

Bifenthrin	Cyfluthrin	Cypermethrin	Esfenvalerate	λ-Cyhalothrin	Permethrin
Total Concentration (ng/L)					
1.9	0.17	0.28	0	0.091	0

- MS4 receiving water / 1 sample for 96 h period

TOC	DOC
(mg/L)	
6.5	5.7

2. Calculate Dissolved Pyrethroid Concentrations – Equation/parameters in Basin Plan

Bifenthrin	Cyfluthrin	Cypermethrin	Esfenvalerate	λ-Cyhalothrin	Permethrin
Dissolved Concentration (ng/L)					
0.13	0.009	0.04	0	0.01	0

3. Calculate Acute and Chronic CGUs

- CGU_{acute} = 0.23 … round to 0.2 (1 significant figure)
- $CGU_{chronic}$ = 1.53 … round to 2
- Chronic CGU of 2 exceeds 1 CGU trigger (rounded values)

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Monitoring & Management Plan

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Baseline Monitoring for MS4s

Option 1 –

- Do I need a pyrethroid management plan?
- Baseline monitoring plan due June 2020 (tentative)
- Complete monitoring by October 2021 (tentative)
- Water & sediment (4x - 1 year)
  - Toxicity & pyrethroid testing
  - Water & sediments

Option 2 –

- Management plan – Assume necessary & prepare
- No baseline monitoring

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Trend Monitoring for MS4s

- Conduct if:
  - Triggers exceeded in baseline testing
- Purpose:
  - On-going compliance with triggers
  - Effectiveness of management practices
- Requirements for Phase 2 MS4s – TBD
  - Previous considerations - water & sediment testing ~ 1/year
  - Representative monitoring via Delta RMP or other program?

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Pyrethroid Management Plans

- Management Plans
  - Practices "…reasonably expected to effectively reduce pyrethroids…"
  - List of practices in Basin Plan
  - Justify rational for selecting (or not) practices
  - Individual or group plan

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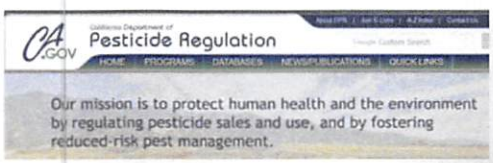
Pyrethroid Management Plans

- Education & Outreach – Reduced pesticide reliance in service area
- Pollution Prevention –
  - Minimize use in discharger's operations
  - Integrated Pest Management (IPM)
- Pollution Prevention via support of pesticide regulation by USEPA & CDPR



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Compliance Considerations

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Statewide Urban Pesticide Amendment

- In development / public comment period in 2019
- *"most effective way to reduce urban pesticide-related impairments … is source control through coordination with state and federal pesticide regulators"* (SWB 2017)
- Standard MS4 NPDES Permit requirements
- Statewide Representative MS4 Monitoring Program

STORMS
STORM WATER STRATEGY
CALIFORNIA WATER BOARDS

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Summary

- San Joaquin Valley MS4s subject to Pyrethroid Conditional Prohibition
- 13267 or 13383 Order from Regional Board anytime
  - Conduct baseline monitoring?
  - Baseline monitoring complete within 2 years
- Pesticide Management Plan – August 2021
  - Individual or group effort
  - Activities consistent with State Pesticide Amendment
- Trend monitoring – TBD

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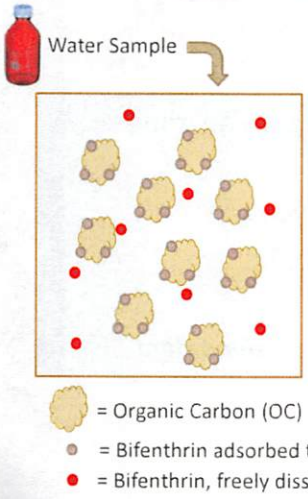
Questions

Dissolved Pyrethroid Concentrations



Bifenthrin concentrations:
Total = 36 ng/L & Dissolved = 9 ng/L

- Use "Freely Dissolved Pyrethroid"
- No commercial methods
- Measure:
  - Total pyrethroids
  - Dissolved & total organic carbon
- Estimate dissolved pyrethroids using equation (*nuanced*)

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