Building a Statewide Wastewater Pesticide Monitoring Network

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BACWA BAPPG
June 2, 2021
CDPR Surface Water Protection Program

Outreach
Monitoring
Surface Water Quality Protection
Mitigation
Regulation
Assessment
Modeling

Outreach, Monitoring, and Surface Water Quality Protection are interlinked and form the core of the program. Prevention and Mitigation are also crucial components, while Regulation and Assessment support the overall efforts. The diagram illustrates the collaborative approach to protecting surface water.
Prevention: Pesticide Registration

Products 1\textsuperscript{st} registered with US EPA

The Surface Water Protection Program routinely evaluates products with potential impact to surface water using a Pesticide Registration Evaluation Model (PREM) wherever possible and expert judgement.

*Examples ONLY - DPR does not endorse any product

Burden of proof for safe use lies with registrants prior to registration
Overview of Pesticide Registration Evaluation Model

Model input data
- Product labels
- Chemistry data *
- Eco-tox data *

PREM
- Evaluation variables
- Decision-making flowchart
- Functional modules
- Graphical user interface (GUI)

Registration recommendations
- Support
- Conditionally support
- Not support
- Watch-listing, flagging etc.

* DPR-accepted data only
Prevention: Pesticide Registration

• PREM expanded to include Down-the-Drain Capabilities.
  • Product Types:
    • Pet Products
    • Washable impregnated materials
    • Applied to sewer lines
    • Applied to floor drains
  • Additional Information:
    • Removal rates
    • Use patterns
    • Wash-off fraction
Fipronil and imidaclorpid concentrations in effluent exceeded U.S. EPA aquatic benchmarks that are used as a screening tool.

### What Pesticide Data is Available?

- **100s of registered pesticides**
- **Data reported for 81 pesticides in the United States**
- **41 pesticides detected**

<table>
<thead>
<tr>
<th>Pesticides &amp; Degradates</th>
<th>Inf./Eff.</th>
<th>Range (ng/L)</th>
<th>Median (ng/L)</th>
<th>DF (%)</th>
<th>No. of Samples</th>
<th>No. of Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D Eff.</td>
<td>&lt;100-1,890</td>
<td>&lt;100</td>
<td>3</td>
<td>102</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Acetamiprid Inf.</td>
<td>3-4.7</td>
<td>3.2</td>
<td>100</td>
<td>17</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Atrazine Eff.</td>
<td>1.3-1.7</td>
<td>76</td>
<td>3</td>
<td>19</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Bifenthrin Inf.</td>
<td>&lt;0.1-14.1</td>
<td>7.7-20.3</td>
<td>96</td>
<td>67</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Carbaryl Eff.</td>
<td>&lt;0.49-663</td>
<td>&lt;41</td>
<td>9</td>
<td>140</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Chlorpyrifos Inf.</td>
<td>&lt;1-81.9</td>
<td>9</td>
<td>13</td>
<td>30</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Clothianidin Eff.</td>
<td>&lt;0.9-34</td>
<td>&lt;1-24.1</td>
<td>13</td>
<td>17</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Diuron Eff.</td>
<td>&lt;4-775</td>
<td>&lt;1-10.3</td>
<td>1</td>
<td>102</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Fipronil Inf.</td>
<td>&lt;1-14.6</td>
<td>7.7-27</td>
<td>4</td>
<td>102</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Fipronil Eff.</td>
<td>&lt;0.5-34</td>
<td>30-306</td>
<td>100</td>
<td>21</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Permethrin Inf.</td>
<td>30-3,800</td>
<td>180-315</td>
<td>100</td>
<td>80</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Permethrin Eff.</td>
<td>&lt;1-170</td>
<td>&lt;1-21.4</td>
<td>64</td>
<td>90</td>
<td>34</td>
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</tr>
<tr>
<td>Thiabendazole Eff.</td>
<td>24-27</td>
<td>25.5</td>
<td>100</td>
<td>2</td>
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<td></td>
</tr>
</tbody>
</table>

*Variable detection limits, Limited spatial and temporal treatment type, Effluent only data.*

Budget Change Proposal to Establish Permanent Wastewater Program

• Awarded July 1, 2019
• Contract and Analytical Support
• Key arguments:
  • Existing monitoring data (in part generated in part by RMP)
  • Source control vs. treatment
California Department of Pesticide Regulation
Surface Water Protection Program Monitoring Efforts
Monitoring Goals

• Spatial trends
• Temporal trends
• Consistent analytical

2019-2020 Study

• 25+ Plants currently participating
• Predominantly in urban centers
• 4 influent/effluent events (time-weighted composites)
• 1 biosolids event

Analytical Support with UC Davis Dr. Tom Young’s Lab
Wastewater

Influent → Effluent

Biosolids
What do we see?
- Fipronil & most degradates
- Some pyrethroids
- Imidacloprid*

What don’t we see?
- Carbamates
- Fungicides
- Insect Growth Regulators
- A subset of pyrethroids

*Intending to lower analytical reporting limit, so detection frequency may increase
2019 and 2020 Influent Seasonality

<table>
<thead>
<tr>
<th>Month</th>
<th>June</th>
<th>August</th>
<th>December</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detected Concentration (ng/L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Bifenthrin**: Red
- **Chlorpyrifos**: Gray
- **Fipronil**: Blue
Concentrated Sources of Pesticides to Wastewater

- Pest Control Operators
- Laundromat/ Professional Laundry
- Pet Grooming/Boarding
- Nurseries

Ubiquitous versus concentrated sources

Impacted due to COVID19
Monitoring Program Next Steps

• Establish analytical methods with Department of Toxic Substances Control as a partner with a focus on lowered reporting limits.

• Select wastewater treatment plants for future monitoring.
  • Plants that serve agricultural regions
  • Smaller wastewater treatment plants
  • Diverse treatment technologies

• Establish long-term sites.

• Craft special studies to target specific questions.
Collaborative Work

• #18-C0019. Indoor Depositional Patterns of Pesticides from Fogger Products to estimate wash-off fraction for down-the-drain modeling. Dr. Choe UC Riverside.
#19-C0031. Quantifying California Municipal Wastewater Discharge Contributions to Streams for Pesticide Source Modeling. Dr. Jacelyn Rice, University of North Carolina at Charlotte.

- Quantify dilution factors for WWTPs discharging to surface water.
- Evaluate impact of climate change
- Better understand relative contribution of pesticide use patterns
  - Agricultural
  - Outdoor urban
  - Wastewater Effluent
Intersections with RMP’s ECWG

- Adjuvants/Inerts
  - PFAS

- Antimicrobials

* Pyrethroids are of low concern in the Bay, but high concern in Bay Area urban creeks
Thank you
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Pesticide Registration Evaluation Model

\[ RQ = \frac{EEC}{TOX} \]

- “Estimated Environmental Concentration”
  - USEPA models (PRZM, VVWM, PFAM)
  - USEPA modeling scenarios for agricultural pesticide uses
  - SWPP development for
    - Urban outdoor uses
    - Pesticide degradates
    - California receiving water
    - Wastewater Effluent

“TOX” determination

- Generally, = \text{min}(all available acute data)
Spot-on Products

- 9.1% Fipronil
- Recommended frequency of application 30 days
- Products “waterproof” once dry
- Wash volunteer dogs 2, 7, or 28 days post application.
Average annual pesticide use and estimated urban consumer use 2011-2015

- Pesticide Use Reporting of Professional Applications
- Estimated Consumer:
  - Outdoor Only
  - Mixed
  - Clothing
  - Pets
  - Indoor Only