

Life After Diazinon:
What's New for Urban Creeks?

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Background

- Humans: Aversion to bugs and weeds
- Response: Use of *pesticides* throughout urban environs
 - Subject to runoff when exposed to rainfall (wet weather)
 - Subject to runoff in irrigation overflows (dry weather)

Background, cont'd

- 1990's: Diazinon
 - organophosphate (OP) pesticide
 - general purpose insecticide - ants especially
 - identified as principal cause of toxicity in urban runoff and urban creeks – Sacramento, SF Bay Area, elsewhere (TIE's etc.)
- Main Toxic Effect:
 - Acute Toxicity (mortality) to *Ceriodaphnia dubia* (aquatic invertebrate – aka common "water flea")

Background, cont'd

The Ultimate BMP:

- USEPA: Phase-out of Urban Uses effective Dec 31 2004; Restrictions on Ag Uses
- Store Sales Banned; *Consumers May Use Existing Supplies on Hand*
- (EPA also restricted chlorpyrifos)

Aquatic Life Regulatory/Effects Levels (all ng/L)

- Diazinon (OP pesticide):
(former) DF&G guidelines: 50 chronic/80 acute;
USEPA draft/provisional criteria: 100
chronic/100 acute
- Malathion (OP pesticide):
USEPA rec. criterion: 100 acute (inst. max.)
DF&G guideline (CMC): 430 acute (1 hour avg.)

What's New? - Current Status

- Urban Creeks: Water Quality Data
- Urban Creeks: Sediment Quality Data
- Dept. Pesticide Regulation (DPR):
Sales Data
- Retail Store Survey Data

Urban Creeks Water Quality Data

- Sacramento Stormwater Quality Partnership
2003-04 Stormwater Monitoring Program,
Urban Tributary Creeks
- Clean Estuary Partnership/SF Bay Area
2004-05 Supplemental Monitoring of
Urban Creeks

Sacramento Stormwater Quality Partnership

- County of Sacramento
- City of Sacramento
- City of Citrus Heights
- City of Elk Grove
- City of Folsom
- City of Galt
- City of Rancho Cordova

Sacramento Urban Tributary Monitoring, 2003-04

- Six urban (downstream) creek sites
- 2-3 Wet weather events/site
- 1-2 Dry weather events/site
- Chemical analysis: Total n = 21
(wet + dry combined)
- Toxicity testing: Total n = 12
(wet + dry combined)

(Source: 2003-2004 Joint Program Report (LWA, 2004)
<http://www.sactostormwater.org/documents.asp>)

Sacramento Urban Tributary Monitoring, 2003-04 – Chemistry

<u>Pesticide</u>	<u>#Detects</u>	<u># > WQO</u>
Chlorpyrifos	1/21	1/21
Diazinon	12/21	12/21
Malathion	7/21	0
Prowl	7/21	NA
Simazine	9/21	0

(most samples had 2,4-D and 4,4'-DDT at very low levels)

Sacramento Urban Tributary Monitoring, 2003-04 - Toxicity

- Ceriodaphnia acute toxicity: 1/12 tests
(June 8, 2004)
- Ceriodaphnia chronic toxicity: 6/12 tests
- Fathead minnow chronic toxicity: 1/12 tests

(+ American River, Sacramento River:
Ceriodaphnia chronic toxicity 7/8 tests)

Chemistry/Toxicity Correspondence: Sacramento Urban Tributaries

Ceriodaphnia/Fathead minnow
chronic toxicity:

In 4 of 6 tests with chronic toxicity,
diazinon > 100 ng/L
(240-500 ng/L)

CEP Project Funding/ Responsibilities

- Clean Estuary Partnership: BACWA, BASMAA, SFBRWQCB
- CEP: funding for supplemental toxicity testing, chemical analysis
- Local agencies responsible for:
 - Storm tracking
 - Sample collection
 - Field log
 - Delivery of samples to lab

CEP Project Funding/ Responsibilities cont'd

- Under direction of:
CEP Technical Committee,
Diazinon/Toxicity Work Group
- Guidance document - Sites, protocols:
CEP Urban Creeks Monitoring Plan (Ruby, 2004)
http://www.up3project.org/up3_monitoring.shtml
- Creek water sampling only

CEP Analytical/Toxicity Testing

- 7 Creeks sampled – all wet weather
- 9 Creek samples/4 months (Jan.-May)

Chemical Analysis

- OP pesticides (or diazinon only)
- Pyrethroids

Toxicity Testing

- 3 Species Acute and Chronic

CEP Preliminary Results Summary (2005) - Chemistry

- 5 diazinon hits: 4 @ ~40-50 ng/L
1 > 100 ng/L
- 4 malathion hits: 56-435 ng/L
1 > 430 ng/L

CEP Preliminary Results Summary (2005) - Toxicity

- 4 of 9 Samples Toxic
- 5 Chronic toxicity effects:
 - 4 Ceriodaphnia reproduction;
 - 1 Fathead minnow growth
- 1 Acute toxicity effect:
 - Ceriodaphnia mortality (50% survival)

Chemistry/Toxicity Correspondence: CEP Urban Creeks

- *February:*
 - Ceriodaphnia (chronic), Fathead minnows (chronic):
Diazinon 117 ng/L
 - Ceriodaphnia (chronic): OPs - ND
- *March:*
 - Ceriodaphnia (chronic):
Diazinon 51.3 ng/L + Malathion 219 ng/L
- *April:*
 - Ceriodaphnia (acute/chronic):
Malathion 435 ng/L

Creek Quality, Other Programs

Bay Area:

- Castro Valley Creek (ACCWP)
- Santa Clara Valley (SCVURPPP)
- San Francisquito Creek (Palo Alto)
- SWAMP (State of CA)

Other Results – 2004/05

SF Bay Area Urban Creeks

Local Agencies/Diazinon:

- Diazinon detected: 4/29 samples (14%)
- Range: 30-147 ng/L
- All detects were wet weather
- No pyrethroids detected

Other Results – 2004/05

SF Bay Area Urban Creeks

Local Agencies/Toxicity:

- Samples collected Sept./Oct. 2004, Jan. 2005
- 3 of 12 Samples were toxic (25%)
 - Fathead Minnows (*Pimephales*): 1 acute
 - Water Flea (*Ceriodaphnia*): 1 chronic, 1 acute
 - Algae (*Selenastrum*): 3 chronic
- Mixed wet/dry weather

Other Results – 2004/05

SF Bay Area Urban Creeks

SWAMP/Toxicity Testing:

- Samples collected Jan., April, June 2005
- 9 of 36 Samples were toxic (25%)
 - Minnows (*Pimephales*): 5 chronic, 1 acute
 - Water Flea (*Ceriodaphnia*): 3 chronic
 - Algae (*Selenastrum*): 3 chronic
- Mixed wet/dry weather

Summary/Current Status: Urban Creeks Toxicity (Water)

- Very little acute toxicity
- Shift to chronic toxicity in Ceriodaphnia
- Some toxicity to fathead minnows, algae

What's New?: Pyrethroids

- Most common diazinon replacements
- Less soluble in water than OP pesticides
- Greater affinity for particles
- Expect to find in sediments

Sediment Testing (2004-05)

- Sediment toxicity found in Sacramento and Bay Area urban creeks
- Pyrethroids found at levels capable of causing toxic effects in majority of toxic samples

(Source: Unpublished university research data, as presented at CASQA June 2005 meeting, UPC June 2005 meeting)

DPR Pesticide Sales Data

- Sales data based on state tax paid by manufacturer
- Pyrethroid sales have increased while diazinon sales have decreased, 1999-2003
- Permethrin: most common pyrethroid sold

(Source: Urban Pesticides Use Trends Annual Report 2005, TDC Environmental

http://www.up3project.org/norcal_ipm_documents.shtml)

Pesticide Retail Store Survey

OSH, Home Depot, Lowes Surveyed

(Bay Area stores, one each chain)

- Pyrethroids dominate insecticide marketplace
- No diazinon or chlorpyrifos products observed
- Product mix similar to 2004 survey

(Source: San Francisco Bay Area Pesticide Retail Store Survey 2005, TDC Environmental

http://www.up3project.org/norcal_ipm_documents.shtml)

Issues for Urban Stormwater Program Managers

- As diazinon disappears, need to assess presence/effects of replacements
- Use of pyrethroids puts emphasis on sediments
- Dysfunctional federal system for approval of pesticides needs to be fixed to account for predictable water quality impacts

Resources/Contacts

- Sacramento County Stormwater Program:
<http://www.sactostormwater.org/>
- Urban Pesticide Pollution Prevention (UP3) Project: <http://www.up3project.org/>
- Armand Ruby Consulting (e-mail):
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