Pesticides in Urban Waterways

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Outline

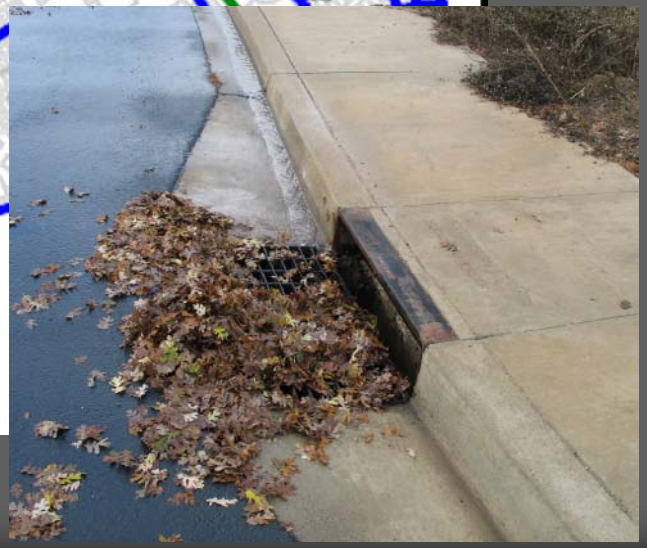
- Objectives
- Monitoring Site Selection
- Monitoring Methods
- Pesticide Selection
- Preliminary Results
- Summary

Objectives

- What pesticides are present in urban surface waters?
- What effect does the type of waterbody have on detections (stormdrain or urban creek)?
- What is the effect of season (dry flow vs rain event)?
- How do the concentrations compare to their water quality or aquatic toxicity benchmarks?

Urban Creeks

Storm Drains



Storm drain map courtesy of San Ramon, CA, 2008

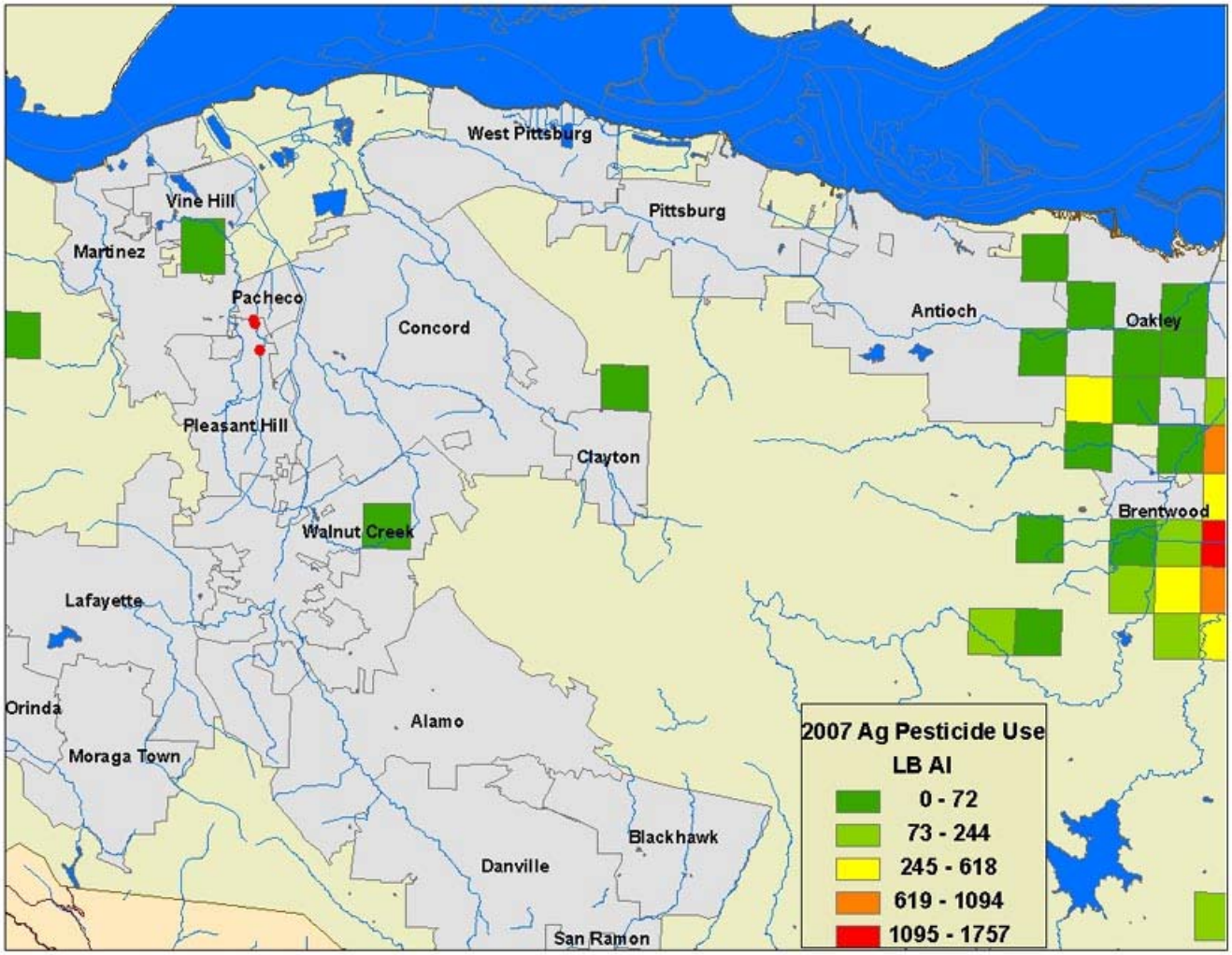
Storm Drains

PGC010
PGC020
PGC030
PGC040
Fiddyment Rd
Angus Rd
Ravenna Way
Adienne Dr
Barossa Way
Cantamar Ct
Bayonne Ct
Courante Way
Camarena Way
La Vina Ct
Terrazo Ct
Baroness Way
Calabria Way
Calabria Ct
Mammoth Way
Mt Baldy Dr
Goldstone Dr
Hopscotch Way
Beyond Woods Circle
Greywood Circle
Rock Creek Way
Grovewood Ln
Arrowwood Ln
Northpark
Macero St
Tradewinds Dr
Corderio Ct
Parkside Way
McCloud Way
Rainbow Trout Pl
Red Fox St
Loon Lake St
Bushy Tail St
Grey Bunny Dr
Avondale Dr
Alicante Dr
Alicante Ct
Crocker
Eskaton Loop
Cabris Ln
Diamond Creek Pl
Woodcreek Oaks Blvd
Blue Oaks Blvd
© 2009 Tele Atlas
Google
38°48'09.48" N 121°20'11.26" W
elev 108 ft
Jun 2007
Eye alt 7083 ft

Monitoring Site Selection

- Larger urban areas
- Minimal agricultural inputs of target pesticide
- Likely to have flow during the dry season
- Stormdrain catchment area with greater than 200 residences or light businesses
- Historical water quality data available
- Ecological importance of receiving waters
- Safety

No Ag Inputs


West Pittsburg
Vine Hill
Pittsburg
Martinez
Pacheco
Concord
Antioch
Oakley
Pleasant Hill
Clayton
Brentwood
Walnut Creek
Lafayette
Orinda
Alamo
Moraga Town
Blackhawk
Danville
San Ramon
2007 Ag Pesticide Use
LB AI
0 - 72
73 - 244
245 - 618
619 - 1094
1095 - 1757

Study 249 Monitoring Sites

Area	Stormdrain Outfall	Receiving Water	Total Sites
Bay Area	5	2	7
Sacramento Area	3	1	4
Orange County	5	2	7
San Diego Area	5	2	7
Total	18	7	25

Credit: Li-Ming He, Environmental Monitoring Branch, DPR 2008

Monitoring Sites

Credit: Li-Ming He, Environmental Monitoring Branch, DPR 2008

Methods

- Water Sampling
  - 3 baseflow sampling events (complete)
  - 3 stormwater sampling events (ongoing)
- Sediment Sampling
  - Sediment sampling for pyrethroids (ongoing)
- Analytical
  - California Department of Food and Agriculture, Center for Analytical Chemistry

Methods

Field Sampling – Water

Methods

Field Sampling - Sediment

Study 207 photo by Kean Goh, Environmental Monitoring, DPR 2004

Methods

Environmental Measurements

Study 249 photo by Li-Ming He, Environmental Monitoring, DPR 2008

Methods

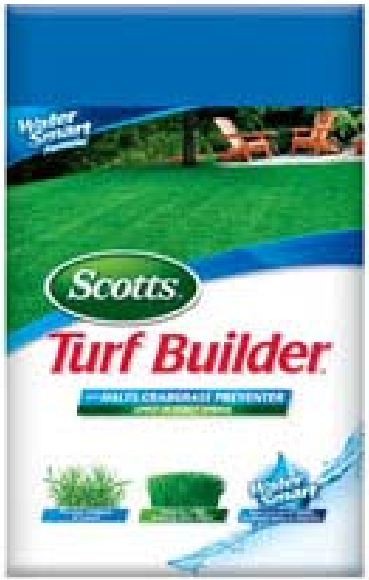
Flow Measurements

Methods

Quality Control

- Field Duplicate Samples: ~10%
- Field Blank Samples: 5%
- Blind Spike Samples: 5-10%
- Laboratory Matrix Spike Samples: 1/batch

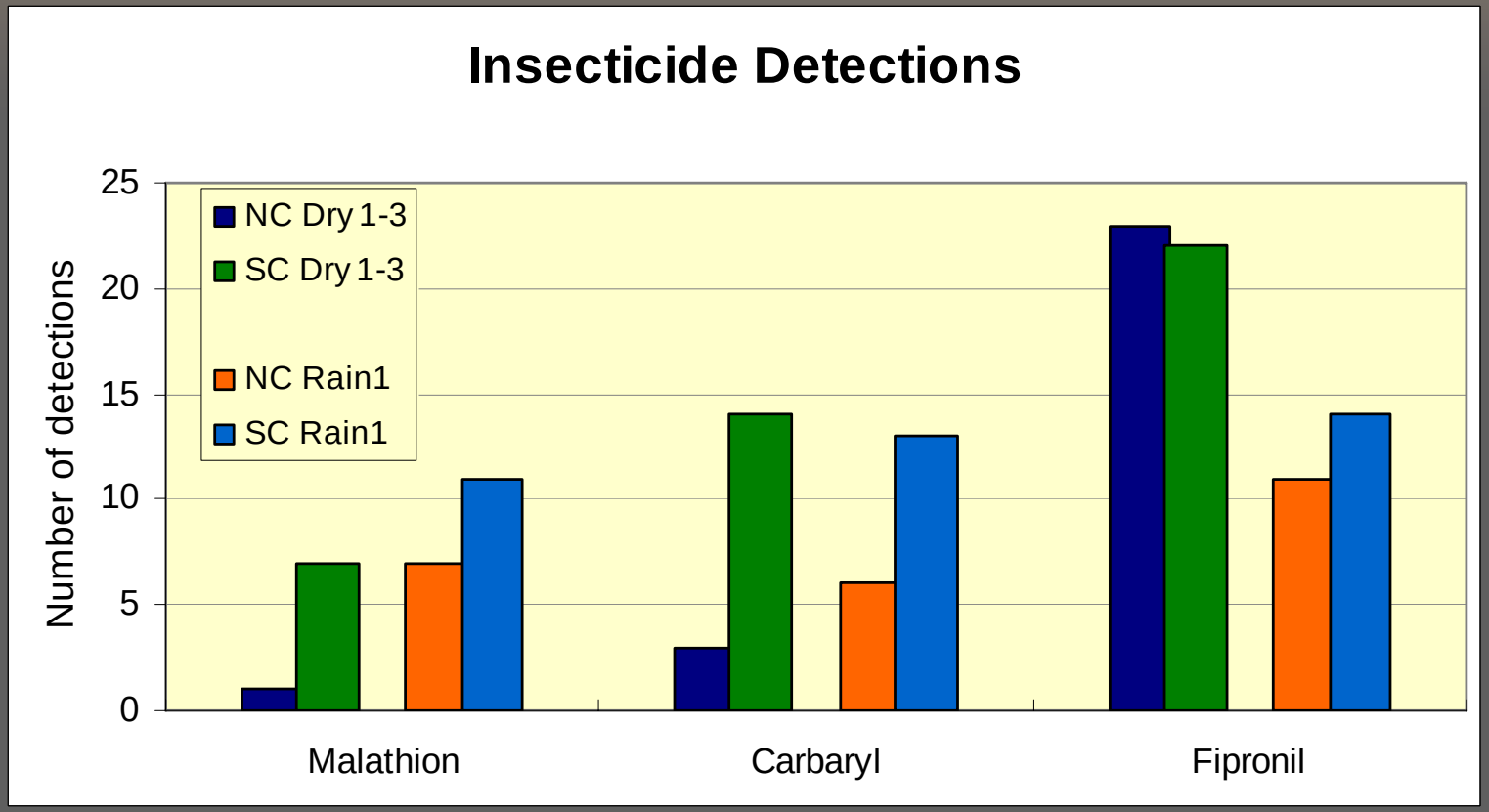
Pesticide Selection



Pesticide Analytes of Interest

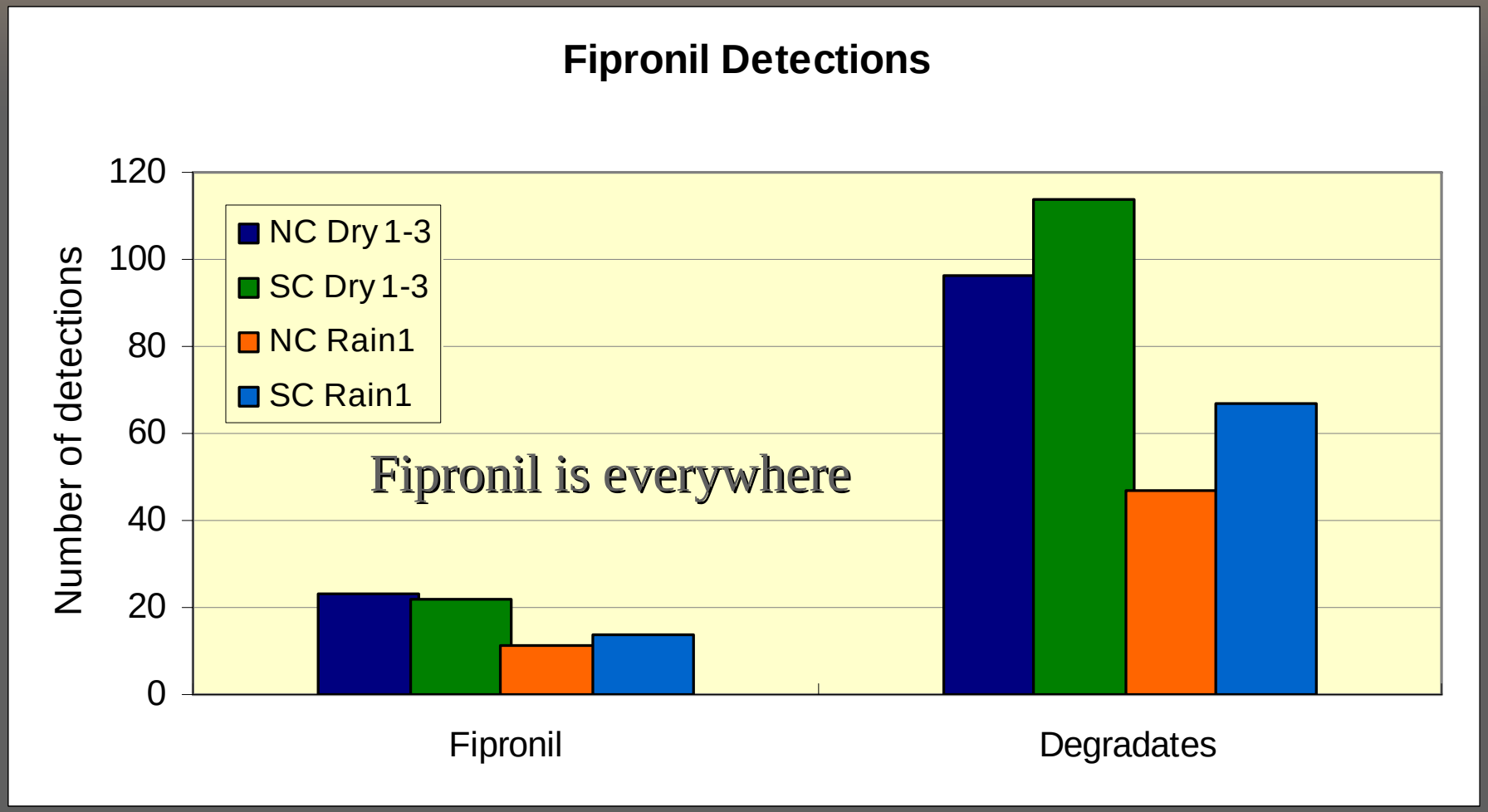
Analyte Group	Number of Pesticides	Matrix
OPs	15	Water
Pyerthroids	11	Sediment, Water*
Carbamate	9	Water
Fipronil	6	Water
Photosynthetic Herbicides	11	Water
Dintroanaline Herbicides	6	Water
Auxin Herbicides	4	Water
Miscellaneous Herbicides	2	Water

Preliminary Results - Insecticides

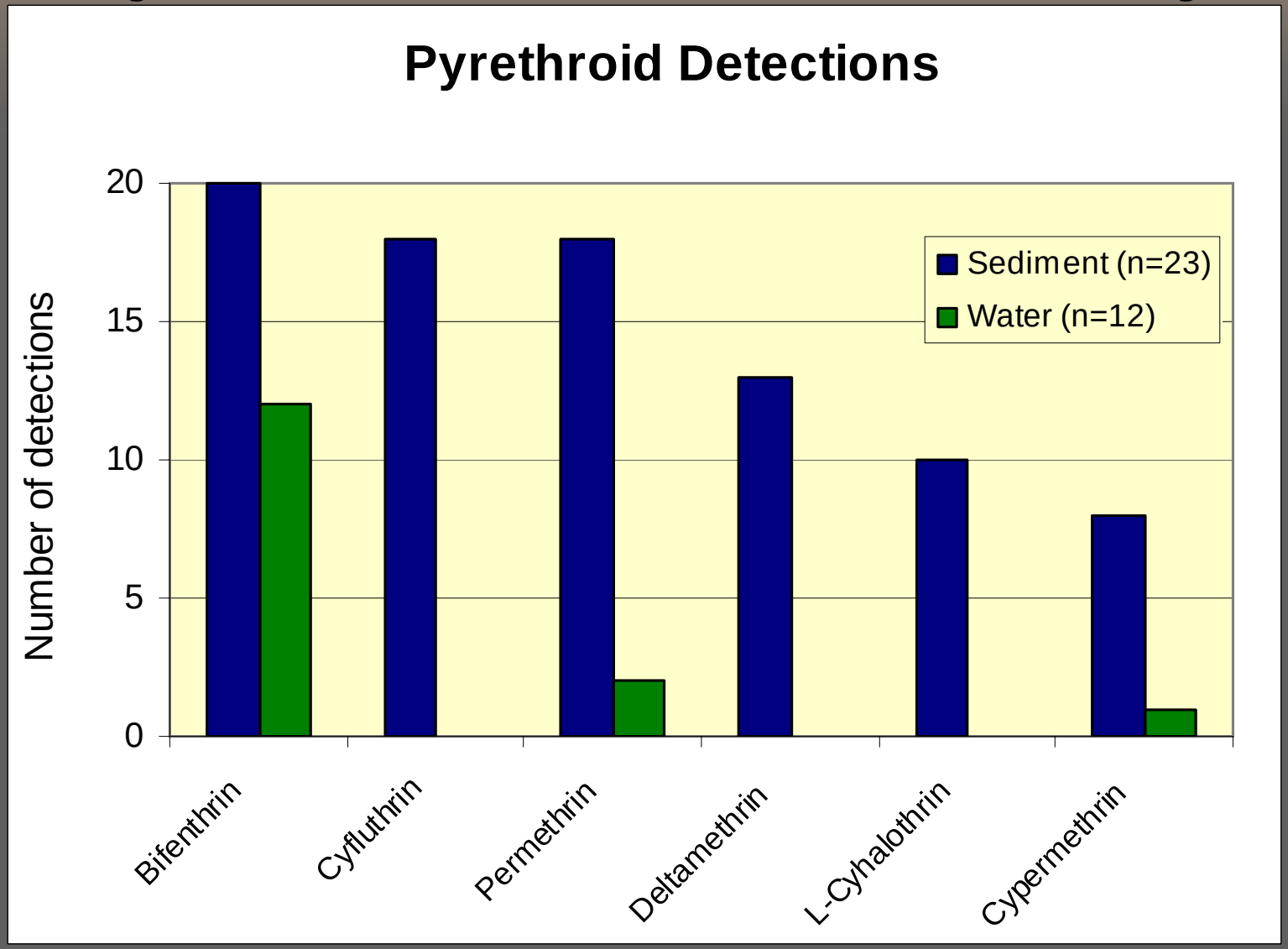


- Malathion, Carbaryl > in S Cal; rain > dry flow
- Fipronil, S Cal = N Cal

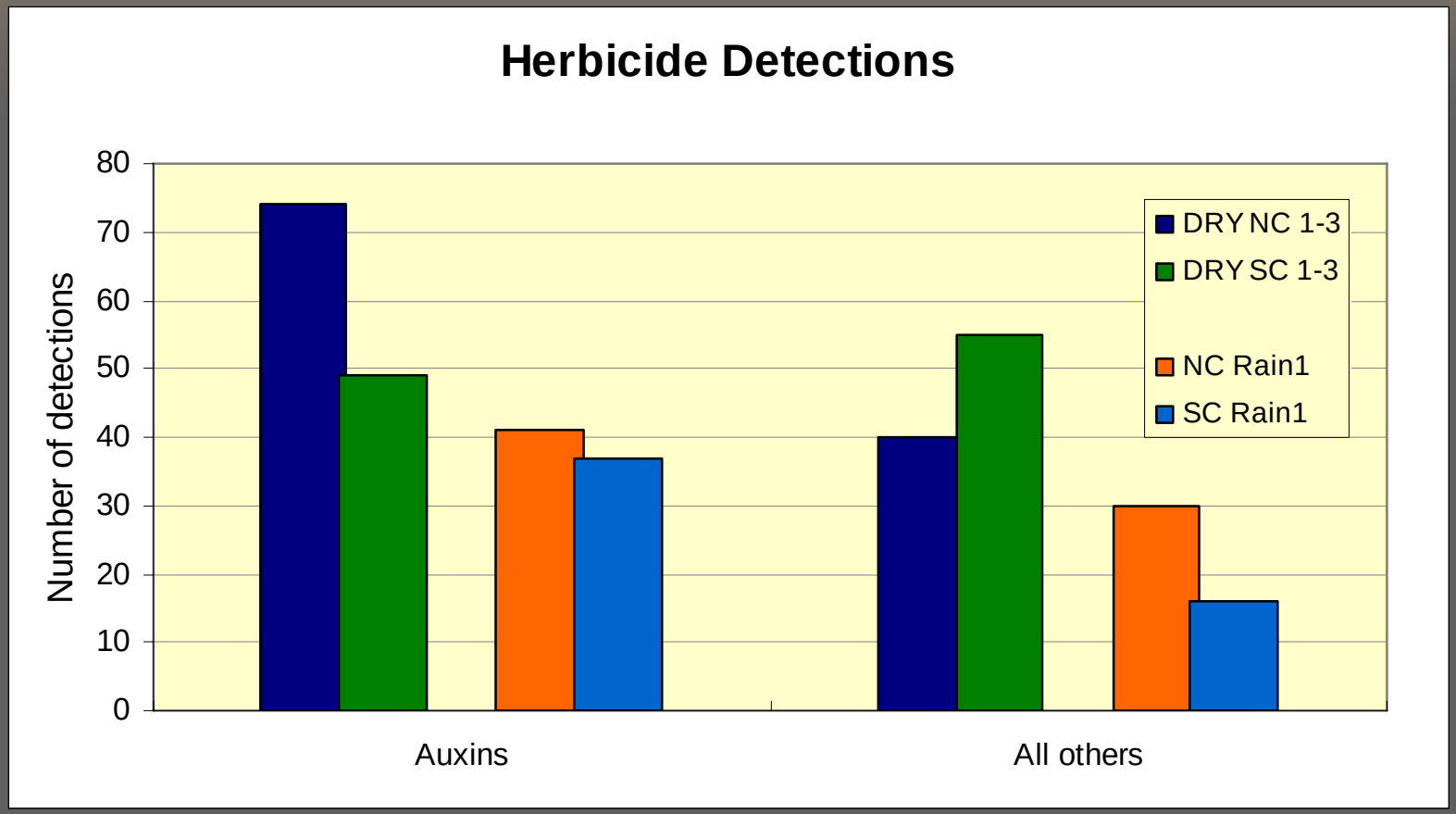
Preliminary Results - Insecticides



Pyrethroids in Urban Waterways

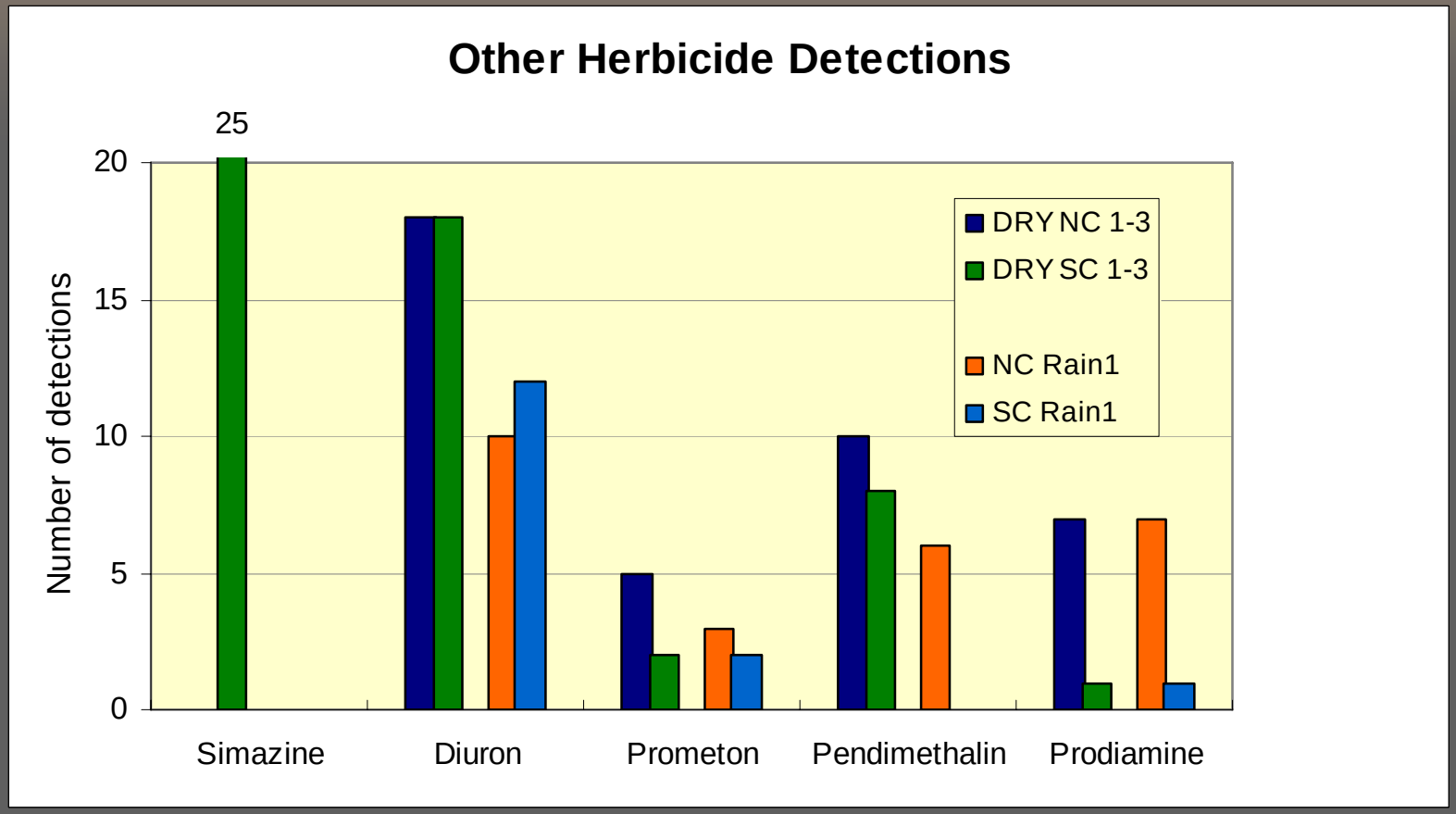


Preliminary Results - Herbicides



- Abundance of Auxins (broadleaf weed killers)
- N Cal > S Cal; rain > dry flow

Preliminary Results - Herbicides



- Diuron, Prometon, Pendimethalin, Prodiamine
  - N Cal = S Cal; rain > dry flow

DPR Urban Pesticide Monitoring Project Summary

- In 2008, DPR initiated an urban pesticide monitoring project
- Dry-weather & wet-weather sampling
- Urban areas of focus: Sacramento, S.F. Bay Area, Orange Co. & San Diego Co.
- 25 receiving water & storm drain sites
- 64 insecticides, herbicides & degradates

Summary – Insecticides

- Fipronil & degradates > carbaryl > malathion
  - Fipronil = everywhere
- Generally
  - S Cal > N Cal
  - Rain > dry flow
- Pyrethroids in sediments and rain runoff water

Summary – Herbicides

- Auxin type herbicides most prevalent
- Diuron > pendimethalin > prodiamine > prometon
- N Cal > S Cal
- Rain > dry flow

Summary – General

- Storm drain sites tend to exhibit higher concentrations than receiving water sites
- Orange County & Sacramento areas had a higher frequency of detections than S.F. Bay & S.D. areas

Thanks!

Photo by Kean Goh, Environmental Monitoring, DPR 2009