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Water-Quality Monitoring of Chemicals Used to Combat West Nile Virus

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Water-Quality Monitoring of Chemicals Used to Combat West Nile Virus

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USGS Monitoring Program

Background

- **In 1999, the USGS began a pilot project in the New York metropolitan area to develop and test analytical methods to monitor for certain insecticides above 5 nanograms per liter dissolved in environmental waters**
  - Resmethrin
  - Piperonyl Butoxide
  - Sumithrin
  - Malathion
  - Methoprene
  - Methoprene acid

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USGS Monitoring Program

Purpose

Culex pipiens is one species of mosquito that can infect humans with West Nile virus.

Courtesy of CDC

- Provide data for environmental risk assessment
- Help manage application of the insecticides
- To insure large amounts of these compounds are not reaching unintended waters

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USGS Monitoring Program

Approach

- Monitor public announcements for insecticide applications
- Identify water sampling locations
- Collect pre- and post-spray samples
- 3 types of samples are collected
  - Grab samples
  - Equal-width Incremental samples (EWI)
  - Passive sampling with Semi-permeable Membrane Devices (SPMD)

Courtesy of Newsday

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Case Studies

Nesconset Air Spray - 8/19/02

- **An area north of Lake Ronkonkoma was selected for spraying Resmethrin in response to detections of West Nile Virus in birds and mosquitoes**
- **0.007 lbs/acre Resmethrin and 0.021 lbs/acre PBO was applied by helicopter**
- **Ponds within or adjacent to areas treated with insecticides selected for sampling**

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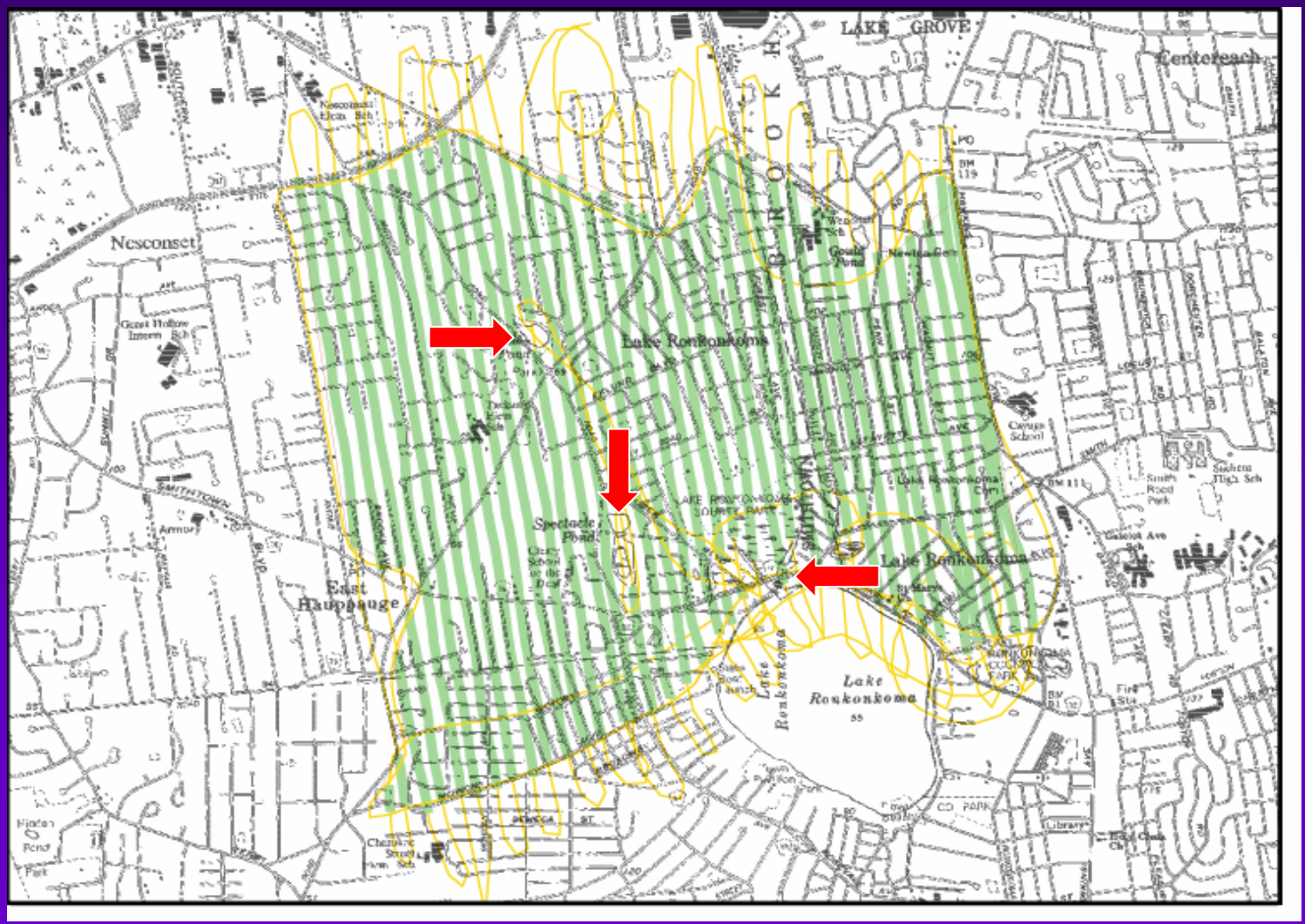
Case Studies

Nesconset - Helicopter Flight Path

Flight Path

Spray Area



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Case Studies

Nesconset – Results

- **Resmethrin and Piperonyl Butoxide (PBO) were detected in grab-samples at two of the three sampling locations**
- **Samples were collected within 30 minutes of nearby helicopter application**
- **An estimated 85+% reduction in the cattail mosquito, Coquillettidia perturbans, was observed based on light trap reductions**

	Resmethrin	Piperonyl Butoxide (PBO)
Gibbs Pond	76 ng/L	6909 ng/L
Spectacle Pond	21 ng/L	343 ng/L
Lake Ronkonkoma County Park	< 5 ng/L	< 5 ng/L

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Case Studies

Wertheim NWR Air Spray - 6/17/03

- **Methoprene, a larvicide, is applied weekly by helicopter to salt marshes in the summer on Long Island**
- **Nominal dose for methoprene is 0.013 lb/acre**

Time	Methoprene
13:36*	< 5 ng/L
15:15	9026 ng/L
16:00	39 ng/L
17:18	846 ng/L

* (prior to spray)

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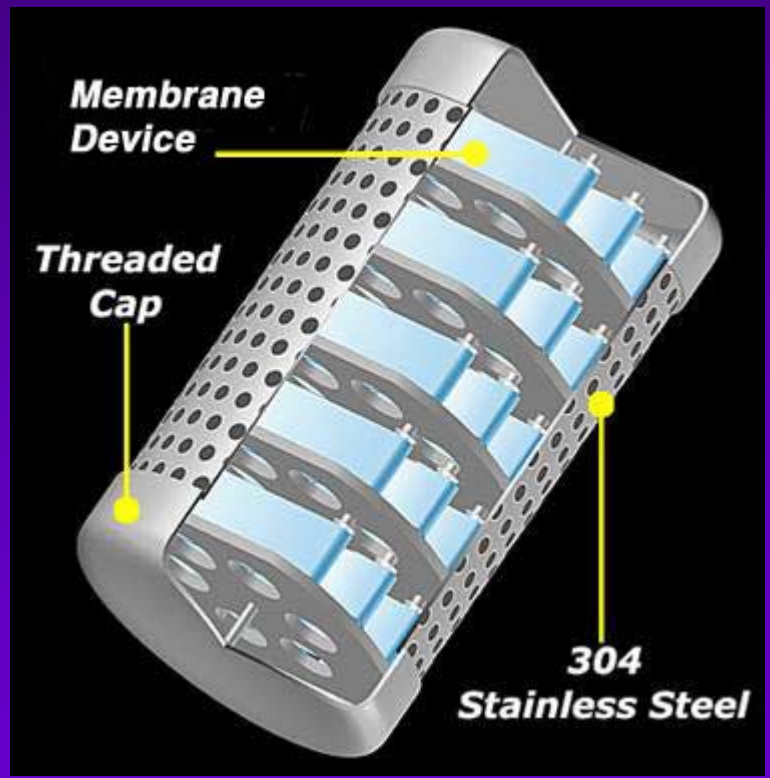
Passive Sampling

SPMD (Semi-Permeable Membrane Device)

- **5 SPMDs and 2 Field Blanks were deployed prior to pyrethroid spraying**
- **SPMDs were deployed for a week**
- **No pyrethroids were detected**



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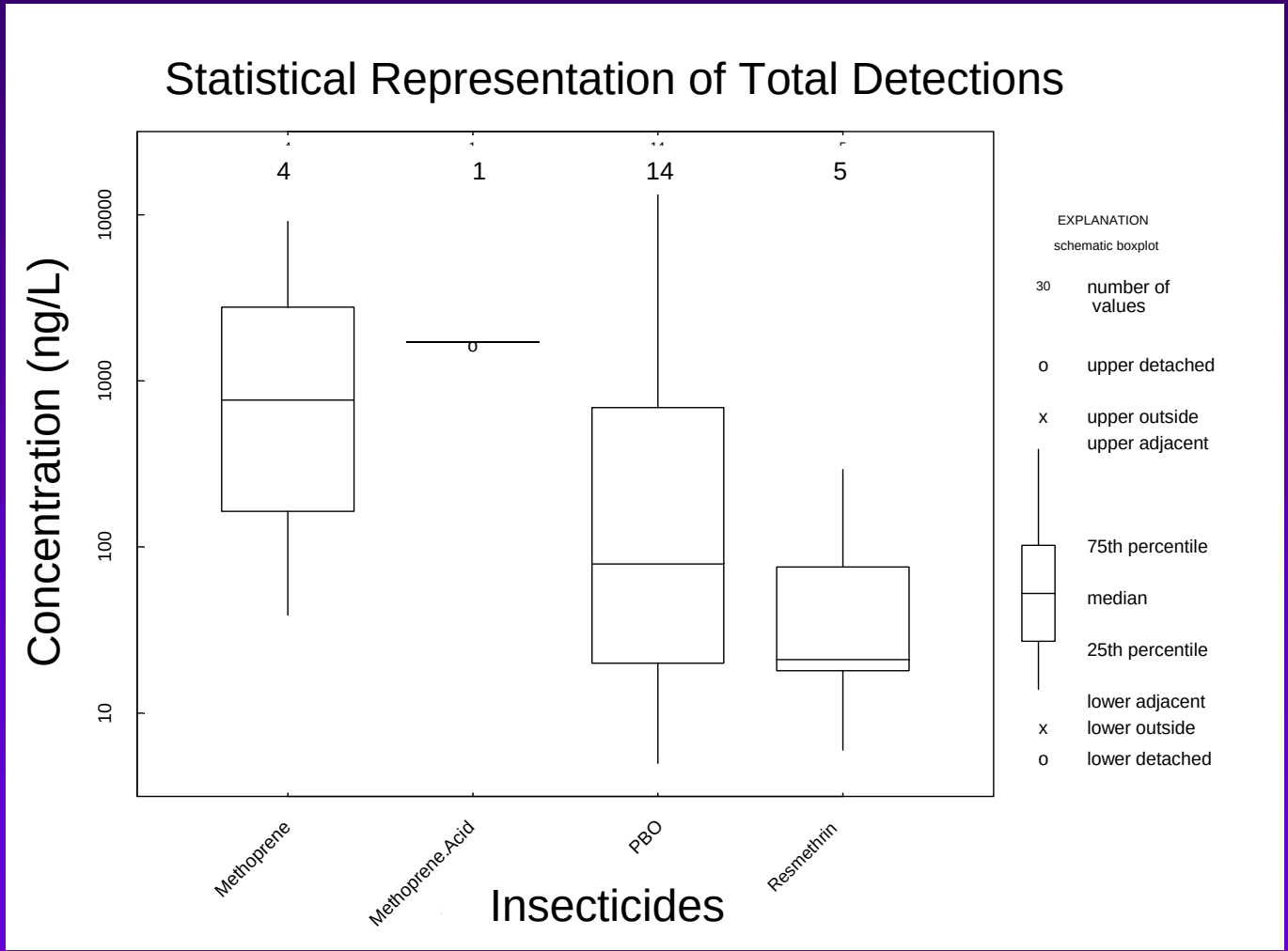
2002 – 2003 Results

Statistical Summary



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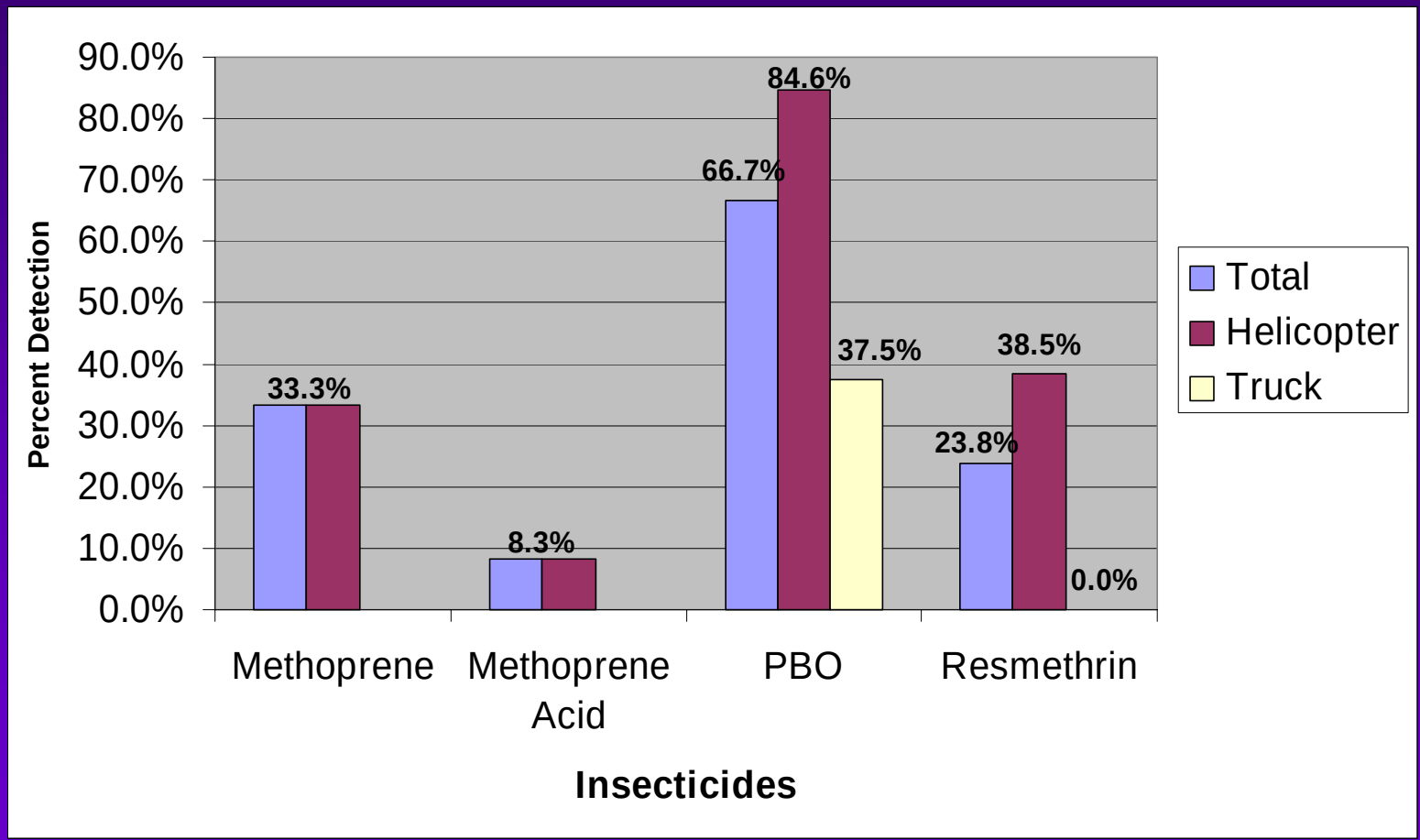
2002 – 2003 Results

Detections versus Mode of Application



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2002 – 2003 Results

Data

Suffolk County Wetlands Management Assessment

2002 - 2003 Stats of 20 spray events	Methoprene	Methoprene Acid	PBO	Resmethrin
total number of helicopter events	10	10	5	5
total number of truck events	0	0	5	5
40 total samples collected	15	15	25	25
7 pre-spray samples	3	3	4	4
33 post-spray samples	12	12	21	21
number of pre-spray detections	0	0	0	0
% detections in pre-spray samples	0%	0%	0%	0%
number of post-spray detections	4	1	14	5
% detections in post-spray samples	33.3% (4/12)	8.3% (1/12)	66.7% (14/21)	23.8% (5/21)
number of detections with helicopters	4	1	11	5
% detections with helicopters	33.3% (4/12)	8.3% (1/12)	84.6% (11/13)	38.5% (5/13)
number of detections with trucks	--	--	3	0
% detections with trucks	--	--	37.5% (3/8)	0% (0/8)

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