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Regional Stream Quality Assessment

Landscape, Stressors, and Ecology

Pete Van Metre, Lisa Nowell, Jason May,
and MANY other!
National Water Quality Program
U.S. Geological Survey




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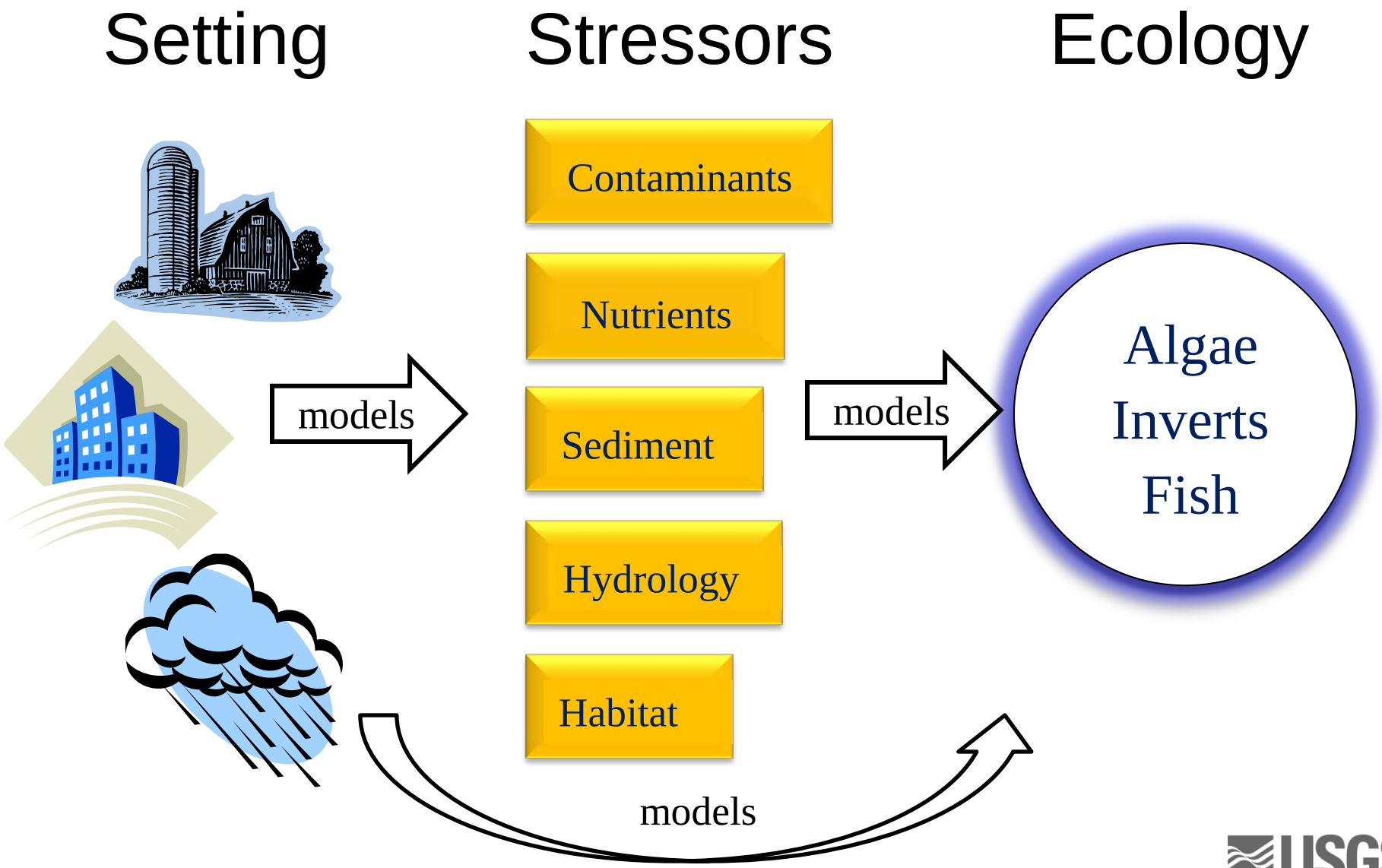
Multistressor Analysis



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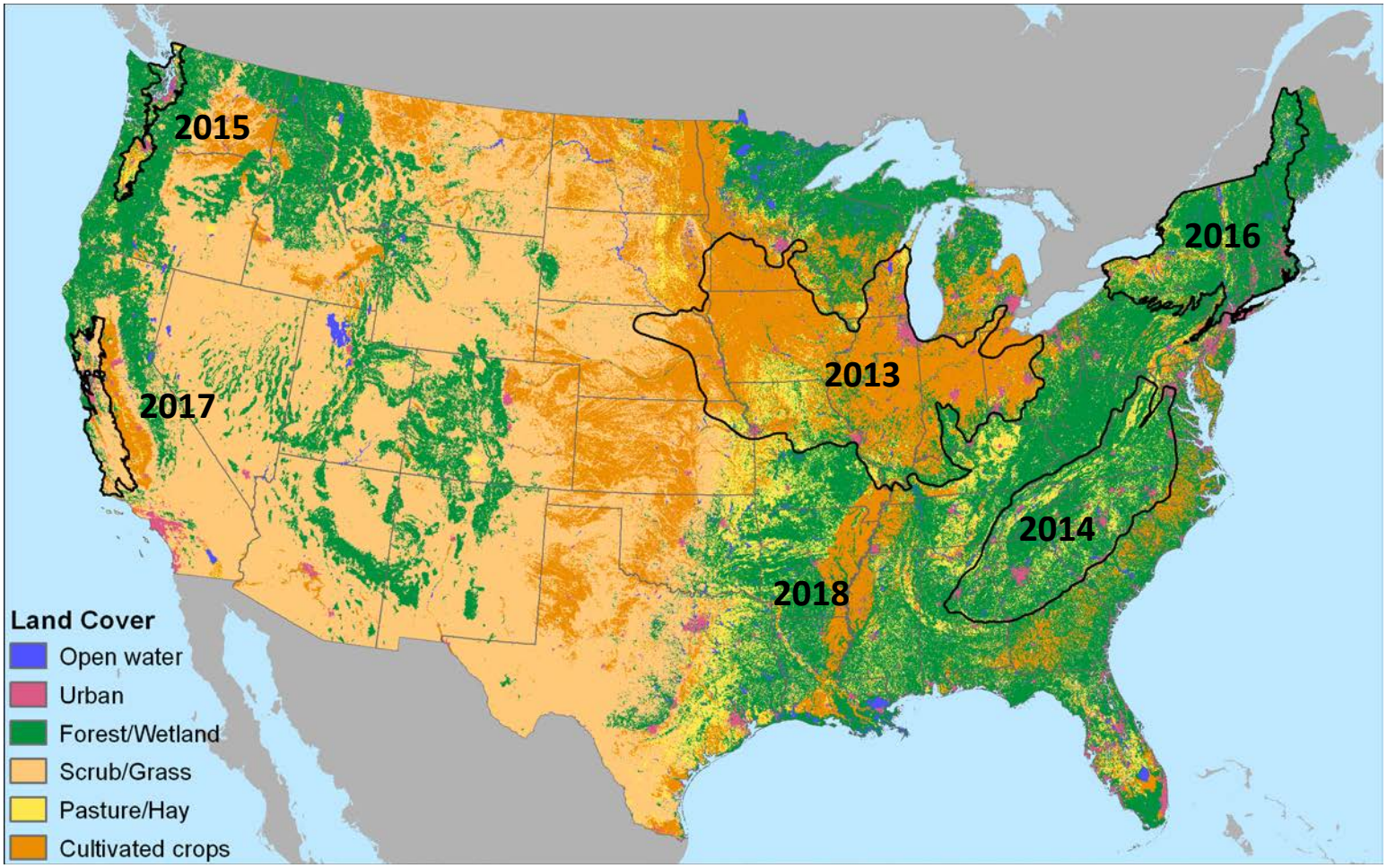
RSQA 2013-2018



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Sampling

- Water
  - **Weekly samples at all sites:** pesticides, glyphosate, nutrients, major ions, sediment, and organic carbon
  - **Selected weeks:** mercury, waste indicator compound, pharmaceuticals, and N and O isotopes
  - **POCIS:** pesticides, waste indicator compound, pharmaceuticals, and estrogen assay test
- Sediment
  - **Chemistry:** metals, PAHs, organohalogens, hormones, waste indicator compounds, radionuclides
  - **Toxicity:** *Hyalella*, *Chironomus*, mussels
- Ecology inverts, algae, fish, and habitat
- Mercury concentration & Hg isotopes in fish

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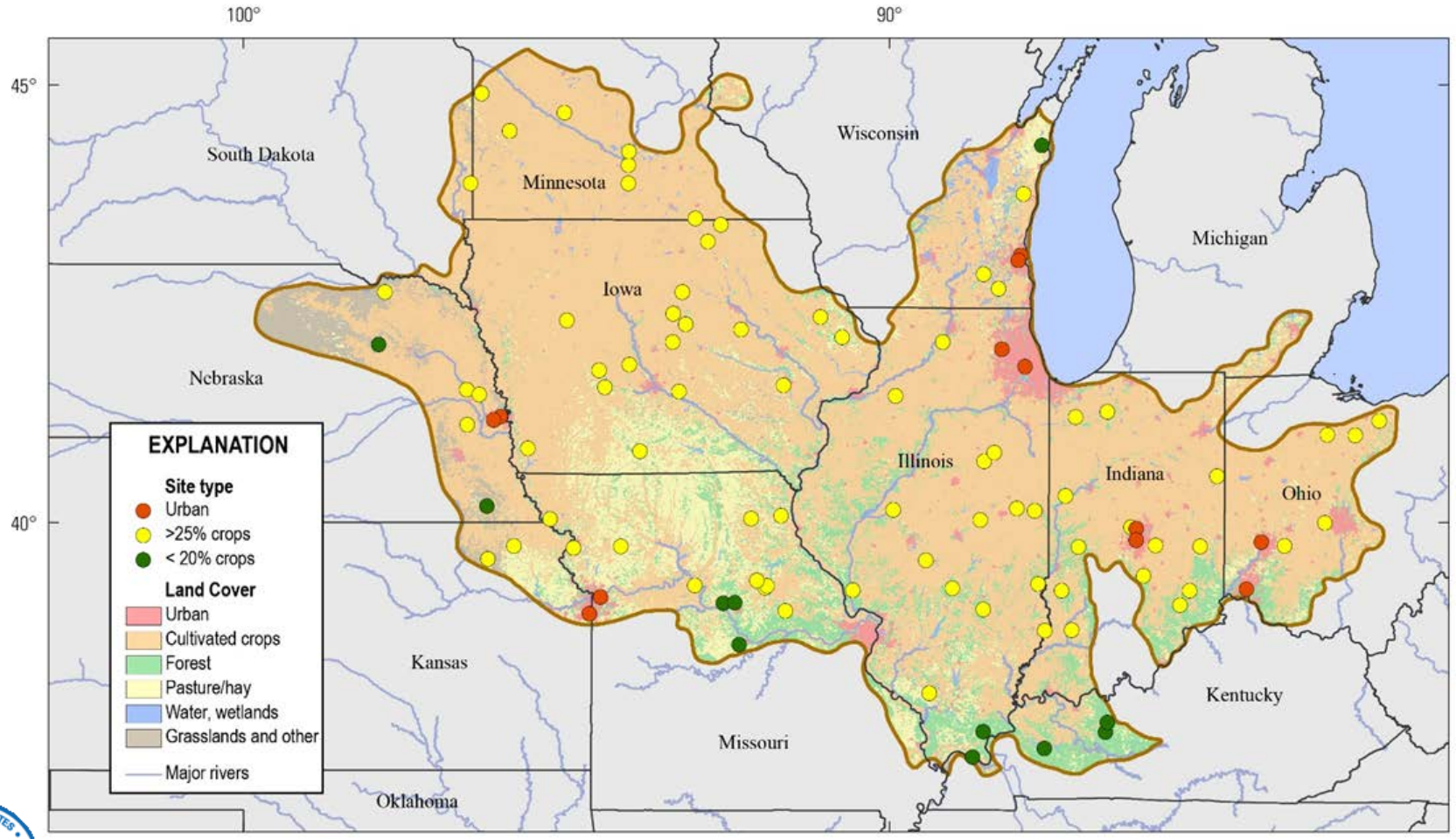
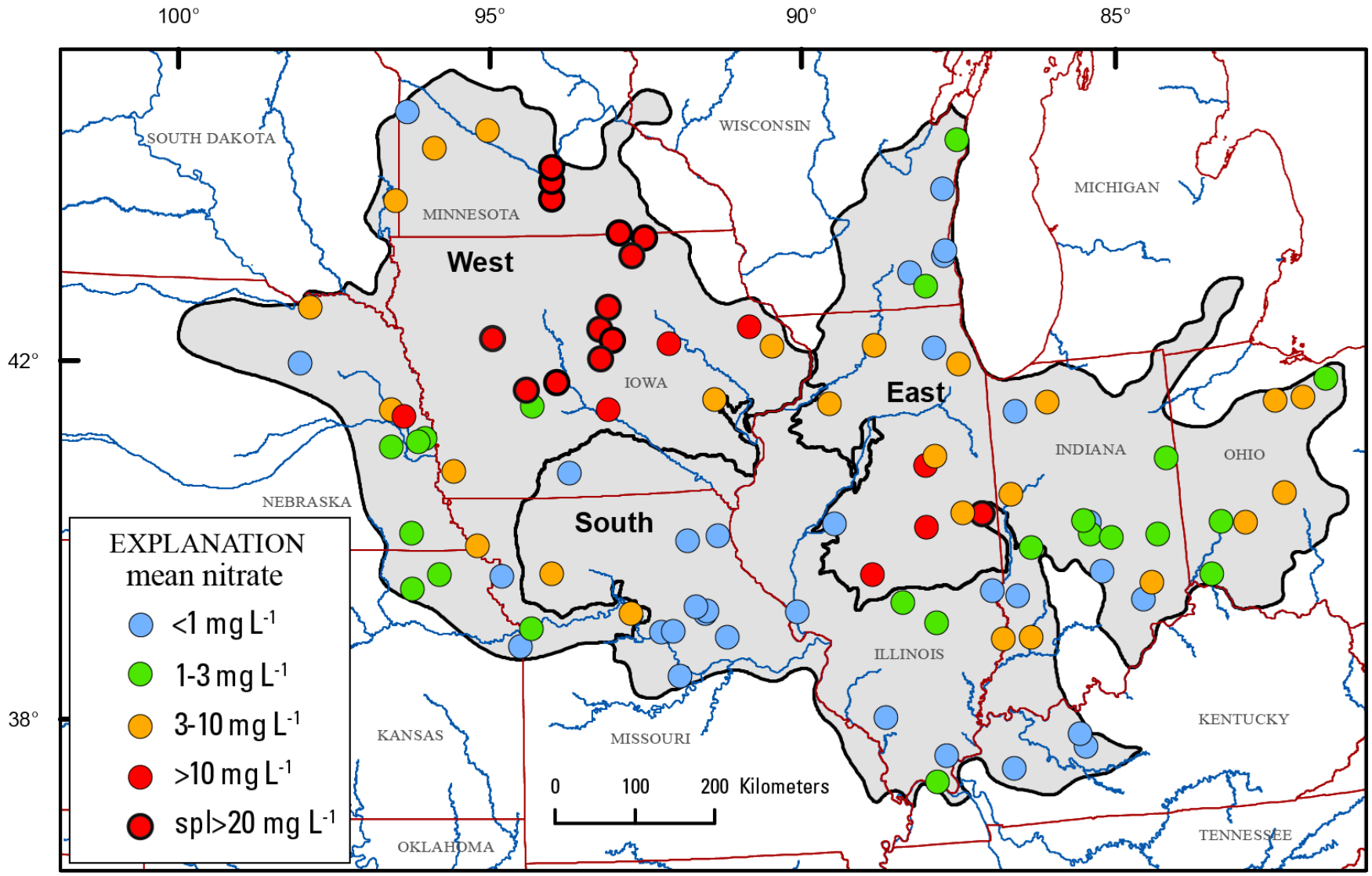
Midwestern Stream Quality Assessment:

Agricultural gradient with urban indicator sites



2013 – record high nitrate in IA and MN



Van Metre et al., 2016, J. Environ. Qual.

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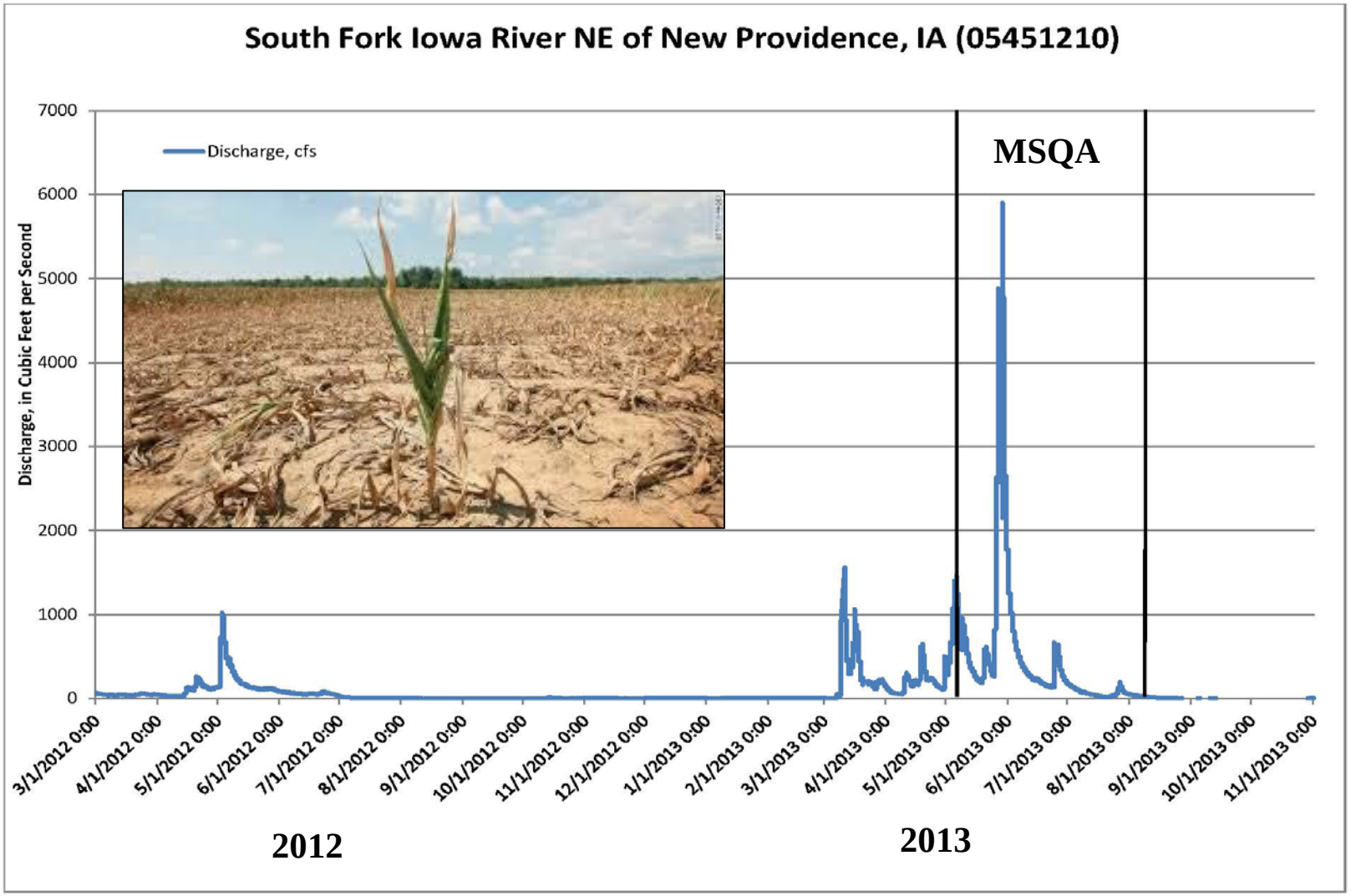
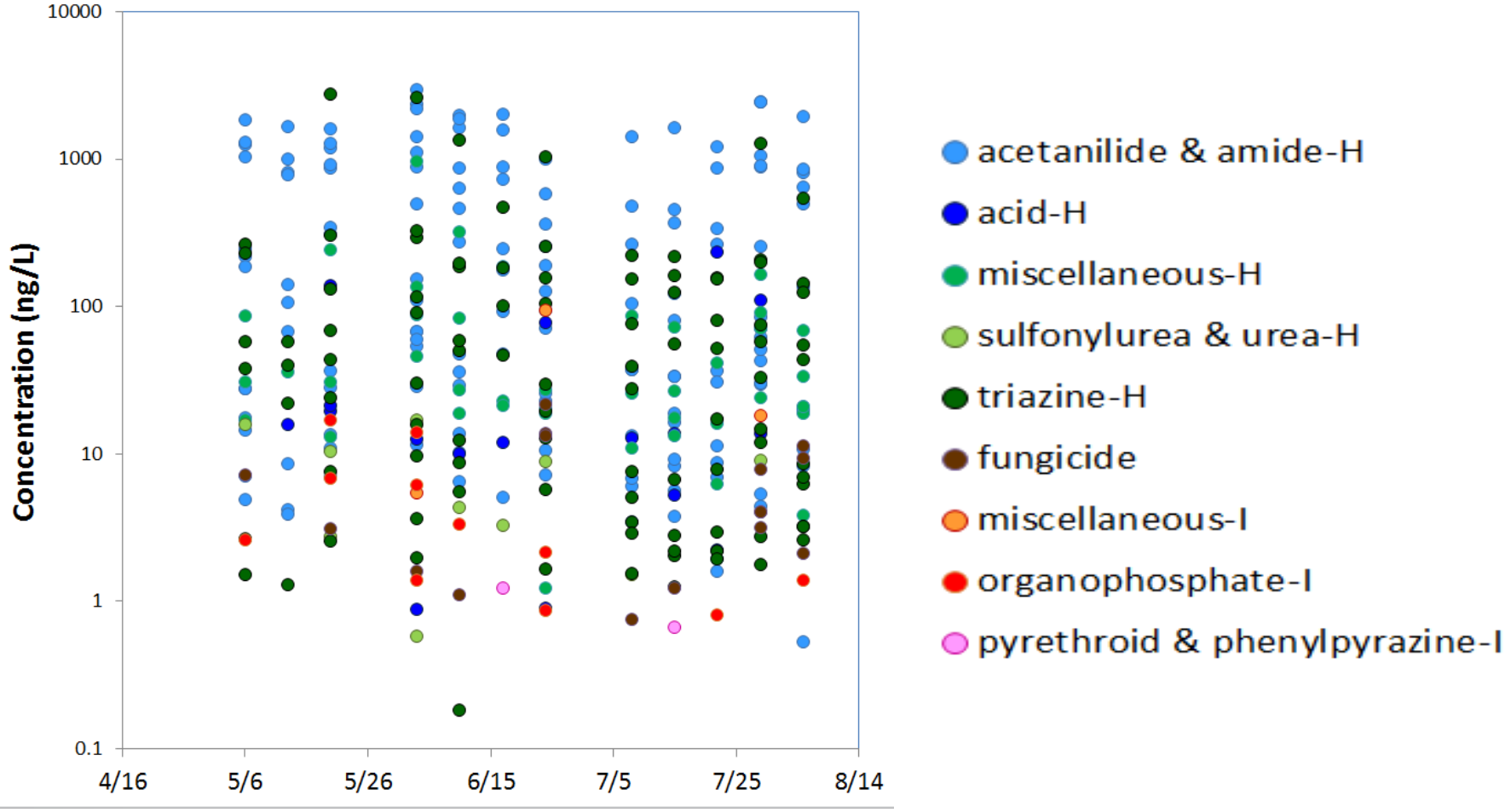
Nitrate and dry-year wet-year cycles



Dissolved pesticides in water

227 pesticide cmpds analyzed by GC-MS/MS



Lisa Nowell

South Fork Iowa River near Providence, IA, 2013:

16-38 compounds per sample (MEDIAN:=25)

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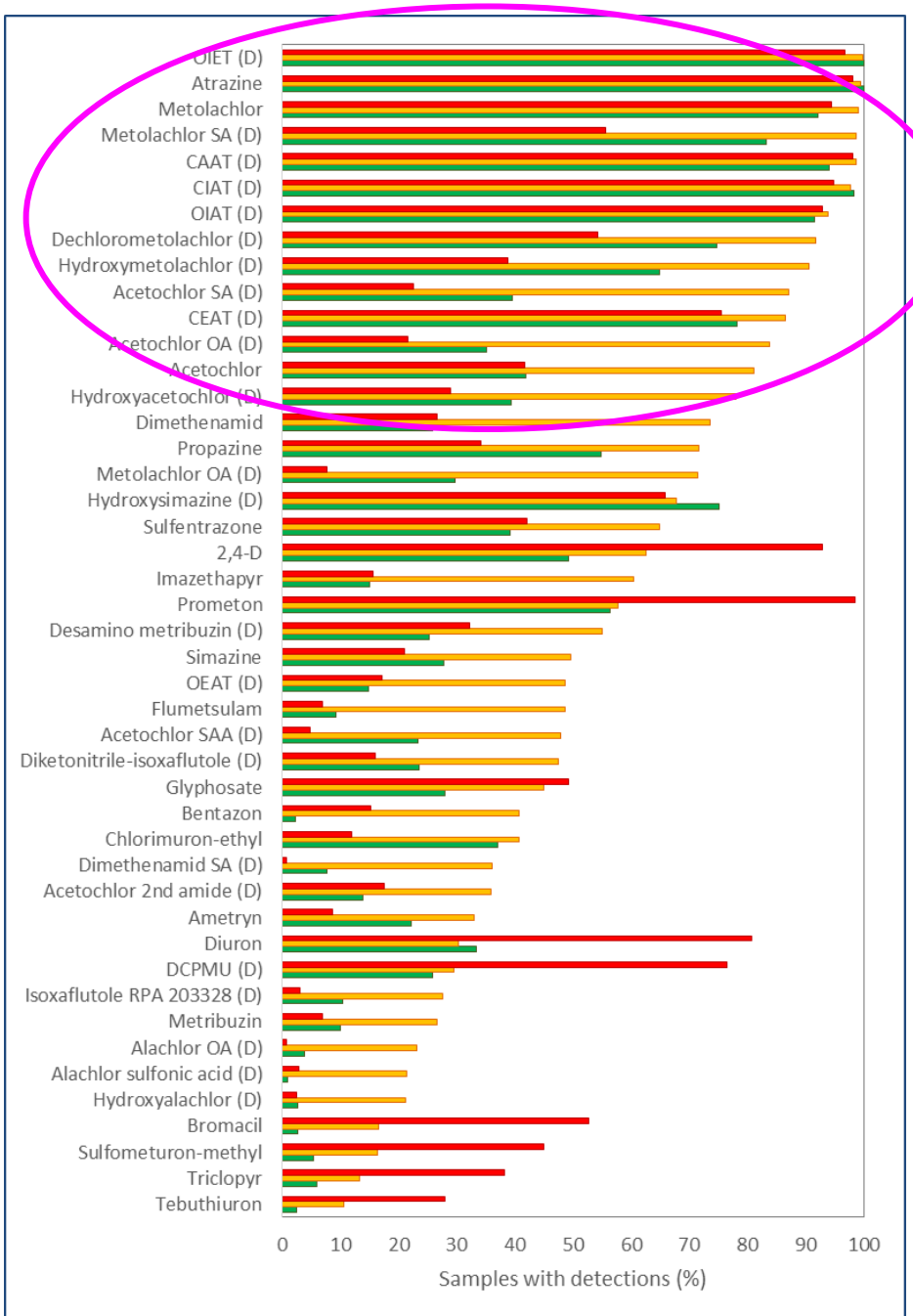
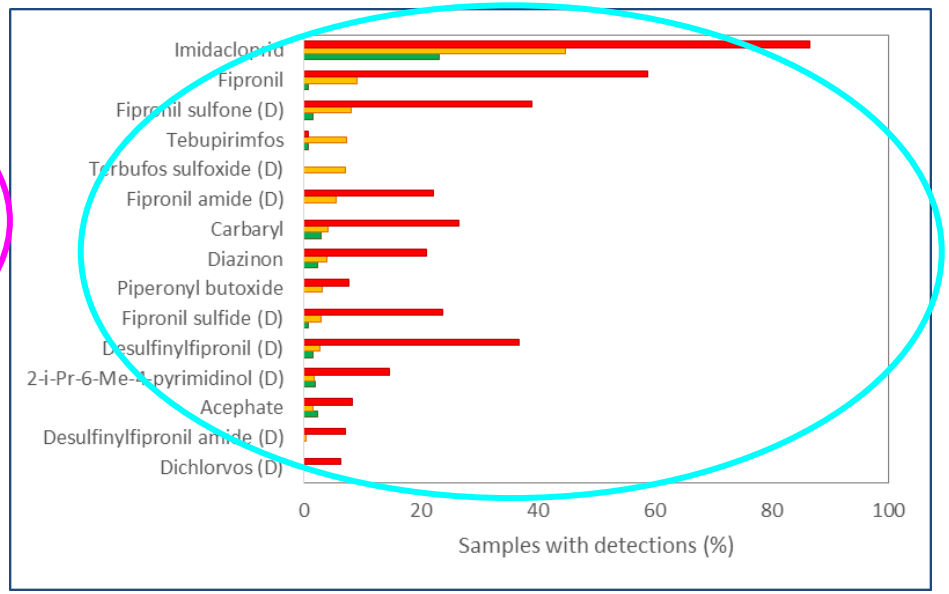
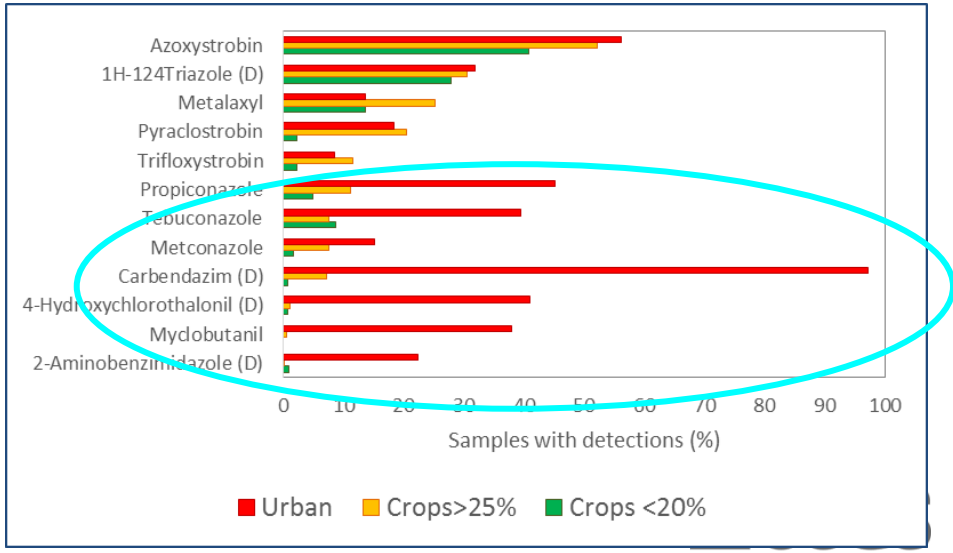
Herbicides



Insecticides

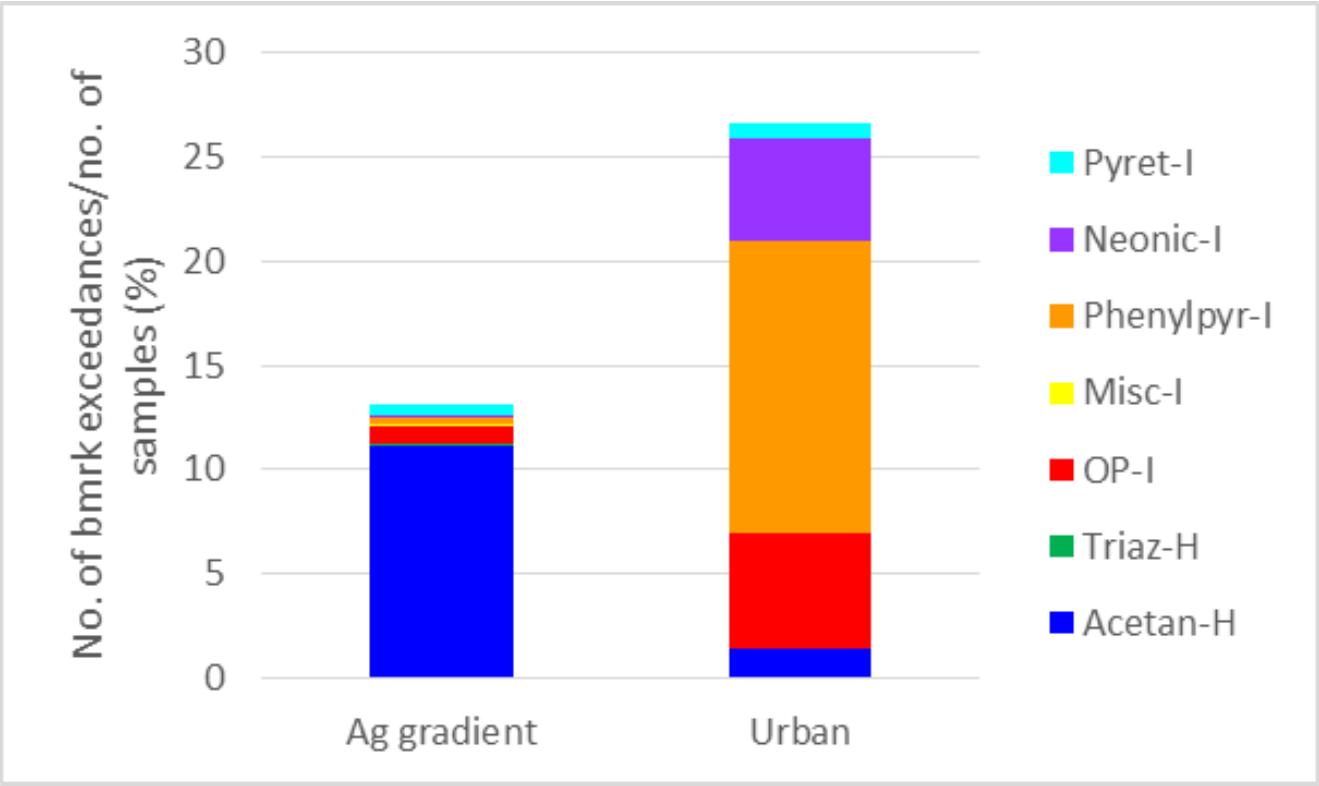


Fungicides



Benchmark exceedances help to identify important components of a mixture

Chronic Invertebrate benchmarks



- **Fipronil, imidacloprid, OP insecticides, bifenthrin (at Urban sites)**
- **Metolachlor (at Ag gradient sites)**

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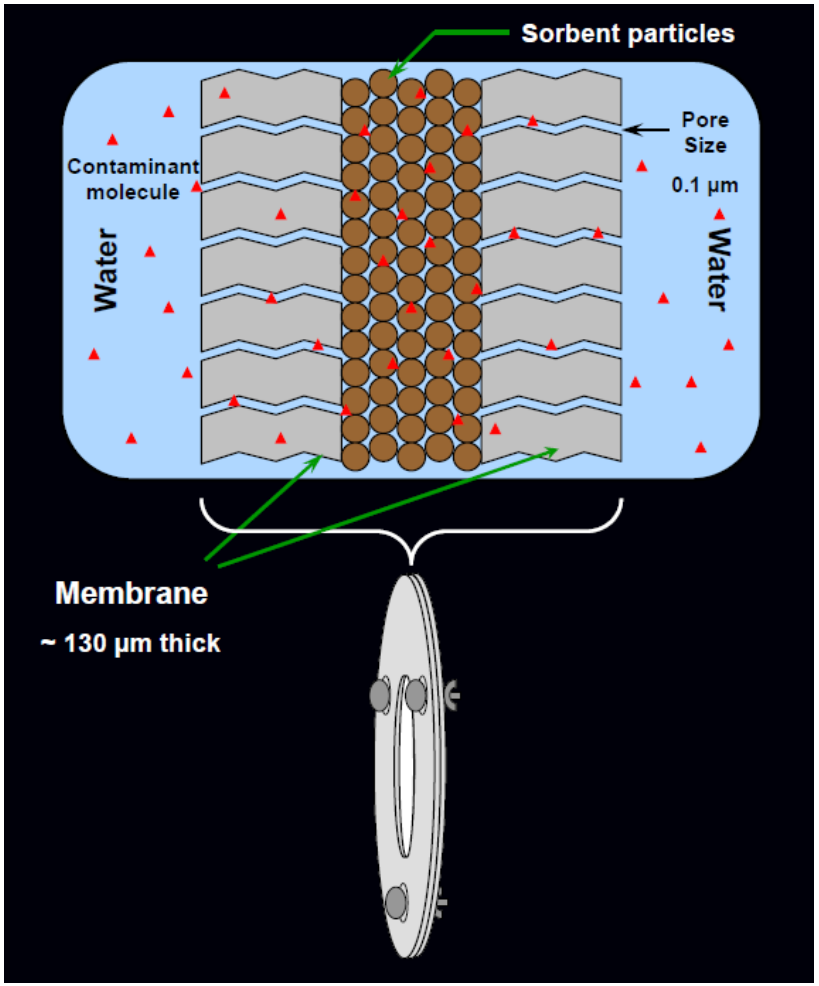
Polar Organic Chemical Integrative Sampler – POCIS

Median of 62 compounds detected per POCIS
(compared to 46 in matching discrete water samples)



Van Metre et al., 2016, Env. Poll.

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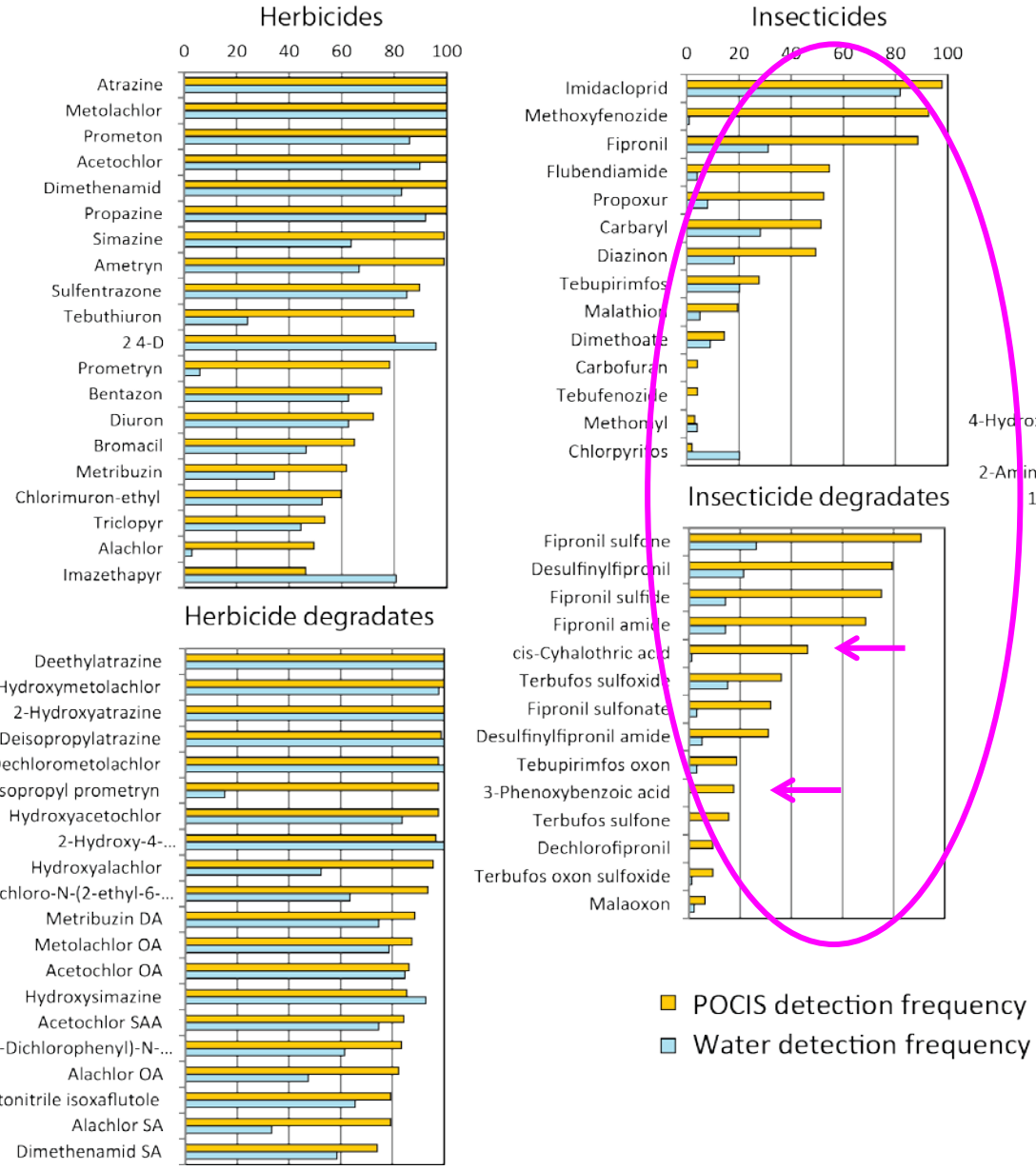
Occurrence in water and POCIS generally similar



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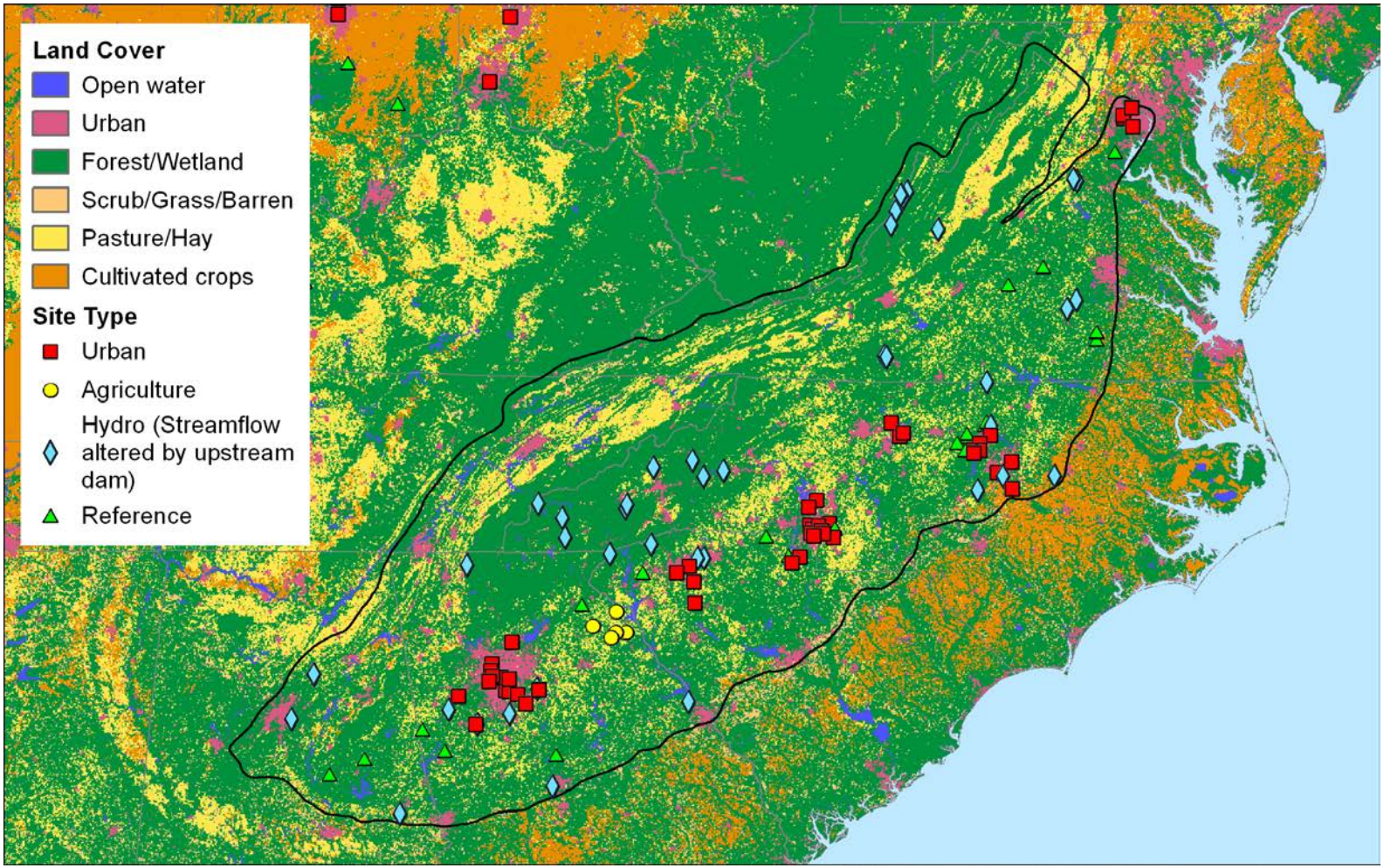
Southeastern Stream Quality Assessment:

Urban gradient with CAFO and flow alteration sites



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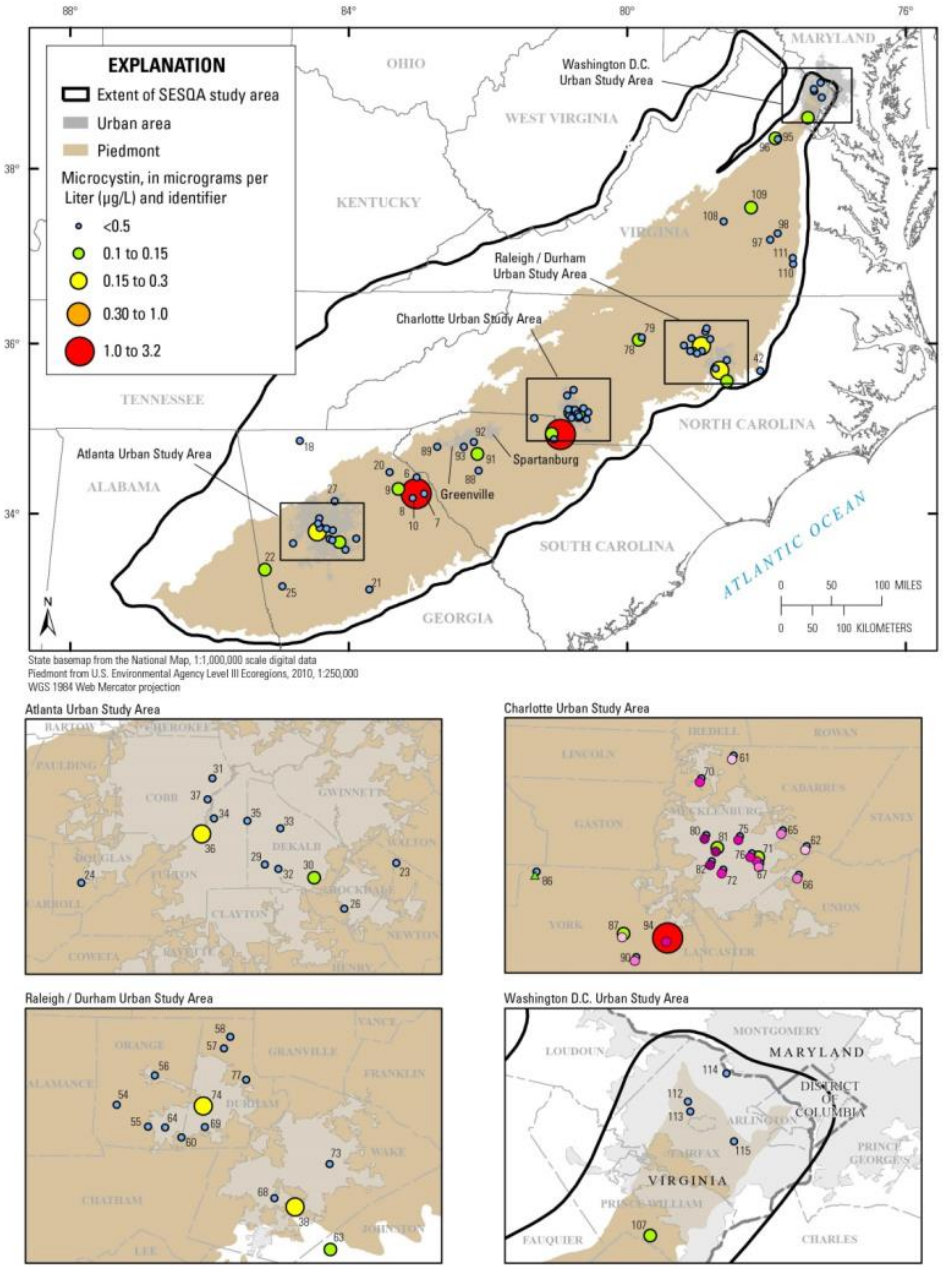
Microcystin in SESQA streams, 2014

NASA image of Lake Erie bloom.



Loftin et al., 2016, ET&C

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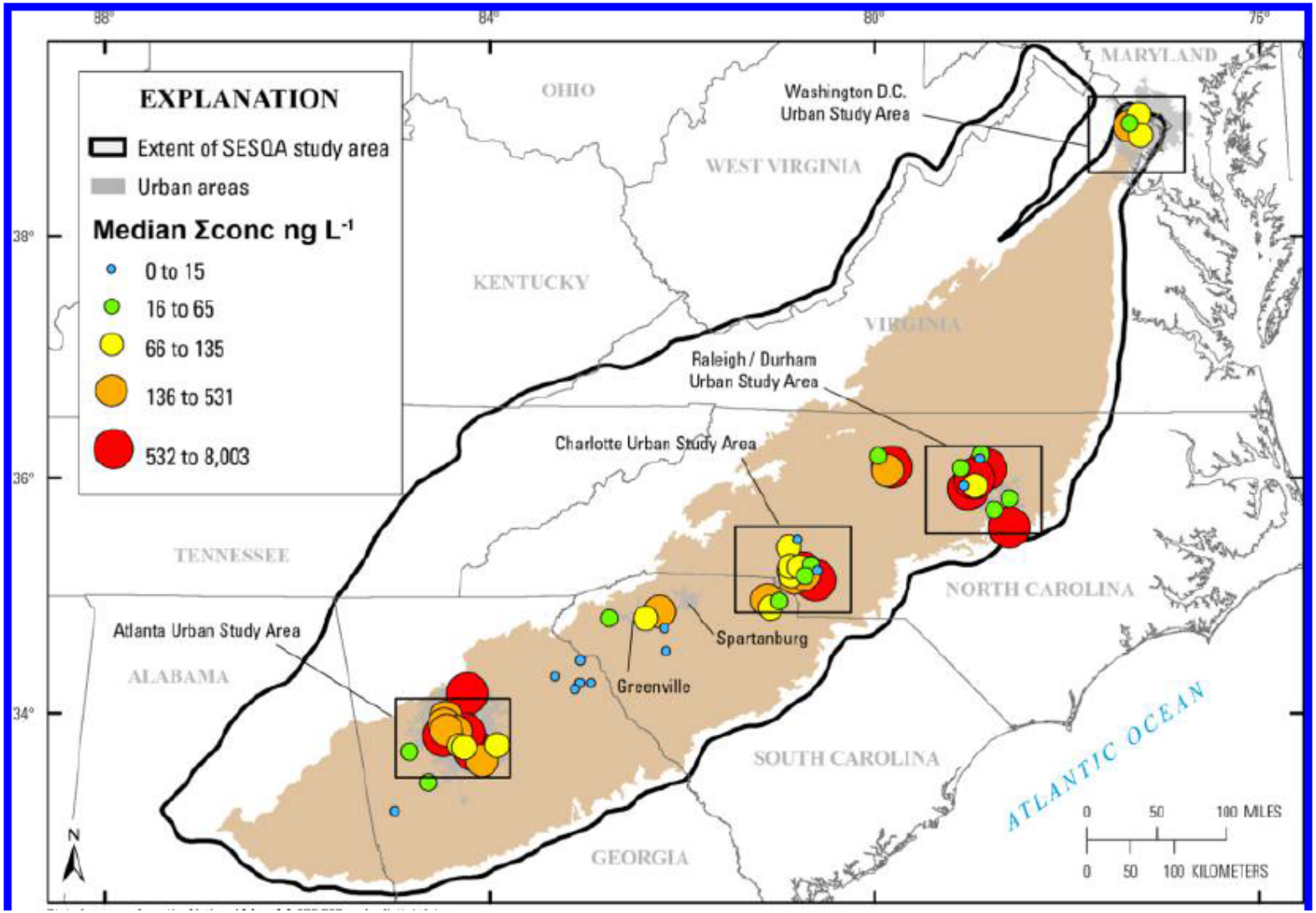
Pharmaceuticals



Bradley et al., 2016, ES&T

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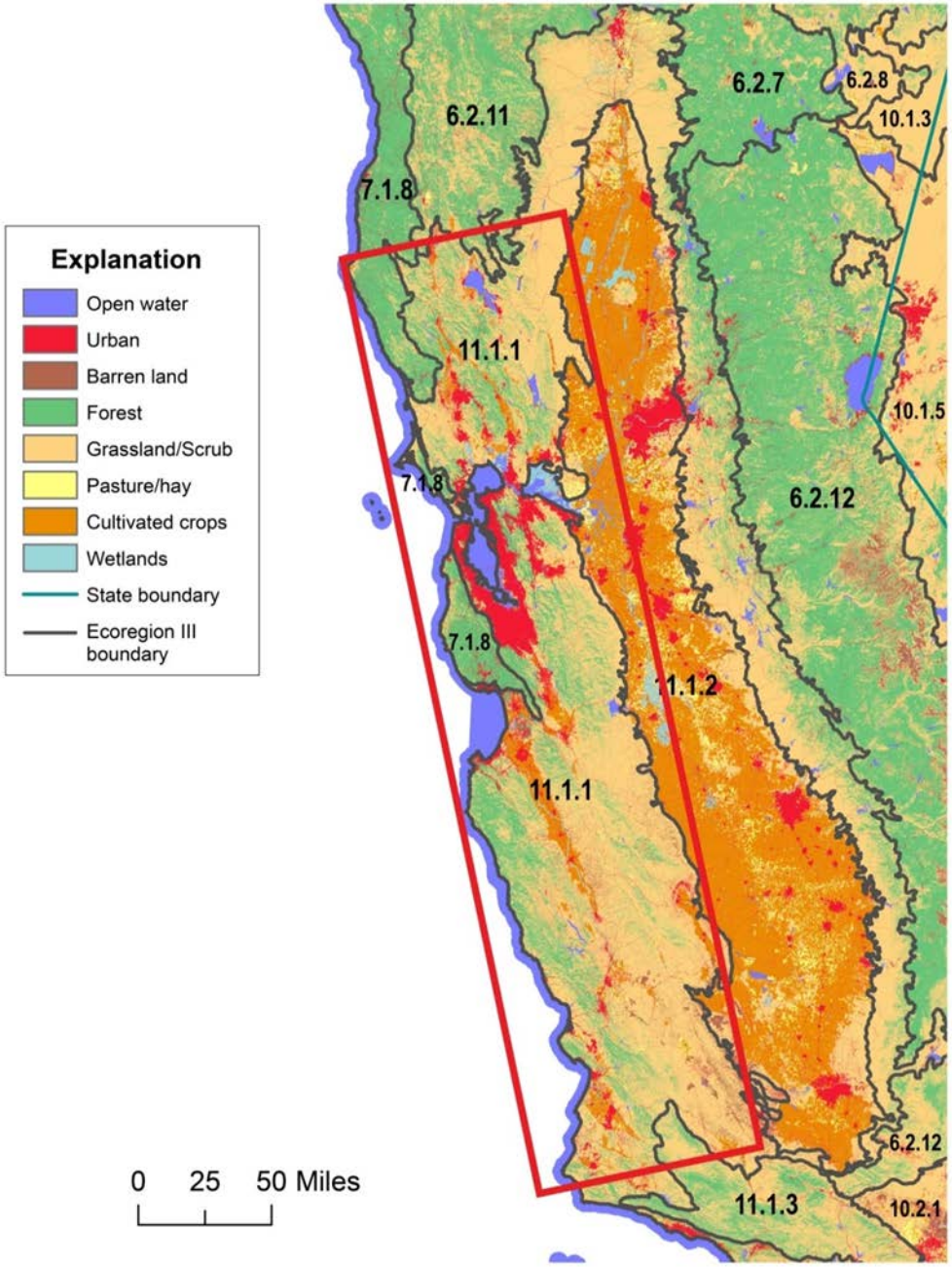
California Stream Quality Assessment (CSQA) – 2017



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General design features

- **Water: 85-90 sites, 6 weekly samples**
  - **Weekly samples at all sites:** pesticides, glyphosate, nutrients, major ions, sediment, and organic carbon
  - **Selected weeks:** mercury, waste indicator compound, pharmaceuticals, hormones, and N and O isotopes, microcystins
  - **POCIS:** pesticides and pharmaceuticals
- **Sediment**
  - **Chemistry:** metals, PAHs, pesticides, organohalogens, hormones, waste indicator compounds
  - **Toxicity:** *Hyalella*, *Chironomus*, mussel

- **Ecology** inverts, algae, fish, and habitat

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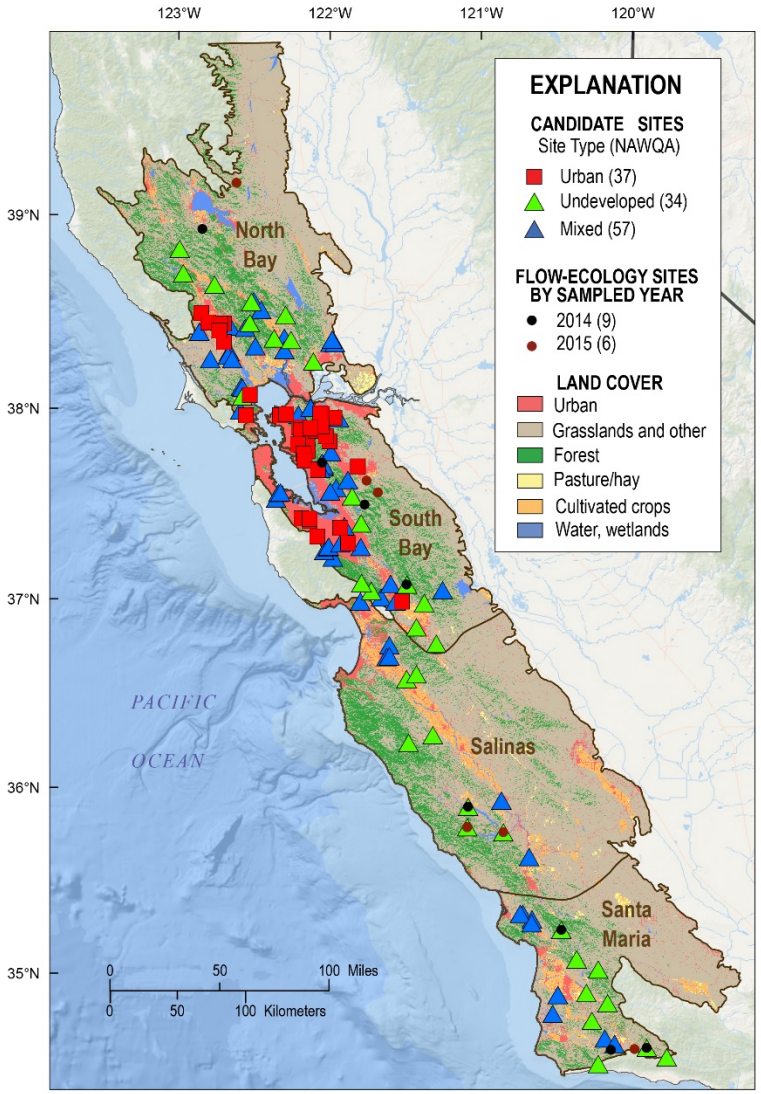
Site selection is underway



Basemap modified from Esri Digital Data, 1:70,000, 2009
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Land cover from the National Land Cover Database 2011
Web Mercator Projection, World Geodetic System of 1984 (WGS 84)

Sub-region	Total target	Urban	Mixed	Agric	Ref
No. Bay	**27**	11	8	5	3
So. Bay	**33**	25	3	2	3
Salinas	**16**	2	4	6	4
Santa Maria	**10**	3	2	2	3
Totals	**86**	41	17	15	13

Factors include: site access; long-term data; State bioassessment sites; land-use gradient w/in 5-km upstream buffer; pesticide use; ***water!***

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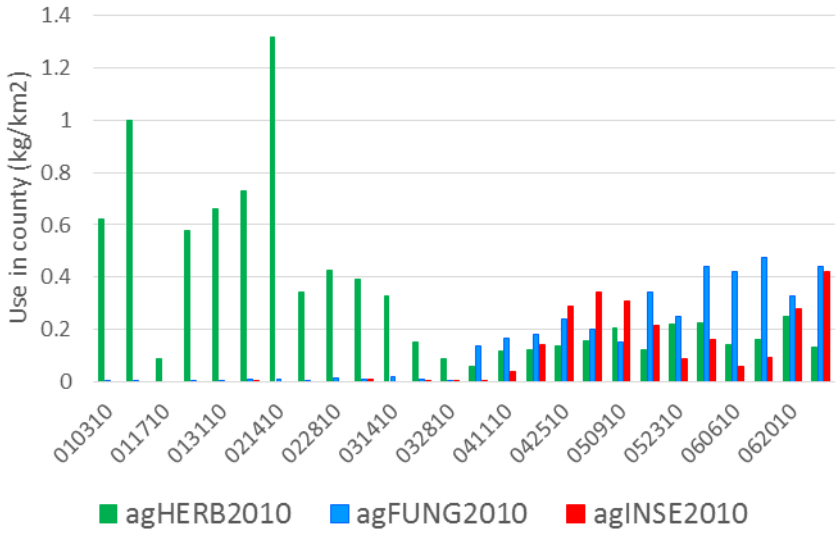
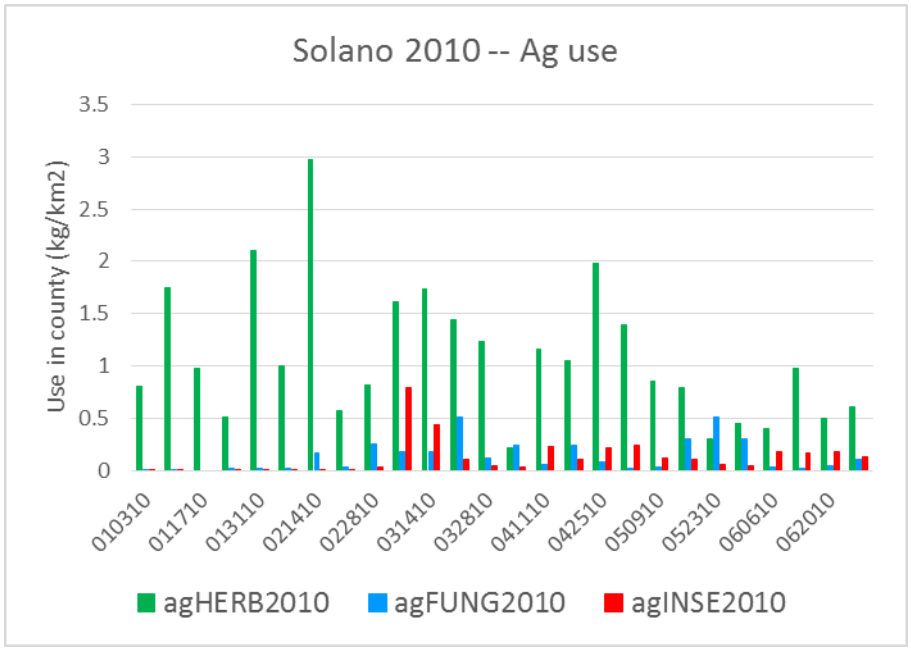
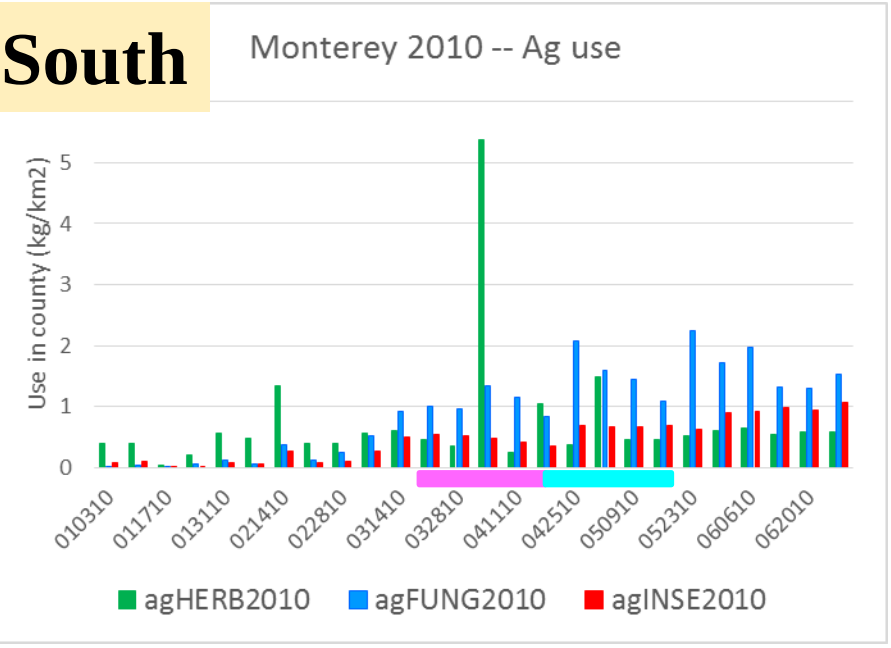
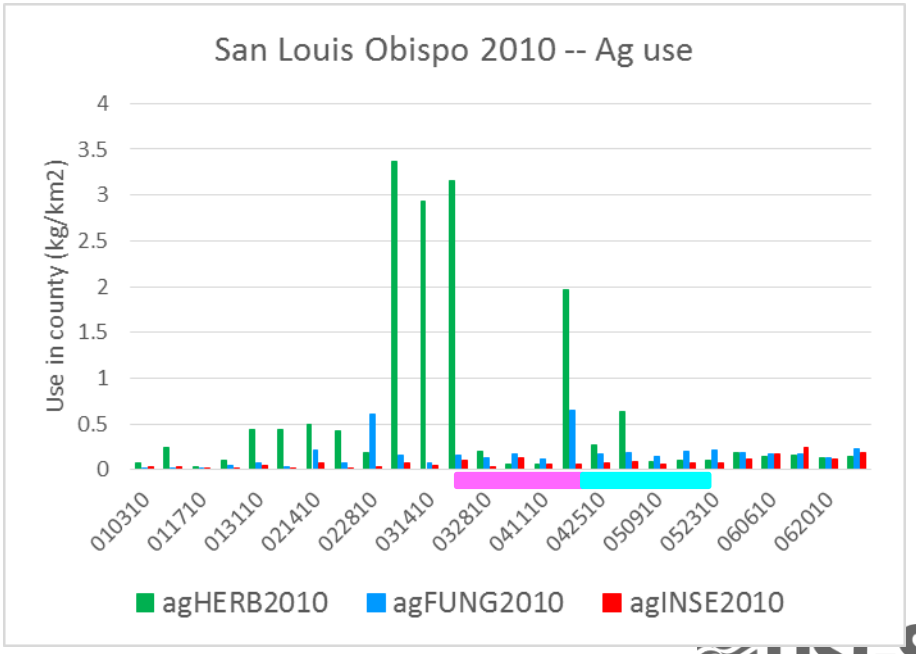
North





South





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Timeline

	Date	6-Mar	13-Mar	20-Mar	27-Mar	3-Apr	10-Apr	17-Apr	24-Apr	1-May	8-May
South	QW		1	2	3	4	5	6			
n=30	POCIS										
	SEDIMENT CHEM										
	ECO SURVEY										
North	QW					1	2	3	4	5	6
n= 58	POCIS										
	SEDIMENT CHEM										
	ECO SURVEY										

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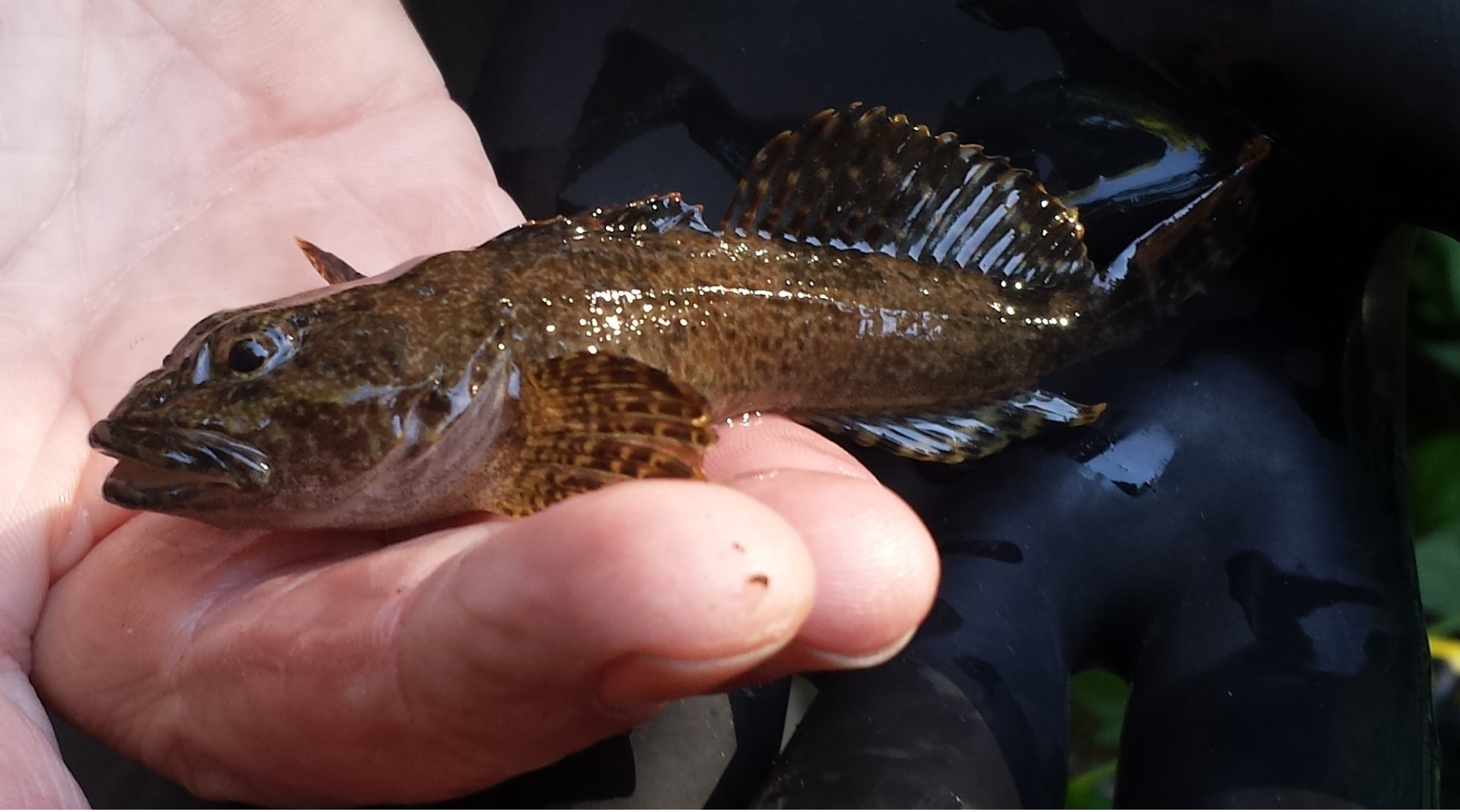

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