

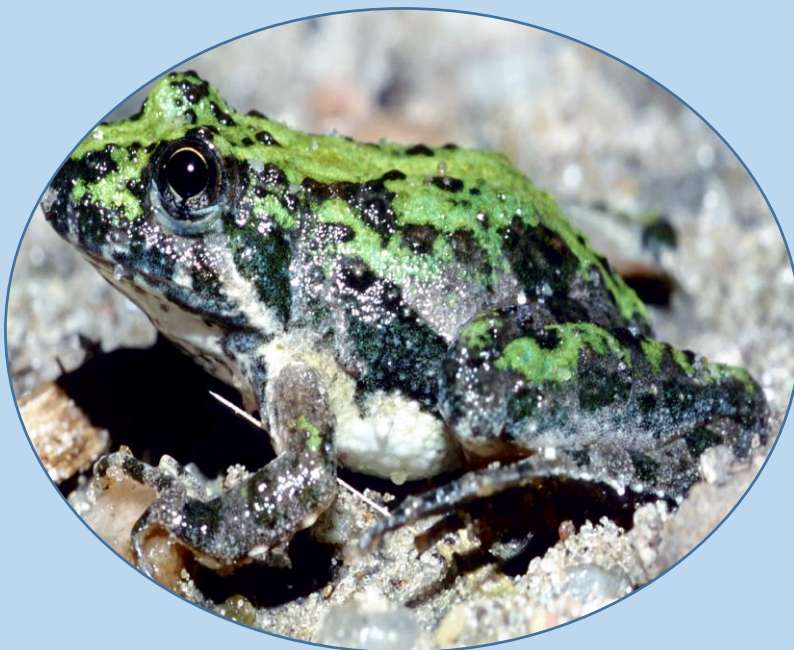
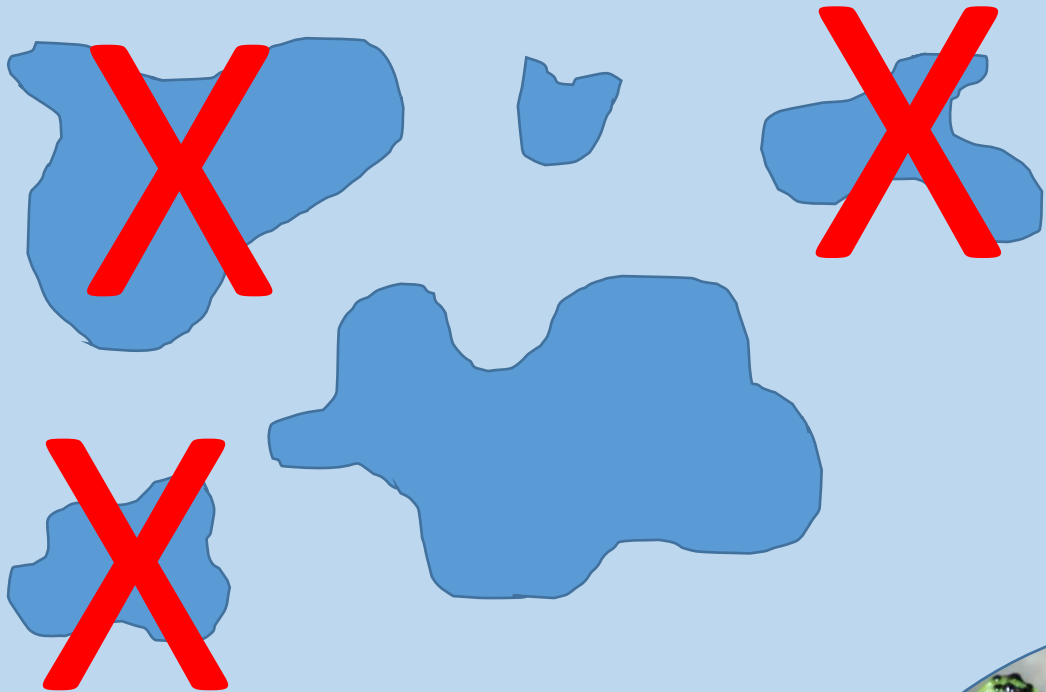
Agrichemicals in the Rainwater Basin: Presence, timing, and the potential for toxicity to amphibians

Michelle L Hellman

NE Cooperative Fish and Wildlife Research Unit

University of Nebraska-Lincoln





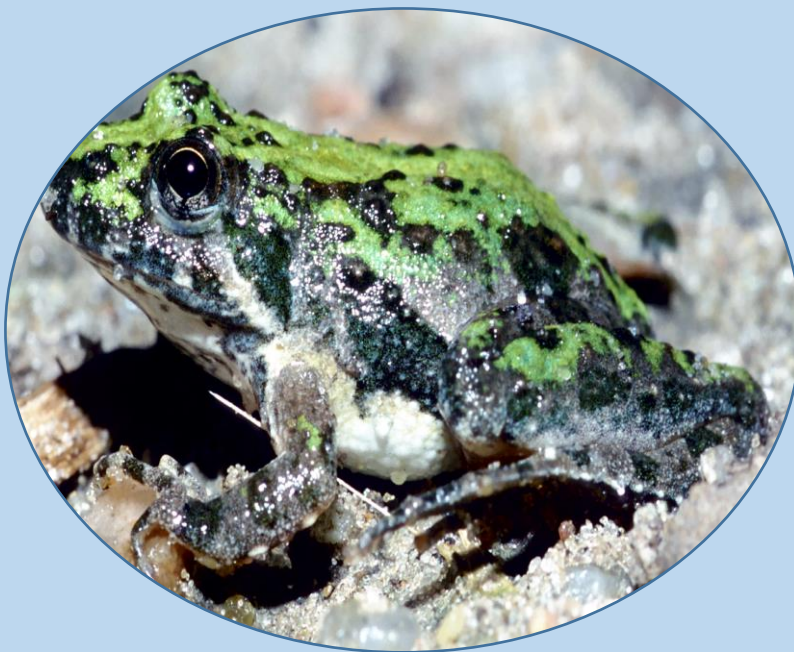
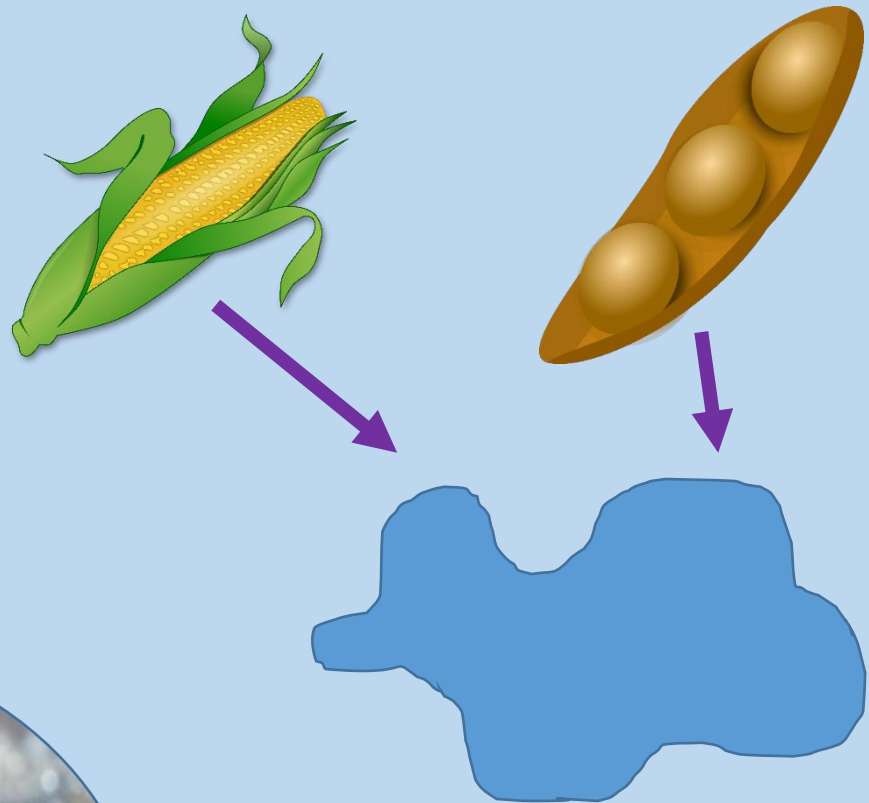
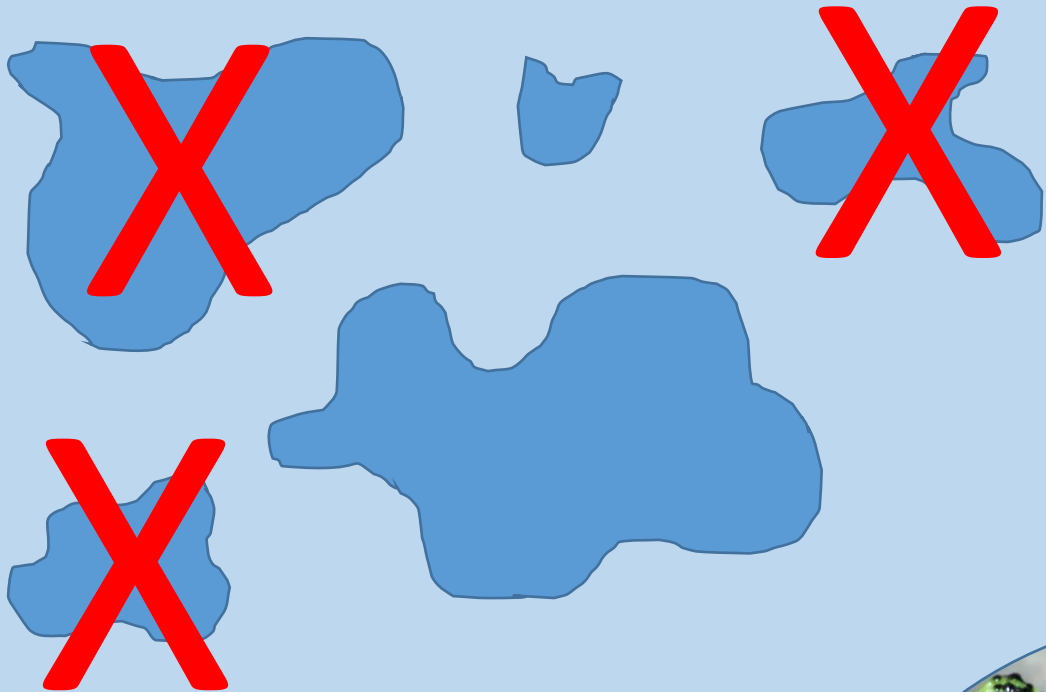
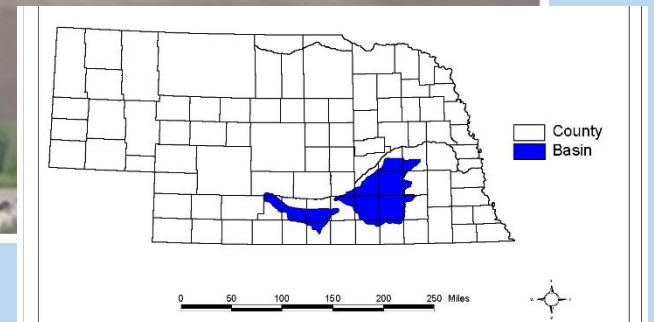


Photo by John McCarty

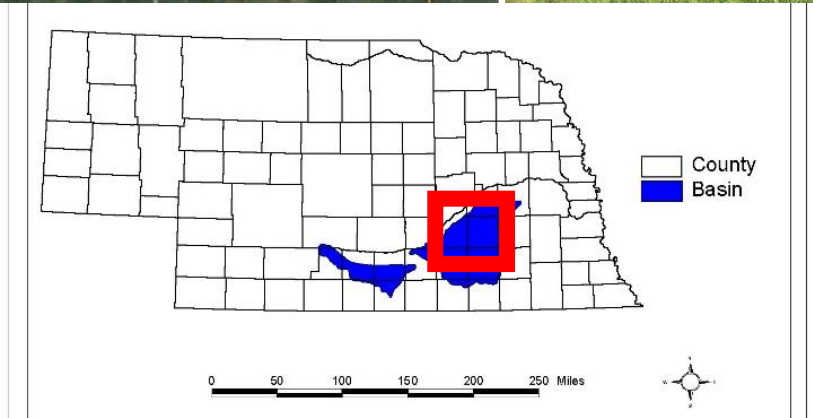
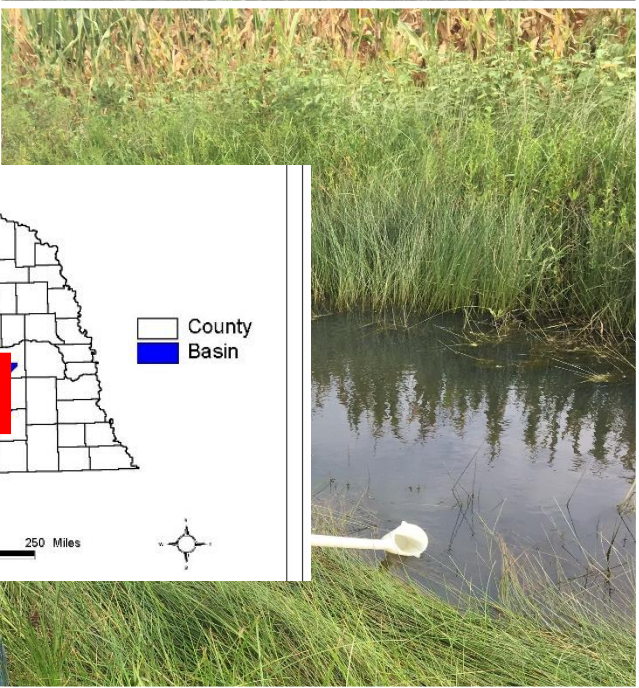
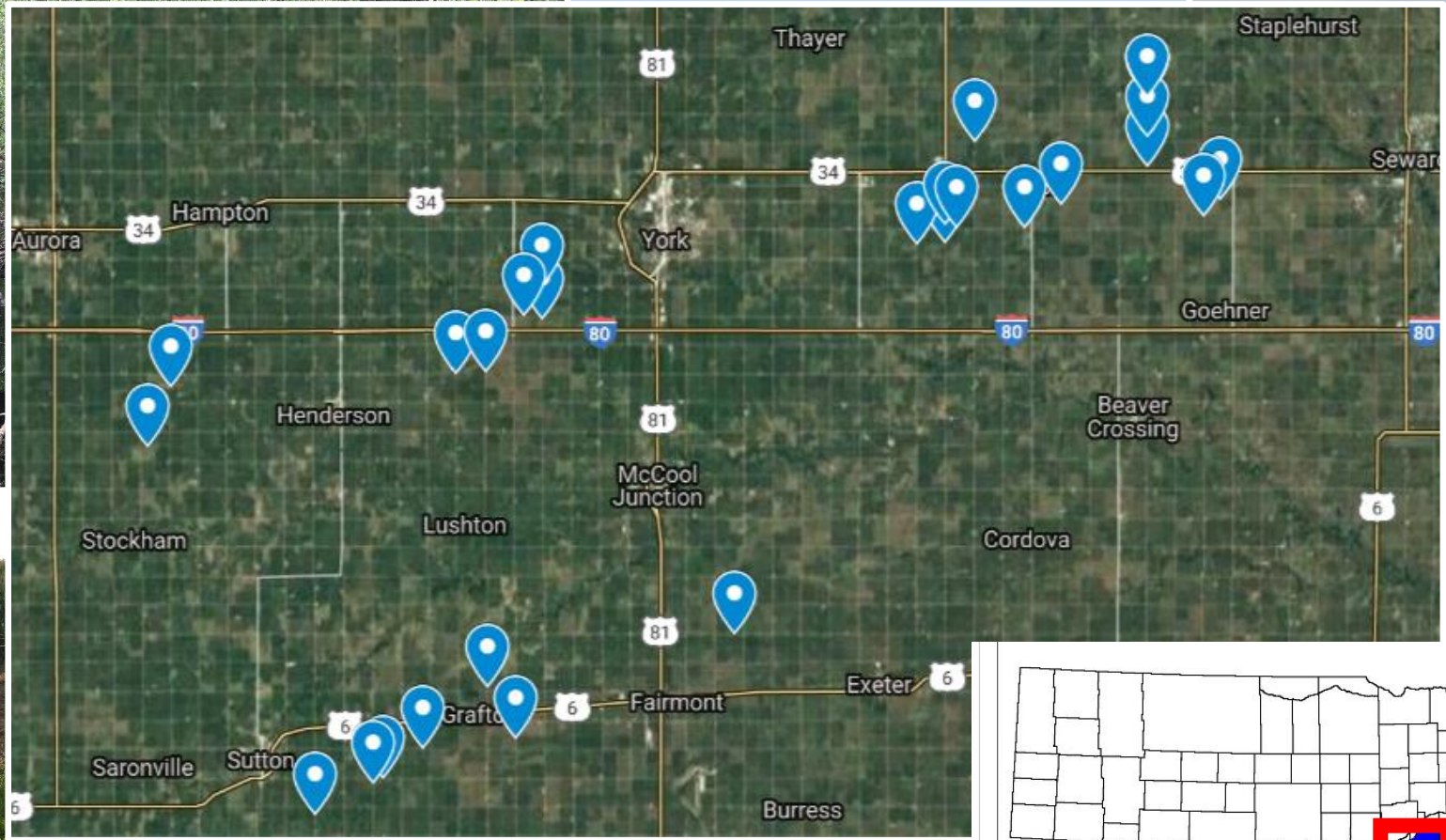
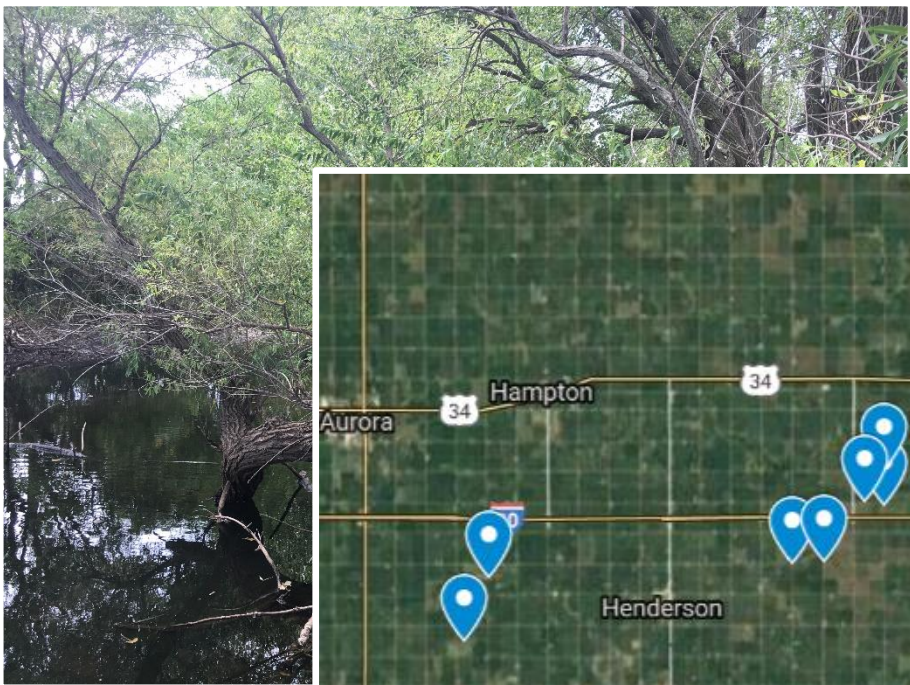




Research questions

- *What* contaminants?
- *When* do they enter?
- *How* do they affect amphibians?





2016

Sites Sampled - Water

Site Type	# of sites	
	<u>Corn</u>	<u>Soy</u>
Ditch	6	1
Drainage	7	1
In-field	5	4
Pit/ Pond	3	1

Sites Sampled - Sediment

Site Type	# of sites	
	<u>Corn</u>	<u>Soy</u>
Ditch	5	0
Drainage	6	1
In-field	3	3
Pit/ Pond	3	1

Methods



Methods



Methods



2017



Contaminants

Neonicotinoids:

- Acetamaprid
- Clothianidin
- Dinotefuran
- Imidacloprid
- Thiacloprid
- Thiamethoxam

Strobilurins:

- Azoxystrobin
- Trifloxystrobin
- Pyraclostrobin

Other:

- Dimethoate
- Metalaxyl

Contaminants

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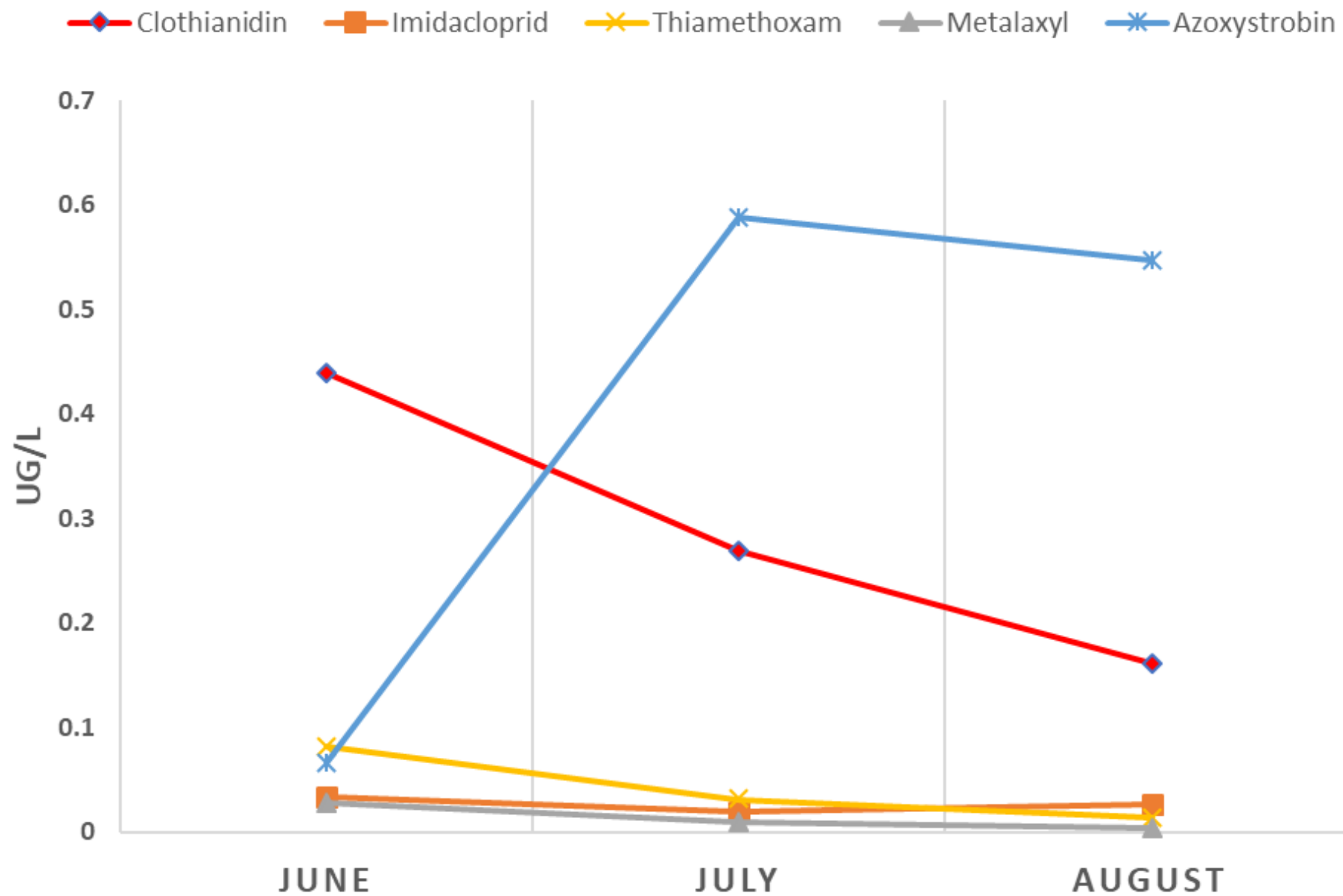
Strobilurins:

- Azoxystrobin = Quilt®
- Trifloxystrobin
- Pyraclostrobin = Headline®

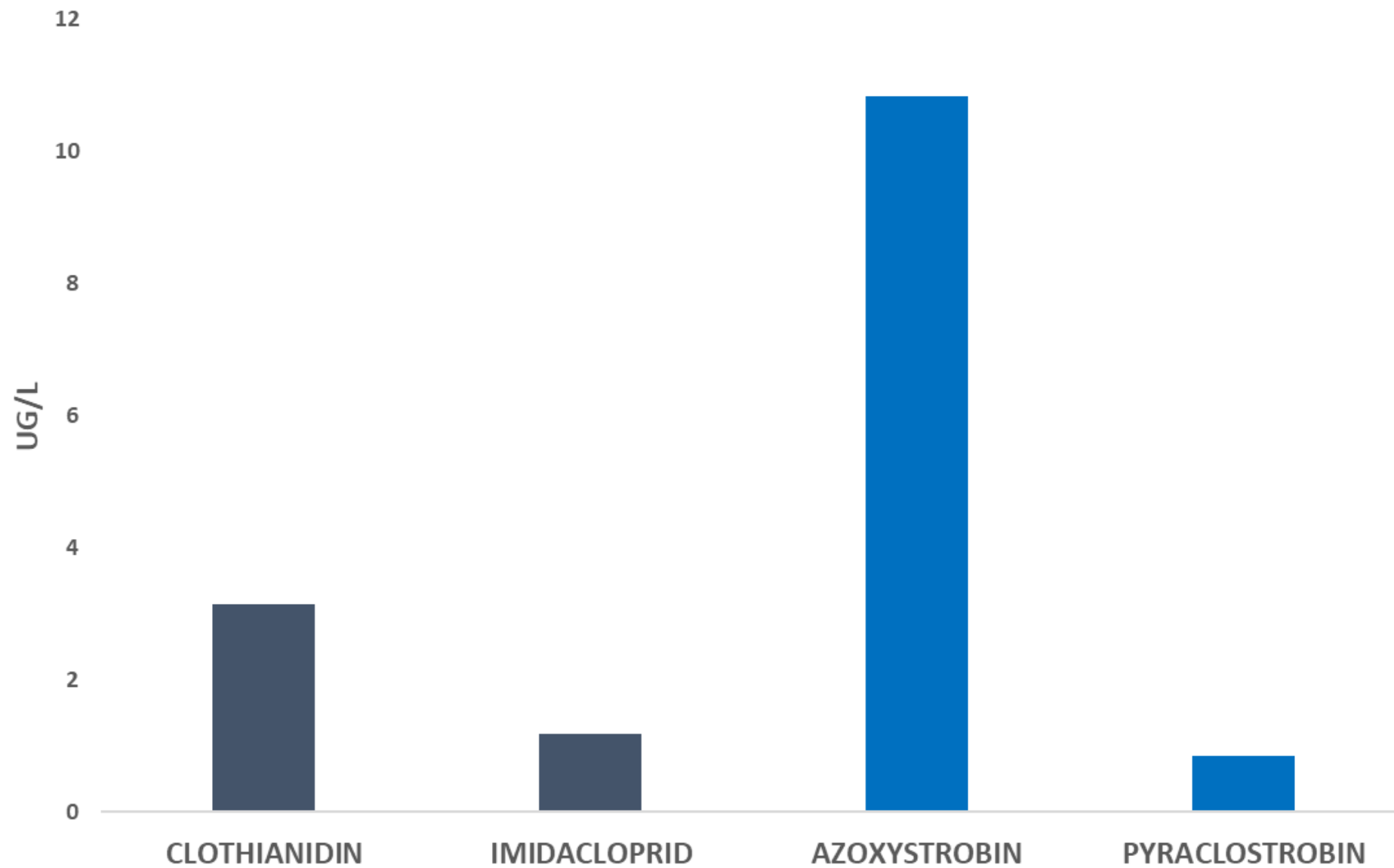
Other:

- Dimethoate
- Metalaxyl

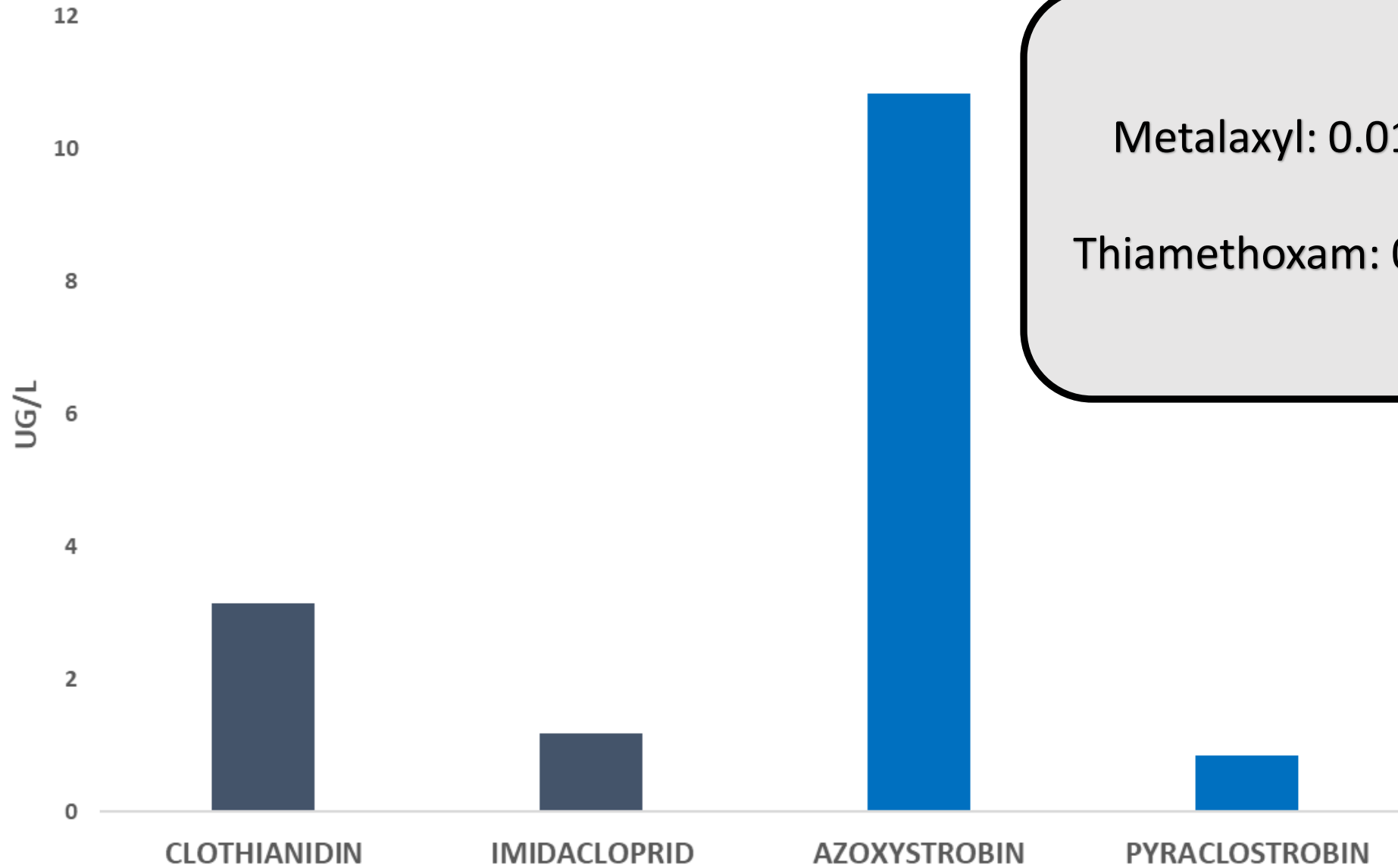
2016 SEASONALITY (WATER)



2016 SEDIMENT



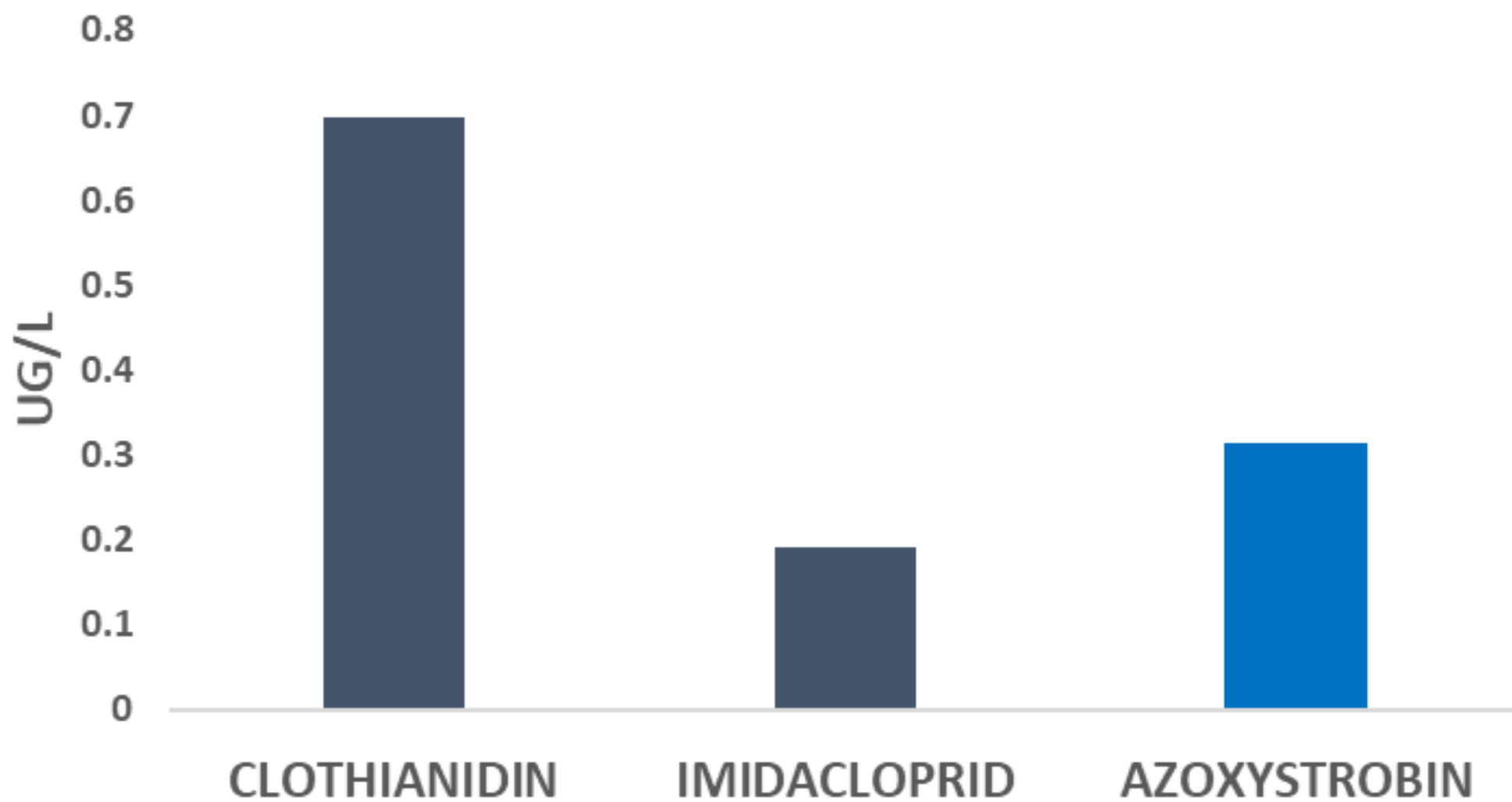
2016 SEDIMENT



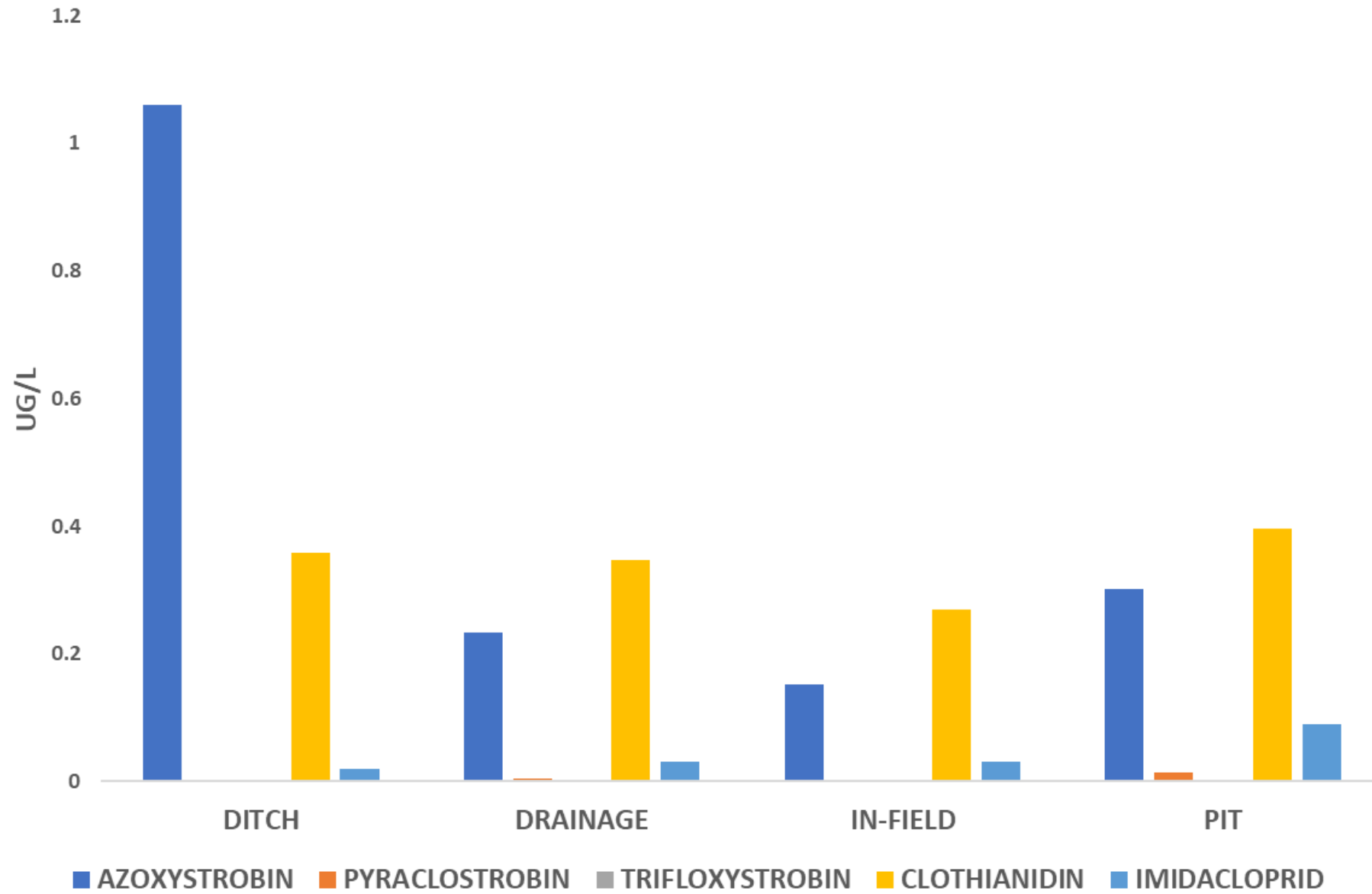
Metalaxyl: 0.0163 ug/L

Thiamethoxam: 0.052 ug/L

2017 SEDIMENT



WETLAND TYPE (2016 & 2017)



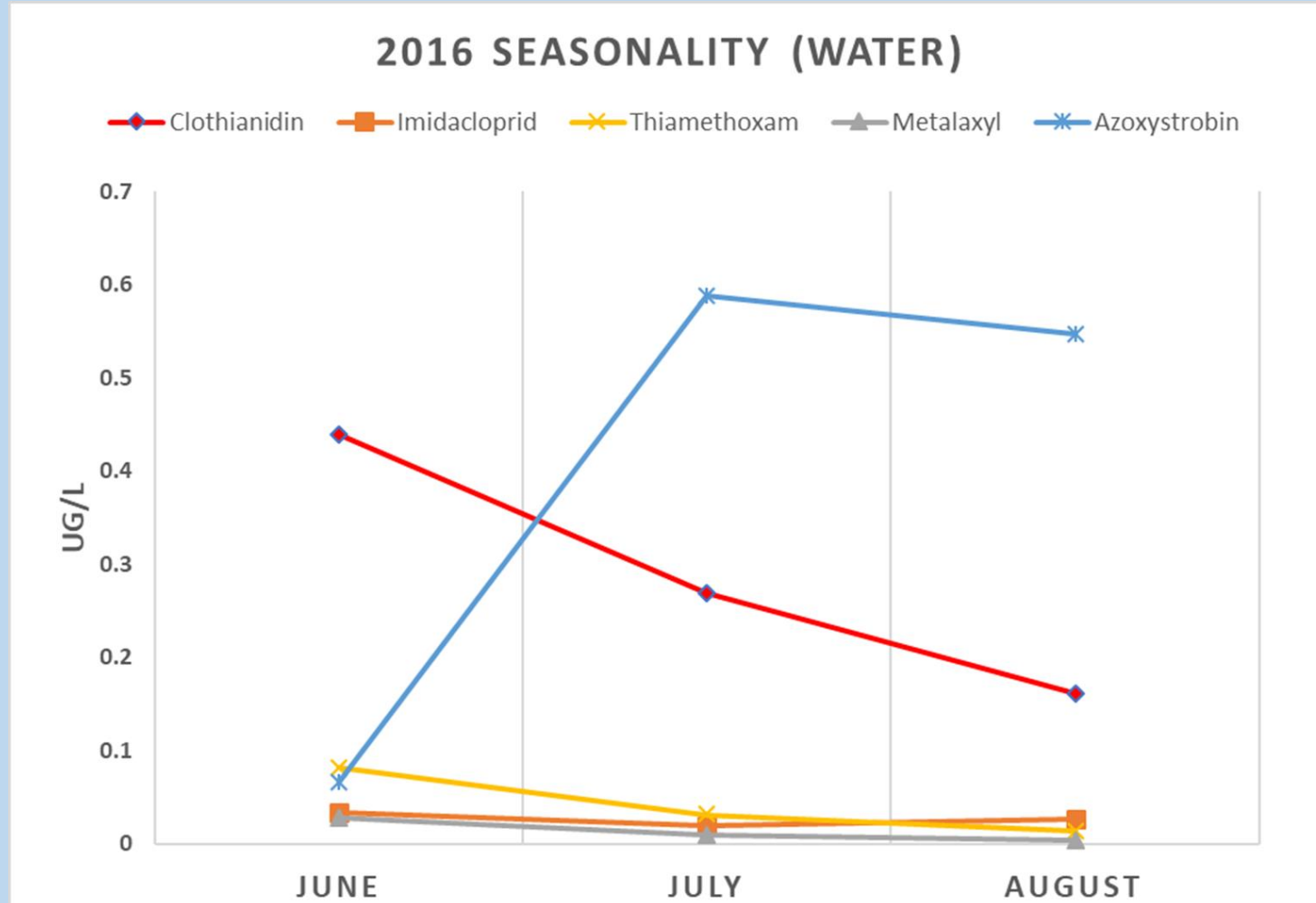
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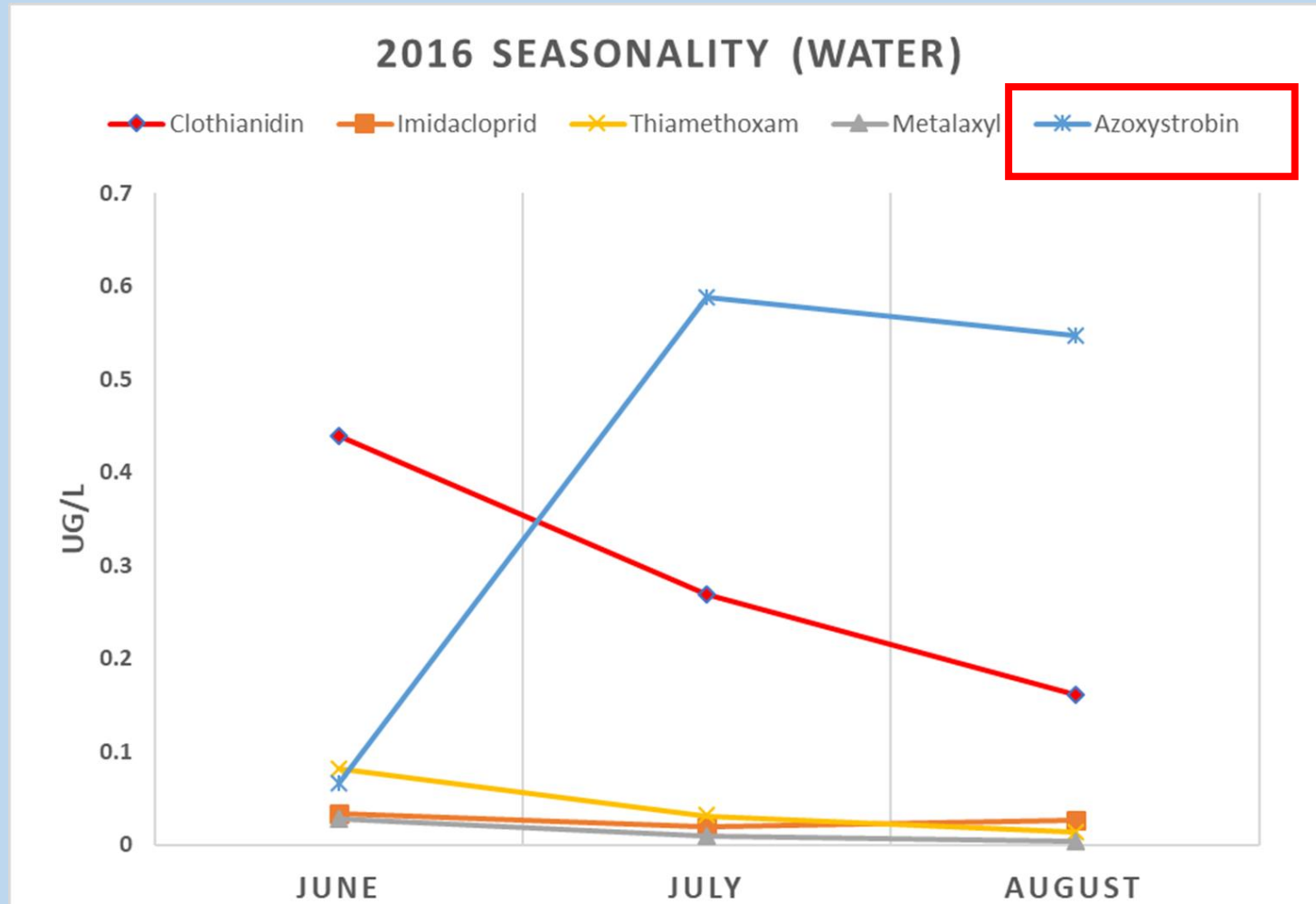
Research questions

- *What* contaminants?
- *When* do they enter?
- *How* do they affect amphibians?

Toxicity Study



Toxicity Study



Toxicity Study

- Azoxystrobin toxicity:
 - Tadpoles: 0.5mg/L (Johanssen et al. 2005), No toxicity (Belden et al. 2009)
- Freshwater Fish Acute Toxicity (EPA Fact Sheet)
 - Rainbow Trout LC50=0.47 ppm, Highly toxic
 - Bluegill LC50=1.1 ppm, Moderately toxic

Belden, J., McMurry, S., Smith, L. and Reilley, P. (2010), Acute toxicity of fungicide formulations to amphibians at environmentally relevant concentrations. *Environmental Toxicology and Chemistry*, 29: 2477–2480. doi:10.1002/etc.297

Johansson, M., Piha, H., Kylin, H. and Merilä, J. (2006), Toxicity of six pesticides to common frog (*Rana temporaria*) tadpoles. *Environmental Toxicology and Chemistry*, 25: 3164–3170. doi:10.1897/05-685R1.1

Toxicity Study

- 115L
- 12 tadpoles
- Treatment Levels
 - 0 $\mu\text{g/L}$
 - 1.5 $\mu\text{g/L}$ (avg)
 - 15 $\mu\text{g/L}$ (max)
- 2 replicates



Toxicity Study

- Time to metamorphosis
- Growth abnormalities
- Skin lesions
- Repeat in spring with *Psuedacris triseriata*



Expected Benefits

- Identify wetlands that could benefit from increased buffer
- Understand the potential impacts to amphibians of agrichemical application
- Inform landowners and land managers about timing of applications

Acknowledgements



Ted LaGrange, NGPC
Bryan Woodbury, USDA
Craig Allen, USGS
Dan Snow, UNL
Loren Giesler, UNL





Questions?